

# 19. RAPPAHANNOCK-RAPIDAN PLANNING REGION LOCAL ACTION PLAN SUMMARY

## WILDLIFE ACTION PLAN AND LOCAL SUMMARIES OVERVIEW

### *Wildlife Action Plan*

Virginia is fortunate to contain a wide variety of natural resources and landscapes that provide Virginians with a range of benefits, services, and economic opportunities. Natural resource conservation in Virginia, as in most states, is implemented by government agencies, non-governmental organizations, private institutions, academic institutions, and private citizens. These groups work to enhance the quality of life within the Commonwealth by conserving Virginia's air, land, water, and wildlife. Adequate funding and human capital needed to manage and conserve these valuable resources are not always available. In 2005, Virginia's conservation community first came together to maximize the benefits of their actions and created the state's first Wildlife Action Plan (Action Plan). It was written to prioritize and focus conservation efforts to prevent species from declining to the point where they become threatened or endangered (DGIF 2005). The 2015 Action Plan is an update of the original Plan. The Action Plan must address eight specific elements mandated by Congress. They are:

- 1. Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife; and*
- 2. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and*
- 3. Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and*
- 4. Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions; and*
- 5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and*
- 6. Descriptions of procedures to review the Plan-Strategy at intervals not to exceed ten years; and*
- 7. Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Plan-Strategy with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or*

*administer programs that significantly affect the conservation of identified species and habitats.*

*8. Congress has affirmed through WCRP and SWG, that broad public participation is an essential element of developing and implementing these Plans-Strategies, the projects that are carried out while these Plans-Strategies are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.*

Each species included in the 2015 Action Plan (Species of Greatest Conservation Need or SGCN) has been evaluated and prioritized based upon two criteria: degree of imperilment and management opportunity.

To describe imperilment, SGCN are grouped into one of four Tiers: Critical (Tier I), Very High (Tier II), High (Tier III), and Moderate (Tier IV).

***Tier I - Critical Conservation Need.*** *Species face an extremely high risk of extinction or extirpation. Populations of these species are at critically low levels, face immediate threat(s), and/or occur within an extremely limited range. Intense and immediate management action is needed.*

***Tier II - Very High Conservation Need.*** *Species have a high risk of extinction or extirpation. Populations of these species are at very low levels, face real threat(s), and/or occur within a very limited distribution. Immediate management is needed for stabilization and recovery.*

***Tier III - High Conservation Need.*** *Extinction or extirpation is possible. Populations of these species are in decline, have declined to low levels, and/or are restricted in range. Management action is needed to stabilize or increase populations.*

***Tier IV - Moderate Conservation Need.*** *The species may be rare in parts of its range, particularly on the periphery. Populations of these species have demonstrated a declining trend or a declining trend is suspected which, if continued, is likely to qualify this species for a higher tier in the foreseeable future. Long-term planning is necessary to stabilize or increase populations.*

While degree of imperilment is an important consideration, it is often insufficient to prioritize the use of limited human and financial resources. In order to identify and triage conservation opportunities, development of the updated Action Plan (2015) included assigning a Conservation Opportunity Ranking to each species identified within the Plan. Rankings were assigned with input from taxa or species experts (biologists) and other members of Virginia's conservation community. They also are based on conservation or management actions and research needs identified for the species within the 2005 Action Plan. In addition, a literature review was conducted to garner any new information available since the first version of the Action Plan. The three Conservation Opportunity Rankings are described as follows:

*A – Managers have identified “on the ground” species or habitat management strategies expected to benefit the species; at least some of which can be implemented with existing resources and are expected to have a reasonable chance of improving the species’ conservation status.*

*B – Managers have only identified research needs for the species or managers have only identified “on the ground” conservation actions that cannot be implemented due to lack of personnel, funding, or other circumstance.*

*C – Managers have failed to identify “on the ground” actions or research needs that could benefit this species or its habitat or all identified conservation opportunities for a species have been exhausted.*

Over 880 SGCN are listed in the 2015 Action Plan and found in varying densities across the state (Figure 1). Of the Plan’s SGCN, 23.4 percent are classified as Conservation Opportunity Ranking A; 7.1 percent are classified Conservation Opportunity Ranking B, and 69.5 percent are classified as Conservation Opportunity Ranking C. Additionally, of the 883 SGCN:

- Approximately 25% of the SGCN are already listed as threatened or endangered under the Federal or Virginia Endangered Species Act,
- Approximately 60% are aquatic,
- Approximately 70% are invertebrates, and
- All are impacted by the loss or degradation of their habitats.

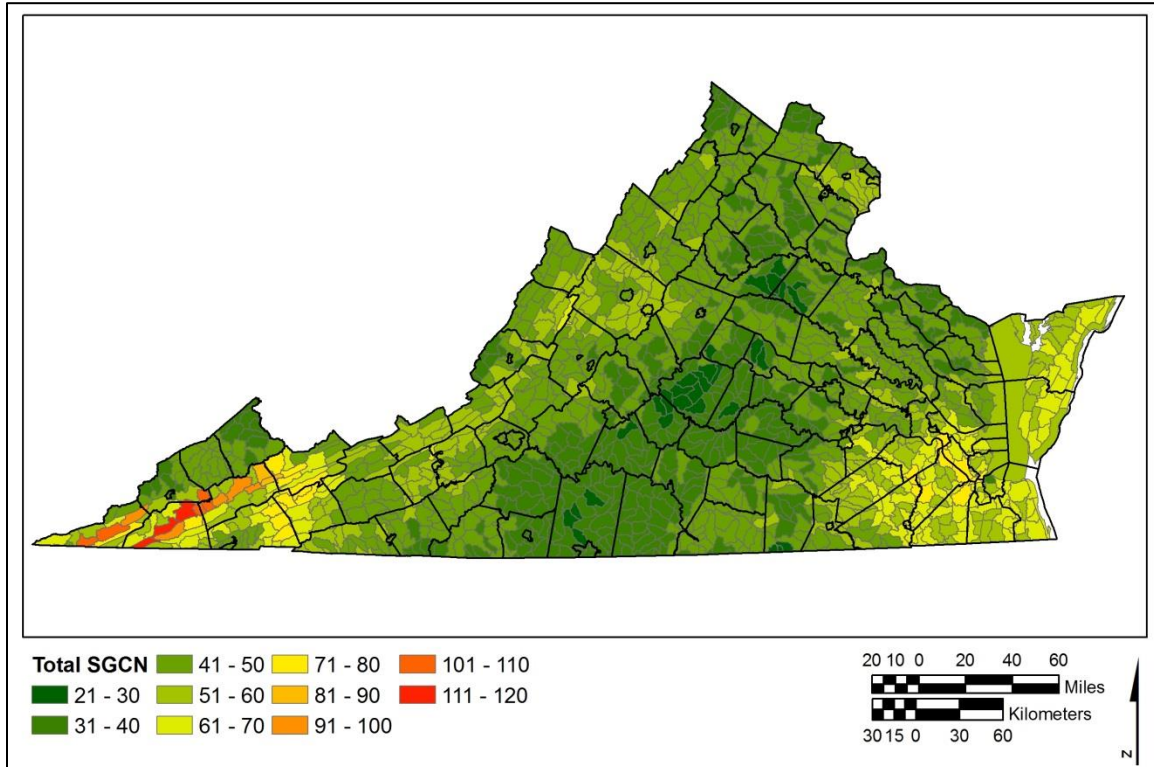


Figure 1. State distribution of Species of Greatest Conservation Need by HUC12 Watersheds.

## *Wildlife Action Plan Implementation*

Since its creation, the Wildlife Action Plan has helped Virginia acquire over \$17 million in new conservation funding through the State Wildlife Grants Program. These resources have been used to implement significant research, advance species recovery efforts via captive propagation, and restore and conserve important wildlife habitats. Despite these successes, many conservation practitioners feel the original Wildlife Action Plan never reached its full potential. One common concern is that it failed to focus at the habitat level where the needs of many species could be addressed at once. Further, many partners indicated the original Action Plan did not provide sufficient details to help prioritize conservation needs and opportunities at a local scale, where many land use decisions are made, and conservation efforts are implemented. Lacking these local insights, it was often difficult for agencies, municipalities, organizations, academic institutions, and landowners to identify and focus on the highest priority wildlife conservation opportunities for their geographic area. To address this concern and make the Action Plan more user-friendly and relevant at a finer scale, this version (2015) of the Action Plan was developed to include locally-based summaries. These summaries identify species that are local priorities, habitats required to conserve those species, regional threats impacting species and habitats, and priority conservation actions that can be taken to address those threats. The goal of these summaries is to facilitate and benefit the work of local governments, conservation groups, landowners, and other members of the conservation community who wish to support wildlife conservation within their regions.

### *Local Action Plan Summaries*

In creating the updated Action Plan, the Virginia Department of Game and Inland Fisheries (DGIF) adopted a model developed by the Virginia Department of Conservation and Recreation (DCR) for the Virginia Outdoors Plan. The Virginia Outdoors Plan describes recreational resource issues for 21 multi-county Recreational Planning Regions. Each Recreational Planning Region is roughly analogous to one of Virginia's 21 local Planning District Commissions (PDC). The PDCs are voluntary associations of local governments intended to foster intergovernmental cooperation by bringing together local officials, agency staff, the public, and partners to discuss common needs and develop solutions to regional issues. With its focus on local-scale actions, the Virginia Outdoors Plan has become an important tool for identifying and addressing local recreational issues. This DCR model was adapted and used in this Action Plan to address wildlife and habitat issues for the benefit of planning region residents. More broadly, the new Action Plan's Local Action Plan Summaries will create a framework that Virginia's diverse conservation community can use to identify issues and locations of mutual conservation interest, enhance collaborative opportunities, develop new conservation resources, and craft "win-win" situations that can be beneficial for both the people and wildlife of Virginia.

## RAPPAHANNOCK-RAPIDAN REGIONAL COMMISSION SUMMARY OVERVIEW

The Rappahannock-Rapidan Planning Region consists of 1,259,414 acres (1,968 square miles) and includes Culpeper, Fauquier, Madison, Orange, and Rappahannock counties and the towns of Culpeper, Gordonsville, Madison, Orange, Remington, Warrenton, and Washington. The human population in this planning region is estimated at almost 173,000 people (U.S. Census Bureau 2015). All counties are projected to experience increases in population by 2020, 2030, and 2040, with Fauquier and Culpepper experiencing the greatest growth (Weldon Cooper Center 2012).

Less developed and more rural areas often provide a diversity of valuable wildlife habitats, which can be degraded or lost as human populations grow. This planning region provides aquatic habitats for a range of SGCN such as the panhandle pebblesnail that has 100 percent of its distribution within the region, Carolina lance, and least brook lamprey. Its forests are home to the Shenandoah salamander as well as the variable mantle slug and ribbed striate snail. The region also includes a variety of other habitats, such as mature mixed hardwood and conifer forests, young forests, retired agricultural land, non-tidal wetlands, and freshwater streams and riparian habitats (Figure 2).

