

Straight TALK

by **John A. Arway**

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Fear of the Known

Many have a fear of the unknown. How often do we run from danger or avoid imaginary threats? Fear can be defined as **False Evidence Appearing Real**. Let's discuss the reverse paradigm. Where true evidence is dismissed as false, causing failure to act to solve a problem.

I was educated as a fisheries scientist and have a long career collecting, analyzing and interpreting biological data, reporting my findings and defending my opinions in court. Properly applying the scientific method and telling the truth have been key factors for my success. The scientific method is defined as "the procedure that has characterized natural science since the 17th century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses."—Oxford English Dictionary, 2014.

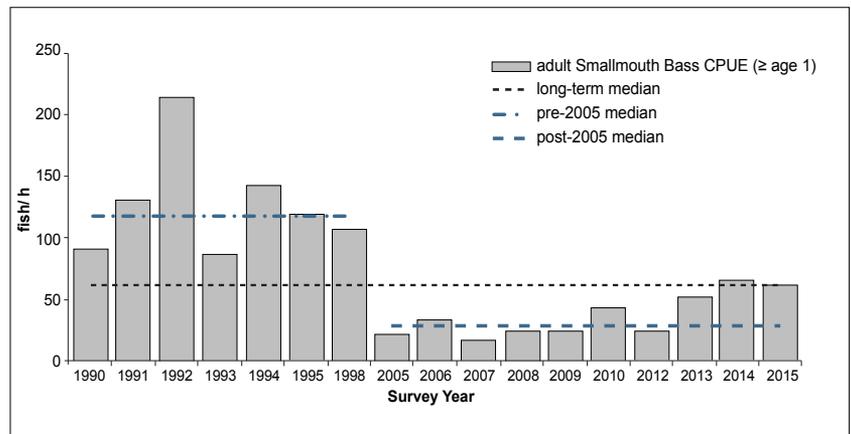
The use of the scientific method is the bond that unifies scientists in all professions. It's ironic to hear non-scientists say, "we will follow the science" as they discuss public policy decisions. Often, it is not the science that prevails. Frequently, political, social and economic variables enter the discussion while science takes a backseat in decision-making.

photo-PFBC Executive Director John A. Arway

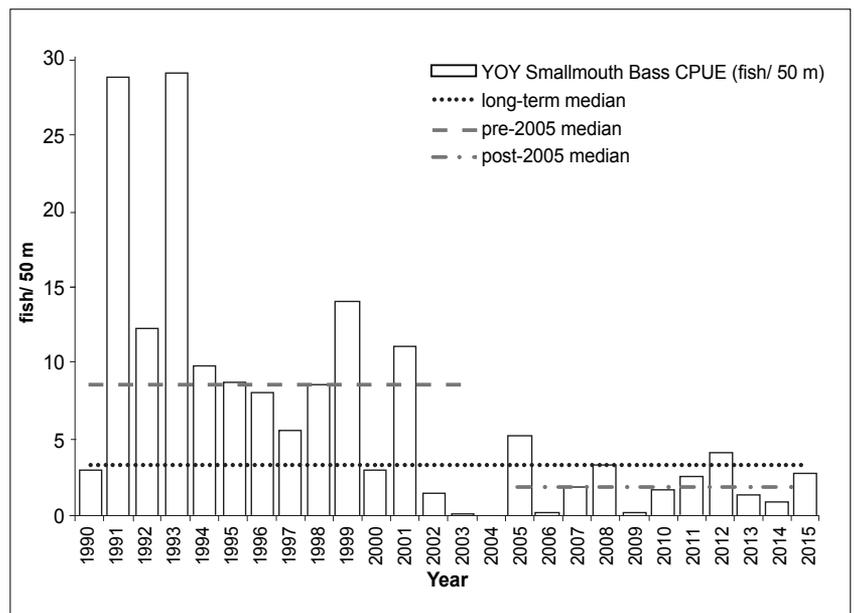


Roundup Ready® crops are genetically modified seeds that resist the effects of herbicides, allowing for the use of more frequent and greater doses to kill intolerant plants.

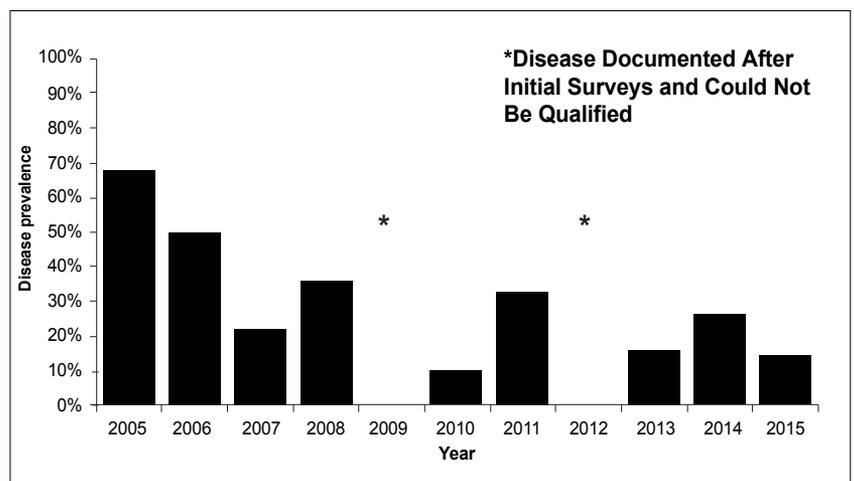
Pennsylvania Fish & Boat Commission (PFBC) Smallmouth Bass Data



Boat electrofishing catch per unit effort (CPUE; fish/h) of adult Smallmouth Bass (age 1 and older) at the Susquehanna River between Sunbury and York Haven.



