**Chapter 7.9 DEQ REGIONAL WATER QUALITY INITIATIVES: 2015-2020**

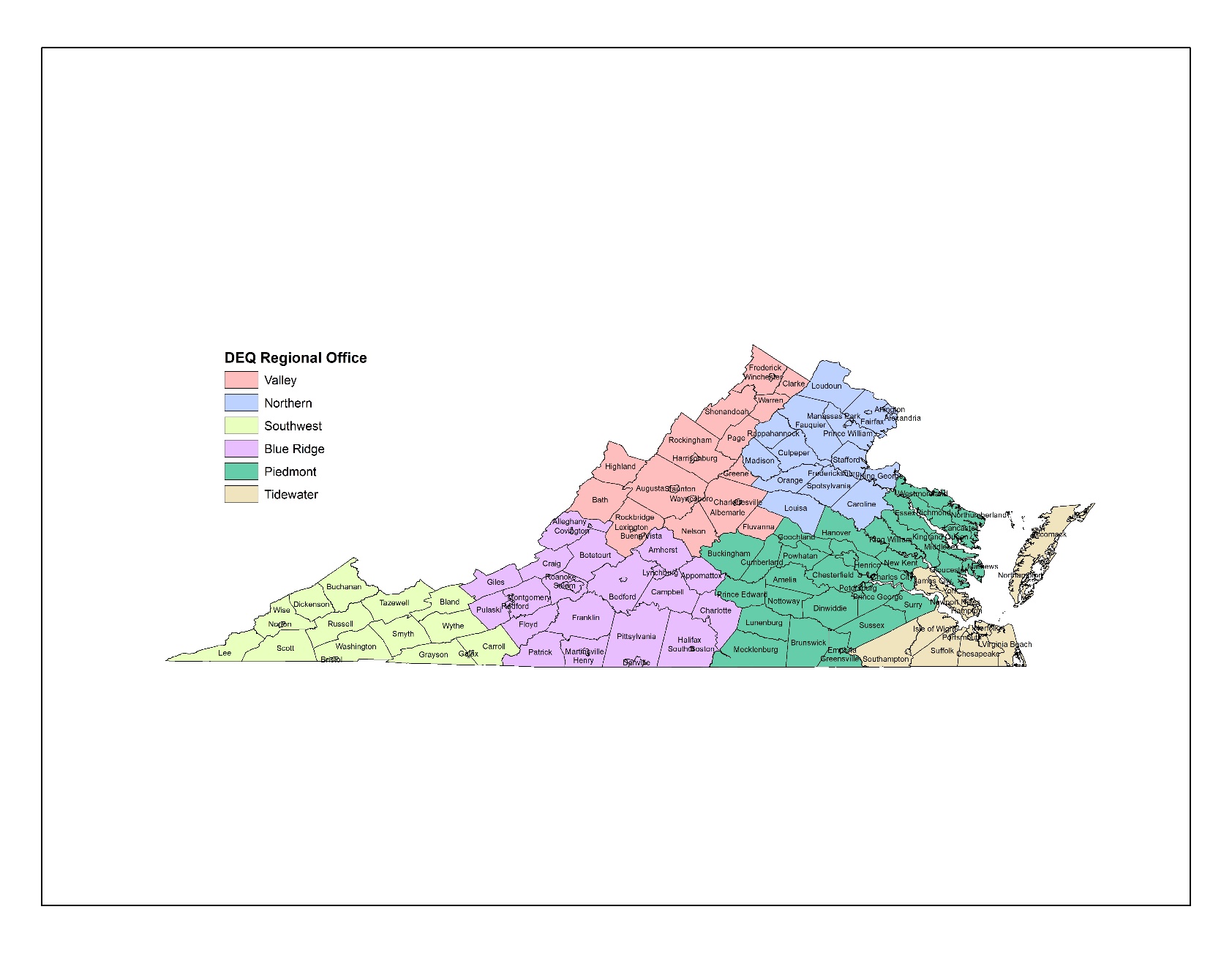
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Figure 7.9-1 Map of DEQ Regional Office Boundaries

*For more information about DEQ’s regional offices, please visit* [*https://www.deq.virginia.gov/get-involved/about-deq/contact-us*](https://www.deq.virginia.gov/get-involved/about-deq/contact-us)

**BLUE RIDGE REGIONAL OFFICE (BRRO)**

**Biological Monitoring Special Projects**

MVP Pre-Construction Baseline Monitoring – BRRO staff collaborated with CO and VRO staff to create a Monitoring Plan for high-priority stream crossings along the proposed Atlantic Coast (ACP within VRO’s regional boundaries) and the Mountain Valley (MVP within BRRO’s regional boundaries) pipelines. Water quality monitoring was conducted in the fall of 2017 before construction activities began and then will be conducted again after construction activities are completed. BRRO-led monitoring efforts on the MVP crossings included macroinvertebrate collection and identification and quantitative habitat assessment in 2017. In addition, Virginia Commonwealth University (VCU) monitored fish assemblages and US Geological Survey (USGS) established continuous monitoring stations which will collect turbidity, temperature, specific conductance, dissolved oxygen and pH parameters over the period of construction activity.

