James River Action Plan
(J-RAP)

By: Reid Williams, Allie Kaltenbach, Michaella Becker, Andrew Ames

Table of Contents

Mission Statement:

Our mission is to attain sufficient water quality standards for wildlife and recreation in the James River Basin of southern Virginia by the year 2030.

Background:

The James River Watershed is over 10,000 square miles in size and comprises of three sections, the Upper, Middle and Lower James (Middle James Roundtable). This watershed is home to about 3 million people. It emcompasses 15,000 miles of tributaries which include the Appomattox River, Chickahominy River, Cowpasture River, Hardware River, Jackson River, Maury River, Rivanna River, Tye River (James River Association). The James River is the largest tributary to the Chesapeake Bay (James River Association).

History:

The first inhabitants along the James water were nomadic hunters starting at least 15,000 years ago. Between about 10,000 to 3,000 years ago a collection of tribes described as Archaic Native Americans lived along the James river. They continued to be nomadic as they moved along the Basin seasonally, following animal migrations and plant growth cycles. This nomadic movement, along with the reasonable population, decreased the stress on the Basin due to human activities. It lasted for thousands of years because the way these tribes interacted with the watershed was sustainable.

Around 3,000 years ago the native practices around the James River changed. The tribes began to settle and have more agricultural practices including: making pottery, using bow and arrow, farming, and living in villages. Up until European discovery, the area was mostly occupied by two main tribes. The Powhatan (formerly the name of this river) were located below the fall line, and west of the fall line the Monacan tribe ruled most of central Virginia. Each tribe was ruled over by the chief, but the land use, including the treatment of the watershed was thought to be owned by the entire tribe itself. All settlements were made along the rivers meaning the water was very sacred to them. It was the source of food and transportation that they needed to survive.

In 1607, the Jamestown settlement was found by European explorers. The settlers chose that location because the deep water of the James River allowed for transportation of ships into the town. The colonials came to the area for profit, meaning they believed that they owned the land and the water; thus, causing conflict with the native tribes. Also, the colony faced a serious water quality issue which nearly destroyed the settlement. The people did not have proper systems set up for their waste causing the water they drank to be contaminated with harmful pathogens. Many died from typhoid fever. Also, new research has shown that by talking water from swampy

areas they exposed themselves to extremely unsafe levels of Arsenic. Before supplies and reinforcements arrived from England, the colony was made of only 500 people.

Eventually, when America became a country, and Virginia a state, the James River Basin was split up into three different sections. The James River is 10,000 square miles long, so a single county controlling the entire area is difficult. The three sections are: the Upper James Watershed which starts in Alleghany County and runs through the Allegheny and Blue Ridge Mountains until Lynchburg, the Middle James which goes from Lynchburg to the Fall Line in Richmond, and the Lower James stretches from the fall line in Richmond to the Chesapeake Bay.

Policies and Mandates in Place:

The James River Association acts as a voice for the river and take action to promote conservation of its natural resources. Their core programs include advocacy, education, community conservation, the James Riverkeeper program, and watershed restoration. Two main goals this association has is to help communities realize the benefits of a healthy James River and support the protection of it. Their overall vision is to see the James River be restored to an A rating in the state of James report.

As of right now, the James River Association promotes advocacy at every level. The association works at a local level on things such as stream buffer protection, political support for river restoration, and emphasizing environmental education. At the state level, the association works with state agencies and the Virginia general assembly to address long term pollution concerns and ensure proper protections are in place to prevent future degradation. Federal advocacy includes supporting federal funding for clean water programs, working with the EPA on the Chesapeake Bay Cleanup, and working on agricultural and urban stormwater issues. The association also participates in the Choose Clean Water Coalition which helps bring together 200 organizations from around the Chesapeake Bay watershed to help everyone choose clean water.

