Handout 2-7 James River Ecology and Wetlands

References (1) Assessing wetland impacts across boundaries using WetCAT (arcgis.com) ; (2) CCRM Annual Reports | Center for Coastal Resources Management (CCRM) | William & Mary (wm.edu); (3) WetCAT (vims.edu) ; (4) Threats and Issues in Virginia // LandScope America.

Source: National Geographic (Ecology | National Geographic Society)

Ecology is the study of organisms and how they interact with the environment around them. An ecologist studies the relationship between living things and their habitats. In order to learn about the natural world, ecologists must study multiple aspects of life ranging from the moss that grows on rocks to the wolf population in Yellowstone National Park. In order to research the environment, scientists ask questions, such as: How do organisms interact with the living and nonliving factors around them? What do organisms need to survive and thrive in their current environments? To find the answers to these questions, ecologists must study and observe all forms of life and their ecosystems throughout our world.

Source Landscope Virginia (Ecoregions in Virginia // LandScope America)
Description of ecoregions is a direct quote from Landscope Virginia.

Ecoregions reflect broad ecological patterns occurring on the landscape. In general, each ecoregion has a distinctive composition and pattern of plant and animal species distribution. Abiotic factors, such as climate, landform, soil, and hydrology are important in the development of ecosystems, and thus help define ecoregions. Within an individual ecoregion, the ecological relationships between species and their physical environment are essentially similar.

Why use ecoregions?

Using ecoregions as a framework for assessing the distribution and status of species and ecosystems makes biological sense, compared to using politically derived lines like county, state or national boundaries. Ecoregions also provide an ecological basis for partitioning the state into subunits for conservation planning purposes.

What ecoregions occur in Virginia?

Virginia's borders contain portions of seven terrestrial ecoregions, each of which will be shortly described on the following pages. These descriptions are intended to provide the reader with a snapshot of each ecoregion, and the statements regarding biodiversity highlights and conservation needs are not meant to be comprehensive.

Central Appalachian Forest Ecoregion The Central Appalachian Forest ecoregion includes the Blue Ridge Mountains from Virginia to southern Pennsylvania, the historic Great Valley, and the dramatic ridges and valleys of the Allegheny Mountains that stretch south to north. Read More

- **Chesapeake Bay Lowlands Ecoregion** Fed from as far away as southern New York by the Susquehanna River, the Chesapeake Bay Lowlands ecoregion is centered on one of the largest estuaries in the world, spanning three states from Maryland and Delaware in the north southward 195 miles to its mouth in eastern Virginia. Read More
- **Piedmont Ecoregion** The piedmont, or foothills, of the Appalachian Mountains is the oldest and most eroded part of the original Appalachian orogeny. It is bounded by the coastal plain to the east and the Southern Appalachians to the west.

James River Watershed Ecology

Source: The Living Shoreline Collaborative (LSC) *is a group of regional and state partners working together to scale up implementation of resilient practices along shorelines in the tidal James River*
Source DCR: https://www.dcr.virginia.gov/search/Virginia%20Coastal%20Plain/
The **Lower James River** runs from the fall line in Richmond to the Chesapeake Bay. Its watershed lies in the Coastal Plain region of Virginia, which includes the Cities of Colonial Heights, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Portsmouth, Virginia Beach, and Williamsburg; Counties of Charles City, Chesapeake, Isle of Wight, James City, New Kent, Prince George, Suffolk, and Surry.
Piedmont Bottomland Forests This is a diverse group of temporarily flooded to seasonally flooded forests occupying floodplains and river terraces of the Coastal Plain and outer Piedmont . It includes all of the relatively well-drained forests of levees and higher terraces, along with wetter swamps that are not dominated by bald cypress (***Taxodium distichum***) and tupelos (*Nyssa* spp.). In the larger Coastal Plain river bottoms, microtopographic heterogeneity is very high, and it can be difficult to determine flooding frequency and duration without repeated observations and study. Communities in this large group tend to sort themselves out along intersecting gradients that include relative elevation above stream level, hydroperiod, soil drainage, soil texture, and soil fertility. **Piedmont Seepage Swamps** This group contains forested vegetation of braided headwaters stream bottoms and seeping toe-slopes saturated by abundant groundwater discharge. Classified units in the group separate along a gradient of soil fertility and groundwater chemistry, which range from extremely acidic and nutrient-poor to

highly calcareous. Despite the wide variation in substrate status, the communities in the group share hydrologically and topographically similar habitats, as well as many wetland species that tolerate a wide range of soil conditions. Seepage swamps occupying the bottoms of Coastal Plain ravines that have downcut into Tertiary shell deposits or limesands have strongly calcareous soils and groundwater. These very rare, small-patch communities are known from the dissected inner Coastal Plain of Surry, Isle of Wight, York, James City, Gloucester, and Lancaster Counties. Hummock-and-hollow microtopography is prevalent, and exposed shells are common in springs and rills. Green ash (***Fraxinus pennsylvanica***), red maple (***Acer rubrum***), and tulip-tree (***Liriodendron tulipifera***) are common overstory trees in most occurrences, but a subset of ravines on the south side of the James River features the unusual co-dominance of bald cypress (***Taxodium distichum***) or swamp tupelo (***Nyssa biflora***). **Dry Calcareous Forests** This is a group of rare, deciduous (rarely mixed) forests and woodlands of subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits. Calcium levels in soil samples collected from these habitats are among the highest documented in Virginia, ranging to > 11,000 ppm. The majority of documented stands are on The Peninsula near Williamsburg (James City and York Counties). Tree canopies range from closed to quite open. Chinquapin oak (***Quercus muehlenbergii***) is the most characteristic tree; southern sugar maple (***Acer floridanum***), white oak (***Quercus alba***), northern red oak (***Quercus rubra***), bitternut hickory (***Carya cordiformis***), American beech (***Fagus grandifolia***), and white ash (***Fraxinus americana***) are common associates. In the stands bordering tidal streams, hackberries (***Celtis occidentalis*** and ***Celtis laevigata***) are characteristic components. The understory includes eastern red cedar (***Juniperus virginiana***), eastern redbud (***Cercis canadensis* var. *canadensis***), American holly (***Ilex opaca* var. *opaca***), buckthorn bumelia (***Sideroxylon lycioides***), American beauty-berry (***Callicarpa americana***) and flowering dogwood (***Cornus florida***).

Depression Swamps and Ponds This diverse group of poorly-drained basin wetlands is characteristic of flat Coastal Plain terraces with fluctuating, seasonally perched water tables. Similar wetlands are scattered throughout the mid-Atlantic Coastal Plain. The best-documented examples of this group in Virginia are the Grafton Ponds, located on The Peninsula in York County, but other sizeable complexes occur on Coastal Plain terraces in Dinwiddie, Surry, Isle of Wight, Gloucester, and Matthews Counties. Typical trees occurring in wooded ponds are red maple (***Acer rubrum***), sweetgum (***Liquidambar styraciflua***), swamp tupelo (***Nyssa biflora***), blackgum (***Nyssa sylvatica***), willow oak (***Quercus phellos***), overcup oak (***Quercus lyrata***), and bald cypress (***Taxodium distichum***). Shrubs that dominate some ponds include buttonbush (***Cephalanthus occidentalis***),

swamp loosestrife (***Decodon verticillatus***), common persimmon (***Diospyros virginiana***), and fetterbush (***Eubotrys racemosus***). For additional information see Handout 5

I have directly copied sections from the Virginia State Wetlands Program Plan (2015-2020) below. This and the references above will provide a good background and a source for further investigation on the subject of Virginia Wetlands.

EXECUTIVE SUMMARY This Wetland Program Plan (WPP) is the second iteration of the planning effort prepared at the direction of the Environmental Protection Agency (EPA), and summarizes (1) the multiple existing regulatory and voluntary wetland program elements in Virginia, (2) identifies opportunities for improvements in current program objectives and operations, and (3) prioritizes program development to achieve an effective and comprehensive program strategy. This WPP provides a framework to improve its wetland programs over the next five years (2015-2020) with incorporation of action items to address wetland management issues. The WPP describes Virginia's efforts in four core element areas, plus three additional areas identified by Virginia as critical to the achievement of wetland no-net-loss and net resources gain. The EPA has identified these four core elements as 1) monitoring and assessment, 2) regulation, 3) voluntary restoration, and 4) water quality standards for wetlands. However, long term sustainability of wetland resources in Virginia necessitates actions in other areas. We have added 3 additional element areas: Planning and sustainability, Information Acquisition and Outreach/Education. Inclusion of these elements, along with the EPA core elements, creates a comprehensive perspective on Virginia's wetland resources and facilitates a plan to address those resources. In Virginia, two agencies, 40 citizen Boards and one academic institution are primarily responsible for the management of wetland resources. The Department of Environmental Quality (DEQ) has jurisdiction over all wetlands both tidal and nontidal under the State Water Control Law. The Virginia Marine Resources Commission (VMRC) administers and has oversight over a state-local program which enables local government to adopt responsibility for tidal wetland permit program administration. The Virginia Institute of Marine Science is mandated by statute to provide advisory support to both DEQ and VMRC. Specific wetland mandates include provision of advice to the State Water Control Board on no-net-loss and net wetland gain in area and function; the provision of comprehensive guidance for tidal shorelines, including tidal wetlands to promote living shorelines and address wetland sustainability; maintenance of a tidal wetland inventory, and

