23. SOUTHSIDE 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 Wildlife Conservation and Recreation Program (WCRP) and State Wildlife Grants (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 (SGCN) 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.

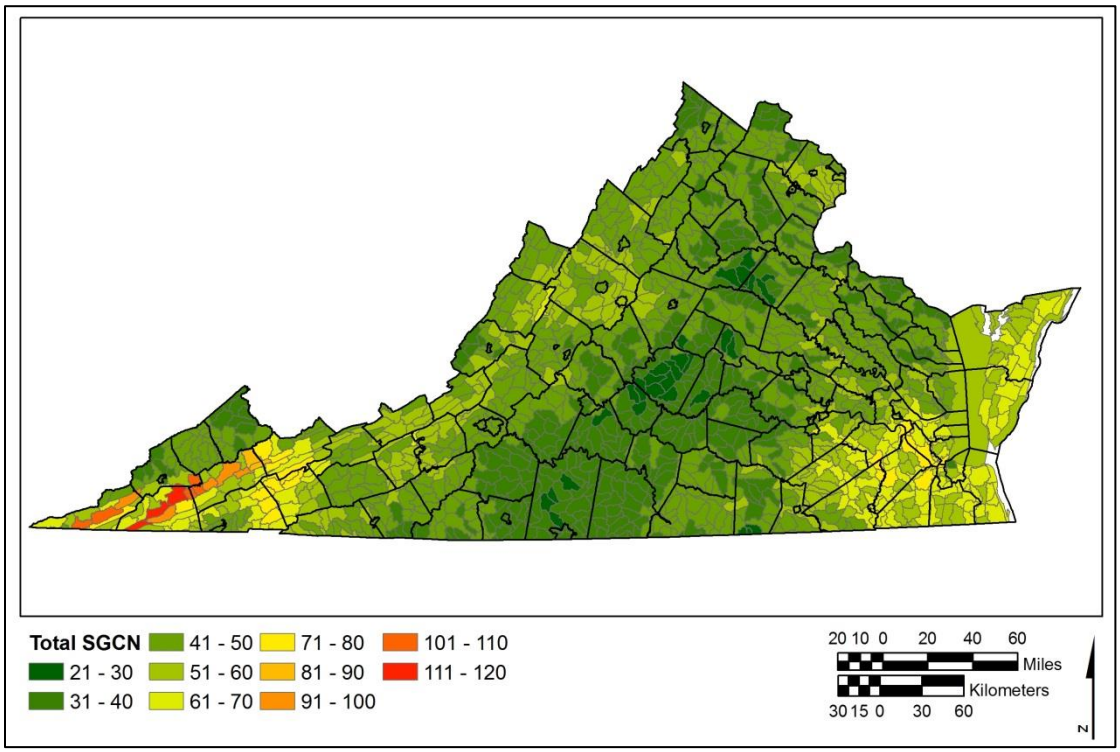

Figure 1. State distribution of Species of Greatest Conservation Need by HUC12 Watersheds.

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.

SOUTHSIDE PLANNING DISTRICT COMMISSION SUMMARY OVERVIEW

The Southside Planning Region consists of 1,330,796 acres (2,079 square miles) and includes the counties of Halifax, Mecklenburg, and Brunswick. The human population in this planning region is estimated to be almost 83,000 people, and it is likely to experience a slight population decrease by 2020 (DCR 2013).

Less developed and more rural areas often provide a diversity of valuable wildlife habitats, which can be degraded or lost as human populations grow or extractive uses expand. This planning region contains aquatic habitats for a range of SGCN, including whitemouth shiner, Carolina darter, snail bullhead, Tidewater mucket, Atlantic pigtoe, and dwarf waterdog. Its pine savannas provide habitat for the Bachman's sparrow, while its mature mixed hardwood and conifer forests are habitat to the southeastern crowned snake. The planning region also includes a variety of other habitats such as 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 considered 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.