In developing conservation actions for habitats and priority species within this planning region, a number of factors must be considered to determine how limited resources can be allocated to best effect. A project's likely impact and probability of success, the effectiveness of historic and ongoing conservation actions, as well as logistical, economic, and political factors will all influence the selection and prioritization of conservation actions. Virginia's Wildlife Action Plan advocates a proactive approach that focuses conservation resources to manage species before they become critically imperiled and to implement projects that can simultaneously benefit multiple species and human communities. These factors were during development of the conservation actions included in the following sections as well as in analyzing the existing threats facing SGCN and their habitats. Threats and conservation actions are organized based on the habitat types found within this planning region upon which priority SGCN depend.

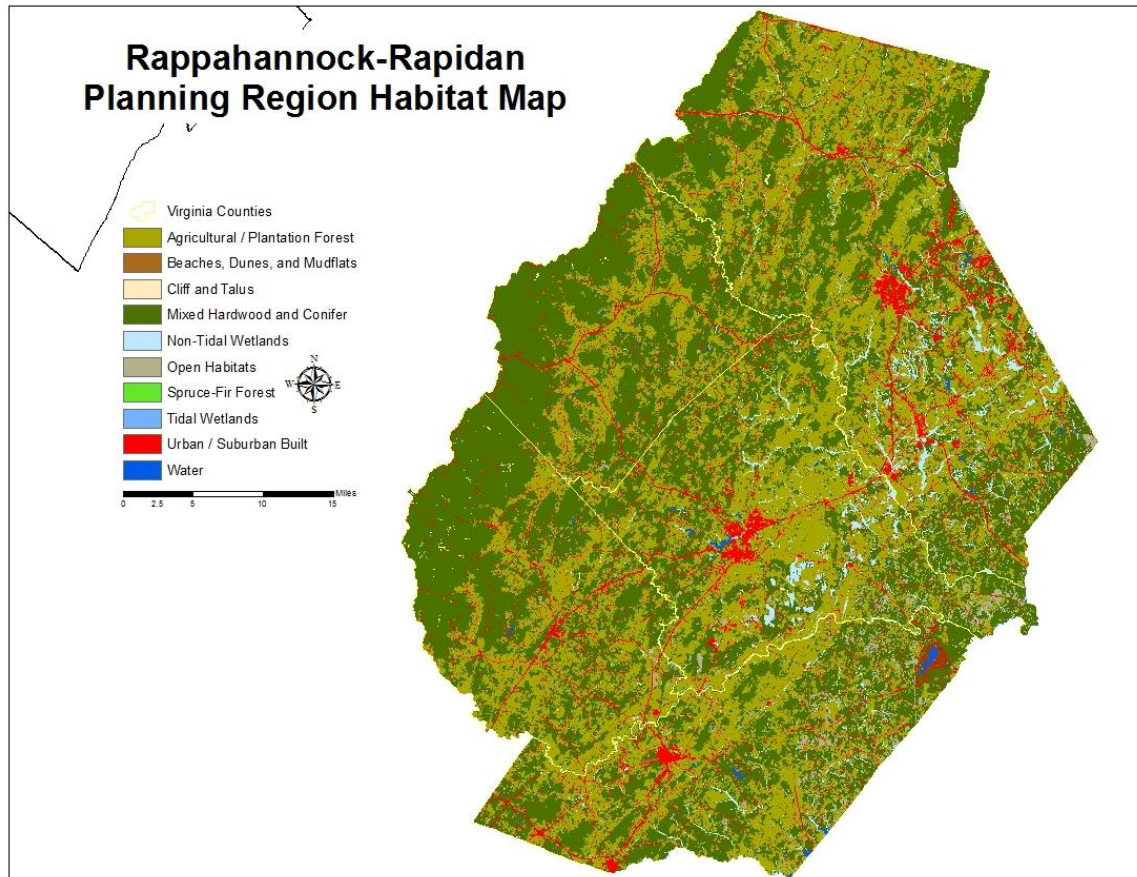


Figure 2. Rappahannock-Rapidan Planning Region Habitats (Anderson et al. 2013).

### *Priority Species of Greatest Conservation Need*

Of Virginia’s 883 SGCN, 93 are believed to either occur, or have recently occurred, within the Rappahannock-Rapidan Planning Region (Appendix A). Of these 93 species, **47 SGCN are dependent upon habitats provided within the Rappahannock- Rapidan Planning Region (Table 2 Figure ). These species constitute the priority SGCN for the region.** A summary of SGCN Tier and Conservation Opportunity Rankings is provided in Table 1, while Figure 3 demonstrates the density of the 46 priority species within this region.

Priority SGCNs within this Local Summary include species for which this planning region comprises a significant portion of its range in Virginia. To determine species priority, the authors implemented a 10 percent rule to identify locally important species. Under the 10 percent rule, an SGCN is included in a Local Summary if the planning region provides at least 10 percent of that species’ range in Virginia. However, there are several other instances that warrant inclusion on a planning region’s priority SGCN list. First, several SGCN occur statewide but in low numbers in each planning region and will never reach the 10 percent threshold in any single planning region. Species that fall in this category were manually added to priority SGCN lists where appropriate. Some species only occur in three or fewer planning regions. These SGCN are also included on priority lists for the planning regions in which they are found due to their rarity in

the state and the importance of those few planning regions to their survival. For migrant species that may only be in Virginia for a matter of days, these migratory habitats are considered critical for their long-term conservation. When these circumstances were identified, specific migratory species were manually added to local SGCN lists as well. Finally, where a species may have a particularly strong population in a relatively small portion of a planning region, the population may be determined to be significant enough to warrant inclusion on the local SGCN list. Again, when these circumstances were identified, species were manually added to the local priority SGCN list.

Table 1. Tier and Conservation Opportunity Ranking Distribution among Priority SGCN.

Tier and Conservation Opportunity Rank	Number of SGCN
Ia	3
Ic	2
IIa	2
IIb	2
IIc	3
IIIa	6
IIIb	1
IIIc	3
IVa	12
IVb	8
IVc	5

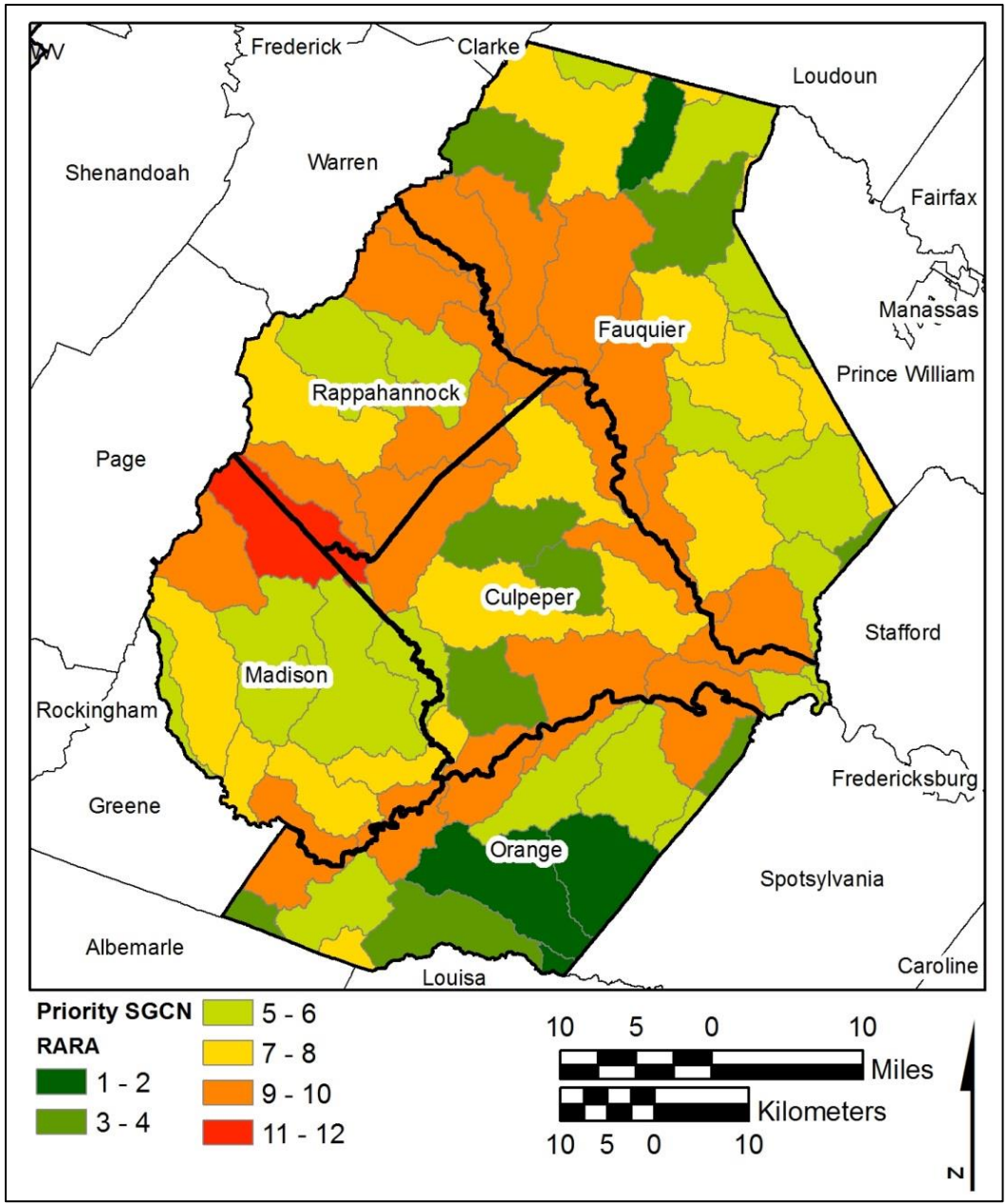


Figure 3. Priority SGCN Density in the Rappahannock-Rapidan Planning Region (HUC12 Watersheds).



Table 2. Priority Species of Greatest Conservation Need Distribution in the Rappahannock-Rapidan Planning Region.