**TMDL and Implementation Planning Activities**

Special studies related to TMDLs included water column PCB sampling in the New River and James River watersheds, diurnal dissolved oxygen studies in the Smith River and Jackson River (Smith River included temperature data).

Additional TMDL and Implementation Plans developed recently include:

Kits Creek

The TMDL was completed and approved by EPA on 08/11/2017 and the SWCB on 07/19/2017. The project addressed benthic impairment in Kits Creek. A public meeting was held to discuss the TMDL process and the sources of sediment and phosphorus unique to Kits Creek watershed.

Kerr Reservoir Tributaries

The TMDL was completed and approved by EPA on 01/26/2018 and the SWCB on 12/07/017. The project addresses bacteria impairments in several tributaries to Kerr Reservoir including, Little Bluestone Creek, Bluestone Creek, Allen Creek, unnamed tributary, Allen Creek, Cotton Creek, Kettles Creek, Smith Creek, and Lizard Creek. A public meeting was held to discuss the TMDL process and the sources of bacteria unique to the Kerr reservoir Tributaries.

James River Basin

The TMDL re-development study was completed and approved by the EPA on 09/27/2017 and the SWCB on 07/19/2017. The project addresses bacteria impairments in the James River as well as several tributaries including, Ivy Creek, Tomahawk Creek, Burton Creek, UT Burton Creek, Judith Creek, Fishing Creek, Blackwater Creek, beaver Creek, Harris Creek, Dreaming Creek, Opossum Creek, Williams Run, Graham Creek, and Pedlar River. A public meeting was held to discuss the TMDL process and the sources of bacteria unique to the James River basin.

James River Tributaries

A TMDL study was developed for several impairments on the upper James River tributaries mainly located in Botetourt County. The final public meeting was held in September 2018 and was preliminarily approved by EPA in December of 2018. This project addressed bacteria impairments on Craig Creek, Catawba Creek, Little Patterson Creek, Barbours Creek, Sinking Creek, Lapsely Run and a portion of the James River. A benthic impairment on Catawba Creek was also included in this project. Six meetings were held throughout the TMDL development process including a tour led by Roanoke Cement Company of restoration activities and best management practices implemented on a farm bordering Catawba Creek.

James River PCB TMDL

Sampling for the Upper James and Jackson River PCB TMDL occurred in 2017 and 2018. This project is a multi-regional TMDL and included waters in VRO and PRO. The TMDL contract began in 2020 with the first public meeting scheduled for the beginning of 2021.

New River PCB TMDL

The New River PCB TMDL development began in 2014 and the final meeting was conducted in 2018. A series of public and TAC meetings were held to discuss modeling approaches and implementation strategies. The TMDL was approved on March 12, 2019.

Lynch and Reed Creek TMDL

The Lynch and Reed Creek TMDL addresses benthic impairments and Lynch and Reed Creek in Campbell and Pittsylvania Counties. The project began in 2020 and the first public and TAC meetings were held in October and November 2020, respectively.

Dan River Watershed Implementation Plan

The project addresses bacteria impairments in the Dan River Watershed, including the Dan River, Birch Creek, Byrds Branch, Doubles Creek, Fall Creek and Sandy Creek. The project start date is February 2017. The plan was approved on January 2, 2020.

Buffalo River Implementation Plan

This project addresses bacteria impairments on the Buffalo River and its tributaries. Several public meetings and working groups were held to assist in the development of the report. The report was completed in December 2020, but has not yet received EPA approval.

Upper Roanoke River Implementation Plan Part I

This project addresses bacteria and benthic impairments for the Upper Roanoke River and tributaries. This large development project was broken up into two parts to help simplify development. Part I is a largely urban with multiple partners and MS4s. Part I was EPA approved 4/22/2016.

Upper Roanoke River Implementation Plan Part II

This project addresses bacteria and benthic impairments for the Upper Roanoke River and tributaries. This large development project was broken up into two parts to help simplify development. Part II addresses impairments in the headwaters of the Upper Roanoke River and tributaries. Part II was EPA approved 8/18/2016.

**Community Involvement**

The BRRO water planning staff (monitoring, TMDL, and assessment staff) participated in numerous outreach events during 2015-2020. Staff taught area students and teachers about biological monitoring at events such as the Clean Valley Council’s Earth Summit, Fall Waterways Cleanup, Smith Mountain Lake State Park’s Junior Rangers program, Bedford Elementary “Camp Bees” day camp, Roanoke area Cub Scouts at “Bug Scouts” day camps, Lynchburg Boy Scouts summer camp, Mountain Castle SWCD Meaningful Watershed Experience Days and the town of Christiansburg’s Stormwater Days. The group had displays at Earth Day Celebration, 18th Annual Salem Fall Home Show, and Philpott Reservoir Environmental Expo. Staff also made presentations on water pollution, monitoring, and restoration at the following events: Friends of Claytor Lake meetings, Roanoke River Currents Conference, Smith River Trout Unlimited Chapter meeting, Southern Rivers Grant Project leaders gathering in Radford, National Water Quality Monitoring Conference (Cincinnati, OH), Jackson River Preservation Association meetings, Isaac Walton League (Covington-Alleghany Chapter) meetings, meetings with Roanoke City Stormwater staff, and a Radford University Environmental Regulations class. DEQ hosted a booth at the Christiansburg High School Environmental Expo with information about water quality monitoring, biomonitoring and watershed stewardship.

