

Evidence of Water Quality Threats from the Atlantic Coast Pipeline Failure to Assure Compliance with Virginia Water Quality Standards

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Introduction

The authors of this report have reviewed the information and analyses the Virginia Department of Environmental Quality (DEQ) cited as the bases for its draft Water Quality Certification (WQC) for the Atlantic Coast Pipeline (ACP) project (Certification No. 17-002).¹ In addition, the authors have each made independent assessments of possible water quality-related impacts of the project and many of those analyses are being submitted to DEQ in separate documents. Many of these analyses are also available to DEQ through the regulatory process conducted by the Federal Energy Regulatory Commission (FERC) and must be considered part of the record for this action as well.² We conclude that:

DEQ's draft WQC, which asserts that there is a "reasonable assurance" that Water Quality Standards (WQS) will be met with the conditions contained in that draft, cannot be supported by the evidence in the record and pertinent scientific authorities and knowledge. Such a finding in the Department's recommendation to the State Water Control Board (SWCB) would be professionally incompetent and would fail to meet minimum standards of scientific proof.

This conclusion is based on our collective professional training and experience in fields related to water quality assessments and pollution impacts and specific knowledge of the environments that could be affected if this project is approved. Brief biographies of each author are included in the Appendix.

The primary bases for our conclusion are listed below. Subsequent sections of the report describe specific evidence and instances of missing, flawed, or incomplete evidence that support our conclusion. However, there are many additional problems that are not described here but which support our findings.

- Neither DEQ nor any other agency has assessed the cumulative impacts to waterbodies and stream systems as is necessary to make findings about protection of waterbody integrity and compliance with state standards.
- Vital information about particular water quality threats is absent from the record and, without this information, a valid assessment cannot be completed.
- DEQ has failed to acknowledge or incorporate facts and assessments of potential and likely impacts that were previously provided by Virginia resource agency

¹ At section IV. of the draft WQC, DEQ states: "In developing this Certification and the additional conditions imposed herein, the Board and Department have considered the record relevant to water quality considerations associated with the Project, including but not limited to" a list of six sources.

² The Draft WQC at Part IV. lists "Information Examined" to include "Draft and Final Environmental Impact Statements issued by FERC and the associated docket materials including all Appendices to the Final Environmental Impact Statement," among other sources.

staff, other government agencies, and members of the public into the current technical/regulatory review.

Water Quality Requirements, Integrity of Aquatic Systems

The Clean Water Act, which provides the basis for DEQ's regulatory review, states an objective "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA § 101 [33 U.S.C. § 1251]. State water quality standards define parameters by which the integrity of waterbodies is to be assessed and describe conditions that must be restored or maintained. Virginia's Water Quality Standards are contained in 9VAC25-260 (for surface waters) and 9VAC25-280 (for ground water). These standards apply to "[a]ll state waters." 9VAC25-260-10. The term "state waters," under Virginia law "means all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands." Va. Code § 62.1-44.3.

Under federal law, state WQS "shall be such as to protect the public health or welfare, enhance the quality of water and serve the purposes of this Act." CWA § 303(c)(2)(a) [33 U.S.C. 1313(c)(2)(A)]. The heart of WQSs is the protection of uses that are designated for all state waters. In every surface water body in Virginia, designated uses that must be fully protected include aquatic life support and recreation. 9VAC25-260-10. To uphold the aquatic life designated use, quality must be sufficient to support "the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them." *Id.*

The Virginia WQS for surface waters include "general criteria" which require that state waters "shall be free from substances . . . in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life." 9VAC25-260-20.A. "General requirements" contained in the ground water standards mandate that "[i]n order to prevent the entry of pollutants into ground water occurring in any aquifer "protective measure[s] or device[s] sufficient to preserve and protect present and anticipated uses of ground water shall be maintained at all times." 9VAC25-280-20.

Antidegradation provisions in both surface and groundwater standards require, at a minimum, that existing uses be fully preserved and protected. See: for surface waters "existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected, 9VAC25-260-30.A.1.; for groundwater, even where existing quality "is less than the limit set forth by ground water standards, the natural quality for the constituent shall be maintained; natural quality shall also be maintained for all constituents, including temperature, not set forth in ground water standards" and in all cases "present and anticipated uses of such water will be preserved and protected." 9VAC25-280-30.

