

13. Fox-Wolf River Basin

Background

The Fox-Wolf River basin of Northeast Wisconsin is a 6,400 square mile drainage area with three distinct sub-basins: the Wolf River, the Upper Fox and Lower Fox River. The Wolf and Upper Fox Rivers drain south and east (respectively) into the Lake Winnebago “pool” lakes and then north through the Lower Fox River to the bay of Green Bay. The Fox-Wolf Basin is the largest drainage basin to Lake Michigan and the third largest to the Great Lakes.

For purposes of this report, the discussion will address all three sub-basins and Lake Winnebago. However, the graphic display and majority of the discussion will focus on the Lower Fox River watershed. Lower Green Bay is also part of the AOC in this area, however, the bay is assessed as part of greater Lake Michigan Open Water chapter. Please see that chapter for further information.

Status of Watershed Management Efforts in the Study Area

Watershed management in the Fox-Wolf basin is conducted under a variety of program initiatives – primarily Wisconsin’s Nonpoint Source Pollution Abatement Program (a.k.a. the Priority Watershed Program) and the Wisconsin Pollution Discharge Elimination System program. Ten of the basin’s 41 watersheds have been identified as priority watersheds. County Land Conservation Departments are provided with state funds for staff and overhead to conduct watershed inventories, develop management plans, contact landowners, and offer cost-share funds to install BMPs.

Funds are also available to other local units of government in urban or urbanizing areas of the watershed. Recently, this program has undergone a re-design which has yet to be completed. No additional watersheds are expected to be selected under the new program, but efforts will continue through local governments on a more limited scope and time frame.

Many other local, state and federal initiatives work on some component of watershed management in the Fox-Wolf basin, too numerous to mention in this introduction. Initiatives range in function from voluntary cost-share programs to local ordinances to state and federal permitting. A recent reorganization of the Department of Natural Resources has established geographic management units (GMUs) designed to better coordinate programs and involve all agencies and individuals. GMU (or Basin) Partner Teams have been established in the Upper Fox, Lower Fox and Wolf River Basins.

Pollutants of Concern

Aquatic Monitoring

Monitoring coverage for LaMP pollutants reported into the STORET system is shown in Figure 43. This map indicates that stations exist for two (mercury and PCBs) of seven critical pollutants, six out of ten pollutants of concern, and none of the listed emerging pollutants. Monitoring for all pollutants is relatively light compared to other watersheds in this analysis. The monitoring is heaviest along the lowest section of the Fox River where it flows out into Green Bay. There are 12 stations monitoring mercury at or near the Fox River outfall, while there are 28 stations for the rest of the Fox-Wolf basin (four in the Lower Fox, three at the entrance and exit of the Fox River to Lake Winnebago, three in the Upper Fox, and 18 in the Wolf River watershed). Ten PCB stations have been placed along the Lower Fox, with one on the shore of Lake

