Results from the IOWATER Fall 2003 Snapshot Sampling

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On October 18, 2003, IOWATER monitors across Iowa (and in southern Minnesota) tested the water quality at their stream sites as part of the IOWATER Fall 2003 Snapshot Sampling event in conjunction with International Water Monitoring Day. A snapshot sampling is when multiple sites throughout a geographic area, such as a watershed or county, are sampled within a short period of time (e.g., eight hours). A snapshot provides a picture of water quality at one point in time. The October 18, 2003 sampling represents the third IOWATER Snapshot Sampling event. The first IOWATER Snapshot Sampling was held on October 18, 2002, and the second on May 24, 2003. A total of 68 sites were sampled across Iowa as part of the October 2002 event, while 119 sites were monitored during the 2003 spring snapshot sampling event last May.

For the October 18, 2003, snapshot sampling, IOWATER monitors were encouraged to monitor their regular sites on October 18 between 10 am and 2 pm and to complete any or all of the IOWATER field assessments. Data collected were then submitted to the IOWATER database at *www.iowater.net*. Results from the sampling were intended to provide a picture in time of water quality in Iowa. (Note: Since not all IOWATER monitors were able to sample on Saturday October 18, this summary includes data submitted to the IOWATER database for sites monitored from October 17 through October 19; most of the data, however, were collected on October 18.)

As part of the October 2003 snapshot, a total of 162 sites were monitored in 41 Iowa counties, as well as one site in Minnesota (Murray County) (Figure 1). Of the 162 sites, six sites were unable to be measured due to insignificant flow, and five sites were standing water sites. Table 1 summarizes the results from the stream sampling. Compared to the May 2003 sampling, the October 2003 sampling represented an increase in both the number of sites sampled (119 to 162) and number of Iowa counties where sites were located (28 to 41). All other sites have been monitored before, with several monitored 20 or more times previously (Figure 2). Of the 162 sites sampled for the 2003 fall snapshot, 19 were monitored during all three snapshot events, and 53 were monitored for the two 2003 snapshots only. The remaining 84 sites were newcomers to the snapshot.

Throughout this report, the three snapshot samplings will be compared. Due to the significant impacts precipitation can have on water quality, it is important to note the climatological trends during the three time periods. During 2002, warm and wet summer weather characterized the state, followed by unseasonably dry weather for most of the final one-third of the year with the exception of October 2002. The wettest week in 17 months occurred during the first week of October 2002, while the second half of the month brought recurrent snowfall, making October snowfall the fifth highest on record. During 2003 prior to the May 2003 sampling, rainfall was frequent and widespread from late April to mid May. However, one of the driest summer periods ever occurred from July 10 through September 8, 2003. The fall continued to be characterized by long periods of very dry, sunny weather, interrupted by a brief episode of very wet weather from September 9th through the 14th (Source: Iowa Department of Agriculture and Land Stewardship, Climatology Bureau).

This report summarizes the water quality from the IOWATER Fall 2003 snapshot sampling, and includes chemical, physical, biological, and habitat stream results, as well as standing water results. The majority of the report (everything except the last section) compares stream data, since there are only five standing water records during a snapshot event.