Antidegradation policies provide even greater protection for waters whose quality is better than the minimum levels required by criteria and necessary to maintain existing uses. “Where the quality of the [surface] waters exceed water quality standards, that quality shall be maintained and protected unless the board finds . . . that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.” 9VAC25-260-30.A.2. “If the concentration of any constituent in ground water exceeds the limit in the standard for that constituent, no addition of that constituent to the naturally occurring concentration shall be made . . . unless it has been affirmatively demonstrated that a change is justifiable to provide necessary economic or social development.” 9VAC25-280-30.

Cumulative Impacts Not Assessed

Any valid conclusion about the integrity and sustainability of a stream or aquatic ecosystem must be based on a review of all conditions and sources of potential impact. It is irresponsible and scientifically indefensible to claim that acceptable water quality will be maintained and Virginia Water Quality Standards met unless all project-related activities and impacts are considered along with non-project-related conditions that affect the same waterbodies. Contrary to this necessary holistic approach, DEQ has segregated analyses of potential causes of pollution from the pipeline into multiple reviews and has refused to acknowledge additive or synergistic effects that will result from multiple sources.

Many activities related to the construction, maintenance, and operation of this project will affect the quality of streams in the watersheds through which the pipeline would pass. These include work directly in the waterbodies at stream and wetland crossing locations, changes in the riparian areas along streams, and land disturbance and changes to terrestrial habitats throughout the watersheds. Changes to subsurface geologic structures and flows from digging and blasting will impact the quality and flows of groundwater and affect surface waters fed by groundwater sources.

Without adequate and proven measures in place, landslides and debris flows will contribute pollutants to streams downslope and will alter in-stream habitat and populations of aquatic organisms. Changes in hydrologic flow patterns anywhere in a watershed where pipeline-related work is done, caused by removal of forests and established terrestrial plant communities, will reduce rates of infiltration into soils, cause preferential flows on and below the land surface, and will result in damage to the physical and biological environments in streams. It is indisputable that land disturbing activities, changes in terrestrial habitats, and compaction of soils through construction activities will cause increased quantities of runoff and increases in the frequency and severity of extreme runoff events.

One of the greatest threats to state waters along the path of the proposed pipeline is the fact that hundreds of streams and wetlands will be severely disrupted when trenches are cut or blasted through them to install the pipeline. The scientific literature clearly proves that such in-stream work will produce sediment discharges, directly and indirectly alter habitats in

the waterbodies and the riparian areas that are intimately connected as parts of the system, impair populations of fish and other aquatic organisms, and result in chemical and physical changes in the affected waters.

In combination with the waterbody crossing impacts, all of the “upland” activities DEQ claims to address through this individual 401 review will contribute pollution discharges and impacts from changes in hydrologic systems. It is without question that sediment will be released to waterbodies both from stream crossing work and other activities occurring in other parts of the drainage area. Likewise, changes in the physical environment in streams from both in-stream and upland activities will have additive and cascading effects on waters directly impacted and on downstream waters.

Multiplying the recklessness of assessing impacts from various pollution-causing activities in a piecemeal fashion, as DEQ has insisted on doing, neither DEQ nor any other regulatory agency has considered cumulative impacts on multiple streams in watersheds in any scientifically-valid way. In its environmental review, the Federal Energy Regulatory Commission (FERC) discussed cumulative impacts on water quality but did so on a scale that is scientifically meaningless. FERC’s discussion of cumulative water impacts looks at watersheds defined as HUC (hydrologic unit code) 10 drainages. FERC FEIS for ACP, Volume I, Table 4.13-1, at page 4-592. HUC 10 drainages typically range in size from 40,000 to 250,000 acres in size. Analysis of cumulative impacts on this scale is wholly inadequate to assess effects in small stream systems, especially in headwater drainages where the greatest damage will occur.

The Corps of Engineers in its permitting reviews for utility lines looks at waterbody crossings it terms “separate and distant,” 33 C.F.R. § 330.2(i), in isolation from each other, refusing to address multiple crossings and impacts that may affect numerous tributaries and downstream waters in a cumulative fashion. DEQ’s proposed reliance on the Corps’ permit for this project implicitly adopts this flawed and scientifically-indefensible approach.