assistance to the VMRC on wetland guidance development. Programmatic descriptions relative to the core elements in the first plan (identified as the Comprehensive Wetland Program Plan, Commonwealth of Virginia, dated 2011 – 2015) are generally still accurate. Explanations are provided herein where notable changes have occurred. The WPP identified seventeen objectives in the first plan for 2010-15. Virginia has completed eleven objectives, some of which are processes that are still on-going and are again included in this plan as objectives. Four objectives were partially completed and two have not yet started. A table of the objectives and their status can be found in Appendix A. ii Most of the work from the previous plan was accomplished with funding support from EPA, as well as funding from NOAA and others, in addition to resources within the state agency (DEQ, VIMS, VMRC, etc.). Given the current state funding outlook, federal and other outside funding is critical to the ability to work on Wetland Plan objectives. While some of the primary threats and stresses to Virginia's wetlands are dependent upon whether the wetlands are non-tidal or tidal, others affect both tidal and non-tidal wetlands. The following list summarizes the major causes of wetland loss in Virginia (Tiner and Finn 1986, Tiner, et al. 2005). 1. Conversion to other land cover – The greatest risk to wetlands in Virginia is conversion to another land cover. These conversions are caused by development and sea level rise. Nontidal wetlands are lost through conversion to uplands. Development conversion is the primary threat. Reservoir and impoundment projects convert nontidal wetlands to open water. Tidal wetlands are lost through conversion to open water and uplands. Conversion to uplands is most commonly associated with shoreline erosion control structures. The conversion of non-tidal adjacent wetlands to tidal wetlands and tidal wetlands to open water is caused by sea level rise. 2. Ecosystem Service modifications associated with climate change – Climatological changes in rainfall and storminess are projected to have significant effect upon wetlands hydrology. While nontidal isolated wetlands maybe of greatest risk, changes in the timing and extent of water inputs to all wetlands can lead to changes in vegetative community and biogeochemical processes impacting habitat and water quality services. 3. Conversion to Other Uses - This threat is most common for non-tidal temporary and seasonal wetlands that are easier to convert. These threats involve managing wetlands as residential lawn or gardens, timbering, stock-pile storage, and temporary fill. These conversions are generally associated with residential and commercial development. 4. Hydrologic Alterations - Diversions, stream channelization, ditches, etc. can divert or prevent water from reaching wetlands resulting in a change in wetland type or possible conversion to upland. 5. Invasive

species – There are a number of species that can be invasive in wetlands. Two plants species of concern are purple loosestrife (Lythrum salicaria) and common reed (Phragmites australis). These species can form dense monotypic stands that reduce habitat and wildlife diversity. Phragmites is identified as one of 22 plant species ranked as highly invasive by the Department of Conservation and Recreation (DCR). 6. Fragmentation - Fragmentation of wetlands by development, crop fields, roads, fences, berms, or other factors limits or eliminates ecosystem services, notably habitat and water quality. Fragmentation, and associated disturbance, can also lead to increased invasion by non-native and aggressive species like Phragmites. (See Appendix D for an expanded list of stressors used in the wetland monitoring and assessment effort). 3 Chesapeake Bay Commitments A new Chesapeake Bay agreement was signed in June 2014. The agreement included new commitments for Partnership, including a new Wetlands outcome under the Vital Habitats Goal. The Wetlands Outcome: Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the watershed. Create or reestablish 85,000 acres of tidal and non-tidal wetlands and enhance function of an additional 150,000 acres of degraded wetlands by 2025. These activities may occur in any land use (including urban), but primarily occur in agricultural or natural landscapes. Virginia has agreed to the Major Desired Outcome for Wetlands (Chesapeake Bay 2000 Agreement, Subsection 2.3) to "(i) achieve no net loss of existing wetland acreage and function through regulatory programs; (ii) achieve net wetland resource gain through wetland restoration; and (iii) assist local governments and community groups with development of wetland preservation plans as part of integrated locally based watershed planning." Under the 2010 Agreement, Virginia had committed to restoring 6,000 new acres of wetlands by 2010 within Virginia's portion of the Chesapeake Bay. In addition, Virginia has set a goal of restoring 4,000 acres outside of the Bay drainage, for a total of 10,000 new acres statewide. Priorities Virginia is committed to a net resource gain of wetlands and the enhancement of wetland ecosystem services. In order to achieve that commitment, Virginia will need to address all of the threats to wetlands. This will require coordinated efforts to better understand the wetland resources and effects of the threats and stressors, effectively manage the resource, improve communications to the public and decision makers to ensure better decision-making and compliance, enhance planning activities, and find efficiencies in integration of wetlands programmatic efforts with other water quality and habitat regulatory and non-regulatory programs, processes and products. Virginia plans to focus effort for the 2015-2020 time period on the greatest causes of

wetlands loss and change and has proposed objectives and actions to address those factors. Several issues need to be addressed in order to preserve and enhance Virginia's wetland resources. Virginia has identified several issues as priorities. These priorities include, but are not limited to, the following: 1. Direct loss and secondary impacts from development; 2. Loss of tidal wetlands due to sea level rise and adverse ecosystem effects on all wetlands due to climate change; 3. Obtain, share, and incorporate new land cover data, tax maps, non-mapped wetlands, and other agency data as needed to enhance Virginia's Wetland Condition Assessment Tool (WetCAT). 4. Update computer software technology in order to maintain programs such as WetCAT that are capable of assessing impacts to Virginia's wetland resources.