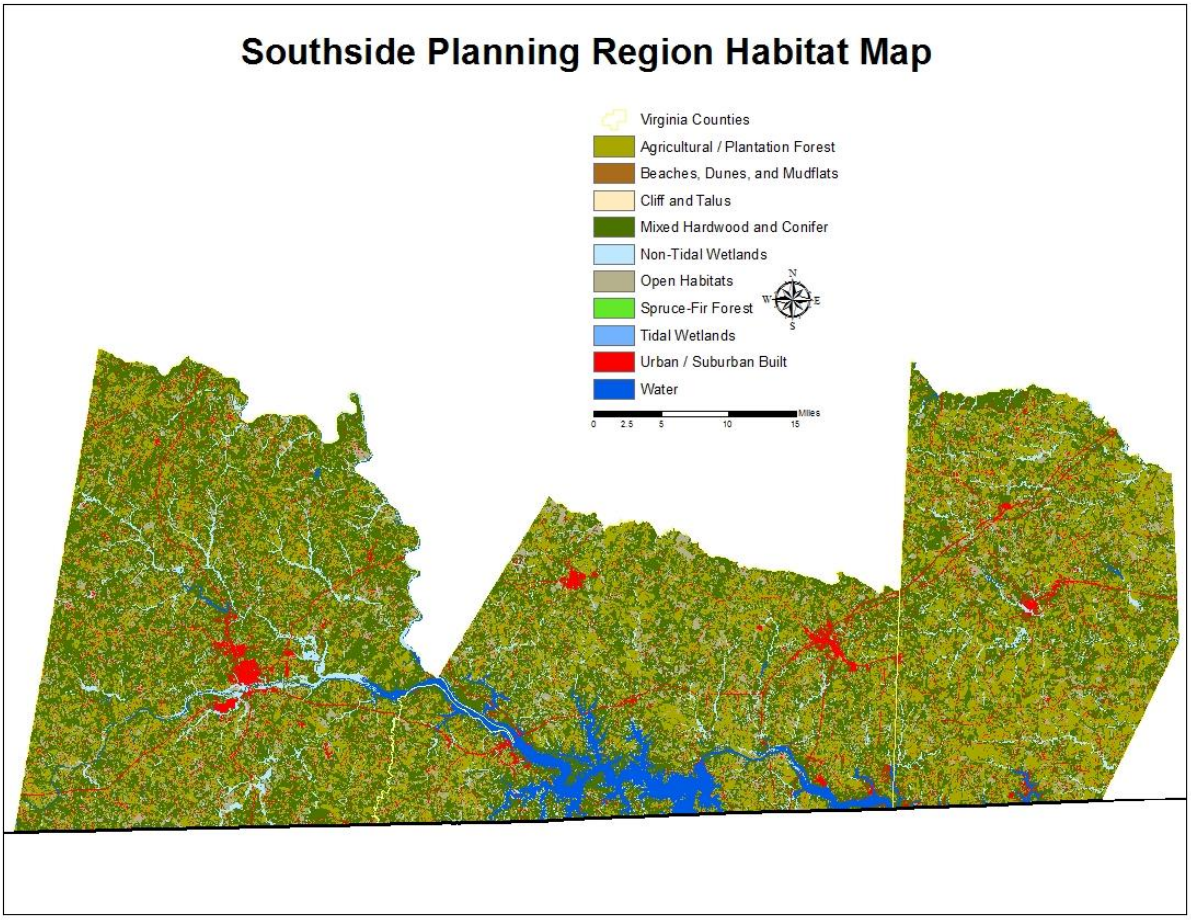

Figure 2. Southside Planning Region Habitats (Anderson et al. 2013).

Priority Species of Greatest Conservation Need

Of Virginia's 883 SGCN, 89 are believed to either occur, or have recently occurred, within the Southside Planning Region (Appendix A). Of these 89 species, ***46 SGCN are dependent upon habitats provided within the Southside Planning Region (Table 2). 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
IIa	3
IIb	1
IIc	3
IIIa	6
IIIb	1
IIIc	5
IVa	13
IVb	7
IVc	4

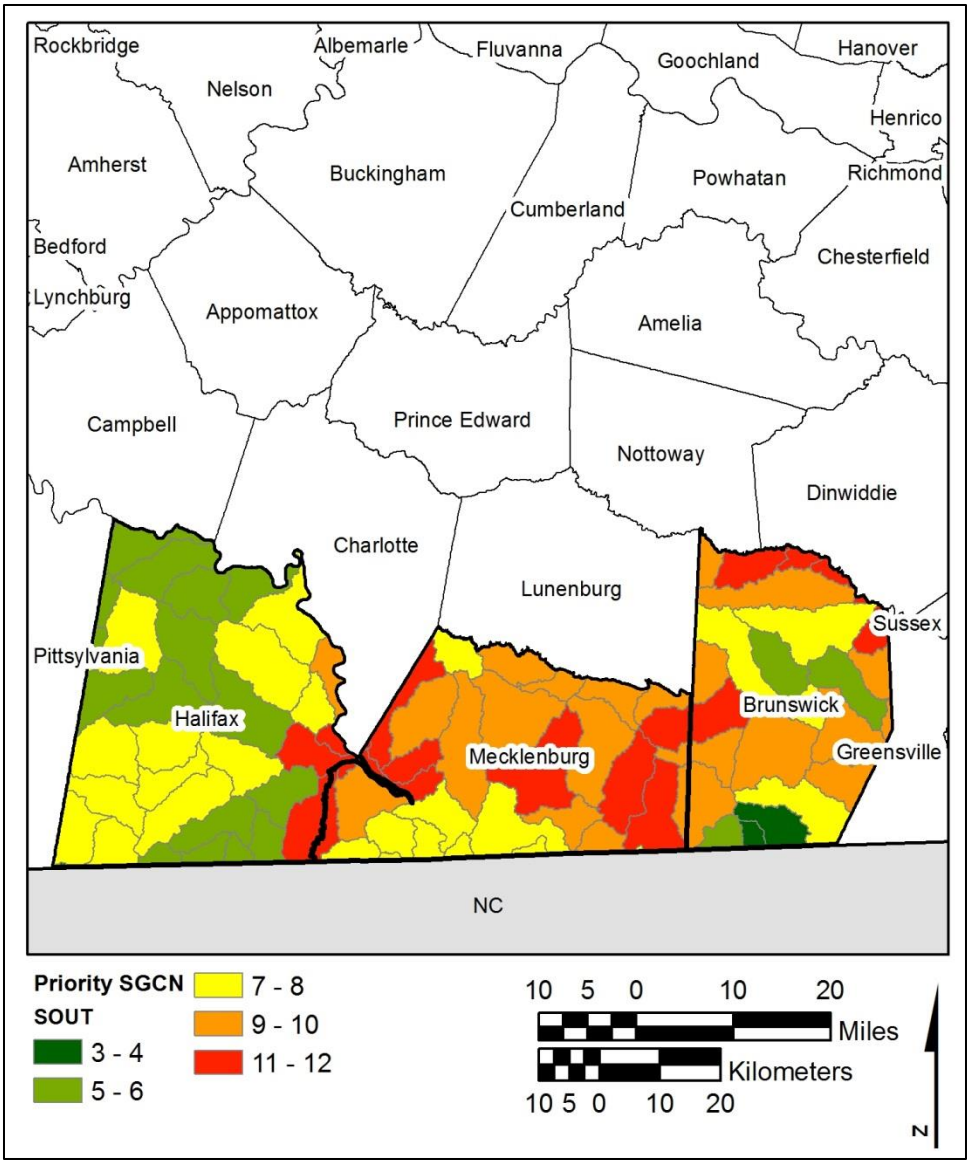

Figure 3. Priority SGCN Density in the Southside Planning Region (HUC12 Watersheds).

Table 2. Priority Species of Greatest Conservation Need Distribution in Southside Planning Region.