DEQ asserts that impacts from waterbody crossings will be merely temporary and that conformance with conditions in the Corps of Engineers’ Nationwide 12 permit, issued under section 404 of the Clean Water Act, will assure adequate water quality protections. Contradicting this assertion, state agency staff noted in comments on the draft Environmental Impact Statement that it was necessary

to conduct preimpact characterizations of proposed stream and wetland crossings to include sufficient evidence that the system will be able to maintain its original functions indefinitely after restoration. DEQ is concerned that the proposed temporary impacts could result in a permanent alteration of the impacted systems post construction. Pre-impact characterizations should include stream surveys and subsurface investigations at temporary stream and wetland impact areas to establish the feasibility of restoring the systems post-construction and hydrologic assessments, including piezometers, to establish pre-impact hydrologic conditions at temporary wetland impact areas.

DEQ Comments on ACP DEIS, Attachment A, page 4, April 6, 2017 (underlining added).

Thus, DEQ has described severe impacts that may result from waterbody crossing activities alone and expressed that pre-impact characterizations should include detailed assessments to determine whether it is even feasible to restore existing conditions and functions. The kinds of permanent alterations DEQ warned of would, without question, harm the integrity of these waterbodies and violate Virginia WQS. The prescribed detailed assessments have not been completed and are not required in the draft WQC.

The severe impacts described from this one activity (waterbody crossings) will be accompanied by damaging impacts from “upland” activities which will also result in WQS violations, even when considered in isolation. The cumulative impacts of all pipeline-related activities will certainly result in even greater impairments of uses.

DEQ has not and cannot demonstrate that these types of cumulative impacts will meet antidegradation requirements, especially in the many waterbodies that currently have high water quality and where any measurable lowering of that quality is prohibited. Likewise, the combined discharges of sediments and associated pollutants will violate the “general criteria” expressed in the WQS, which require that waters “shall be free from substances . . . in concentrations, amounts, or combinations which interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.” 9VAC25-260-20.A. Among other conditions that must be controlled to meet the general criteria, the WQS list those that produce color and turbidity. *Id.*

Sediment discharges from stream crossing work alone will create conditions that violate all pertinent parts of the WQS (support of designated uses, general criteria, and antidegradation) and all authorities admit that such conditions will occur. Even industry-sponsored studies admit that such impairments of aquatic ecosystems will sometimes persist for months or even years.³ Virginia WQS do not allow impairment of aquatic life uses for any period and certainly not for multiple years.

³ See e.g. the study prepared for the Interstate Natural Gas Association of America (INGAA) stating that effects of in-stream pipeline construction on downstream waters are typically short-term and recovery to pre-construction conditions “is generally apparent within a year.” INGAA, *River and Stream Crossings Study, (Phase I), Executive Summary*; also see Reid et al., which says “sediment load increases during construction have been reported to directly and/or indirectly affect fish through modification of their habitats,” terming these impacts “temporary” because pre-construction conditions will be restored within “1 to 2 years.” Reid, Scott M., Scott Stoklosar, Serge Metikosh, and Jim Evans, *Effectiveness of Isolated Pipeline Crossing Techniques to Mitigate Sediment Impacts on Brook Trout Streams*, *Water Qual. Res. J. Canada*, Volume 37, No. 2, 2002, at 473 (internal citation omitted).

The requirement to maintain conditions that support “the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them,” as required at 9VAC25-260-10., certainly prohibits such impacts. It is also important to note that WQS prohibit pollution impacts that “*interfere* directly or indirectly with designated uses.” 9VAC25-260-20.A. (emphasis added). This prohibition on interference with uses is a stringent condition that cannot be met if DEQ allows temporary pollution impacts or seeks merely to “minimize” those impacts, as it and the applicant repeatedly promise in their assessments.