Projects the association has completed include increasing the adoption of Low Impact Development (LID) requirements throughout the watershed. These regulations are in place to complement the state's stormwater regulations. Each of the localities in Virginia were ranked on 76 LID principles grouped into 5 major categories; minimizing land disturbance, preserving vegetation, minimizing impervious cover, protecting general water quality, and nontidal locality supplement. Scores ranged from 3% to 72% with an average watershed score of 27%. Another project was completed to provide local governments in the James River watershed with cost-effective solutions for meeting stormwater pollution obligations outlined in the Chesapeake Bay Cleanup. The results showed one city was able to reduce the costs of meeting the requirements by 70% by adapting the suggested cost effective practices to their local watershed. If the city had the option to implement certain practices that are not yet EPA approved, that number could be as high as 80%. A third project was conducted to see how localities could simultaneously meet their Chesapeake Bay and local cleanup goals. The focus for this particular

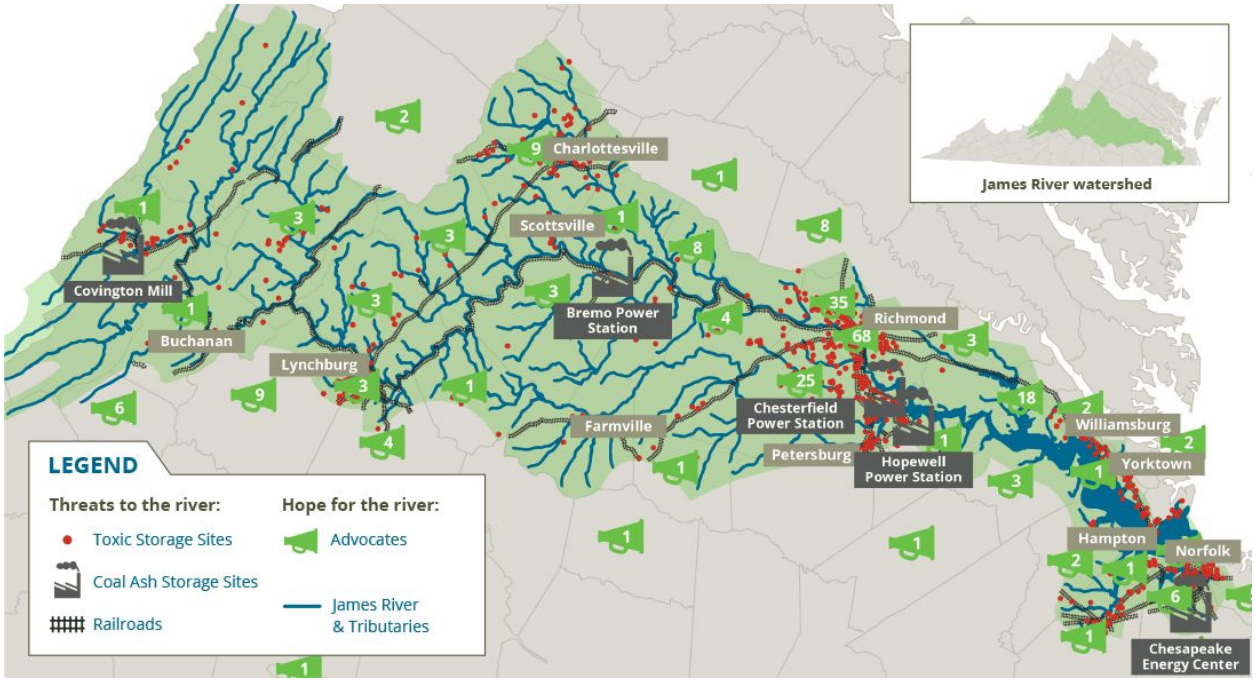
study was on bacteria cleanup goals and the results showed the localities can make significant progress towards both local goals and Chesapeake Bay cleanup goals at the same time.

There are several policies and mandates in place to restore and protect the James River Watershed. A comprehensive conservation plan and environmental assessment for the James River outlines each of these policies and mandates.

Policy on:	Definition
The National Wildlife Refuge System	The act states that the Refuge System must focus on wildlife conservation first. It also states that the mission of the Refuge System, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction on that refuge.
National Wildlife Refuge System Mission, Goals, and Purposes	This policy sets forth the Refuge System mission noted above, how it relates to the Service mission, and explains the relationship of the Refuge System mission and goals, and the purpose(s) of each unit in the Refuge System.
Maintaining Biological Integrity, Diversity, and Environmental Health	This policy provides guidance on maintaining or restoring the biological integrity, diversity, and environmental health of the Refuge System, including the protection of a broad spectrum of fish, wildlife, and habitat resources in refuge ecosystems. It provides refuge managers with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and restore lost or severely degraded components of the environment.
Coordination and Cooperative Work with State Fish and Wildlife Agencies	This policy establishes procedures for coordinating and working cooperatively with state fish and wildlife agency representatives on management of units of the Refuge System.
Refuge System Planning	This policy establishes the requirements and guidance for the Service and Refuge System