Taxa	Conservation Status	Tier	Opportunity Ranking	Common Name	Scientific Name	Habitat
<b>Amphibian</b>		IV	a	Jefferson salamander	<i>Ambystoma jeffersonianum</i>	West of Shenandoah River - high elevation hardwood forests
<b>Amphibian</b>	<b>FESE</b>	I	c	Shenandoah salamander	<i>Plethodon shenandoah</i>	Handful of sites in Shenandoah National Park
<b>Bird</b>		III	a	Barn owl	<i>Tyto alba</i>	Fields of dense grass. Open and partly open country (grassland, marsh, lightly grazed pasture, hayfields) in a wide variety of situations, often around human habitation.
<b>Bird</b>		III	b	Belted kingfisher	<i>Megaceryle alcyon</i>	Primarily along water, both freshwater and marine, including lakes, streams, wooded creeks and rivers, seacoasts, bays, estuaries, and mangroves. Perches in trees, on over hanging branches, posts and utility wires.
<b>Bird</b>		II	b	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	Forest edge and open woodland, both deciduous and coniferous, with dense deciduous thickets
<b>Bird</b>		IV	a	Brown thrasher	<i>Toxostoma rufum</i>	Thickets and bushy areas in deciduous forest clearings and forest edge, shrubby areas and gardens; in migration and winter also in scrub
<b>Bird</b>		IV	b	Canada warbler	<i>Cardellina canadensis</i>	Breeding habitat includes moist thickets of woodland undergrowth (especially aspen-poplar), bogs, tall shrubbery along streams or near swamps, and deciduous second growth
<b>Bird</b>		II	a	Cerulean warbler	<i>Setophaga cerulea</i>	A structurally mature hardwood forest in a mesic or wetter situation, with a closed canopy
<b>Bird</b>		IV	b	Chimney swift	<i>Chaetura pelagica</i>	Inhabits rural and urban environments having both an abundance of flying arthropods and suitable roosting/nesting sites
<b>Bird</b>		IV	a	Eastern kingbird	<i>Tyrannus tyrannus</i>	Forest edge, open situations with scattered trees and shrubs, cultivated lands with bushes and fencerows, and parks; in winter more closely associated with forest clearings and borders
<b>Bird</b>		IV	a	Eastern meadowlark	<i>Sturnella magna</i>	Grasslands, savanna, open fields, pastures, cultivated lands, sometimes marshes
<b>Bird</b>		IV	a	Eastern towhee	<i>Pipilo erythrophthalmus</i>	Inhabits forest and swamp edges, regenerating clearcuts, open-canopied forests, particularly those with a well-developed understory, reclaimed strip mines, mid-late successional fields, riparian thickets, overgrown fencerows, shrub/small-tree thickets, and other brushy habitats.

<b>Bird</b>		III	a	Eastern whip-poor-will	<i>Caprimulgus vociferus</i>	Forest and open woodland, from lowland moist and deciduous forest to montane forest and pine-oak association
<b>Bird</b>		IV	b	Eastern wood-pewee	<i>Contopus virens</i>	Inhabits a wide variety of wooded upland and lowland habitats including deciduous, coniferous, or mixed forests
<b>Bird</b>		IV	a	Field sparrow	<i>Spizella pusilla</i>	Old fields, brushy hillsides, overgrown pastures, thorn scrub, deciduous forest edge, sparse second growth, fencerows
<b>Bird</b>		IV	a	Grasshopper sparrow	<i>Ammodramus savannarum</i>	Grassland obligate
<b>Bird</b>		IV	a	Gray catbird	<i>Dumetella carolinensis</i>	Thickets, dense brushy and shrubby areas, undergrowth of forest edge, hedgerows, and gardens, dense second growth
<b>Bird</b>		IV	b	Green heron	<i>Butorides virescens</i>	Swamps, mangroves, marshes, and margins of ponds, rivers, lakes, and lagoon
<b>Bird</b>		III	a	Kentucky warbler	<i>Geothlypis formosa</i>	Humid deciduous forest, dense second growth, swamps
<b>Bird</b>	<b>ST</b>	I	a	Loggerhead shrike	<i>Lanius ludovicianus</i>	Grasslands, orchards, and open areas with scattered trees
<b>Bird</b>		III	a	Northern Bobwhite	<i>Colinus virginianus</i>	Early successional habitats including croplands, grasslands, pastures, grass-brush rangelands, and open forests
<b>Bird</b>		IV	b	Northern Flicker	<i>Colaptes auratus</i>	Open forest, both deciduous and coniferous, open woodland, open situations with scattered trees and snags, riparian woodland, pine-oak association, parks
<b>Bird</b>		III	a	Ruffed grouse	<i>Bonasa umbellus</i>	Dense forest with some deciduous trees, in both wet and relatively dry situations from boreal forest (especially early seral stages dominated by aspen) and northern hardwood ecotone to eastern deciduous forest and oak-savanna woodland.
<b>Bird</b>		IV	b	Rusty blackbird	<i>Euphagus carolinus</i>	Wooded swamp and wooded wetland winter habitat
<b>Bird</b>		IV	b	Wood thrush	<i>Hylocichla mustelina</i>	Deciduous or mixed forests with a dense tree canopy and a fairly well-developed deciduous understory, especially where moist
<b>Bird</b>		III	a	Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland
<b>Bird</b>		IV	a	Yellow-breasted chat	<i>Icteria virens</i>	Second growth, shrubby old pastures, thickets, bushy areas, scrub, woodland undergrowth, and fence rows, including low wet places near streams, pond edges, or swamps; thickets with few tall trees; early successional stages of forest regeneration; commonly in sites close to human habitation.
<b>Bird</b>	<b>ST</b>	I	a	Peregrine falcon	<i>Falco peregrinus</i>	Human structures in the east and cliff sites in the west

<b>Crustacean</b>	<b>FS</b>	II	b	Luray Caverns amphipod	<i>Stygobromus pseudospinosus</i>	Caves with clean abundant water flowing through the system
<b>Fish</b>		IV	c	American brook lamprey	<i>Lampetra appendix</i>	Requires clear flowing water but can tolerate a range of temperatures and substrates
<b>Fish</b>		IV	a	Brook trout	<i>Salvelinus fontinalis</i>	Clear, cool, well-oxygenated creeks, small to medium rivers, and lakes
<b>Fish</b>		IV	c	Least brook lamprey	<i>Lampetra aepyptera</i>	Warm small streams with slow flows and sand/ silt substrates
<b>FW Mollusk</b>		IV	c	Atlantic spike	<i>Elliptio producta</i>	Areas with moderate current and sand, rocky, or mud bottom
<b>FW Mollusk</b>		III	c	Blue Ridge springsnail	<i>Fontigens orolibas</i>	Springs and cave streams in the Potomac basin and along the Blue Ridge
<b>FW Mollusk</b>		IV	c	Carolina lance mussel	<i>Elliptio angustata</i>	Clean flowing water with sand and gravel substrates and aquatic vegetation
<b>FW Mollusk</b>		IV	a	Creeper	<i>Strophitus undulatus</i>	It is usually found in streams and rivers in a range of flow conditions (rarely in high-gradient streams of mountainous regions) but can tolerate lakes and ponds, particularly in outlets
<b>FW Mollusk</b>	<b>FESE</b>	I	a	Dwarf wedgemussel	<i>Alasmidonta heterodon</i>	Clean warm streams and rivers with low to moderate current and unsilted substrates
<b>FW Mollusk</b>		IV	b	Northern lance mussel	<i>Elliptio fisheriana</i>	Shallow water near stable banks with intact riparian zones and soft substrates
<b>FW Mollusk</b>	<b>FS</b>	II	c	Panhandle pebblesnail	<i>Somatogyrus virginicus</i>	Very clear flowing water with rocky substrates
<b>FW Mollusk</b>		IV	a	Triangle floater	<i>Alasmidonta undulata</i>	Clean streams with stable banks and sand or gravel substrates
<b>FW Mollusk</b>	<b>FS</b>	II	a	Yellow lance	<i>Elliptio lanceolata</i>	Requires slow currents with unsilted sandy substrates and can tolerate a various water sizes
<b>Insect</b>	<b>FS</b>	II	c	Hubbard's cave beetle	<i>Pseudanophthalmus hubbardi</i>	Caves with clean abundant water flowing through the system
<b>Insect</b>	<b>FS</b>	II	c	Petrunkevitch's cave beetle	<i>Pseudanophthalmus petrunkevitchi</i>	Caves with clean abundant water flowing through the system
<b>Insect</b>	<b>FS</b>	I	c	Regal fritillary	<i>Speyeria idalia idalia</i>	Glades and prairie remnants
<b>Other Terrestrial Invertebrate</b>		III	c	Depressed glyph	<i>Glyphyalinia virginica</i>	No habitats have been identified for this terrestrial snail
<b>Other Terrestrial Invertebrate</b>		IV	c	Ribbed striate	<i>Striatura exigua</i>	No habitats have been identified for this terrestrial snail
<b>Other Terrestrial Invertebrate</b>		III	c	Variable mantleslug	<i>Pallifera varia</i>	Moist forest habitats

\*\* Federal Endangered (FE), State Endangered (SE), Federal Threatened (FT), State Threatened (ST), Federal Species of Concern (FS), Federal Candidate (FC), Federal Proposed (FP), and Species of Collection Concern (CC).

## *Conserved Lands in the Rappahannock- Rapidan Planning Region*

Recognizing the importance of the local habitats to resident and migratory wildlife, state, federal, and private entities have made significant investments to conserve lands within this planning region. Conservation mechanisms range from national parks and state parks and forests to state wildlife management areas to conservation easements. Significant conservation assets, in terms of size, include:

- Shenandoah National Park,
- Rapidan Wildlife Management Area,
- G.R. Thompson Wildlife Management Area,
- C.F. Phelps Wildlife Management Area,
- Weston Wildlife Management Area,
- Sky Meadows State Park,
- Spotsylvania National Military Park, and
- Bull Run Mountains State Natural Area Preserve.

These properties contain a diversity of open water, forest, agricultural, and wetland habitats (Figure 5). They have been conserved to provide a range of conservation, recreational, and economic benefits such as habitat protection and restoration, ecotourism, and fishing and hunting opportunities.

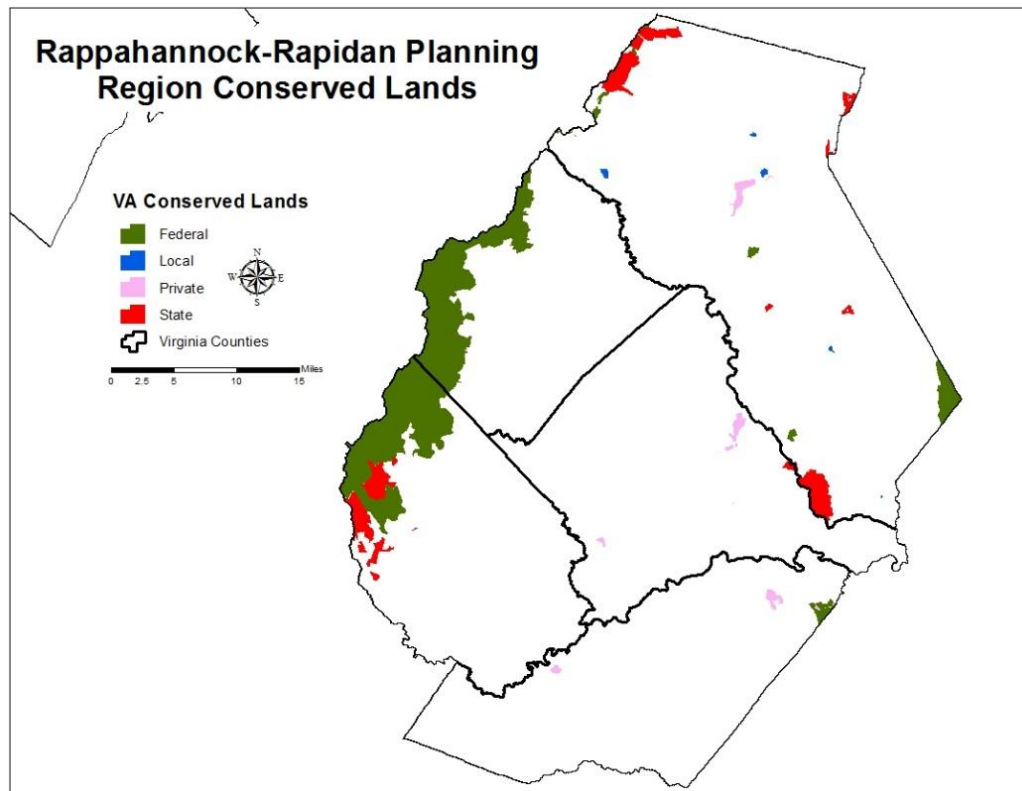


Figure 4. Conservation Lands in the Rappahannock-Rapidan Planning Region (DCR, Natural Heritage 2014).