The prohibition of impairments in streams for any period is vital, because additional stresses on the aquatic systems (both from separate project-related pollution sources and others in the same watersheds) will invariably occur during these extended periods of disturbance, threatening the systems’ stability and reducing the likelihood that recovery of habitats and functions can occur. And, it is particularly important that antidegradation requirements for high quality waters be enforced at all times, because many of the remaining high quality streams and the biota they contain (brook trout, mussels, etc.) are especially sensitive to even “temporary” pollution events. Populations in systems where multiple headwater tributaries and downstream waters are affected will have much less capacity for re-population by native species and recovery.

Vital Information Missing

DEQ claims its draft Certification covers

all proposed upland land-disturbing activities associated with the construction, operation, maintenance, and repair of the pipeline, any components thereof or appurtenances thereto, and related access roads and rights-of-way as well as certain project-related surface water withdrawals. This Certification covers all relevant upland Project activities within the route identified in the Environmental Impact Statement.

Draft Certification at pages 2 - 3.

Despite the above claim, DEQ has explicitly excluded detailed erosion/sediment control and stormwater management plans from this section 401 review. Rather, DEQ acquired these plans and made them available to the public only after the current comment period had begun and the Department states that it will consider comments from the public on these issues after this comment period has ended.

To the extent that erosion/sediment control plans and stormwater management plans have been acquired by DEQ, those plans allow great latitude for the company to choose from a menu of pollution-control measures. This laxity by DEQ cedes its authority and duty to determine through regulatory action what measures will be properly protective and legally acceptable. Further, there are multiple provisions through which the pipeline company may

request and be granted variances to standard conditions and DEQ has neither defined the criteria by which such variance requests will be judged or included these criteria into the draft WQC.

One example, of this failure is the Department's customary allowance for companies building "linear" projects to ignore the requirement that open trenches be limited to 500 feet in length at any one time. Past records show that DEQ has approved every such variance request it has received in recent years, allowing trenches to be open for miles at a time. Given the prevalence of intense rain events, the steep terrain through which much of the project would pass, and the presence of unstable and highly-erodible soils, such variances are reckless and essentially guarantee that major sediment discharges and extreme runoff volumes will affect streams. We have discovered no analysis of the potential impacts these variances may cause or assessments that give any assurance that WQS can be met if the variances are granted. Other construction projects throughout Virginia are held to this open trench requirement and the vast majority of those projects occur in much less challenging and risky environments. When asked for an explanation for this disparate and favorable treatment given to pipeline companies, DEQ staff can only cite the convenience of the pipeline builders as justification.

Failure to Consider Information in the Record

Above, we cited the state agencies' recommendation that pre-impact studies of stream and wetland crossings be required to prove that waterbody integrity and function will not be severely and maybe permanently damaged. This is just one finding by Virginia agency scientists that has been ignored or applied in ways that fail to protect water quality in this individual WQC review process. There are numerous additional instances.

One such instance relates to threats to ground water and surface waters in karst areas. Agency staff rightly insisted in comments on the DEIS for this project that studies to characterize groundwater flow paths and potential impacts from pipeline-related activities are necessary to prevent damage to groundwater and surface water resources in areas on and adjacent to karst terrain. Staff noted that there are hydrologic connections between karst features in areas to be affected by pipeline work and springs and wells miles away. (See discussion in DEQ Comments on DEIS for ACP at Attachment A, page 5 for recommendations and supporting materials in Attachment B to DEQ Comments.)

The pipeline company, with FERC's blessing, has identified only those surface features indicating the presence of karst geology that lie within 500 feet of the pipeline's proposed path. This effort is far from sufficient to know how the project may affect waters through pollution entering the groundwater and through changes in hydrologic connections and flows. The analyses are inadequate to understand how blasting and excavation activities will affect water resources and cannot assure that the project will not diminish or destroy water supplies or negatively affect surface waters.

DEQ's draft WQC requires the company to submit a revised Karst Hazard Assessment but that assessment will not be available to the Department or the public in time to judge its adequacy during this regulatory review. This deferral of vital information until after this regulatory process is completed prevents DEQ from making any valid findings in regard to the project's possible compliance with either ground water or surface water WQS. For example, the ground water standards explicitly require the imposition of requirements for "protective measure[s] or device[s] sufficient to preserve and protect present and anticipated uses of ground water shall be maintained at all times." 9VAC25-280-20. The Department clearly cannot ensure protection of uses that may be threatened or require adequate protections without first characterizing the karst areas and knowing the flow paths.