Boy Scout Camp 2016, 2017, 2018, 2019, 2020

TMDL staff participated in a Boy Scout camp at the Leesville Methodist Church in Lynchburg in June over the past several years. The class presented outreach and educational information on benthic macroinvertebrates. Regional staff conducted several activities related to macroinvertebrates, including bug rocks, bug specimens, and bug presentation.

Virginia Tech Science Festival 10/8/2016 & 11/4/17

Assessment and TMDL staff presented the Augmented Reality Sandbox at the Virginia Tech Science Festival at the annual event on October 8, 2016 and November 4, 2017. This was educational outreach to show school-aged children topography and how a watershed changes.

Botetourt County & Craig County Schools Meaningful Watershed Education Experience 4/7/2016, 4/8/2016, 10/19/2016, 4/4/2017, 4/5/2017, 9/25/2017, 4/17/2018, 4/19/2018

TMDL IP staff participated in a MWEE field day sponsored by Mountain Castles SWCD held at Roanoke Cement Company for Botetourt students and Craig County High School for Craig County students. A MWEE or Meaningful Watershed Educational Experience is an investigative or experimental project that engages students in thinking critically about the Bay watershed. MWEEs are extensive projects that allow students to gain a deep understanding of the issue or topic being presented. Students participate in background research, hands-on activities and reflection periods that are appropriate for their ages and grade levels.

Christiansburg Stormwater Days 2017, 2018, 2019

TMDL, Water quality monitoring staff, and stormwater staff participated in Stormwater Days for middle school students hosted by the City of Christiansburg. The students learned how DEQ use benthic macroinvertebrates to evaluate water quality and how stormwater may affect their local water quality.

New River Watershed Roundtable – New River Cleanup 8/27/2016

TMDL IP staff participated in the first annual ReNew the New cleanup event. The ReNew the New Clean-up event brings together Floyd, Giles, Montgomery, and Pulaski Counties, and the City of Radford, to remove tires and trash from the New River.

Envirothon – 5/2/2018

TMDL IP staff participated as a judge in a local area Envirothon competition. Envirothon is a team based natural resources competition for high school students. Students who participate learn stewardship and management concepts and work to solve real world environmental problems. The program is field-oriented, community based and gives students an opportunity to work with natural resource professionals

**Jackson River Restoration and the Gathright Dam Water Control Plan**

The Virginia Department of Environmental Quality’s monitoring and assessment data and Jackson River benthic Total Maximum Daily Load (TMDL) development (DEQ 2010) has documented that low flow conditions in the fall represent the most stressed water quality conditions in the Jackson River. The Jackson River benthic TMDL study established nitrogen and phosphorous reduction targets in the Jackson River and called for restoring natural flow variability during the growing season (defined in the TMDL study as June 1st to October 31st). To assess flow variability impacts on water quality habitat and biology, DEQ asked the U.S. Army Corps of Engineers (ACE) to perform a 216 study that could result in permanent flow modifications in the Jackson River. The 216 Study was later changed to the Gathright Dam Water Control Plan. As part of the study and later the plan, the ACE performed test pulses during the following dates: August 17, 2010, September 28, 2011, and October 3, 2012. In 2010 thru 2014, DEQ collected an extensive suite of field data, water chemistry, habitat, and biological parameters in order to document baseline conditions and evaluate effects of the test pulses. DEQ is committed to extensive water quality monitoring in the Jackson River throughout the development of the Water Control Plan project and during the implementation of the recommended hydrologic changes. DEQ published the following reports which summarize existing water quality conditions and document results of the pulse events: *Characterization of 2010 Base Flow and Pulse Flow Water Quality in the Jackson River and Characterization of Jackson River Base Flow* and *Pulse Flow Water Quality: 2011 and 2012*. DEQ continues to monitor and evaluate water quality on the Jackson River. In addition to pulse event monitoring, DEQ Staff worked with VADGIF to collect benthic macroinvertebrate and RPBII data in the tailwater to aid in the discussion of JRPA concerns.

Jackson River Dissolved Oxygen Special Study

In 2019, DEQ and Westrock began a 2 year special study to evaluate dissolved oxygen patterns along the Jackson River in Covington, VA. The project involved collecting 951 data points predominantly in the early morning hours when conditions were most stressful. During more stressful seasons (i.e. Fall and Spring), more intensive DO monitoring occurred. The resulting study found 0 violations of DEQ’s water quality standard and was able to identify areas along the river that are more vulnerable to low concentrations of DO in stressful seasons.