	Policies and Mandates Guiding Planning Chapter including CCPs and step-down management plans
Appropriateness of Refuge Uses	This policy provides a national framework for determining appropriate refuge uses to prevent or eliminate those that should not occur in the Refuge System.
Compatibility	This policy complements the appropriateness policy. Once a refuge manager finds a use appropriate, they conduct a further evaluation through a compatibility determination assessment.
Wildlife-dependent Public Uses	This policy of the Service manual presents specific guidance on implementing management of the priority public uses.
The Archaeological Resources Protection Act	Establishes detailed requirements for issuance of permits for any excavation for, or removal of, archaeological resources from Federal or Native American lands. It also establishes civil and criminal penalties for the unauthorized excavation, removal, or damage of those resources

* taken from
https://www.fws.gov/uploadedFiles/Entire_JamesRiverDraftCCPEA_25Sept2014_Smaller.pdf



Problems:

The James River Action Plan will focus on three environmental problems regarding water quality standards. The problems chosen will begin to address the issues of pollutants in the river basin as well as habitat preservation and wildlife conservation.

Problem	**Description**	**Causes**
Harmful Algae blooms (blue algae)	90% of the water samples collected in the summer of 2015 from the freshwater portion of the James Estuary tested positive for the algal toxin microcystin. These algae blooms degrade water quality, decrease DO levels, hurt populations of fish and other animal wildlife, and can produce dangerous toxins.	A multitude of human sources carry nutrient runoff into the Chesapeake watershed including: irrigation, manure, pesticides, and fertilizers.
Bacteria levels	In the last four years, 16% of	Lack of proper Sewage

	samples taken from James river showed bacteria levels unfit for human consumption. After rainfall, samples have detected E.coli CFU concentrations over 100 times the Virgina limit for recreational use	maintenance, overflow from storms Household and farmland animal feces
Wildlife/Habitat degradation	11,821,961 million pounds of pollution were dumped into Virginia waterways in 2012 Oysters and brook trout continue to struggle at low levels relative to their historical populations. Both rock fish and smallmouth bass, which were at very healthy numbers within the past decade, declined over the past 2 years showing that even healthy populations are susceptible when the river ecosystem is out of balance	Urbanization in areas once made of wetlands Overfishing of keystone species including the blue crab, sturgeon, and trout populations Pollution runoff Invasive species, including the flathead catfish

Problem 1: Harmful Algae Blooms

The largest contributors to algae blooms in the James river are agricultural sources such as manure, pesticides, and fertilizers. Stormwater runoff carries these into the Chesapeake Bay watershed, contributing to massive algae blooms.

Agriculture is the largest private industry in the state of Virginia, supplying over 300,000 jobs and bringing in roughly $70 billion each year. Farmland covers 32% of Virginia's total land, with many farms bordering the James river watershed. Fertilizers and pesticides are vital to the agricultural industry but can be detrimental to river habitat and wildlife populations. When nutrient levels in the water are high, this causes algae to grow at a tremendous rate, during which time it may also produce harmful toxins. About 90% of the water samples collected in 2015 from the freshwater portion of the James Estuary tested positive for the algal toxin microcystin.

Toxic and even non-toxic algae blooms deplete oxygen in the water killing fish populations and making water treatment much more difficult and expensive. The Virginia government estimates pollution reduction could cost up to $2 billion or more. Nutrient concentrations must decrease if we hope to reach liveable standards.

Goals:

Reduce Harmful Algae Blooms

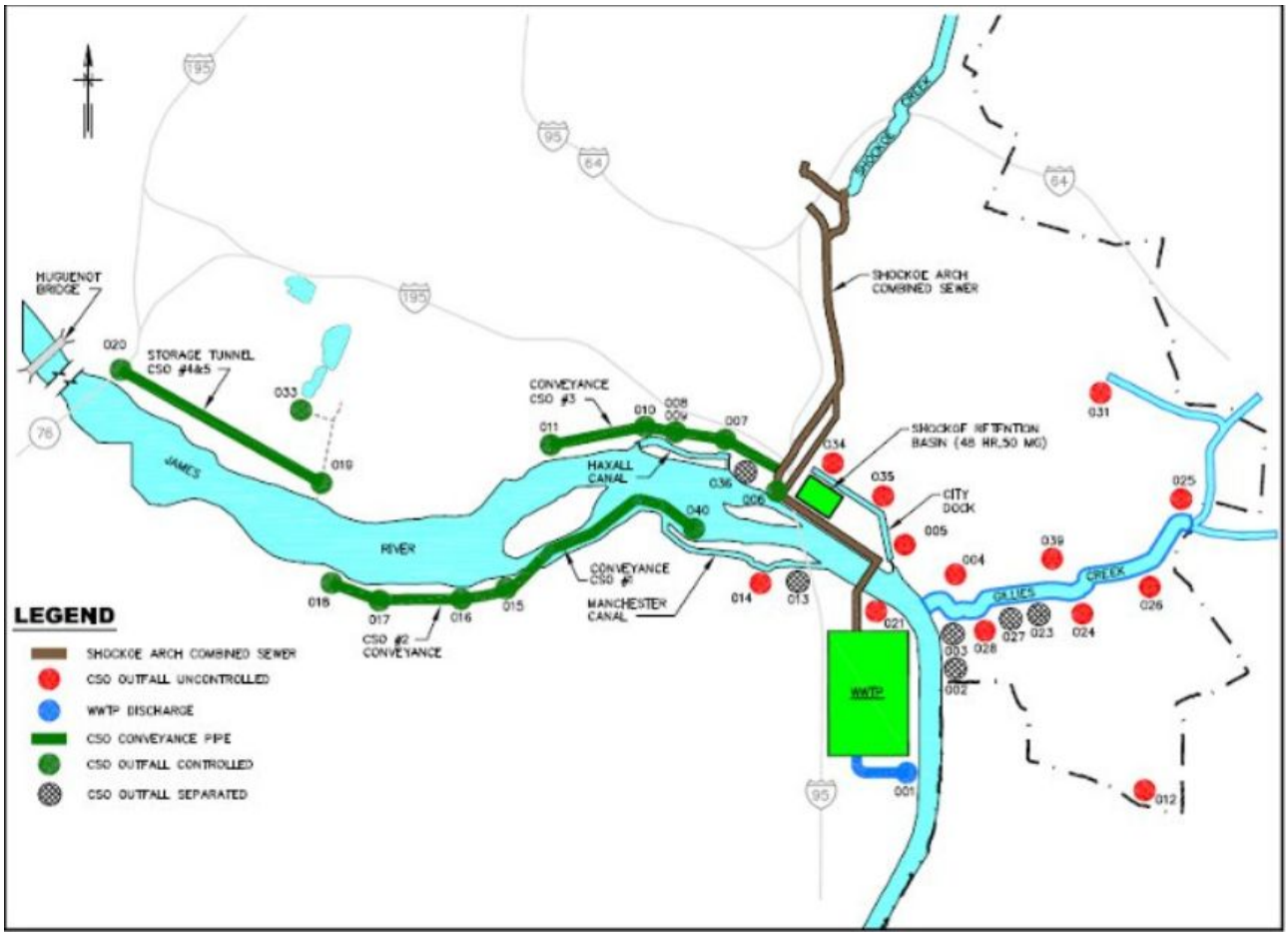
The James River Action Plan proposes soil and groundwater well tests for nutrient and manure content. Farms should not be applying manure and/or pesticides to areas of land with high runoff risk. Livestock should be prohibited from grazing near stream banks, thus maintaining vegetation that can help filter nutrient runoff during storms or flooding. These preventative measures can significantly reduce the amount of runoff from agriculture into the James river watershed to protect against further environmental damage.

Problem 2: High Bacteria Levels

In the James River Basin area, the lack of proper sewage overflow maintenance, and the pollution into rivers due to materials from livestock being carried into creeks and rivers during storms, causes the area to have excess amounts of bacteria.