DEQ further required submittal of a Karst Mitigation Plan and has stated that conformance with that plan will be a condition of the WQC. Finally, a condition in the draft WQC would require that the company "develop a Karst Dye Tracing Plan to be submitted and approved by the Department" and that "[a]ny dye trace studies proposed in the approved Karst Dye Tracing Plan shall be completed prior to initiation of land disturbing activities in karst terrain."

Given the widespread use of groundwater in these areas for both public and private water supply and the sensitive nature of subterranean species that depend on these karst environments, a proper understanding of the threats posed by the pipeline, before any regulatory approvals are given, is of utmost importance.

Conclusion

As stated above, the specific issues addressed in this report are just a sampling of the deficiencies in evidence and analyses that make a competent assessment of water quality impacts from this proposed project impossible. DEQ has not required necessary information from the applicant and has not performed reviews to support the draft finding that compliance with Virginia Water Quality Standards can be assured. Rather, the evidence in the record indicates that serious impairments of both surface and ground water will occur unless additional conditions are imposed. Further, it is unlikely that construction and pollution control measures can be devised to fully protect the integrity of waterbodies in some areas that would be affected.

Appendix - Author Biographies

Dr. Paul L. Angermeier

Paul Angermeier holds MS and PhD degrees in Ecology, Ethology, and Evolution from the University of Illinois. He has been on the faculty at Virginia Tech for 32 years. During that time, his research and teaching has addressed many topics related to the ecology and conservation of fishes and aquatic ecosystems, especially those in Virginia. He has authored or coauthored 130 peer-reviewed articles in more than 40 different scientific journals. He has taught 8 university courses focusing on ecology, conservation, and management of ecosystems. He currently serves on the editorial boards of the scientific journals *Conservation Biology* and *Freshwater Biology*.

Ralph Bolgiano

Ralph Bolgiano holds a B.S. degree from the University of Maryland and an M.S. degree from James Madison University. He worked at the Virginia State Water Control Board and the Department of Environmental Quality for a total of twenty years, holding positions as a Senior Field Specialist and Regional Biologist in the Valley Regional Office. Bolgiano conducted pollution investigations and field studies and led investigations of mercury contamination in South River and PCB contamination in the South Fork Shenandoah and Shenandoah Rivers, was the primary author of VASWCB *Basic Data Bulletin #46* (1980), and co-authored other published reports for the SWCB.

Malcolm Cameron

Malcolm Cameron has a degree from James Madison University, with a major in Geology and a minor in Geography. He completed graduate level courses in Environmental Science at the University of Virginia, including Geomorphology and Climatology. He worked as both a construction quality control technician for soils and a field geologist with a drill crew for analyzing sites for new building foundations from 1984 to 1986 and then spent twenty-three years as an Environmental Engineer and Construction Monitor in the Staunton District of the Virginia Department of Transportation. Cameron administered the Erosion and Sediment Control Compliance Program and ensured that all in-stream construction complied with Army Corps of Engineers and other agency permit requirements. He developed and taught classes for Virginia Erosion and Sediment Control Inspector certification for VDOT construction inspectors, in coordination with the Virginia Department of Conservation and Recreation. For the last two years, he has served as Coordinator of Geohazards Analysis for the Dominion Pipeline Monitoring Coalition.

David Collins, P.E.

David Collins is a practicing Civil Engineer and Land Surveyor in Nelson County, Virginia. He is licensed as a Professional Engineer in Virginia since 2000 and in licensed as a Land Surveyor in Virginia since 1985. He has a B.S. Degree in Civil Engineering from Virginia Tech (V.P.I. & S.U.) and has worked on land development projects preparing Boundary and Topographic Surveys, Site Plans, Erosion & Sediment Control Plans, Stormwater Management Plans, and other Engineering Studies since his graduation in 1982. Collins is a Nelson County Director of the

Thomas Jefferson Soil & Water Conservation District since 2004 and is a member of the American Society of Civil Engineers (ASCE) and the Virginia Association of Surveyors (VAS).