**Philpott Dam and Smith River**

In 2016 BRRO water monitoring group worked with Dan River Basin Association, Henry County, USACE, USFWS, VADGIF, and VADEQ Surface Water Investigations and Water Supply groups to monitor the Smith River below Philpott Dam during repairs to the powerhouse following damage from a fire. The repairs resulted in limited operation of the Philpott dam and stakeholder concerns including: low flow in the tailwater during the summer months resulting in the potential for thermal stress to the trout fishery, limited release options from the dam resulting in abnormal turbidity in the Smith River, and the turbidity in the river resulted in concerns of impacts to the drinking water supply and aquatic life.

Numerous collaborative efforts were ongoing during the repair period (completion expected Fall 2017):

* BRRO staff facilitating and participating in stakeholder conference calls
* VADEQ Surface Water Investigations group reinstating water quality sensors at the Martinsville stream gage allowing for real-time monitoring of temperature which allowed for adjustment of flows to prevent thermal stress to the trout fishery
* VADEQ BRRO staff surveying the Smith River following turbidity reports, collecting water samples, data analysis and reporting findings back to stakeholders
* USACE implementing releases from various depths at the dam in an effort to reduce turbidity in the river

**Environmental Pollution Response**

Dan River Coal Ash Spill

On February 2, 2014 a broken stormwater pipe beneath a Duke Energy coal ash retention pond located next to the Dan River near Eden, NC was reported. Approximately 38,000 tons of coal ash spilled into the Dan River. Coal ash contains heavy metals and can be harmful to human health. Monitoring for metals in the water and sediment at eight Dan River sites and two Kerr Reservoir sites began in February 2014 and continued monthly through 2016. Bi-monthly monitoring has begun in 2017. In addition, two boatable probabilistic sites on the Dan River will be sampled in the spring and fall on an annual basis for benthic macroinvertebrates, fish, algae, water chemistry, and habitat quality.

Post–Incident Monitoring Results for Tinker Creek 2018-2019

In response to a fishkill that occurred in Tinker Creek in July 2017, Virginia Department of Environmental Quality’s (DEQ) Blue Ridge Regional Office (BRRO) water monitoring staff began monitoring Tinker Creek in spring 2018 as part of the Natural Resource Damage Assessment and Restoration (NRDAR) process. The fish kill was caused by an agricultural-use surfactant that leaked from a container into a tributary of Tinker Creek in Botetourt County. The tributary was affected for a distance of 0.6 miles and Tinker Creek was affected for approximately five miles.

Historical ambient chemical and biological (benthic) monitoring stations existed in the affected reach as well as a Probabilistic monitoring station that had two years (2007, 2008) of fish community data. Results from sampling in 2018 and 2019 showed that chemical parameters and benthic community scores were similar before and after the fishkill. Fish community results showed that all species observed in 2007 and 2008 were also observed in 2018 with the exception of Riverweed Darters. The number of fish collected in 2018 was substantially lower than in previous surveys; however, stream flow during this event was more than three times the median flow. In 2019, flow conditions were close to normal and more fish were collected with less effort than in 2018 but the overall number of fish was lower than in 2007 and 2008. The post fishkill composition changed with fewer minnows and more sunfish.

BRRO was unable to monitor the impacted reach in 2000 due to COVID 19 and plans to monitor in 2021.

Post-Incident Monitoring Results for Roanoke River 2020

On the night of October 30, 2020, a Norfolk Southern train derailed in the Glenvar area of Roanoke County. During the derailment, a trestle over the Roanoke River collapsed and 12 coal hoppers carrying 2600 tons of coal fell into the river with a portion of the coal being released. The river was above normal flow at the time due a storm event on October 29; therefore, released coal was deposited on the river bed for several miles below the accident site.

In response to the train derailment Virginia Department of Environmental Quality’s (DEQ) Blue Ridge Regional Office (BRRO) water monitoring staff collected benthic macroinvertebrate community and habitat data to determine impacts from the coal that spilled in the river. Four stations were sampled including one control station above the site of the train wreck and three stations below.

The benthic macroinvertebrate community at the upstream control station had a VSCI score similar to those at the two downstream stations in Green Hill Park. However, the station immediately below the derailment site had a lower VSCI score that was influenced by the lower abundance of Mayflies which are typically more sensitive to pollution. Net-spinning caddisflies were also found in low abundance at the impact site relative to the other three stations. The large amount of coal released during the derailment scoured the river substrate likely causing a physical habitat impact that affected the aquatic community.

During the benthic surveys, DEQ observed large deposits of coal in the reach below the impact site. Norfolk Southern was able to hydrovac some of the released coal from the river before a rain event on November 11 which washed most of the coal downstream. DEQ plans to survey the benthic macroinvertebrate and fish communities and habitat in 2021 to assess impacts.

