V. NONPOINT SOURCE ASSESSMENT

NONPOINT SOURCE ASSESSMENT

Water quality assessment and monitoring is the foundation of an effective NPS management program. Missouri has a variety of water quality monitoring activities, as well as a strategy for current and future NPS assessment.

OVERVIEW OF MONITORING ACTIVITIES (2002)

Fixed Station Monitoring Network

Eighty-three of the 95 stations in Missouri's fixed station chemical monitoring network are sites uninfluenced by point source discharges, making these sites good indicators of water quality influenced by extensive regional nonpoint sources. These sites cover all major physiographic regions of the state and provide valuable information on typical water quality during stormwater runoff as well as the subsurface flow contributions of NPS pollutants during baseflow conditions. This network includes monitoring of six large springs which provide information of the quality of storm waters entering the groundwater system. In addition to the state ambient monitoring network, the state routinely reviews similar data generated by other agencies. In total, about 117 sites provide data on NPS pollutants from such extensive land uses as cropland, mixed cropland and pasture, mixed forest and pasture. (See Appendix K, Proposed Water Quality Monitoring Plan for Missouri, 05/99.)

Over 60 Missouri reservoirs are being sampled for nutrients, chlorophyll and suspended solids and secchi depth by the University of Missouri under contract to DNR and some of these lakes receive more intensive monitoring assisted by volunteers. Volunteers are sending in data for over 840 stream sites.

Fixed Station Fish Tissue Network

With the passing of the use of chlorinated hydrocarbon insecticides such as dieldrin, chlordane, DDT, heptachlor, mirex and lindane, there is less need in the Midwest for an aggressive fish tissue monitoring effort. New pesticides are more water-soluble, degrade much more rapidly and do not tend to concentrate in body tissue. Heavily used pesticides such as atrazine tend to be metabolized or passed from the body of fish and other aquatic animals at about the same rate as their uptake from the environment. However, fish consumption advisories for chlordane, dieldrin and PCBs remain in effect for some areas of the state. Levels of mercury in fish are increasing. Missouri DNR and USEPA jointly maintain a fish tissue (whole fish) monitoring network of fifteen stations with half of these sites sampled each year. Samples are analyzed for several chlorinated hydrocarbon insecticides, PCBs, lead, mercury and cadmium.

The Missouri Department of Conservation (MDC) also collects and analyzes many fish tissue (fillets) samples per year. They do not maintain a fixed network but they do analyze for a similar list of contaminants as the DNR/EPA network. Fish tissue monitoring in Missouri has documented declines in chlorinated hydrocarbon insecticides in fish over time, but increasing levels of mercury in fish.

Mercury Advisory

In 2001 the Missouri Department of Health and Senior Services issued a statewide advisory against consumption of Largemouth Bass greater than 12" in length by pregnant women, women who may become pregnant and children 12 years of age and younger. Review of the state's fish tissue data base showed 40 streams and lakes with average Largemouth Bass mercury tissue levels above those deemed to be safe. These waters are proposed for the state 303(d) impaired waters list and a multi-agency committee is looking at development and funding of a larger mercury monitoring strategy for the state.

Special Studies

An extremely large number of monitoring activities fall into this category including: monitoring of watershed projects sponsored by Section 319, by the NRCS, by the DNR Soil and Water Conservation Program, by the US Geological Survey NAWQA program, the USDA Management Systems Evaluation and Analysis (MSEA) projects, water quality or hydrologic studies by the US Geological Survey, special water pollution investigations undertaken by state agencies such as the DNR or the MDC. Many waterbodies in the state impaired or believed to be impaired by NPS pollution will be the subject of additional study under section 303(d) of the CWA.

Aquatic Biological Community Data

Over the years a relatively large volume of data has been gathered on fish and aquatic invertebrate communities in Missouri streams. The major sources of data include William Pflieger's *Fishes of Missouri,* which summarized fish distribution in the state from records from 1853 through 1969, considerable unpublished data on fish collections made by the MDC since 1969, and a large number of reports by both the DNR and the MDC on collections of aquatic macroinvertebrates. Most recently two projects, the USEPA REMAP project and the development of water quality criteria for aquatic invertebrates by the DNR have added to the information base for fishes and invertebrates.

