

IOWA'S WATER

Ambient Monitoring Program

Snapshot Events

Pictures of Water Quality Across Iowa

Introduction

Since August 2000, volunteers across Iowa have participated in 50 snapshot events conducted at the county, watershed, and statewide levels. Most of these events were initiated, coordinated, and conducted by volunteers through the IOWATER volunteer water monitoring program. During a snapshot, multiple sites throughout a geographic area are sampled within a short period of time, thus providing a picture in time of water quality. Nearly 2,100 Iowans have contributed more than 10,000 hours towards the success of these events, with close to 3,400 sites being sampled. Results from the snapshot sampling events conducted in Old Mans Creek and Clear Creek watersheds in Iowa and Johnson counties in east-central Iowa demonstrate the value and importance of volunteer collected data.



Snapshot samplings have involved volunteers of all ages.

Background

Historically, data collected from only one site on Old Mans Creek in Johnson County had to tell the story of water quality for the entire watershed. Data from this site have shown that Old Mans Creek has some of the highest bacteria levels of any stream sampled statewide. While monthly professional monitoring of this site provides information on how water quality changes over time at this particular location, it does not explain if it is from a localized source or if elevated bacteria levels occur throughout the entire 246 mi² watershed.

In order to answer this question, and to better understand water quality throughout the entire watershed, an IOWATER volunteer organized the first of several snapshot events of the Old Mans Creek Watershed on September 20, 2003. Sampling of Old Mans Creek Watershed included chemical, physical, biological, and discharge measurements collected by trained volunteers.

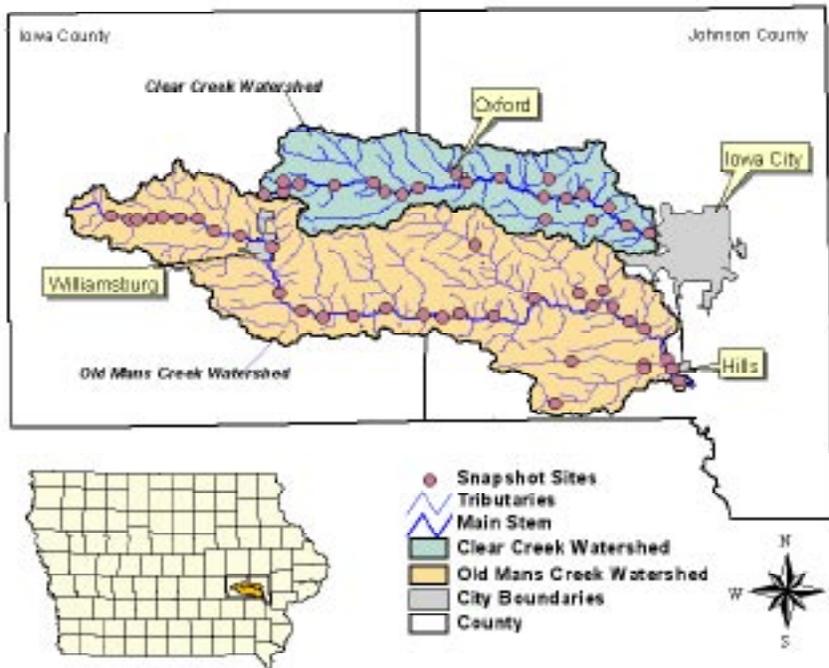


Figure 1. Snapshot sites in Old Mans Creek and Clear Creek watersheds, located in Iowa and Johnson counties in east-central Iowa.

A total of 28 sites were sampled along the main stem of Old Mans Creek, from the headwaters in Iowa County to where it empties into the Iowa River in Johnson County (Figure 1). Results from these sites provided a picture of how water quality of Old Mans Creek changed from its headwaters to its outlet. For comparison purposes, sites were also monitored in the Clear Creek Watershed (103 mi²) located immediately north of Old Mans Creek. Both watersheds are primarily agricultural, although a few urban areas are present. Since September 2003, most of these sites were sampled

six times during different times of the year at varying flow conditions. Results from these snapshots provided a clearer picture of how water quality differs between and within these two watersheds.

Biological/Habitat Monitoring

During the fall of 2003, a small team of IOWATER trained volunteers sampled the aquatic insects and observed habitat conditions at 16 sites along the main stem of Old Mans Creek. Data showed a relationship between the number of microhabitats and the diversity of benthic macroinvertebrates. Benthic macroinvertebrates are small animals, such as aquatic insects, crustaceans, leeches and snails that live on the stream bottom. As the number of microhabitats increased, so did the number of different benthic macroinvertebrates identified and the diversity in tolerance values of these organisms (Figure 2).

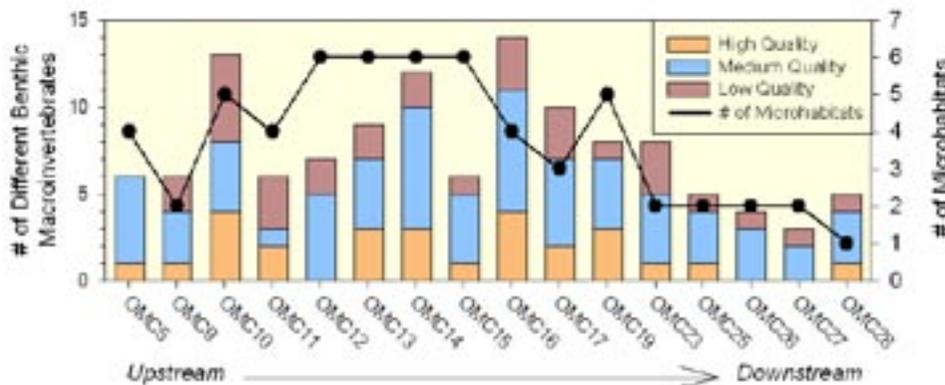


Figure 2. Range in number and quality of benthic macroinvertebrates identified at sites on main stem of Old Mans Creek, as well as the number of microhabitats.

Chemical/Microbiological Monitoring

Volunteers measured a variety of chemical parameters at each site, including nutrients, dissolved oxygen, chloride, and transparency. Water samples were also collected and sent to the University of Iowa Hygienic Laboratory for both bacteria and additional nutrient analyses. Figure 3 compares results from sites along the main stem of Old Mans Creek for September 20, 2003, and May 31, 2004. The September 20, 2003, sampling occurred under low-flow conditions, with stream flow at 12% of the long-term average for Old Mans Creek, while the May 31, 2004 event occurred under high-flow conditions, with discharge at 347% of the long-term average (source: <http://ia.water.usgs.gov/>). These two data sets illustrate the impact of point source inputs to the stream under low-flow conditions versus nonpoint source inputs under high-flow conditions.

Under low-flow conditions, the site immediately downstream of the town of Williamsburg is influenced by the city's wastewater treatment facility, located on the east edge of town (downstream). The dashed lines in Figure 3 separate sites upstream of Williamsburg from sites downstream. These impacts are noted by the increase in chloride, total phosphorus, and ammonia nitrogen between the sites above and below Williamsburg. Levels of these parameters steadily decrease downstream of the input. This same pattern occurred with data collected from several other snapshot events around the state conducted under low-flow conditions with similar point source inputs, for example, White-breast Creek Watershed in south-central Iowa between Osceola and Knoxville.

Under higher flow, spring conditions (i.e., May 2004), total phosphorus, *E.coli* bacteria, and ammonia nitrogen levels steadily increase from sites located in the upper reach of the watershed to sites downstream, illustrating the input of nonpoint sources throughout the watershed. Under these conditions, chloride is lower and nitrate nitrogen declines downstream as they are diluted by the large volume of water.

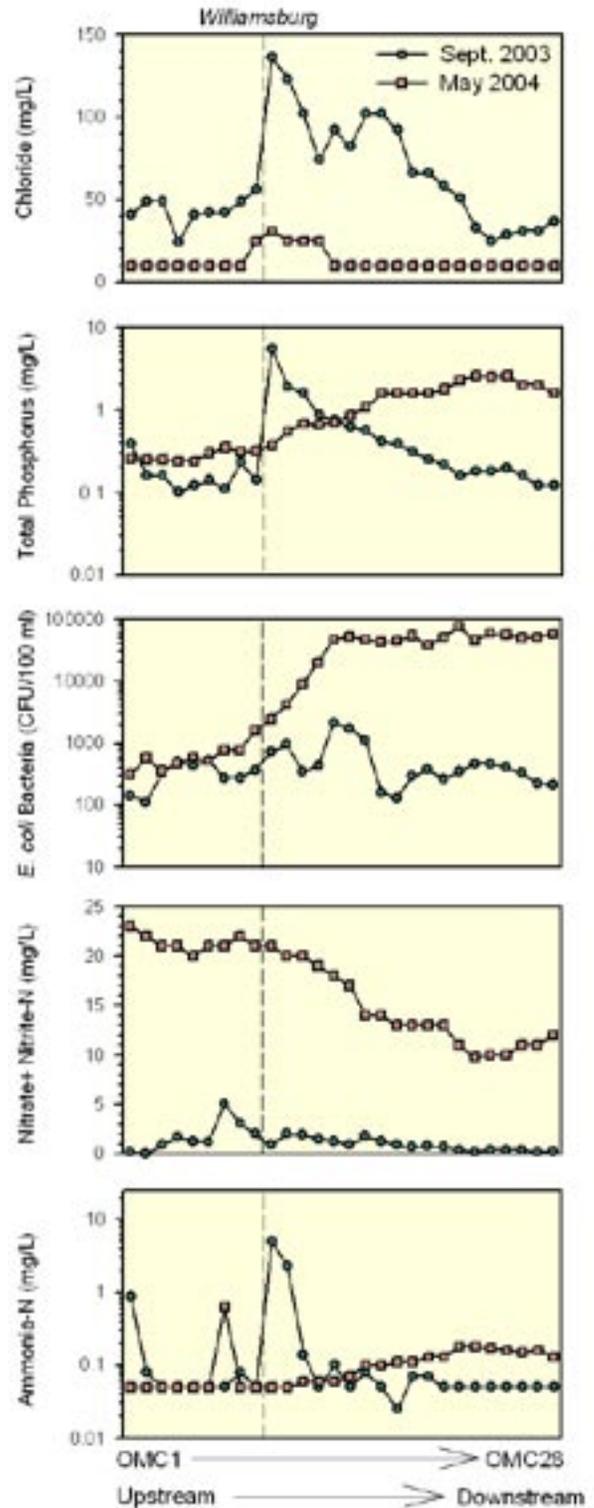


Figure 3. Comparison of results from September 20, 2003, and May 31, 2004, snapshot events of sites along the main stem of Old Mans Creek. Vertical dashed lines separate sites upstream of the town of Williamsburg from sites downstream.



Monitoring of aquatic organisms in the stream was done to assess biological population changes throughout Old Mans Creek Watershed.

Data from these snapshots indicate that bacteria levels are highly variable throughout all of Old Mans Creek Watershed; bacteria levels increase downstream after rainfall events; and elevated bacteria levels appear to be primarily caused by nonpoint sources throughout the watershed.

Snapshot Surprises

There have been a few surprises with the data collected from Old Mans Creek and Clear Creek. Results from September 20, 2003, identified elevated chloride at the upper end of Clear Creek (639 mg/L). Further investigation of this area identified a series of five tile lines which provide the initial flow for Clear Creek. Further monitoring has shown consistently elevated chloride levels from one tile line in particular, suggesting a potential point source, which has yet to be identified. At another tile line, toilet paper, floating sewage material, and a strong sewage smell have been observed on several occasions. These observations, coupled with lab analyses, suggest septic inputs are impacting the headwaters of Clear Creek.

Summary

The snapshot sampling efforts in Old Mans Creek and Clear Creek have been repeated in numerous watersheds and counties across Iowa, thanks to the efforts of countless IOWATER volunteers. These snapshot events have allowed Iowans to become actively involved in monitoring their local water resources and to begin to paint a picture of water quality across Iowa.

Acknowledgements

The Iowa DNR would like to acknowledge the contributions of Dave Ratliff in organizing and conducting the snapshot samplings of Old Mans Creek and Clear Creek. We would also like to recognize all of the IOWATER volunteers who have coordinated and/or participated in the 50 snapshot samplings conducted across Iowa since August 2000. You have all contributed to a greater understanding of water quality in Iowa. Thanks also to the staff with the University of Iowa Hygienic Laboratory – Environmental Microbiology, Nutrient Demand, and Sample Receiving sections who have managed and analyzed the periodic influxes of large numbers of samples associated with these snapshot events.

Photos by Tina Jennings (page 1) and Lynette Seigley (page 4).

Funding

Water monitoring activities of the Iowa Department of Natural Resources are funded by Iowa Infrastructure – Environment First Fund appropriations, as well as grants provided by the U.S. Environmental Protection Agency from Sections 106 and 319 of the Clean Water Act.

Iowa Water Monitoring Program Web Site – wqm.igsb.uiowa.edu



Prepared by
Iowa Department of Natural Resources, Geological Survey
109 Trowbridge Hall, Iowa City, IA 52242-1319