

Chapter 1. Introduction

1.1. Purpose

The development of Virginia's Comprehensive Wildlife Conservation Strategy (CWCS) has provided an unprecedented opportunity to assess the Commonwealth's wildlife resources and to develop important partnerships. This is an historic event as all 56 states and territories are developing plans concurrently. DGIF sees this project as an opportunity to identify key species and habitats in need of conservation and to prioritize actions and research needs for future statewide conservation activities for all interested Virginians.

In Virginia, the authority and responsibility for fish and wildlife conservation is vested with DGIF and VMRC. For more than 50 years, these agencies have partnered with USFWS to conserve and manage specific species of wildlife (including fish) under the Endangered Species Act, the Federal Aid in Wildlife Restoration Act, and the Federal Aid to Sport Fish Restoration Act. As a result, populations of many species that are actively hunted or fished for have rebounded, and some of them are currently at record levels.

Beyond these responsibilities, however, DGIF is also charged with managing all other wildlife in the Commonwealth. This responsibility has presented numerous challenges, primarily because of a lack of adequate funding. In 2000, the Virginia General Assembly recognized the importance and value of a broader "user pay, user benefit" approach and, under legislation known as House Bill 38, directed a portion of the state sales tax collected on wildlife-related outdoor recreation equipment (e.g., birdseed, fishing gear, etc.) to DGIF. While this additional revenue has enabled the agency to continue its wide array of conservation and management programs, these resources did not address the continued shortfall of funds available for comprehensive wildlife conservation.

In response to interactions with a national coalition of more than 3,000 agencies and organizations, Congress provided one year of funding to all of the states through Title IX of the Commerce, Justice and State Appropriations Act of 2000 (specifically known as the Wildlife Conservation and Restoration Program, WCRP). In subsequent years, Congress has appropriated funding annually to support a new program, State Wildlife Grants (SWG), with an emphasis on species of greatest conservation need. This program will be guided by each state's CWCS to address the needs of a wide array of wildlife and habitats of greatest conservation need. Both of these pieces of legislation, the WCRP and SWG Programs, required the development of comprehensive wildlife plans. The decision was made to combine the two requirements into one document (the CWCS), due to the USFWS on October 1, 2005. This requirement is intended to help states focus their efforts in addressing the unmet needs of these species.

Eight Essential Elements

Congress and USFWS have determined that the CWCS should focus on the "species in greatest conservation need" while still accounting for the "full array of wildlife" and related issues. These requirements, the "eight essential elements," are reproduced here in their entirety because of the importance they held in the development of our approach and the subsequent results. The CWCS is required to include:

- 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.

The result of fulfilling these requirements is a science-based dynamic document representing a plan for action to conserve Virginia's wildlife resources. The Virginia Department of Game and Inland Fisheries, as the wildlife agency for the Commonwealth of Virginia, was the lead agency in developing the strategy. However, this CWCS is intended to be a strategy for statewide wildlife conservation, a framework for coordination and cooperation between agencies and groups, and not just a strategy for DGIF's use.

1.2. Structure and Scope of the Document

Virginia's CWCS addresses a diverse array of wildlife, from mammals and fish to crustaceans and millipedes. Because of the complexity of these species and their habitats, we decided to approach the document from an ecoregional perspective. As ecoregions are large areas with similar climate and geology, they are ideal functional units for the CWCS. We chose to use Bailey's ecoregions as described and displayed by Keys et al. (1995). This classification divides the state into six ecoregional sections: Mid-Atlantic Coastal Plain, Southern Appalachian Piedmont, Blue Ridge Mountains, Northern Ridge and Valley, Southern Cumberland Mountains, and Northern Cumberland Mountains. Ecoregions were used in the CWCS as the first level of habitat classification and as an organizational unit. Detailed descriptions of the ecoregions are provided at the opening of Chapters 4 through 9.

1.2.1. Document Structure

Virginia's CWCS contains ten chapters and 15 appendices. This section indicates where within the document each of the eight elements is addressed. Note that each element may be addressed several times throughout the document.

Chapter 1

This chapter introduces the reader to the CWCS through a discussion of its background, scope, and purpose, an explanation of the structure of the document, and an introduction to the natural resources and natural resource agencies and organizations of Virginia.

Chapter 2

The Methods chapter describes the approach we took in addressing the eight essential elements. It includes sections on public participation and coordination, selecting the species of greatest conservation need, mapping habitats, threats assessment, and identification of conservation actions and monitoring and research needs (*Elements 1, 2, 3, 4, 7, and 8*).

Chapter 3

This chapter was developed to provide the reader an overview or summary of many of our analyses, including the list of species of greatest conservation need, the terrestrial and aquatic habitat descriptions and relative condition, threats to wildlife, and results of Virginia's terrestrial gap analysis program (*Elements 1, 2, 3 and 8*).

Chapters 4 to 9

There are six chapters representing each of the six ecoregions. All follow the same format, shown below with an indication of which of the eight elements are addressed:

Introduction	
List of SGCN	<i>(Element 1)</i>
Terrestrial and wetland species	
Tier 1 species accounts	<i>(Element 1)</i>
Life history	<i>(Elements 1 and 2)</i>
Location	<i>(Element 2)</i>
Description of essential habitat	<i>(Element 2)</i>
Relative condition of habitat	<i>(Element 2)</i>
Specific threats and trends	<i>(Element 3)</i>
Conservation actions and strategies	<i>(Element 4)</i>
Research and monitoring needs	<i>(Elements 3 and 5)</i>
Forest SGCN	<i>(Elements 1 and 2)</i>
Status of forested habitats	<i>(Element 2)</i>
Trends in forested habitats	<i>(Elements 2 and 3)</i>
Open vegetated habitat SGCN	<i>(Elements 1 and 2)</i>
Status of open habitats	<i>(Element 2)</i>
Trends in open habitats	<i>(Elements 2 and 3)</i>
Barren habitat SGCN	<i>(Elements 1 and 2)</i>
Status of barren habitats	<i>(Element 2)</i>
Trends in barren habitats	<i>(Elements 2 and 3)</i>
Wetland habitat SGCN	<i>(Elements 1 and 2)</i>
Status and trends of habitats	<i>(Elements 2 and 3)</i>
Aquatic species	
Ecoregional drainage unit (see Chapter 2)	
Tier 1 species accounts	<i>(Element 1)</i>
Life history	<i>(Elements 1 and 2)</i>
Location	<i>(Element 2)</i>
Description of essential habitat	<i>(Element 2)</i>
Relative condition of habitat	<i>(Element 2)</i>
Specific threats and trends	<i>(Element 3)</i>
Conservation actions and strategies	<i>(Element 4)</i>
Research and monitoring needs	<i>(Elements 3 and 5)</i>
SGCN by stream habitat groups	<i>(Elements 1 and 2)</i>
Relative condition of habitat	<i>(Elements 2 and 3)</i>
Subterranean species	
Tier 1 species accounts	<i>(Element 1)</i>
Life history	<i>(Elements 1 and 2)</i>
Location	<i>(Element 2)</i>
Description of habitat requirements	<i>(Element 2)</i>
Relative condition of habitat	<i>(Element 2)</i>
Specific threats and trends	<i>(Element 3)</i>
Conservation actions and strategies	<i>(Element 4)</i>
Research and monitoring needs	<i>(Elements 3 and 5)</i>
SGCN by subterranean habitat types	<i>(Elements 1 and 2)</i>
Status and trends of subterranean habitats	<i>(Elements 2 and 3)</i>

Chapter 10

The closing chapter in the CWCS presents the actions necessary for the conservation of Virginia's wildlife and plans for their implementation, a description of existing monitoring efforts and how future monitoring can be established, and a description of how and when the plan will be revisited (*Elements 4, 5, 6, 7, and 8*).

1.2.2. Scope of the CWCS

DGIF has the authority for managing all wildlife, including non-endangered or threatened insects, in Virginia. As such, we included the following taxonomic groups in the CWCS: mammals, birds, fish, reptiles, amphibians, freshwater invertebrates, and terrestrial invertebrates. As Virginia's wildlife agency, DGIF has responsibility for maintaining healthy populations of these species. However, specific responsibility for threatened and endangered insects and plants has been given to VDACS. We worked closely with them, DCR-NH, and many other institutions and individuals to incorporate their knowledge of all taxa as necessary. A further discussion of the natural resource agencies in Virginia and their responsibilities can be found below.

In the past, due to a lack of staff, DGIF has been only marginally involved in the management of marine mammals and sea turtles. Recently, however, the Department has hired a biologist who coordinates issues related to these species. Other marine species, including finfish and invertebrates, are under the jurisdiction of VMRC and NMFS. Because of DGIF's relative lack of expertise with most marine species and habitats, lack of jurisdiction over marine species and waters, and limited time for additional research and analysis, the Agency made the decision early in the development of the CWCS not to conduct an exhaustive analysis of these species and habitats, but to rely on existing plans and strategies. A section in the Coastal Plain chapter of the CWCS is devoted to summarizing existing marine resource planning and management efforts. We have also identified many of the key organizations involved in marine conservation in the next section. DGIF plans to include a more complete analysis of the status and trends of marine wildlife and habitats in the next iteration of the CWCS, with the concurrence of VMRC, NMFS, and other key partners.