Taxa	Conservation Status	Tier	Opportunity Ranking	Common Name	Scientific Name	Habitat
Amphibian		II	a	Oak toad	*Anaxyrus quercicus*	Pine savanna
Bird	**ST**	I	a	Bachman's sparrow	*Peucaea aestivalis*	Pine savanna/ open pine woodlands
Bird		III	b	Belted kingfisher	*Megaceryle alcyon*	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.
Bird		IV	a	Black-bellied plover	*Pluvialis squatarola*	Winter resident along beaches and estuaries
Bird		IV	a	Brown thrasher	*Toxostoma rufum*	Thickets and bushy areas in deciduous forest clearings and forest edge, shrubby areas and gardens; in migration and winter also in scrub
Bird		IV	b	Chimney swift	*Chaetura pelagica*	Inhabits rural and urban environments having both an abundance of flying arthropods and suitable roosting/nesting sites
Bird		II	a	Common tern	*Sterna hirundo*	Nests on beaches
Bird		IV	a	Eastern kingbird	*Tyrannus tyrannus*	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
Bird		IV	a	Eastern meadowlark	*Sturnella magna*	Grasslands, savanna, open fields, pastures, cultivated lands, sometimes marshes
Bird		IV	a	Eastern towhee	*Pipilo erythrophthalmus*	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
Bird		III	a	Eastern whip-poor-will	*Caprimulgus vociferus*	Forest and open woodland, from lowland moist and deciduous forest to montane forest and pine-oak association
Bird		IV	b	Eastern wood-pewee	*Contopus virens*	Inhabits a wide variety of wooded upland and lowland habitats including deciduous, coniferous, or mixed forests
Bird		IV	a	Field sparrow	*Spizella pusilla*	Old fields, brushy hillsides, overgrown pastures, thorn scrub, deciduous forest edge, sparse second growth, fencerows
Bird		III	a	Forster's tern	*Sterna forsteri*	Breeds in marshes with lagoon system
Bird		IV	a	Grasshopper sparrow	*Ammodramus savannarum*	Grassland obligate
Bird		IV	a	Gray catbird	*Dumetella carolinensis*	Thickets, dense brushy and shrubby areas, undergrowth of forest edge, hedgerows, and gardens, dense second growth
Bird		IV	b	Green heron	*Butorides virescens*	Swamps, mangroves, marshes, and margins of ponds, rivers, lakes, and lagoons
Bird		III	a	Kentucky warbler	*Geothlypis formosa*	Humid deciduous forest, dense second growth, swamps

Bird	**ST**	I	a	Loggerhead shrike	*Lanius ludovicianus*	Grasslands, orchards and open areas with scattered trees
Bird		III	a	Northern Bobwhite	*Colinus virginianus*	Early successional habitats including croplands, grasslands, pastures, grass-brush rangelands, and open forests
Bird		IV	b	Northern Flicker	*Colaptes auratus*	Open forest, both deciduous and coniferous, open woodland, open situations with scattered trees and snags, riparian woodland, pine-oak association, parks
Bird		IV	b	Rusty blackbird	*Euphagus carolinus*	Wooded swamp and wooded wetland winter habitat
Bird		IV	b	Wood thrush	*Hylocichla mustelina*	Deciduous or mixed forests with a dense tree canopy and a fairly well-developed deciduous understory, especially where moist
Bird		III	a	Yellow-billed cuckoo	*Coccyzus americanus*	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland
Bird		IV	a	Yellow-breasted chat	*Icteria virens*	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.
Crustacean	**FS**	III	c	Chowanoke crayfish	*Orconectes virginiensis*	Sluggish streams and swamps with abundance of dead wood on the bottom
Fish	**ST**	II	c	Carolina darter	*Etheostoma collis*	Very slow moving water with sand or gravel substrates flowing through wooded areas or pastures
Fish		III	c	Freshwater drum	*Aplodinotus grunniens*	Warm turbid water in lakes, reservoirs, and pools in low gradient rivers over mud substrate
Fish		III	c	Ironcolor shiner	*Notropis chalybaeus*	Moderately acidic creeks, streams, and swamps
Fish		IV	c	Roanoke hog sucker	*Hypentelium roanokense*	Moderate to high gradient streams with rock, gravel, or sand substrates
Fish		III	c	Snail bullhead	*Ameiurus brunneus*	Well flowing streams and rivers with rocky substrates
Fish		IV	c	Speckled killifish	*Fundulus rathbuni*	Slow moving streams and creeks with sandy substrates
Fish	**ST**	II	c	Whitemouth shiner	*Notropis alborus*	Clear to somewhat turbid creeks, with varying substrates
FW Mollusk		IV	a	Alewife floater	*Anodonta implicata*	Alewife obligate - coastal streams and lakes with sand or gravel substrates
FW Mollusk	**FSST**	I	a	Atlantic pigtoe	*Fusconaia masoni*	Clean swift waters with stable gravel or sand/ gravel substrate
FW Mollusk		IV	a	Carolina slabshell mussel	*Elliptio congaraea*	Small streams to rivers with swift flow and sandy substrates
FW Mollusk		III	c	Dwarf waterdog	*Necturus punctatus*	Sluggish streams and blackwater streams with debris
FW Mollusk		IV	c	Gravel elimia	*Elimia catenaria*	Streams and rivers with high ground water content and good flow
FW Mollusk		III	a	Notched rainbow	*Villosa constricta*	Clean streams with stable banks and sand or gravel substrates
FW Mollusk	**FS**	II	b	Roanoke slabshell	*Elliptio roanokensis*	Deeper channels of relatively fast flowing rivers
FW Mollusk		IV	a	Tidewater mucket	*Leptodea ochracea*	Ponds, canals, and slow moving sections of rivers, often connected to the ocean and can tolerate a wide variety of substrates
FW Mollusk		II	a	Yellow lampmussel	*Lampsilis cariosa*	Large streams and rivers with low gradient and sand and gravel substrates

Other Terrestrial Invertebrate	**FS**	II	c	A millipede	*Auturus erythropygos*	No habitats have been identified for this species
Reptile		IV	a	Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*	Upland pine habitats
Reptile		IV	c	Southeastern crowned snake	*Tantilla coronata*	Forest generalist but require soils suitable for digging
Reptile		IV	b	Yellow-bellied slider	*Trachemys scripta scripta*	A variety of freshwater habitats including rivers, ponds, lakes, and roadside ditches

** 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 Southside 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 conservation easements to state parks and natural area reserves to state wildlife management areas. Significant conservation assets, in terms of size, include:

- Occoneechee State Park,
- Staunton River State Park,
- Dick Cross Wildlife Management Area,
- Difficult Creek State Natural Area Preserve,
- Ward Burton Wildlife Foundation Preserve, and
- John H. Kerr Reservoir.

These properties contain a diversity of open water, forest, agricultural, and wetland habitats (Figure 4). 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.

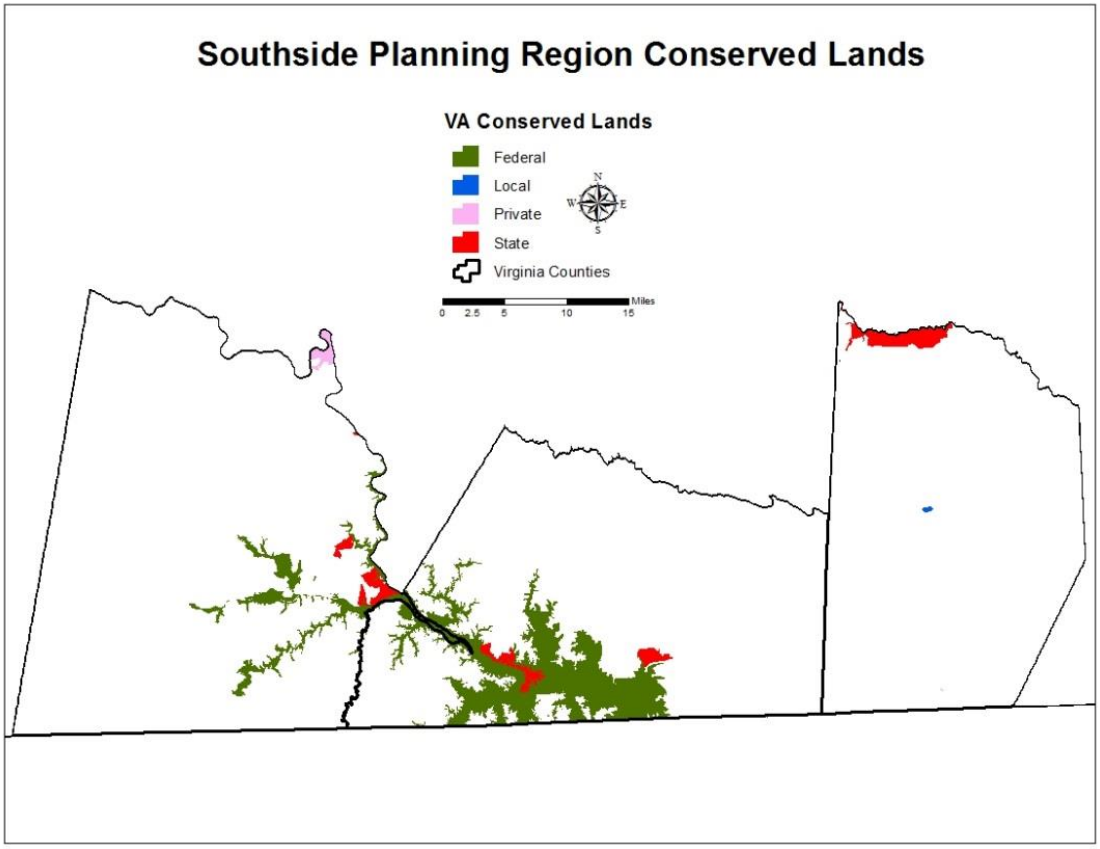

Figure 4. Conservation Lands in the Southside Planning Region (DCR, Natural Heritage 2014).

These properties serve as an important component of wildlife conservation efforts within Southside 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 the 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 Southside Planning Region

Changes in temperature and precipitation will likely negatively affect habitats and SGCN in the Southside 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 (Melilo et al. 2014). Earlier models used for 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 Southside 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 Southside Planning Region priority SGCN and other species. Many of these activities are also expected to benefit landowners and communities.

Table 1. Summary Conservation Strategies and Actions for the Southside Planning Region.

Conservation Strategies	Conservation Actions	Threats Addressed	Economic/ Human Benefits	Priority Areas
Enhance, maintain, and restore aquatic and riparian habitats	1) Exclude livestock from streams;2) Establish riparian buffers in agricultural areas; 3) Reforest erodible pasture lands and establishing permanent vegetative cover on critical areas; 4) Improve pasture and loafing lot management to reduce tainted runoff; 5) Create runoff impoundments or other structures to slow the flow of runoff into streams; 6) Enhance manure incorporation into croplands;7) Establish vegetative buffers in residential areas; 8) Repair failing septic systems and eliminating "straight pipes;" 9) Establish a pet waste program to reduce bacterial inputs from pets; 10) Continue to identify impaired waters within the planning region; 11) Restore aquatic connections; 12) Monitor and address invasive species impacts; and 13) 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	Banister River, Polecat Creek, Sandy Creek, Three Creek
Maintain and restore forest habitat	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
Maintain and restore open habitats	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	Areas supporting SGCN that are not already protected

Enhance, Maintain, and Restore Aquatic and Aquatic Habitats

Aquatic systems in the Southside Planning Region include warm water, freshwater rivers, streams, and creeks. Most of the planning region is in the Roanoke River watershed. Approximately 48,300 acres (3.6 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 whitemouth shiner, Carolina darter, snail bullhead, speckled killifish, Roanoke slabshell, freshwater drum, and Chowanoke, among others.

Threats

Aquatic and riparian habitats within the Southside 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 Southside 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). 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 Southside Planning Region has a low percentage of impervious surfaces (Figure 5).