These conserved lands serve as an important component of wildlife conservation efforts within the Rappahannock-Rapidan Planning Region. Healthy and important habitats have been conserved within their boundaries; however, working to conserve other lands could be beneficial for many SGCN and habitats within the region. Additionally, although there may be concern over the economic and social impacts of putting lands into conservation, many of these areas provide recreation and ecotourism benefits (DCR 2013; Carver and Caudill 2013). Through these mechanisms local economies could be bolstered; however, insufficient data exist to fully describe the benefits and drawbacks of lands held in conservation within this planning region. To balance these interests, especially as conditions change, it will be critical for the conservation community to actively engage with local governments and stakeholders to ensure that conservation spending is beneficial for both wildlife and localities.

### *Climate Change Impacts in Rappahannock-Rapidan Planning Region*

Changes in temperature and precipitation will likely negatively affect habitats and SGCN in the Rappahannock-Rapidan Planning Region. Based on scientific reports and research, it is clear that temperatures in the state will get warmer. The National Climate Assessment (NCA) is a national climate assessment that provides state level information. The NCA indicates Virginia's average temperature could increase by as much as 7°F by 2100 (Melillo et al. 2014). Earlier models used by Virginia's 2008 Climate Action Plan project that average temperatures may increase by 3.1°C (5.6°F) by the end of the century in Virginia (Governor's Commission on Climate Change 2008).

Increased temperatures may lead to heat stress for species and affect water temperature, temperature regime timing, and associated behaviors as well as potentially resulting in changes to food availability (Boicourt and Johnson 2011; Kane 2013). Temperature increases may also be problematic for species at the edge of their ranges. For example, if species are at the more southern end of their range, they may not survive significant increases in temperature that are greater than they can withstand (Pyke et al. 2008). Warmer temperatures may also result in warmer waters, which could favor parasites and other pests in aquatic environments (Pyke et al. 2008; Najjar et al. 2010; Kane 2013). Additionally, if temperatures and precipitation change such that season length is altered, fish and other species reproductive cycles and other phenological processes may be affected. Ecological conditions may also be altered, including food supplies and sympatric animal behaviors (e.g., fish migrations and nest building).

## CONSERVATION THREATS AND ACTIONS TO WILDLIFE AND HABITATS IN THE RAPPAHANNOCK-RAPIDAN PLANNING REGION.

The following sections on threats, conservation actions, and conservation priorities are subdivided based on habitat type. Key habitat conservation strategies, actions, threats, and other impacts are summarized in Table 3. In many cases, actions taken to protect or enhance habitat will positively affect many Rappahannock-Rapidan Planning Region priority SGCN and other species. Many of these activities are also expected to benefit landowners and communities.

Table 1. Summary of Conservation Strategies and Actions for the Rappahannock-Rapidan Planning Region.

Conservation Strategies	Conservation Actions	Threats Addressed	Economic/ Human Benefits	Priority Areas
<b>Enhance, maintain, and restore aquatic and riparian habitats</b>	1) Establish vegetated or forested riparian buffers and incorporate riparian buffers into land use planning and management; 2) Reforest erodible pasture or croplands and establish permanent vegetative cover on croplands; 3) Work with private landowners to implement pasture management BMPs; 4) Utilize conservation tillage and cover crop techniques; 5) Establish rain gardens in appropriate sites; 6) Fence livestock and horses out of streams and providing alternative water sources; 7) Improve pasture and loafing lot management to prevent manure-tainted water from flowing into streams; 8) Develop improved methods for incorporating manure and other biosolids into soil; 9) Repair failing septic systems and eliminating "straight pipes;" 10) Work to slow storm water runoff by establishing vegetated buffers, bioretention filters, and infiltration trenches in urban and residential areas; 11) Work to prevent pet waste from entering the watershed; 12) Continue to identify impaired waters within the planning region; 13) Restore connectivity; 14) Monitor and address invasive species impacts; and 15) Adopt land use practices or policies through zoning or other means to help improve the health of aquatic systems.	Sedimentation, contaminants loading, water chemistry alteration, temperature regime alteration, stream nutrient dynamics alteration, land use changes, water withdrawals, climate change, invasive species	Address TMDL concerns by reducing amounts of sediment, nutrients, pesticides, and other pollutants that enter water ways; sustain sport fisheries and recreation opportunities, contribute to clean water supply	Beaver Creek, Mountain Run, Pamunkey Creek, Terrys Creek, Browns Run, Craig Run, Marsh Run, Carter Run, Deep Run, Great Run, Thumb Run, Hazel River, Hughes River, Rush River, Little Dark Run, Robinson River
<b>Maintain and restore forest habitat</b>	1) Protect land through acquisition, easement, incentives, or other mechanisms; 2) Implement vegetative buffers around extractive practices and development; 3) Work with state and federal agencies to ensure implementation of appropriate best management practices; 4) Maintain forest health to help ensure forest viability; and 5) Monitor and control invasive species.	Land use change and conversion, invasive species, climate change	Flood control; water quality; ecotourism/ wildlife viewing/other outdoor recreation	Forest patches adjacent to already protected parcels
<b>Maintain and restore open habitats</b>	1) Restore native grasses, shrubs, and forbs; 2) Maintain existing open habitats with periodic disturbance (e.g., prescribed burning, mowing, disking, etc.); and 3) Conserve, via acquisition, easement, collaboration, or agreement, patches from 20 acres to 100 or more acres.	Land use changes, invasive species	Conservation of native pollinators; erosion control; sequestration of nutrients, pesticides, and other pollutants before they enter rivers or karst systems	Areas supporting SGCN that are not already protected

## *Enhance, Maintain, and Restore Aquatic and Riparian Habitats*

Aquatic systems in the Rappahannock-Rapidan Planning Region include primarily warm water, non-tidal rivers, streams, and creeks with coldwater stream reaches in Rappahannock and Madison Counties. Watersheds include the Rappahannock and York. Approximately 6,480 acres (0.5 percent) of the planning region is considered aquatic (Anderson et al. 2013). These systems provide important habitat for numerous species of wildlife, fish, and invertebrates. Priority SGCN that depend on these habitats include the panhandle pebblesnail, Atlantic spike, Carolina lance, Northern lance mussel, brook trout, and American brook lamprey, among others.

### **Threats**

Aquatic and riparian habitats within the Rappahannock-Rapidan Planning Region face multiple threats from water quality related issues to invasive species.

1. **Water Quality Degradation:** Pollution is the most significant threat to aquatic species and riparian habitats within the Rappahannock-Rapidan Planning Region. Fertilizers, eroded sediment, and human and animal waste flow into the region's tidal creeks from storm water runoff, failing septic systems, and agricultural practices that do not conform to standard best management practices (DEQ 2014). In many cases, watersheds have insufficient riparian buffers and vegetative areas to stop the flow of these materials and prevent them from running into the creek or stream (ACJV 2005). Once present in aquatic systems, these materials may concentrate in sediment and bottom-dwelling organisms where they can result in reduced levels of dissolved oxygen and altered pH levels (Chesapeake Bay Foundation 2014). In addition to the impacts on aquatic life, many of these substances pose a risk to human health and local economies (Chesapeake Bay Foundation 2014).
2. **Impervious Surface:** Impervious surfaces (i.e., land covers that do not permit water to permeate the ground) give a useful measure of the environmental condition of an area. In a developed watershed there is often significant impervious surface cover; thus, a greater amount of surface water, often laden with pollutants, arrives into a stream at a faster rate than in less developed watersheds, increasing the likelihood of more frequent and severe flooding. Substantial amounts of impervious surface area can also lead to degradation of water quality, changes in hydrology, habitat structure, and aquatic biodiversity. Additionally, impervious surfaces often run along areas that directly interact with the stream or river through flooding, geomorphology, or material inputs. Most of the Rappahannock-Rapidan Region has a low percentage of impervious surface cover (Figure 5).



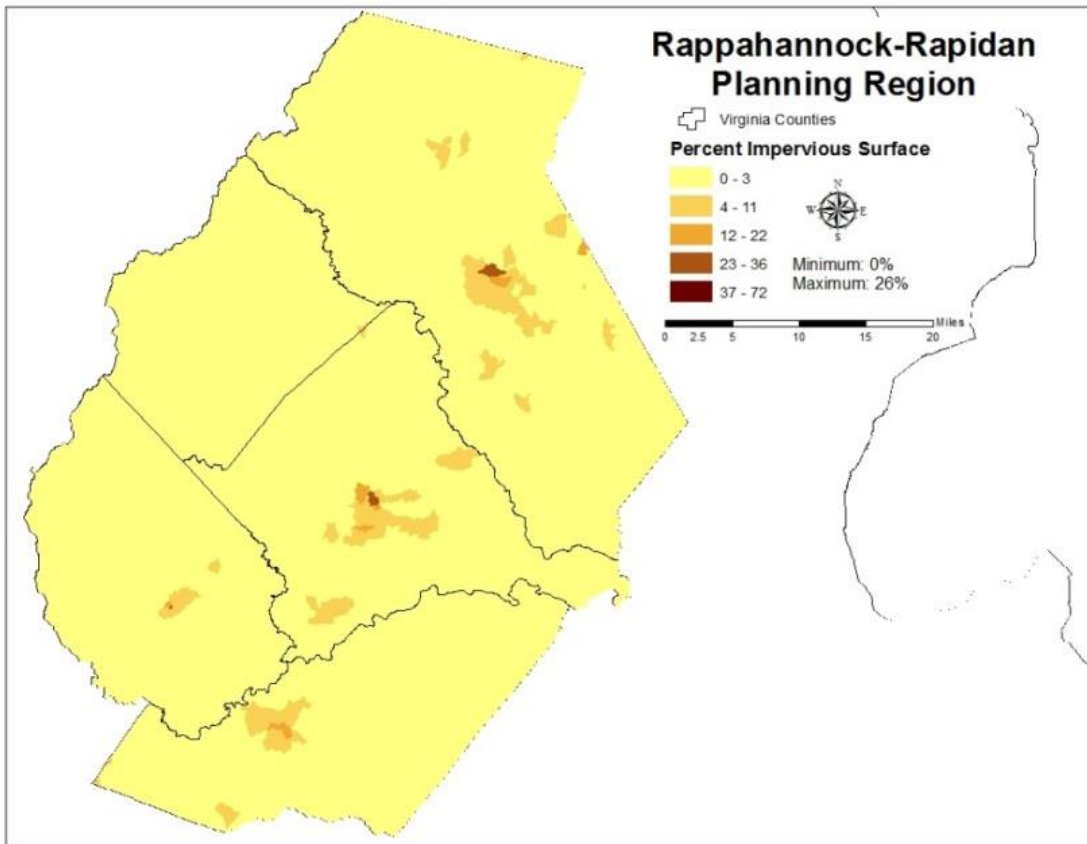


Figure 5. Impervious Surface Cover in Rappahannock-Rapidan Planning Region (SARP 2014).