**NORTHERN REGIONAL OFFICE (NRO)**

**Biological Monitoring**

In addition to routine biological monitoring, response to citizen requests, NRO biologically monitored three streams (Dog Branch, Milltown Creek, and Giles Run) in CY2019 and two streams (Milltown Creek and Dog branch) in CY2020. All of the locations were sampled twice in one year, once each in the spring and the fall.

**High Frequency Bacteria Monitoring**

NRO continued in 2019 the special study monitoring program initiated in 2018 on the free-flowing, riverine portion of Rappahannock River. This special study was continued to further understand the potential implications of the new water quality criterion for E.coli on both the level of staff effort in collection of high frequency monitoring data and the assessment of the data. The special study involved weekly sampling of seven stations on the mainstem of the Rappahannock River from early June through mid-August 2019.

NRO began a new special study effort in which stations were located on streams, which had existing USGS gauges and continuous monitoring date available. This study began in 2019 and continued into 2020. Two stations were located in each of the following watersheds: Accotink Creek, Difficult Run and Bull Run. One DEQ monitoring station was located in the upper watershed and the other station lower in the watershed; majority of the lower stations were co-located with a USGS gage station.

**Harmful Algae Bloom (HAB) Monitoring**

Since 2018, NRO has been collecting samples in response to observed algal blooms in the upper portion of Lake Anna (above the “splits”, generally west of the Rte. 208 bridge) in partnership with VDH. Samples with cell counts for algae species that are potential toxin producers exceeding the VDH advisory for primary contact are the basis for the swim advisories issued by VDH for parts of the upper areas of Lake Anna in 2019 and 2020.

**Total Maximum Daily Load (TMDL) Development Monitoring**

In 2019, NRO collected ambient monitoring data to support anticipated development of TMDLs to address aquatic life use and recreational use impairments in the following streams: Catharpin Creek, Cub Run, Elklick Run, Flat Run, Flatlick Branch Jonas Run, Mountain Run, Pohick Creek, Middle Run, Sand Branch, Sideburn branch, and South Run. The Sand Branch monitoring plan included sampling to gather additional information regarding ionic strength to aid in further TMDL development.

**TMDL Implementation Plan Follow-Up Monitoring**

In 2019 and 2020, NRO collected ambient monitoring data as follow-up to TMDL implementation plans developed for the following streams: Blue Run, Carter Run, Covington River, Garth Run, Dark Run, Great Run, Marsh Run, Robinson River, Rose River, Rush River, Summerduck Run, Terry’s Run, and Thumb Run.

**TMDL Studies and Implementation Plan Projects**

Initiated in 2017, work continued in 2019 and 2020 on development of the Salt Management Strategy (SaMS), which is a resource of recommended practices to minimize the over application of winter salts in Northern Virginia. The toolkit, which is the document comprising the recommendations, was drafted and scheduled to be public noticed and finalized in early 2021. This effort aids the implementation of the chloride TMDL for the Accotink Creek watershed approved by USEPA in 2018, which identified the main source stemming from anti-icers/deicers used during winter storm maintenance activities and winter stormwater runoff. SaMS is a proactive approach by extending the project area to the entire northern Virginia region as it was accepted that winter management practices do not follow watershed boundaries and impacts from winter salts are likely prevalent throughout the urban area.

Development of a watershed management plan was completed in 2019 that developed, concurrently, a TMDL and an Implementation Plan to address a benthic macroinvertebrate impairment in North Fork Catoctin Creek. The effort began with a stressor analysis, initiated in 2015, which identified sediment as the most probable stressor. The concurrent development of a TMDL and an Implementation Plan enables implementation to occur more quickly in this watershed where the majority of the sources are unregulated nonpoint sources.

A TMDL project for PCBs in the Mountain Run Watershed in Culpeper was ongoing during 2019 and 2020 in collaboration with DEQ’s Central Office. DEQ and its contractor collected applicable data, started data analysis, and prepared to host project kickoff meetings in 2021.

A TMDL project for bacteria in Dorrell Creek, Gravel Run, Herring Creek, and non-tidal Mattaponi River in King and Queen and King William Counties was ongoing during 2019 and 2020 in collaboration with DEQ’s Piedmont Regional Office. Two technical advisory committee meetings were held in 2019 and the final public meeting was held in 2020.

Development of an implementation plan for the Mattaponi River Watershed was completed in 2020 for the following streams: Brock Run, Chapel Creek, Doctors Creek, Glady Run, Maracossic Creek, Mat River, Matta River, Mattaponi River, Motto River, Po River, Polecat Creek, Poni River, Reedy Creek, and Root Swamp. In the implementation plan development process, major emphasis was placed on discussing best management practices (BMPs), locations of control measures, education, technical assistance, monitoring, and funding. A Randolph-Macon College environmental studies seminar class provided detailed analysis of bacteria levels at multiple locations on the Po and Matta Rivers to inform implementation efforts in these watersheds.

