The Politics of Science or the Science of Politics

by John Arway
Executive Director, PFBC

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Part 4: Susquehanna River Impairment

An impaired waterbody is "any waterbody of the United States that does not attain water quality standards (as defined in 40 CFR part 131) due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment." (U.S. Environmental Protection Agency 2016). The Clean Water Act, as amended, 33 U.S.C. 1251 et seq. further requires under subsection 303(d) of the Act that:

(1)(A) Each State shall identify those waters within its boundaries for which the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) of this Act are not stringent enough to implement any water quality standard applicable to such waters. The State shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

The term "303(d) list" contains a state's list of impaired and threatened waters. States are required to submit their list for Environmental Protection Agency (EPA) approval every two years. For each water on the list, the state identifies the pollutant causing the impairment, when known. In addition, the state assigns a priority for development of Total Maximum Daily Loads (TMDL), a plan designed to abate the sources and causes of impairment (40 C.F.R. §130.7(b)(4)).

Pennsylvania's 303(d) lists are due to be submitted to the U.S. EPA by April 1 of every even numbered year. However, Pennsylvania's draft report was sent out for public comment on August 1 and the deadline for comments was September 12. The final report must be submitted to U.S. EPA Region 3 for review. Within 30 days after receipt, EPA can approve, disapprove, or conditionally approve the state's list. If EPA partially approves and partially disapproves a list because some waters have been omitted, it must act within 30 days to add these waters to the state's list.

Lesions and sores caused by bacterial infections appeared in 2005 on young-of-year (YOY) Smallmouth Bass and produced a massive fish kill that still affects the fishery today. The average catch rate of adult Smallmouth Bass is only 20 percent of what it was prior to 2005. YOY Smallmouth Bass catch rates are a third of what they were prior to 2002. Adult bass have been found with cancerous tumors, open sores, and lesions. Black spots that aren't understood (blotchy bass syndrome or melanosis), as well as high rates of intersex conditions (male bass with egg precursors and hormones, which should be found only in female bass) caused by exposure to endocrine disrupting chemicals (EDCs) now occur. These chemicals are coming from sewage treatment plant outfalls and other anthropogenic sources. Unprecedented algae blooms fueled by excessive dissolved phosphorus, along with low dissolved oxygen and high pH conditions are all factors in this complicated problem.

A team of scientists from a variety of state and federal agencies as well as academia came together in 2015 to "identify the causes of Smallmouth Bass declines on the Susquehanna River." They analyzed complex sets of environmental data to input into a U.S. Environmental Protection Agency (EPA) modeling tool called CADDIS (Causal Analysis/Diagnosis Decision Information System). They concluded, based on known evidence, that Endocrine Disrupting Chemicals (EDCs) and herbicides along with pathogens and parasites and other stressors were likely causes of the disease (Shull and Pulket 2015).

In a recent article, I discuss the facts that we know about herbicides and endocrine disrupting chemicals and why we need to begin taking action (Arway 2016). I also discuss the challenges controlling nutrients, since Pennsylvania contributes the majority of nutrients and sediments that are delivered to the Chesapeake Bay by the waters of the Susquehanna River. Dissolved phosphorus has been widely accepted as the rate-limiting nutrient that controls algae blooms in flowing waters. Therefore, it continues to make sense that we create and implement a plan (Total Maximum Daily Load) to protect the Bay, the river, and our bass.

The dissolved phosphorus dilemma of the Susquehanna River and Chesapeake Bay is a national problem identified by EPA in its National Rivers and Streams Assessment Report (U.S. Environmental Protection Agency 2013). A key finding of the report is "Forty percent of the nation's river and stream length has high levels of phosphorus." It concludes, "Our rivers and streams are under significant stress and more than half exhibit poor biological condi- tion." Staff from the PFBC mined the dataset used in the national report and found data from the only four sites sampled on the Susquehanna River that rated poor for total phosphorus and fish metrics.

In a May 2016 News Release, the Pennsylvania Department of Agriculture proudly announced that "Pennsylvania is the third largest egg-producing state in the nation, with an average of 23.9 million hens producing more than 7 bil- lion eggs each year." Should it not follow that Pennsylvania is the third largest poultry litter producing state in the nation? It might be time to start thinking more about whether we are properly disposing our animal manure or over treating our soils.