Backpack electrofishing catch per unit effort (CPUE; fish/50m) of Young-Of-Year Smallmouth Bass at the Susquehanna River between Sunbury and York Haven.



Proportion of Young-Of-Year Smallmouth Bass with clinical sign of disease caught during backpack electrofishing surveys at the Susquehanna River between Sunbury and York Haven. Asterisks indicate years when onset of disease was outside of typical survey period and could not be quantified due to changes of capture efficiency of fish.

The average catch rate of adult Smallmouth Bass is five times less than what it was prior to 2005. Young-of-year (YOY) Smallmouth Bass average catch rates are 1/3 of what they were prior to 2002. Bacterial infections plague more than 20 percent of the YOY bass that are collected in nursery areas. Melanosis (black spots) began appearing on adult bass after the 2005 fish kill, and anglers report more fish with black spots every year. High rates of intersex conditions have been found at sampling locations.

Causal Analysis Diagnosis/Decision Information System (CADDIS)

Scientists came together in 2015 to “identify the causes of Smallmouth Bass declines on the Susquehanna River.” They used a United States Environmental Protection Agency (EPA) tool called CADDIS and found, 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.

Herbicides

Glyphosate (Roundup™): Glyphosate, the world’s most popular weed killer, is an herbicide used on agricultural lands across the country to control weeds and maximize crop production. The rate of glyphosate application increased tenfold after Roundup Ready® crops were introduced in 1996. According to the New England Journal of Medicine, the use of glyphosate in herbicides has increased more than 250 times in the United States over the last 40 years.

Last year, the World Health Organization found that glyphosate was “probably carcinogenic to humans,” resulting in the ban of its use in a number of European countries.

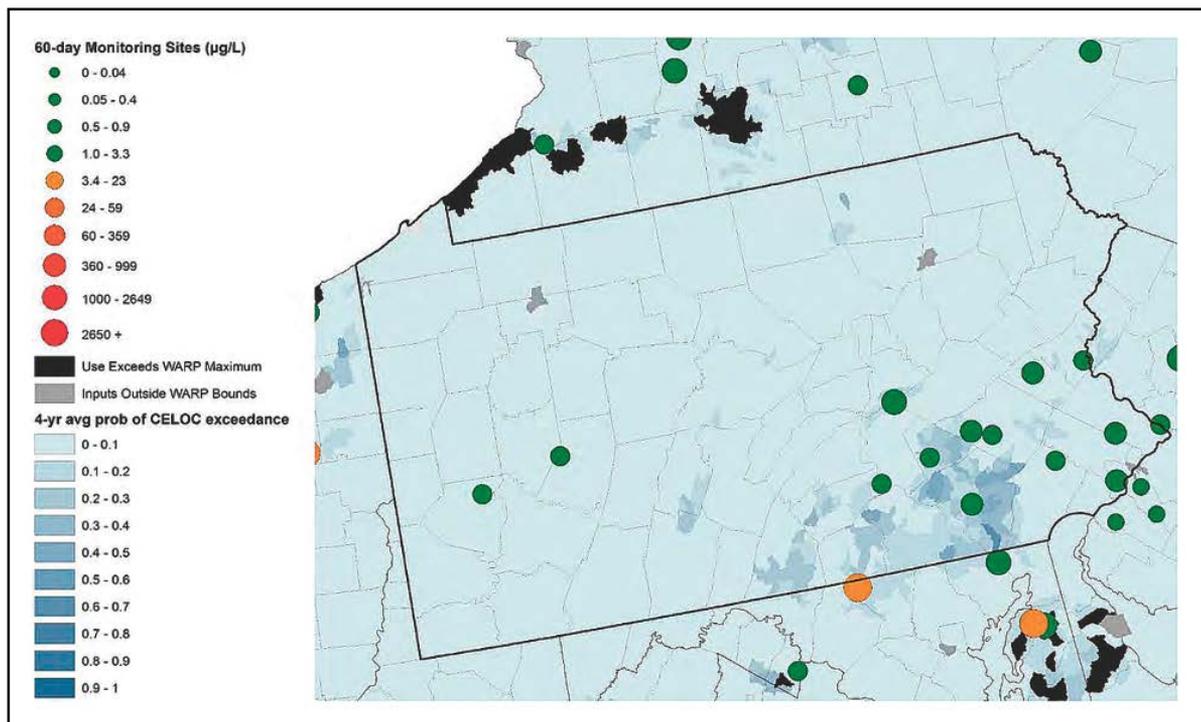
Atrazine: Atrazine is the second-most widely used herbicide in the United States, and it’s estimated that about 70 million pounds of atrazine are used annually in the United States. It was banned in the European Union (EU) in 2004 when the EU found groundwater levels exceeding the limits set by regulators (Wikipedia.com).