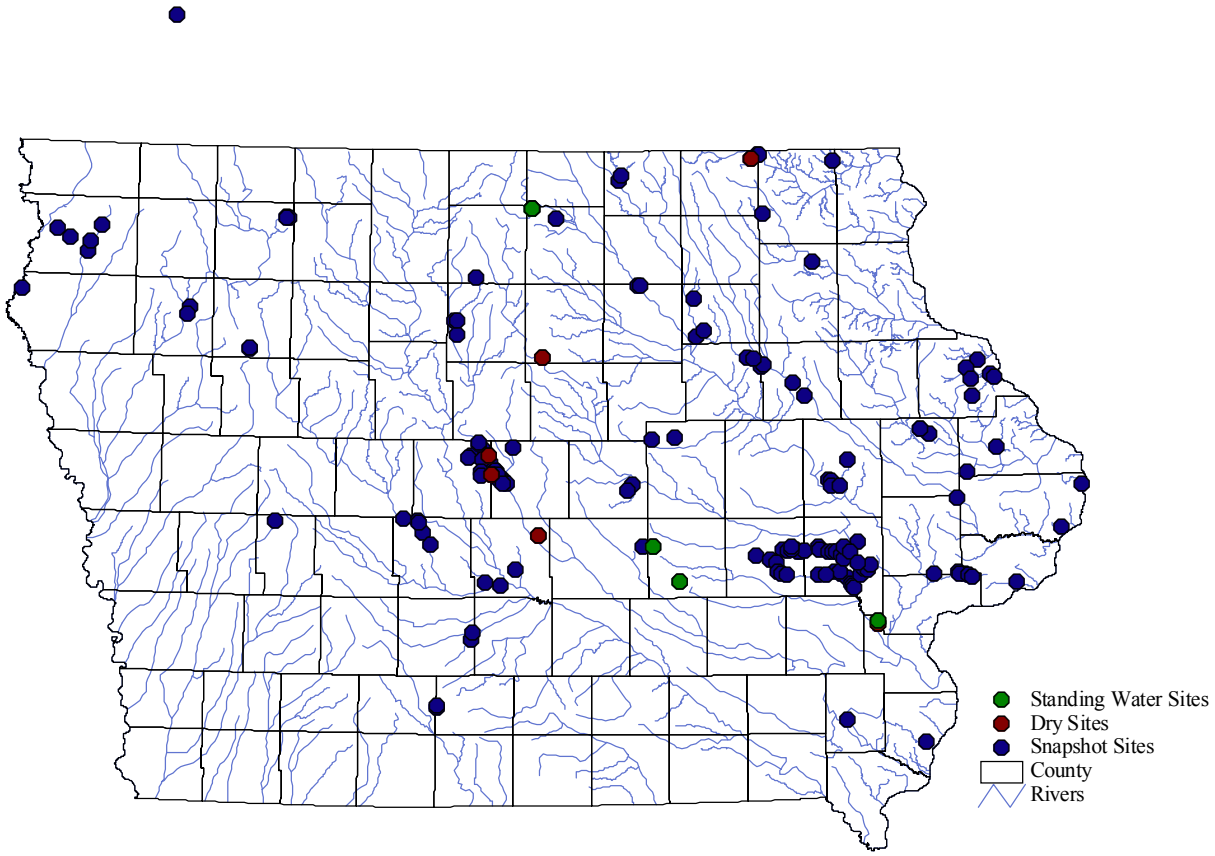

Figure 1. *Location of IOWATER sites sampled as part of the Fall 2003 Snapshot. Note the one site in Murray County, Minnesota.*

Table 1. *Stream chemical/physical parameter results for the IOWATER Statewide Snapshot Sampling – October 18, 2003.*

Parameter	Unit	Number of Samples	Min Value	Percentiles			Max Value
				25th	50th	75th	
Water Temperature	degrees F	133	20	48	51	56	69
pH	pH units	137	7	8	8	9	9
Dissolved Oxygen	mg/L	137	3	6	8	10	12
Nitrite-N	mg/L	137	0	0	0	0.15	1.5
Nitrate-N	mg/L	137	0	0	2	2	20
Chloride	mg/L	70	<24	24	41	92	639
Transparency	centimeters	134	0	30	60	60	60
Orthophosphorus	mg/L	137	0	0.1	0.2	0.6	10
E.coli Bacteria	CFU/100 ml	14	0	92	400	4009	150,000