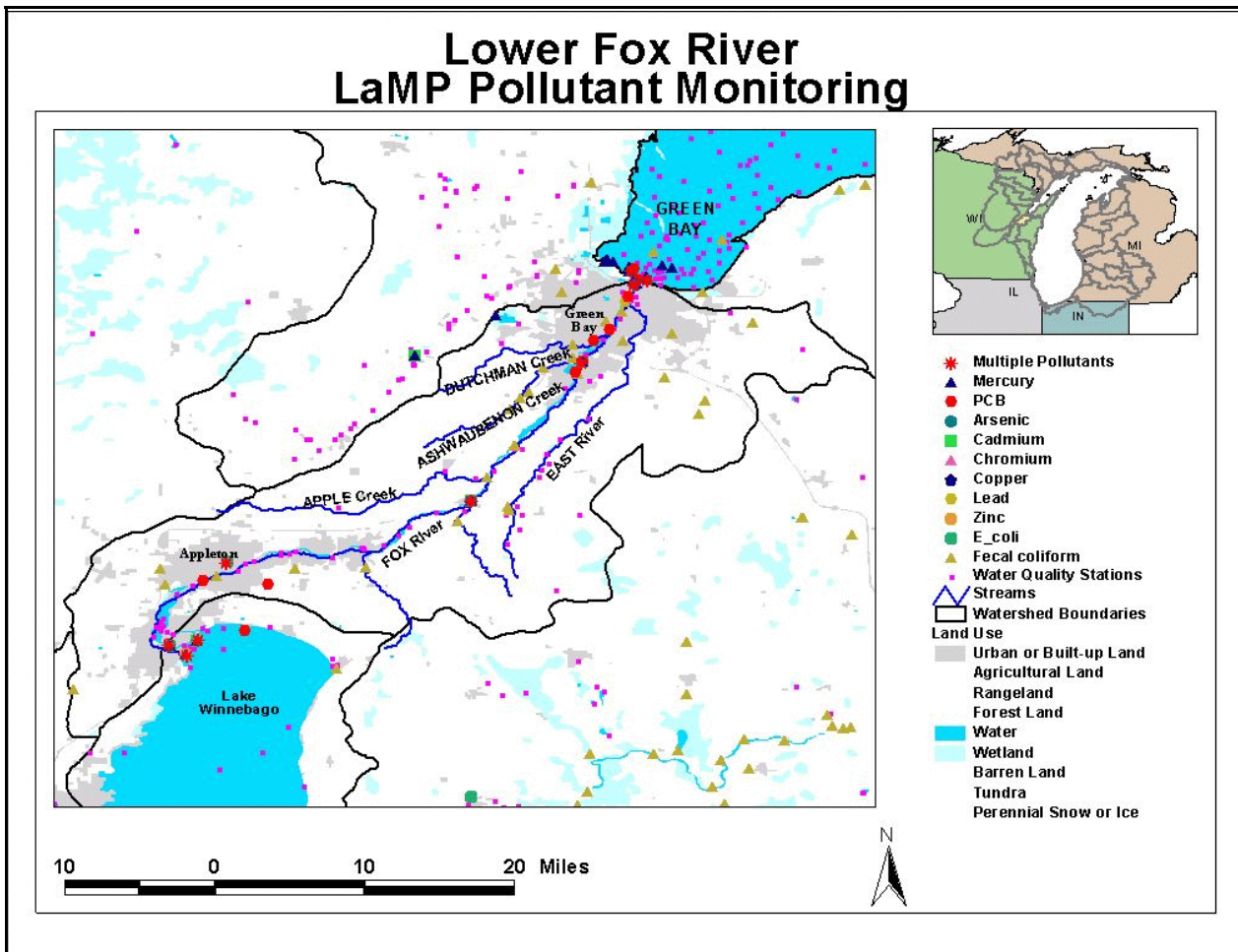


Figure 43. The Lower Fox River watershed with ambient water quality and bacteria monitoring stations from U.S. EPA's STORET system displayed by indicators measured.

Winnebago. The stations monitoring for LaMP pollutants are maintained by WDNR, U.S. EPA (3 programs), COE, USGS-WRD (NAWQA and baseline stations), or EPRI.

In addition, surveys indicate that the Green Bay MSD monitors for all LaMP pollutants with the exceptions of dioxins/furans, hexachlorobenzene, PAHs, and atrazine. This monitoring is conducted on the Lower Fox River at its outflow to Green Bay. Also, the University of Wisconsin-Stevens Point tracks atrazine in the Tomorrow-Waupaca River watershed.

Pollutant Release Monitoring

An examination of Permit Compliance System and Toxic Release Inventory reporting locations in the Fox-Wolf basin indicates a large number of monitoring locations for potential pollution sources throughout the basin (see Figure 44). Clusters of these locations can be found all along the Lower Fox River, as well as in Oshkosh on the western shore of Lake Winnebago, in Fond du Lac on the south shore, and on the shore of Shawano Lake in the Wolf River watershed.

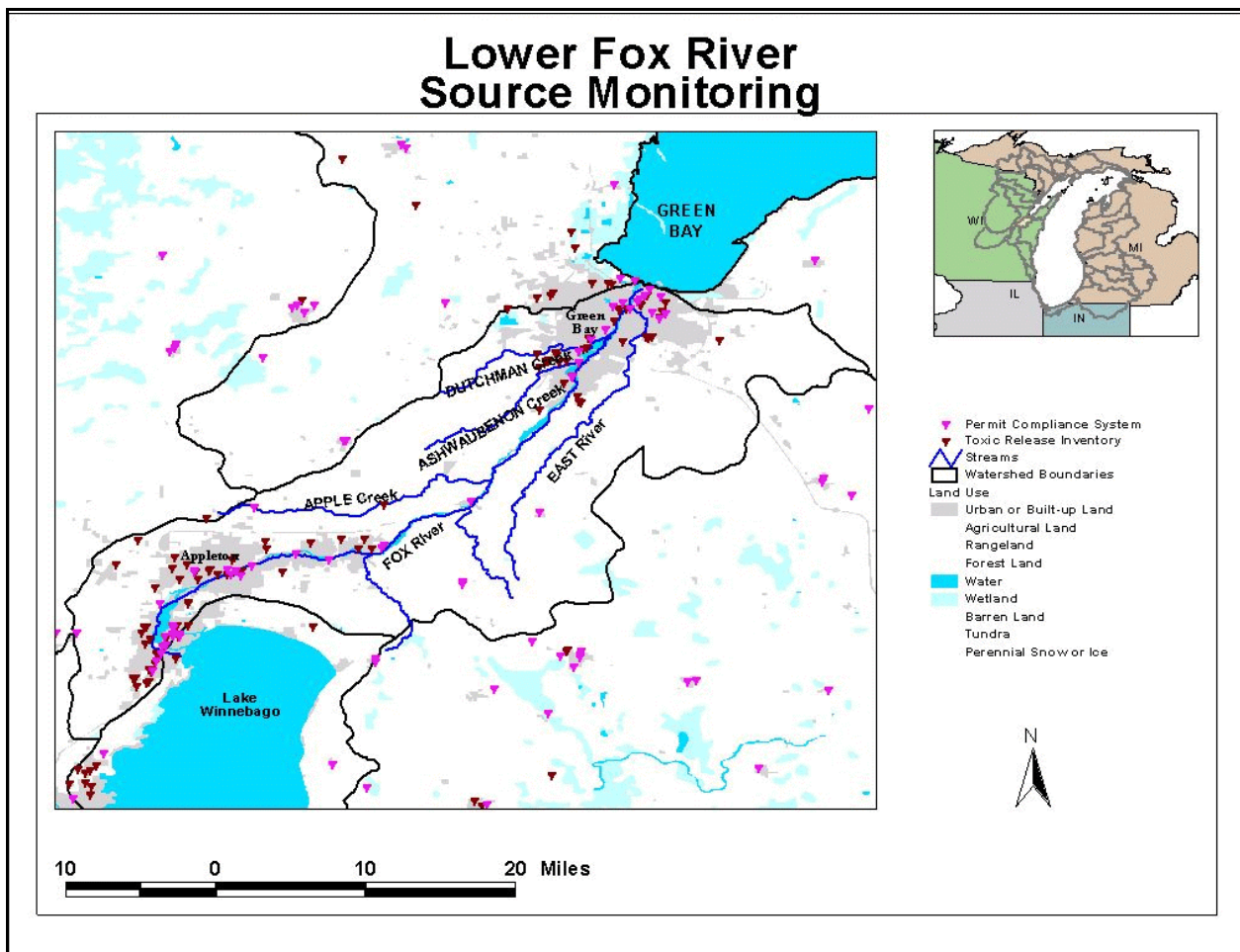


Figure 44. Lower Fox River watershed with pollutant sources from the Permit Compliance System and Toxic Release Inventory databases indicated.

Nutrients and Bacteria

There are more than 120 water quality monitoring stations within the Lower Fox River watershed listed in the STORET system. An additional 720 stations are located throughout the remaining watersheds in the Fox-Wolf basin. Also, there are a large number of stations in the near shore region of Green Bay. A vast majority of these stations (shown in Figure 43) monitor for some form of nitrogen and phosphorus, the chief nutrients impacting water quality. Thus, where monitoring stations exist, they are likely tracking nitrogen and phosphorus. The density of stations is greater at the Fox River outfall to Green Bay, but the rest of the stations are distributed fairly evenly throughout the basin. According to our surveys, there are several other organizations in the basin monitoring for nutrients. These include the Brown County Land Conservation Department, the University of Wisconsin-Stevens Point, the Green Bay MSD, Waupaca County Land Conservation Department, University of Wisconsin-Milwaukee, Green Bay RAP, and Green Bay Public Schools WAV.