On July 28, 2014, in a letter I wrote to Mr. Shawn Garvin, Regional Administrator of the U.S. EPA Region 3 Office, I observed that "a review of data produced by the United States Department of Agriculture's National Agriculture Statistics Service shows that the acres of cropland and pastureland treated with manure ha[ve] increased 1.5 percent from 2007 through 2012 despite the fact that there are over 1,000 less farms spreading manure. Over 13 percent (3.9 million acres) of Pennsylvania's land surface (28.6 million acres) was treated with manure and/or commercial fertilizer in 2012. It is easy to see that the concentration of these applications is greatest in the Susquehanna River Basin."

CADDIS results were reported to the PADEP which independently decided that there is still not enough information to list the Susquehanna River as an impaired water (PADEP 2016). PADEP staff will continue to collect and evaluate data to make a "final" decision in their 2018 Integrated Report. The importance of this decision is critical to the fate of the Smallmouth Bass in the Susquehanna River. It is also integrally related to the Commonwealth's responsibility to meet the cleanup goals for the Chesapeake Bay. We know what the problems are, but do we care enough

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to fix them?

When appointed PFBC executive director, I agreed to take on public policy issues that address our public rights for clean air, pure water, and the preservation of the natural, scenic, historic, and esthetic values of our environment guaranteed to all of us by Article 1, Section 27, of our state Constitution. When I took my oath of office, I welcomed my professional responsibility to uphold the Constitution and fulfill my duty as trustee of our public natural resources and to conserve and maintain them for the benefit of all the people. They are, after all, the common property of all the people, including generations yet to come. As an advocate for the Smallmouth Bass that continue to be impacted by a variety of environmental stressors, I thought that, as an agency, we did all that we could do when our board enacted the catch and release regulations and closed bass season from May 1 through June 12 to protect the adult bass and their developing fry. I was wrong.

We can and should do more as the public service agency responsible for protecting, conserving, and enhancing our Commonwealth's aquatic resources and providing fishing and boating opportunities. We created our Save Our Susquehanna (SOS) campaign. The campaign asks all Pennsylvanians to either buy a fishing license or donate through our SOS First Giving fund-raising site to help begin fixing the river's problems. Over the past year, we have received over $50,000 in public donations, which we matched with $50,000 in PFBC funds. These funds were used to complete a watershed restoration project on Limestone Run, Northumberland and Montour counties. Significant reductions in sediment and nutrients to the Susquehanna River were accomplished and native Brook Trout were transferred into the restored stream habitat.

The appearance of a single cancerous tumor on a Smallmouth Bass caught from the Susquehanna on Election Day in 2014 took this story viral and changed it from a fishing and science story to a public policy story. You can imagine the questions that were being posed on discussion boards all across the country about what caused this tumor to occur and what other problems, both aquatic and human health, it may indicate?

These known facts should serve as the basis for identifying solutions that can be used to reduce and repair the harm we have done to our land, water, and public natural resources. I previously explained that scientists are taught to follow the scientific method, which requires repeated experimentation to minimize the uncertainty with the results. I also understand the more subjective standards of proof required by the law and used by our courts for their decisions.

So, what standard of proof should be used to judge the fate and future of the remaining bass in the Susquehanna River? Five different PADEP Secretaries, spanning three separate administrations, have said, "We will follow the science for this decision." In this case, I believe that the trier of the facts should use the certainty of the information we have collected rather than focus on the uncertainty of the information we have yet to collect. Our scientists have been collecting information for over 11 years and will continue to collect information into the future. That is their job. It's time for policy makers to become brave enough to not "fear the known" or the results of their own decisions. We need to make this critical public policy decision involving the impairment of the river using a rational standard of proof based upon known facts.

The longer we delay the decision, the more probable that the harm will continue due to our fear of the unknown. So, which fear will determine the fate of our bass? Fear of the known, resulting in action, or fear of the unknown and inaction? I will continue to advocate for urgent action. Our bass depend on it, our anglers expect it, and our Constitution requires it.