The EPA published a draft ecological risk assessment for triazines. The EPA reported atrazine’s effects exceeded its “levels of concern” for chronic risk by 198 times for mammals and 62 times for fish. The following figure from the EPA report shows atrazine application rates for areas of Pennsylvania where the United States Geological Survey Watershed Regressions for Pesticides model (WARP) predicts exceedances of Concentration Equivalent Level of Concern (CE-LOC) will occur. Is it coincidence that these areas coincide with areas of concern for the bacterial infections for Smallmouth Bass?

Atrazine is an endocrine disruptor and has been linked to hormonal defects and cancer in humans. Amphibians have been found at-risk from atrazine exposure by researchers at the University of California, Berkeley, who found about 3/4 of male frogs are sterilized by the chemical, and male tadpoles metamorphosed into female frogs after exposure to certain levels of atrazine. It remains unclear about how much atrazine is actually applied in Pennsylvania; what rates are applied in different watersheds; what the recent trends of application may be; and what levels may be reaching the nursery areas of YOY Smallmouth Bass at critical times?

Nutrients

An article by Karl Blankenship titled “Despite progress, states likely to fall short of interim cleanup targets” (Chesapeake Bay Journal 04 May 2016) points out the challenges confronting Pennsylvania. Pennsylvania contributes the “lion’s share” of



EPA estimated atrazine application rates for Pennsylvania.

nutrients and sediments to the Bay, and they are delivered by the waters of the Susquehanna River. "In the past, the Bay Program's watershed model assumed that the amount of phosphorus that runs off farmland was related to the amount that is applied. But, research has shown that in areas where phosphorus levels have built up in soils over many decades, the nutrient continues to leak out even if little or none is spread on fields."

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 their National Rivers and Streams Assessment Report, 2008-2009 (EPA/841/D-13/001) published in February 2013. A key finding of the report is that "Forty percent of the nation's river and stream length has high levels of phosphorus." It concludes that "Our rivers and streams are under significant stress and more than half exhibit poor biological condition." Staff from PFBC mined the dataset used in the national report and found data from four sites sampled on the Susquehanna River that rated poor for total phosphorus and fish metrics.

Poultry production

On May 20, 2016, the Pennsylvania Department of Agriculture 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 billion eggs each year." It follows that Pennsylvania should be the third largest poultry litter producing state in the nation. Might it be time that we think about whether we are properly disposing our animal manure or over treating our soils?

On July 28, 2014, I wrote a letter to Mr. Shawn Garvin, Regional Administrator of the 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 has 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."

Conclusions

These facts should be the basis for identifying solutions that reduce and repair the harm we have done to our land, water and public natural resources. Although my training caused me to believe that I was going to change the world by

producing good science, that perspective changed when I became involved in public policy and regulatory decisions. I was initially challenged by my professors to design experiments to test the null hypothesis and repeat my experiments to minimize the uncertainty with my conclusions—just as the scientific method requires. A certainty factor of 95 percent was acceptable, but 99.9 percent was the goal. I learned after many hours testifying as an expert witness that judges never expect absolute certainty (100 percent) but only an opinion to "a reasonable degree of scientific certainty."

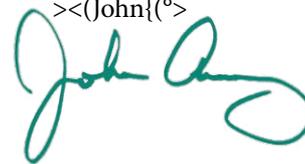
The law has more subjective standards of proof. In civil courts, the standard of proof is "preponderance of evidence" (more likely than not). Although the proof is much greater in criminal courts—"beyond a reasonable doubt" (no reason to believe otherwise), it's a much lower standard of proof than what scientists hold.

So, what standard of proof should be used to judge the fate and future of the remaining bass in the Susquehanna River? Five different Department of Environmental Protection (DEP) 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." We need to make this critical public policy decision involving the impairment of the river using a rationale standard of proof based upon known facts.

If we don't act soon, we run the risk of delaying decisions 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 us to do our duty.

Your Director,

><(John{°>



Director's Note: On July 28, 2016, DEP notified PFBC that they **will not** list the Susquehanna River as impaired. DEP staff will continue to collect and evaluate data to make a "final" decision in their 2018 Integrated Report. The 2016 Report is currently available for public comment through September 12, 2016. The PFBC recommends that anyone concerned about the future of the river and health of the Smallmouth Bass provide comments to DEP at ecomment@pa.gov or DEP, Policy Office, RCSOB, P.O. Box 2063, Harrisburg, PA 17105-2063.



The mission of the Pennsylvania Fish & Boat Commission is to protect, conserve and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities.