VIRGINIA ECOLOGICAL SERVICES STRATEGIC PLAN 2010 - 2014

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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 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 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 Planning

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

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 offer 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 (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, who can help Ecological Services address the problem) 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 and 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 which 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	X	X	X	Add priority area
Virginia round-leaf birch				Do not add priority area - already encompassed by other priority areas, on U.S. Forest Service (USFS) lands
Virginia spiraea				Do not add priority area – brink of recovery species
James spinymussel	X	X	X	Add remaining Virginia distribution as priority area
Northeastern beach tiger beetle			X	Add remaining Virginia distribution as priority area – work with Corps to increase recovery prospects
Roanoke logperch	X	X	X	Add remaining Virginia distribution as priority area

Priority	EC Focus	PFW Focus	ES/CPA Focus	Comments
Virginia sneezeweed				Do not add priority area – see if Missouri will take the lead
Shale barren rock-cress				Do not add priority area – partially encompassed by other priority areas mostly on USFS lands
Sensitive joint-vetch				Do not add priority area – sea level rise, already on NWR lands, not a lot more we can do
Shenandoah salamander				Do not add priority area – completely on National Park Service lands
Virginia fringed mountain snail				Do not add priority area – low prospect for recovery
Peter's mountain mallow				Do not add priority area – 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 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 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. The result was the following 12 priorities areas:

Blackwater River Watershed (PFW Focus) – This watershed contains 80+ priority migratory bird species, several fish species of conservation concern, 1 listed species, and several species of concern. It is an important headwater to the Albemarle and Pamlico Sounds. Through 2011, 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 longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with over 20 partners in America'sLongleaf: 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).

Clinch and Powell Rivers Watershed – This watershed has 30+ federal listed, proposed, and candidate species, many of which are also fish 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). The Upper Tennessee River Basin in southwestern Virginia is at the epicenter of one of six areas that TNC, using a "rarity-weighted richness index," has identified as biodiversity hotspots in the U.S. (Stein et al. 2000). Our goal is to protect and recover these species and maintain and restore the habitats upon which they depend.

Eastern Shore – This area has 95 priority migratory bird species, several fish species of conservation concern, and 11 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.

Great Dismal Swamp National Wildlife Refuge (PFW and EC Focus) – This area has 60+ priority migratory bird species, several fish species of conservation concern, and 1 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. Through 2011, 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.

Holston River Watershed - This watershed has 25 federal listed, proposed, and candidate species, many of which are also fish 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. The Upper Tennessee River Basin in southwestern Virginia is at the epicenter of one of six areas that TNC, using a "rarity-weighted richness index," has identified as biodiversity hotspots in the U.S. (Stein et al. 2000). Our goal is to protect and recover these species and maintain and restore the habitats upon which they depend.

James Spinymussel – This species is federally listed as endangered; its extant range is West Virginia, Virginia, and North Carolina with the majority occurring in Virginia. Through 2011, 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 protect/restore habitat and water quality for the James spinymussel and other Atlantic slope freshwater mussels to aid in recovery and conservation efforts.

Madison Cave Isopod – 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 best management practices (BMP) for landowners/project proponents and subsequent implementation by working with localities.

Northeastern Beach Tiger Beetle – 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.

Nottoway River Watershed – This watershed contains 50+ priority migratory bird species, several fish species of conservation concern, 6 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 restore/protect habitat for federally listed species, aquatic species of conservation concern, and priority migratory birds.

Rappahannock River Valley National Wildlife Refuge (EC Focus) – This NWR contains 100+ priority migratory bird species, several fish species of conservation concern, and several listed species/species of concern. The Rappahannock River is a spawning and nursery area for striped bass, American shad, blueback herring, and alewife. It is also an important nursery area for American eel. Our goal is to assess the effects of endocrine disrupting chemicals to fish and aquatic dependent and piscivorus species, such as bald eagles and wading birds, in support of the NWR.

Roanoke Logperch – 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, augment populations, conduct reintroductions, and accomplish other recovery actions.

Upper James River Watershed – This watershed contains 30+ priority migratory bird species, several fish species of conservation concern, 8 listed species, and 50+ species of concern. This watershed is an important headwater and the largest tributary to the Chesapeake Bay in Virginia. Through 2011, 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 protect/restore habitat and water quality for the James spinymussel and aquatic species of concern and protect/restore habitat for priority migratory birds.

Map Development

The preliminary map (Appendix 1) was revised to reflect the 12 priority areas in a final map (Appendix 2). The boundary of each priority area was determined as follows.

The six priority areas identified by watershed were mapped based on the associated 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.
- Upper James River Watershed - boundaries defined by the extent of HUC 02080201.

The two priority areas identified by NWR were mapped based upon 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 four priority areas identified by species were mapped as follows:

- James Spinymussel – boundaries defined by 10-digit HUCs where the species is known to occur; Virginia Department of Game and Inland Fisheries (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 10-digit HUCs where the species is known to occur; VDGIF and VDCR-DNH databases were used to delineate known species occurrences.

<u>Supporting Species List Development</u>

For each of the eight 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 four priority areas identified by species, supporting species lists were not developed since these areas are defined by listed species occurrence data 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 are those 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# - 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 ESA, 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.

Threats Assessment Development

After the 12 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 eight priority areas identified by watershed/NWR and (2) identify, characterize, and prioritize threats to a specific species (James spinymussel, Madison Cave isopod, northeastern beach tiger beetle, Roanoke logperch) in the four 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, who can help Ecological Services address the problem. 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 the results. We agreed that within each of the 12 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 Tables

SHC planning tables were developed for each priority area (Appendix 6). The SHC planning tables indicate how we will address each high level threat in each priority area through biological planning, conservation design, conservation delivery, monitoring, and research over the life of this plan. Specific conservation actions completed, planned, and contemplated are outlined. Additionally, some key activities will take place outside of priority areas, these activities are captured in a separate table in Appendix 6.

Virginia Ecological Services – Strategic Plan

Approach

Virginia Ecological Services will focus our personnel and financial resources in the 12 priority areas indicated on the map in Appendix 2 to obtain a more 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 the SHC planning tables (Appendix 6). At times we will be working on species/issues outside the priority areas. However, 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 the SHC planning tables (Appendix 6).
- Make known to our internal and external partners/stakeholders where priority 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 that our focus remains on addressing high level threats in priority areas.

Inter-Program Coordination

To be effective in our efforts to address our highest priories, 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 areas, as described below. Specific actions are identified in the SHC planning tables (Appendix 6).

SVFO ES Program - Consultation

SVFO ES staff 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 highest level of scrutiny and Service involvement to maximally reduce threats and 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 staff and VAFO ES staff will coordinate to ensure consistency.

SVFO ES Program - Recovery

SVFO ES staff will lead efforts in the Clinch and Powell Rivers Watershed and Holston River Watershed priority 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 staff will continue to work with VAFO EC staff 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 staff will work with VAFO ES staff, as needed, to accomplish recovery activities related to high level threats in other priority areas.

VAFO CPA Program/VAFO ES Program - Consultation

VAFO ES staff will provide consultation throughout Virginia. The web-based 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 web-based 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 highest level of scrutiny and Service involvement to maximally reduce threats and 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. Within CPA, staff will become involved in projects/issues/activities that relate to priority areas and high level threats.

VAFO ES Program - Recovery

VAFO ES staff will lead efforts to identify, foster, and carry out recovery activities that will ameliorate high level threats in each of the priority areas in which the Program has a role. For the Clinch and Powell Rivers Watershed and Holston River Watershed priority areas, VAFO ES staff will coordinate with SVFO ES staff to aid in developing a mutual understanding of the high priority actions to be undertaken in those areas so these priorities can be addressed cooperatively when opportunities arise.

VAFO EC Program

VAFO EC staff 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 Total Maximum Daily Load (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.

In the Upper James River, Holston, and Clinch and Powell Rivers Watersheds and Roanoke Logperch priority areas conduct permit reviews to lessen pollutant impacts. In the Upper James River Watershed work with the local Resource Conservation and Development program, TNC, and James River Association for protection of waterbodies through water use planning and management. In the Roanoke Logperch priority area continue working with VDEQ on the development and implementation of the TMDL for PCBs in the Roanoke River. In the Clinch and Powell Rivers Watershed, work with VDEQ and VDCR as they develop and implement regulations, set pollutant limits and BMPs to reduce overall contaminant, nutrient, and sediment releases; and work with state regulatory agencies to develop and implement measures to protect species and habitat from effects of mining-related run-off and discharges. VAFO EC staff will support SVFO ES staff 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 the 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.

<u>VAFO PFW Program</u>

VAFO PFW staff will: Eastern Shore – (1) 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 and (2) provide technical review to U.S. Department of Agriculture's Natural Resource Conservation Service for BMP Standards and Specifications. 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 – Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal in locations jointly determined, especially where habitat corridors can be linked; the Roanoke logperch and the same species of migratory birds are conserved through PFW staff and financial commitments in other priority areas; therefore the same emphasis will not be provided in this priority area. 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. Upper James River Watershed – Work with private landowners and other partners to obtain funds to implement stream restoration. 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. The conservation of these same listed species is achieved through PFW staff and financial commitments in the Clinch and Powell Rivers Watershed; due to program limitations, the same 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 staff to obtain funds and implement habitat restoration and protection in locations jointly determined. Madison Cave Isopod – Work with VAFO ES staff and conservation partners to obtain funds to restore and protect habitat; due to PFW staff limitations this species will not be a priority for the Program. 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.

Partner/Stakeholder Involvement

An outline of this strategic plan was shared with other Service Station Supervisors/Mangers in March 2010 and with select members of EPA, NMFS, Corps, and VDEQ in June 2010. We plan to share this plan with additional partners and stakeholders listed in Appendix 8 in 2011, providing them an opportunity for review and comment.

Literature Cited

Atlantic Coast Joint Venture and Partners in Flight Initiative. 2010. Bird Conservation Regions. [Internet]. [cited February 22, 2010]. Available from: http://www.acjv.org/bird_conservation_regions.htm.

Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe. Arlington, Virginia [cited March 9, 2010]. Available from: http://www.natureserve.org/explorer.

North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. Raleigh, North Carolina. Available from: http://www.ncwildlife.org/Plan/WSC_WAP_Downloads.htm.

Regional Working Group for America's Longleaf. 2009. Rangewide Conservation Plan for Longleaf Pine. [Internet]. www.americaslongleaf.org. Available from: http://americaslongleaf.org/resources/the-conservation-plan/Conservation%20Plan.pdf.

Stein, B.A., L.S. Kutner, and J.S. Adams (eds). 2000. Precious Heritage: The Status of Biodiversity in the United States. Oxford University Press, New York.

The Nature Conservancy. 2009. The Nature Conservancy's watershed approach to compensation planning for the Virginia Aquatic Restoration Trust Fund. Charlottesville, Virginia.

U.S. Fish and Wildlife Service. 1992. Roanoke logperch (*Percina rex*) recovery plan. Newton Corner, Massachusetts.

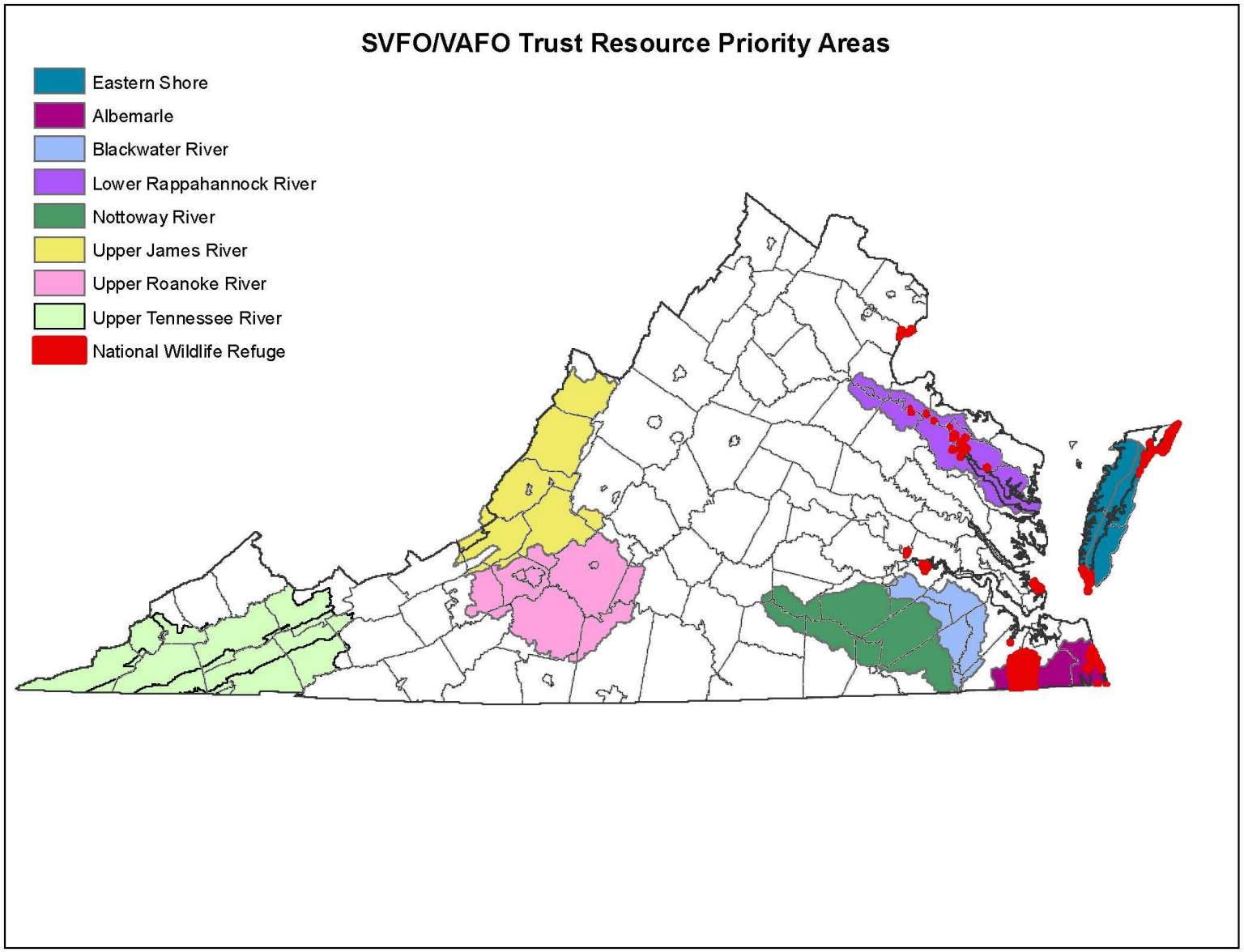
U.S. Fish and Wildlife Service. 2007. U.S. Fish and Wildlife Service's Northeast Region Strategic Plan Fiscal Year 2007-2011, Partners for Fish and Wildlife/Coastal Program. Hadley, Massachusetts. Available from: http://www.fws.gov/northeast/coastal/pdfs/Final.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. [Internet]. Arlington, Virginia [cited February 22, 2010]. Available from: http://library.fws.gov/Bird_Publications/BCC2008.pdf.

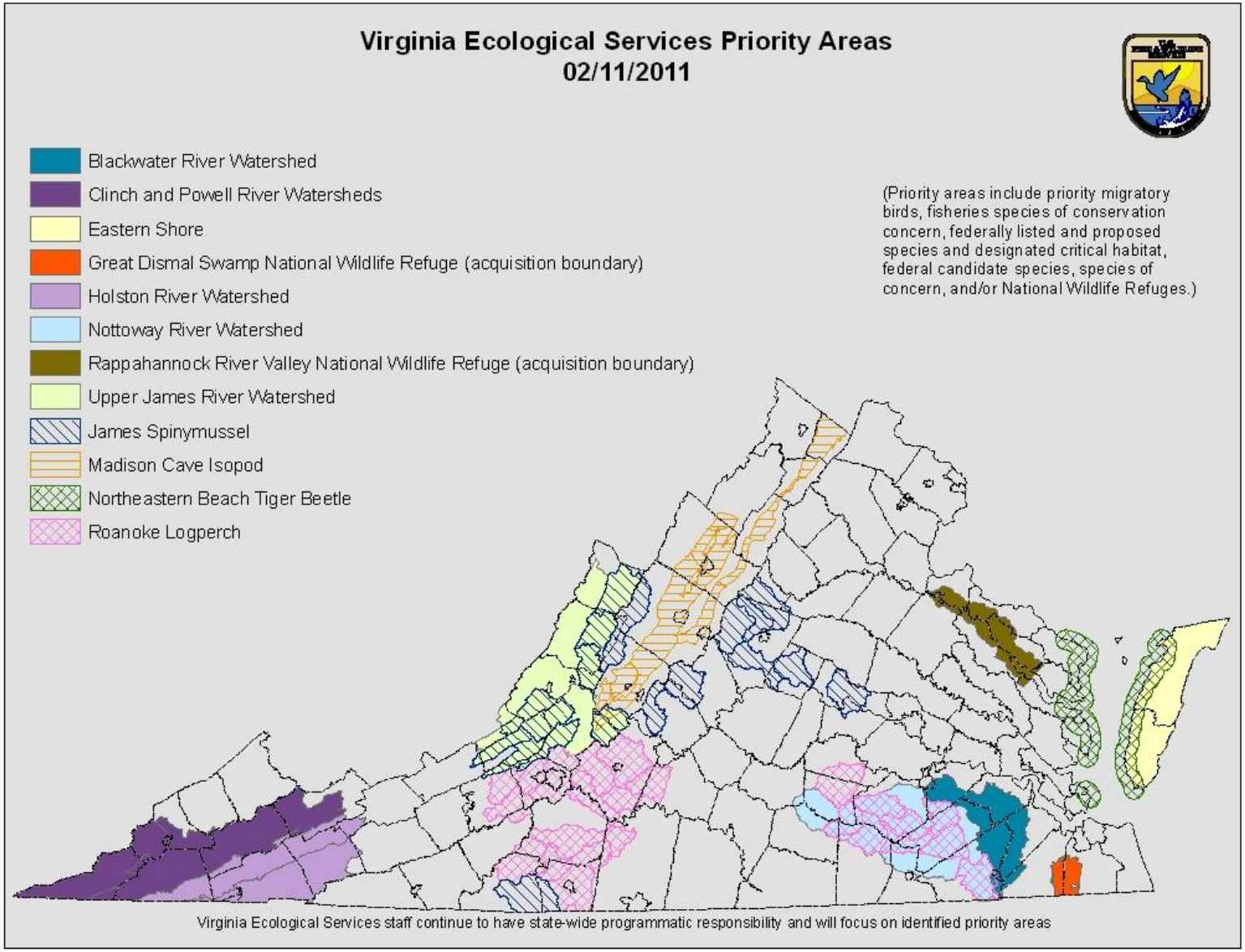
U.S. Fish and Wildlife Service. 2009. U.S. Fish and Wildlife Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013. Hadley, Massachusetts. Available from: http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf.

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.