The Future

Pennsylvania has 86,000 miles of streams and rivers, nearly 4,000 lakes and reservoirs, more than 404,000 acres of wetlands, and 63 miles of Lake Erie shoreline, which are home to more than 25,000 species of known plants and animals, and perhaps, many thousands more yet to be identified. These facts demonstrate the enormity and complexity of the challenges that we all face as public servants as we strive to fulfill our statutory, regulatory, and Constitutional duties to protect our environmental rights.

More than 150 species of plants and animals have been lost from Pennsylvania, and 664 others are species of greatest conservation need and are detailed in our Commonwealth's State Wildlife Action Plan: "90 birds, 19 mammals, 65 fish, 22 reptiles, 18 amphibians and 450 invertebrates. The major threats to their continued existence have been identified as residential and commercial development (15 percent), energy production and mining (13 percent), pollution (13 percent), invasive and other problematic species, and genes and diseases (12 percent)."
We currently have a population of 12,763,536 people, which continues to increase on a fixed amount of land, 45,333 square miles. As of 2015, 83,438 miles of streams and rivers, out of a total of 86,000 miles, have been assessed by PADEP staff for aquatic life use support. Approximately 19 percent (15,882 miles) do not fully support healthy aquatic communities. Furthermore, some of these waters are still not fishable or swimmable. We have the nation's 16th largest river, the Susquehanna River, which drains nearly half of Pennsylvania's land area and has been identified as a major contributor to the impairment of the Chesapeake Bay. We also know that 15,882 miles of our streams and rivers and 37,761 acres of our lakes are not attaining their aquatic life uses because of the current and legacy impacts from agriculture and coal mining creating sil- tation, metals, nutrients, and organic enrichment of our waters (PADEP 2016). I believe that our future is bright but not without challenges. We have made substantial progress over the last generation by cleaning up our waters so that we can now say that we have more waters to fish today than when we were children. However, yesterday's challenges were simple compared to the environmental and natural resource challenges that we face in the future.

Today's challenges include cancerous tumors, bacterial infections, black spot, and intersex in Smallmouth Bass in the Susquehanna River; rapidly expanding deep natural gas development across Pennsylvania and the uncertainties about fracking; native Brook Trout compromised by changing climate; aquatic invasive species (AIS) outcompeting native species; lakes, rivers, and Chesapeake Bay clogged with nuisance algae blooms; fewer people, including our legislators, fishing, boating, and recreating outdoors; and our unfulfilled obligation to restore American Shad to the mighty Susquehanna River.

Our new challenges will no longer be at the local scale, thus requiring much different solutions at the watershed, regional, national, and even global scales. We will have to work across disciplines and use the appropriate science to diagnose problems. Innovative engineering skills will have to be applied to develop solutions, and we must have the political will to create laws and provide funding for solutions. It won't be easy, but I am confident that our next generation will have the knowledge, skills, abilities, and the guts to get it done right.

There was a time in American history during the Great Depression in the 1930s when a technocracy was our society's preferred form of governance (Wikipedia 2016a, 2016b). It provided for people in positions of responsibility to be selected on the basis of their technical knowledge and involved applying the scientific

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A Commonwealth Plan for Fishing and Boating in PA

Many readers of On Target were Boy Scouts or Girl Scouts as kids. Even if you were not a Scout, I am sure you are familiar with the motto to "Be Prepared."

On September 25, 2017, the Pennsylvania Fish and Boat Commission (PFBC) Board of Commissioners took steps to be prepared by voting to authorize me as Executive Director to make up to $2 million in cuts in fiscal year 2018-19 absent a revenue increase. Despite having repeatedly made our case for the delegation of authority to set our own fees or a fee increase by the legislature, I felt it was important to explain the reasoning behind the Board's action and sent a note entitled Fiscal Responsibility to all members of the General Assembly four days after the Board acted.

It soon became apparent that legislators and the public were also very interested to know what we would do with our reserve funds if we received a revenue increase. To explain how we would use our uncommitted reserves, I drafted a follow up message to the legislature entitled "A Commonwealth Plan for Fishing and Boating in PA."