3. **Invasive Species**: Additional threats to aquatic systems within the Planning Region include invasive species that either consume native species or consume aquatic vegetation, thereby altering the quality of these aquatic habitats.
4. **Habitat Conversion and Alteration**: Rivers are fragmented by dams, culverts, and other impediments that limit the connectivity of these aquatic habitats. This fragmentation can prevent aquatic species from accessing important aquatic habitats crucial to various life stages. Channelization, shoreline alteration, and extractive land use practices can alter aquatic habitats in terms of changes to hydrology, chemistry, and water temperature. These practices may also directly alter habitats through loss of vegetative riparian cover, filling of streams, or hardening of stream banks.
5. **Water Withdrawals**: Water withdrawals for human and land uses can also alter stream hydrology and cause stress to aquatic species that depend on specific water levels and flow rates.
6. **Climate change**: Climate change will also affect aquatic systems in this planning region. Changes in temperature and precipitation regimes could result in drier more drought prone

summers. Water temperatures may also be affected, resulting in potential harm to fish and other aquatic species.

### Conservation Management Actions

Water Quality Improvement Plans have been developed by the Virginia Department of Environmental Quality (DEQ) and various partners. Watersheds within the planning region that have Water Quality Improvement Plans include: Beaver Creek, Mountain Run, Pamunkey Creek, and Terrys Creek (Blue Ridge Environmental Solutions 2011a); Browns Run, Craig Run, and Marsh Run (Blue Ridge Environmental Solutions 2009); Carter Run, Deep Run, Great Run, and Thumb Run (Engineering Concepts 2006); Hazel River, Hughes River, and Rush River (Engineering Concepts 2009); and Little Dark Run and Robinson River (Blue Ridge Environmental Solutions 2011b) (Figure 6).

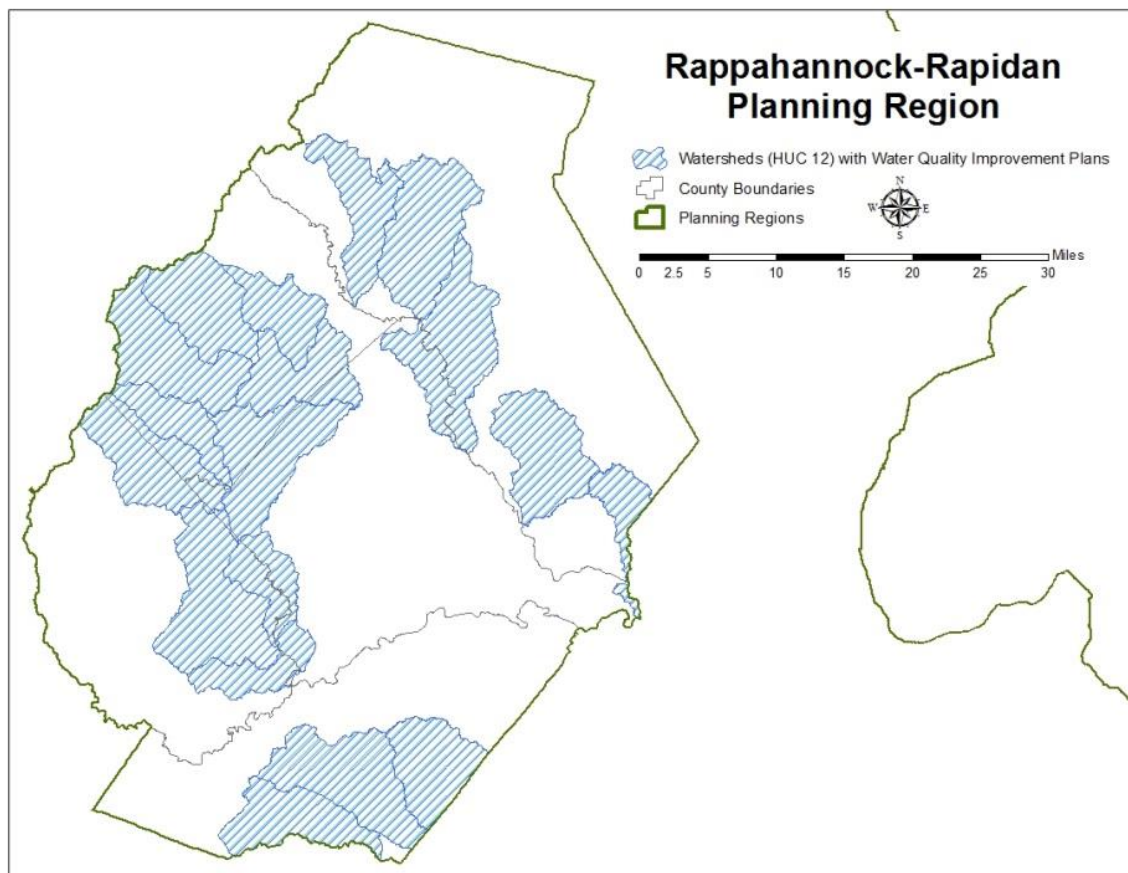


Figure 6. Watersheds with Water Quality Improvement Plans.

Each of these watersheds is designated as being impaired, and the primary actions needed to improve water quality within these watersheds include:

- Establishing vegetated or forested riparian buffers and incorporating riparian buffers into land use planning and management;
- Reforesting erodible pasture or croplands and establish permanent vegetative cover on croplands;

- Working with private landowners to implement pasture management BMPs;
- Utilizing conservation tillage and cover crop techniques;
- Establishing rain gardens in appropriate sites;
- Fencing livestock and horses out of streams and providing alternative water sources;
- Improving pasture and loafing lot management to prevent manure-tainted water from flowing into streams;
- Developing improved methods for incorporating manure and other biosolids into soil;
- Repairing failing septic systems and eliminating “straight pipes” depositing human waste into streams;
- Working to slow storm water runoff by establishing vegetated buffers, bioretention filters, and infiltration trenches in urban and residential areas; and
- Working to prevent pet waste from entering the watershed.

Members of Virginia’s conservation community may consider working in other watersheds of local significance that may not have a Water Quality Improvement Plan. The Virginia Watershed Integrity Model identifies high value watersheds within the planning region for conservation based on their proximity to headwater streams, drinking water source protection, and biological integrity indices (Ciminelli and Scrivani 2007). These areas provide a starting point for identifying additional areas to focus conservation efforts (Figure 7).

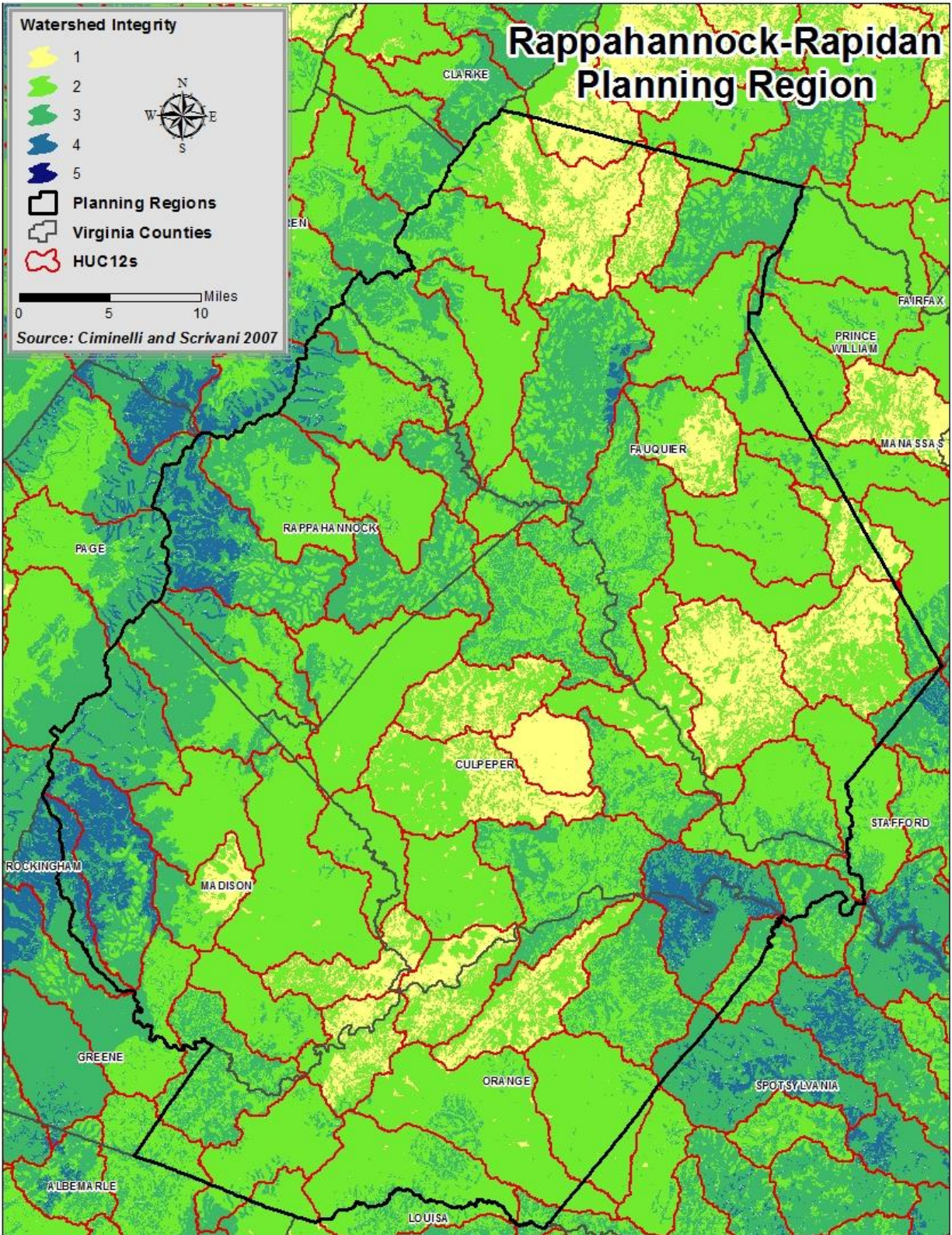


Figure 7. Watershed Integrity Model for Rappahannock-Rapidan Planning Region (Ciminelli and Scrivani 2007).