Virginia has an extensive livestock supply. Virginia's beef industry includes more than 650,000 beef cows raised on more than 26,000 farms across all regions of the state. The abundance of available land and resources, and the popularity of seedstock causes for this high market of cows. Unfortunately, this does not bode well for the water quality in the area. Runoff from storms would take the manure from these animals into close streams and rivers, causing for high amounts of bacteria found in these areas.

Also, the maintenance of Virginia's sewer system has become a water quality issue for the James River Basin. A total of 29 overflow outlets are along the James River (meaning they are at risk for sewage overflow into the river given a certain amount of rainfall in the area). Moreover, 15 overflow outlets are at risk of discharging rainfall into the river with just 0.2 to 0.3 inches of rain per hour.



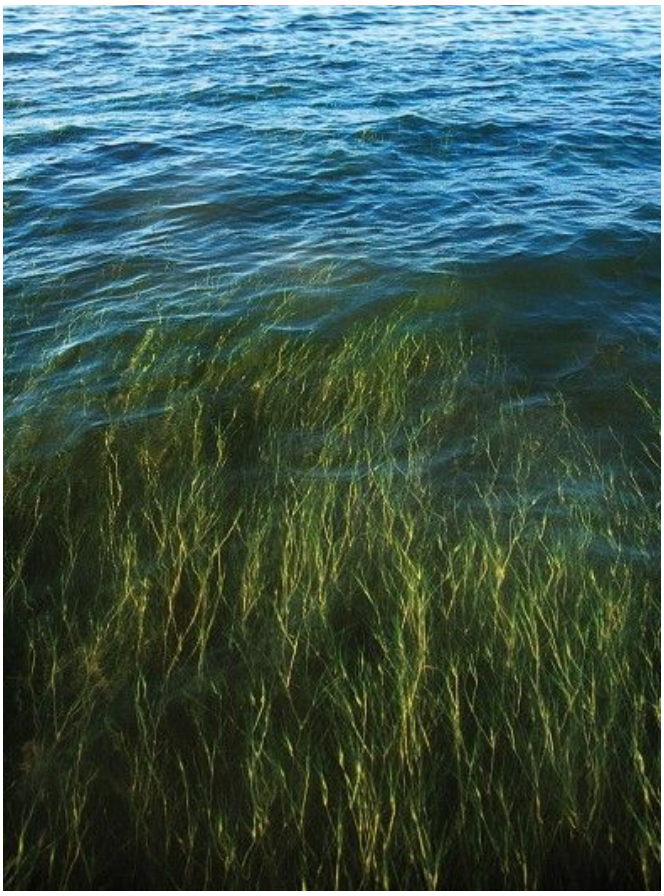
Map of outfalls of treatment systems located in Richmond Virginia and leading into the James River

Goals:

The J-RAP goal is to prevent the influx of bacteria causing elements into the rivers and streams of the James River Basin. J-RAP plans on implementing 10,000 acres of fencing to keep all livestock away from important streams and rivers. Also, surveying fences and farms to gain valuable information on which areas are leading to the most pollution. Finally, J-RAP plans to work with the city of Richmond on building a massive storage system to capture the surge of stormwater mixed with raw sewage after a rainstorm.

Problem 3: Habitat Degradation

Urbanization, overfishing of keystone species, pollution runoff, and invasive species have all contributed to the overall habitat and wildlife populations dropping in the James River. Oysters and brook trout continue to struggle at low levels relative to their historical populations. Both rock fish and smallmouth bass, which were at very healthy numbers within the past decade, declined over the past 2 years showing that even healthy populations are susceptible when the river ecosystem is out of balance. Indicators such as a decrease in the amount of underwater grasses in the James River have shown stream health, tidal water quality, and biodiversity have suffered in recent years. Although the amount of underwater grasses has shown promise for the quality of the river in the past, the populations tend to fluctuate dramatically from year to year (Blankenship). Even considering these fluctuations, there is still an absence of underwater grasses in the mainstem of the river.



Goals:

The underwater grasses provide essential habitat and food for young fish, crabs and waterfowl; therefore allowing greater biodiversity. These grasses also help the ecosystem by pumping oxygen into the water, trapping sediments, and absorbing wave energy. To allow the grasses to grow we must reduce pollution from both nutrients and sediments to improve water clarity. Sediment and algae that feed on excess nutrients in the water prevent sunlight from reaching the grasses on the bottom. Another factor that impacts the inconsistent population growth of these grasses is the species diversity of the grasses themselves, primarily because certain grass species grow better in different conditions. Therefore, the diversity of the underwater grasses in the James River Watershed along with water clarity must increase to allow for a more resilient and steady rehabilitation.