As I have told many people, the PFBC would much rather implement that plan than have to further curtail services to Pennsylvania anglers, boaters, and aquatic resources. (Even if we are forced to make additional cuts, the decision about which streams and lakes will or not will not be stocked in the absence of a fee increase will not need to be made until July 1, 2018. We will reserve any such decisions until that time.)

With new revenue in place, our first action would be to continue to operate all of our hatcheries at current production levels, which would mean no reductions in trout, warmwater, or coolwater fish stockings.

Next, we would implement a plan to restore law enforcement services. Vacant Waterways Conservation Officer (WCO) positions statewide have risen through attrition to 17 WCOs, which include one investigator and five sergeants and has resulted in 10 open field districts. With approximately 30 of our officers eligible to retire now (and nearly as many more in the next three years), that number will continue to grow, and customer service, public safety, and resource protection will continue to diminish. As soon as revenue increases or we receive legislative approval to increase fees, we will request authorization from the Governor's Office to expand our complement to run a new school of 20 officers to keep the fish in our waterways and our recreational users safe.

We would also immediately begin spending uncommitted reserves on prioritized deferred infrastructure and other critical needs when we receive a fee increase. In the short-term, we will start addressing a backlog exceeding $6 million, and we will begin to address other projects that total approximately $110 million.

The following are the top 10 projects we have identified for initial attention: Hatchery Oxygen Alarms; Stocking Truck Tanks; Watercraft (Boats, Engines); Access Upgrades (Docks, Signs, ADA); Law Enforcement Radio Upgrade; Infrastructure (Boiler and Roof Repairs); Mowers, Trapnets, and Transport Trailers; Law Enforcement Patrol Vehicles; Construction and Fisheries Pickups; Muncy Access Replacement.

The Hatchery Oxygen Alarms are particularly timely given all of the recent attention on stocked trout. Hatcheries are complex systems with multiple variables necessary to raise fish, but oxygen is the limiting factor for life support. Oxygen alarms are the most important tool available to alert hatchery staff to a life-threatening event that could cause a fish kill.

The following major categories represent pressing needs toward which we could direct unrestricted revenues long-term: state fish hatcheries and support for cooperative nurseries; fishing and boating access areas; Commonwealth-owned dams managed by the PFBC; habitat projects that maximize ecological and recreational benefits of streams and lakes. These investments are statewide, have broad public safety benefits and economic value, and form the cornerstone of fishing and boating opportunities throughout Pennsylvania.

Finally, the PFBC is required to obtain legislative authorization (capital authorization) for all capital projects with an estimated cost of $300,000 or more. Generally speaking, once capital authorization is provided for a PFBC capital project and we decide to move forward with the project, our agency must advance 100 percent of the estimated cost of the project to the Department of General Services (DGS). DGS will bid, award contracts, and manage and oversee all such projects. With the exception of funding for a number of high-hazard unsafe dams, the PFBC has historically relied on the reserves in its Fish Fund and Boat Fund and Growing Greener 2 funds to provide the required money up front to pay for all capital projects.

This is an excellent example of why our agency needs to maintain a solvent unrestricted reserve to be prepared. In fact, we recently needed to tap

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the reserve to advance over $10 million to DGS for the Tamarack Lake project in Crawford County. We will be reimbursed over a number of years for a majority of the project through an H2O PA grant, but we needed to front the money to advance the project.

By having a solvent reserve, the PFBC is better positioned than most state agencies to both weather uncertain financial times and to reinvest in projects that benefit our customers once our fiscal situation improves.

PFBC

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method to solve social problems.

Technocrats are defined as individuals with technical training who perceive many important societal problems as being solvable. This is unlike our present bureaucratic system in which a group of nonelected government officials govern large institutions and enjoy managing information, processing records, and administering complex systems (Clegg, Harris, and Hopfl 2011). The German sociologist Max Weber ([1922] 1978) explained that a bureaucratic form of government was necessary because more people create a more complex administrative system and supported the need of a bureaucracy as the most efficient form of an organization. He also warned that increasing bureaucratization can lead to a soulless "iron cage" of bureaucratic, rule-based, rational control.