Ari Daniels

Ari Daniels graduated with a B.S. in Civil Engineering from the University of Virginia with a focus on water resources and hydrology. He has a background in large-scale design-build construction management, and currently works with the Center for Watershed Protection, Inc. designing urban stormwater retrofits, developing watershed restoration plans, updating state-level low-impact development and erosion and sediment control guidance documents, and to a lesser degree is involved in stream assessment and restoration efforts. His areas of expertise are primarily stormwater runoff and erosion and sediment control. He also sits on the Albemarle County Natural Heritage Committee, and the Education, and Invasive Species and Climate Change subcommittees.

Dr. Pamela C. Dodds, P.G.

Dr. Dodds, a Licensed Professional Geologist, received her B.A. in Geology and her PhD in Marine Geology from the College of William and Mary, Williamsburg, VA. She also has a Credential in Ground Water Science from Ohio State University. Dr. Dodds specializes in hydrogeology and has served as an expert witness in hydrogeology before the West Virginia Public Service Commission and the West Virginia Environmental Quality Board. Dr. Dodds has provided numerous presentations and workshops to state and federal environmental employees. She has worked as a Senior Geologist for the Virginia Department of Environmental Quality and for S&ME, Inc. in Blountville, TN. She served as the District Geologist for the Virginia Department of Transportation. Dr. Dodds has worked as a Hydrogeological Consultant since 2000. Her expertise includes assessment of surface water and groundwater resources and the interaction between surface water and groundwater as well as determining groundwater flow characteristics to identify source water areas and contaminant flow directions. Dr. Dodds is a member of the Geological Society of America, the West Virginia Academy of Sciences, and the National Speleological Society.

Dr. David Harbor

Dr. Harbor is a Professor of Geology at Washington and Lee University. He received his PhD in Earth Resources from Colorado State University and a Master of Science degree in Geology from Pennsylvania State University. During a professional and academic career spanning nearly 30 years Dr. Harbor's research and teaching have focused on stream morphology and hydraulics, erosional processes, hydrology, and water resources. He has authored numerous papers published in peer-reviewed journals and in the proceedings of professional conferences, including *Ecology of Freshwater Fish*, *Geomorphology*, and *Proceedings of the Annual Conference of the Southeast Association of Fish and Wildlife Agencies*.

Robert K. Johnson

Robert K. Johnson was a Senior Environmental Engineer in the West Central Regional Office of the Virginia DEQ where he worked on water quality issues for more than 25 years. During his career, he oversaw the regional VPDES (discharge permit) inspection program and the regional

Industrial Pretreatment Program. In these roles and in others at DEQ, Johnson reviewed and analyzed water quality data, assessed potential pollution impacts, reviewed pollution control plans, and applied regulatory standards. In a private capacity, he led the effort to gather ecological and water quality data on Bottom Creek and to have it designated as an Outstanding National Resource Water (Tier III water), under the Clean Water Act and the Virginia water quality standards regulation and he has conducted water quality assessments through stream benthic macroinvertebrate sampling.

Rick Lambert

Rick Lambert is a member of the Virginia Cave Board. The Cave Board was created to administer the Virginia Cave Protection Act and its members are chosen "on the basis of activity and knowledge in the conservation, exploration, study and management of caves." Lambert is a member and has served as President of the Virginia Speleological Survey, an official survey of the National Speleological Society. He is database manager for the Highland County Cave Survey, an organization which collects karst data on Highland County, Virginia and archivist for the Lambert Archives, an organization which collects karst data on Virginia and West Virginia.

William Limpert

William Limpert holds a B.S. degree from the University of Maryland. He performed stormwater management reviews and inspections for the National Capital Park and Planning Commission and worked with the Montgomery County Department of Environmental Protection on floodplain projects. He worked for the Maryland Department of the Environment for 28 years, performing inspections and enforcement duties pertaining primarily to erosion and sediment control, stormwater management, and waterway construction. He also performed inspections and enforcement duties pertaining to discharge permits, surface mines, agricultural pollution issues, timber operations, and non-tidal wetlands. Limpert was head enforcement officer for erosion and sediment control and stormwater management for the Interstate 68 project through Western Maryland.

