

Exploring the Black Hole in Nonpoint Source Water Quality Data

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ABSTRACT:

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To get to where you want to be, you have to start from where you are. That is particularly true with water quality and water quality monitoring data at the state and federal level. This paper will explore public perceptions and stakeholder realities of agricultural nonpoint source water quality based on data contained in the states' water quality assessments 305(b) reports and the U.S. EPA's National Water Quality Assessments. The paper will critique the current information and data reporting methods. Using the data reported, empirical evidence will be presented to show that there is a critical lack of high quality water quality information in 14 states that report >50% of their stream assessment information as being evaluated information. Another 24 states use evaluated information 1 to 49% of the time. This lack of good quality information is dramatically affecting public perception and awareness and impeding goodwill and thus reducing potential involvement of many key stakeholders. Solutions will be offered for restructuring information reporting methods that will improve stakeholder outreach and public understanding.

BIOGRAPHIES:

James W. Porterfield is a technical specialist in land, water and forestry resources for the American Farm Bureau Federation. Since joining AFBF in 1978, he has worked closely with state Farm Bureaus on problems relating to soil conservation, energy resources, water quality and forestry. Porterfield holds a bachelor's degree in forestry and a master's degree in water resources from Iowa State University. He served on the U.S. Geological Survey's Advisory Committee on Water Data for Public Use and the National Water Quality Assessment (NAWQA) Advisory Committee. He currently represents the AFBF on the board of the Conservation Technology Information Center and on the advisory committee of the International Certified Crop Advisers.

Don R. Parrish is an environmental specialist in water quality at the American Farm Bureau Federation. Since joining AFBF in 1988, he has provided ongoing support for State Farm Bureaus, while also serving as a liaison to numerous commodity organizations, industry and trade associations and government agencies. Don holds a Bachelor of Science Degree in Agronomy and Chemistry from Auburn University and a Master of Science Degree in Agricultural Economics from Auburn University. Don serves on the Environmental Protection Agency's (EPA) Phase II Stormwater Federal Advisory Committee, American Society for Testing and Materials (ASTM) Environmental Committee, and the Small Business Administration's (SBA) Small Business Regulatory Enforcement Fairness Act (SBREFA) Committee on Animal Feeding Operations/Concentrated Animal Feeding Operations and Effluent Guidelines.

To get to where you want to be, you have to start from where you are. However, if it is not clear where you are, and especially if you are in a black hole, it is difficult, at best, to determine how to get to where you want to be. And so it is with water quality data.

On March 9, 1999, EPA and USDA released their Unified National Strategy for Animal Feeding Operations. EPA's drive to regulate livestock operations known as Animal Feeding Operations (AFO's) is predicated on concerns for water quality and public health risks. This drive, as you will see in the accompanying graphics is built on a flimsy house of cards which anyone can find in the Appendix of EPA's National Water Quality Inventory 1996 Report to Congress. There is a huge black hole of water quality misinformation that EPA is using to feed public fear that agriculture is polluting 70% of the nation's streams and rivers Figure 1. The reality is that the situation is not anywhere near that bad. According to EPA's own data, agriculture might pollute from 4.8 to 25 percent of the nation's stream and river to some degree, Figures 2 & 3. Where agriculture is responsible for water pollution it must take responsibility and fix it. But, the black hole of data must also be illuminated and cleaned and the house of cards demolished before true progress can be made on water quality.

The data in Table 1 were taken directly from the Appendix of EPA's National Water Quality Inventory 1996 Report to Congress. We have resorted the information to show where information is totally lacking in the seven agricultural subcategories, where data quality is poor ("evaluated" based on someone's best professional judgement) and where states are double, triple and even quadruple counting impaired stream miles.

The question arises, how could they [U.S. EPA and the states] report a total number for miles of rivers impaired by agriculture if there are no numbers reported in any of the seven agricultural subcategories?

The Black Hole of Data

There are 27 states, plus Puerto Rico and several Indian tribes, territories and river basins, where data in the seven agricultural subcategories was not reported in a quantifiable format to EPA by the states or the data was unknown.

However, 22 of these 27 states reported a total number for river miles impaired by agriculture. The question arises, how could they report a total number for miles of rivers impaired by agriculture if there are no numbers reported in any of the seven agricultural subcategories? We have labeled this area of the table "EPA's Black Hole of Data."