J-RAP Summary of Goals:

J-RAP is focused on resolving the problems addressed in this report. In order to create a safe environment and improve the health of the watershed the following goals must be met:

G1: Reduce Harmful Algae Blooms
Significantly reduce the concentration of algae and chlorophyll in the river basin.

G2: Reduce E.coli and other Bacteria Concentrations
Control sewage overflow into the James river at certain overflow points.

G3: Maintain and Restore Biodiversity and Ecosystem Health by Rehabilitating Underwater Grass Populations
Reduce sediment and nutrient pollution and monitor grass species diversity to allow for steady growth, therefore, restoring a balance to the ecosystem by providing habitat, food, and oxygen and trapping sediments.

References:

"2016 Bacteria Testing-Virginia Data." *Chesapeake Bay Foundation*, www.cbf.org/issues/polluted-runoff/rainfall-revelations/2016-bacteria-testing-virginia-data.html.

"About the James River." *James River Association*, James River Association, jrava.org/about-the-james-river/.

"Algal Blooms." *James River Algal Bloom Study*, Virginia Commonwealth University, 20 June 2014, wp.vcu.edu/jamesriver/algal-blooms/.

Blankenship, Karl. "Bay Journal." *Bay Journal RSS*, 26 Apr. 2014, www.bayjournal.com/article/sav_rebounds_24_in_2013.

"Combined Sewer Overflow (CSO) in Richmond." *Combined Sewer Overflow (CSO) in Richmond*, Virginia Places, www.virginiaplaces.org/waste/csorichmond.html.

"James River ." *Virginia Places*, Virginia Places, www.virginiaplaces.org/watersheds/james.html.

"James River National Wildlife Refuge: Draft Comprehensive Conservation Plan and Environmental Assessment." *U.S Fish and Wildlife Services*, Oct. 2014, www.fws.gov/uploadedFiles/Entire_JamesRiverDraftCCPEA_25Sept2014_Smaller.pdf.

"The James River Still Haunted by Toxic Runoff and Bacteria." *The James River Still Haunted by Toxic Runoff and Bacteria* , Environment Virginia, 29 Oct. 2015, environmentvirginia.org/news/vae/james-river-still-haunted-toxic-runoff-and-bacteria .

"Middle James River Sub-Basin Watershed-Based Plan, Wilsons Creek: 2016-2017." *Middle James River Sub-Basin Watershed-Based Plan, Wilsons Creek: 2016-2017*, 2017, static1.squarespace.com/static/590e3cede3df2845837660df/t/5a5fac01e2c483f7cb9368d2/1516219414696/Middle+James+Watershed+Managment+Plan+2016.pdf.

"On the Ground Projects ." *Atlantic Fish Habitat*, www.atlanticfishhabitat.org/wp-content/uploads/2012/10/ACFHP-project-factsheet-FY12-VA-v2-updated.pdf.

"Our River at Risk." *James River Association*, jrava.org/about-the-james-river/river-at-risk/.

"Reports & Plans." *James River Basin Partnership*, www.jamesriverbasin.com/reports-plans/.

"State of the James River ." *James River Association*, jrava.org/wp-content/uploads/2016/04/state-of-the-james-11.pdf.

Stebbins, Sarah J. "The Powhatan Indian World." *National Parks Service*, U.S. Department of the Interior, Mar. 2011, www.nps.gov/jame/learn/historyculture/copy-of-the-powhatan-indian-world.htm.

"They Really Drank This Stuff?" *William and Mary*, William and Mary, 17 Oct. 2011, www.wm.edu/research/ideation/social-sciences/they-really-drank-this-stuff6752.php.

"Virginia Agriculture Facts & Figures." *VDAC*, Virginia Department of Agriculture and Consumer Services, www.vdacs.virginia.gov/markets-and-finance-agriculture-facts-and-figures.shtml.

"A Vision for the James Watershed ." *Envision the James* , chesapeakeconservancy.org/images/A_Vision_for_the_James_River_Watershed_2013-sm all.pdf.