Work began in 2020 to develop an implementation plan for the Mountain Run, Muddy Run, and Lower Hazel River watersheds in Culpeper County. These adjoining watersheds were addressed in three separate bacteria TMDLs from 2000, 2004 and 2008, and included several new impairments following completion of the TMDLs. A comparative analysis of BMP recommendations from approved IPs in similar landscape settings is being used to inform the new IP’s BMP goals, and this approach has enabled DEQ to prepare the IP entirely “in-house.” The project also addresses aquatic life use/benthic impairments in Mountain Run by emphasizing BMPs that provide co-benefits of sediment and nutrient reductions, as these pollutants are benthic community health stressors. The initial public meeting and first workgroup meetings were held in October 2020 and the project is on-track for completion early in 2022.

**PIEDMONT REGIONAL OFFICE (PRO)**

# Harmful Algal Blooms (HABs)

# As part of the Virginia Harmful Algal Bloom Taskforce, PRO responded to 29 reports of algae blooms between 2015 and 2020. The 29 responses were from a variety of water bodies, including estuaries, lakes and rivers. Samples were collected for analysis by Old Dominion University, and based on the results of those samples the Virginia Department of Health issued recreational HAB advisories at two locations. Both of the advisories were issued in 2019, one on Wilcox Lake in the City of Petersburg and the other on an unnamed tributary to the Chickahominy River in Henrico County. Follow up sampling occurred at both locations until results indicated cyanobacteria levels had fallen below VDH HAB Advisory criteria.

# Total Maximum Daily Load (TMDL) Studies

# During 2015 - 2020, the Piedmont Regional Office (PRO) completed TMDLs for the following waterbodies:

# Kits Creek Watershed Benthic TMDL

# Turkey Island Creek and James River Westover to Claremont Watershed Bacterial TMDL

# Pamunkey River and Tributaries Bacterial TMDL

# Lower Chickahominy River Bacterial TMDL

# Rappahannock River and Tributaries Bacterial TMDL

# In addition, PRO developed the Mattaponi River and Tributaries Bacterial TMDL, began the James River and Tributaries Benthic TMDL, and assisted with the ongoing development of the Tidal James River PCB TMDL and the Non-Tidal James River PCB TMDL.

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# PCB Monitoring Studies

# Tidal James River - Between 2015 and 2020, PRO collected PCB water column samples from seven stations for the tidal James River PCB study. Base flow and storm targeted sampling occurred at all seven stations.

# Non-Tidal James River - Between 2015 and 2020, PRO collected PCB water column samples from 22 stations for the non-tidal James study. At 12 of the 22 stations, coordination between PRO and the Office of Surface Water Investigations occurred in order to obtain stream flow measurements at the same time that water quality sampling occurred. Stream gages were present at or near the other 10 stations. Base flow and storm targeted sampling occurred at all 22 stations. In addition, PCB sediment samples were collected at 14 stations.

**Southwest Regional Office (SWRO)**

**Total Maximum Daily Load (TMDL) Development Projects**

Bluestone River PCB - Biological Systems Engineering of Virginia Tech has been contracted to provide support for the development of a PCB TMDL for impaired segments of the Bluestone River and tributaries in southwestern Virginia. EPA Region 3 has conducted two previous PCB remediation efforts in the Bluestone watershed. DEQ water sampling during periods of high and low flows in 2017 and 2018 along Whitley Branch, a tributary of the Bluestone River, show improving PCB conditions likely as a result of EPA PCB removal efforts. However, corresponding samples collected along Beaverpond Creek continue to show elevated PCB concentrations. Water samples collected from Beaverpond Creek within Beacon Cave during a high flow period on September 19, 2018, yielded PCB concentrations between 26,666 and 57,182 pg/L. VADEQ surface water data suggests that the Beacon Cave system itself could be the current source of the PCB contamination impacting this creek and migrating via surface water to the Bluestone River. Tetra Tech was contracted by the EPA in 2021 to conduct a removal assessment at the Bluefield Beacon PCB Groundwater Site. In October 2021, Tetra Tech collected water and sediment samples at newly identified potential source areas. Coordinated discussions continue among West Virginia DEP, Virginia DEQ, and EPA to address the PCB impairment and the possibility of developing a joint TMDL between Virginia and West Virginia.

Middle Fork Holston River and Tributaries - The SWRO has initiated the development of a TMDL to address benthic impairments in the Middle Fork Holston River and tributaries. The SWRO and Emory & Henry College hosted the kick-off meeting for the TMDL on December 2, 2021. This TMDL updates and revises two previously completed TMDLs. *TMDL Development for Cedar Creek, Hall/Byers Creek, and Hutton Creek* was completed in December of 2003 and *Bacteria and Benthic TMDL Development for Middle Fork Holston River* was completed in October 2009. This TMDL will address the benthic impairment and adjust for future growth. The impaired segments are in the Middle Fork Holston River in Smyth, Wythe and Washington Counties and its tributaries Greenway Creek, Hall Creek, Byers Creek, Cedar Creek, and Tattle Branch in Washington County. These streams are listed on the 303(d) TMDL Priority List and Report as impaired due to violations of the State’s General (Benthic) Water Quality Standard for failing to support the aquatic life use.