Several conservation actions common to most water quality and instream habitat enhancement plans can be implemented with little chance of ill consequence to wildlife or human communities downstream in these areas. Some of the most beneficial actions would include:

- Working with landowners to exclude livestock from streams;
- Restoring or enhancing vegetated riparian buffers; and
- Working to enhance the health of upland forests and grassland habitats.

Additionally, many agencies help landowners in the Rappahannock-Rapidan Planning Region establish vegetative buffers along waterways flowing through their properties. The Virginia Department of Forestry (DOF), Virginia Department of Agriculture and Consumer Services (VDACS), and DCR have established best management practices (BMPs) for various land uses, which if implemented serve to minimize land use impacts upon adjacent and downstream waters. In addition, landowners are encouraged to work with DOF through the Forest Stewardship Program to utilize timber production BMPs, such as implementation of buffers and careful planning of roads and stream crossings, and agricultural producers are encouraged to work with VDACS and the local Soil and Water Conservation Districts to control erosion and limit runoff through the various available programs (DOF 2014; DCR 2014). The Natural Resources Conservation Service (NRCS) provides landowners with other opportunities, including the Environmental Quality Incentives Program.

Stream restoration and connectivity projects (e.g., removing dams and culverts or modifying them to allow for passage) help improve and provide additional aquatic habitats for fish species within the state; however, there are many dams, and not all can or should be removed. Priority watersheds that would benefit from enhanced connectivity have been identified by the Chesapeake Bay Fish Prioritization Tool and the Southeast Aquatic Connectivity Assessment Tool (Figure 8) (Martin and Apse 2013).

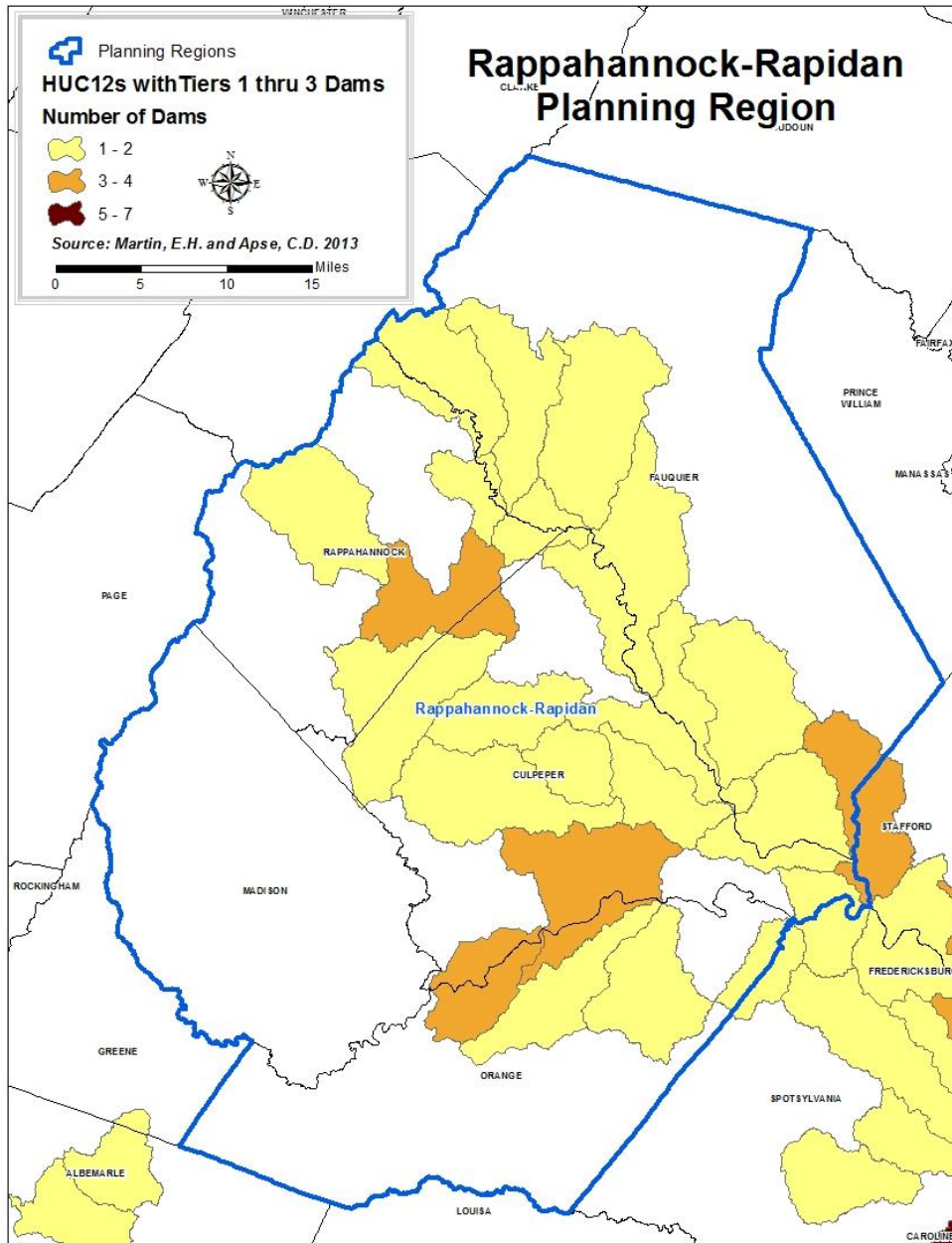


Figure 8. HUC12 Watersheds with Priority Dams for Removal/ Modification for Enhanced Connectivity (Martin and Apse 2013).

Additional actions to improve aquatic systems in the Rappahannock-Rapidan Planning Region include: restoring aquatic connections (i.e., removing culverts, dams, etc.), monitoring and addressing invasive species impacts, and working with the planning region to adopt use practices or policies through zoning or other guidelines (e.g., impervious surface limits) to help improve the health of aquatic systems within and downstream of regions that have significant impervious surface areas. Additionally, land acquisitions or easements that will help protect the land surrounding creeks should also be considered.

## Climate-Smart Management Actions

When planting, restoring, or maintaining riparian buffers, managers should consider how conditions may change in the area and work with appropriate vegetation. For example, if stream flow is expected to become erratic due to increased precipitation or more frequent flooding as is projected to occur, native tree and shrub species that can tolerate flood conditions and inundation should be included in the selected plant species. Utilizing native species that may provide better erosion control (broader, deeper roots) than other species should be encouraged. Techniques and tools may be needed (e.g., fencing, biomats, etc.) to ensure success. Additionally, as stream temperatures will likely increase and hydrologic regimes may shift, it will be important to focus on maintaining and/ or improving stream connectivity to ensure aquatic organism can move to preferred habitats as these conditions change. Minimizing impervious surface will be even more important under climate change as increased storm intensity will likely result in increased levels of stormwater runoff. Improving stormwater control methods, to ensure they account for predicted changes in precipitation and flow, could help minimize the future impacts of storm water under climate change (Kane 2013).

### *Conserve and Manage Forest Habitats*

Mixed hardwood and conifer forests make up almost half of the Rappahannock-Rapidan Planning Region and are important for a broad range of species (Table 4). Within this forest type the majority of the trees are mature. Young forest habitat can be loosely defined as referring to areas dominated by woody seedlings and saplings (Oehler et al. 2006). Previously, young forests may have been referred to as an early successional habitat for eastern portions of North America. Lack of young forest habitat has detrimental effects on the wildlife species that depend on this forest stage for survival. Mixed hardwood and conifer forests help protect water resources within the region and provide habitat for species such as the Eastern whip-poor-will, Eastern wood-pewee, ruffed grouse, Shenandoah salamander, variable mantle slug, ribbed striate snail, and the Jefferson salamander, among other species.

Table 4. Forest Acreage Totals in Rappahannock-Rapidan Planning Region (Anderson et al. 2013).

Forest Type	Acres	Percent of Planning Region
<b>Mixed Hardwood and Conifer</b>	608,116.26	48.26%

## Threats

Forests within this planning region face a range of threats.

1. **Land Use Changes and Conversion:** The largest threat to mixed hardwood and conifer forests within the Rappahannock-Rapidan Planning Region is fragmentation, mainly due to expanding development and resulting roads. In many cases, as with urban or commercial development, the losses can be complete and have profound impacts on local wildlife species composition, water quality, and outdoor recreational opportunities. In other situations, such as conversion to pine plantations, the mixed forest habitat is lost, but the newly planted forest can be managed for several years to provide open young forest habitats that support a diversity of landowner goals, wildlife species, and recreational opportunities. If established BMPs are followed, impacts to

waterways and adjoining properties can be prevented or mitigated such as through implementation of vegetative buffer areas (see below).

2. Invasive Species: Invasive plant species and pests are also a significant problem in this region. Of particular note is the gypsy moth. Although more prevalent in the western portion of the state, it may still affect oaks and other species within these forests (DOF 2014).
3. Climate Change: More intense storm events, higher temperatures, and the potential for droughts may exacerbate existing stressors as well as damage intact forests and result in more forest fires and an increase in incidence of pests.

### **Conservation Management Actions**

Actions for conserving mixed hardwood and conifer forests in Rappahannock-Rapidan Planning Region may include working to conserve, either through acquisition, easement, cooperative management, or incentives, intact forest patches capable of supporting a variety of Action Plan species. Land protection will help reduce conversion of forests to development.

Working with landowners to ensure BMPs such as vegetative buffers are in place around agricultural or timber harvest areas will help prevent erosion and run off of sediments and nutrients into adjacent streams. Research demonstrates that vegetative riparian buffers can filter significant amounts of nutrient run off from timber operations and agricultural fields (DOF 2014). Some BMPs recommend a 50 foot buffer and allow some timber harvest within the buffers, while other BMPs encourage a 100 foot buffer with no harvest (DOF 2014; A. Ewing, Virginia Department of Game and Inland Fisheries, personal communication, 2015). BMPs also recommend building roads on areas with minimum slope and minimizing or avoiding stream crossings (DOF 2014). The *Upper York River Basin Watershed Implementation Plan* developed by DEQ and stakeholders specifically highlights reforestation areas around eroding crop lands and pastures within the Beaver Creek, Mountain Run, Pamunkey Creek, and Terrys Run watersheds to help decrease sediment run off as well as provide wildlife habitat (Blue Ridge Environmental Solutions 2011).

Working to maintain forest health (balance age classes and diversity of tree species) is also integral to ensuring forest habitat is available to be conserved and protected. DOF makes several key recommendations that relate to habitat health, including but not limited to using species within their native ranges, if feasible using a mix of tree species to help minimize susceptibility to pests, preventing unnecessary site disturbance, and protecting unusual (rare) forest habitats (DOF 2014). In terms of invasive species and pests, monitoring and control will be important to prevent its spread. Some of these forest habitats should be managed with thinning and prescribed burns to minimize outbreaks (Brooks and Lusk 2008; DOF 2014).

### **Climate-Smart Management Actions**

To best manage forests in the Rappahannock-Rapidan Planning Region as the climate changes, it will be imperative to understand how climate may affect potential future composition of forests in Virginia and how that may affect SGCN. Conservation and management efforts may need to focus on trees that can better withstand increased temperatures and drought, among other impacts. Managers may wish to



consult the U.S. Forest Service's tree atlas when planning management and conservation of these forests. Additionally, harvest guidelines may need to be revised, depending on projections for future tree composition. Invasive species monitoring and prevention will also become even more important to include in forest management as climate change may favor some tree pests, diseases, and invasive species.

In terms of considering how to best manage for birds, mammals, and other species that depend on these forests, managers will want to try to provide refugia for SGCN as habitat is lost as well as establishing corridors both north/ south and east/west between protected areas to assist with species movements as conditions change (King and Finch 2013). Some SGCN will not be able to migrate without contiguous forests, so some species may still be lost, but implementing conservation management actions and developing corridors can help provide can them the best chance at continued existence. It will also be important to work to maintain species diversity and continue to reduce existing stressors that will likely exacerbate impacts from climate change (McKelvey et al. 2013).

### *Maintain and Restore Open Habitats*

Open habitats represent an assortment of habitat types that are botanically characterized by grasses, forbs, and shrubs. Trees may be present, but they tend to be widely spaced and crowns do not form a canopy. DGIF biologists and partners have indicated several varieties of open habitats are important for action plan species. Open habitats are often comprised of post-agricultural lands, glades, barrens, outcrop and summit scrub and make up approximately 27,720 acres (2.2 percent) of the planning region (Anderson et al. 2013). These habitats are becoming rare in Virginia as agriculture and timber harvest practices change; however, they are important to a range of species that depend on these areas for nesting, feeding, protection, etc. These open habitats provide habitat for the loggerhead shrike, barn owl, Eastern meadowlark, grasshopper sparrow, and regal fritillary among other species.

### **Threats**

Changing land use patterns has played a large role in the loss of open and young forests habitats as has alteration to natural disturbance regimes.

1. Land Use Changes: Dozens of open habitat species have been affected by changing land use and agricultural practices that resulted in either degraded or destroyed open habitats. The most serious threats to remaining open habitats within the planning involve either development (where habitats are converted for human use) or natural succession (where trees are allowed to dominate and the site eventually becomes forest).
2. Invasive Species: Invasive species are also problematic, especially tree of heaven, Japanese stilt grass, garlic mustard, and privet. These species can out-compete native open habitat species and take over the landscape. Some species such as tree of heaven can change the landscape from an open habitat to a more closed habitat relatively quickly due to its ability to spread and colonize areas rapidly (VISWG 2012). Japanese stilt grass also grows quickly and in mats that can crowd out native grasses. It also alters soil pH inhibiting growth of other native plants (VISWG 2012).

## Conservation Management Actions

DGIF has recognized that the loss of open habitats, such as glades, savannas, and post-agricultural areas have caused significant declines in several Action Plan species, including the northern bobwhite, loggerhead shrike, field sparrows, eastern towhees, brown thrashers, prairie warblers, regal fritillary, and monarch butterflies. It is likely that the loss of these habitats has contributed to the declines in native pollinator species like bumblebees as well (Xerces Society 2011). To address this issue, Virginia has become a leader in the Northern Bobwhite Conservation Initiative (NBCI). DGIF contributes to this national effort by leading the Virginia Quail Recovery Initiative (QRI), which is a robust, state-based, multi-partner effort dedicated to conserving and restoring open habitats within Virginia. Both the NBCI and the QRI have determined that Culpepper, Orange, Rappahannock, and Madison Counties offer some of the best opportunities for restoring open habitats that support a diversity of open habitat species (DGIF 2007).

Agriculture and forestry are large industries in Virginia, and landowners are important conservation partners. The QRI was created to find opportunities that help private landowners meet their economic goals while also contributing to the conservation and recovery of important wildlife and pollinator species. QRI efforts within this planning region focus on helping landowners manage retired agricultural lands and forested areas to benefit open habitat species, and DGIF provides information for landowners on its quail website (DGIF 2015).

For landowners seeking to improve the habitat quality of pastures and field edges, the QRI generally recommends removing nonnative grasses and invasive species. In many instances, a sufficient seedbank of native species will exist in the soil to allow the restoration of native plant communities and replanting will likely not be required. Once a native plant community has been established, the QRI recommends managing these habitats either through burning, disking, or (least favorable) mowing. Additionally, within *Managing Pines for Profit and Wildlife* biologists describe landowner opportunities to create a commercially viable forest plot that also benefits open habitat species such as quail (Puckett et al. 2008). Recommendations are provided for site preparation, planting density, pre-commercial thinning, hardwood and grass suppression, commercial thinning, and post-thinning management.

A few patches of glade habitats occur within this planning region. The majority occur on private lands. The key to their conservation will involve working with willing private landowners to conserve and restore those habitats through acquisition, easement, or agreement.

## Climate-Smart Management Actions

Changes in temperature and precipitation regimes could negatively affect open lands as temperatures increase and summers become drier and more drought prone. However, research demonstrates that many species that make up open habitats are already relatively drought tolerant, meaning that open lands may not be as affected by climate change as other habitats if they can maintain their diverse mix of vegetation species (Craine et al. 2012). It is important to note that if there is extended severe drought, open lands may succumb over time (Craine et al. 2012). To maintain diversity and help build resiliency in open lands within this planning region, it will be important to implement the management options above, especially focusing on removing non-natives and ensuring a diverse mix of vegetation species. Additionally, working to protect and preserve larger tracts of grasslands will help provide refugia for the species that depend on this habitat.

## EFFECTIVENESS MEASURES EXAMPLES

As discussed within the Action Plan’s Introduction (see Measuring the Effectiveness of Conservation Actions), it is increasingly important for the conservation community to demonstrate the effectiveness of conservation actions. Elected officials, budget authorities, private donors, and members of the public want to know that their investments in wildlife conservation are having the desired effects. During 2011, the Association of Fish and Wildlife Agencies developed and tested a series of effectiveness measures meant to support the Wildlife Action Plan implementation and the State Wildlife Grants program (AFWA 2011).

Virginia’s 2015 Wildlife Action Plan describes a diversity of conservation actions that should help keep species from becoming endangered. The majority of these involve habitat protection, habitat restoration, controlling invasive species, or implementing efforts to keep pollutants from flowing into Virginia’s waterways. Important data that can demonstrate the effectiveness of these conservation actions can include the following:

Conservation Action	Indicators of Effectiveness
<b>Creation of Vegetative/ Forest Buffers along Streams or Wetlands</b>	<ul style="list-style-type: none"> <li>• Before/ after photos of project site;</li> <li>• Photos documenting changes as vegetation matures over multiple years;</li> <li>• Before/ after measurements of sedimentation immediately downstream of site; and</li> <li>• Changes in the number and diversity of species utilizing the site.</li> </ul>
<b>Control of Invasive Plants</b>	<ul style="list-style-type: none"> <li>• Before/ after photos of project site;</li> <li>• Photos documenting changes as restored vegetation matures over multiple years; and</li> <li>• Before/ after comparison of the number and diversity of species utilizing the site.</li> </ul>
<b>Remove Cattle from Streams</b>	<ul style="list-style-type: none"> <li>• Before/ after photos of project site;</li> <li>• Photos of alternative watering systems (if appropriate)</li> <li>• Photos documenting changes in shoreline as restored vegetation matures over multiple years;</li> <li>• Before/ after comparison of sediment and water chemistry immediately downstream of site; and</li> <li>• Before/ after comparison of the number and diversity of species utilizing the site.</li> </ul>
<b>Creating or Improving Open Habitats</b>	<ul style="list-style-type: none"> <li>• Before/after photos of project site;</li> <li>• Photos documenting changes to the site as the vegetation matures; and</li> <li>• Before/ after comparison of the number and diversity of species utilizing the site.</li> </ul>

## CONCLUSION

The development of the Virginia Wildlife Action Plan presented a unique opportunity for the Commonwealth—an opportunity not only to assess the condition and status of the state’s wildlife and habitat resources, but to provide a shared vision and purpose in the management and conservation of

this “common wealth.” The true value of this initiative is this recognition of common interests and the enhancement of existing and fostering of new partnerships to address issues of mutual concern. The Action Plan’s long-term success will depend on the implementation of the recommended actions by partners across the state and the effectiveness with which conservation partners collectively manage these natural resources.

This Local Action Plan Summary aims to prioritize species, habitats, and conservation actions within this planning region, so that partners working within this region can use limited resources to greatest effect. However, Virginia faces serious issues. Not addressing these problems would risk more species becoming threatened or endangered, the quality of our land and water would decline, and Virginians could lose important pieces of our natural heritage that contribute to our quality of life. However, there are significant conservation opportunities to benefit wildlife and people in the planning region. Our problems are not insurmountable, and most can be addressed with proven conservation management techniques.

Working to maintain and protect existing high quality habitat will be a priority before restoration; however, restoration is still an important action and necessary in many cases. Within the Rappahannock-Rapidan Planning Region, priority conservation opportunities include:

- Protecting the quantity and quality of water.
- Maintain and conserve patches of mixed hardwood conifer forests.
- Maintaining open habitats and pursuing opportunities to restore native grasslands where possible.

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## APPENDIX A. COMPLETE LIST OF SPECIES OF GREATEST CONSERVATION NEED IN RAPPAHANNOCK-RAPIDAN PLANNING REGION

Complete SGCN list for the Rappahannock-Rapidan Planning Region (SGCN=92). Table includes federal and state statuses, Wildlife Action Plan Tier, and Conservation Opportunity Rankings. Species are listed in alphabetical order by taxa.

Taxa	Conservation Status	Tier	Opportunity Ranking	Common Name	Scientific Name
Amphibian		IV	a	Eastern mud salamander	<i>Pseudotriton montanus montanus</i>
Amphibian		IV	c	Eastern spadefoot	<i>Scaphiopus holbrookii</i>
Amphibian		IV	a	Jefferson salamander	<i>Ambystoma jeffersonianum</i>
Amphibian	FESE	I	c	Shenandoah salamander	<i>Plethodon shenandoah</i>
Bird		II	a	American black duck	<i>Anas rubripes</i>
Bird		II	a	American woodcock	<i>Scolopax minor</i>
Bird		III	a	Barn owl	<i>Tyto alba</i>
Bird		III	b	Belted kingfisher	<i>Megaceryle lcyon</i>
Bird		IV	a	Black-and-white warbler	<i>Mniotilta varia</i>
Bird		II	b	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Bird		IV	a	Brown thrasher	<i>Toxostoma rufum</i>
Bird		IV	b	Canada warbler	<i>Wilsonia canadensis</i>
Bird		II	a	Cerulean warbler	<i>Dendroica cerulea</i>
Bird		IV	b	Chimney swift	<i>Chaetura pelagica</i>
Bird		II	a	Common tern	<i>Sterna hirundo</i>
Bird		IV	a	Dunlin	<i>Calidris alpina hudsonia</i>
Bird		IV	a	Eastern kingbird	<i>Tyrannus tyrannus</i>
Bird		IV	a	Eastern meadowlark	<i>Sturnella magna</i>
Bird		IV	a	Eastern towhee	<i>Pipilo erythrophthalmus</i>
Bird		III	a	Eastern Whip-poor-will	<i>Caprimulgus vociferus</i>
Bird		IV	b	Eastern wood-pewee	<i>Contopus virens</i>
Bird		IV	a	Field sparrow	<i>Spizella pusilla</i>
Bird		III	a	Forster's tern	<i>Sterna forsteri</i>
Bird		I	a	Glossy ibis	<i>Plegadis falcinellus</i>
Bird		IV	a	Grasshopper sparrow	<i>Ammodramus savannarum</i>
Bird		IV	a	Gray catbird	<i>Dumetella carolinensis</i>
Bird		IV	a	Greater scaup	<i>Aythya marila</i>
Bird		IV	b	Green heron	<i>Butorides virescens</i>
Bird		III	a	Kentucky warbler	<i>Oporornis formosus</i>

Bird		III	b	Least bittern	<i>Ixobrychus exilis</i>
Bird	ST	I	a	Loggerhead shrike	<i>Lanius ludovicianus</i>
Bird		III	a	Northern bobwhite	<i>Colinus virginianus</i>
Bird		III	a	Northern harrier	<i>Circus cyaneus</i>
Bird		IV	c	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
Bird	ST	I	a	Peregrine falcon	<i>Falco peregrinus</i>
Bird		III	a	Ruffed grouse	<i>Bonasa umbellus</i>
Bird		IV	b	Rusty blackbird	<i>Euphagus carolinus</i>
Bird		IV	b	Wood thrush	<i>Hylocichla mustelina</i>
Bird		III	a	Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Bird		IV	a	Yellow-breasted chat	<i>Icteria virens</i>
Crustacean	FS	II	b	Luray Caverns amphipod	<i>Stygobromus pseudospinosus</i>
Crustacean	FTST	II	c	Madison Cave isopod	<i>Antrolana lira</i>
Fish		IV	b	Allegheny pearl dace	<i>Margariscus margarita</i>
Fish		IV	c	American brook lamprey	<i>Lampetra appendix</i>
Fish		III	a	American eel	<i>Anguilla rostrata</i>
Fish		IV	a	American shad	<i>Alosa sapidissima</i>
Fish		I	a	Bridle shiner	<i>Notropis bifrenatus</i>
Fish		IV	a	Brook trout	<i>Salvelinus fontinalis</i>
Fish		IV	c	Least brook lamprey	<i>Lampetra aepyptera</i>
Fish		IV	c	Slimy sculpin	<i>Cottus cognatus</i>
FW Mollusk	FSST	I	a	Atlantic pigtoe	<i>Fusconaia masoni</i>
FW Mollusk		IV	c	Atlantic spike	<i>Elliptio producta</i>
FW Mollusk		III	c	Blue Ridge springsnail	<i>Fontigens orolibas</i>
FW Mollusk	SE	I	a	Brook floater	<i>Alasmidonta varicosa</i>
FW Mollusk		IV	c	Carolina lance mussel	<i>Elliptio angustata</i>
FW Mollusk		IV	a	Carolina slabshell mussel	<i>Elliptio congaraea</i>
FW Mollusk		IV	a	Creeper	<i>Strophitus undulatus</i>
FW Mollusk	FESE	I	a	Dwarf wedgemussel	<i>Alasmidonta heterodon</i>
FW Mollusk		IV	c	Gravel elimia	<i>Elimia catenaria</i>
FW Mollusk	ST	II	a	Green Floater	<i>Lasmigona subviridis</i>
FW Mollusk	FESE	I	a	James spiny mussel	<i>Pleurobema collina</i>
FW Mollusk		IV	b	Northern lance mussel	<i>Elliptio fisheriana</i>
FW Mollusk	FS	II	c	Panhandle pebblesnail	<i>Somatogyrus virginicus</i>
FW Mollusk		IV	a	Pocketbook mussel	<i>Lampsilis ovata</i>
FW Mollusk	FS	II	b	Roanoke slabshell	<i>Elliptio roanokensis</i>
FW Mollusk		IV	a	Triangle floater	<i>Alasmidonta undulata</i>
FW Mollusk		II	a	Yellow lampmussel	<i>Lampsilis cariosa</i>

<b>FW Mollusk</b>	<b>FS</b>	II	a	Yellow lance	<i>Elliptio lanceolata</i>
<b>Insect</b>	<b>FSST</b>	I	c	Appalachian grizzled skipper	<i>Pyrgus wyandot</i>
<b>Insect</b>	<b>FS</b>	II	c	Dotted skipper	<i>Hesperia attalus slossonae</i>
<b>Insect</b>	<b>FS</b>	II	c	Hubbard's cave beetle	<i>Pseudanopthalmus hubbardi</i>
<b>Insect</b>	<b>FS</b>	II	c	Persius duskywing	<i>Erynnis persius persius</i>
<b>Insect</b>	<b>FS</b>	II	c	Petrunkevitch's cave beetle	<i>Pseudanopthalmus petrunkevitchi</i>
<b>Insect</b>	<b>FS</b>	I	c	Regal fritillary	<i>Speyeria idalia idalia</i>
<b>Mammal</b>		IV	c	Allegheny woodrat	<i>Neotoma magister</i>
<b>Mammal</b>		IV	c	Appalachian cottontail	<i>Sylvilagus obscurus</i>
<b>Mammal</b>		IV	c	Eastern spotted skunk	<i>Spilogale putorius putorius</i>
<b>Mammal</b>	<b>FESE</b>	I	b	Indiana myotis	<i>Myotis sodalis</i>
<b>Mammal</b>		IV	c	Long-tailed shrew	<i>Sorex dispar dispar</i>
<b>Mammal</b>	<b>FESE</b>	II	a	Virginia big-eared bat	<i>Corynorhinus townsendii virginianus</i>
<b>Other Terrestrial Invertebrates</b>		III	c	Depressed glyph	<i>Glyphyalinia virginica</i>
<b>Other Terrestrial Invertebrates</b>		IV	c	Ribbed striate	<i>Striatura exigua</i>
<b>Other Terrestrial Invertebrates</b>		III	c	Variable mantleslug	<i>Pallifera varia</i>
<b>Reptile</b>		IV	a	Common ribbonsnake	<i>Thamnophis sauritus sauritus</i>
<b>Reptile</b>		III	a	Eastern box turtle	<i>Terrapene carolina carolina</i>
<b>Reptile</b>		IV	c	Eastern hog-nosed snake	<i>Heterodon platirhinos</i>
<b>Reptile</b>		IV	a	Eastern slender glass lizard	<i>Ophisaurus attenuatus longicaudus</i>
<b>Reptile</b>		I	a	Northern pinesnake	<i>Pituophis melanoleucus melanoleucus</i>
<b>Reptile</b>		IV	a	Queen snake	<i>Regina septemvittata</i>
<b>Reptile</b>		III	a	Smooth greensnake	<i>Opheodrys vernalis</i>
<b>Reptile</b>	<b>CC</b>	III	a	Spotted turtle	<i>Clemmys guttata</i>
<b>Reptile</b>	<b>CC</b>	IV	a	Timber rattlesnake	<i>Crotalus horridus (timber)</i>
<b>Reptile</b>	<b>ST</b>	I	a	Wood turtle	<i>Glyptemys insculpta</i>

## APPENDIX B. SGCN SPATIAL ANALYSIS METHODS

### *Analysis Units*

The species data was analyzed within three spatial units for Virginia: county, planning region, and hydrologic unit (HUC12). The source spatial data for these units were provided by Virginia Department of Game and Inland Fisheries (DGIF). The analysis extent was constrained to that of the Virginia counties, so that portions of the planning region and HUC12 units falling outside of the county boundaries were eliminated from the analysis. Each of the 21 planning region units was assigned an alphabetic code (e.g. Accomack-Northampton = "ACNO"). Nottoway County does not fall within the jurisdiction of any Virginia planning region and was not included in any of our analyses.

### *Species Data*

The source data for the species analysis consisted of three datasets, all of which were provided by DGIF: aquatic tier I-II plus species, terrestrial potential and confirmed species, and peer-reviewed HUC12 species. Within these datasets, individual species are identified by Biota of Virginia (BOVA) code.

### *Methods*

#### **Aquatic Species**

The aquatic species are represented in the source dataset by linear stream segments, or reaches. For each BOVA code present, the total length was calculated for all assigned reaches within the analysis extent. The dataset was then divided by the three analysis units, and the total BOVA length was summarized again by county, planning region, and HUC12. The BOVA percent of total length was calculated by dividing the species length for the analysis unit by the total species length.

#### **Terrestrial Species**

The terrestrial species are represented in the source dataset by area. For each BOVA code present, the total area was calculated within the analysis extent. The dataset was then divided by the three analysis units, and the total BOVA area was summarized again by county, planning region, and HUC12. The BOVA percent of total area was calculated by dividing the species area for the analysis unit by the total species area in Virginia.

#### **Peer-Reviewed HUC12 Species**

The peer-reviewed species are represented in the source dataset by 6<sup>th</sup> order hydrologic units. For each BOVA code present, the total area was calculated within the analysis extent. The dataset was then divided by the county and planning region analysis units, and the total BOVA area was summarized by county, planning region, and HUC12. The BOVA percent of total area was calculated by dividing the species area for the analysis unit by the total species area.

## **Priority SGCN**

For each planning region, priority species were identified as those SGCNs with a total planning region unit area or length  $\geq 10\%$  of the total SGCN area or length for Virginia. SGCN unit calculations were drawn from only one of the source datasets: if an SGCN was present in both the aquatic dataset and the HUC12 dataset, then the aquatic dataset took preference; and if an SGCN was present in the terrestrial dataset and the HUC12 dataset, then the terrestrial dataset took preference.