Dr. Brian R. Murphy

Brian R. Murphy is a Fellow of both the American Fisheries Society and the American Institute of Fishery Research Biologists, holds a PhD degree in fisheries science and aquatic conservation from Virginia Polytechnic Institute & State University, and an M.S. degree from Purdue University focused on water quality and aquatic contaminants. His 38-year career as a research and teaching professor at three major universities (Texas Tech University, Texas A&M University, and Virginia Tech) has focused on broad issues in natural resources conservation, particularly aquatic ecology and fisheries management. He has authored or coauthored more than 140 peer-reviewed articles in more than 30 different scientific journals dealing with conservation and management of natural resources. He has taught more than 20 different university courses in 7 countries focusing on all aspects of conservation of both terrestrial and aquatic ecosystems. Murphy edited *Fisheries Techniques* (1996), a globally standard text in fisheries education and research, and he authored *Case Studies in Fisheries Conservation & Management* (2010). He currently serves as Second Vice-President of the American Fisheries Society (AFS), the oldest and largest aquatic conservation organization in the world. He will

ascend to the presidency of the AFS in 2020. Murphy has been recognized with lifetime achievement awards for significant contributions to aquatic and fisheries science and education by the Fisheries Management Section of AFS, the Education Section of AFS, the Texas Chapter of AFS, and the Virginia Chapter of AFS. He serves as the Chair of the Science Committee for Preserve Craig Inc., a citizen group dedicated to protecting the environment and quality of life in Craig County, Virginia.

David Sligh

David Sligh has a degree in Environmental Science from the University of Virginia and completed course work in ecology at McNeese State University. He has more than 35 years of experience in planning, conducting, and reviewing water quality assessments and pollution investigations. He worked as a water quality specialist for the State Water Control Board and as a Senior Environmental Engineer for the Department of Environmental Quality. He planned and conducted an EPA-funded study on stormwater pollution impacts in western Virginia, designed an ambient water quality monitoring system for the West Central Region that served as a model for other DEQ regional offices, and he supervised DEQ engineers conducting water permitting and enforcement activities. He has served as an expert witness for DEQ in state and federal court proceedings and for citizen groups in Georgia, providing testimony on stream ecology, pollution impacts, and application of water quality standards. Sligh has worked on water quality issues and cases in ten states and the District of Columbia, designing water monitoring studies and preparing technical reports on pollution impacts and the application of regulatory standards for submittal to regulatory agencies and use in court cases. Sligh helped plan and supervised comprehensive watershed assessments funded by state and federal grants and designed implementation plans to address pollution impacts. He currently serves as Conservation Director for Wild Virginia, working in regulatory processes before the U.S. Forest Service and Virginia state agencies. He has worked as a consultant for organizations in Maryland, Pennsylvania, West Virginia, South Carolina, and Virginia, with special emphasis on water quality impacts from natural gas pipelines

Rick Webb

Rick Webb has an M.S. degree in Environmental Science from the University of Virginia. He recently retired as a Senior Scientist in the University's Department of Environmental Sciences where his professional emphasis was on scientific investigation, analysis, and assessment contributing to the preservation of ecosystem integrity in the forested mountains of western Virginia and the central Appalachian region. During 30 years at the University he coordinated and participated in the development of regional research and monitoring programs addressing hydrologic and biogeochemical status and trends in relatively undisturbed stream and watershed systems. Webb participated in technical committees and as a report author for a number of regional assessments concerning the effects of air pollutants on aquatic and terrestrial ecosystems in national parks and national forests in the Appalachian region. As an expert witness for the U.S. Department of Justice he prepared expert reports and provided testimony in multiple civil cases concerning the effects of power plant emissions on aquatic systems. On behalf of the U.S.D.A. Forest Service and the National Park Service he contributed to development of protocols for stream and soil data collection and monitoring programs. He is

an author of multiple papers published in peer-reviewed scientific journals. Since 2014 he has served as Program Coordinator for the Dominion Pipeline Monitoring Coalition, an organization of citizen volunteers, conservation groups, and environmental scientists working to ensure rigorous and objective review of water resource impacts and other environmental issues related to the proposed Atlantic Coast Pipeline.