Eleven stations monitor *E. coli* in the Fox-Wolf basin — three in the Lower Fox, six in the Upper Fox (including three on Lake Butte Des Morts), and two in the Wolf watershed. All 11 stations are maintained by WDNR. Monitoring for fecal coliform is significantly more extensive. About 120 stations can be found throughout the basin. As with other monitoring coverage in the basin, monitoring of fecal coliform levels is

Lower Fox River Sediment, Air, & Flow Monitoring

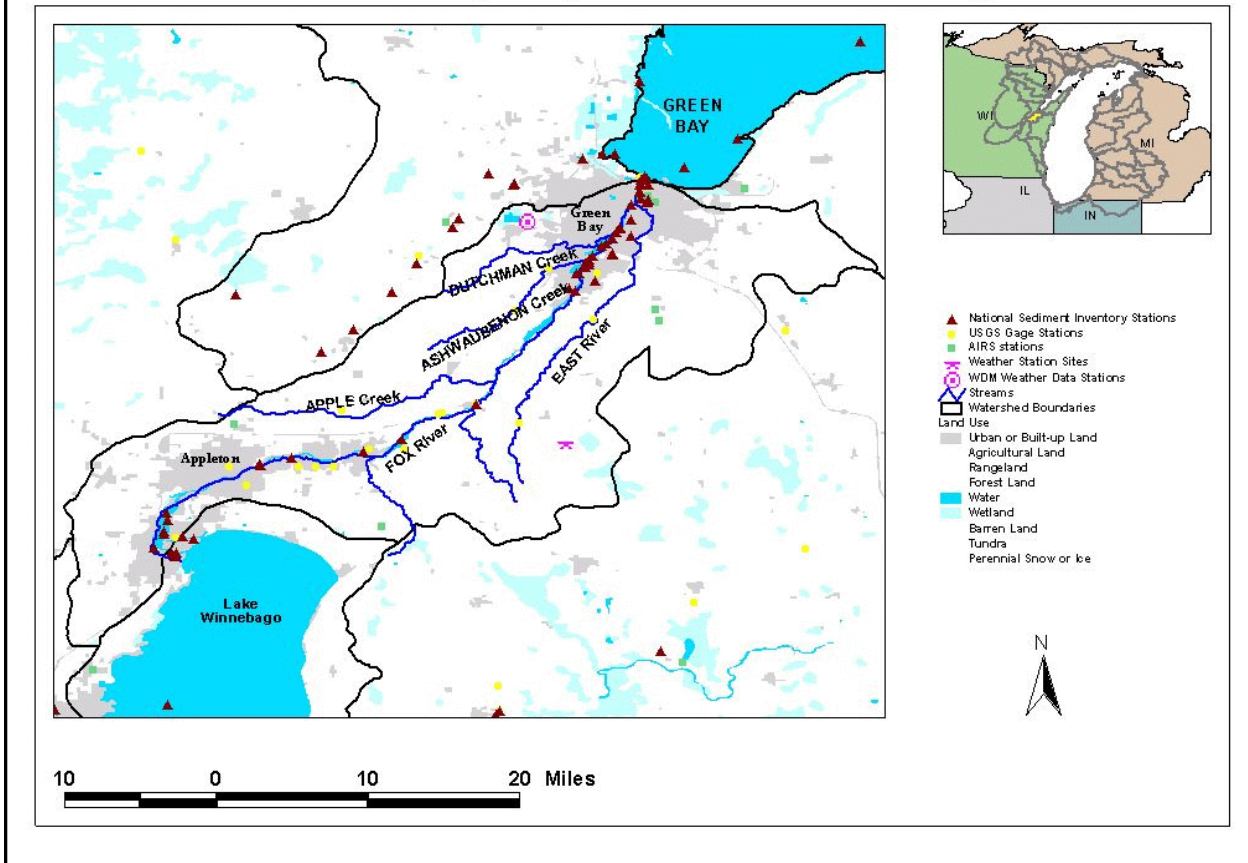


Figure 45. Lower Fox River watershed with National Sediment Inventory stations, USGS gage stations, U.S. EPA's Aerometric Information Retrieval System (AIRS) stations, and NOAA weather stations indicated.

clustered near Green Bay. However, there are numerous stations distributed throughout the rest of the basin. Organizations monitoring for fecal coliform in the watersheds include WDNR, USGS-WRD, U.S. EPA, and the U.S. Forest Service (USFS). In addition, two other organizations report through surveys to monitor bacteria in the basin. These include Brown County Land Conservation Department and Brown County Health Department.

Meteorological and Flow Monitoring

USGS maintains 85 gage stations throughout the Fox-Wolf basin to measure flow rates and various other physical characteristics of streams (see Figure 45). Some of these stations have been used for physical and chemical monitoring through the NAWQA program. Gage stations are located on all major rivers and streams in the watershed.