APPENDIX 1 – PRELIMINARY MAP OF PRIORITY AREAS


SVFO/VAFO Trust Resource Priority Areas
Eastern Shore
Albemarle
Blackwater River
Lower Rappahannock River
Nottoway River
Upper James River
Upper Roanoke River
Upper Tennessee River
National Wildlife Refuge

APPENDIX 2 – FINAL MAP OF PRIORITY AREAS


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 Spinymussel
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 3 – SUPPORTING SPECIES LISTS FOR PRIORITY AREAS

Blackwater River Watershed Priority Migratory Bird Species

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

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]	*Picoides borealis*

Species of Concern

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

[1]VDGIF VaFWIS database (http://vafwis.org).
[2]VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
[3]The 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.

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

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

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

Threatened

Common Name	Scientific Name
Blackside dace[1 2]	*Phoxinus cumberlandensis*
Slender chub[1 2]	*Erimystax cahni*
Small whorled pogonia[2]	*Isotria medeoloides*
Virginia spiraea[1 2]	*Spiraea virginiana*
Yellowfin madtom[1 2]	*Noturus flavipinnis*

Proposed Endangered

Common Name	Scientific Name
Rayed bean[1 4]	*Villosa fabalis*
Sheepnose[1 2]	*Plethobasus cyphyus*
Snuffbox[1 2]	*Epioblasma triquetra*
Spectaclecase[1 2]	*Cumberlandia monodonta*

Candidate

Common Name	Scientific Name

Fluted kidneyshell[1] [2]	*Ptychobranchus subtentum*
Slabside pearlymussel[1] [2]	*Lexingtonia dolabelloides*

Critical Habitat

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

Species of Concern

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

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

Yarrow-leaved ragwort[2]	*Packera millefolia*	G2

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

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	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
American shad	*Alosa sapidissima*
Atlantic sturgeon	*Acipenser oxyrinchus*
Blueback herring	*Alosa aestivalis*
Gizzard shad	*Dorosoma cepedianum*
Shortnose sturgeon	*Acipenser brevirostrum*
Striped bass	*Morone saxatilis*

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).

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]	*Sciurus niger cinereus*
Kemp's (Atlantic) ridley sea turtle[1]	*Lepidochelys kempii*
Leatherback sea turtle[1]	*Dermochelys coriacea*
Roseate tern[1]	*Sterna dougallii dougallii*
Shortnose sturgeon	*Acipenser brevirostrum*

Threatened

Common Name	**Scientific Name**
Green sea turtle[1]	*Chelonia mydas*
Loggerhead sea turtle[1]	*Caretta caretta*
Northeastern beach tiger beetle[1] [2]	*Cicindela dorsalis dorsalis*
Piping plover[1]	*Charadrius melodus*
Seabeach amaranth[2]	*Amaranthus pumilus*

Candidate

Common Name	**Scientific Name**
Red knot	*Calidris canutus*

Species of Concern

Common Name	**Scientific Name**	**Rank**
Creamflower tick-trefoil[2]	*Desmodium ochroleucum*	G1G2
Virginia least trillium[2]	*Trillium pusillum* var. *virginianum*	G3T2

[1]VDGIF VaFWIS database (http://vafwis.org).
[2]VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
[3]The 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#	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.

Great Dismal Swamp National Wildlife Refuge Priority Migratory Bird Species

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

Great Dismal Swamp National Wildlife Refuge Fisheries Species of Conservation Concern

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

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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]	*Picoides borealis*

Species of Concern

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

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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).
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Holston River Watershed Priority Migratory Bird Species

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

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).

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

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

Threatened

Common Name	Scientific Name
Spotfin chub[1 2]	*Erimonax monachus*
Virginia round-leaf birch[1 2]	*Betula uber*
Yellowfin madtom[2]	*Noturus flavipinnis*

Proposed Endangered

Common Name	Scientific Name
Snuffbox[1 2]	*Epioblasma triquetra*
Rayed bean[1 2 4]	*Villosa fabalis*

Candidate

Common Name	Scientific Name
Fluted kidneyshell[1 2]	*Ptychobranchus subtentum*
Slabside pearlymussel[1 2]	*Lexingtonia dolabelloides*

Critical Habitat

Common Name	Scientific Name
Spotfin chub	*Erimonax monachus*

Species of Concern

Common Name	Scientific Name	Rank[3]

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

[1]VDGIF VaFWIS database (http://vafwis.org).
[2]VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
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[4]Believed to be extirpated in Virginia.

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Nottoway River Watershed Priority Migratory Bird Species

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

Nottoway River Watershed Fisheries Species of Conservation Concern

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

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]	*Schwalbea americana*
Dwarf wedgemussel[1]	*Alasmidonta heterodon*
Michaux's sumac[2]	*Rhus michauxii*
Red-cockaded woodpecker[1]	*Picoides borealis*
Roanoke logperch[1]	*Percina rex*
Smooth coneflower [2]	*Echinacea laevigata*

Species of Concern

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

[1]Virginia Department of Game and Inland Fisheries BOVA/FWIS database (http://vafwis.org).
[2]Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
[3]The 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.

Rappahannock River Valley National Wildlife Refuge Priority Migratory Bird Species

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

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	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
American shad	*Alosa sapidissima*
Atlantic sturgeon	*Acipenser oxyrinchus*
Blueback herring	*Alosa aestivalis*
Gizzard shad	*Dorosoma cepedianum*
Hickory shad	*Alosa mediocris*
Striped bass	*Morone saxatilis*

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]	*Aeschynomene virginica*
Small whorled pogonia[4]	*Isotria medeoloides*
Swamp pink[4]	*Helonias bullata*

Species of Concern

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

[1]VDGIF VaFWIS database (http://vafwis.org).
[2]VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
[3]The 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).
[4]Rappahannock 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).

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.

Upper James River Watershed Priority Migratory Bird Species

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

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).

Upper James River Watershed Fisheries Species of Conservation Concern

Common Name	**Scientific Name**
Alewife	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
American shad	*Alosa sapidissima*
Brook trout	*Salvelinus fontinalis*
Gizzard shad	*Dorosoma cepedianum*
James spinymussel	*Pleurobema collina*
Walleye	*Sander vitreus*

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; Paul Bugas, John Copeland, and Scott Smith; VDGIF; March 22, 2010.

Notes on Species:

1. Alewife – introduced.
2. American eel – native.
3. American shad – historic.
4. Brook trout – native.
5. Gizzard shad – introduced.
6. Walleye – introduced.

Upper James River Watersheds Known or Likely Federally Listed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Gray bat[1]	*Myotis grisescens*
Indiana bat[1] [2]	*Myotis sodalis*
James spinymussel[1] [2]	*Pleurobema collina*
Northeastern bulrush[1] [2]	*Scirpus ancistrochaetus*
Shale barren rock cress[1] [2]	*Arabis serotina*
Smooth coneflower[1] [2]	*Echinacea laevigata*
Virginia big-eared bat[1] [2]	*Corynorhinus townsendii virginianus*

Threatened

Common Name	Scientific Name
Small whorled pogonia[2]	*Isotria medeoloides*

Species of Concern

Common Name	Scientific Name	Rank[3]
Addison's leatherflower[2]	*Clematis addisonii*	G2
Alleghany County cave amphipod	*Stygobromus hoffmani*	G1
An orchid	*Corallorhiza bentleyi*	G1G2
Appalachian Bewick's wren[1] [2]	*Thryomanes bewickii altus*	G5T2Q
Appalachian grizzled skipper[1] [2]	*Pyrgus wyandot*	G1G2Q
Atlantic pigtoe[1] [2]	*Fusconaia masoni*	G2
Bath County cave amphipod[2]	*Stygobromus mundus*	G2G3
Burnsville Cove cave amphipod[2]	*Stygobromus conradi*	G2G3
A cave beetle[2]	*Pseudanophthalmus gracilis*	G1G2
A cave beetle[2]	*Pseudanophthalmus pusio*	G2G3
A cave beetle[2]	*Pseudanophthalmus* sp. 8	G1
A cave centipede[2]	*Nampabius turbator*	G1G2
A cave obligate dipluran[2]	*Litocampa fieldingi*	G2G3
A cave pseudoscorpion[2]	*Apochthonius holsingeri*	G1G2
A cave pseudoscorpion[2]	*Kleptochthonius anophthalmus*	G1
A cave spider[2]	*Islandiana muma*	G1G2
A cave springtail[2]	*Arrhopalites caedus*	G1G2
A cave springtail[2]	*Arrhopalites carolynae*	G2G3
A cave springtail[2]	*Arrhopalites lacuna*	G1G2
A cave springtail[2]	*Arrhopalites sacer*	G1G2
A cave springtail[2]	*Arrhopalites silvus*	G1G2
A cave springtail[2]	*Schaefferia hubbardi*	G1G2
Crossroads cave beetle[2]	*Pseudanophthalmus intersectus*	G1G2
Kankakee globe-mallow[2]	*Iliamna remota*	G1Q
Maryland glyph[2]	*Glyphyalinia raderi*	G2
Maureen's shale stream beetle[2]	*Hydraena maureenae*	G2
Mcgraw Gap xystodesmid[2]	*Nannaria ericacea*	G2

Millboro leatherflower[2]	*Clematis viticaulis*	G2
A millipede[2]	*Brachoria separanda calcaria*	G2T2
A millipede[2]	*Rudiloria trimaculata tortua*	G5T2
Montgomery County cave amphipod[2]	*Stygobromus fergusoni*	G2G3
Morrison's Cave amphipod[2]	*Stygobromus morrisoni*	G2G3
Natural Bridge cave beetle[2]	*Pseudanophthalmus pontis*	G1
Natural Bridge cave isopod[2]	*Caecidotea bowmani*	G1G2
Nelson's cave beetle[2]	*Pseudanophthalmus nelsoni*	G1G2
New Castle Murder Hole amphipod[2]	*Stygobromus interitus*	G1G2
Orangefin madtom[1 2]	*Noturus gilberti*	G2
Peaks of Otter salamander[1 2]	*Plethodon hubrichti*	G2
Piratebush[2]	*Buckleya distichophylla*	G2
Rockbridge County cave amphipod[2]	*Stygobromus baroodyi*	G2G3
Roughhead shiner[1 2]	*Notropis semperasper*	G2G3
Shaggy coil[1 2]	*Helicodiscus diadema*	G1
Sword-leaved phlox[2]	*Phlox buckleyi*	G2
Talus coil[2]	*Helicodiscus triodus*	G2
Tawny crescent[2]	*Phyciodes batesii batesii*	G4T1
Tennessee pondweed[2]	*Potamogeton tennesseensis*	G2
Venetia millipede[2]	*Conotyla venetia*	G2
Virginia springsnail[2]	*Fontigens morrisoni*	G1
White alumroot[2]	*Heuchera alba*	G2Q
Yellow lance[1 2]	*Elliptio lanceolata*	G2G3
Yellow stoneroot borer moth[2]	*Papaipema astuta*	G2G3

[1]VDGIF VaFWIS database (http://vafwis.org).
[2]VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).
[3]The 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.

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, run-off, 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, run-off, 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

*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 may 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.

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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 may 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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**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.

UPPER JAMES RIVER WATERSHED 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; conduct public outreach with landowners;	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, ES, Fisheries
habitat loss/ degradation/ fragmentation	contaminants	spills	H	all species	spill prevention/planning, respond to spills; work with others on training for spill response	EC, CPA, ES, VDEQ, EPA, Fisheries
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, USFS, Fisheries
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	H	all species	work with VDEQ and USGS on water supply planning to include trust resource needs; restore habitat/protect lands	VDEQ, USGS, ES, USFS, PFW, Coastal Program, TNC, Fisheries
demographic constraints	genetics, isolated populations, small population size, etc.	dams - large	H	aquatics	remove dams or modify for fish passage, change operations,	ES, PFW, Coastal Program, Appalachian Coordinator, NRCS, dam owners, VDEQ,
demographic constraints	genetics, isolated populations, small population size, etc.	spills	H	aquatics	spill prevention/planning; respond to spills; work with others on training for spill response; work w UJRC&D engage in spill training locally	EC, CPA, ES, NWRS, VDGIF, VDEQ, EPA,
demographic constraints	genetics, isolated populations, small population size, etc.	low reproductive viability in existing patchy habitat	H	James spinymussel	restore habitat/protect lands work w landowners and UJRRC&D; connectivity/corridors; permit reviews; investigate level of threat; conduct PVA; determine if captive propagation is appropriate	Coastal Program, NAWCA, PFW, ES, NRCS, CPA, Fisheries, VDGIF
non-native/ problematic native species and diseases	intentionally left blank	climate change	H	all species	implement appropriate control measures; planning; habitat restoration; public outreach/education; monitoring for disease and invasive outbreaks; identify problem species and vectors	PFW, EC, NWRS, USDA-APHIS, VDACS, VDGIF, localities, TNC, USFS, USGS, Fisheries

habitat loss/ degradation/ fragmentation	hydrologic alterations	deforestation	M	migratory birds, fish, listed species	land protection; conduct public outreach with landowners; restore forests; facilitate acquisition of timber rights	ES, PFW, TNC, Coastal Program, NOAA, NAWCA, USFS, VDOF, Fisheries
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer/biosolids application	M	aquatics	work with VDEQ on regulations; work with NRCS/VCDR on standards and specs; restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs; EC special studies	EC, TNC, Chesapeake Bay Foundation, PFW, NRCS, SWCD, VDEQ, VCDR, Fisheries
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; work w UJRC&D	ES, localities, CPA, industry, VDEQ, VDGIF, TNC, NGOs, USFS, NPS, VSCC, FERC
demographic constraints	genetics, isolated populations, small population size, etc.	wind power development	M	migratory birds, bats	conduct research on effects of turbines to birds and bats; develop HCPs; permit review; land protection; public outreach to localities	landowners, ES, PFW, CPA, VDGIF, VDEQ, TNC, Migratory Birds, USGS, industry, SCC, localities
demographic constraints	genetics, isolated populations, small population size, etc.	nutrient loading, sedimentation, contaminants from agriculture, forestry, wastewater treatment plants	M	aquatics	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ decisions to promote connectivity; work with VDEQ on wastewater treatment permit review; permit review; EC special studies; planning; education/ public outreach; work w UJRC&D	Coastal Program, VDEQ, VCDR, NOAA, NAWCA, PFW, ES, NWRS, NRCS, VDGIF
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 to the public, govt agencies, biologists; monitoring to identify outbreaks; create a response team/task force	CPA, ES, PFW, Coastal Program, Fisheries, EC, VDGIF, VDCR, VDACS, VDOT, USDA, localities, TNC, USFS
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill (instream and associated wetlands)	L	migratory birds, fish, listed species	land protection; conduct public outreach with landowners; restore wetlands and streams; permit review	ES, PFW, CPA, TNC, RC&D, SWCD, Coastal Program, NAWCA, Fisheries
habitat loss/ degradation/ fragmentation	hydrologic alterations	agricultural water withdrawal	L	migratory birds, fish, listed species	land protection; restore wetlands and streams; conduct public outreach with landowners	NRCS, SWCD, PFW, TNC, NAWCA, Fisheries
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; conduct public outreach with landowners;	CPA, VDEQ, ES, Fisheries

habitat loss/ degradation/ fragmentation	hydrologic alterations	dams (existing - operation and maintenance, removal; new - proposed)	L	migratory birds, fish, listed species	removal of dams; permit review for proposed and existing dams; review for FERC relicensing	PFW, CPA, FERC, Corps, TNC, VDEQ, VMRC, NRCS, ES, American Rivers, FishAmerica, VDGIF, Fisheries
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches/tile drains	L	migratory birds, fish, listed species	restore wetlands; work with NRCS; land protection; conduct public outreach with landowners	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, NRCS, VDGIF, Fisheries
habitat loss/ degradation/ fragmentation	hydrologic alterations	forestry runoff	L	all species	work with USFS and VDOF on BMP implementation; restore forests	Coastal Program, USFS, NOAA, NAWCA, PFW, TNC, NRCS, VDOF, ES, Fisheries
habitat loss/ degradation/ fragmentation	hydrologic alterations	construction/land disturbance	L	all species	support E&S regulations; develop enhanced E&S control; work with localities; change buffer regulations; permit reviews/section 7	ES, CPA, VDCR, localities
habitat loss/ degradation/ fragmentation	nutrient loading	aging septic systems/straight pipes	L	aquatics	work with VDEQ	EC, RC&Ds, VDEQ, Fisheries
habitat loss/ degradation/ fragmentation	nutrient loading	livestock	L	aquatics	restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	VDEQ, VDCR, Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC, Fisheries
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	VCDR, EC, PFW, VDEQ, USDA, SWCD, Fisheries
habitat loss/ degradation/ fragmentation	contaminants	forestry runoff/ pesticides	L	all species	buffer restoration and protection work with VDACS, VDOF, USFS; section 7 consultation for gypsy moth treatment	USFS, PFW, NRCS, SWCD, EC, VDACS, VDOF, Fisheries
habitat loss/ degradation/ fragmentation	contaminants	air pollution (including mercury, acid deposition)	L	all species	EC special study to assess the level of threat; promote carbon sequestration; conduct VADEQ air permit reviews/section 7	EC, PFW, CPA, ES, VDEQ, Fisheries, USFS
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; work with VDEQ on discharge permit reviews/section 7	EPA, VDEQ, ES, EC, Fisheries

habitat loss/ degradation/ fragmentation	upland habitat conversion/ alteration	silviculture	L	all species	work with USFS, VDOF, NRCS to restore forests and strategically reduce fragmentation; participate in Upper James River RC&D; work with localities on comprehensive planning, zoning, etc.	USFS, RC&D, localities, TNC, ES, PFW, Appalachian Coordinator, VDOF, NRCS
habitat loss/ degradation/ fragmentation	upland habitat conversion (permanent)	deforestation	L	all species	work with USFS, VDOF, NRCS to restore forests and strategically reduce fragmentation; participate in Upper James River RC&D; work with localities on comprehensive planning, zoning, etc.	USFS, RC&D, localities, TNC, ES, PFW, Appalachian Coordinator, VDOF, NRCS
demographic constraints	genetics, isolated populations, small population size, etc.	dams - small	L	aquatics	remove dams or modify for fish passage	PFW, Coastal Program, Appalachian Coordinator
demographic constraints	genetics, isolated populations, small population size, etc.	highway development/ maintenance	L	all species	appropriate culvert sizing and placement for fish passage; ford maintenance; Corps permit review; investigate if roadside spraying is a threat; road underpasses; recommend bridges vs culverts/fill	CPA, VDOT, PFW, Coastal, ES, EC, Corps, Appalachian Coordinator, Fisheries
demographic constraints	genetics, isolated populations, small population size, etc.	residential/ commercial development	L	all species	work with VDEQ on reporting requirements/ permitting thresholds for water withdrawal; land protection; encourage local zoning; permit review; review county water supply plans; work with counties to leave corridors intact ; public outreach and work w UJRRC&D	Coastal Program, NAWCA, PFW, ES, NWRS, NRCS, CPA, VDEQ, localities
non-native/ problematic native species and diseases	intentionally left blank	habitat disturbance (forestry, development, agriculture, etc.)	L	all species	implement appropriate control measures; planning; habitat restoration; outreach/ education; monitoring for outbreaks; comment on permits	PFW, EC, NWRS, VDGIF, localities, USFS, USDA, VDOF, CPA, VDACS, VDOT
non-native/ problematic native species and diseases	intentionally left blank	pollution - e.g., biosolids, Hg (e.g., immune response effects, reduced fitness)	L	all species	EC special studies; habitat restoration; work with regulatory agencies; permit review of biosolid application, coal fired plants	USGS, USDA, USFS, localities, PFW, EC, VDEQ, EPA, CPA
habitat loss/ degradation/ fragmentation	contaminants	Marcellus shale extraction	unknown at this time	unknown at this time	unknown at this time	unknown at this time

*Includes impacts 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.