1.3. The Context of Natural Resource Conservation in Virginia

Natural resource conservation in Virginia, as in most states, is tackled by a broad array of government agencies, NGOs, private institutions, and public citizens. This coalition of agencies and organizations collaborate across the Commonwealth to maximize the opportunities for conserving wildlife and habitats. It would be difficult to prepare an exhaustive list of these groups in the pages of this document. However, we provide a list and brief description of many of the key partners working in Virginia. As mentioned above, DGIF was the lead agency in developing the strategy. However, from the beginning, we recognized that a great deal of expertise on Virginia's wildlife exists outside the agency. Therefore, throughout this effort, we have involved a broad cross section of people and organizations. Representatives from many of these groups have been an important part of the development of the CWCS as described in Section 2.1.

1.3.1. Federal Agencies

U.S. Environmental Protection Agency (USEPA)

The mission of the USEPA is to protect human health and to safeguard the natural environment (USEPA 2005a). Region 3 of USEPA, the Mid-Atlantic Region, is composed of five states (including Virginia) and the District of Columbia (USEPA 2005b). Within USEPA's Office of Water, many programs and regulations work to restore and maintain oceans, watersheds, and aquatic ecosystems (USEPA 2004b). The Office of Wetlands, Oceans, and Watersheds (within the Office of Water) is composed of Assessment and Watershed Protection, Oceans and Coastal Protection, and Wetlands divisions (USEPA 2005d). Each division has many programs that protect coastal areas, including water quality standards and monitoring, permitting of discharges, total maximum daily load standards, the National Estuary Program, funding, marine habitat protection, marine debris abatement, and watershed protection, restoration, and planning (USEPA 2005c). The Division of Oceans and Coastal Protection regulates ocean dumping,

dredged material, ocean discharges, and vessel discharges. The Office of Water works closely with other federal and state agencies, local government, interest groups, and the public to accomplish its goals.

National Oceanic and Atmospheric Administration (NOAA)

This division of the Department of Commerce is responsible for protecting and managing living marine resources and their habitats and administers several programs to that end (NOAA 2004b). The Office of Ocean and Coastal Resource Management includes the National Coastal Zone Management Program, which administers the Coastal Zone Management Act of 1972 through developing and supporting state coastal zone management programs (CPD 1999, NOAA 2004d). The National Estuarine Research Reserve System (NERRS) helps the states preserve prime estuaries for research, education, and conservation. There are 26 such reserves in the U.S., including Virginia's Chesapeake Bay (NERRS 2004). The Coastal Ocean Program provides information necessary to make sound decisions about managing coastal resources, especially estuaries and coastal waters. Its goal is to improve decision-making with regard to these resources (CSCOR 2005). This office will be an excellent resource and partner in developing the coastal/marine section of the next iteration of the CWCS.

The Marine Protected Areas (MPA) Program was initiated by NOAA in response to Executive Order 13158 (MPA 2005). This Order instructed NOAA and the Department of the Interior to work with other federal and state agencies to create a system of marine preserves (NOAA 2004e). An MPA is "an area of the marine environment that has been reserved by federal, state... or local laws or regulations to provide lasting protection to...natural or cultural resources therein."

NOAA provides funding for the National Sea Grant College Program, a 30 state cooperative that fosters relationships among universities and organizations that manage living and non-living ocean resources (NOAA 2004c, NSGO N.d.). Sea Grant colleges conduct research on issues such as fisheries management, aquaculture, estuarine ecology, marine ecology, and education.

National Marine Fisheries Service – NOAA Fisheries (NMFS)

This organization is the division of NOAA that is responsible for conservation and management of living marine resources within the zone that is 3 to 200 miles (5 to 320km) offshore (NMFS 2003). The Service manages fish stocks, enforces federal regulations, works with localities on fisheries issues, promotes sustainable fisheries, conducts research, and works to conserve and protect habitat (NMFS N.d). The Marine Mammal Protection Act and ESA are enforced by NMFS, with regard to managing whales, dolphins, seals, and sea turtles in balance with economic and recreational needs.

National Park Service (NPS)

The responsibility of NPS, located within the Department of the Interior, is to protect and preserve sites selected based on cultural or ecological significance (NPS 2001). The NPS 2001 to 2005 Strategic Plan emphasizes their role in conservation and stewardship of natural resources, and identifies their primary goal as the long-term preservation of park resources (NPS 2000). Their five identified goal groups are park natural resources, park cultural resources, park visitors, external partnership programs, and organizational effectiveness. Natural resource goals include the protection of threatened and endangered species, geological goals, and protection of aquatic resources (NPS 2000).

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) is a federal agency that works with Virginians to improve and protect the soil, water and other natural resources. For decades, private landowners have voluntarily worked with NRCS specialists to prevent erosion, improve water quality and promote sustainable agriculture (NRCS N.d.a.)

The Natural Resources Conservation Service provides conservation planning with and technical assistance to individuals, groups and units of government. These clients develop and implement conservation plans to protect, conserve and enhance their natural resources.

Specific programs include:

- Conservation Reserve Program (reducing soil erosion, reducing sedimentation, improving water quality, establishing wildlife habitats, and enhancing forest and wetland resources);
- Conservation Security Program (conservation stewardship in environmentally sensitive areas in target watersheds);
- Environmental Quality Incentives Program (improving and maintaining water and environmental quality);
- Farm and Ranchland Protection Program (purchasing development rights to keep farmlands in agricultural uses);
- Watershed Programs (protecting, restoring, and enhancing local watersheds);
- Wildlife Habitat Incentive Program (developing and improving wildlife habitat, primarily on private land);
- Wetlands Reserve Program (protecting, restoring, and enhancing wetlands) (NRCS N.d.b.).

U.S. Army Corps of Engineers (USACE)

This agency has diverse responsibilities in navigation, flood control, disaster response, and environmental protection. Its mission is investigating, developing, and maintaining the nation's water and related environmental resources; constructing and operating projects for navigation, flood control, major drainage, shore and beach restoration and protection, and outdoor recreation (USACE 2002). It is one of the three agencies involved in the review, approval, and enforcement of Joint Permit Applications (JPAs) for wetlands construction projects. In Virginia, the other agencies in the JPA process are VMRC, VADEQ, and local wetlands boards (USACE N.d.a).

The Civil Works Office (CWO) undertakes environmental management and restoration missions, along with water infrastructure and natural disaster response. Funding for CWO comes from the annual Energy and Water Development appropriation, not the Defense budget (USACE 2002). The total CWO budget is about \$5 billion a year, including non-Federal money from cost sharing sponsors. Proposed projects must first be recommended by citizens to Congress, studied with initial reconnaissance and a feasibility study performed by USACE, and then funding for the project must be authorized by Congress. CWO's environmental mission includes ecosystem restoration (USACE 2002). The Corps has partnered with NPS to help restore the Florida Everglades. USACE promotes environmental stewardship and operates fish hatcheries in cooperation with State wildlife agencies. In 2002 USACE announced a list of Environmental Operating Principles to ensure that all employees consider conservation, environmental preservation, and restoration in all Corps activities (USACE N.d.b).

U.S. Department of Defense (DoD)

The Sikes Act of 1960 promotes the planning, development, maintenance, and coordination of wildlife resource conservation on military reservations. Under the Sikes Improvement Act of 1997, DoD installations with significant natural resources are required to prepare and implement integrated natural resources management plans (DoD 2002). These efforts are accomplished in cooperation with USFWS and state fish and wildlife agencies. The plans are formulated based on input about the conservation, protection, and management of fish and wildlife resources at each installation, without a loss of the installation's ability to support its military mission (DoD 2002). The Act also requires that each plan provide for fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation (DoD 2002).

U.S. Fish and Wildlife Service (USFWS)

The mission of USFWS, within the U.S. Department of the Interior, is to promote the conservation of fish and wildlife and their habitats (USFWS N.d.c). The Service contributes to the health of our environment and quality of life by protecting and restoring important wildlife habitat, safeguarding endangered species, minimizing environmental contamination, and restoring fish populations (USFWS N.d.b). In addition, USFWS provides funding to support state fish and wildlife programs and enforce federal laws protecting wildlife.

Programs administered by USFWS that concern wildlife resources in Virginia include: the Coastal Barrier Resource Program; the National Wildlife Refuge Program; the Endangered Species Program; national fisheries programs; and the National Wetlands Inventory. In Virginia, USFWS has fisheries offices located in Gloucester and Harrison Lake and oversees sixteen national wildlife refuges, many of which are coastal (USFWS N.d.a). There is also a

Chesapeake Bay emphasis area under the Coastal Program that seeks to provide technical and financial assistance for Bay restoration programs.

U.S. Forest Service (USFS)

The Forest Service is the federal agency that manages National Forests and Grasslands. It accomplishes its mission through several activities: the protection and management of natural resources on National Forests; research on all aspects of forestry and forest resource use; and technical assistance to governmental entities, forest industries, and private landowners to help protect non-Federal forests (USFS N.d.a.). In Virginia, there are two National Forests administratively combined, the George Washington and Jefferson National Forests, located in western Virginia, including nearly 1.8 million acres (USFS N.d.c.).

Forest research includes an assessment of the diversity, quality, or productivity of fish and wildlife populations. Studies enhance the understanding of populations and systems essential to managing forests and to sustaining biological diversity. Particular emphasis is placed on threatened and endangered species and on declining or vulnerable species and communities, such as migratory birds, old-growth forests, and riparian communities (USFS N.d.b.). Forest research also focuses on warm and cold water fishes and aquatic invertebrates, many of which are identified as species of special concern.

Marine Mammal Commission

The MMC is an independent agency of the U.S. government that was created under the Marine Mammal Protection Act of 1972 (MMC 2004). The Commission was created to provide independent oversight of the marine mammal conservation policies and programs being carried out by the federal regulatory agencies to prevent the over harvesting and endangerment of stocks. The Commission is charged with developing, reviewing, and making recommendations on domestic and international actions and policies of all federal agencies with respect to marine mammal protection and conservation and with carrying out a research program. A primary objective is to ensure that federal programs are being administered in ways that maintain the health and stability of marine ecosystems and do not disadvantage marine mammal populations or species (MMC 2004).

1.3.2. State Agencies

Virginia Department of Agriculture and Consumer Services (VDACS)

The Virginia Department of Agriculture and Consumer Services is responsible for, among other things, the conservation, protection, and management of endangered and threatened species of plants and insects (Endangered Plant and Insect Species Act, §3.1-1020-1030). This legislation empowers the Board of Agriculture and Consumer Services to promulgate and adopt regulations to list plants and insects as threatened or endangered.

Virginia Department of Conservation and Recreation (DCR)

The mission of this agency is “to conserve, protect, enhance, and advocate the wise use of the Commonwealth’s unique natural, historic, recreational, scenic, and cultural resources (DCR 2005a).” Within this Agency reside the Virginia State Park System, Chesapeake Bay Local Assistance Boards (CBLAD), Soil and Water Conservation Programs, the Division of Natural Heritage (DCR-NH), the Office of Land Conservation, the Outdoor Planning and Recreation Resources Programs, and the Dam Safety and Floodplain Management Program.

The State Park System is a varied and robust assortment of natural, cultural, and recreational venues for the enjoyment, education, and use of Virginians and visitors. The system encompasses thirty-four sites and over 26,000ha managed for public use and at least six additional sites currently being acquired or developed.

Local and regional governments are supported in managing the impacts of land use on water quality in the Chesapeake Bay watershed by CBLAD (CBLAD 2002a). The Virginia Bay Act Program established a cooperative relationship between the Commonwealth and local governments to reduce and prevent non-point source pollution (CBLAD 2002c). Local Bay Act programs adopt or amend local land use plans and ordinances, including zoning

ordinances, subdivision ordinances, and comprehensive plans. These incorporate water quality protection measures. The Riparian Buffer Project's goals are to encourage the use of riparian forest buffers in the coastal zone, to form committees for establishing guidance in the development of these buffers, and to change local ordinances to help protect riparian buffers (CBLAD 2002b). CBLAD also runs the "Better Land Use Planning for Coastal Areas" program, which educates citizens, communities, and developers about impacts of shoreline development, determining development suitability, shoreline health indicators, and land management practices to mitigate shore development (DCR 2004a).

The Soil and Water Conservation programs are primarily focused on reducing and controlling non-point source pollution, and as such are a valuable way for implementing aquatic strategies related to water quality (DCR 2004c). The major non-point source pollution control programs include erosion and sediment control, storm water management, nutrient management, agricultural best practices, shoreline erosion control, and public beach conservation.

The Division of Natural Heritage (DCR-NH) inventories and preserves rare animals and plants and unique communities in Virginia (DCR N.d.a). The Division is a member of the Natural Heritage Network and NatureServe and provides information used for global biodiversity planning. The Division recently published the Conservation Lands Database, a complete GIS inventory of lands owned and managed for conservation (DCR N.d.b). The agency is also completing the first phase of the Virginia Conservation Lands Needs Assessment (VCLNA), which is a GIS tool for identifying prime areas for conservation action (DCR 2004d).

The Office of Land Conservation serves as the statewide, central contact, repository and clearinghouse for land conservation interests in Virginia, and delivers assistance to local land trusts, conservation organizations, local, state and federal agencies, and citizens to further land conservation (DCR 2004d). Two examples include technical assistance and workshops offered to the land trust community and grant funds are offered through the Virginia Land Conservation Foundation.

The Outdoor Planning and Recreation Resources Programs work to provide opportunities for many to experience the outdoors. This includes help to local parks and recreation departments through funding, expertise and training. Through this partnership, more than 20,000ha have been purchased for parks and recreation in more than 400 parks around the state. Since 1967, the department has provided more than \$72 million in state funds and channeled more than \$61 million in federal funds to local parks. DCR provides policy and direction to the public and private sectors so they may better manage recreational resources, and outdoor and open spaces. As well, DCR programs address scenic rivers, highways and byways. The agency's experience with local planners makes it a natural to help localities plan for greenways. The agency also produces the state's comprehensive outdoor recreation and conservation plan every five years, the "Virginia Outdoors Plan."

The Dam Safety and Floodplain Management Program works to provide for safe design, construction, operation and maintenance of dams and management of floodplains to protect public safety.

Virginia Department of Environmental Quality (DEQ)

The mission of DEQ is to protect and enhance Virginia's environment and promote the health and well being of its citizens (DEQ 2004a). The agency develops and enforces environmental regulations and permits regarding air quality, water quality, and waste disposal.

The Clean Water Act in Virginia is enforced by DEQ, which protects and manages water quality and quantity for people and wildlife (DEQ 2005g). The Division of Water monitors over 130 pollutants and establishes total maximum daily load (TMDL) standards that regulate the total amount of a given pollutant a water body can assimilate and still meet standards (DEQ 2005h). The Virginia Water Protection Program (VWPP), in the Office of Wetlands and Water Protection/Compliance, is responsible for regulating impacts to wetlands and other state waters. One of the primary mechanisms for doing this is the JPA process.

This department also works with other state agencies, local governments, and citizens under the Chesapeake Bay Program on nutrient point source reduction, toxic substance reduction, and a monitoring program (DEQ 2004b).

During the revision of the Tributary Strategies, DEQ made recommendations regarding point source pollution (specifically, nitrogen and phosphorous reduction from industrial and municipal wastewater treatment plants) (DEQ 2004b).

The Virginia Coastal Program was created in 1986 to restore and protect coastal resources, help ensure healthy fisheries and aquaculture, and provide for sustainable development (DEQ 2005b). This area includes 29 counties, 17 cities and 42 towns in eastern Virginia, all the fresh waters in the region (including parts of the Chesapeake Bay and Albemarle-Pamlico Sound), and ocean waters within three miles offshore. The Coastal Program plays a key role in the implementation of the Coastal Zone Management Act and in the coordination of partnerships for coastal resource management within Virginia (DEQ 2005c). The Coastal Program's grant program has provided funding for many valuable research and management projects over the years, and could be a source of funding for coastal CWCS implementation projects.

Virginia Department of Forestry (DOF)

Virginia's state forests are managed by DOF. The mission of this department is to protect and develop healthy, sustainable forest resources that support and enhance a healthy living environment (DOF 2005). The Department envisions forest resources that are protected from damaging fire, insects, weeds (including invasive species); are diverse in composition and distribution; provide extensive cover in all of the Commonwealth's watersheds; include unique and fragile habitats; are available for all to enjoy; and contribute financially to the state and local communities (DOF 2005).

The Department has a statewide network of experienced foresters that assist landowners, businesses, and local governments in the management of forest lands across Virginia. Through the Forest Stewardship Program, DOF assists private landowners in more actively managing their forests and related resources to increase the economic and environmental benefits of these lands (DOF 2003). Each stand described in a Forest Stewardship Management Plan is evaluated for wildlife habitat, especially for any species desired by the landowner. Forest management recommendations include expected impacts on wildlife, water, and flora. These plans are also developed by consulting foresters and staffs of other natural resource agencies, following the prescribed format.

Virginia Department of Game and Inland Fisheries

Under the Code of Virginia, DGIF is identified as the state agency with regulatory responsibility for all wildlife (including invertebrates) and inland fish and other aquatic wildlife, responsible for "conserving, protecting, replenishing, propagating, preserving, and increasing populations" (Code of Virginia §29.1-103). The agency accomplishes its work under the guidance of a three-part mission:

- to manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;
- to provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation; and
- to promote safety for persons and property in connection with boating, hunting and fishing.

Conservation of wildlife is accomplished through surveys, research, management and regulatory initiatives by the agency's Fisheries, Wildlife, and Wildlife Diversity Divisions. Enforcement of laws and regulations, and educating Virginians and visitors about these legal requirements, is performed by the Law Enforcement Division. Public outreach programs are conducted by all of the agency's Divisions, and include programming for children and adults alike. Additional information for the media, and other promotional materials, are developed by DGIF's Communications program. The agency has maintained a suite of databases, known as the Virginia Fish and Wildlife Information System, for more than 20 years that is used in environmental reviews, responses to public inquiries for information, research, management, and education. These systems contain information about the life history and distribution of more than 3,000 species in the Commonwealth. Land acquisitions are coordinated by the Agency's Office of Capital Programs and are designed to provide access to wildlife-associated recreational opportunities and secure wildlife habitats.