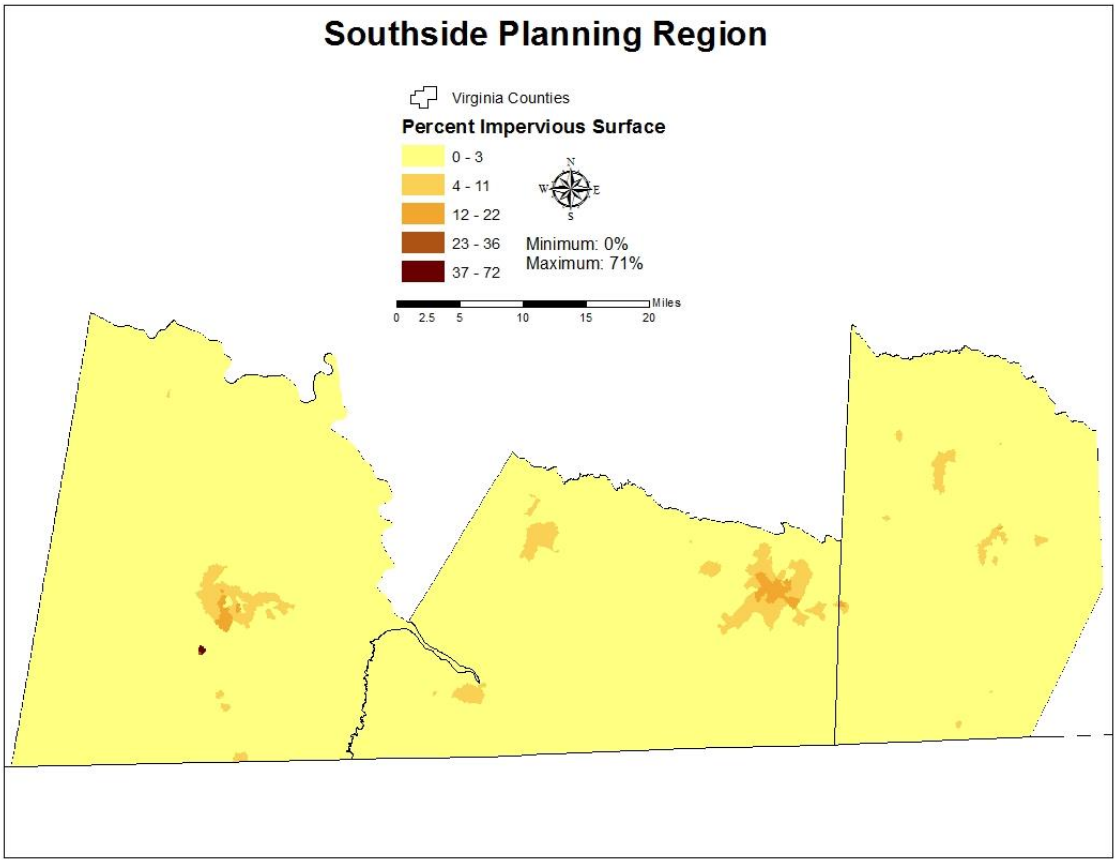

Figure 5. Impervious Surface Cover in Southside Planning Region (SARP 2014).

3. Invasive Species: Additional threats to aquatic systems within Southside Planning Region include invasive species that 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: Banister River, Polecat Creek, and Sandy Creek (Blue Ridge Environmental Solutions, 2012), and Three Creek (Working Group 2013) (Figure 6).

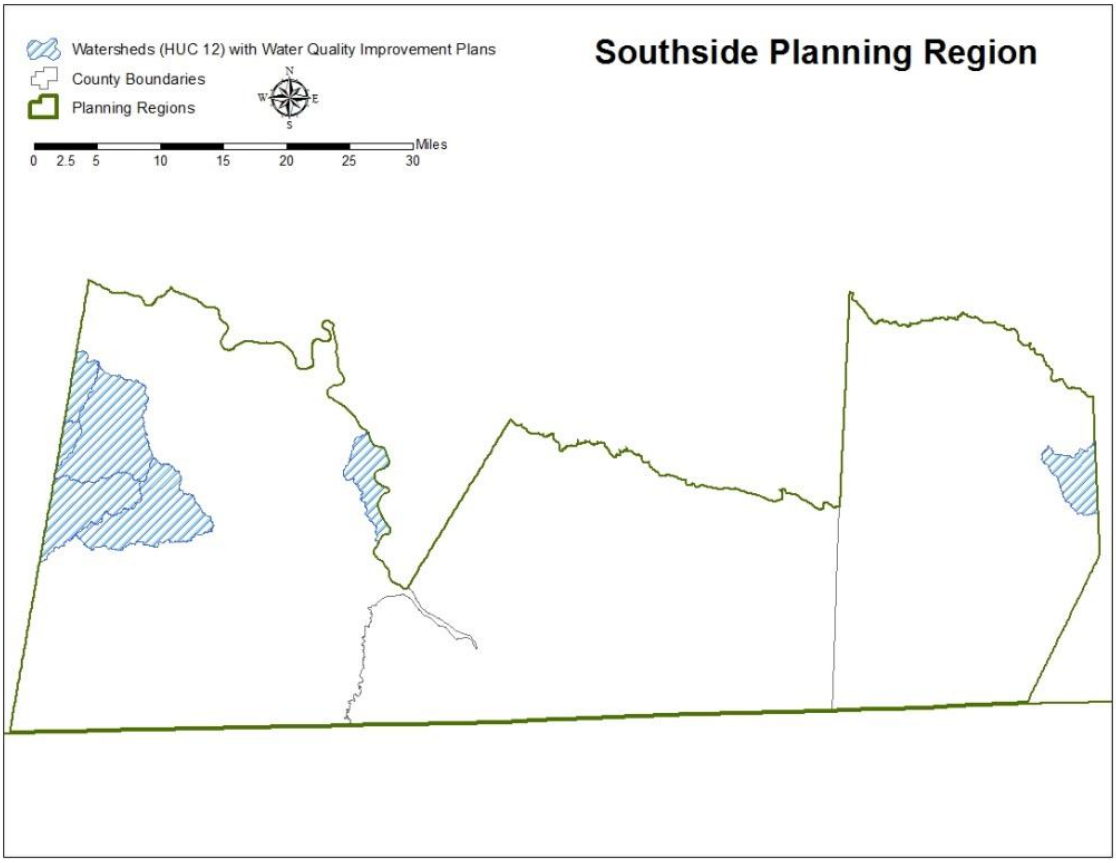

Figure 6. Watersheds with Water Quality Improvement Plans.