**TMDL Implementation Plan (IP) Development Projects**

McClure River IP- This IP was completed in April 2021 and approved by EPA on November 22, 2021. The McClure River IP addresses the *E. coli* impairments in the McClure River watershed (McClure River, Buffalo Creek, Big Spraddle Branch, and Roaring Fork) in Dickenson County. Two public meetings and two Working Group meetings (agricultural and residential combined) provided feedback and recommendations for the plan. Best management practices consist of agricultural, residential and pet waste control measures.

**Harmful Algae Bloom (HAB) on John W. Flannagan Reservoir**

In 2017, 2018, 2019, and 2020, SWRO investigated reports of algae blooms on Flannagan Reservoir. The 2017 and 2018 blooms occurred during the month of February. The 2019 and 2020 blooms occurred during the summer months and the 2019 incident resulted in health advisory issued by the Virginia Department of Health (VDH) on August 9, 2019. The advisory was lifted on August 21, 2019 after sampling showed algae concentrations in the safe range. All sampling events were conducted in cooperation with the VDH. While investigating potential causes of the algae blooms, SWRO reinstated a long term trend monitoring station on the mainstem of the Pound River in 2018 and has continued to collect data as part of the long term trend monitoring network.

**Clinch Powell Clean Rivers Initiative (CPCRI) Sampling**

DEQ’s Central Office and SWRO completed sampling for trace elements and ionic constituents at 9 sites in the Clinch River drainage system. The sampling was targeted at low flow or base flow conditions and is intended to assist with identifying inorganic, ionic, and trace elemental constituents present in the water column throughout the impacted mussel assemblages in the Clinch River. Currently, DEQ’s Central Office staff is working on development of the final report to detail results of the sampling.

**TIDEWATER REGIONAL OFFICE (TRO**)

**Harmful Algal Blooms Monitoring**

Algal blooms occur throughout Virginia’s lakes, rivers, estuaries and coastal zones including those that may affect human and environmental health through toxin production or other impacts. The Virginia Department of Health, the Virginia Department of Environmental Quality, Old Dominion University, and the Virginia Institute of Marine Science at the College of William and Mary monitor Virginia’s waters for harmful algae as part of the Virginia HAB Task Force. Additional information about the task force and potentially harmful algal blooms can be found at <http://www.vdh.virginia.gov/environmental-epidemiology/harmful-algal-blooms-habs/>

**High Frequency Bacteria Monitoring**

In 2019, TRO initiated a special study bacteria-monitoring program for a set of prioritized stations that were monitored on a weekly basis for a period of 90 days. The special study involved sampling ten stations from early April through October 2019 (recreation season). This special study sampling prioritized eleven new stations for the recreation season of 2020. This new sampling is designed to meet the new bacteria water quality standards effective October 18, 2019.

**Coastal 2000 Initiative**

The Tidewater Regional Office has been involved with the Coastal 2000 Program as part of the EPA National Coastal Assessments Program. Data has been collected during summer months from 2001 through 2020 at randomly selected sites.

**James River/ Elizabeth River PCB Water Column Study**

The James and Elizabeth Rivers have a VDH issued fish consumption advisory. The advisory extends from I-95 James River Bridge in Richmond to Hampton Roads Bridge Tunnel, including tidal portion of tributaries.

In preparation for development of the Tidal Lower James and Elizabeth River PCB TMDL, DEQ initiated a study of PCBs in ambient water in the James and the Elizabeth using a high resolution/low detection method (EPA Method 1668A). During 2013, TRO collected one-time samples at thirteen stations along the lower James and Elizabeth River. Additional water, sediment and fish tissue samples were collected between 2016 and 2020 by TRO to support the model and development of the James and Elizabeth River PCB TMDL.

**Eastern Shore Accomack County Poultry Study**

TRO monitored three ambient water quality stations located downstream of three VPDES poultry facilities during the summer of 2018. Staff collected field parameters and analyzed water quality parameters -bacteria, solids and nutrients.

**Valley Regional Office (VRO)**

**Water Quality Monitoring Special Projects**

James River PCB Monitoring – VRO Monitoring and TMDL staff coordinated with Central Office and Office of Surface Water Investigations to support PCB monitoring in the Upper James River Watershed. This effort included water column, sediment and fish tissue sample collection on the James River as well as several of its large tributaries, including the Rivanna River, the Hardware River, the Maury River and Lewis Creek (not part of the James River drainage, but included in the project area due to its proximity). This large-scale monitoring effort has required close coordination with the Office of Surface Water Investigations in order to collect samples and measure river flow simultaneously.