The Virginia Endangered Species Act was enacted in 1972 and has been amended several times (Code of Virginia §29.1-564-568). This legislation prohibits the taking, transportation, sale, etc., of endangered and threatened species except as permitted and empowers the Board of Game and Inland Fisheries to promulgate regulations that protect

these rare resources and enumerate species not already occurring on the federal list. Broader protections for all wildlife are afforded through state law (Code of Virginia §29.1-521), whereby all animals are protected from possession, capture, or other taking unless specifically permitted by other law or regulation.

Virginia Marine Resources Commission (VMRC)

The Commission is responsible for the regulation and management of shellfish harvest, crabbing, wetland development, sand dune protection, and commercial and recreational saltwater fisheries (VMRC 2002a). VMRC seeks to balance conservation of marine resources with the needs that accompany population growth, industry, and recreation (VMRC 2002c). The Commission is the primary state agency with authority for all marine species, with the exception of federally listed threatened and endangered species. It is composed of Fisheries Management, Habitat Management, and Law Enforcement divisions.

The Fisheries Management Division's goal is to provide maximum benefit and long-term use of the Commonwealth's finfish and shellfish resources through conservation and enhancement (VMRC 2002b). To this end the division collects statistics on Virginia's fisheries to assess stock conditions, develops fisheries management plans, promotes recreational fishing activity, and participates in interstate and federal fisheries management organizations. The Habitat Management Division administers a joint permit program that encompasses subaqueous habitat preservation and the protection and preservation of tidal wetlands and coastal primary dunes (VMRC 2004). The Commission works with USACE's Norfolk District, DEQ, and local wetlands boards to grant permits for work within waters or wetlands of Virginia.

Virginia Museum of Natural History (VMNH)

The mission of VMNH is to increase understanding of and appreciation for the natural resources of the Commonwealth through education, research, collections, publications, and exhibits (VMNH 2005). The Museum encourages and promotes research on Virginia's natural heritage and natural history.

Virginia Outdoors Foundation (VOF)

The VOF was created by the Virginia General Assembly in 1966 (VOF N.d.). Its purpose as defined by the legislature is to "promote the preservation of open space lands and to encourage private gifts of money, securities, land or other property to preserve the natural, scenic, historic, open-space and recreational areas of the Commonwealth." The foundation primarily accomplishes its goal through its easement program. It also owns parcels of land, provides financial assistance to landowners to institute easements, and assists with the purchase of lands that are then transferred to another state agency for management.

Virginia Sea Grant Program (VSG)

Part of the National Sea Grant program funded by NOAA, VSG provides an opportunity for researchers, managers, educators, and officials to collaborate on effective solutions to coastal and marine resource issues. This program collaborates closely with the Maryland Sea Grant on Chesapeake Bay conservation issues (VSG 2004). Universities currently participating in the consortium include VIMS, ODU, UVA, and VPI&SU. The priorities of VSG are as follows: economic leadership consisting of developing sustainable aquaculture, revitalizing Virginia's commercial fisheries, enhancing competitiveness of the seafood industry, enhancing marine resource economics and business, and coastal business development; coastal ecosystem health; and education and human resources consisting of promoting marine and science-based education and literacy (VSG N.d.).

Tennessee Valley Authority (TVA)

The Tennessee Valley Authority is not a Virginia state agency, but rather a regional Authority responsible for providing energy to the Tennessee Valley; managing the Tennessee River system, and promoting economic development (TVA 2004). This agency has responsibilities in all seven states that contain portions of the Tennessee River system, including Virginia. With these broad areas, TVA has considerable stewardship responsibilities. It integrates environmental practices into its business operations through a comprehensive environmental management

system. The agency also manages competing demands on the river and has supported numerous aquatic resource research and life history studies in the upper reaches of the Valley.

1.3.3. Non-Governmental Organizations

In addition to those listed below, many other non-governmental organizations have an impact on natural resource conservation and management. These range from homeowner's associations to internationally recognized conservation organizations. A comprehensive survey of all organizations in Virginia should be undertaken during implementation of the CWCS and included in the next iteration of the strategy.

Chesapeake Bay Foundation (CBF)

This is the largest conservation organization focused solely on the Chesapeake Bay watershed (CBF N.d.a). Its mission is to improve the quality of the Bay by furthering efforts to restore and conserve fisheries, wetlands, SAV and forests, and reduce pollution. The Foundation has spoken "for the fish" at legislative hearings, regulatory forums, and directly to fishermen. Their Resource Protection Program focuses on protecting natural resources, restoring bay habitat and filtering mechanisms, and working with volunteers. The Foundation has also worked to determine how many fish, crabs, and oysters can be caught from the Bay without harming these resources (CBF N.d.b). The Foundation issues the *State of the Bay* report, which assigns the Bay a letter grade (a D, or 27 out of 100 points in 2004) based on pollution, habitat, and fisheries (CBF 2004). With offices in the states of Maryland, Virginia, and Pennsylvania, CBF is a key organization in coordinating efforts among these states.

Defenders of Wildlife (DOW)

This organization's mission is "the protection of all native wild animals and plants in their natural communities ... [by focusing on] two of the most serious environmental threats to the planet: the accelerating rate of extinction of species and the associated loss of biological diversity, and habitat alteration and destruction (DOW N.d.a)." This group has Species Conservation Programs for various marine and land animals. Defenders worked with several other groups to write a letter to the Virginia Secretary of Commerce encouraging a moratorium on horseshoe crab fishing in Virginia's waters (DOW 2003). While still active in endangered species protection and restoration, the Defenders have expanded their focus to prevent species from becoming endangered and to conserving entire ecosystems (DOW N.d. a).

Ducks Unlimited (DU)

Ducks Unlimited is one of the primary organizations involved in the conservation, restoration, and management of wetlands and waterfowl (DU N.d.). Since its inception in 1937, DU has conserved more than 9.4 million acres of nesting, brood-rearing, staging, migration, and wintering waterfowl habitat throughout North America (DU N.d.). In doing so, they have protected habitat for many other species that utilize wetlands.

Friends of the Rivers of Virginia

The Friends of the Rivers of Virginia is dedicated to the conservation, preservation and enhancement of Virginia's river resources. The organization provides input into the planning and coordination of many projects. Activities include identifying, assessing, and resolving river-related programs and opportunities through research, education, communication and activism (FORVA 2005). It seeks to protect river quality and quantity; protect and enhance wildlife and fisheries habitats; preserve riverine endangered species; and develop effective basin water quality management plans (FORVA 2005).

Marine Science Consortium (MSC)

The Marine Science Consortium is a non-profit educational institution composed of 15 universities that seeks to encourage learning and research in the marine and environmental sciences (MSC N.d.b). The Marine Science Center is located on Wallops Island, with a Marine Science Consortium Research Center located directly on Chincoteague Bay at Greenbackville. The MSC offers a variety of programs for education and research and undertakes outreach

efforts. One research project currently underway is the Coastal Dolphin Survey project, which is investigating the status of the coastal migratory stock of the Atlantic bottlenose dolphin *Tursiops truncatus* as they pass through this region (MSC N.d.a). This project is coordinated with NMFS and other authorized institutions and organizations.

National Wildlife Federation (NWF)

This organization seeks to protect America's wildlife through education of children, families, and concerned citizens and through their endangered species, wetlands, climate change, flood plain management, and other programs (NWF N.d.a). The Federation maintains global, national, and regional programs in land stewardship, water resources, and wildlife conservation (NWF N.d.b).

The Nature Conservancy (TNC)

The mission of this organization is "to preserve the plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive (TNC N.d.a)." Their primary approach is to utilize a science-based planning process called Conservation by Design to identify high priority places. Specific studies and initiatives include land, freshwater and marine conservation, global warming, fire, and invasive species. The Virginia Chapter of The Nature Conservancy is active in many ways including preservation of ecologically important areas. They have six programs in Virginia: Clinch Valley, Allegheny Highlands, Piedmont, Chesapeake Rivers, Southern Rivers, and the Virginia Coast Reserve (TNC N.d.b).

The Ocean Conservancy

The Ocean Conservancy "promotes healthy and diverse ocean ecosystems and opposes practices that threaten ocean life and human life" (OC 2004). Their main goals are to promote the health, diversity, and resilience of coastal and ocean ecosystems; ensure healthy, abundant marine fish communities and responsible fishing; conserve and restore marine wildlife and the habitats that sustain them; restore and protect clean ocean and coastal waters to benefit people and ocean life; and empower a broad and diverse constituency to speak and act on behalf of ocean conservation.

Piedmont Environmental Council

The Piedmont Environmental Council promotes and protects the economy, natural resources, history, and landscapes of the Piedmont of Virginia (PEC 2005). The Council supports and promotes land conservation through easements and other solutions for preserving open space. It also supports a number of local issues, including land use planning, education and outreach (PEC 2005).