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

- Excluding livestock from streams;
- Establishing riparian buffers in agricultural areas;
- Reforesting erodible pasture lands and establishing permanent vegetative cover on critical areas;
- Improving pasture and loafing lot management to reduce tainted runoff;
- Creating runoff impoundments or other structures to slow the flow of runoff into streams;
- Enhancing manure incorporation into croplands;
- Establishing vegetative buffers in residential areas;
- Repairing failing septic systems and eliminating “straight pipes” depositing human waste into streams; and

- Establishing a pet waste program to reduce bacterial inputs from pets.

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).

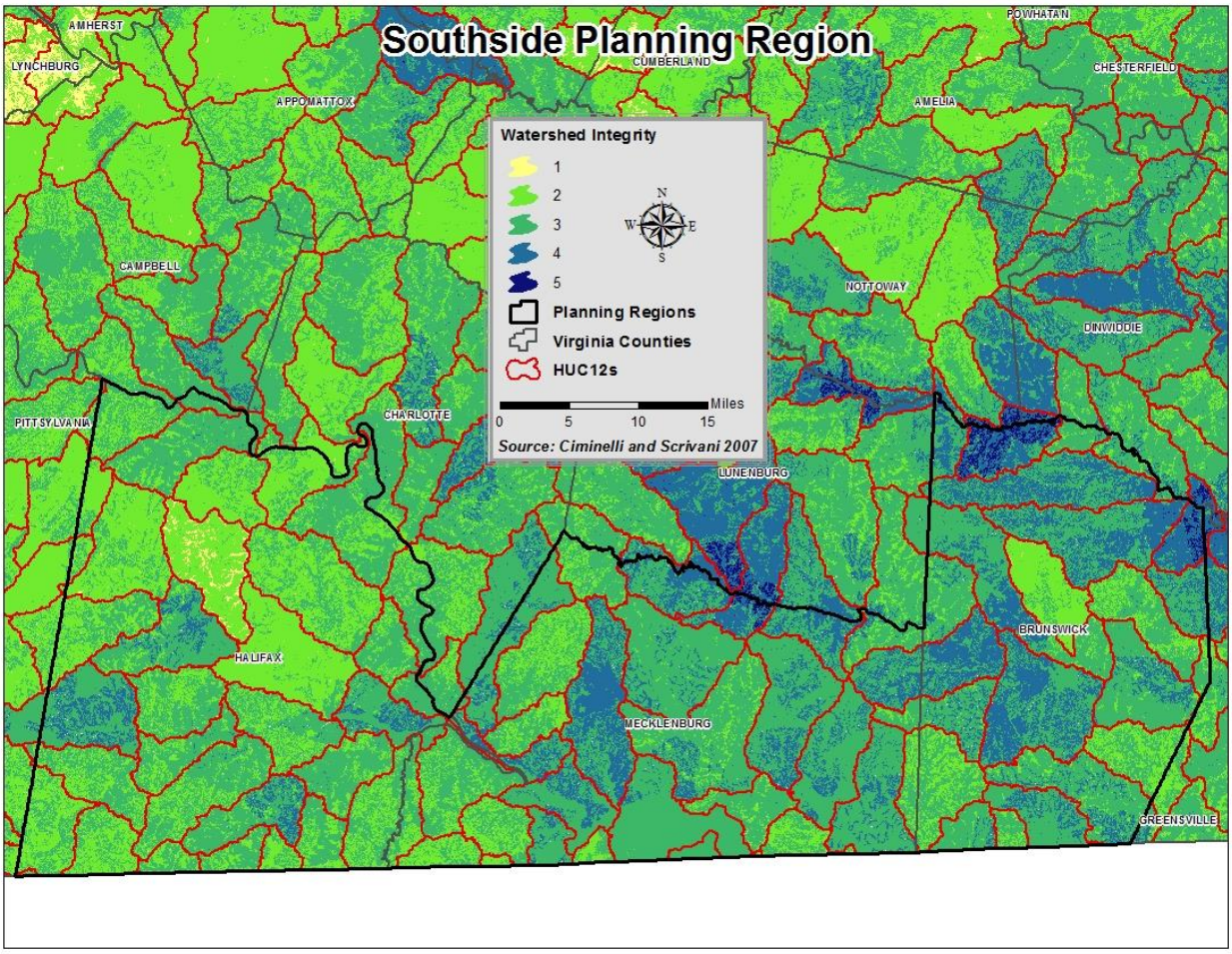

Figure 7. Watershed Integrity Model for Southside Planning Region (Ciminelli and Scrivani 2007).

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.

Many agencies help landowners in the Southside 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).

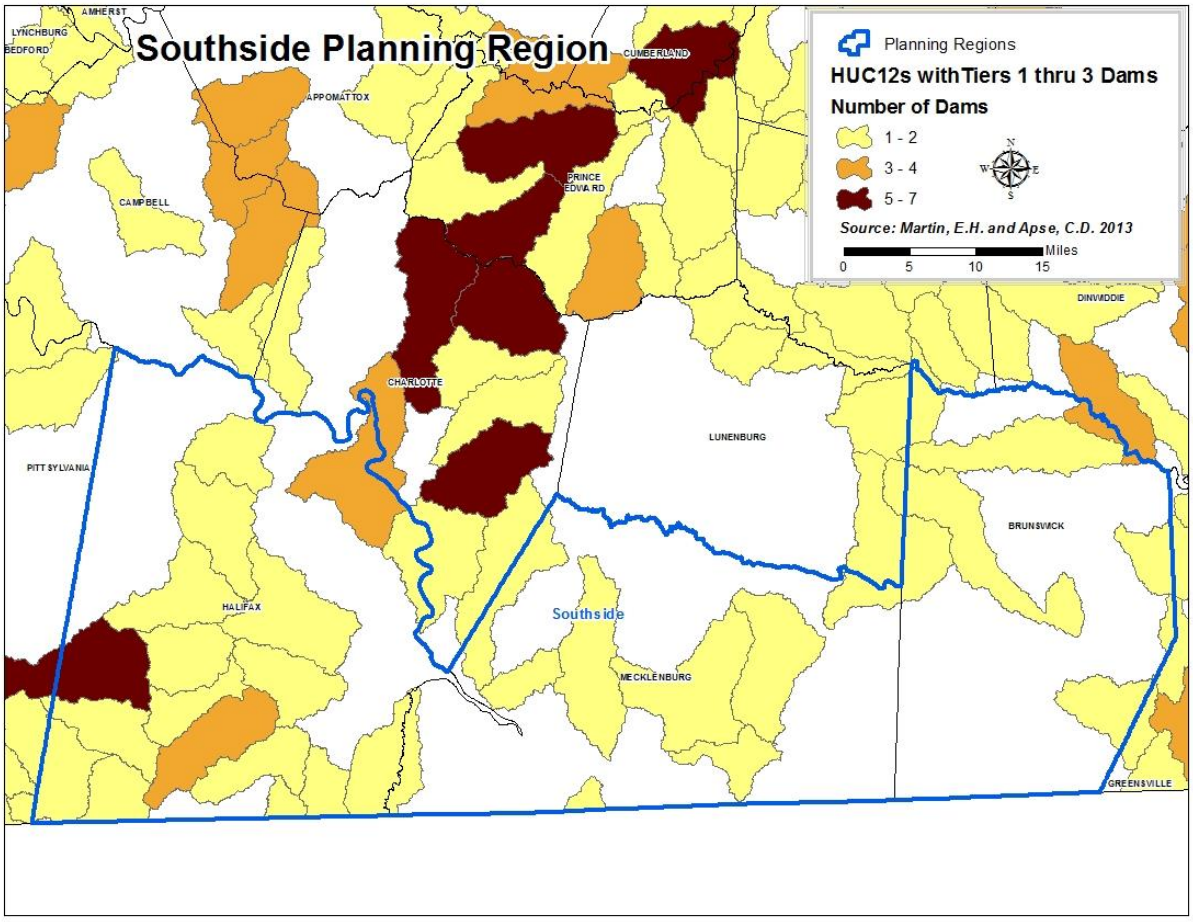

Figure 8. HUC12 Watersheds with Priority Dams for Removal/ Modification for Enhanced Connectivity (Martin and Apse 2013).

Additional actions to improve aquatic systems in the Southside Planning Region include 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, 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 storm water runoff. Improving storm water 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 Southside 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 were often 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, wood thrush, Kentucky warbler, southeastern crowned snake, Eastern slender glass lizard, and a variety of other species.

Table 4. Forest Acreage Totals in Southside Planning Region (Anderson et al. 2013).

Forest Type	Acreage	Percent of Planning Region
Mixed Hardwood and Conifer	602,026.98	45.23%

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 Southside Planning Region is fragmentation, mainly due to expanding development and resulting road as well as extractive uses. 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 Southside 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 operations 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, 2015). BMPs also recommend building roads on areas with minimum slope and minimizing or avoiding stream crossings (DOF 2014). The *Water Quality Improvement Plan to Reduce Bacteria in Darden Mill Run, Mill Swamp, and Three Creek* developed by DEQ and stakeholders specifically highlights reforesting areas around eroding crop lands and pastures within the Three Creek watershed to help decrease sediment run off as well as provide wildlife habitat (Working Group 2013).

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 Southside 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 higher salinities, 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, long leaf pine savannas, glades and barrens, and outcrop and summit scrub. These habitats make up approximately 130,575 acres (9.8 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, such as the loggerhead shrike and grasshopper sparrow that can depend on these areas for nesting, feeding, protection, etc. Pine savanna provides habitat for the Bachman's sparrow and oak toad.

Threats

Changing land use patterns has played a large role in the loss of open 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 Halifax County offers 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. The NRCS provides landowners with opportunities to improve or restore open habitats via programs like the Conservation Reserve Program and the Environmental Quality Incentive Program.

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 make up 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
Creation of Vegetative/ Forest Buffers along Streams or Wetlands	• Before/ after photos of project site; • Photos documenting changes as vegetation matures over multiple years; • Before/ after measurements of sedimentation immediately downstream of site; and • Changes in the number and diversity of species utilizing the site.
Control of Invasive Plants	• Before/ after photos of project site; • Photos documenting changes as restored vegetation matures over multiple years; and • Before/ after comparison of the number and diversity of species utilizing the site.
Remove Cattle from Streams	• Before/ after photos of project site; • Photos of alternative watering systems (if appropriate) • Photos documenting changes in shoreline as

	restored vegetation matures over multiple years; • Before/ after comparison of sediment and water chemistry immediately downstream of site; and • Before/ after comparison of the number and diversity of species utilizing the site.
Creating or Improving Open Habitats	• Before/after photos of project site; • Photos documenting changes to the site as the vegetation matures; and • Before/ after comparison of the number and diversity of species utilizing the site.

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 be borne out in 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 Southside 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 SOUTHSIDE PLANNING REGION