It is also important to notice that the states surveyed only 693,905 miles of rivers (see column 2 of Table 1.) for their 1996 reports. That is about 19 percent of the nation's 3.6 million miles of streams and rivers. These surveyed streams were not selected by random sample. More often than not, the surveyed streams were selected because there was reason to suspect that water quality problems existed. And, water quality monitoring, if any, was often performed downstream of a sewage treatment plant.

"Evaluated" Information Giving Ag a Bad Image.

The next item to consider in Table 1 is in column 3 under the heading "Percent of Impaired Miles Evaluated." The data is further suspect because so much of it is "Evaluated." Evaluated means it is not based on actual water quality monitoring, but rather on someone's best professional judgement (BPJ). Figure 4 graphically summarizes the information from column 3. This is the first time that empirical data shows that inadequate water quality monitoring is giving agriculture an unnecessary bad image. The 14 states that made extensive use of "evaluated" information to assess water quality were 3.5 times more likely to declare agriculture as the source of pollution than states that used actual water quality monitoring data 100 percent of the time for their assessments. However, this is not to say that all the data reported by states that monitor water quality is current data. In fact, much of it is more than five years old, and in at least three states where we have looked closely at the state's information, they are still using some monitoring data that is 15 to 20 years old. Things change in 20 years and it is inappropriate to just recycle decades old information as representing today's conditions.

In Table 1 there are seven agricultural subcategories listed as sources of pollution. In the appendix of EPA's report, each subcategory is broken down into whether it is a Major, or Moderate, Minor or Unknown problem. EPA, in its guidance document, states that "...these designations are difficult to quantify and will continue to reflect the best professional judgement (BPJ) of the data analyst."

Divide and Conquer

The last column of Table 1 is also worth noting because it is the sum of the impaired miles of streams from the seven agricultural subcategories. It should add up to the same number as the number in column four (River Miles Impaired by Agriculture.) However, 11 out of 23 states report a larger number in the last column than in column 4, which indicates they are double, triple and even quadruple counting some impaired stream miles within the seven subcategories.

U.S. EPA also double counts stream miles in its graph on page 33 of the 1996 NWQI Report, see Figure 5. This practice of showing total miles or percentages of pollutants by each source is not a useful method of depicting the scope or severity of the true problem. In reality, it is an inappropriate accounting scare tactic that leads to a divide and conquer mentality.

We're Really All in This Together

Illinois is one of the few states where the data is organized in such a manner that it will allow a more accurate depiction of the scope of the water quality problem in the state's streams. Figure 6 is based on data from Illinois EPA. It counts each stream mile only once. It gives the reader a clear picture that cleaning up a mile of stream that is polluted by 11 different sources will be a much different project than cleaning up a stream that is polluted by only one type of source. It also clearly shows that, more often than not, agriculture is not the sole source of pollution within a given stream mile as U.S. EPA's graphic would lead readers to believe. Instead of pitting one group against another, the graph of the Illinois data fosters a climate that we are all in this together and should work cooperatively on problems where they exist. Other states and the U.S. EPA should follow Illinois' example in collecting, organizing and displaying this information.

Ag- a Water Quality Risk to Public Health?

Meanwhile, section 2.2 of the Unified AFO Strategy is entitled "Water Quality and Public Health Risks." It uses the words "can pose," "have the potential to," "can result," "which may be harmful," "can contaminate," "have been associated," and "may produce odors." Not once does it state definitively that there are scientifically documented water quality problems or water quality related public health risks due to livestock. It simply implies that livestock agriculture is big, that big is bad, and therefore, must be regulated.

The United AFO Strategy also states that "Pathogens, such as Cryptosporidium, have been linked to impairments in drinking water supplies and threats to human health." The strategy does not state that livestock are responsible for these problems, but it certainly gives that impression. In a further misrepresentation by omission, it does not acknowledge that a Center for Disease Control report found that agriculture was not to blame for the crypto outbreak that hit the city of Milwaukee a few years back.

Unfortunately, as with many issues, perception and reality often lead to much different conclusions. Despite the perceptions, all indications are that surface water quality in our streams and rivers is improving, and the trend will more than likely continue in that direction for some time even without the costly AFO strategy regulations. But that good news will never see the light of day until we clean up EPA's black hole of data and its associated water quality dust bunnies.

We all need to illuminate and clean this black hole of data. This cleaning must operate at two levels. The best way is to find agricultural problems, if there are any, and fix them. At the same time, we all need to be working with the state agencies to clean up the data mess.

1. Get your state to use reliable water quality monitoring data that is less than 5 years old.
2. States should follow Texas's example and use only actual monitored data that meets QA/QC requirements, to determine whether streams should be listed as impaired.
3. Use graphics like those from Illinois (Figure 6) to show the extent and scope of water quality pollution in rivers and streams.

4. Maps of Change

The general public, as well as farmers and ranchers, should be demanding that the responsible state agency produce a Map of Change every two years as part of the water quality assessment that it must submit to EPA. In fact, there should be two maps, one that shows all waterbodies that have improved in the last two years and are now meeting their designated uses, and one that shows all waterbodies that have degraded in the last two years and are now considered impaired. Currently, based on examining state 305(b) Water Quality reports, there are no states that we know of that produce such maps. Without these maps, there is no clear way of showing whether all the money spent on water quality is really doing any good.

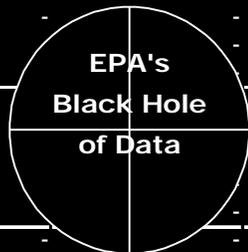
For a more detailed description of the problems with EPA's reports, you can obtain a copy of "By the Numbers, A Review of EPA's National Water Quality Inventory A Crisis in the Making," revised edition, January, 1999. You may obtain it by calling your state Farm Bureau natural resources coordinator or by contacting AFBF at 847-685-8843.

Documented Problems with EPA's Inventory

- Random samples not used to pick streams to be assessed;
- State often assess water bodies with suspected problems;
- Less than 51% of data is gathered via in-stream monitoring;
- "Evaluated" Information (Best Professional Judgement) accounts for 41 % of data;
- Many times there is no water quality monitoring data available.
- Often, data that is cited is more than 5 years old.
- Natural background levels of nutrients & sediment are not considered;
- No allowances made for streambank and stream bottom erosion.

Table 1. Agricultural Sources of Pollution in Surveyed Rivers and Streams, 1996 **

State, Tribe, Territory, or Commission	Total Miles Surveyed	Percent of Impaired Miles "Evaluated"	River Miles Impaired by Agriculture	Nonirrigated	Irrigated	Range	Pasture	Feedlots	Animal	Animal	Sum of Miles in the 7 Sub-categories
				Crops Miles	Crops Miles	land Miles	land Miles	Miles	Operations Miles	Holding Areas Miles	
Other	1,596	na	512	na	na	na	na	na	na	na	0
New York	52,337	?	2,724	-	-	-	-	-	-	-	0
Delaware	735	?	-	-	-	-	-	-	-	-	0
Alaska	-	-	Not File Report	-	-	-	-	-	-	-	0
Idaho	-	-	Not File Report	-	-	-	-	-	-	-	0
Oregon	-	-	Not File Report	-	-	-	-	-	-	-	0
Vermont	5,261	83%	549	-	-	-	-	-	-	-	0
Colorado	35,112	72%	2,088	-	-	-	-	-	-	-	0
Alabama	14,770	70%	1,616	-	-	-	-	-	-	-	0
Missouri	21,015	66%	7,130	-	-	-	-	-	-	-	0
North Carolina	33,931	44%	3,390	-	-	-	-	-	-	-	0
Kentucky	9,219	42%	1,126	-	-	-	-	-	-	-	0
Massachusetts	1,307	42%	69	-	-	-	-	-	-	-	0
California	15,110	42%	4,091	-	-	-	-	-	-	-	0
Arkansas	8,668	39%	3,275	-	-	-	-	-	-	-	0
Maryland	17,000	37%	1,060	-	-	-	-	-	-	-	0
Iowa	10,139	28%	3,349	-	-	-	-	-	-	-	0
Georgia	8,197	26%	48	-	-	-	-	-	-	-	0
Florida	11,403	25%	2,615	-	-	-	-	-	-	-	0
Pennsylvania	24,482	22%	633	-	-	-	-	-	-	-	0
Indiana	8,355	16%	740	-	-	-	-	-	-	-	0
Utah	6,582	13%	1,031	-	-	-	-	-	-	-	0
Maine	31,672	12%	78	-	-	-	-	-	-	-	0
Connecticut	893	10%	83	-	-	-	-	-	-	-	0
South Dakota	3,584	4%	3,121	-	-	-	-	-	-	-	0
New Jersey	3,815	0%	-	-	-	-	-	-	-	-	0
Puerto Rico	5,385	0%	114	-	-	-	-	-	-	-	0
Texas	14,177	0%	355	-	-	-	-	-	-	-	0
Washington	2,645	0%	1,431	-	-	-	-	-	-	-	0
Mississippi *	39,191	95%	36,840	19,894	15,917	-	786	12,915	-	-	49,512*
Nebraska	8,594	73%	5,406	-	-	-	-	-	-	97	97
Hawaii *a	32	69%	10	2	10	-	10	-	-	2	24*
Montana *	17,822	66%	11,187	1,882	7,251	6,855	916	-	102	171	17,177*
Minnesota *	7,793	64%	5,963	5,675	1,369	-	3,813	-	3,384	4,090	18,331*
Wisconsin	19,898	61%	8,198	909	133	0	1,540	0	0	765	3,347
New Mexico	4,061	59%	3,315	-	-	3,148	-	-	-	-	3,148
Arizona *	5,410	57%	2,205	-	551	1,753	-	-	-	-	2,304*
Wyoming *	6,781	57%	3,642	679	2,547	3,642	1,975	-	189	209	9,240*
Illinois	28,454	55%	11,361	7,218	8	5	1,986	124	-	301	9,643
North Dakota *	11,913	47%	3,614	3,112	23	313	1,142	-	-	-	4,590*
Tennessee *	57,436	24%	6,583	2,929	642	1,094	1,094	-	-	1,132	6,891*
Louisiana	15,623	22%	5,682	1,747	1,337	407	1,350	157	-	103	5,100
Rhode Island	532	19%	80	-	20	-	-	-	7	-	26
New Hampshire	10,881	13%	6	0	0	0	6	0	0	0	6
Kansas * b	19,330	11%	15,828	12,728	5,805	-	-	-	7,794	-	26,327*
Virginia *	31,952	8%	1,757	868	-	-	-	-	1,073	-	1,940*
Nevada	1,493	5%	552	-	-	24	-	-	-	-	24
West Virginia	6,644	1%	2,217	490	-	-	673	-	6	240	1,409
Oklahoma *	6,053	0%	3,130	3,117	1,882	3,061	3,060	734	-	1,011	Total 12,865*
Michigan	20,575	0%	586	101	32	15	73	8	-	25	Impaired 254
Ohio	6,560	0%	1,471	600	35	-	115	56	-	24	By 830
South Carolina	19,487	0%	2,773	-	-	-	1,228	-	282	-	Livestock 1,509
Total River Miles	693,905	45%	173,630	61,950	37,562	20,316	19,765	13,994	12,835	8,170	75,081
All Livestock Problems (c) as a % of 693,905 Surveyed River Miles						3%	3%	2%	2%	1%	11%
Miles Reported as "Major" Problems due to Livestock c						3,192	2,328	240	7,158	1,158	14,075
"Major" Livestock Problems as a % of 693,905 Surveyed River Miles						0.5%	0.3%	0.0%	1.0%	0.2%	2.0%



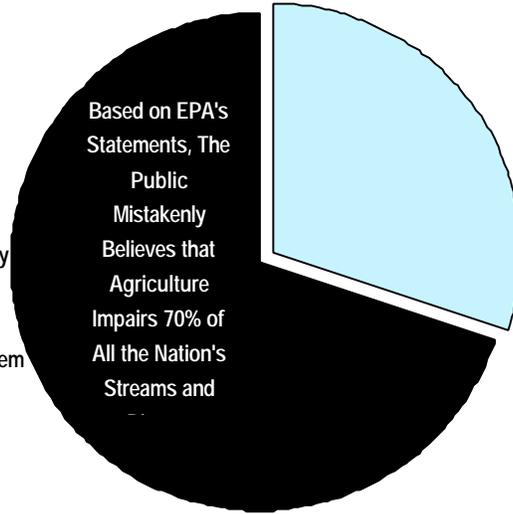
- Not reported in a quantifiable format or unknown
a Entered 1994 data because the State did not report data in its 1996 Section 305(b) report.
b Assessment of streams with beneficial use designation include chronic aquatic life support and contact recreation as described in the Kansas Water Quality Assessment, 305(b) Report, 1996.
c Numbers reported here are the sum of Major, Moderate, Minor and Unknown levels of impairments as reported by the states.
* States where the sum of the seven agricultural subcategories is greater than total for River Miles Impaired by Agriculture.
** Source: 1996 Section 305(b) reports submitted by States, Tribes, Territories, and Commissions, in conjunction with EPA's Total Waters Database.

EPA says agriculture pollutes 70% of the "impaired" streams and rivers,

BUT the public isn't told that a total of only 248,028 miles of streams are reported as "impaired" by all sources, so, it believes that 70% of ALL 3.6 million miles of streams and rivers in the U.S. are polluted by agriculture.

The misperception is that agriculture is a huge problem and that more regulation is needed.

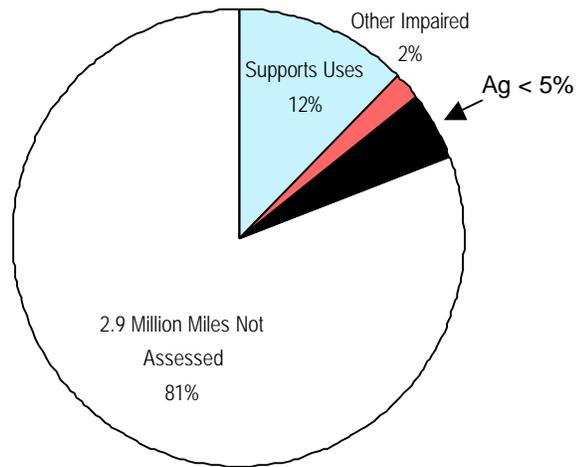
Figure 1



REALITY:

Based on EPA data for the nation's 3.6 million miles of rivers and streams, agriculture is claimed to be responsible for some degree of water quality impairment in less than 5% of ALL the miles of rivers and streams.

Figure 2



The Probability that Agriculture Will be Blamed for Polluting Streams and Rivers Increases Greatly as the Use of "Evaluated" Data Increases

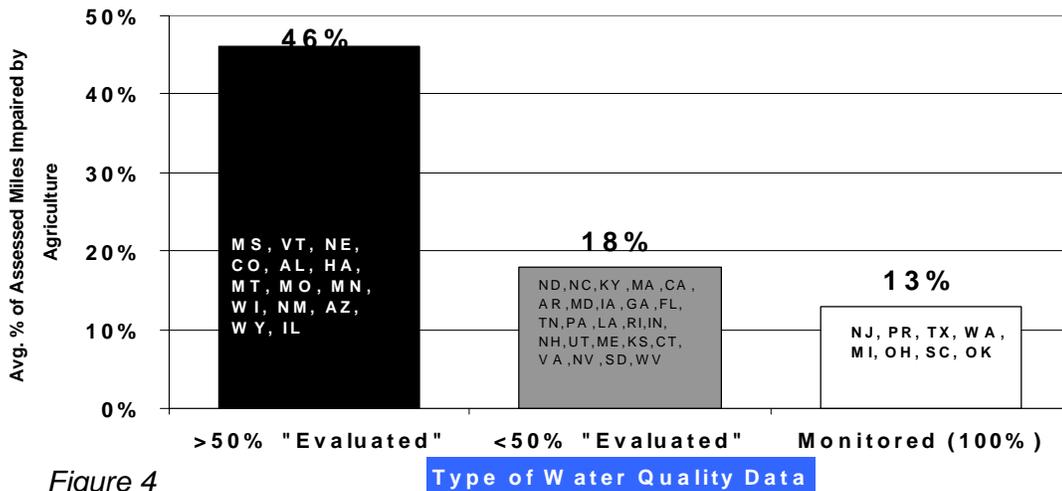
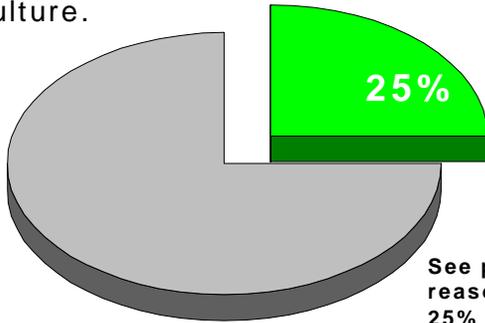