Ruffed Grouse Society

The mission of the Ruffed Grouse Society is to support forest management programs that provide appropriate habitat for ruffed grouse, woodcock, and other forest wildlife (RGS 2003b). The Society provides technical and financial assistance to public land management agencies and provides training to private forest landowners about forest management techniques (RGS 2003b). There are three Virginia chapters: H. C. Edwards, James River, and Virginia Mountains (RGS 2003a).

Scenic Virginia

Scenic Virginia's mission is centered on the preservation, protection, and enhancement of Virginia's scenic resources (Scenic Virginia 2005). As part of those efforts, the organization promotes urban forestry, roadway landscaping, flexible highway design, and a statewide anti-litter campaign (Scenic Virginia 2005).

Sierra Club-Virginia Chapter

The mission of the Sierra Club is to protect wild places, promote responsible use of ecosystems and resources, and educate citizens about the need to protect and restore the natural environment (Sierra Club N.d.). The Virginia Chapter consists of 12 local groups located throughout the state. They annually support environmental legislation

discussed in the Virginia legislature. Other issues of importance to this Chapter at the time of writing this document included sprawl and smart growth, water quality, air quality, Virginia's forests, solid waste, mercury, and the proposed King William Reservoir on the Mattaponi (VC-SC N.d.).

The Surfrider Foundation (SRF)

The mission of SRF is the protection and enjoyment of the world's oceans, waves, and beaches for all people through conservation, activism, research, and education. Two of SRF's guiding principles are environmental education and the recognition that biodiversity and ecological integrity are vital for the planet's coastal environment (SRF 2005). The Surfrider Foundation used the following as indicators of beach health in their 2004 State of the Beach Report: beach access, surf zone water quality, beach erosion, beach fill, shoreline structures, erosion response, beach ecology, and surfing areas (SRF 2004).

Trust for Public Land

This national, nonprofit land conservation organization conserves lands for parks, community gardens, historic sites, rural lands, and other natural places (TPL 2005). The organization has a number of conservation initiatives, including urban/suburban park development; protecting working lands; conserving natural lands; safeguarding heritage lands; and protecting the coastlines and waterways (TPL 2005). The Trust offers technical services to agencies and communities to help define conservation priorities; identify funding opportunities; acquire lands; and improve the practice of conservation (TPL 2005).

Virginia Association of Soil and Water Conservation Districts

This organization is a nonprofit association of the 47 soil and water conservation districts in Virginia. The Association plays an active role in natural resource stewardship and education by supporting the efforts of the member districts (VASWCD 2005). The conservation districts were established to support the development of programs and plans to conserve soil resources, control and prevent soil erosion, prevent floods, and support effective use of water resources (DCR 2005c). These efforts include farm conservation education initiatives; planning and approval of farm plans; and local assistance with erosion and sediment control.

Virginia Audubon Council

The Virginia Audubon Council is designed to express the "Audubon Cause" on environmental issues and legislation in Virginia (VAC 2005a). The Council accomplishes this task through educational and scientific programming statewide. One of the Council's primary initiatives is the Virginia Important Bird Areas Program, a science-based partnership, identifying and conserving Virginia habitat critical to North American birds (VAC 2005b). Specifically, the IBA program protects birds through the identification and conservation of bird sites critical for providing nesting, wintering, and migration stopover habitat.

Virginia Bear Hunters Association

The Virginia Bear Hunters Association is a nonprofit organization dedicated to the preservation of hunting bears and to sound wildlife principles (VBHA N.d.). The Association accomplishes its mission through the promotion of ethical and safe hunting, collaboration with other groups and organizations; work with private landowners; and involved in community-based activities (VBHA N.d.).

Virginia Chapter National Wild Turkey Federation

The National Wild Turkey Federation supports scientific wildlife management on public, private and corporate lands as well as wild turkey hunting as a North American sport (NWTF N.d.a). There is a statewide organization, with many local chapters in Virginia. The Virginia chapter has participated in many efforts to improve habitat in Virginia including Operation Oak (NWTF N.d.b). This regional program is designed to improve and create oak woodland habitat for wildlife in the southeast. To date, more than 4000 oak groves have been established.

Virginia Conservation Network

The Virginia Conservation Network is committed to advancing an environmentally sound vision for Virginia (VCN N.d.). The Network is comprised of more than 100 member organizations committed to protecting the state's natural resources. The Network accomplishes its mission through the management of an extensive communication network, tracking environmental legislation, and sponsoring statewide environmental workshops (VCN N.d.).

Virginia Council of Trout Unlimited

The Virginia Council of Trout Unlimited is dedicated to the stewardship of Virginia's cold water wildlife and habitat resources, with emphasis on trout fisheries (VCTU 2005). It accomplishes these efforts through conservation activities, public policy involvement, education programs, and chapter development (VCTU 2005).

Virginia Deer Hunters Association

The mission of the Virginia Deer Hunters Association is the responsible management of white-tailed deer in the Commonwealth (VDHA N.d.). The organization focuses its efforts on the promotion and protection of the rights of deer hunters.

Virginia Division of the Izaak Walton League

The Izaak Walton League of America was established to conserve, maintain, protect and restore the soil, forest, water and other natural resources of the United States, and to promote opportunities for public education. In Virginia, the Division has 25 chapters and has been a driving force in the implementation of the Virginia Save Our Streams Program, a volunteer water quality monitoring program (VIWLA N.d.).

Virginia Native Plant Society

The Virginia Native Plant Society is a statewide organization whose purpose is to further the appreciation and conservation of Virginia's native plants and habitats (VNPS N.d.). The Society accomplishes these goals through public education, protection of endangered species, habitat preservation, and use of native plants.

Virginia Society of Ornithology (VSO)

The Virginia Society of Ornithology encourages the systematic statewide study of birds and assists in the conservation of wildlife and other natural resources in the Commonwealth (VSO N.d.). The Society provides educational programming about a variety of ornithological subjects and areas of the state, conducts surveys for birds around the state, and funds study projects to address and expand the ornithological knowledge of the state. The Society currently has 26 member chapters.

Virginia's United Land Trusts

This organization was established in 2000 to address the increased interest in local land conservation. The organization currently represents about 30 private land trusts/conservation organizations in the state. The primary goals of VaULT are to promote land conservation statewide; create or build land trust capacity; foster coordination between land trusts; and coordinate between the public and private sectors, especially for statewide conservation planning and green infrastructure development (DCR 2005b). VaULT has completed a plan that identifies regional priorities for land conservation in the state that should facilitate local organizations targeting resources and efforts (VaULT 2003).

World Wildlife Fund (WWF)

WWF directs its conservation efforts toward three global goals: saving endangered species, protecting endangered habitats, and addressing global threats such as toxic pollution, over-fishing, and climate change. Their mission is the conservation of nature, which includes preservation of diversity and abundance of life as well as the health of ecological systems (WWF 2005).

1.3.4. Commissions and Task Forces

Aquatic Nuisance Task Force (ANSTF)

This task force is an intergovernmental group with the goal of preventing and controlling aquatic nuisance species (ANSTF N.d.a). The task force was established to coordinate governmental efforts related to non-indigenous aquatic species in the U.S., with those of the private sector and other North American interests (ANSTF N.d.b). It is made up of regional panels of experts and is chaired by NOAA and USFWS. The ANSTF consists of seven Federal agency representatives, ten members who represent non-Federal governmental entities, and one invited observer from Canada (ANSTF N.d.b). Non-indigenous aquatic nuisance species threaten the diversity and abundance of native species, the ecological stability of infested waters, and commercial, agricultural, aquacultural or recreational activities (ANSTF N.d.c).

Atlantic States Marine Fisheries Commission (ASMFC)

Made up of the fifteen Atlantic coastal states, the ASMFC is a mechanism for cooperation among these states. Their mission is to promote the better utilization of the fisheries (marine, shell, and anadromous) of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by preventing pollution (ASMFC N.d.a). The ASMFC's five-year Strategic Plan (2004-2008) sets the goal of "healthy, self-sustaining populations for all Atlantic coast fish species or successful restoration well in progress by 2015 (ASMFC 2003)." The Commission's Interstate Fisheries Management Program coordinates the conservation and management of 22 Atlantic coastal fish species or species groups (ASMFC N.d.b) The commission works cooperatively with the relevant East Coast Regional Fishery Management Councils and the NMFS for certain species or regulations.

Chesapeake Bay Commission (CBC)

The CBC is a tri-state advisory commission serving Maryland, Pennsylvania, and Virginia that was created to advise the General Assemblies of those states on matters of Bay-wide concern. The Commission is made up of legislators, cabinet secretaries, and citizen representatives from each state and acts as the legislative arm of the multi-jurisdictional Chesapeake Bay Program (CBC N.d). The CBC is a signatory to the Chesapeake Bay Agreement. Among its tasks are recommending legislative and administrative actions necessary to encourage effective and cooperative management of the Bay, identifying interjurisdictional concerns, and collecting, analyzing, and disseminating information for legislative bodies (CBC N.d).

Chesapeake Bay Program (CBP)

The CBP is a regional partnership which has been directing and conducting the restoration of the Chesapeake Bay since the signing of the Chesapeake Bay Agreement in 1983 (CBP 2001). The Executive Council is made up of the governors of Maryland, Virginia, and Pennsylvania, the mayor of the District of Columbia, the USEPA administrator, and the chair of the Chesapeake Bay Commission. Delaware, New York, and West Virginia became members of the partnership after 2000 since headwaters in these states eventually flow into the Bay. CBP's goal is to "restore, enhance, and protect the finfish, shellfish, and other living resources, their habitats, and ecological relationships to sustain all fisheries and provide for a balanced ecosystem" (CBP 2000). They seek to do this by reducing toxic and nutrient inputs to the Bay and monitoring Bay resources. The key focus areas in the Chesapeake 2000 Agreement are living resource protection and restoration, vital habitation protection and restoration, water quality protection and restoration, sound land use, and stewardship and community engagement. CBP develops Bay policies and works with scientists in the field.

In Virginia the responsibility for Bay restoration is split between DEQ and DCR, both under the Secretary of Natural Resources (DEQ 2004b). DEQ focuses on point source pollution while DCR is primarily concerned with non-point source pollution strategies. The Chesapeake Bay tributary strategies for the Eastern Shore, James River, Rappahannock River, Potomac River, and the York River have been revised recently (DEQ 2004b, COV 2005, SNR 2005). The strategies identify ways to improve water quality, with the aim of removing the Bay and its tidal tributaries from the Federal impaired waters list by 2010.

International Whaling Commission (IWC)

The mission of this organization is to conserve and regulate whale stocks by governing the conduct of whaling throughout the world (IWC 2005). These measures provide protection for certain species, designate areas as whale sanctuaries, set limits on the numbers and size of whales that may be killed, establish the whaling season, and prohibit the capture of a calf or its mother. The IWC places an emphasis on science and sponsors and promotes international research (IWC 2005). Although IWC has no legal authority over small cetaceans, IWC works to promote cooperation and conservation of these species as well.

Mid-Atlantic Fishery Management Council (MAFMC)

The Council was established to implement actions of the Magnus-Stevens Fishery Conservation and Management Act of 1976 (MAFMC N.d.). These actions are intended to ensure sound fishery conservation and management for domestic and foreign fisheries. The Council is tasked with developing fishery management plans that are implemented by the U.S. Secretary of Commerce. The management zone extends from 3 to 200 miles offshore. The Mid-Atlantic Council has 25 members that represent State and Federal agencies and the public. Seven states are represented: Virginia, New York, New Jersey, Pennsylvania, Delaware, Maryland, and North Carolina.

Pew Oceans Commission (POC)

The Pew Oceans Commission was established by the Pew Charitable Trusts. Pew Charitable Trusts is an independent non-profit group that provides information, policy solutions, and support for civic life (Pew N.d.a). The work of POC is aimed at preserving the biological integrity of marine ecosystems and primarily focuses on efforts to curb over-fishing, reduce bycatch, and prevent the destruction of marine habitat (Pew N.d.b). In 2003 the Commission published "America's Living Oceans: Charting a Course for Sea Change," a report making specific recommendations aimed at guiding the way in which the federal government manages America's marine environment in the coming years (POC 2003). Some of these recommendations included improving the management of the nation's commercial fisheries, establishing networks of marine reserves in coastal waters, increasing the involvement of USACE in environmental restoration, applying strong environmental standards to fish farms, and regulating the discharge of waste by cruise ships (Pew N.d.b). Pew Charitable Trusts' marine advocacy efforts seek to ensure that NMFS and regional marine fisheries councils comply with federal laws related to the protection of the nation's fisheries and other living marine resources, including marine mammals, birds and invertebrates (Pew N.d.b). They also recently established the Pew Institute for Ocean Science.

U. S. Commission on Ocean Policy (USCOP)

In its final report in September of 2004 to the President and Congress, USCOP makes 212 recommendations on coastal and ocean policy (USCOP 2004). It urges immediate action to halt the decline of ocean resources and advocates the development of a national policy on ocean resource management that is coordinated among all agencies. The guiding principles listed in the report include sustainability, stewardship, ecosystem-based management, preservation of marine biodiversity, participatory governance, accountability, and international responsibility (USCOP 2004). The report also notes that effective ocean governance and public education will play a large role in the successful implementation of ocean policies.

In December 2004, as a response to the Commission's report, the President issued an executive order establishing a Committee on Ocean Policy as a part of the Council on Environmental Quality, and he released the U.S. Ocean Action Plan to implement the USCOP's recommendations (USCOP 2005, CEQ 2005). USCOP expired in December of 2004 under the terms of its legislation.

1.3.5. Regional and Local Agencies

Virginia's regional government structure consists of 21 Planning District Commissions (PDCs) and their member counties (VAPDC N.d.). The purpose of the PDCs as established by Section 15.2-4207 in the Code of Virginia is to promote and facilitate cooperation among local governments and between the state and local governments to

regionally address problems of regional and statewide significance. The Commissions are also intended to encourage efficient planning for the physical, social and economic components of each district (VAPDC N.d.).

Localities are under enormous pressure to favor economic growth. The Commissions are instrumental in the implementation of environmental programs such as the Chesapeake Bay Act, wetlands protection, and watershed planning (DEQ 2005g). Some localities are taking bold steps to improve land use planning and protect natural resources. One example is the James City County Protecting Resources in Delicate Environments (PRIDE) program, which educates citizens about water quality and watershed protection and provides them with tools for watershed protection and restoration (JCC N.d.). This innovative program gives residents, neighborhoods, and businesses the opportunity to earn PRIDE designations for using watershed protection measures, such as best management practices.

1.4. Brief Natural History of Virginia

To set the stage for the remainder of this document, we provide a brief discussion of the natural history of Virginia. Reference maps of Virginia are provided in Appendix O.

1.4.1. Geology of Virginia

A wide variety of geologic forces has created and continues to mold the landscape of Virginia. The eastern edge of North America has been shaped by times of accretion, when smaller continental pieces extended the eastern shore, by periods of sea level rise and fall, in which deep sediments were deposited, by episodes of volcanic activity, in which rocks were melted, restructured, and extruded, and times of uplift, and deformation in which the mountains were formed (Frye 1986; Woodward and Hoffman 1991).

Virginia is divided into five geologic provinces (Frye 1986). The Appalachian Plateau of the southwest contains coal seams buried beneath beds of massive horizontal red sandstone cut into high cliffs. East of the Appalachian Plateau, the Valley and Ridge province, as its name implies, contains long sharp ridges dissected by wide valleys. The third province, the Blue Ridge, is relatively narrow at its northern edge at the Potomac River and then widens as it reaches south and west. The Piedmont province is known for its weathered, gently rolling landscape, while the Coastal Plain slopes down to the Atlantic and is identified by relatively young, unconsolidated rock formations.

Virginia has been inundated by shallow inland seas several times during its history (Frye 1986). The gradual rise and fall of the sea deposited large amounts of sediment that were then uncovered and buried in the next inundation event. The fall of the seas created periods of erosion in which sediments and less resistant rocks were deposited on the lowlands or washed out to sea. The tidal rivers of the Chesapeake Bay, the barrier islands, and offshore bars are results of the most recent rise and submergence of the land. During the last Ice Age, so much water was frozen in glaciers that the sea level dropped an estimated 120-140m and the "beaches" of the Atlantic were 80-95km east of their present location. The subsequent sea rise has flooded the coast and deposited still accumulating beach, estuary, and swamp sediments. These forces have most frequently affected the Coastal Plain. The topography of the Coastal Plain is low and the deposits are largely unconsolidated. The strata of sediments on the surface of the Coastal Plain have been eroded to reveal many layers of buried crystalline rock formations that start in the Piedmont.

The Fall Line represents the gradual boundary between the Piedmont and the Coastal Plain. It is the area where the sediments on the western edge of the Coastal Plain thin out as they reach the crystalline igneous and metamorphic rocks of the Piedmont (Frye 1986). The Fall Line got its name from the many small waterfalls and larger rapids that have formed by erosion of the softer Coastal Plain sedimentary rock formations, leaving the more resistant Piedmont metamorphic rocks behind and hence forming a line of cliffs (Frye 1986; Woodward and Hoffman 1991).

The Piedmont rocks have been greatly weathered to saprolitic clay (Frye 1986). Bedrock is rarely exposed, except in stream channels and quarries. The saprolitic clay can reach 100 ft. or more in depth. Traveling downward through the clay, one reaches rocks that are less and less weathered until eventually reaching the bedrock. The composition of the underlying bedrock can be deduced from the composition of the clay. While most of the Piedmont's landscape

can be considered flat to rolling, there are a few mountains dotting the horizon. These mountains are composed of very resistant rocks that have not weathered under the pressures of wind and water. These materials include greenstone, quartzite, schists, and phyllites.

The Blue Ridge province is only about 8 km wide at its northern edge and 80 km wide at its southern edge in Virginia (Woodward and Hoffman 1991). This is a result of higher erosion rates in the Atlantic Slope streams of the north vs. the lower erosion rates of the streams of the south (mainly the New River drainage). Erosion-resistant rocks form a landscape of high relief created when older bedrock was faulted and lifted over younger rock. Elevation ranges from about 600 m asl in the north to an average of 900-1050m in the south. The two highest peaks in the state, Mount Rogers and Whitetop, are located in the Blue Ridge at elevations of 1746m and 1682m, respectively.

The Ridge and Valley was formed when sedimentary rock formations were folded along long axes as the Appalachian Mountains formed (Woodward and Hoffman 1991). These axes determined the alignment of the ridges and valleys, but the composition of the rocks has largely determined the modern landscape. As in the Blue Ridge, erosion rates of the various formations dictates the structure of the landscape: resistant sandstones form broad plateaus and sharp ridges, while more erodible limestones, dolomites, and shales are washed away or dissolved to leave behind wide lowlands and valleys. Limestone and dolomite also can be dissolved to leave behind caverns, sinkholes, and disappearing streams, phenomena known collectively as karst. The caves of Virginia are home to many species of conservation concern in Virginia.

The eastern half of the Ridge and Valley is part of the Great Valley, a significant North American formation. Within Virginia, these valleys are named for the rivers they drain and include the Shenandoah, James, New, Holston, and Roanoke valleys (Woodward and Hoffman 1991). West of the Great Valley in Virginia is the Allegheny Mountain section. This section contains the ecoregion we recognize in this plan as the Southern Cumberlands. The unique bowl-shaped formation of Burke's Garden is in this section. Burke's Garden was formed within a breached anticline or upfold in the rocks. At the western edge of Burke's Garden is the highest peak in Virginia's Alleghenies, Beartown Mountain (1434m).

Unlike the dramatic folding and uplifting forces that created the Ridge and Valley, the mountains of the Appalachian Plateau were sculpted by the erosion and incision of small streams (Woodward and Hoffman 1991). This has created a highly dissected and dendritic pattern on the landscape. Peaks have approximately the same elevation, 760m, and level surfaces are rare. This province is heavily mined for coal.

1.4.2. Climate of Virginia

Because of its latitudinal location, warm or hot summers, and mild winters, Virginia's climate is classified as humid subtropical (Woodward and Hoffman 1991). However, specific temperatures and precipitation amounts vary across the state as one moves further from the coast and higher in elevation. In fact, five climate regions have been identified in the state: the tidewater, Piedmont, Northern Virginia, Western Mountain, and Southwestern Mountain (Hayden and Michaels N.d.).

There are three primary local controls on Virginia's climate (Hayden and Michaels N.d.). One is the warm waters of the Atlantic Ocean's Gulf Stream. Winter storms moving from west to east hit the transition zone between the cold land and warm ocean and shift movement to a northeasterly direction. These storms can then grow quickly and fill with moisture. This moisture largely falls on the eastern side of the Blue Ridge Mountains.

The second local control on Virginia's climate is the topography of the Appalachians and Blue Ridge Mountains (Hayden and Michaels N.d.). Moist airflow in Virginia can come from the west or from the east. As air masses hit these two mountain ranges, they drop much of their moisture in the form of rain or snow. Thus, when the air mass is traveling from the west, the New and Shenandoah river valleys are in the rain shadow of the Appalachians; and when the air mass is traveling from the east, these valleys are in the rain shadow of the Blue Ridge. Therefore, the New River and Shenandoah River valleys are the driest parts of the state. Areas with rainfall levels this low are rare in the eastern U.S.

The third local control on Virginia's climate is the rivers and streams of the state (Hayden and Michaels N.d.). The rivers and streams, of course, drain the precipitation as it falls and also modify the direction of moist airflow. Air flowing across Virginia either flows through these river valleys or over mountain crests and down into the river valleys. For example, moist air flowing from a southerly direction would move up the Clinch or Holston valleys and subsequently rainfall levels would increase as the air moved up into the upper sections of the valley. Conversely, that same southerly flow of air would be flowing downstream through the New River valley toward the Ohio River basin. This downhill flow of air typically does not lead to rainfall.

Topography can act in an even more localized way in areas such as Burke's Garden (Woodward and Hoffman 1991). This area is at a high elevation (1060m) and surrounded by mountains rising to 1360m. Late spring and early fall frosts result from the downhill movement of dense cold air from the mountains to the valley below. This air is then trapped and results in cool, moist weather patterns.

Average annual maximum temperature is 66.7°F (19.3°C), with a minimum of 44.6°F (7°C) (Hayden and Michaels N.d.). Within the year, the monthly maximum temperature occurs in July at 86.1°F (30.1°C), and the monthly minimum temperature occurs in January at 26.0°F (-3.3°C). Average annual precipitation amount is 42.7in (108.5cm). These averages were measured over the time period of 1895 to 1998 (Hayden and Michaels N.d.).

1.4.3. Drainages of Virginia

Jenkins and Burkhead (1994) described 10 major drainages in the state. Within the CWCS, we use 12 drainages, as described in Chapter 2. However, for the purpose of this introduction, we will set the stage using the drainages as described by Jenkins and Burkhead (1994). Virginia is separated by the Atlantic-Gulf divide. The Atlantic-Gulf divide splits Virginia's drainages into those that generally flow eastward to the Chesapeake Bay and Atlantic Ocean and those that flow generally north or west to the Ohio River and subsequently the Gulf of Mexico.

1.4.3.1. Atlantic Slope Drainages

The Atlantic Slope drainages include the Potomac, Rappahannock and York, James, Chowan, Roanoke, Pee Dee, and minor drainages like the Delmarva Peninsula and Piankatank River. The Great Dismal Swamp and Lake Drummond (one of only two natural lakes in Virginia) have indeterminate drainage patterns, but are also part of this drainage. There are many wetlands in the Coastal Plain sections of these drainages. These drainages often contain populations of migratory fish such as alewife *Alosa pseudoharengus*, American shad *A. sapidissima*, Atlantic sturgeon *Acipenser oxyrinchus*, and American eel *Anguilla rostrata*. Several of these drainages arise in the mountains of the Ridge and Valley or Blue Ridge ecoregions and cross multiple ecoregions before emptying into the Chesapeake Bay or Atlantic Ocean. The biota of these drainages can be very diverse and distinct as one travels downstream from the headwaters.

1.4.3.2. Ohio River Drainages

The New, Tennessee (including the Clinch, Powell, and Holston rivers), and Big Sandy are the three major Ohio River drainages that flow through Virginia. As a whole, the Ohio River drainage contains one of the most diverse assemblages of aquatic organisms in North America if not the world (Abell, et al. 2000). There are large numbers of fish, mussels, and crayfish found in these three drainages, and many have very limited distributions. Mountain Lake, the second of the natural lakes in the state, is found in the New River drainage.

Detailed discussions of the species of greatest conservation need and habitats of these drainages are provided in Chapters 4-9.

1.4.4. The Flora and Fauna of Virginia

Stein et al. (2000) placed Virginia in the second highest group of states based on the diversity of plants, vertebrates, and select invertebrates that inhabit the state. They indicate that within those groups 3388 native species have been documented in Virginia.

1.4.4.1. Natural Vegetation of Virginia

Most of Virginia is covered by temperate broadleaf deciduous forest, typically consisting of four layers (Woodward and Hoffman 1991). The top layer (the canopy) is dominated by oaks *Quercus* spp. The second layer is an understory of smaller trees, such as dogwoods *Cornus* spp. and redbud *Cercis canadensis*. A shrub layer and herb layer round out the last two. *Rhododendron* spp. (rhododendrons and azaleas) are common components of the shrub layer. The herb layer is comprised of diverse perennial forbs, mosses, lichens, and clubmosses. One common vegetation type that transcends all four layers is the vines, more specifically, wild grape *Vitis* spp., Virginia creeper *Parthenocissus quinquefolia*, and poison ivy *Rhus radicans*.

Woodward and Hoffman (1991) describe 4 basic types of broadleaf deciduous forests in Virginia, based on Braun (1950). These are mixed mesophytic, oak-chestnut, oak-pine, and southeastern evergreen forests. The oak-chestnut forest is the most common (Woodward and Hoffman 1991). This forest type is far from pristine. A principle component of this forest, the American chestnut has been nearly extinct since the 1930s, and much of this forest type was cleared in the 1700s and 1800s. Oaks are now much more abundant in this type with white oak *Quercus alba*, chestnut oak *Q. prinus*, and red oak *Q. rubra* occurring most frequently. This forest type varies with elevation. Between 1220m and 1370m, American beech *Fagus grandifolia*, sugar maple *Acer saccharum*, and yellow birch *Betula lutea* become more prevalent. On Beartown Mountain, Mount Rogers, and Whitetop, the broadleaf forest disappears altogether and is replaced by boreal needleleaf evergreen forest.

The mixed mesophytic forest found in the western counties of Virginia is the most diverse in the state, with more than 20 species of trees that share dominance of the canopy (Woodward and Hoffman 1991). In the cool mesic environs of the deep valleys of the Allegheny and Blue Ridge Mountains, this forest type is known as cove forest.

South of the James on the Piedmont and onto the Coastal Plain peninsulas, pines become more abundant and red oak is largely replaced by black oak *Quercus velutina* (Godfrey 1980). This can be thought of as a transitional forest type between the oak-chestnut and southeastern evergreen forest (Braun 1950). The predominant pine species are Virginia *Pinus virginiana*, shortleaf *P. echinata*, and loblolly *P. taeda*. Pines are believed to be much more common now than prior to European settlement (Woodward and Hoffman 1991).

The Coastal Plain of Virginia south of the James River is the most northerly extent of the southeastern evergreen forest (Woodward and Hoffman 1991). The indicator species of this forest type is the longleaf pine *Pinus australis*. The composition of an individual site is determined by drainage and substrate. These mosaic communities include sandy, fire controlled uplands, pine savanna with a complete herbaceous layer, and swamp forest complete with baldcypress *Taxodium distichum*, tupelo *Nyssa aquatica*, and black gum *N. sylvatica*. Live oak *Quercus virginiana* may become a part of this forest in maritime settings.

1.4.4.2. The Fauna of Virginia

This is not intended to be a thorough overview of the faunal composition of Virginia, but is intended to introduce the vast diversity of animals found in Virginia.

1.4.4.2.1. Invertebrates

The invertebrate fauna of Virginia, as in most of the world, is poorly known. When we do know something about the number of species in a taxon, we then know little or nothing about the life history or even complete distribution of the species. For instance, according to Hoffman (1991), most of the 10,000 arthropod species recorded for Virginia are known from only one or two localities. This lack of baseline data makes it difficult to impossible to adequately assess their status and need for conservation. For some groups, however, more is known.

Freshwater Crustaceans

The known freshwater crustaceans of Virginia are comprised of 34 amphipods, 21 isopods, and 29 crayfish (Holsinger 1991a,b; McGregor 2002). All three of these groups can occur in completely aquatic situations, in small seeps and springs, and, particularly for the amphipods and isopods, in caves and the interstitial spaces of soil. Most of the isopods and amphipods that have been studied to date are cave dwellers, and many are considered to be of

conservation concern (Holsinger 1991a,b). Distributions of the crayfish are not well known. A few are considered to be of conservation concern.

Millipedes

Millipedes are common in broadleaf deciduous forest (Hoffman 1991). They feed on decomposing plant matter. It is thought that there could be nearly 200 species in Virginia. Much of the research to date has been in the southwestern part of the state. A large number of endemic millipedes are among Virginia's fauna. Several are considered of conservation concern.

Insects

Insects are frequently discussed in two groups, aquatic and terrestrial. Aquatic insects are frequently used as indicators of water quality, so many samples are taken annually. However, those studying aquatic insects for this purpose rarely identify them beyond genus or even family. Therefore, there is little knowledge of the species diversity of aquatic insects in Virginia. There are three orders of aquatic insects for which more is known and species of concern have been identified: mayflies (order Ephemeroptera), stoneflies (order Plecoptera), and dragonflies (order Odonata, in part). There are a few aquatic individuals of otherwise predominantly terrestrial orders that have also been identified as species of conservation need.

As of 1991, 138 species of mayflies had been identified in Virginia (Kondratieff and Kirchner 1991). Many are restricted in distribution to one stream or watershed and are therefore vulnerable to extinction. Kondratieff and Kirchner (1991) provide some discussion of 11 species of conservation need. In Virginia, 149 species of stoneflies have been identified. More than half of these are associated with the Appalachians. Seven are endemic to Virginia. Kondratieff and Kirchner (1991) provide some detail about 18 species they consider to be of conservation need. One of the best-known groups of insects is the dragonflies. Carle (1991) indicated that there were 193 species in Virginia. Fifteen dragonflies were identified by Carle (1991) as being of conservation concern.

The number of true bugs (order Hemiptera) in Virginia is unknown but believed to reach around 500 (Hoffman 1991c). True bugs include squash bugs, stink bugs, bed bugs, and giant water bugs. Fourteen have been identified as being of conservation need. Tiger beetles (order Coleoptera, family Cicindellidae), as dominant predators, are one of the more flashy and interesting invertebrate groups. Of the 21 species known in Virginia, eight were considered by Knisley (1991) to be of conservation need. Butterflies and moths (order Lepidoptera) are probably the best known of the insect groups, with approximately 2000 species known from Virginia (Pague and Schweitzer 1991). Because of their host specificity as caterpillars and even as adults, they can be very vulnerable to disturbance. Pague and Schweitzer (1991) indicated that nine were of conservation need.

Insects were included in the CWCS where possible. There was not much detailed or complete distribution or life history data for this group. An *ad hoc* taxonomic advisory committee was created to discuss issues pertaining to invertebrates. The professional judgment of these committee members was relied on extensively in assigning species to tiers and providing other information where available.

Mollusks

Virginia has one of the more diverse molluscan communities, with approximately 80 species of mussels and 53 species of freshwater snails. There is some controversy about taxonomy so that number varies among experts. Despite this diversity, many species have declined drastically in numbers, and several that had occurred in Virginia are now extirpated. Forty-one mussels and one freshwater snail were considered by Neves (1991a) to be of conservation concern. Neves (1991a) also discussed the status of land snails in Virginia. There are approximately 187 known species in Virginia. While we do not know much about the distribution or life history of these species, the assemblage is considered to be one of the most diverse in the eastern United States. The Appalachian Plateau has more than 50% of the known species in the state. Because of the lack of data for land snails, it is difficult to thoroughly assess their status. However, fifty have been identified as being of conservation need by Neves (1991a). Freshwater clams, limpets, and slugs are groups of mollusks for which we have little to no information. We considered mussels, snails, and other individual mollusk species for which any distributional and life history information was known.

1.4.4.2.2. Vertebrates

Fishes

The fish assemblage of Virginia includes 210 species of freshwater and euryhaline species (includes the migratory fishes) (Burkhead and Jenkins 1991). The distribution of these species is determined by drainage, physiography, and the ecology of an individual stream system. While the fishes are better known than most of the invertebrates, there are still several undescribed species and many more with incomplete life history or distribution information. Since the mid-17th century, seven species have become extirpated or extinct (Burkhead and Jenkins 1991). Burkhead and Jenkins (1991) indicated that 39 species were in need of listing as threatened, endangered, or special concern. Within the CWCS, we considered all freshwater and migratory fish.

Amphibians and Reptiles

The herpetofauna of Virginia includes 30 species of snakes, 54 salamanders, 22 freshwater or land turtles, 5 sea turtles, 28 frogs and toads, and 9 lizards (DGIF 2004). Along with several of our neighbors to the south, Virginia ranks as one of the states with the highest amphibian species diversity (Stein et al. 2000). While many amphibians and reptiles are fairly well known, one new salamander species has been described and the range of one frog species has been extended to include Virginia in the last few years (Highton 2004; Hobson and Moriarty 2003). Life history and distribution for these and many other amphibians and reptiles are not completely understood. A number of these species are very secretive.

Studies have shown that the composition of herpetofauna in Virginia have been relatively stable over the last 10,000 years, though there have been some distributional shifts (Mitchell 1991). The northern or southern extent of many species just reaches into Virginia, including the wood turtle *Clemmys insculpta*, chicken turtle *Deirochelys reticularia*, red-bellied watersnake *Nerodia erythrogaster erythrogaster*, and eastern cottonmouth *Agkistrodon piscivorus* (Mitchell and Reay 1999). In addition, several salamanders are only known from a range limited to Virginia or a small area including part of Virginia. Mitchell (1991) recommended 24 species for listing as threatened, endangered, or special concern; status could not be determined for eighteen additional species. Within the CWCS, we considered all amphibians and reptiles except sea turtles that do not nest in Virginia (green *Chelonia mydas*, Kemp's Ridley *Lepidochelys kempii*, hawksbill *Eretmochelys imbricata*, and leatherback *Dermochelys coriacea*).

Birds

There are known to be about 390 species of birds that occur regularly in Virginia (Byrd and Johnston 1991). Because of their generally highly mobile nature, many species are seen infrequently and considered accidentals. For the CWCS, we considered all breeding, migrating, and wintering species. Only pelagic seabirds were excluded. While some bird species may have very limited distributions, none are endemic to Virginia (Byrd and Johnston 1991). As with reptiles and amphibians, Virginia is the edge of the breeding range for several bird species. The numbers of many bird species are in decline. This decline may be caused by a wide variety of factors but most are linked to habitat destruction or degradation. Determining the reason for declines is further complicated by the migratory nature of most birds. Byrd and Johnston (1991) identified 31 species as threatened, endangered, or of special concern. An additional 23 were listed with undetermined status.

Mammals

There are approximately 100 species of mammals in Virginia (Handley 1991). Twenty of those are marine mammals which will not be covered in detail in this version of the CWCS. While the majority of mammals spend most of their time on four feet on the ground, others are primarily arboreal or aquatic. Only the bats are true fliers. There are a number of specialists among the mammals in Virginia. These are typically associated with either the caves, cliffs, bogs, or spruce forests of the mountains, or the sandy beaches and extensive wetlands of the eastern lowlands. Handley (1991) identified 16 mammals as endangered, threatened or of special concern. An additional five were classified with undetermined status.

1.5. Conclusions

The CWCS provides a foundation for the future of Virginia's and the nation's wildlife conservation efforts. The species and habitats identified here, along with the associated stresses and conservation actions, will serve to focus efforts to conserve and properly manage all wildlife in the state. We hope that this document will guide existing and future management plans and conservation programs in Virginia, at all levels of government and with non-governmental organizations, to conserve all of Virginia's wildlife for future generations.

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