Complete SGCN list for the Southside Planning Region (SGCN=89). 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		III	a	Dwarf waterdog	*Necturus punctatus*
Amphibian		IV	a	Eastern mud salamander	*Pseudotriton montanus montanus*
Amphibian		IV	c	Eastern spadefoot	*Scaphiopus holbrookii*
Amphibian		IV	a	Many-lined salamander	*Stereochilus marginatus*
Amphibian		II	a	Mole salamander	*Ambystoma talpoideum*
Amphibian		II	a	Oak toad	*Anaxyrus quercicus*
Bird		II	a	American black duck	*Anas rubripes*
Bird		II	a	American woodcock	*Scolopax minor*
Bird	**ST**	I	a	Bachman's sparrow	*Aimophila aestivalis*
Bird		III	c	Bank swallow	*Riparia riparia*
Bird		III	a	Barn owl	*Tyto alba*
Bird		III	b	Belted kingfisher	*Megaceryle lcyon*
Bird		IV	a	Black-and-white warbler	*Mniotilta varia*
Bird		IV	a	Black-bellied plover	*Pluvialis squatarola*
Bird		IV	a	Brown thrasher	*Toxostoma rufum*
Bird		IV	b	Chimney swift	*Chaetura pelagica*
Bird		II	a	Common tern	*Sterna hirundo*
Bird		IV	a	Eastern kingbird	*Tyrannus tyrannus*
Bird		IV	a	Eastern meadowlark	*Sturnella magna*
Bird		IV	a	Eastern towhee	*Pipilo erythrophthalmus*
Bird		III	a	Eastern Whip-poor-will	*Caprimulgus vociferus*
Bird		IV	b	Eastern wood-pewee	*Contopus virens*
Bird		IV	a	Field sparrow	*Spizella pusilla*
Bird		III	a	Forster's tern	*Sterna forsteri*
Bird		IV	a	Grasshopper sparrow	*Ammodramus savannarum*
Bird		IV	a	Gray catbird	*Dumetella carolinensis*
Bird		IV	a	Greater scaup	*Aythya marila*
Bird		IV	b	Green heron	*Butorides virescens*
Bird		III	a	Kentucky warbler	*Oporornis formosus*
Bird		III	b	Least bittern	*Ixobrychus exilis*

Bird	**ST**	I	a	Loggerhead shrike	*Lanius ludovicianus*
Bird		IV	b	Marsh wren	*Cistothorus palustris*
Bird		III	a	Northern bobwhite	*Colinus virginianus*
Bird		III	a	Northern harrier	*Circus cyaneus*
Bird		IV	c	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Bird		IV	b	Rusty blackbird	*Euphagus carolinus*
Bird		IV	a	Short-billed dowitcher	*Limnodromus griseus*
Bird		IV	b	Wood thrush	*Hylocichla mustelina*
Bird		III	a	Yellow-billed cuckoo	*Coccyzus americanus*
Bird		IV	a	Yellow-breasted chat	*Icteria virens*
Crustacean	**FS**	III	c	Chowanoke crayfish	*Orconectes virginiensis*
Fish		IV	a	Alewife	*Alosa pseudoharengus*
Fish		III	a	American eel	*Anguilla rostrata*
Fish		IV	a	American shad	*Alosa sapidissima*
Fish	**FS**	III	c	Bigeye jumprock	*Moxostoma ariommum*
Fish	**ST**	II	c	Carolina darter	*Etheostoma collis*
Fish		III	c	Freshwater drum	*Aplodinotus grunniens*
Fish		III	c	Ironcolor shiner	*Notropis chalybaeus*
Fish		IV	c	American brook lamprey	*Lampetra appendix*
Fish		IV	c	Mud sunfish	*Acantharchus pomotis*
Fish	**FSST**	II	b	Orangefin madtom	*Noturus gilberti*
Fish		I	a	Roanoke bass	*Ambloplites cavifrons*
Fish		IV	c	Roanoke hog sucker	*Hypentelium roanokense*
Fish	**FESE**	II	a	Roanoke logperch	*Percina rex*
Fish		III	c	Snail bullhead	*Ameiurus brunneus*
Fish		IV	c	Speckled killifish	*Fundulus rathbuni*
Fish	**ST**	II	c	Whitemouth shiner	*Notropis alborus*
FW Mollusk		IV	a	Alewife floater	*Anodonta implicata*
FW Mollusk	**FSST**	I	a	Atlantic pigtoe	*Fusconaia masoni*
FW Mollusk		IV	c	Atlantic spike	*Elliptio producta*
FW Mollusk		IV	c	Carolina lance mussel	*Elliptio angustata*
FW Mollusk		IV	a	Carolina slabshell mussel	*Elliptio congaraea*
FW Mollusk		IV	a	Creeper	*Strophitus undulatus*
FW Mollusk	**FESE**	I	a	Dwarf wedgemussel	*Alasmidonta heterodon*
FW Mollusk		IV	a	Eastern pondmussel	*Ligumia nasuta*
FW Mollusk		IV	c	Gravel elimia	*Elimia catenaria*
FW Mollusk	**ST**	II	a	Green Floater	*Lasmigona subviridis*

FW Mollusk		IV	b	Northern lance mussel	*Elliptio fisheriana*
FW Mollusk		III	a	Notched rainbow	*Villosa constricta*
FW Mollusk		IV	c	Ridged lioplax	*Lioplax subcarinata*
FW Mollusk	**FS**	II	b	Roanoke slabshell	*Elliptio roanokensis*
FW Mollusk		IV	a	Tidewater mucket	*Leptodea ochracea*
FW Mollusk		IV	a	Triangle floater	*Alasmidonta undulata*
FW Mollusk		II	a	Yellow lampmussel	*Lampsilis cariosa*
FW Mollusk	**FS**	II	a	Yellow lance	*Elliptio lanceolata*
Mammal		IV	c	Marsh rabbit	*Sylvilagus palustris palustris*
Mammal	**SE**	I	a	Rafinesque's eastern big-eared bat	*Corynorhinus rafinesquii macrotis*
Other Terrestrial Invertebrate	**FS**	II	c	A millipede	*Auturus erythropygos*
Reptile		IV	a	Common ribbonsnake	*Thamnophis sauritus sauritus*
Reptile		III	a	Eastern box turtle	*Terrapene carolina carolina*
Reptile		IV	c	Eastern hog-nosed snake	*Heterodon platirhinos*
Reptile		IV	a	Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*
Reptile		IV	a	Mudsnake	*Farancia abacura abacura*
Reptile		IV	a	Queen snake	*Regina septemvittata*
Reptile		IV	a	Scarletsnake	*Cemophora coccinea copei*
Reptile		IV	c	Southeastern crowned snake	*Tantilla coronata*
Reptile	**CC**	III	a	Spotted turtle	*Clemmys guttata*
Reptile	**CC**	IV	a	Timber rattlesnake	*Crotalus horridus (timber)*
Reptile		IV	b	Yellow-bellied slider	*Trachemys scripta scripta*

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 6th 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 ≥ 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.