Several organizations also reported that they monitor numerous physical properties in streams in the basin. These include the Brown County Land Conservation Department, WDNR, the Oneida Tribe of Indians, and Green Bay MSD. Paper mills also monitor physical properties through their Industry Rivers Study

Committee. Physical properties measured by all these organizations include stream flow, temperature, pH, dissolved oxygen, biological oxygen demand, chlorophyll, suspended solids, and turbidity.

Three NOAA weather stations are located in the Fox-Wolf basin, and one other station is located just outside the northern boundary of the Wolf watershed. The stations inside the watershed are located within and south of Green Bay in the Lower Fox, and in New London in the southern portion of the Wolf watershed. The station north of the Wolf is located at the Laona Ranger Station in the Nicolet National Forest. These stations measure continuous precipitation data, as well as other meteorological data.

Sediments

There are 97 National Sediment Inventory sites within the Fox-Wolf basin (see Figure 45). The sites are clustered along the Lower Fox, at the inlets and outlets of the “pool” lakes, and along the Red River in the Wolf watershed. Other sites are located more randomly throughout the watersheds in the basin. These sites are administered by the WDNR, USGS-WRD, and U.S. EPA. Some of these sites are involved in cooperative projects between USGS-WRD, WDNR, and Oneida and Menominee Tribes, involving PCB sediment remediation, agricultural BMPs, and trace elements from the Crandon Mine. The Green Bay MSD also reports to conduct some sediment sampling. About 50 of the sites monitor sediment chemistry to assess human health and aquatic life impacts. A total of 48 sites monitor benthic organism tissue, discussed below.

Fish Contaminants, Fish Health, and Aquatic Nuisance Species

As discussed earlier, we have been unable to find specific locational information (i.e. sampling locations) for programs monitoring fish populations or their health. There are statewide programs in existence, but these are discussed in the overall findings discussion. The National Sediment Inventory lists 48 stations that monitor fish tissue to assess the impacts of sediment contamination. These are located throughout the basin, and are administered by WDNR and the U.S. EPA. USGS also maintained NAWQA stations in the basin to examine fish tissue. Two organizations also conduct fish habitat assessments. These include WDNR and the Oneida Tribe of Indians.

A search of the Fish and Wildlife Advisory database on all major Fox-Wolf basin waterbodies revealed fish consumption advisories for nine locations in the basin. Advisories had been issued for six sections of the Fox River, all of the Lake Winnebago “pool” lakes, Shawano Lake, and a section of the Wolf River. In addition, fish advisories have been issued for most of Green Bay. The advisories were all state issued, covered a variety of fish species and related to PCB and mercury levels.

One program was discovered to be monitoring for zebra mussels within the Fox-Wolf basin. The WDNR monitors zebra mussel veligers in the Fox River. Refer to the overall discussion of Lake Michigan monitoring for a discussion about programs that cover multiple tributary watersheds.

Benthos Monitoring

No specific locational information was discovered for state or national programs monitoring benthic organisms. However, several organizations report that they collect macroinvertebrate data (including community composition, and structural and functional integrity) in numerous locations in the basin. These organizations include WDNR (for the Index of Biotic Integrity (IBI)), Brown County Land Conservation Department, Integrated Paper Services, Inc. Other organizations may be monitoring benthic organisms generally in the watershed, among others. These are discussed in the overall discussion of Lake Michigan monitoring (see the NAWQA discussion, for example).

Air Monitoring

Figure 45 illustrates the locations of the 13 air monitoring stations in the basin, according to the U.S. EPA's AIRS database. The stations are distributed evenly throughout the basin. The stations monitor for three of eight indicators in the database, including low-level ozone, particulate matter, and sulfur dioxide.

Wildlife Monitoring

Several organizations are monitoring wildlife in the basin. The Northeast Wisconsin Audubon conducts an annual bird count; the University of Wisconsin-Green Bay Richer Museum monitors colonial nesting birds; Long Point Bird Observatory monitors breeding marsh birds and amphibians at a couple of sites; and Barkhausen and Green Bay Wildlife Sanctuaries track various bird populations. In addition, there are organizations monitoring wildlife species in the basin on a more regional basis. These are discussed in the overall discussion of Lake Michigan monitoring.

Land Use

The Lower Fox watershed consists of a large portion of urbanized land with relatively few wetlands. Large developments include Green Bay, Appleton, Menasha, Oshkosh, Neenah and Fond du Lac. A substantial portion of the rest of the basin does exist as wetlands. Large wetland areas can be found throughout the Wolf watershed, especially around the headwaters of the Wolf River. The wetlands are not extensively monitored, except in the Wolf headwaters.