Figure 4

The Big Picture

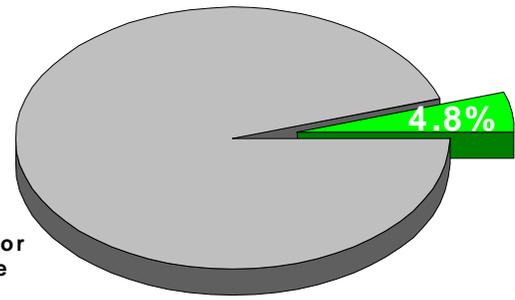
Worst Case Scenario

The worst case conclusion that could be extrapolated from EPA's data would be that water quality in 25% of the nation's 3.6 million miles of rivers and streams might be somewhat impaired due to agriculture.



Best Case Scenario

EPA data shows Agriculture might impair 173,629 miles to some degree, or 4.8% of the nation's 3.6 million miles of streams.

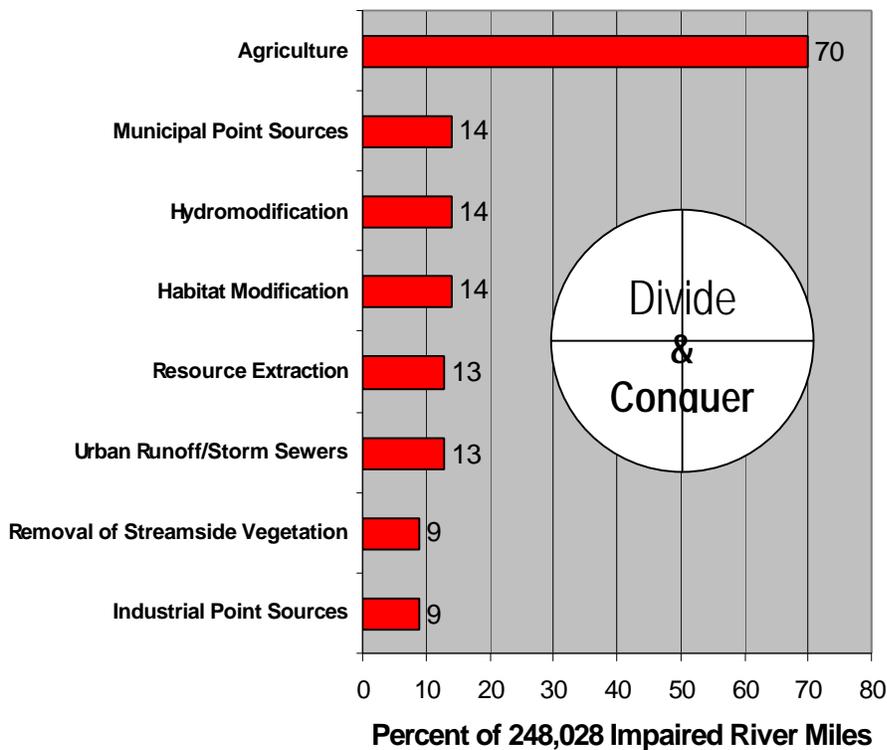


See previous pages for reasons why even the 25% may be too high

The Truth is Somewhere Between 25% and 4.8%, Not 70% as EPA Suggests

Figure 3

Sources of Pollution in Impaired Streams and Rivers of the U.S.



Divide
&
Conquer

This graphic from the U.S. EPA Double Counts Stream Miles and Clearly Implies "Divide and Conquer."

Source: NWQI, page 33, 1996

Figure 5

Type and # of Pollutant Sources Impairing the Same Stream Mile in Illinois

This graphic, based on IL EPA data, demonstrates that cleaning up one source of pollution usually does not take that stream segment off the impaired list. It clearly shows that we are all in this together.

Figure 6