Much of our future assessment of NPS problems will probably be based on aquatic biological monitoring. In 2002, DNR and MDC began a state-wide biomonitoring program for fish and aquatic macroinvertebrate communities. The program, will include fish monitoring on at least 50 streams and aquatic invertebrate monitoring on 15 streams this year. When fully implemented, the program will monitor between 50 and 100 stream sites per year and will also measure the quality of the physical habitat of the stream site and collect some basic water chemical data. About one-third of the sites will be randomly selected and the remainder will be selected based on potential or documented water quality concerns.

Volunteer Water Quality Monitoring Program

Since 1993, 2673 individuals have attended at least one training workshop offered by the Missouri Volunteer Water Quality Monitoring Program. Water qua lity data has been submitted by volunteers from 1378 sites around the state. By August 30, 2002, 10,976 sets of data had been received from those monitoring sites, including 2271 sets of visual survey data, 6180 sets of chemical data and 2521 sets of biological monitoring information. As more citizens participate in the quality assurance/quality control portion of the program, the value of volunteer generated data will increase. Of the 345 individuals who have participated in the Quality Assurance/Quality Control (QA/QC) program, 59 of those individuals have been certified as

Level III monitors, which is the highest level of QA/QC the program offers. Volunteer data supplements the information used by state and local decision-makers to determine current stream conditions and helps them identify potential problems or trends in water quality.

NONPOINT SOURCE ASSESSMENT STRATEGY

In the past, assessment of the impacts of nonpoint sources were required for completion of the state's 305(b) report, for writing statewide section 208 plans and for developing section 319 plans, and those assessments have relied on these strategies:

A. Discrete, relatively localized nonpoint sources such as drainage from abandoned mine lands could be accurately characterized by water chemistry studies. All of these areas, both coal and lead-zinc mined lands have been accurately assessed as to NPS pollution impact on receiving waters by a combination of intensive studies which have characterized the degree and extent of problems in the short term and for some sites, fixed station water quality monitoring which has tracked longer term time trends and improved our knowledge of the relationship of the problem to flow regimes and other variables.

B. Frequency and concentrations of synthetic organic chemicals such as pesticides have been well documented by chemical monitoring of waterbodies. The biological impact of these chemicals on aquatic fauna and humans has not been fully researched.

C. Large scale, diffuse nonpoint sources such as row crop agriculture, animal production and pasture have been much more difficult to quantify, not only because of their diffuse nature, but because the pollutants of primary concern, sediments and nutrients, and the processes which deliver them to waterbodies are natural ones. Assessing the amount of NPS pollution from these sources by quantifying sediment and nutrient loads first requires we know the natural, or background, level of sediment and nutrients in these waters. We do not know these background levels. Another serious drawback to attempting to quantify NPS pollutant loads from these extensive land uses is the difficulty and expense of getting adequate water chemistry data.

In the past, Missouri has relied heavily on the fish distribution work of Pflieger, which has shown the loss or the substantial decline in the populations of certain fish species across the agricultural northern third of Missouri and similar losses in the agricultural Bootheel of Missouri. In the less intensively farmed Ozark plateau, fish populations have suffered less, but the distribution of many species seems to be retreating from headwater streams. This data, combined with studies in the technical literature on the impacts of channelization and other physical disturbance to stream channels has been the foundation of our assessment that agricultural NPS pollution affects virtually all streams in the glaciated plains, Osage plains and Bootheel regions of Missouri. We will continue to track, with interest, the US Geological Survey studies pertaining to heavy gravel loads in Ozark streams and their relationship to land use.

As the NPS program in Missouri has matured, our NPS assessment activities have become more focused. The three major areas of interest are:

A. Research into the relationships of nutrients, algae and suspended sediments in Midwestern reservoirs by Dr. Jack Jones, Univ. of Missouri

B. Research on stream biota and how they are affected by physical changes in the stream channel and riparian zone

C. Development of biological criteria for aquatic macro invertebrate communities and subsequent development of a statewide fixed station network of aquatic macro-invertebrate monitoring sites

Our hope is that over the next ten years the overall improvement of our understanding of the relationship of aquatic biota communities to such physical manifestations of extensive nonpoint sources such as eutrophication, sedimentation, channel morphometry changes and changes in the riparian zone will allow us to better discern NPS problems in specific watersheds and target future watershed projects more accurately.

REFERENCES

Pflieger, Wm. L., 1975, The Fishes of Missouri, Missouri Department of Conservation, Jefferson City, MO 65102.