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

*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

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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.

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

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

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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.

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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; 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	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 invasive; evaluate stressor	PFW, Coastal Program, NRCS, VDGIF, ES, LCCs, TNC, Fisheries

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

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

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

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

UPPER JAMES 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; conduct public outreach with landowners	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, ES, Fisheries
habitat loss/ degradation/ fragmentation	contaminants	spills	all species	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, VDEQ, EPA, Fisheries
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	NWRS, NOAA, NAWCA, all, NRCS, TNC, USFS, Fisheries
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	all species	work with VDEQ and USGS on water supply planning to include trust resource needs; restore habitat/protect lands	VDEQ, USGS, ES, USFS, PFW, Coastal Program, TNC, Fisheries
demographic constraints	genetics, isolated populations, small population size, etc.	dams - large	aquatics	remove dams or modify for fish passage; change operations	ES, PFW, Coastal Program, Appalachian Coordinator, NRCS, dam owners, VDEQ
demographic constraints	genetics, isolated populations, small population size, etc.	spills	aquatics	spill prevention/planning; respond to spills; work with others on training for spill response; work with RC&D; engage in spill training locally	EC, CPA, ES, NWRS, VDGIF, VDEQ, EPA
demographic constraints	genetics, isolated populations, small population size, etc.	low reproductive viability in existing patchy habitat	James spinymussel	restore habitat/protect lands; work with landowners and RC&D; connectivity/corridors; permit reviews; investigate level of threat; conduct PVA; determine if captive propagation is appropriate	Coastal Program, NAWCA, PFW, ES, NRCS, CPA, Fisheries, VDGIF
non-native/ problematic native species and diseases	intentionally left blank	climate change	all species	implement appropriate control measures; planning; habitat restoration; public outreach/education; monitoring for disease and invasive outbreaks; identify problem species and vectors	PFW, EC, NWRS, USDA-APHIS, VDACS, VDGIF, localities, TNC, USFS, USGS, Fisheries

*Assessment includes impacts 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.

APPENDIX 6 – STRATEGIC HABITAT CONSERVATION PLANNING TABLES FOR PRIORITY AREAS + KEY ACTIVITIES OUTSIDE PRIORITY AREAS

Blackwater River Watershed Priority Area Strategic Habitat Conservation Planning Table

		Key Community/Species	
		Longleaf Pine Community	**Red-cockaded Woodpecker**
Priority Area Boundaries		Defined by the extent of HUC 03010202.	
Notes		Blackwater River Watershed is Important headwaters to Albemarle Pamlico Sounds. Longleaf pine (LLP) restoration goals are part of a long-term federal, state, and non-profit effort to restore LLP savannah and its dependant species to a portion of what was once 1 million acres of LLP in Virginia.	Blackwater River Watershed is Important headwaters to Albemarle Pamlico Sounds. Endemic to open, mature and old growth pine ecosystems in the southeastern U.S. Estimated 14,068 red-cockaded woodpeckers living in 5,627 known active clusters across 11 states (Service 2003). Virginia is at northern extent of species range. Species extant in 2 counties in Virginia.
Other Species that Benefit from Conservation Actions taken for this Community/Species		This watershed contains 80+ priority migratory bird species, several fish species of conservation concern, one listed species, and several species of concern. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.	
Biological Planning	Relevant documents	• 2009 Rangewide Conservation Plan for Longleaf Pine. • 2001 Partners in Flight Bird Conservation Plan for South Atlantic Coastal Plain Bird Conservation Regions. • 1999 Partners in Flight Bird Conservation Plan for Mid Atlantic Coastal Plain. • 2005 South Atlantic Migratory Bird Initiative Implementation Plan.	<u>Recovery Plans</u> • 2003 Red-cockaded woodpecker <u>5-year Reviews</u> • 2006 Red-cockaded woodpecker <u>Other</u> • 2009 Rangewide Conservation Plan for Longleaf Pine.
	High level threats	<u>High level threats</u> • Habitat loss/degradation/fragmentation resulting from instream flow-alterations; contaminants; shifts in native communities/species composition, including non-natives; human migration/relocation; increased drought/increased rainfall; change in instream temperatures. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Non-native/problematic native species. • Disease.	
	Conservation actions	FY12 - PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia. DUE – 9/30/12. Cost – staff time.	FY12 - PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia. DUE – 9/30/12. Cost – staff time.

Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> The 15-year goal for the 2009 Rangewide Conservation Plan for Longleaf Pine is to increase LLP acreage from 3.4 to 8 million acres, with half of this acreage targeted in the 16 range-wide "Significant Landscapes" (identified in Appendix B of the Plan) to support a majority of ecological and species' needs. The remaining acreage will be either in Significant Landscape sites or distributed across the range. The goal for the 2005 South Atlantic Migratory Bird Initiative Implementation Plan is to increase LLP acreage from 1,500,047 to over 2,200,069 and improve conditions favoring warm season grass ground cover on at least 650,020 acres by year 2025. Maintenance and/or restoration of large tracts of bottomland hardwood forests and fire-maintained pine savannah are key over-arching goals. <u>Virginia Contribution</u> Virginia Ecological Services goal is to restore longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with over 20 partners. Work is being conducted through 2011 under the Service's Northeast Region Strategic Plan Fiscal Year 2007-2011, Partners for Fish and Wildlife/Coastal Program.	<u>Conservation Goal</u> Red-cockaded Woodpecker Recovery Plan: Virginia portion necessary for delisting: one stable or increasing population containing at least 100 potential breeding groups (110 to 140 active clusters) in northeastern North Carolina and southeastern Virginia, and these populations are not dependent on continuing artificial cavity installation to remain at or above this population size. Red-cockaded Woodpecker 5-Year Review: Aggressive and effective prescribed burning programs, installation of artificial cavities until forests are old enough to provide sufficient numbers of potential cavity trees, and translocation of birds to the many small, at-risk (of extirpation) populations required to satisfy recovery criteria. The federal and state (and select private land) land base has been identified and is sufficient to recover the species, and much of the habitat is currently available. However, many tens of thousands of acres require restoration and improvement prior to establishing red-cockaded woodpecker territories. <u>Virginia Contribution</u> Virginia Ecological Services goal is to restore longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with over 20 partners. Work is being conducted through 2011 under the Service's Northeast Region Strategic Plan Fiscal Year 2007-2011, Partners for Fish and Wildlife/Coastal Program.
	Conservation actions	FY12 - PFW and partners will coordinate with SE Longleaf Pine Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast. DUE – 9/30/12. COST – staff time. FY13 - PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range. DUE – 9/30/13. COST – staff time.	FY12 - PFW and partners will coordinate with SE Longleaf Pine Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast. DUE – 9/30/12. COST – staff time. FY13 - PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range. DUE – 9/30/13. COST – staff time.
Conservation	Implementation of on-	Actions to address high level threats of habitat loss/degradation/fragmentation, demographic constraints, non-	

Delivery	the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	native/problematic native species, and disease due to climate change, agriculture/forestry, low reproductive viability in existing patchy habitat, habitat disturbance, mercury: establish habitat corridors; restore habitat/protect lands; restore wetlands; landowner outreach/education.	
	Conservation actions	FY10 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/10. COST – staff time. FY11 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/11. COST – staff time. FY11-12 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. Review VPDES permits, pesticide application, landfill and biosolids application projects in the watershed, as appropriate. DUE – on-going. COST – staff time. FY11-13 - 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) and pesticides. DUE – on-going. COST – staff time. FY11-13 - Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones). DUE – on-going. COST – staff time. FY14 - PFW and partners will develop 25-year acreage goal for LLP habitat restoration in Virginia. DUE – 9/30/14. COST – staff time.	FY10 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/10. COST – staff time. FY11 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/11. COST – staff time. FY14 - PFW and partners will develop 25-year acreage goal for LLP habitat restoration in Virginia. DUE – 9/30/14. COST – staff time.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>	<u>Existing Plans</u>

	Conservation actions	FY10-14 - PFW and partners will monitor the survival of LLP plantings. DUE – on-going. COST – staff time.	FY10-14 - PFW and partners will monitor the survival of LLP plantings. DUE – on-going. COST – staff time.

Clinch and Powell Rivers Watershed Priority Area Strategic Habitat Conservation Planning Table

		Key Community	
		Aquatic Community: 28 endangered, threatened, proposed, and candidate mussel and fish species and designated critical habitat for 6 species. Of these, 26 are also Fisheries Species of Conservation Concern.	**Karst Community**: endangered species, including gray bat, Indiana bat, Virginia big-eared bat, Lee County cave isopod.
Priority Area Boundaries		Defined by the extent of HUCs 06010206 and 06010205, which includes the upper Clinch and Powell rivers watershed in Virginia.	
Notes		The Clinch and Powell Rivers Watershed is recognized by the Service, TNC, and others as a globally significant area and a major national hotspot of biodiversity. All key species of concern within the aquatic community require free-flowing stream habitats with good water quality and substrates not impacted by excessive sedimentation.	The Clinch and Powell Rivers Watershed is recognized by the Service, TNC, and others as a globally significant area and a major national hotspot of biodiversity. All key species of concern within the karst community require specific microclimate conditions. The endangered bats require specific temperature regimes and cave habitats that are protected from disturbance. The Lee County cave isopod requires good subsurface water quality and cave stream habitat protected from disturbance.
Other Species that Benefit from Conservation Actions taken for this Community		7 additional endangered and threatened species (4 of which are species within the karst community); 78 species of concern (ranked critically imperiled or imperiled); 4 fisheries species of conservation concern (not already considered as listed and candidate aquatic species); 31 priority migratory bird species. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.	31 additional endangered, threatened, and candidate species (many of which are species within the aquatic community); 4 fisheries species of conservation concern (not already considered as listed and candidate aquatic species); 78 species of concern (ranked critically imperiled or imperiled); 31 priority migratory bird species. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.
Biological Planning	Relevant documents	<u>Recovery Plans</u> • 1984 Appalachian Monkeyface Pearly Mussel • 1984 Birdwing Pearlymussel • 1991 Cracking Pearlymussel • 1984 Cumberland Bean • 1984 Cumberland Monkeyface Pearlymussel • 2004 Cumberland Elktoe, Oyster Mussel, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot • 1984 Dromedary Pearlymussel • 1994 Duskytail Darter • 1991 Fanshell • 1984 Fine-rayed Pigtoe • 1984 Green Blossom Pearlymussel	<u>Recovery Plans</u> • 1982 Gray Bat • 2007 Indiana Bat (Draft: First Revision) • 1984 Ozark/Virginia Big-Eared Bat • 1997 Lee County Cave Isopod <u>5-year Reviews</u> • 2009 Indiana Bat • 2009 Gray Bat • 2008 Virginia Big-Eared Bat • 2008 Lee County Cave Isopod <u>Other</u> • 2007 Coal Mining in West Virginia: Guidelines for Protecting the Indiana Bat (Myotis sodalis). • 2009 Range-wide Indiana Bat Protection and

		• 1984 Littlewing Pearly Mussel • 1985 Pink Mucket • 1984 Rough Pigtoe • 1984 Shiny Pigtoe • 1984 Tan Riffleshell • 1988 Blackside Dace • 1983 Slender Chub • 1983 Yellowfin Madtom <u>5-year Reviews</u> • 2006 (draft) 19 Southeastern Species (includes duskytail darter, yellowfin madtom, birdwing pearlymussel, cracking pearlymussel, dromedary pearlymussel, little wing pearlymussel, fine-rayed pigtoe, shiny pigtoe) • 2010 Cumberland Bean • 2007 Cumberlandian Combshell • 2007 Green Blossom <u>Spotlight Species Action Plans</u> • 2009 Fanshell • 2010 Purple Bean <u>Species Assessment and Listing Priority Assignment Forms</u> • 2010 Fluted Kidneyshell • 2007 Sheepnose • 2010 Slabside Pearlymussel • 2007 Spectaclecase <u>Proposed Rules to List</u> • 2010 Rayed Bean and Snuffbox • 2011 Sheepnose and Spectaclecase <u>Other</u> • 2009 Plan for Population Restoration of Freshwater Mollusks of the Cumberlandian Region. • Virginia's Freshwater Mussel Restoration Strategy for the Upper Tennessee River Basin. • 2009 TNC Conservation Action Plan for the Clinch Valley. • TWRA Strategic Mussel Recovery Plan. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from:	Enhancement Plan Guidelines (specific to coal mining). • Robbins, L.W., K.L. Murray, and P.M. McKenzie. 2008. Evaluating the effectiveness of the standard mist-netting protocol for the endangered Indiana bat. Northeastern Naturalist 15:275–282.

		http://www.deq.state.va.us/water/reports.html.	
	High level threats	High level threats • Agriculture resulting from livestock and pasture and cropland development/maintenance. • Climate change resulting from human migration/relocation. • Mining resulting from runoff from abandoned mine lands (including acid mine drainage); channelization/instream modifications and fill; point source effluents (e.g., sedimentation ponds, valley fill ponds, coal preparation plants); non-point source run-off; re-mining. • Gas resulting from mining runoff, coal bed methane. • Power generation resulting from carbon burning power plants. • Recreation resulting from caving/vandalism. • Transportation resulting from spills; highway, airport, and rail development/maintenance (including runoff and pesticide applications). • Urbanization and commercial/industrial development resulting from construction/land disturbance. • Demography resulting from poor demography. • Right-of-way development and maintenance resulting from utility corridors.	
	Conservation actions	FY10 – Develop and submit funding proposal to USGS Climate Change RFP to complete down-scaled modeling for Appalachian habitats. DUE – 9/30/10. COST – staff time plus $350,000 USGS funds. FY10 - Complete final year of field work for EC Special Study Investigation of In-Stream Contaminant Impacts to Endangered Mussels in the Upper Tennessee River Basin. DUE – 9/30/10. COST - $63,400 (total cost of project). FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 - 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) and pesticides. DUE – ongoing. COST - staff time. FY10-13- Represent the Service on the Virginia WQS Triennial	FY10 - Develop and submit funding proposal to USGS Climate Change RFP to complete down-scaled modeling for Appalachian habitats. DUE – TBD. COST - $350,000 USGS funds plus staff time.

		Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones). DUE – ongoing. COST - staff time. FY11 – Prepare request for EC Special Study, monitoring effects of straight pipe sewage discharges upstream of critical habitat and listed species in the Powell River watershed, Virginia. DUE – 3/01/11. COST – Request for $6,000. FY11 - USGS SSP resubmittal: An in situ assessment of [interstitial] chemical stressors and their effects on Imperiled Freshwater Mussels in the Clinch River and its tributaries. DUE – 4/15/11. COST - $100,000 (R4 and R5 through SSP). FY12 - Develop proposal for laboratory study to assess impact of various instream flow rates to mussel fauna. DUE – 5/1/12. COST – TBD.	
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives.	<u>Conservation Goal</u> Population and threat assessment and reduction goals for downlisting and/or delisting are outlined in the recovery plans of listed species. The recovery plans include information on number of populations and demographic outcomes necessary for recovery. In general the goal in Virginia is to increase the abundance and distribution of populations and assess and reduce threats to species. <u>Virginia Contribution</u> Virginia Ecological Services goal is to protect and recover these species and maintain and restore the habitats upon which they depend.	<u>Conservation Goal</u> Population and threat assessment and reduction goals for downlisting and/or delisting are outlined in the recovery plans of listed species. The recovery plans include information on number of populations and demographic outcomes necessary for recovery. In general the goal in Virginia is to increase the abundance and distribution of populations and assess and reduce threats to species. <u>Virginia Contribution</u> Virginia Ecological Services goal is to protect and recover these species and maintain and restore the habitats upon which they depend.
	Conservation actions	FY10 - Conduct GIS assessment of current water withdrawal locations in comparison to active USGS flow gauges, and proximity to documented locations of federally listed fish and mussel fauna. DUE – 9/30/10. COST – staff time. FY10-13 – Coordinate conservation and recovery activities with TNC Conservation Action Plan. DUE – on-going. COST – staff time. FY10-13 - Work with NWRs and others to plan and develop	FY11 – Complete Lee County cave isopod drainage analysis (schedule# 4.1) and permanent monitoring stations (schedule# 5.3). DUE – 12/31/11. COST – staff time. FY11-12 – Develop strategic conservation plan for the Cedars karst area. DUE – on-going. COST – staff time.

		UTRB refuge. DUE – ongoing. COST – staff time.	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of agriculture due to nutrient loading; chemical contamination; sedimentation; stream instability; trampling; habitat degradation, fragmentation, and loss: restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers.	
	Conservation actions	FY10 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/10. COST – staff time plus approximately $400,000 NRCS funds. FY10 – Host a landowner outreach event for Copper Creek. DUE – 9/30/10. COST – staff time plus approximately $3,000. FY11 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/11. COST – staff time plus approximately $940,000 NRCS funds. FY11 – Work with Fish America Foundation to develop landowner brochure for Copper Creek CCPI. DUE – 1/30/11. COST – staff time plus approximately $300. FY12-13 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/13. COST – TBD.	FY10 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/10. COST – staff time plus approximately $400,000 NRCS funds. FY11 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/11. COST – staff time plus approximately $940,000 NRCS funds. FY12-13 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/13. COST – TBD.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of climate change due to changes in instream temperatures; change in flow/hydrologic regime; shift in native species/non-native species/diseases; pollution; habitat loss: 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; work with partners on models and research projects to inform; assess potential need for refugia populations; water conservation and supply planning; identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans.	
	Conservation actions	FY10 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/10. COST – staff time plus approximately $400,000 NRCS funds. FY11 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/11. COST – staff time plus approximately $940,000 NRCS funds.	FY10 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/10. COST – staff time plus approximately $400,000 NRCS funds. FY11 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/11. COST – staff time plus approximately $940,000 NRCS funds.

		FY12-13 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/13. COST – TBD.	FY12-13 - Implement NRCS CCPI funds in Copper Creek watershed. DUE – 9/30/13. COST – TBD.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of mining due to contaminants; sedimentation; instream flows-alterations, habitat loss/degradation: provide FWCA reports and technical assistance to Corps and others; review AML "emergency" projects and AML reclamation 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; work with VMRC, Corps, VDEQ, VDOT, DMME 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; outreach on environmental impacts of mining and of benefits energy conservation and alternative energy development; continue to partner with USGS on SSP studies; 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; outreach on impacts of mining contaminants to industry and regulators.	
	Conservation actions	FY10 – Continue implementation and oversight of the EPA - HAP Interagency Agreement and subsequent cooperative agreement with TNC. DUE - 9/30/11. COST - $50,000 (EPA IAG). FY10-11 – Review OSM draft stream protection rule and EIS. DUE – 2/28/11. COST – staff time. FY11-12 – Review and contribute to Straight Creek TMDL (Powell River tributary) to ensure adequate protection of listed fish and mussel populations. DUE – on-going. COST – staff time. FY11-12 – Review Straight Creek UAA (Powell River tributary). DUE – on-going. COST – staff time. FY11-12 – Review and contribute to Upper Clinch River TMDL. DUE – on-going. COST – staff time. FY11-12 – Review and contribute to Powell River TMDL. DUE – on-going. COST – staff time. FY11–13 – Review AML reclamation projects for ESA compliance as submitted. DUE – on-going. COST – staff time. FY11-13 – Continue coordinated project reviews through Virginia Interagency Coal Meetings. DUE – on-going. COST -	FY11-13 - Review AML reclamation projects for ESA compliance as submitted. DUE – on-going. COST – staff time. FY11-13 – Continue coordinated project reviews through Virginia Interagency Coal Meetings. DUE – on-going. COST - staff time.

		staff time.	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of gas extraction due to contaminants, sedimentation, habitat loss/fragmentation: 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; HCPs; work with DMME on BMPs; review EPA deep well injection permits; work with industry to minimize impacts; outreach on environmental impacts of coal-bed methane production.	
	Conservation actions	FY12-13 – Work with gas industry representatives to develop coal bed methane gas well BMPs. DUE – on-going. COST – staff time.	FY12-13 – Work with gas industry representatives to develop coal bed methane gas well BMPs. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of power generation due to contaminants (air and water), habitat loss/fragmentation, water withdrawal: 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.	
	Conservation actions	FY11 – Prepare EC proposal to conduct mixing zone impact assessments for mussels in Clinch River at both the Dominion and APCO power plants. DUE – 5/30/11. COST – TBD. FY11-15 – Consult with federal agencies on actions related to permitting and operating coal-fired plants, coal combustion byproducts disposal. DUE – on-going. COST – staff time.	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of recreation due to habitat loss/degradation, directly mortality, disease vector: promote cave gating; research associated with disease vectors; outreach to cavers and landowners about disease vectors and caving impacts.	
	Conservation actions		
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of transportation due to contaminants, habitat loss/degradation/fragmentation: respond to spills as needed; follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge and road design; outreach to transportation industry and public via signage at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills; section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels.	
	Conservation actions	FY10 – Work with VDOT Bristol District to limit herbicide application effects on aquatic species. DUE – 9/30/10. COST	FY10 – Work with VDOT Bristol District to limit herbicide application effects on aquatic species. DUE – 9/30/10. COST –

		– staff time. FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time. FY12-13 – Work with VDOT to develop bridge and roadway design BMPS to prevent contaminants/spills from entering waterways. DUE – on-going. COST – staff time.	staff time. FY12-13 – Work with VDOT to develop bridge and roadway design BMPS to prevent contaminants/spills from entering waterways. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of urbanization and commercial/industrial development due to habitat loss/degradation/ fragmentation, sedimentation, contaminants, instream flow alteration, degradation of karst systems: 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.	
	Conservation actions		
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demography due to low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity: 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.	
	Conservation actions	FY10-13 - Implement Certus NRDA contract with VT and VDGIF to propagate and restore mussel populations in upper Clinch River and Indian Creek. DUE – on-going. COST - $100,000/year. FY11 – Complete at least one fish passage project to improve aquatic habitat connectivity within Copper Creek. DUE – 8/31/11. COST – staff time plus $120,000 PFW and grant funds. FY11 – Brink of Extinction project to upgrade hatchery facilities to optimize propagation and rearing of freshwater mussels in UTRB. DUE – 12/31/10. COST - $67,000. FY11 – Spotlight Species project to collect and propagate purple bean from Copper Creek (Clinch River tributary). DUE – 12/31/10. COST – $9,182.	

		FY11-12 – Implement Lone Mountain NRDA contract with CFI to propagate and restore yellowfin madtom populations in the Powell River. DUE – 9/30/12. COST - $50,000. FY11-13 – Implement Lone Mountain NRDA contract with VDGIF to propagate and restore mussel populations in Powell River. DUE – on-going. COST - $142,000. FY11-13 – Review and update captive propagation and reintroduction plans for UTRB species. DUE – on-going. COST – staff time.	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of right-of-way development and maintenance due to habitat loss/fragmentation/degradation: 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).	
	Conservation actions	FY10-13 – Assist Cookeville Field Office with interagency programmatic consultation on TVA transmission line right-of-way management. DUE – on-going. COST – staff time. FY11 – Provide oversight of TNC's implementation of project proposals approved for use of Certus funds in Cedar Bluff area of Indian Creek. DUE – 9/30/11. COST – staff time plus approximately $400,000 in Certus settlement funds. FY11-12 – Complete erosivity model as a planning tool to inform and guide implementation of appropriate E&S controls. DUE – 9/30/12. COST – $9,300. FY11-12 – Implement and refine online project review process to aid in planning and ensuring consideration of listed species. DUE – on-going. COST – staff time.	
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>	<u>Existing Plans</u>

	Conservation actions	FY09-11 – USGS Eastern Regional Initiative on the Clinch River assessing contaminant levels in river as related to mussel declines (continued from FY 09). DUE – 9/30/11. COST - $33,741 (FY 11 QRP). FY10 – Virginia Tech study of coal fines impacts to mussels. DUE – 12/10/10. COST - $10,000. FY10-11 – Clinch-Powell watershed environmental data analysis of EPA, VDMLR, and VDEQ data. DUE – 7/31/11. COST - $60,000. FY10-12 - USGS SSP: Bayesian population dynamics modeling to guide population restoration and recovery of endangered mussels in the Clinch and Powell Rivers, Tennessee and Virginia. DUE – 12/30/11. COST – $57,522. FY10-12 – Survey for slender chub and pygmy madtom in the upper Clinch and Powell rivers. DUE – 12/31/11. COST - $15,000. FY11 - Collaborate with APCO, CFI, and others to develop a repeatable protocol to establish baseline population levels for federally listed fish species in Copper Creek/Clinch River. DUE – TBD. COST – TBD. FY11 - Collaborate with USGS to initiate continuous water quality and instream flow monitors within Copper Creek/Clinch River. DUE - 9/30/11. COST – staff time. FY11 – Collaborate with USGS to re-activate strategically located flow gauges in the Clinch River watershed. DUE - 9/30/11. COST – staff time. FY11 – Dumps and Thompson creeks mussels and environmental contaminants study, final report. DUE – 9/30/11. COST – staff time. FY11- 14 – EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and	FY10-12 – Complete hydrological study of Lee County cave isopod habitat. DUE – 12/31/12. COST – staff time plus $2,500. FY10 -14 – Monitor populations and habitat of Lee County cave isopod. DUE – 12/31/14. COST - $42,000 cooperative agreement with DNH. FY11 - Collaborate with USGS to initiate continuous water quality and instream flow monitors within Copper Creek/Clinch River. DUE – 4/1/11. COST – staff time plus $50,000. FY11 – Collaborate with USGS to re-activate strategically located flow gauges in the Clinch River watershed. DUE – 4/1/11. COST – staff time plus $30,000 (year one).

		North Fork Holston Rivers using histological evaluations of vital organs. DUE – 10/31/13. COST – $283,131. FY12 – 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. DUE – 12/31/11. COST – staff time (total project cost $406,909). FY12 – Brink of Extinction project: surrogate mussel monitoring for tan riffleshell (*Epioblasma florentina walkeri*) and purple bean (*Villosa perpurpurea*) [using mussel silos] and stream assessment in Indian Creek – final report. DUE – 9/30/12. COST – staff time. FY14 - Analyze existing species surveys and YSI monitor data to evaluate effectiveness of the 5-year CCPI grant. DUE – 9/30/14. COST – TBD.	

Eastern Shore Priority Area Strategic Habitat Conservation Planning Table

		Key Community/Species	
		Migratory Birds	**Listed Species**
Priority Area Boundaries		Defined by the extent of HUCs 02080109 and 02080110 and include both the Eastern and Western Lower Delmarva HUCs.	
Notes		The Eastern Shore of Virginia is the location of Chincoteague NWR, Eastern Shore of VA NWR, and Fishermen's Island NWR as well as TNC's Virginia Coast Reserve. This area of Virginia has been designated as a global Biosphere Reserve by the United Nations.	
Other Species that Benefit from Conservation Actions taken for this Community/Species		This area has 95 priority migratory bird species, including the red knot, a candidate species. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.	This area has 11 listed and candidate species: Northeastern beach tiger beetle, piping plover, seabeach amaranth, Kemp's Ridley sea turtle, green sea turtle, loggerhead sea turtle, leatherback sea turtle, hawksbill sea turtle, Delmarva fox squirrel, and shortnose sturgeon and proposed endangered Atlantic sturgeon. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.
Biological Planning	Relevant documents	• 1999 Partners in Flight Bird Conservation Plan for Mid Atlantic Coastal Plain. • 2000 United States Shorebird Conservation Plan. • 2010 Red Knot Spotlight Species Action Plan. • 2000 North Atlantic Regional Shorebird Management Plan.	Recovery Plans • 1991 US Population of Atlantic Green Sea Turtle • 1992 Leatherback Sea Turtles in the US Caribbean, Atlantic, and Gulf of Mexico • 1993 Delmarva fox squirrel • 1993 Hawksbill sea turtle • 1994 Northeastern Beach Tiger Beetle • 1996 Piping plover Atlantic Population • 1996 Seabeach Amaranth • 2009 Northwest Atlantic Population of the Loggerhead Sea Turtle • 2010 Draft Bi-annual Recovery Plan for Kemp's Ridley Sea Turtle 5-year Reviews • 2007 Green Sea Turtle • 2007 Leatherback Sea Turtle • 2007 Delmarva fox squirrel • 2007 Hawksbill sea turtle • 2009 Piping plover • 2007 Seabeach Amaranth • 2009 Northeastern Beach tiger beetle • 2007 Loggerhead Sea Turtle

			• 2007 Kemp's Ridley Sea Turtle <u>Proposed Rules to List</u> • 2010 Nine Distinct Population Segments of Loggerhead Sea Turtles • 2010 Two Distinct Population Segments of Atlantic Sturgeon in the Southeast
	High level threats	<u>High level threats</u> • Habitat loss/degradation/fragmentation resulting from hydrologic alterations, sedimentation, nutrient loading, contaminants, shifts in native communities/species composition (including non-natives), human migration/relocation, sea level rise, increased drought/increased rainfall/temperature change, increased storm events resulting from climate change, habitat alteration/fragmentation (including migration impacts), shoreline alteration. • Non-native/problematic native species and diseases.	
	Conservation actions	FY10-12 – Complete environmental contaminants special study to evaluate effects of mercury on saltmarsh sharp-tailed sparrows (*Ammodramus caudacutus*). DUE – 9/30/12. COST - $58,400. FY11 - PFW and partners will develop GIS assessment of forested habitat fragmentation. DUE – 9/30/11. COST – staff time.	FY10-12 – Participate with Chincoteague NWR on their CCP planning team. DUE – on-going. COST - staff time. FY11-13 – PFW and partners will participate with Chincoteague NWR LPP. DUE – on-going. COST - staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Restore and protect sufficient upland and wetland habitat to support priority bird species utilizing the peninsula; target forested uplands and wetlands. (Note: Population goals are available for many migratory bird species in the Mid-Atlantic Coastal Plain but these have not yet been translated into acreage goals for suitable habitats.) The U.S. Shorebird Conservation Plan calls for increased acres of managed impoundments to supply feeding and resting habitat during autumn and spring migrations. <u>Virginia Contribution</u> Virginia Ecological Services goal is to restore/protect upland, wetland, and coastal habitat for priority migratory birds and federally listed species on state, federal, and private lands.	<u>Conservation Goal</u> Population and threat assessment and reduction goals for downlisting and/or delisting are outlined in the recovery plans of listed species. The recovery plans include information on number of populations and demographic outcomes necessary for recovery. In general the goal in Virginia is to increase the abundance and distribution of populations and assess and reduce threats to species. <u>Virginia Contribution</u> Virginia Ecological Services goal is to restore/protect upland, wetland, and coastal habitat for priority migratory birds and federally listed species on state, federal, and private lands.
	Conservation actions	FY11 - PFW and partners will use GIS assessment of forested habitat fragmentation to strategically target future habitat restoration/protection efforts. DUE – 9/30/11. COST – staff time.	FY10-12 – Participate on the Chincoteague NWR CCP planning team. DUE – 9/30/12. COST - staff time. FY10-14 - Continue to work with conservation partners on

		FY10-14 – PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection, especially those with significant potential to allow habitat migration with sea level rise. DUE – TBD. COST – staff time.	Southern Tip Ecological Partnership to identify high priority properties for land protection, especially those with significant potential to allow habitat migration with sea level rise. DUE – on-going. COST - staff time. FY11-12 – Initiate efforts to work with county wetlands boards on comprehensive shoreline management planning or HCPs. DUE – 9/30/12. COST - staff time. FY12 - Identify high priority sites for establishment of living shoreline projects for beach and shoreline stabilization to benefit listed species. DUE – 9/30/11. COST - staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and non-native/problematic native species and diseases caused by ditches/tile drains, climate change, deforestation, sea level rise, increased storm events, and habitat disturbance (forestry, development, agriculture, etc.): restore wetlands; work with NRCS; land protection; outreach/education with agriculture and forest landowners, localities, and Plant Natives campaign; establish (protect/restore) habitat corridors; work with NRCS and SWCDs to implement BMPs; prioritize conservation actions/funding decisions to consider climate change; control invasives; planning; work with VDEQ on water supply planning to include trust resource needs; work with VDOF, NRCS to restore forests and strategically reduce fragmentation; implement appropriate control measures; monitoring for disease outbreaks; comment on permits.	
	Conservation actions	FY10 – PFW will restore migratory bird habitat funded under STEP 3 NAWCA grant. DUE – 9/30/10. COST – NAWCA grant funds plus staff time. FY10 – PFW will work with partners to develop signage on habitat restoration and native plants at Morgan Environmental Center, KSP. DUE – 9/30/10. COST – staff time. FY11 – PFW will complete approximately 230 acres of wetland enhancement activities at the Level Ponds property on the Bay-side of the Eastern Shore. DUE – 9/30/11. COST – staff time plus $87,000 Virginia Duck Stamp Grant. FY10-14 – PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties, especially those with significant potential to allow habitat migration with sea level rise. DUE – on-	FY10-14 – PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties, especially those with significant potential to allow habitat migration with sea level rise. DUE – on-going. COST – staff time. FY11-14 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – on-going. COST – staff time. FY11-14 – PFW will work with partners to obtain funding for future habitat restoration work. DUE – on-going. COST – staff time.

		going. COST – staff time. FY11 - PFW will complete restoration of migratory bird habitat funded under STEP 3 NAWCA grant. DUE – 9/30/11. COST – NAWCA grant funds plus staff time. FY11-14 - PFW will continue to conduct outreach to other partners and the community by conducting site visits on completed habitat restoration projects. DUE – on-going. COST –staff time. FY11-14 – PFW will work with partners to obtain funding for future habitat restoration work. DUE – on-going. COST – staff time. FY11-14 – Continue successful efforts to restore SAV. Work with VMRC/VIMS on oyster restoration. DUE – on-going. COST – staff time.	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation caused by bulkheads/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/education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context.	
	Conservation actions		FY11 - PFW will give oral presentation on Oyster, Virginia living shoreline project at state conference of environmental interests. DUE – 7/30/11. COST – staff time. FY11-12 – Initiate efforts to work with county wetlands boards on comprehensive shoreline management planning or HCPs. DUE – 9/30/12. COST – staff time. FY11-12 – ES program will give presentation at county wetlands board meetings about beach and shoreline management. DUE – 9/30/12. COST – staff time. FY11-14 - 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. DUE – on-going. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation caused by animal waste storage facilities, agricultural fertilizer, spills (on and off shore), agricultural (poultry/row crops) runoff: work on regulations with VDEQ; comment on discharge permits; review USDA BMP specs; restore/protect habitat buffers; spill prevention/planning; respond to spills; work with others on training for spill response; conduct EC special studies to evaluate poultry waste.	
	Conservation actions	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>	<u>Existing Plans</u>
	Conservation actions	FY10-14 - PFW will monitor the survival of reforestation projects completed under STEP 3 NAWCA grant. DUE – TBD. COST –staff time.	FY10-14 - PFW will monitor living shoreline completed in FY09 near Oyster, Virginia. DUE – on-going. COST – staff time. FY10-14 – Continue monitoring of Clarke breakwater project and its effects on beach habitat in conjunction with VIMS and Corps. DUE – on-going. COST – staff time. FY11-12 - Develop consistent sea turtle management and monitoring protocols. DUE – 9/30/12. COST – staff time. FY11-13 – Conduct tiger beetle genetics analysis to help delineate functional tiger beetle populations. DUE – 12/31/13. COST – staff time plus Intra-agency agreement $83,070 total cost ($49,000 obligated in FY10).

Great Dismal Swamp National Wildlife Refuge Priority Area Strategic Habitat Conservation Planning Table

		Key Community/Species	
		Migratory Birds	**Red-cockaded Woodpecker**
Priority Area Boundaries		Defined by the extent of approved NWR acquisition boundary.	
Notes		Great Dismal Swamp NWR is one of the largest intact blocks of forested wetlands/uplands in the Eastern U.S. and therefore critically important to forest migratory birds. Preliminary data suggests that mercury from atmospheric deposition may be a concern for federal trust resources. Great Dismal Swamp NWR is in the South Atlantic Coastal Plain Bird Conservation Region 27 (and is identified as a focal area for Landbird Conservation), 64 migratory bird species designated as high priority conservation targets for Bird Conservation Region 27 will benefit from this effort.	Endemic to open, mature and old growth pine ecosystems in the southeastern U.S. Estimated 14,068 red-cockaded woodpeckers living in 5,627 known active clusters across 11 states (Service 2003). Virginia is at northern extent of species range. Species extant in 2 counties in Virginia. A suitable site for near-future establishment of a new red-cockaded woodpecker colony has been delineated within Great Dismal Swamp NWR.
Other Species that Benefit from Conservation Actions taken for this Community/Species		Nine fisheries species of conservation concern: alewife, American eel, American shad, Atlantic sturgeon, blueback herring, gizzard shad, hickory shad, shortnose sturgeon, and striped bass. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.	
Biological Planning	Relevant documents	• 1999 Partners in Flight Bird Conservation Region Plan for Mid Atlantic Coastal Plain. • 2001 Partners in Flight Bird Conservation Region Plan for South Atlantic Coastal Plain. • 2006 Great Dismal Swamp National Wildlife Refuge and Nansemond National Wildlife Refuge Final Comprehensive Conservation Plan. http://library.fws.gov/CCPs/GDS/greatdismalswamp06.pdf. • 2005 South Atlantic Migratory Bird Initiative Implementation Plan.	<u>Recovery Plans</u> • 2003 Red-cockaded woodpecker <u>5-year Reviews</u> • 2006 Red-cockaded woodpecker <u>Other</u> • 2006 Great Dismal Swamp National Wildlife Refuge and Nansemond National Wildlife Refuge Final Comprehensive Conservation Plan. http://library.fws.gov/CCPs/GDS/greatdismalswamp06.pdf.
	High level threats	<u>High level threats</u> • Habitat loss/degradation/fragmentation resulting from hydrologic alterations, contaminants, shifts in native communities/species composition (including non-natives), human migration/relocation, sea level rise, increased drought/increased rainfall/temperature change, increased storm events. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Non-native/problematic native species and diseases.	
	Conservation actions	FY11 - PFW will work with NWR hydrologist to initiate GIS assessment of whole-system hydrology. DUE – on-going. COST	FY11 - PFW will work with NWR hydrologist to initiate GIS assessment of whole-system hydrology. DUE – on-going.