Local Assessment

One of the best examples of monitoring data put to beneficial use is "The State of the Bay: A Watershed Perspective" produced by UW-Green Bay's Bud Harris. This very simple, graphicly based format has been an exceptional education tool in a variety of contexts. Dr. Harris is initiating, with Fox/Wolf Basin 2000 assistance, a Strategic Data Acquisition Task Force to help expand monitoring coordination, improve data analysis and guide future activity.

From the perspective of a non-profit watershed alliance (Fox/Wolf Basin 2000), there are several important points to be made with regard to monitoring in the Fox-Wolf basin. First, where data is collected and disseminated, it has been particularly helpful in making the case for enhanced watershed management efforts as well as adding to the understanding of watershed functions and conditions. However, there is likely a large amount of monitoring that was not discovered through this project. Further efforts need to be made to complete the Fox-Wolf basin content in the monitoring database.

When the data collection is not coordinated from a geographic perspective consistently over the years, the ability to effectively manage resources on a watershed basis is lost. Evidence of this is found in this statement taken from the Lake Winnebago Comprehensive Management Plan compiled by the Wisconsin Department of Natural Resources in 1989:

"There are no current ongoing programs in DNR or other agencies to collect the short- or long-term information necessary to allow adequate assessment of any efforts to reduce nutrient or sediment loading."

Granted, there are some monitoring programs designed to help resource managers, for example the "Single Sites Program" initiated by the WDNR and assisted by USGS. However, according to an observation made

by a WDNR employee during a recent Fox-Wolf Basin Strategic Data Acquisition Task Force meeting, WDNR's current "Baseline Monitoring Program" is constrained by U.S. EPA guidelines for data collection in support of Clean Water Act Section 305(b) reports — guidelines that may not be conducive to monitoring to understand ecosystems, evaluate programs or enhance watershed resource management.

Fox-Wolf Basin 2000's own experience in the Pigeon River Watershed (Wolf sub-basin) provides an example. Data collected on the watershed and its impoundment were somewhat scattered among a variety of locations and program files. When brought together, the information was helpful in developing an understanding of the condition of the watershed and the history leading to those conditions. Two data points 20 years apart suggested an annual sedimentation rate in the impoundment near the outlet of the watershed. But because little assessment was done upstream of the impoundment in that time, interpretations of the problem ranged from blaming eroded stream banks to poor farmland management to a golf course upstream to shoreline erosion on the impoundment itself. While those arguments ensued, many citizens responded to additional monitoring efforts by calling for action in the place of monitoring. One recent action, at a cost of about \$100,000, was a series of highly visible shoreline stabilization projects that will do little to address the upstream soil and nutrient inputs.

It should also be noted that the information that was derived from the limited data available in the Pigeon River Watershed paralleled some of the "gut" feelings of long-time users or managers of the resource. This suggests anecdotal data and information also needs to be recorded and made accessible. However, this gives rise to another limitation we have encountered – the "quality" of data. The state has a Self-Help Monitoring Program and a Water Action Volunteer Program that encourages citizens to collect basic data (water clarity, phosphorus concentrations and temperature, for example). Efforts to expand such activity have been met with staunch criticism because the data collected would not be reliable and could not meet the rigors of quality assurance and control. Indeed, the uncertainty of anecdotal or non-professionally gathered data have made it easy for those asked to change land use practices or behaviors to question whether they are really the problem.

Another limitation has to do with the measurement of the efficacy of nonpoint source best management practices (BMPs) on a broader (subwatershed or catchment) scale. Much of the research available on BMPs was done in very narrowly defined contexts, which creates a lot of uncertainty when applying pollution reduction efficacy on a broader scale. Little, if any, of the studies look at long term efficiency – how well a practice performs after several years or what kind of maintenance needs and costs can be expected. In addition, literature reviews generally provide a broad range of efficacy estimates. For example, nutrient and sediment reduction rates of 5-90 percent were reported in studies assessing the effectiveness of vegetative filter strips (or buffers). Paired watershed study-designs have been proposed (and implemented in some areas) to address this deficiency. However, they are longer term, a bit unwieldy in garnering adequate participation and quite costly to conduct.

Several observations have been made in the past that there is plenty of data, but little information. The current movement in the Fox-Wolf basin to develop a coordinated monitoring framework is indicative of the inadequate quantity of data, quality of analysis and availability of information necessary to improve watershed management activity.