The most challenging part of my position has been the politics of science and trying to convince our scientists to become advocates for the science they produce. We have far too many data collectors who are well trained in the scientific method but unwilling to advocate for what it concludes. Their reluctance is often explained by their desire to stay unbiased and many believe their role is to hand over their experimental data to others who will use it to further public policy positions. Unfortunately, there are not sufficient numbers of technocrats in today's society who understand how to translate the science for policy or political decisions and far too many bureaucrats who are concerned only about processing decisions based upon the letter of the law, regulation, or policy as defined by someone who preceded them.

My other major challenge is with the science of politics and trying to explain the meaning and importance of the science so that politicians can apply it during the drafting of the laws that they promulgate. House Bill 1576 was introduced in the General Assembly several years ago, and it was intended to place additional legislative oversight on the process of listing plants and animals on the Commonwealth's Threatened and Endangered species lists, which fall within the statutory responsibilities of the PFBC, the Pennsylvania Game Commission, and the Pennsylvania Department of Conservation and Natural Resources. HB 1576 also included the designations of wild trout streams. These designations are science-based determinations based on whether a species is rare or whether a stream supports wild trout. The science-based process was targeted to undergo a social/economic public interest test if promulgated. After many debates at public hearings across the Commonwealth, the science arguments and the public will prevail due to widespread public outcry about politicizing a truly science-based decision.

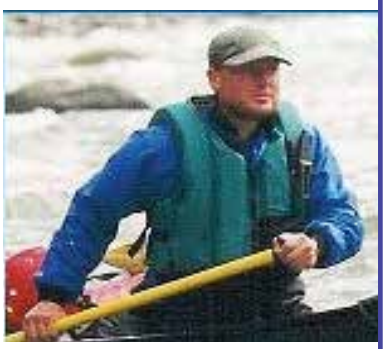
Our future decisions will be far more complicated than those of our past and present. They will involve decisions about environmental and human health impacts that will test our political, social, economic, engineering, and science knowledge and require multidisciplinary cooperation. Our scientists must understand the politics and our politicians and administrators must understand the science. We cannot afford to waste energy debating whether a river is impaired, the climate is changing, a species is rare or common or a stream supports wild trout. We need to begin rolling up our sleeves and working together, technocrats and bureaucrats, politicians on both sides of the aisle, in order to prepare for tomorrow's challenges. The alternative could be Weber's prediction.

John arway is executive director of the Pennsylvania Fish and Boat Commission. He is the Commission's chief executive officer and chief waterways conservation officer. He has worked for the Commission as a fisheries biologist for 37 years. He is a member of the Atlantic States Marine Fisheries Commission, Mid-Atlantic Fishery Management Coun- cil, Pennsylvania Environmental Quality Board, Wild Resource Conservation Board, and Sportfishing and Boating Partnership Council and serves on the executive committees of the Association of Fish and Wildlife Agencies and the Northeast Association of Fish and Wildlife Agencies. He is past president of the Pennsylvania Chapter and Northeast- ern Division of the American Fisheries Society. He has received the American Fisheries Society, Fisheries Management Section Award of Merit, Pennsylvania Council of Trout Unlimited's Outstanding Professional Conservationist Award, and Pennsylvania Associa- tion of Environmental Professionals' Water Lyon Award. He has dedicated his career to the protection, conservation, and management of the Commonwealth's aquatic resources in order to provide fishing and boating opportunities. He has testified as an expert witness in over 100 cases and is an effective advocate for applying scientific facts in legal, public policy, and political discussions. He holds a bachelor's degree in biology from the Univer- sity of Pittsburgh and a master's degree in aquatic biology from Tennessee Technological University.

Commonwealth Forum

Life Jackets Save Lives - Follow Safety Tips in Cold Weather

When sunny days tempt the boater in you, don't forget about your life jacket, especially if you are planning to use a canoe, kayak or similar small boat. Beginning Nov. 1 and lasting through April 30, individuals are required to wear a life jacket while underway or at anchor on boats less than 16 feet in length or on any canoe or kayak. The requirement applies to all PA waters.



To learn more about life jackets and cold water survival, visit
http://fishandboat.com/safety.htm and www.wearitpennsylvania.com