		– staff time. FY12- PFW and NWR will finalize GIS assessment of current hydrology on NWR. DUE – 9/30/12. COST – staff time. FY14- PFW and NWR will assess climate change influence on future hydrology and predict likely outcomes for the Great Dismal Swamp. DUE – 9/30/14. COST – staff time.	COST – staff time. FY12- PFW and NWR will finalize GIS assessment of current hydrology on NWR. DUE – 9/30/12. COST – staff time. FY14- PFW and NWR will assess climate change influence on future hydrology and predict likely outcomes for the Great Dismal Swamp. DUE – 9/30/14. COST – staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> The goal for the 2005 South Atlantic Migratory Bird Initiative Implementation Plan is to increase LLP acreage from 1,500,047 to over 2,200,069 and improve conditions favoring warm season grass ground cover on at least 650,020 acres by year 2025. Maintenance and/or restoration of large tracts of bottomland hardwood forests and fire-maintained pine savannah are key over-arching goals. <u>Virginia Contribution</u> Virginia Ecological Services 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.	<u>Conservation Goal</u> Red-cockaded Woodpecker Recovery Plan: Virginia portion necessary for delisting: one stable or increasing population containing at least 100 potential breeding groups (110 to 140 active clusters) in northeastern North Carolina and southeastern Virginia, and these populations are not dependent on continuing artificial cavity installation to remain at or above this population size. Red-cockaded Woodpecker 5-Year Review: Aggressive and effective prescribed burning programs, installation of artificial cavities until forests are old enough to provide sufficient numbers of potential cavity trees, and translocation of birds to the many small, at-risk (of extirpation) populations required to satisfy recovery criteria. The federal and state (and select private land) land base has been identified and is sufficient to recover the species, and much of the habitat is currently available. However, many tens of thousands of acres require restoration and improvement prior to establishing red-cockaded woodpecker territories. <u>Virginia Contribution</u> Virginia Ecological Services 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.
	Conservation actions	FY12 - Based on GIS/data assessments during Biological Planning stage and monitoring of 9,500 acres restored in FY11, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to forest migratory birds; hydrology	FY12 - Based on GIS/data assessments during Biological Planning stage, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to planned red-cockaded woodpecker colony

		restoration will stabilize water levels in these areas and thereby improve habitat and potentially reduce mercury exposure risk. DUE – 9/30/12. COST – TBD. FY14 - Based on climate change outcomes predicted in Biological Planning stage, PFW, ES, and NWR will determine priority mitigative actions. DUE – 9/30/14. COST – TBD.	establishment site; hydrology restoration will facilitate prescribed burns necessary to establish and maintain suitable habitat and potentially reduce mercury exposure risk. DUE – 9/30/12. COST – TBD. FY13 - Based on GIS/data assessments during Biological Planning stage and on Monitoring of 9,500 acres restored in FY11, PFW, ES, and NWR will determine where and when increased areas within the NWR could safely be burned to improve habitat for future red-cockaded woodpecker colony establishment. DUE – 9/30/13. COST – TBD. FY14 - Based on climate change outcomes predicted in Biological Planning stage, PFW, ES, and NWR will determine priority mitigative actions for red-cockaded woodpecker recovery. DUE – 9/30/14. COST – TBD.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by fill for roads, historic side-casting for ditches, water control structure operation and maintenance, ditches, hydrologic manipulations that release mercury: install culverts to reconnect hydrology; inreach to NWR hydrologists and staff; provide technical assistance; comment on CCP; land protection; work with Corps and NWR on Feeder Ditch WCS and locks; coordinate with NWR hydrologist; fund replacement of failing structures; restore wetlands; install water control structures; EC special study; work with NWR to minimize Hg releases .	
	Conservation actions	FY10-14 – PFW staff will coordinate and provide technical assistance to NWR and with NWR hydrologist to plan and implement hydrology restoration activities. DUE – on-going. COST – staff time. FY11 - PFW will complete hydrology restoration on 9,500 acres of forest under approved $1.3M NAWCA grant. DUE – 9/30/11. COST - staff time plus $1.4M NAWCA grant. FY13 - PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp. DUE – on-going. COST – staff time.	FY10-14 – PFW staff will coordinate and provide technical assistance to NWR and with NWR hydrologist to plan and implement hydrology restoration activities. DUE – on-going. COST – staff time. FY11 - PFW will complete hydrology restoration on 9,500 acres of forest under approved $1.3M NAWCA grant. DUE – 9/30/11. COST - staff time plus $1.4M NAWCA grant. FY13 - PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp. DUE – on-going. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and non-native/problematic native species and diseases caused by climate change: protect/restore recharge areas; monitor plant and animal communities; restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives; planning; implement appropriate control measures; habitat restoration; monitoring for disease outbreaks; inreach to NWR and outreach/education.	
	Conservation actions	FY11 - PFW will complete hydrology restoration on 9,500 acres of forest under approved $1.3M NAWCA grant. DUE – 9/30/11. COST – staff time plus $1.4M NAWCA grant. FY13 - PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp. DUE – on-going. COST – staff time.	FY11 - PFW will complete hydrology restoration on 9,500 acres of forest under approved $1.3M NAWCA grant. DUE – 9/30/11. COST - staff time plus $1.4M NAWCA grant. FY13 - PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and demographic constraints caused by land use conversion (increased impervious surface and runoff) and residential/commercial development: work with localities on low impact development and comprehensive planning; work with state agencies on BMP development and implementation; land protection; encourage local zoning; permit review; work with counties to leave corridors intact.	
	Conservation actions		
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by spills: spill prevention/planning; respond to spills; work with others on training for spill response; inreach and public outreach.	
	Conservation actions	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by air pollution (including mercury): EC special study; promote carbon sequestration; permit review; work with VDEQ and EPA on Hg regulations.	

	Conservation actions	FY10-12 – Work with the Washington Office to establish a long-term national-scale mercury monitoring program, called MercNet, to track long-term trends of atmospheric mercury deposition and mercury levels in watersheds and fish and wildlife in response to changing mercury emissions over time. DUE – on-going. COST – staff time.	
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>	<u>Existing Plans</u>
	Conservation actions	FY12 - PFW and NWR will monitor extent and duration of hydrology restored on 9,500 acres in FY11. DUE – on-going. COST – staff time. FY14 - PFW and NWR will update GIS assessment of hydrology on NWR. DUE – 9/30/14. COST – staff time.	FY12 - PFW and NWR will monitor extent and duration of hydrology restored on 9,500 acres in FY11. DUE – on-going. COST – staff time. FY14 - PFW and NWR will update GIS assessment of hydrology on NWR. DUE – 9/30/14. COST – staff time.

Holston River Watershed Priority Area Strategic Habitat Conservation Planning Table

		Key Community
		Aquatic Community: 21 endangered, threatened, proposed, and candidate mussel and fish species and designated critical habitat for 1 species. Of these, 18 are also Fisheries Species of Conservation Concern.
Priority Area Boundaries		Defined by the extent of HUCs 06010101 and 06010102, which includes the upper Holston River watershed in Virginia.
Notes		The Holston River watershed lies within an area of the Appalachians identified by the Service, TNC, and others as a globally significant area and a major national hotspot of biodiversity. All species of concern within the aquatic community require free-flowing stream habitats with good water quality and substrates not impacted by excessive sedimentation.
Other Species that Benefit from Conservation Actions taken for this Community		4 additional endangered and threatened species, 38 species of concern (ranked critically imperiled or imperiled), 3 fisheries species of conservation concern (not already considered as listed and candidate aquatic species), 33 priority migratory bird species. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.
Biological Planning	Relevant documents	<u>Recovery Plans</u> • 1984 Birdwing Pearlymussel • 1984 Cumberland Bean • 2004 Cumberland Elktoe, Oyster Mussel, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot • 1984 Dromedary Pearlymussel • 1994 Duskytail Darter • 1984 Fine-rayed Pigtoe • 1984 Green Blossom Pearlymussel • 1984 Littlewing Pearly Mussel • 1984 Shiny Pigtoe • 1984 Tan Riffleshell • 1983 Spotfin Chub • 1983 Yellowfin Madtom <u>5-year Reviews</u> • 2006 (draft) 19 Southeastern Species (includes duskytail darter, yellowfin madtom, birdwing pearlymussel, dromedary pearlymussel, littlewing pearlymussel, fine-rayed pigtoe, shiny pigtoe) • 2010 Cumberland Bean • 2007 Cumberlandian Combshell • 2007 Green Blossom Pearlymussel <u>Spotlight Species Action Plans</u> • 2010 Purple Bean <u>Species Assessment and Listing Priority Assignment Forms</u> • 2010 Fluted Kidneyshell • 2010 Slabside Pearlymussel <u>Proposed Rules to List</u>

		• 2010 Rayed Bean and Snuffbox Other • 2009 Plan for Population Restoration of Freshwater Mollusks of the Cumberlandian Region. • Virginia's Freshwater Mussel Restoration Strategy for the Upper Tennessee River Basin. • 2009 TNC Conservation Action Plan for the Clinch Valley. • Tennessee Wildlife Resources Agency Strategic Mussel Recovery Plan. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html.
	High level threats	High level threats • Agriculture resulting from sediment runoff, livestock, pasture and cropland development/maintenance. • Climate change resulting from human migration/relocation. • Power generation resulting from carbon burning power plants. • Recreation resulting from caving/vandalism. • Transportation resulting from spills; highway, airport, and rail development/maintenance (including runoff and pesticide applications). • Urbanization and commercial/industrial development resulting from point and non-point waste (e.g., lawn care); legacy point and non-point industrial discharges. • Demography resulting from poor demography. • Right-of-way development and maintenance resulting from utility corridors.
	Conservation actions	FY10 – Restoration of North Fork Holston River population of yellowfin madtom meeting. DUE – 03/02/10. COST - staff time. FY10 – Develop and submit funding proposal to USGS Climate Change RFP to, in part, complete down-scaled modeling for Appalachian Streams. DUE – TBD. COST - staff time plus $350,000 USGS funds. FY11 – Submit proposal for LE funds in support of Endangered Species program for "Survey, propagation, and augmentation of endangered littlewing pearlymussel (*Pegias fabula*) at sites of historical occurrence in southwestern Virginia." DUE – 01/12/11. COST - $60,000, 2.5 years. FY12 - Develop proposal for laboratory study to assess impact of various instream flow rates to mussel fauna. DUE – 5/1/12. COST – TBD.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	Conservation Goal Population and threat assessment and reduction goals for downlisting and/or delisting are outlined in the recovery plans of listed species. The recovery plans include information on number of populations and demographic outcomes necessary for recovery. In general the goal in Virginia is to increase the abundance and distribution of populations and assess and reduce threats to species. Virginia Contribution Virginia Ecological Services goal is to protect and recover these species and maintain and restore the habitats upon which they depend.

	Conservation actions	FY10 - Conduct GIS assessment of current water withdrawal locations in comparison to active USGS flow gauges, and proximity to documented locations of federally listed fish and mussel fauna. DUE – 9/30/10. COST – staff time. FY09–13 – Coordinate conservation and recovery activities with TNC Conservation Action Plan. DUE – on-going. COST – staff time. FY10-13 - Work with NWR program and others to plan and develop UTRB NWR. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of agriculture and urbanization and commercial/ industrial development due to sedimentation; nutrient loading; stream instability; trampling; habitat degradation, fragmentation, and loss; contaminants; mercury (Saltville): restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers; 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; continue NRDA and work with EPA through the BTAG; comment on TMDLs; NRDA/EC studies on legacy sites.
	Conservation actions	FY10 - Complete final year of field work for EC Special Study Investigation of In-Stream Contaminant Impacts to Endangered Mussels in the Upper Tennessee River Basin (assessed mussel impacts due to agricultural practices in NFHR). COST – $63,400 (total cost of project). FY10-13 - Provide "riverkeeper" services by monitoring watershed for pollution and alerting appropriate entities about problems encountered. DUE – on-going. COST – staff time. FY10-13 - 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) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones). DUE – ongoing. COST - staff time. FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY11-12 - 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. DUE – ongoing. COST - staff time. FY11-12 – 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. DUE – on-going. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of climate change due to change in instream temperatures; change in flow/hydrologic regime; shift in native species/non-native species/diseases; pollution; habitat loss: 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; work with partners on models and research projects to inform; assess potential need for refugia populations; water conservation and supply planning; identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans.
	Conservation actions	FY 11-14 – Conduct consultation and provide conservation planning assistance on water supply planning and development projects. DUE – ongoing. COST - staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of power generation due to contaminants (air and water), habitat loss/fragmentation: 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.
	Conservation actions	FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with Virginia DEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY11-14 – Consult with federal action agencies and coordinate with non-Federal project proponents on energy projects. DUE – ongoing. COST - staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of recreation due to habitat loss/degradation, direct mortality, disease vector: 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.
	Conservation actions	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat	Actions to address high level threat of transportation due to contaminants, habitat loss/degradation/fragmentation: respond to spills as needed; follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge, and road design; outreach to transportation industry and public via signage at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills; section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels.

	management)	
	Conservation actions	FY10-13 - Provide "riverkeeper" services by monitoring watershed for pollution and alerting appropriate entities about problems encountered. DUE – on-going. COST – staff time. FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demography due to low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity: 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.
	Conservation actions	FY11 – Brink of Extinction project to upgrade hatchery facilities to optimize propagation and rearing of freshwater mussels in the UTRB. DUE – 12/31/10. COST - $67,000.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of right-of-way development and maintenance due to habitat loss/fragmentation/ degradation: 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).
	Conservation actions	FY10-14 – Assist Cookeville Field Office with interagency programmatic consultation on TVA transmission line right-of-way management. DUE – on-going. COST – staff time. FY11 – Develop erosivity model as a planning tool to help reduce sedimentation. DUE – 9/30/11. COST – $24,000.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>

	Conservation actions	FY10 – Population status survey of endangered shiny pigtoe, littlewing pearlymussel, fluted kidneyshell, and slabside pearlymussel in the North Fork Holston River. DUE - 12/31/10. COST - $12,000. FY11-12 – 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." DUE – 9/30/12. COST - $175,000. FY11-14 –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. DUE – 10/31/13. COST – $283,131.

James Spinymussel Priority Area Strategic Habitat Conservation Planning Table

		Key Species **James Spinymussel**
Priority Area Boundaries		Defined by 10-digit HUCs where the species is known to occur; VDGIF and VDCR-DNH databases were used to delineate known species.
Notes		Suitable habitat includes free-flowing freshwater streams 10 to 75 feet wide and 15 to 100 centimeters deep. The James spinymussel requires a slow to moderate water current with clean sand and cobble bottom sediments. This species is extant in Virginia, North Carolina, and West Virginia.
Other Species that Benefit from Conservation Actions taken for this Species		Native aquatic species inhabiting same waterways as James spinymussel, including Atlantic pigtoe and green floater.
Biological Planning	Relevant documents	Recovery Plans • 1990 James Spinymussel 5-year Reviews • 2008 James Spinymussel (draft) Other • Population/occurrence surveys, historic/current distribution maps, published research. • Petty, M.A. 2005. Distribution, genetic characterization, and life history of the James spinymussel, *Pleurobema collina* (Bivalvia: Unionidae), in Virginia and North Carolina. M.S. Thesis, Virginia Polytechnic Institute and State University, Virginia • The Nature Conservancy. 2004. Rivanna Watershed conservation area plan. Charlottesville, Virginia. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html.
	High level threats	High level threats • Habitat loss/degradation/fragmentation resulting from sedimentation, temperature, downstream scour, suspended solids, contaminants, hydrologic alteration. • Demographic constraints resulting from genetics, isolated populations, small population size, etc., Allee effect. • Non-native/problematic native species resulting from shifts in species composition.
	Conservation actions	FY10-14 – Revise Recovery Action Team Annual Action Plan; conduct quarterly Recovery Action Team planning meetings. DUE – on-going. COST – staff time. FY11 – Plan mussel festival outreach event with partners. DUE – 8/30/11. COST – staff time plus $450 travel. FY11 – Collaborate with NWR Division on planning activities and landowner outreach for expansion of James River NWR. DUE - 8/1/11. COST – staff time.

		FY11 – Pursue development of a population viability plan or similar analysis. DUE – on-going. COST – staff time. FY12 – Develop a plan to evaluate the threat of Allee effect. DUE – 9/30/12. COST – staff time. FY12 – Complete draft James spinymussel conservation plan for the Dick's/John's/Little Oregon Creek population and management area. DUE – 9/30/12. COST – staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> James spinymussel recovery plan criteria objectives to reclassify this mussel to threatened by (1) Determining that populations in the Craig Creek drainage and 80% of all other known populations are stable or expanding (focusing on distribution of populations within four rivers or creeks). (2) Protecting all known populations and their habitat from foreseeable threats. 2008 James spinymussel 5-year status review - Recommendations for Future Actions: (1) Revise current recovery plan. (2) Conduct long term, systematic monitoring of populations. (3) Assess and survey to identify recovery habitat. (4) Continue to conduct research and monitoring to determine the effects of water quality and other stressors. (5) Implement measures to address sediment and pollutant loading. <u>Virginia Contribution</u> Virginia Ecological Services goal is to protect/restore habitat and water quality for the James spinymussel and other Atlantic Slope freshwater mussels to aid in recovery and conservation efforts.
	Conservation actions	FY10 – Initiate a captive propagation and augmentation plan. DUE – on-going. COST – staff time. FY11 – Develop a draft searcher efficiency plan/detection probability plan. DUE – 9/30/11. COST – staff time. FY11 – Complete captive propagation/augmentation plan. DUE – 9/30/11 pending WSSNFH. COST – staff time. FY11-12 – Work with NiSource to identify conservation sites and develop mitigation/conservation plan for priority areas. DUE – 9/30/12. COST – staff time. FY11-12 – Develop preliminary potential habitat model for the species. DUE – 9/30/12. COST – staff time plus 10,000.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation, demographic constraints, and non-native/problematic native species caused by large dams/reservoirs (operation and maintenance of existing dams, construction of new dams), poor land practices (e.g., small dams, residential and industrial development, forestry, agriculture), transportation/utilities, spills, climate change: comment on new projects and relicensing and operations; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements; riparian and stream restoration; work with state agencies on relevant regulatory changes; comment/consultation on projects; public outreach at annual mussel event; spill prevention/planning; respond to spills; work with others on training for spill response; identify sensitive areas and potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; evaluate translocation/augmentation/reintroduction; 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; control invasives; evaluate stressor.
	Conservation actions	FY10 – Conduct mussel outreach event at Fort Lewis Lodge on Cowpasture River. DUE – 6/30/10. COST – staff time plus $450 travel. FY10 – Conduct quantitative mussel surveys, including tagging, in Dicks Creek and Little Oregon Creek. DUE – 9/30/10. COST - staff time. FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY11 – Conduct streamside infestation: John's Creek, Craig Creek, Mill Creek or Cowpasture River. DUE – 9/30/11. COST - staff time plus $300 travel. FY11 – Conduct surveys: SF Potts Creek; Dicks Creek/Little Oregon Creek; James River mainstem and tributaries. DUE – 9/30/11. COST - staff time plus $1,000 travel. FY11 – Complete riparian posting at Black Diamond Ranch and coordinate with homeowners. DUE – 9/30/11. COST - staff time plus $1,000 travel. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – on-going. COST – staff time. FY11 – Collaborate with Appalachian Partnership Coordinator Office to develop a NRCS Cooperative Conservation Partnership Initiative grant for tributaries of the Upper James identified as high priority areas for James spinymussel. DUE – 9/30/2011. COST - staff time. FY11-12 - Participate in EPA and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time. FY12-FY14 – 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 spinymussel. DUE - 9/30/2014. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demographic constraints caused by movement barriers for fish host and mussel (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness) and Allee effect: 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; evaluate this threat; conduct PVA; improve our understanding of demographics; assess genetic diversity in remaining populations to facilitate recovery.
	Conservation actions	
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	Existing Plans
	Conservation actions	FY11 – Coordinate all relevant Appalachia-related activities with Appalachian Landscape Conservation Cooperative Coordinator to ensure the successful launch of this LCC. DUE 7/31/11. COST – staff time. FY11-12– Assess habitat at known occurrences to characterize the species' "optimal environmental envelope" and use information to refine potential habitat model. DUE – ongoing. COST - staff time.

Madison Cave Isopod Priority Area Strategic Habitat Conservation Planning Table

		Key Species **Madison Cave Isopod**
Priority Area 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.
Notes		A subterranean freshwater crustacean known from an area approximately 70 miles wide and 200 miles long. The species is known from 16 locations in the Shenandoah Valley from Leetown, West Virginia to Lexington, Virginia. The species has only been found in Cambrian/Ordovician aged carbonate bedrock. Little is known about its basic biology and life history.
Other Species that Benefit from Conservation Actions taken for this Species		Karst species inhabiting same geographic area as Madison Cave isopod, including the Madison cave amphipod.
Biological Planning	Relevant documents	Recovery Plans • 1996 Madison Cave isopod 5-year Reviews • 2010 Madison Cave isopod (draft Sep 2010) Other • Population/occurrence surveys, historic/current distribution maps. • Virginia Department of Environmental Quality. 2008. Water Quality Assessment 305b/303d Integrated Report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html. • Nelms, D.L., G.E. Harlow, Jr., L. Niel Plummer, and E. Busenberg. 2003. Aquifer susceptibility in Virginia 1998-2000. Water-Resources Investigations Report 03-4278. Available from: http://pubs.usgs.gov/wri/wri034278/wrir03_4278.pdf.
	High level threats	High level threats • Habitat loss/degradation/fragmentation resulting from hydrologic alterations, nutrient loading, contaminants. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Lack of information on species.
	Conservation actions	FY10-12 – 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. DUE – ongoing. COST – staff time. FY11-14 – Continue surveys of southern extent of population. DUE – ongoing. COST – staff time plus $9,000. FY11-14 – Genetic study to determine population structure and connectivity. DUE – ongoing. COST – staff time plus $62,000. FY11-14 – Land protection on priority site. DUE – ongoing. COST – TBD. FY11-14 – Coordinate with other members of recovery group. DUE – ongoing. COST – staff time.

Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Madison Cave isopod recovery plan criteria for delisting may be considered when: (1) Populations and groundwater quality at Front Royal Caverns, Linville Quarry Cave No. 3, and Madison Saltpetre Cave/Steger's Fissure are shown to be stable over a 10-year monitoring period. (2) The recharge zone of the deep karst aquifer at each of the population sites identified in criterion 1 is protected from all significant contamination sources. (3) Sufficient population sites are protected to maintain the genetic diversity of the species. Madison Cave isopod 5-year Review - Recommendations for Future Actions: (1) Recovery plan should be updated. (2) Continue sampling in additional locations and continue genetic research to determine if there are more than three genetic units. (3) Continue survey work to determine northern/southern extent of species' range. (4) To address recovery criterion 1, many mark-recapture studies would be needed. We would recommend changing this criterion to a sampling regime that will cover the different genetic units that Hutchins (2007) found in his research. (5) Begin to assess connectivity of habitat. (6) Population size should be assessed for each geographic unit using mark-recapture techniques. (7) State and federal agencies in Virginia and West Virginia are working on developing management guidelines to provide landowners, land managers, and localities recommendations and general land management practices to avoid impacts to the Madison Cave isopod and its habitat. (8) Protect Madison Cave isopod genetic units, not site specific locations. <u>Virginia Contribution</u> Virginia Ecological Services goal is to further the recovery of this species through development of best management practices for landowners/project proponents and subsequent implementation by working with localities.
	Conservation actions	FY11-12 – Incorporate Madison Cave Isopod restoration alternatives into DuPont NRDAR settlement negotiations. DUE – ongoing. COST – staff time plus TBD.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by fill (sinkholes, fissures, etc.), impervious surface, runoff, non-point source (e.g., roads, pesticides): clean out sinkholes; 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 and that it's a water quality issue; 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.
	Conservation actions	FY10-11 – Work with NiSource to develop best management practices for gas pipeline installation and management. DUE – ongoing. COST – staff time. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General

		VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY11 – Complete management guidelines for the Madison Cave isopod in Virginia. No due date. COST – staff time. DUE – ongoing. COST - staff time. FY11 – Coordinate all relevant Appalachia-related activities with Appalachian Landscape Conservation Cooperative Coordinator to ensure the successful launch of this LCC. DUE - 7/31/11. COST – staff time. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST - staff time. FY11-12 – Complete management guidelines for Madison Cave isopod in Virginia. DUE – 9/30/11. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by 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.
	Conservation actions	FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, Biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST - staff time. FY11-12 – Investigate groundwater withdrawal permits in Madison Cave isopod potential habitat to evaluate threat and assess options to reduce threat. DUE – on-going. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by climate change: assess and monitor affects of climate change; habitat restoration/protection.
	Conservation actions	FY11 – Complete management guidelines for Madison Cave isopod in Virginia. DUE – 9/30/11. COST – staff time. FY11-14 – Work with USGS to secure funding for project titled "Assessing the Vulnerability of Threatened Macroinvertebrates in Karst Using Paleohydrologic Indicators of Climate Change." DUE – 9/30/10. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by agricultural fertilizer/biosolids application and biosolids: 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 special studies.
	Conservation actions	FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, Biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST - staff time. FY11 – Complete management guidelines for Madison Cave isopod in Virginia. DUE – 9/30/11. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by spills: spill prevention/planning; respond to spills; work with others on training for spill response.
	Conservation actions	FY11-12 - Participate in EPA and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demographic constraints caused by loss of connectivity and genetic diversity (e.g., hydrologic alteration, habitat degradation/loss, spills) and lack of information on species: 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; determine connectivity of aquifers and identify recharge zones; determine range and conduct rangewide survey; genetic information; life history information.
	Conservation actions	FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST - staff time. FY11 – Complete management guidelines for Madison Cave isopod in Virginia. DUE – 9/30/11. COST – staff time. FY11 – Conduct high resolution genetics study to evaluate population structure and connectivity. DUE – ongoing. COST – $62,000. FY11-12 – Work with American University and VDCR on mark re-capture study to determine population size at site and connectivity. DUE – 9/30/12. COST – staff time plus $7,500.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>
	Conservation actions	

Northeastern Beach Tiger Beetle Priority Area Strategic Habitat Conservation Planning Table

		Key Species **Northeastern Beach Tiger Beetle**
Priority Area Boundaries		Boundaries delineated 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.
Notes		Insect inhabiting coastal beaches from Massachusetts to Virginia. At listing, the beetle was considered to be extirpated from Rhode Island, Connecticut, and New York (Long Island) (Service 1994). It is unclear if potential habitat for the tiger beetle may exist at any of the historical sites along the Atlantic Coast. The only known extant populations along the Atlantic Coast are in southeastern Massachusetts. Adult beetles mate and lay eggs on the beach during the summer. Larval beetles pass through three instar stages, pupate, and emerge as adults one to two years following hatching.
Other Species that Benefit from Conservation Actions taken for this Species		Native coastal species utilizing the same habitat as the northeastern beach tiger beetle. Including the diamondback terrapin known to use these beaches for nesting.
Biological Planning	Relevant documents	Recovery Plans • 1994 Northeastern beach tiger beetle 5-year Reviews • 2009 Northeastern beach tiger beetle Other • Population/occurrence surveys, historic/current distribution maps. • 2009 Chesapeake Bay Executive Order. • Fiscal Year 2011 Action Plan Executive Order 13508 Strategy for Protecting and Restoring the Chesapeake Bay Watershed http://executiveorder.chesapeakebay.net/file.axd?file=2010%2f9%2fChesapeake+EO+Action+Plan+FY2011.pdf. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html.
	High level threats	High level threats • Habitat loss/degradation/fragmentation resulting from shoreline modification (changes in sand transport and placement of structure and change in habitat conditions), contaminants, climate change. • Demographic constraints resulting from genetics, isolated populations, small population size, etc.
	Conservation actions	FY10-12 - Planning shoreline stabilization project Bavon Beach/Chesapeake Shores in Mathews County. DUE – on going. COST - $380,000. FY11 – Develop tiger beetle habitat management BMPs. DUE – on going. COST – staff time.

		FY11-12 – Population surveys (adult beetles) of eastern and western shorelines of Chesapeake Bay. DUE – 9/30/12. COST – staff time. FY11-14 – Develop genetic tools for conservation and planning (USGS). DUE – 9/30/14. COST - $84,500. FY11-14 – Coordinate with Mathews County in the development of a countywide HCP. DUE – on going. COST – staff time. FY11-14 – Coordinate with tiger beetle recovery group and maintain tiger beetle NBII website. DUE – on going. COST – staff time. FY12-13 – Develop a rangewide tiger beetle captive propagation/translocation plan. DUE – 9/30/13. COST – TBD. FY12-13 – Refine and revise tiger beetle PVA. DUE – 9/30/13. COST – TBD.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Northeastern beach tiger beetle recovery plan criteria for delisting: (1) At least three viable populations have been established and permanently protected in each of four designated Geographic Recovery Areas (GRA) covering the subspecies' historical range in the Northeast, with each GRA having one or more sites with large populations (peak count > 500 adults) and sufficient protected habitat for expansion and genetic interchange. (2) At least 26 viable populations distributed throughout all five Chesapeake Bay GRAs are permanently protected. (3) Life history parameters (including population genetics and taxonomy), human impacts, and factors causing decline are understood well enough to provide needed protection and management. (4) An established, long-term management program exists in all states where the species occurs or is reintroduced. Northeastern beach tiger beetle 5-year Review - Recommendations for Future Actions: (1) Revise current recovery plan. (2) Develop a survey protocol to ensure consistent monitoring of populations. (3) Determine land ownership of sites, and evaluate methods to improve long-term protection for those areas. (4) Continue surveys to monitor population and habitat trends to obtain a better understanding of the beetle's status and metapopulation structure. (5) Expand genetic work to further evaluate the four subspecies of *C. dorsalis*, and to compare the beetles within the Chesapeake Bay to those in Massachusetts. (6) Evaluate the potential effects of sea level rise on tiger beetles, and develop appropriate management strategies to address this potential threat. (7) Evaluate the geomorphology of the Atlantic Ocean sites using the same parameters used for the Chesapeake Bay sites. (8) Conduct range wide assessment of available and potential habitat and shoreline alterations/hardening that have occurred to date. (9) Implement a prey base study for the larval stage of the beetle. (10) Work with the local governments to ensure the permitting authorities are aware of the beetle and the threats to it from shoreline projects. (11) Work with the Corps to improve understanding of shoreline projects that are being implemented on the Chesapeake Bay without proper permits and consultation. (12) Work with the Corps and shoreline erosion experts to design appropriate shoreline stabilization methods that will not eliminate beetle habitat. <u>Virginia Contribution</u> Virginia Ecological Services goal is to develop and implement a multi-faceted, multi-partner, long-term recovery strategy for the species.

	Conservation actions	FY10-14 – PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection and habitat restoration, especially those with significant potential to allow habitat migration with sea level rise. DUE – on-going. COST – staff time. FY10-14 – 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. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and demographic constraints caused by bulkhead/riprap; groins/jetties; construction/upland disturbance; shifts in native communities/species composition, including non-natives; human migration/relocation; sea level rise; increased storm events (number and severity); development/shoreline alteration: 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; comment on projects; work with localities on comprehensive planning; regional HCPs; conservation agreements; restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives; prioritize conservation actions/funding decisions to consider climate change; planning; encourage local zoning; permit review; work with counties on comprehensive shoreline management plans and to promote protection of shoreline habitats.
	Conservation actions	FY10-14 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – on going. COST – staff time. FY10-14 – PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties, especially those with significant potential to allow habitat migration with sea level rise. DUE – on-going. COST – staff time. FY10-14 – Landowner education. DUE – on going. COST – staff time. FY11 – Conduct sand grain analysis (Randolph-Macon College) to clarify optimal sand characteristics and tolerances. DUE – on going. COST - $4,000 FY11 – Programmatic BO with Corps on shoreline stabilization structures. DUE – on going. COST – staff time. FY11-12 – Develop and promote alternative shoreline stabilization designs and methods that protect property and maintain beetle habitat. DUE – on going. COST – staff time. FY11-12 – Work with counties to develop large-scale conservation plans that will maintain beetle habitat. DUE – on going. COST – staff time. FY11-12 – Develop countywide HCPs to guide conservation efforts to maintain sufficient habitat. DUE – on going. COST – staff time. FY12 - Initiate GIS analysis using SLAMM data to evaluate site longevity for tiger beetle sites within the Chesapeake Bay. DUE –

		9/30/12. COST- staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and demographic constraints caused by spills (offshore): spill prevention/planning; respond to spills; work with others on training for spill response; respond and assess effects.
	Conservation actions	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demographic constraints caused by 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.
	Conservation actions	FY10-14 – Landowner education. DUE – on going. COST – staff time. FY11-14 – 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. DUE – 9/30/14. COST – staff time. FY11-14 – Hold public meeting with Mathews County and other interested counties. DUE – on going. COST – staff time.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>
	Conservation actions	FY10-14 – Continue monitoring breakwater project at Savage Neck to evaluate long-term effects and expected effects from project. DUE – on going. COST – staff time.

Nottoway River Watershed Priority Area Strategic Habitat Conservation Planning Table

		Key Species/ Community	
		Listed Aquatic Species	**Migratory Birds**
Priority Area Boundaries		Defined by the extent of HUC 03010201.	
Notes		This watershed is an important headwater to the Albemarle and Pamlico Sounds and is uniquely pristine. The Nottoway watershed supports two federally listed aquatic species: Roanoke logperch and dwarf wedgemussel.	This watershed is an important headwater to the Albemarle and Pamlico Sounds and is uniquely pristine. The Nottoway watershed supports 53 high priority bird species, including the federally listed red-cockaded woodpecker. Longleaf pine (LLP) restoration goals are part of a long-term federal, state, and non-profit effort to restore LLP savannah and its dependant species to a portion of what was once 1 million acres of LLP in Virginia.
Other Species that Benefit from Conservation Actions taken for this Community/Species		This watershed contains 50+ priority migratory bird species, 8 fish species of conservation concern, 3 listed species, and several species of concern. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.	
Biological Planning	Relevant documents	Recovery Plans • 1992 Roanoke logperch • 1993 Dwarf wedgemussel 5-year Reviews • 2007 Roanoke logperch • 2007 Dwarf wedgemussel Other • Population/occurrence surveys, historic/current distribution maps. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html. • Lahey, A.M., and Angermeier, P.L. 2006. Range-wide assessment of habitat suitability for Roanoke logperch (*Percina rex*). Unpublished report to VDOT. • Rosenberger, A. 2007. An update to the Roanoke logperch recovery plan. Report to the U.S. Fish and Wildlife Service. 90 pp.	Recovery Plans • 2003 Red-cockaded woodpecker 5-year Reviews • 2006 Red-cockaded woodpecker Other • 2009 Rangewide Conservation Plan for Longleaf Pine. • 2001 Partners in Flight Bird Conservation Plan for South Atlantic Coastal Plain. • 1999 Partners in Flight Bird Conservation Plan for Mid Atlantic Coastal Plain. • 2005 South Atlantic Migratory Bird Initiative Implementation Plan.

	High level threats	<u>High level threats</u> • Habitat loss/degradation/fragmentation resulting from hydrologic alterations, contaminants, shifts in native communities/species composition (including non-natives), human migration/relocation, sea level rise, increased drought/increased rainfall/temperature change, increased storm events. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Non-native/problematic native species and diseases.	
	Conservation actions	FY12 - PFW will determine feasibility of completing assessment of stream impediments within the watershed. DUE – 9/30/12. COST – staff time.	FY12 - PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia. DUE – 9/30/12. COST – staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Roanoke logperch recovery plan criteria for downlisting: (1) All four populations are stable or expanding and are protected from foreseeable threats. (2) Population and/or range has been increased in the upper Roanoke drainage and in at least two of the other three drainages supporting the species. Roanoke logperch 5-year Review - Recommendations for Future Actions: (1) Maintain and increase health and vigor of present populations through a watershed-level conservation approach. (2) Evaluate the feasibility of propagating and determine whether a controlled propagation and reintroduction/augmentation plan should be developed. (3) Increase connectivity of populations by identifying major and minor artificial movement barriers and eliminating them when feasible. (4) Prevent and reduce the risk of catastrophic extirpation from toxic spills. (5) Survey streams with suitable habitat and continue to identify habitat that is potentially suitable for reintroduction/augmentation. (6) Revise recovery plan. Dwarf wedgemussel recovery plan criteria for downlisting: (1) Populations in the mainstem Connecticut River, Ashuelot River, Neversink River, upper Tar River, Little River, -rift Creek (Neuse system), and Turkey Creek, as well as populations in at least six other rivers (or creeks) representative of the species' range, must be shown to be viable. (2) At least 10 of the rivers or creeks referred to above must support a viable population widely enough dispersed within its habitat such that a single adverse event in a given river would be	<u>Conservation Goal</u> Red-cockaded Woodpecker Recovery Plan: Virginia portion necessary for delisting: one stable or increasing population containing at least 100 potential breeding groups (110 to 140 active clusters) in northeastern North Carolina and southeastern Virginia, and these populations are not dependent on continuing artificial cavity installation to remain at or above this population size. Red-cockaded Woodpecker 5-Year Review: Aggressive and effective prescribed burning programs, installation of artificial cavities until forests are old enough to provide sufficient numbers of potential cavity trees, and translocation of birds to the many small, at-risk (of extirpation) populations required to satisfy recovery criteria. The federal and state (and select private land) land base has been identified and is sufficient to recover the species, and much of the habitat is currently available. However, many tens of thousands of acres require restoration and improvement prior to establishing red-cockaded woodpecker territories. The goal for the 2005 South Atlantic Migratory Bird Initiative Implementation Plan is to increase LLP acreage from 1,500,047 to over 2,200,069 and improve conditions favoring warm season grass ground cover on at least 650,020 acres by year 2025. Maintenance and/or restoration of large tracts of bottomland hardwood forests and fire-maintained pine savannah are key over-arching goals. The 15-year goal for the 2009 Rangewide Conservation Plan

		unlikely to result in the total loss of that river's population. (3) All populations referred to above must be protected from present and foreseeable anthropogenic and natural threats that could interfere with their survival. Dwarf wedgemussel 5-year Review - Recommendations for Future Actions: (1) Revise recovery plan. (2) Complete population genetic analyses. (3) Complete ongoing statewide population surveys. (4) Identify high priority populations. (5) Develop habitat protection strategies for high priority populations. (6) Publication of gray literature. (7) Develop accurate fact sheets. <u>Virginia Contribution</u> This river has been identified as a priority Roanoke logperch recovery area in the species' recovery plan. Virginia Ecological Service's goal is to restore/protect habitat for federally listed species, the Service's Region 5 aquatic species of concern, and priority migratory birds.	for Longleaf Pine is to increase LLP acreage from 3.4 to 8 million acres, with half of this acreage targeted in the 16 range-wide "Significant Landscapes" (identified in Appendix B of the Plan) to support a majority of ecological and species' needs. The remaining acreage will be either in Significant Landscape sites or distributed across the range. <u>Virginia Contribution</u> Virginia Ecological Service's goal is to restore/protect habitat for federally listed species, the Service's Region 5 aquatic species of concern, and priority migratory birds.
	Conservation actions	FY12 - PFW and partners will coordinate with SE LLP Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast. DUE – 9/30/12. COST – staff time. FY13 - PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range. DUE – 9/30/13. COST – staff time.	FY12 - PFW and partners will coordinate with SE LLP Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast. DUE – 9/30/12. COST – staff time. FY13 - PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range. DUE – 9/30/13. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and non-native/problematic native species and diseases caused by climate change: establish (protect/restore) habitat corridors; work with localities on watershed planning; restore habitat/protect lands; prioritize conservation actions/funding decisions to consider climate change; control invasives; education/outreach; planning; work with VDEQ on water supply planning to include trust resource needs; implement appropriate control measures; monitoring for disease outbreaks.	

	Conservation actions	FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 - 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) and pesticides. DUE – ongoing. COST - staff time. FY10-13 - Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones). Due – ongoing. Cost - staff time. FY13 - If feasibility assessment of stream impediments proposed for FY11 is successful, PFW will develop protocols to determine which impediments are highest priority for conservation action. DUE – on-going. COST – staff time.	FY10 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/10. COST – staff time plus approximately $56,000 PFW funds. FY11 - PFW will restore at least 100 acres of LLP on private lands. DUE – 9/30/11. COST – staff time plus approximately $56,000 PFW funds. FY14 - PFW and partners will develop 25-year acreage goal for LLP habitat restoration in Virginia. DUE – 9/30/14. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and demographic constraints caused by spills: spill prevention/planning; respond to spills; work with others on training for spill response; work with DoD.	
	Conservation actions	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>	<u>Existing Plans</u>

	Conservation actions	FY12-13 – Identify priority dwarf wedgemussel habitats within the watershed and conduct surveys within these areas to evaluate populations and identify potential threats. DUE – 9/30/13. COST - $17,000.	FY10-14 - PFW and partners will monitor the survival of LLP plantings. DUE – on-going. COST – staff time.

Rappahannock River Valley National Wildlife Refuge Priority Area Strategic Habitat Conservation Planning Table

		Key Community
		Fishes of Conservation Concern: alewife, American eel, Atlantic sturgeon, American shad, blueback herring, gizzard shad, Hickory shad, and striped bass. **Bald eagles and wading birds** that depend on the river for foraging.
Priority Area Boundaries		Defined by Refuge acquisition boundary.
Notes		The Rappahannock River is a major spawning and nursery area for anadromous fish species and an important nursery area for the catadromous American eel. The river is also an important foraging area for bald eagles and wading birds.
Other Species that Benefit from Conservation Actions taken for this Community		All other resident fish species not noted above. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.
Biological Planning	Relevant documents	• 2009 Rappahannock River Valley National Wildlife Refuge Final Comprehensive Conservation Plan. • Assessment of endocrine disruption in smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*M. salmoides*) in Region 5 National Wildlife Refuges – study ongoing. • 2008 Decision Rationale Total Maximum Daily Loads Recreational Use (Bacteriological) Impairments Tidal Freshwater Rappahannock River Caroline, King George, Spotsylvania, and Stafford Counties, Virginia. • 2010 NOAA Assessment of Existing Information on Atlantic Coastal Fish Habitats: Development of a web-based spatial bibliography, query tools, and data summaries. • 2009 Chesapeake Bay Executive Order. • Fiscal Year 2011 Action Plan Executive Order 13508 Strategy for Protecting and Restoring the Chesapeake Bay Watershed http://executiveorder.chesapeakebay.net/file.axd?file=2010%2f9%2fChesapeake+EO+Action+Plan+FY2011.pdf. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html. Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html.
	High level threats	<u>High level threats</u> • Poor water quality.
	Conservation actions	FY10 - Completed field sampling planning for the Regionwide Environmental Contaminants Endocrine Disruptor study.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Rappahannock River Valley NWR Final Comprehensive Conservation Plan: historically, Atlantic sturgeon was found throughout the Chesapeake Bay and its tributaries, including the Rappahannock River. Populations began to decline in the late 19th century due to commercial overfishing. Additionally, sedimentation, dredging, and excessive nutrients have led to spawning and nursery habitat loss in the bay, which could be contributing to the species' recent decline. Decision Rationale Total Maximum Daily Loads Recreational Use (Bacteriological) Impairments Tidal Freshwater Rappahannock River Caroline, King George, Spotsylvania, and Stafford Counties, Virginia: identifies impaired waterbodies in the Rappahannock

		River drainage and is the basis for establishing pollutant load limits to improve water quality. Assessment of Existing Information on Atlantic Coastal Fish Habitats: Development of a web-based spatial bibliography, query tools, and data summaries - Document provides a strategy to conserve, protect, restore, and enhance aquatic habitats along the Atlantic Coast, including the Chesapeake Bay watershed. Top three classified threats and actions for Mid-Atlantic watersheds. Threats: (1) Dams and Passage, (2) Impervious Surfaces, (3) Water Quality Actions: (1) Riparian Buffers-Conserve and Restore, (2) Water Quality-Protect and Restore, (3) Improve Fish Passage. Chesapeake Bay Executive Order - Despite efforts by federal, state, and local governments and other interested parties, water pollution in the Chesapeake Bay prevents the attainment of existing State water quality standards and the "fishable and swimmable" goals of the CWA. The pollutants that are largely responsible for pollution of the Chesapeake Bay are nutrients, in the form of nitrogen and phosphorus, and sediment. These pollutants come from many sources, including sewage treatment plants, city streets, development sites, agricultural operations, and deposition from the air onto the waters of the Chesapeake Bay and the lands of the watershed. Fiscal Year 2011 Action Plan Executive Order 13508 - Goals: (1) Restore Clean Water Goal: Reduce nutrients, sediment, and other pollutants to meet Bay water quality goals for dissolved oxygen, clarity, and chlorophyll-a and other toxic contaminants. (2) Recover Habitat Goal: Restore a network of land and water habitats to support priority species and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed. (3) Sustain Fish and Wildlife Goal: Sustain healthy populations of fish and wildlife which contribute to a resilient ecosystem and a vibrant economy. (4) Conserve Land and Increase Public Access Goal: Conserve landscapes treasured by citizens to maintain water quality and habitat; sustain working forests, farms, and maritime communities; and conserve lands of cultural, indigenous and community value. Expand public access to the Bay and its tributaries through existing and new local, state and federal parks, refuges, reserves, trails and partner sites. Objectives: (1) Expand Citizen Stewardship Objective: Foster a dramatic increase in the number of citizen stewards of every age who support and carry out local conservation and restoration. (2) Develop Environmental Markets Objective: Working collaboratively, USA, EPA, Bay states, and other federal partners will develop environmental markets for the Chesapeake Bay, including the management infrastructure for measuring, reporting and verifying environmental performance for a suite of ecosystem services. (3) Respond to Climate Change Objective: Minimize the vulnerability of the Chesapeake Bay watershed, including its habitats, public infrastructure and human communities, to adverse impacts of climate change. (4) Strengthen Science Objective: Strengthen science to support ecosystem-based adaptive management, to more effectively prioritize, implement, monitor and evaluate the actions and policies needed, and to identify new threats to the health of the Chesapeake Bay and its watershed. <u>Virginia Contribution</u> Virginia Ecological Services goal is to assess the effects of endocrine disrupting chemicals and other contaminants to fish populations in the Rappahannock River which is an important foraging area for bald eagles and wading birds.
	Conservation actions	FY10 - Use information in existing plans to make decisions about sampling locations. DUE – 9/30/10. COST – staff time. FY11- Continue to develop interjurisdictional fish restoration alternatives at the L.A. Clarke NPL Site NRDAR that will improve fish habitat, reduce non-point source run-off and sedimentation, and improve water quality within an important tributary of the

		Rappahannock River. DUE – 9/30/11. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of poor water quality caused by point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.) and non-point source discharges (agriculture land runoff): VDEQ permit review; work with NWR; EC special study; work with EPA on regulations; public education.
	Conservation actions	FY10 - Complete field sampling for Regionwide Environmental Contaminants Endocrine Disruptor study. DUE – 9/30/10. COST – $11,880. FY11 - Assist in final year of Regionwide Environmental Contaminants Endocrine Disruptor study. DUE – 9/30/11. COST – staff time. FY11-12 - Evaluate feasibility of assisting VDEQ with TMDL implementation. DUE – on-going. COST – staff time. FY12-13 - Work with VDEQ on development and implementation of TMDL for Rappahannock River. This work is contingent upon funding for a GS-9 FTE. DUE – N/A. COST – Funding for a GS-9 FTE. FY13 – Submit environmental contaminants study to evaluate effects to water quality from biosolids application. DUE – 5/30/13. COST – staff time. FY13 - 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. DUE – 5/30/13. COST – staff time.
Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>
	Conservation actions	FY14 - Define the extent and magnitude of endocrine disruption (including intersex) in largemouth bass in the Rappahannock River, as evidenced by gonad histopathology including intersex; abnormal hormone concentrations; or abnormal plasma vitellogenin concentrations. DUE – 8/30/16. COST – TBD.

Roanoke Logperch Priority Area Strategic Habitat Conservation Planning Table

		Key Species **Roanoke logperch**
Priority Area Boundaries		Defined by 10-digit HUCs where the species is known to occur utilizing VDGIF and VDCR-DNH databases for known species occurrences.
Notes		Roanoke logperch occupy medium to large warmwater streams with moderate to low gradient. Microhabitats with loosely embedded substrate free of silt appear to be critical. Habitat use varies among age classes and between rivers. Eleven populations have been identified; populations have been designated due to their separation by large dams and the associated reservoirs that prevent genetic exchange. These populations are found in Rockingham County, North Carolina and several counties in Virginia. The majority of the species extant range is in Virginia.
Other Species that Benefit from Conservation Actions taken for this Species		Native aquatic species inhabiting same waterways as Roanoke logperch, including species of concern and/or state listed orangefin madtom, bigeye jumprock, Roanoke hogsucker, riverweed darter, green floater, Roanoke slabshell, Atlantic pigtoe, triangle floater.
Biological Planning	Relevant documents	<u>Recovery Plans</u> • 1992 Roanoke logperch <u>5-year Reviews</u> • 2007 Roanoke logperch <u>Other</u> • Population/occurrence surveys, historic/current distribution maps. • Virginia Department of Environmental Quality. 2008. Water quality assessment 305b/303d integrated report [Internet]. Richmond, Virginia. Available from: http://www.deq.state.va.us/water/reports.html. • Lahey, A.M., and Angermeier, P.L. 2006. Range-wide assessment of habitat suitability for Roanoke logperch (*Percina rex*). Unpublished report to VDOT. • Rosenberger, A. 2007. An update to the Roanoke logperch recovery plan. Report to the U.S. Fish and Wildlife Service. 90 pp.
	High level threats	<u>High level threats</u> • Habitat loss/ degradation/fragmentation resulting from sedimentation/suspended solids, contaminants, movement/migration barriers, hydrologic alteration. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Non-native/problematic native species resulting from shifts in species composition.
	Conservation actions	FY10 - Develop and submit funding proposal to USGS Climate Change RFP to, in part, complete down-scaled modeling for Appalachian streams. DUE – 9/30/10. COST – staff time. FY11 - Coordinate all relevant Appalachia-related activities with Appalachian Landscape Conservation Cooperative Coordinator to ensure successful launch of LCC. DUE - 7/31/11. COST – staff time.

		FY11 – Develop erosivity model as a planning tool to help reduce sedimentation in portions of the upper Roanoke basin. DUE – 9/30/11. COST – $24,000. FY11-14 – Quarterly recovery action team meetings or as needed. DUE – on-going. COST – staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> Roanoke logperch recovery plan criteria for downlisting: (1) All four populations are stable or expanding and are protected from foreseeable threats. (2) Population and/or range has been increased in the upper Roanoke drainage and in at least two of the other three drainages supporting the species. Roanoke logperch 5-year Review - Recommendations for Future Actions: (1) Maintain and increase health and vigor of present populations through a watershed-level conservation approach. (2) Evaluate the feasibility of propagating and determine whether a controlled propagation and reintroduction/augmentation plan should be developed. (3) Increase connectivity of populations by identifying major and minor artificial movement barriers and eliminating them when feasible. (4) Prevent and reduce the risk of catastrophic extirpation from toxic spills. (5) Survey streams with suitable habitat and continue to identify habitat that is potentially suitable for reintroduction/augmentation. (6) Revise recovery plan. <u>Virginia Contribution</u> Virginia Ecological Services goal is to recover the species within 10 years by working with an interagency team to protect/restore habitat, augment populations, conduct reintroductions, and accomplish other recovery actions.
	Conservation actions	FY11 – PFW will develop a GIS layer identifying all known fish passage/dam impediments within the 4 geographic areas with extant subpopulations of Roanoke logperch; goal will be to prioritize these for dam removal or restoration of fish passage capability. DUE – 9/30/11. COST – staff time. FY11 – Complete Blacksburg Country Club North Fork Roanoke River Stream Restoration Plan and finalize NRDAR settlement and consent decree with DOJ and DOI/SOL. DUE – 8/30/11. COST – staff time. FY11-12 – Adopt or develop a potential habitat model for the species. DUE – 9/30/12. COST – staff time plus $10,000.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and demographic constraints caused by large dams/reservoirs (operation and maintenance of existing dams, construction of new dams), dams, pipelines, large sections of unsuitable habitat, culverts, low water crossings, movement barriers (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness): comment on new projects and relicensing and operations; coordinate with FERC on relicensing and downstream management; permit reviews; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements; remove/modify barriers; restore habitat; provide fish passage; remove/re-route/bury pipelines; identify which impediments are problematic; fund additional studies (e.g., cues to movement); evaluate translocation/augmentation/reintroduction; conduct outreach to localities and dam/utility owners on instream effects; conduct outreach with VDOT, localities, and private landowners.
	Conservation actions	FY10 – Congressionally-coordinated public hearing held in Franklin County to decide project purpose for proposed Power Dam removal on Pigg River. DUE – 9/30/10. COST – staff time.

		FY10 – Replacement of low water bridge with elevated bridge at Wiley Drive in City of Roanoke on Roanoke River; reconnecting 80 miles of river for logperch. DUE – 9/30/10. COST – $977,400. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, Biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 – Represent the Service on Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). Due – ongoing. Cost - staff time. FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST – staff time. FY11 – Begin implementation of Blacksburg Country Club NRDA Restoration project #1 on the North Fork Roanoke River. DUE – 9/30/24. COST – staff time plus $10,619. FY11 – Develop Preliminary Engineering Design for removal of Power Dam in Franklin County. DUE - 9/30/11. COST – PFW staff time plus funds TBD. FY11 – Remove Veterans Park Dam in Rocky Mount. DUE - 09/30/11. COST - staff time plus $112,890 PFW and partner funds. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST – staff time. FY11-14 – 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. DUE – on-going. COST – staff time plus funds TBD. FY12 – Begin implementation of Blacksburg Country Club NRDA Restoration projects #2 and 3 on the North Fork Roanoke River. DUE – 9/30/24. COST – staff time plus $13,962. FY13 - Complete Power Dam removal on Pigg River, Franklin County. DUE – 9/30/13. Cost – staff time plus funds TBD. FY13 – Begin implementation of Blacksburg Country Club NRDA Restoration projects #4 and 5 on the North Fork Roanoke River. DUE – 9/30/24. COST – staff time plus $17,038. FY14 – PFW will assess feasibility and potential recovery implications for a dam removal project at Martinsville on the Smith River. DUE – 9/30/14. COST – staff time plus $50,000.

		FY14 – Begin implementation of Blacksburg Country Club NRDA Restoration project #6 on the North Fork Roanoke River. DUE – 9/30/24. COST – staff time plus $9,392.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation caused by 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.
	Conservation actions	FY10 – Veterans Park Dam removal - Several meetings with local government officials held to complete negotiations and finalize design plans. DUE – 9/30/10. COST – staff time. FY10 – Congressional fact sheets finalized for Wiley Drive Fish Passage and Veterans Park Dam removal. DUE – 9/30/10. COST – staff time. FY10 – Wiley Drive Fish Passage ARRA Project - Congressional fact sheet, several news articles, and a Project Dedication Event completed. DUE – 9/30/10. COST – staff time. FY10-13 – Represent the Service on Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST – staff time. FY10-13 – Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, Biosolids) and pesticides. DUE – ongoing. COST – staff time. FY10-13 – Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST – staff time. FY10-13 – Work with VDEQ on development and implementation of TMDLs in Roanoke River basin. DUE – ongoing. COST – staff time. FY11 – Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance. DUE – ongoing. COST – staff time. FY11 – Work with Corps toward developing a programmatic section 7 consultation on the effects of small construction projects on Roanoke logperch. DUE – N/A. COST – staff time. FY11 – Remove Veterans Park Dam in Rocky Mount. DUE – 9/30/11. COST – staff time plus $112,890 Service and PFW funds.

		FY11 – News release for Veterans Park Dam removal. DUE – 9/30/11. COST – staff time. FY11 – Develop Preliminary Engineering Design for removal of Power Dam in Franklin County. DUE - 9/30/11. COST – staff time plus funds TBD.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and demographic constraints caused by 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.
	Conservation actions	FY10 – Begin drafting a controlled propagation and reintroduction/augmentation plan. DUE – ongoing. COST – staff time. FY11 – Continue to develop controlled propagation and reintroduction/augmentation plan. DUE – 9/30/11. COST – staff time. FY11-12 - Participate in EPA and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time. FY12 – Develop bridge and roadway design BMPs to minimize risk of spills from roads. DUE - 9/30/12. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threats of habitat loss/degradation/fragmentation and non-native/problematic native species caused by climate change: restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; work with localities to support low impact development; work with VDEQ on water supply planning to include trust resource needs; control invasives; education/outreach.
	Conservation actions	FY11 – Remove Veterans Park Dam in Rocky Mount. DUE - 9/30/11. COST – staff time plus $112,890 PFW and partner funds. FY11 – Develop Preliminary Engineering Design for removal of Power Dam in Franklin County. DUE - 9/30/11. COST – staff time plus funds TBD. FY11-14 – Work with VDEQ on development and implementation of TMDLs in Roanoke River basin. DUE – ongoing. COST – staff time. FY12 – Devise funding strategy to support full removal of Power Dam. DUE - 9/30/12. COST – staff time. FY13 – Complete Power Dam removal on Pigg River, Franklin County. DUE – 9/30/13. COST – staff time plus funds TBD.

Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>
	Conservation actions	FY10 – Complete 2nd year of Roanoke logperch swimming performance study contracted to TTU. DUE - 12/29/10. COST– $56,000 FY11 – Review final Roanoke logperch swimming performance study contracted to TTU. DUE - 9/30/11. COST – staff time. FY11 – Conduct baseline fish survey and tagging in support of Veterans Park Dam removal in Pigg River. DUE - 11/21/10. COST – staff time. FY12 – Survey for logperch in additional locations in the Pigg River. DUE - 9/30/12. COST – staff time plus $80,000. FY11-14 – Determine impediments to upstream movement in upper Roanoke using swim performance study results. DUE – 9/30/14. COST – staff time plus $50,000. FY11-14 – Post-removal fish and habitat monitoring for Veterans Park Dam removal. DUE – 9/30/14. COST – TBD. FY13 – Determine water intake impacts on logperch life stages and population. DUE – 9/30/13. COST – staff time plus $25,000-50,000. FY13-14 – Post-removal fish and habitat monitoring for Power Dam removal. DUE – on-going. COST – TBD. FY14 – Determine effects of instream construction activities on life stages of logperch. DUE – 9/30/14. COST – staff time plus $50,000.

Upper James River Priority Area Strategic Habitat Conservation Planning Table

		Key Community **Chesapeake Bay Trust Resources**
Priority Area Boundaries		Defined by the extent of HUC 02080201.
Notes		This watershed is an important headwater to and the largest tributary to the Chesapeake Bay in Virginia.
Other Species that Benefit from Conservation Actions taken for this Community		This watershed contains 30+ priority migratory bird species, several fish species of conservation concern, 8 listed species, and 50+ species of concern. See Virginia Ecological Services Strategic Plan 2010-2014 Appendix 3.
Biological Planning	Relevant documents	Recovery Plans • 1991 Shale barren rock cress • 1995 Smooth coneflower • 1982 Gray bat • 1984 Ozark big-eared bat and the Virginia big-eared bat • 1990 James spinymussel • 1992 Small whorled pogonia • 1992 Northeastern bulrush 5-year Reviews • 2010 Shale barren rock cress (Draft) • 2009 Gray bat • 2008 Virginia big-eared bat • 2008 James spinymussel • 2008 Small whorled pogonia • 2008 Northeastern bulrush Other • Virginia Department of Environmental Quality. 2010. Draft Virginia 305(b)/303(d) Water quality integrated report to Congress and EPA Administrator for the period January 1, 2003 to December 31, 2008. Virginia Department of Environmental Quality, Richmond, VA. http://www.deq.state.va.us/water/reports.html. • Chesapeake Bay Total Maximum Daily Load for Nitrogen Phosphorus and Sediment (USEPA, December 29, 2010. • 2009 Chesapeake Bay Executive Order. • Fiscal Year 2011 Action Plan Executive Order 13508 Strategy for Protecting and Restoring the Chesapeake Bay Watershed http://executiveorder.chesapeakebay.net/file.axd?file=2010%2f9%2fChesapeake+EO+Action+Plan+FY2011.pdf. • 2010 NOAA Assessment of Existing Information on Atlantic Coastal Fish Habitats: Development of a web-based spatial bibliography, query tools, and data summaries.

	High level threats	<u>High level threats</u> • Habitat loss/degradation/fragmentation resulting from hydrologic alterations, contaminants, shifts in native communities/species composition (including non-natives, increased drought/increased rainfall/temperature change. • Demographic constraints resulting from genetics, isolated populations, small population size, etc. • Non-native/problematic native species and diseases.
	Conservation actions	FY11 - Collaborate with NWR Division on planning activities and landowner outreach for expansion of James River NWR. DUE - 8/1/11. COST – staff time.
Conservation Design	Bring together results of biological planning into products that guide management and provide on-the-ground strategy for achieving objectives	<u>Conservation Goal</u> 2009 Chesapeake Bay Executive Order: Executive departments and agencies, working in collaboration, can use their expertise and resources to contribute significantly to improving the health of the Chesapeake Bay. Fiscal Year 2011 Action Plan Executive Order 13508 - Goals: (1) Restore Clean Water Goal: Reduce nutrients, sediment, and other pollutants to meet Bay water quality goals for dissolved oxygen, clarity, and chlorophyll-a and other toxic contaminants. (2) Recover Habitat Goal: Restore a network of land and water habitats to support priority species and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed. (3) Sustain Fish and Wildlife Goal: Sustain healthy populations of fish and wildlife which contribute to a resilient ecosystem and a vibrant economy. (4) Conserve Land and Increase Public Access Goal: Conserve landscapes treasured by citizens to maintain water quality and habitat; sustain working forests, farms, and maritime communities; and conserve lands of cultural, indigenous and community value. Expand public access to the Bay and its tributaries through existing and new local, state and federal parks, refuges, reserves, trails and partner sites. Objectives: (1) Expand Citizen Stewardship Objective: Foster a dramatic increase in the number of citizen stewards of every age who support and carry out local conservation and restoration. (2) Develop Environmental Markets Objective: Working collaboratively, USA, EPA, Bay states, and other federal partners will develop environmental markets for the Chesapeake Bay, including the management infrastructure for measuring, reporting and verifying environmental performance for a suite of ecosystem services. (3) Respond to Climate Change Objective: Minimize the vulnerability of the Chesapeake Bay watershed, including its habitats, public infrastructure and human communities, to adverse impacts of climate change. (4) Strengthen Science Objective: Strengthen science to support ecosystem-based adaptive management, to more effectively prioritize, implement, monitor and evaluate the actions and policies needed, and to identify new threats to the health of the Chesapeake Bay and its watershed. Assessment of Existing Information on Atlantic Coastal Fish Habitats: Development of a web-based spatial bibliography, query tools, and data summaries - Document provides a strategy to conserve, protect, restore, and enhance aquatic habitats along the Atlantic Coast, including the Chesapeake Bay watershed. Top three classified threats and actions for Mid-Atlantic watersheds. Threats: (1) Dams and Passage, (2) Impervious Surfaces, (3) Water Quality Actions: (1) Riparian Buffers-Conserve and Restore, (2) Water Quality-Protect and Restore, (3) Improve Fish Passage. <u>Virginia Contribution</u> The Virginia Ecological Services goal is to protect/restore habitat and water quality for the James spinymussel and aquatic species of concern and protect/restore habitat for priority migratory birds.
	Conservation actions	

Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and non-native/problematic native species and diseases caused by climate change: establish (protect/restore) habitat corridors; work with localities on watershed planning; restore habitat/protect lands; prioritize conservation actions/funding decisions to consider climate change; control invasives; work with VDEQ and USGS on water supply planning to include trust resource needs; implement appropriate control measures; planning; habitat restoration; public outreach/education; monitoring for disease and invasive outbreaks; identify problem species and vectors.
	Conservation actions	FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 - Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY10-13 - Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, biosolids) and pesticides. DUE – ongoing. COST - staff time. FY11 - Collaborate with Appalachian Partnership Coordinator Office to develop a NRCS Cooperative Conservation Partnership Initiative grant for tributaries of the Upper James identified as high priority areas for James spinymussel. DUE - 1/30/11. COST – staff time. FY11 - Collaborate with Appalachian Partnership Coordinator Office to develop a NRCS Cooperative Conservation Partnership Initiative grant for tributaries of the Upper James identified as high priority areas for James spinymussel. DUE - 1/30/11. COST – staff time. FY11 - Collaborate with NWR Division on planning activities and landowner outreach for expansion of James River NWR. DUE - 8/1/11. COST – staff time. FY12-14 - 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 spinymussel. DUE - 9/30/2012. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of habitat loss/degradation/fragmentation and demographic constraints caused by spills: spill prevention/planning; respond to spills; work with others on training for spill response; work with RC&D; engage in spill training locally.

	Conservation actions	FY11-12 - Participate in RRT and USCG spill planning and preparedness meetings and exercises. DUE – on-going. COST – staff time.
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demographic constraints caused by large dams: remove dams or modify for fish passage; change operations.
	Conservation actions	
Conservation Delivery	Implementation of on-the-ground actions (e.g., building partnerships, acquiring funding, habitat management)	Actions to address high level threat of demographic constraints caused by low reproductive viability in existing patchy habitat: restore habitat/protect lands; work with landowners and RC&D; connectivity/corridors; permit reviews; investigate level of threat; conduct PVA; determine if captive propagation is appropriate.
	Conservation actions	FY10-13 - Review General and Individual VPDES Permits (new and renewals) and work with VDEQ to integrate into the General VPDES Permit regulations a direction to access the Virginia Field Office website for information on listed species and critical habitat. DUE – ongoing. COST - staff time. FY10-13 - Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards [WQS] CWA 401, total maximum daily loads, biosolids) and pesticides. DUE – ongoing. COST - staff time. FY10-13 - Represent the Service on the Virginia WQS Triennial Review technical advisory committee (2011 potential issues: ammonia; copper; cyanide; mixing zones and listed species and critical habitat). DUE – ongoing. COST - staff time. FY11 - Collaborate with Appalachian Partnership Coordinator Office to develop a USDA Cooperative Conservation Partnership Initiative grant for tributaries of the Upper James identified as high priority areas for James spinymussel. DUE - 9/30/2011. COST – staff time. FY11 – Continue to implement and refine the online project review process. DUE – ongoing. COST - staff time.

Monitoring + Research	Evaluate assumptions, response of habitat and populations to conservation actions and progress towards achieving objectives	<u>Existing Plans</u>
	Conservation actions	FY11 - Coordinate all relevant Appalachia-related activities with Appalachian Landscape Conservation Cooperative Coordinator to ensure the successful launch of this LCC. DUE - 7/31/11. COST – staff time.

Key Actions Outside Priority Areas

Program	Actions
Administration	FY10-11 - Respond to Gulf oil spill. DUE – on-going. COST – staff time and travel. FY11 - Secure new lease for SVFO. DUE – N/A. COST – staff time. FY11 - Work with GSA on new lease for VAFO. DUE – N/A. COST – staff time. FY11 – Attend training and transition to Federal Business Management System. DUE – 11/30/11. COST – staff time. FY11 – Convene annual Virginia Project Leaders Meeting for PLs in Virginia or surrounding states. DUE – 03/30/11. COST – staff time.
Conservation Planning Assistance	FY11 - Maintain and improve project review website. DUE – on-going. Cost – staff time. FY11-13 - Provide review of the Service's Information, Planning, and Conservation System (IPaC) and assist with maintaining accurate information in this system for Virginia. DUE – on-going. Cost – staff time. FY11 - Complete new "Standard Operating Procedures/ Local Operating Procedures" with Corps Norfolk District Regulatory for coordination of proposed permits under the Endangered Species Act, Clean Water Act, Fish and Wildlife Coordination Act, and NEPA. DUE – 5/31/11. COST – staff time. FY11 - 3.1.13 # non-FWS riparian (stream/shoreline) miles restored/enhanced, conservation planning assist - 5 miles. DUE – 9/30/11. COST – staff time. FY11 - GP-3.2.4 # of non-FWS instream miles protected/conserved through technical assistance-annual 10 miles. DUE – 9/30/11. COST – staff time. FY11 - GP-3.2.5 # non-FWS riparian (stream/shoreline) miles protected/conserved, technical assistance-annual - 10 miles. Due to RO – 9/30/11. Cost – staff time. FY11 - 3.2.8 # non-FWS riparian (stream/shoreline) acres protected/conserved, technical assistance-annual - 10 acres. DUE - 9/30/11. COST – staff time. FY11 - 4.1.18 # of non-FWS wetland acres restored/enhanced through conservation planning assistance - 50 acre. DUE – 9/30/11. COST – staff time. FY11 - 4.2.9 # of non-FWS upland acres restored/enhanced through conservation planning assistance - 50 acres. DUE – 9/30/11. COST – staff time.

	FY 11 - 4.3.4 # of non-FWS coastal/marine acres restored/enhanced through conservation planning assistance - 10 acres. DUE – 9/30/11. COST – staff time. FY11 - GP-4.4.6 # of non-FWS wetland acres protected/conserved through technical assistance-annual - 50 acres. DUE – 9/30/11. COST – staff time. FY11 - GP-4.5.4 # of non-FWS upland acres protected/conserved through technical assistance-annual - 50 acres. DUE – 9/30/11. COST – staff time. FY11 - GP-4.6.3 # of non-FWS coastal/marine acres protected/conserved through technical assistance-annual - 10 acres. DUE – 9/30/11. COST – staff time. FY11 - 4.7.5.1 # of technical assistance requests completed – 50. DUE – 9/30/11. COST – staff time. FY11 - 4.7.8.2 # of transportation activities reviewed – 10. DUE – 9/30/11. COST – staff time. FY11 - 4.7.15 # all other activities reviewed (e.g., non-energy, non-transp, non-water supply, non-rest) – 20. DUE – 9/30/11. COST – staff time. FY11 - 4.8.1 # of large-scale landscape-level planning and/or programmatic approaches in progress – 3. DUE – 9/30/11. COST – staff time. FY11 - 4.8.2 # of large-scale landscape planning and/or programmatic approaches completed-annual – 2. DUE – 9/30/11. COST – staff time. FY11 - 14.1.5.2 # of energy activities (non-hydropower) reviewed – 20. DUE – 9/30/11. COST – staff time. FY11 - 14.2.5.2 # of hydropower activities reviewed – 2. DUE – 9/30/11. COST – staff time. FY11 - 14.3.5.2 # of water supply/delivery activities reviewed – 2. DUE – 9/30/11. COST – staff time.
Endangered Species - SVFO	FY11 - Provide assistance to VAFO with ongoing Dupont NRDAR. DUE – on-going. COST - staff time. FY11 - Provide assistance to VAFO with ongoing Avtex NRDAR. DUE – on-going. COST - staff time
Endangered Species - VAFO	FY11 - Roanoke logperch 5 year review. DUE - 9/30/11. Cost – staff time. FY11-13 - Maintain and improve project review website. DUE – on-going. COST – staff time FY11-13 - Provide review of the Service's Information, Planning, and Conservation System (IPaC) and assist with maintaining

	accurate information in this system for Virginia. DUE – on-going. COST – staff time. FY11 - Complete Virginia roundleaf birch (*Betula uber*) 5-year status review. DUE - 9/30/11. COST – staff time. FY11 - Complete sensitive joint vetch (*Aeschynomene virginica*) 5 year status review (contract with VDCR). DUE – 03/30/11. COST – $5,000 plus staff time. FY11 - Complete Virginia sneezeweed (*Helenium virginicum*) 5 year status review. DUE – 12/31/10. COST – staff time. FY11 - Complete programmatic section 7 consultation with National Park Service's Shenandoah National Park for ongoing and planned activities. DUE- 03/31/11. COST – staff/detailee time, IAG from NPS to fund $30,000. FY11 - Complete new "Standard Operating Procedures/Local Operating Procedures" with Corps Norfolk District Regulatory for coordination of proposed permits under the Endangered Species Act, Clean Water Act, Fish and Wildlife Coordination Act, and NEPA. DUE – 5/31/11. COST – staff time. FY11 - Conduct a meeting among Federal agencies that may support nesting sea turtles to improve management consistency and coordination for effective management. DUE – 5/01/11. COST – staff time. FY16 – Conduct status assessments and 12-month findings for petitioned species (CBD 404 species petition). DUE – 12/31/17. COST – staff time or contractor.
Environmental Contaminants	FY11 - Prepare a Refuge Cleanup proposal for Potomac Rivers Complex NWR. DUE - 6/30/11. COST – staff time and $250 travel. FY11 - Finalize the Contaminant Assessment Process for Presquile NWR, Back Bay NWR, Eastern Shore of Virginia NWR, and Fisherman Island NWR. DUE - 9/30/11. COST - $8,600 staff time and $1,400 travel. FY11—Work on injury determination and quantification for Dupont NRDAR. DUE – on-going. COST – staff time. FY11 – Develop and research restoration options for Dupont NRDAR. Cost-staff time and contract with IEc. DUE – 9/30/11. COST – staff time. FY11 - Finalize Assessment Plan for Dupont NRDAR. DUE – 9/30/11. COST - $5000. FY11 - Award contract to IEC to complete the Preliminary Estimate of Damages for Avtex NRDAR. DUE – 6/30/11. COST - $5,000. FY11 - Plant trees and award a contract for erosion control at Presquile NWR as part of C&R Battery NRDAR restoration. DUE – 9/30/11. COST – $60,000. FY11 - Develop a scaling tool with Institute of Bird Populations, College of William & Mary, Dupont, USGS, Biodiversity Research Institute, and Industrial Economics to facilitate neo-tropical migrant songbird restoration project assessments in the Shenandoah

	Valley and Central America. DUE – 9/30/11. COST – $75,000. FY11 - Work with co-trustees on Atlantic Wood NRDAR and EPA on developing potential restoration of wetland habitat in Elizabeth River watershed. DUE – ongoing. COST—staff time FY11 – Provide technical assistance and agency recommendations to EPA's BTAG on trust resource issues at 15 Superfund and other hazardous waste sites in Virginia. DUE – ongoing. COST – staff time. FY11 - Provide technical assistance to EPA and Elizabeth River Project on sediment remediation and restoration issues in Elizabeth River. DUE – ongoing. COST – staff time.
IT/GIS/WEB	FY11 - Work to secure additional server/digital storage space to improve digital document storage and management. DUE – 7/30/11. COST - $ 12,000. FY10-14 – PFW staff will assist VAFO/SVFO with technical support for website and GIS maintenance and special project development, as well as database management. DUE – on-going. COST – staff time.
Partners for Fish and Wildlife	FY10-14 – 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. DUE – on-going. COST – staff time. FY10-14 – Provide technical assistance to all Service divisions and programs, as needed and when available. DUE – on-going. COST – staff time. FY10-14 – Provide technical support to North Atlantic LCC, as requested. DUE – on-going. COST – staff time. FY10-14 – Provide technical support to South Atlantic LCC, as requested. DUE – on-going. COST – staff time. FY11 – Mentor a senior biology student from the Governor's School for Science and Technology. DUE – 6/1/11. COST – staff time. FY11 – Guest instructor for graduate Habitat Restoration course at Christopher Newport University. DUE – 2/30/11. COST – staff time.

APPENDIX 7 – 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 – Longleaf 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
NRDAR - 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

APPENDIX 8 – PARTNERS/STAKEHOLDERS TO REVIEW AND COMMENT ON STRATEGIC PLAN

Individuals Provided with Strategic Plan for Review and Comment

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