

IOWA'S WATER

Ambient Monitoring Program

Community Water Sampling Event City of Bondurant & Bondurant-Farrar School students

On April 23, 2009, students from Bondurant-Farrar High School and Middle School sampled a total of five sites within the city limits over the course of three class periods. The goals were to collect data on in-stream water quality conditions; determine the impact of Bondurant on water quality; and to provide an outdoor water quality education activity for the students. High school students collected data at four locations (Sites 1 through 4; Figure 1) and middle school students gathered information from Site 5. Bondurant-Farrar students used IOWATER test kits and methods to analyze stream water quality. Grab samples were also collected and delivered to the University of Iowa Hygienic Laboratory in Ankeny, Iowa, for analysis. This fact sheet provides a summary of the sampling event and an analysis of the data associated with the sampling event.



Sampling Locations and Parameters Monitored

Figure 1 shows the locations where sampling was planned. Due to low flow conditions on April 23, 2009, one site on the south side of town was not sampled. To accommodate for the number of student volunteers, a site on the north side of town was not sampled as well. Green numbers on Figure 1 indicate the sites that were sampled. "N/S" indicates sites not sampled during this event. Sites were selected in order to determine conditions upstream, within, and downstream of the city limits.

Sites were monitored for a variety of IOWATER parameters, including chloride, transparency, water temperature, pH, nitrite nitrogen (N), nitrate nitrogen, dissolved oxygen, and phosphorus. Samples were also collected and submitted to the University of Iowa Hygienic Laboratory and analyzed for total



Student sampling for benthic macroinvertebrates.

Benthic Macroinvertebrate Investigation

Students from Bondurant-Farrar Middle School used dip nets to collect benthic macroinvertebrates at Site 5 near the school grounds. The students then identified what they found using the IOWATER key. There was very little flow in the stream at this location when sampling occurred. At Site 5, all organisms found were identified as pollution tolerant based on the IOWATER benthic macroinvertebrate key. During other times of the year, the number and types of organisms present may differ. This may be a project or activity to repeat at various times during the year in order to accurately characterize the benthic macroinvertebrate community.

Summary and Recommendation

While this event was only one "snapshot" in time in terms of water quality assessment and analysis, the data collected by these students does provide some very basic background information on conditions within the streams flowing through the City of Bondurant. In order to determine whether or not these conditions are "normal" for the streams, more data should be collected. Additional "snapshot" events, as well as monthly or bi-weekly sampling by IOWATER volunteers, would contribute to this initial data set by gathering further information and a depth of knowledge regarding the streams in and around the City of Bondurant.

As an outdoor activity for middle and high school students, sampling streams helped the students understand water quality issues in their own community. If ongoing sampling of these five sites occurs, data collected can be compiled to assess trends and changes in water quality conditions over time.

Acknowledgements

The City of Bondurant paid for the lab analyses, while Roy McCleary, stormwater coordinator for the City of Bondurant, provided bus transportation for students to the sites. Iowa Department of Natural Resources staff assisted with data collection, as well as training students on use of field equipment and sample collection. Lance Maffin, biology and earth science instructor for the high school, coordinated the monitoring activities (lance_maffin@bondurant.k12.ia.us).

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Iowa Watershed Monitoring and Assessment Program Web Site – www.igsb.uiowa.edu/wqm/



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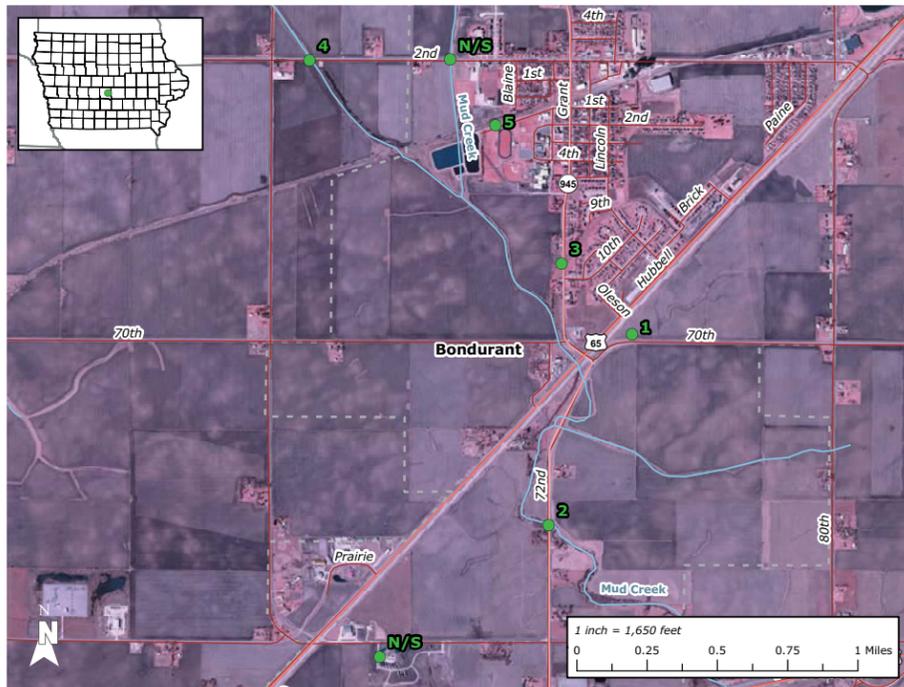


Figure 1. Map showing monitoring sites in and around Bondurant.

Green numbers correspond to sites monitored. N/S=not sampled.

Kjeldahl nitrogen, *E. coli* bacteria, total suspended solids, total phosphorus, cadmium, copper, lead, and zinc. Metals were included, as they are some of the pollutants of concern in urban runoff. Sources of metals in urban runoff can include vehicle traffic; rooftops, gutters, and downspouts; and scrap metals piles. The IOWATER and lab results are in Table 1.

Interpreting the Data

This event was a one-time "snapshot" event to gather initial data on water quality conditions for the streams that flow through the City of Bondurant. In order to complete a more comprehensive assessment of ongoing water quality conditions, additional data are needed. However, an event of this nature begins the data collection process and helps define priorities for further monitoring and adaptive management for water quality.

Overall nutrient concentrations (total Kjeldahl nitrogen and total phosphorus) were relatively low (Table 1). Nitrate-N and nitrite-N levels were relatively low for most samples collected. Site 4 (Mud Ck N) had a nitrate-N concentration of 10 mg/L. This site is located upstream of the city limits. In general, nitrate-N was higher for rural sites relative to urban sites. This likely reflects greater inputs of nitrate to land in the rural watershed relative to the urban watershed. Additional monitoring would help determine if that is typical for these sites. Phosphorus was higher at sites 2 and 5. It is not known why phosphorus concentrations were higher at these sites. Phosphorous levels measured with an IOWATER kit were similar to those reported by the lab.

The metal results for cadmium, copper, lead, and zinc were low, with all but one of the results reported as below their respective detection limit. These results were similar to metal results for a network of

Table 1. IOWATER and lab results for sites sampled.

IOWATER Results								
Site ID and Name	Chloride (mg/L)	Transparency (cm)	Water Temperature (degrees F)	pH (pH units)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Dissolved Oxygen (mg/L)	Phosphate (mg/L)
1.The Cove	<27	60+	62	9	5	0	12	0.01
2. Mud Ck S	<27	60+	60	8	5	0.15	12	0.70
3.McCleary's	80	50	62	9	2	0	12	0.01
4. Mud Ck N	<27	60+	58	7	10	0	12	0.01
5. BFHS	<27	55	50	8	0	0	-	-
University of Iowa Hygienic Laboratory Results								
Site ID and Name	Total Kjeldahl Nitrogen (mg/L)	<i>E. coli</i> Bacteria (CFU/100 ml)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Cadmium (mg/L)	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)
1.The Cove	0.6	10	14	0.04	<0.02	<0.01	<0.1	<0.02
2. Mud Ck S	0.9	20	7	0.24	<0.02	0.01	<0.1	<0.02
3.McCleary's	0.8	30	5	0.05	<0.02	<0.01	<0.1	<0.02
4. Mud Ck N	0.3	20	5	0.04	<0.02	<0.01	<0.1	<0.02
5. BFHS	0.9	63	390	0.23	<0.02	<0.01	<0.1	<0.02

urban stream sites monitored statewide by the Iowa DNR. Additional data will help determine whether results from this event are typical of water quality for these sites or if seasonal or year to year differences occur.

E. coli bacteria concentrations were very low, as all results were below Iowa's single-sample maximum water quality standard for recreational waters (235 colonies per 100 milliliters of water – CFU/100 ml).

Total suspended solids concentrations were relatively low at sampling sites, with the exception of Site 5, which was sampled by the Middle School students. This measurement may be due to sampling error, as bottom sediment may have been stirred up as the sample was collected. The total suspended solids result for Site 5 was 390 mg/L, while all other sites were 14 mg/L or less. The Iowa DNR maintains a network of streams statewide that have been monitored on a monthly basis since 2000. Based on data from these sites, the average total suspended solids concentration for streams statewide is 33 mg/L, so the 390 mg/L result for Site 5 is high compared to statewide results.

Chloride concentrations were low, with <27 mg/L reported for all sites except Site 3, which was 80 mg/L (Table 2). Additional sampling of these sites would help determine if the elevated chloride at Site 3 relative to the other sites is a one-time occurrence or typical for this site. If future chloride results for Site 3 continue to be high, it may suggest inputs to the stream from residual road salt or other sources of chloride such as wastewater treatment plant effluent or wastewater input from industries.

Transparency and water temperature levels indicate clear, cool conditions for a springtime urban stream. Dissolved oxygen levels were relatively consistent and also were at adequate levels for an urban stream. Values for pH ranged from 7 to 9. Additional monitoring would help determine if pH results show any trends based on whether the site drains primarily an urban or a rural watershed.