**Harmful Algae Bloom (HAB) Investigations**

In the summers of 2017 and 201, VRO Water Monitoring staff responded to reports of Harmful Algae Blooms (HABs) in Chris Green Lake, a recreational lake owned and operated by Albemarle County Department of Parks and Recreation. Sampling was conducted in cooperation with the Virginia Department of Health (VDH) and the County. Based on the results of samples collected by DEQ, VDH recommended that an advisory to be placed on Chris Green Lake both years, restricting recreational use due to risk to human and pet health. In 2019, a total of 32 potential HABs were reported in the VRO region, on both private and public water bodies. In 2020, a total of 30 potential HABs were reported in the VRO region. VRO Water Monitoring staff respond to potential HAB reports based on recommendations from VDH, recreational potential of the water body, and resources available.

**High Frequency Bacteria monitoring**

VRO staff prioritized 10 sites in 2019 to begin a pilot study of high frequency bacteria monitoring. The goal was to build a foundational data set from public access points on highly utilized recreational large river segments. Staff collected weekly samples from 5 monitoring stations in the Shenandoah Basin and 5 monitoring stations in the James Basin for 12 consecutive weeks each, thereby covering the major river basins in the region. In 2020, the same sites were monitored in each Basin, but the timing was flipped in order to encompass the seasonality of the April to October recreational season.

**Total Maximum Daily Load (TMDL) Projects**

South Fork Rivanna River Benthic TMDL - This TMDL project was begun in 2020 and included a number of tributaries including Power Creek, Slabtown Branch, Broad Axe Run, Ivy Creek, Little Ivy Creek tributary, Fishing Creek, Naked Creek, Lickinghole Creek, Mechums River, Spring Creek, an unnamed tributary of Parrott Branch, an unnamed tributary of the South Fork Rivanna and a segment of the South Fork Rivanna itself. All of these stream segments have benthic impairments to be addressed through the TMDL process.

Lewis Creek PCB TMDL – Lewis Creek is a small tributary of the Middle River flowing through the City of Staunton and Augusta County. Included in the monitoring and contracting plans for the larger James River PCB TMDL, this project kicked off in January of 2020. VRO TMDL staff worked closely with local government officials and Land Protection Division staff to understand historic land uses within the city center and legacy contamination processes, as well as local community fishery resource uses.

North Fork Rivanna River TMDL – This TMDL project was begun in 2018 and included a number of tributaries including Marsh Run, Stanardsville Run, Blue Run, Quarter Creek, unnamed tributary to Flat Branch, North Branch Preddy Creek, Swift Run, Preddy Creek and a segment of the North Fork Rivanna itself. Through innovative partnerships with James Madison University (JMU) and local citizen monitoring organization Rivanna Conservation Alliance (RCA), additional data was collected to support benthic stressor analysis and enable a more comprehensive investigation of potential pollutants. Sediment and phosphorus were identified as the most likely stressors in these watersheds and the project ended with a public meeting in early 2019. This project is prioritized for an innovative IP, incorporating not only these projects but also previously developed bacteria TMDLs for the same watersheds.

Bullpasture River TMDL **–** This TMDL project was begun in 2018 and concluded in 2019. Focusing on bacteria as the pollutant of concern, this watershed was located in a rural and primarily agricultural area in Highland and Bath Counties.

**TMDL Implementation Plan (IP) Development Projects**

Woods Creek – In 2017, a TMDL to address bacteria was completed for Woods Creek, a small tributary of the Maury River that runs through downtown Lexington. In addition, “A Proactive Approach to Address the Benthic Impairment” was included in the TMDL document which recommended practices and actions that will address the aquatic life impairment. An Implementation Plan (IP) based on the bacteria TMDL was begun in 2018 and completed in 2019. This project built on the strong community relationships built through the TMDL development process and featured a strong focus on community engagement and cost effective BMPs that will focus on the sources of bacteria in Woods Creek, including cattle exclusion fencing, riparian buffers, pet waste disposal, and rain gardens.

**Community Outreach**

Community and School Event Outreach – VRO WMA/TMDL program staff regularly assist with education events in conjunction with local schools stream days or other community events. Over the last two years, staff have supported the following school systems and organizations working to educate local residents about water quality and watershed issues: Harrisonburg City Public Schools, Rockingham County Public Schools, Rockbridge County Public Schools, Buena Vista Public Schools, Augusta County Public Schools, Boxerwood Education Association, Earth Day Staunton, Blacks Run Clean-up Day, Shenandoah Valley Soil and Water Conservation District Envirothon competition and the Headwaters Soil and Water Conservation District Envirothon Competition, Area 1 Envirothon Competition.

Coliscan Citizen Monitoring Support – VRO TMDL staff support multiple stakeholder networks who monitor their local waterways for bacteria using the Coliscan Easy-Gel methods and materials. These supplies are provided through DEQ funding and VRO staff coordinate the monitoring networks: giving feedback on station locations, collecting data on a monthly basis from monitors, providing an annual overview of data collected, coordinating an annual gathering for monitors (oftentimes over a potluck meal), being a liaison for questions and other DEQ programs, and much more. DEQ funding allows these volunteer networks, located in watersheds with TMDL IPs in place, to collect extremely useful data from places were DEQ does not have monitoring stations and inform stakeholders on the effectiveness of BMP installation.