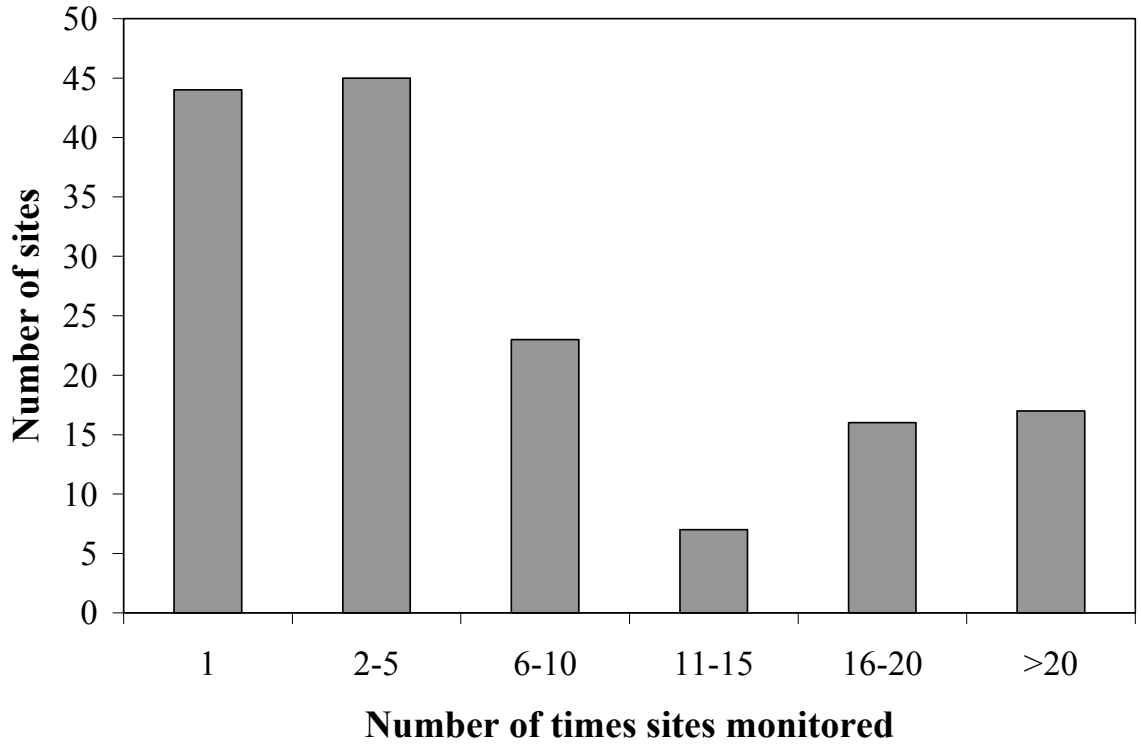

Figure 2. *Frequency that IOWATER snapshot sites have been monitored, including the October 2003 snapshot.*

Chemical/Physical Parameters

Water Temperature

Water temperature affects many of the biological, chemical, and physical processes in a stream, including the amount of oxygen gas that can dissolve in water, the rate of photosynthesis by algae and plants, as well as the metabolic rate of aquatic animals.

Water temperatures varied from 20 to 69 degrees Fahrenheit, with the lowest temperature reported on an unnamed creek downstream from a spring fed pond in Bremer County, and the highest on Squaw Creek in Story County (see Appendix 1A). For the majority of sites, water temperature was between 36 to 52 degrees Fahrenheit (Table 1; Figure 3). Temperatures were lower for the October 2003 snapshot sampling compared to the May 2003 sampling, but higher relative to the October 2002 sampling.

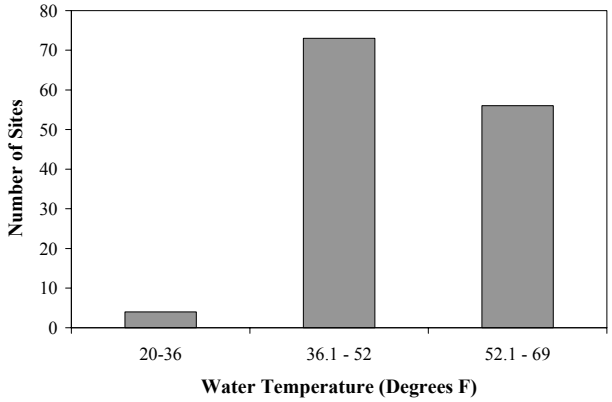

Figure 3. *Histogram of water temperature.*

Water temperatures for streams sampled during the snapshot sampling were similar to those collected by Iowa's Ambient Water Monitoring Program during October 2003. A network of 85 streams statewide is monitored monthly as part of this program. Samples

from these streams are tested using field meters and lab analyses, and data from these sites will be used throughout this report to provide perspective on results from the fall 2003 IOWATER Snapshot Sampling. For the streams monitored professionally during October 2003, water temperature ranged from 43 to 71 degrees Fahrenheit, with an average temperature of 55 degrees Fahrenheit. Cooler temperatures occurred in streams in the northern half of Iowa.

pH

pH is a measure of a water's acidity. Changes in pH can be caused by atmospheric deposition of acid rain, the types of soils and bedrock that the water comes in contact with, wastewater discharges, and acid mine drainage. A pH of 7 is neutral; pH values greater than 7 are alkaline or basic, while a pH less than 7 is acidic.

One-hundred and thirty seven sites were tested for pH during the October 2003 snapshot. Appendix 1B shows the pH values for sites across Iowa. The pH values are similar to what was measured as part of Iowa's Ambient Water Monitoring Program during October 2003. During the IOWATER snapshot sampling, the majority of streams had a pH of 8 or 9 (Table 1; Figure 4). The October 2002 sampling also had a median value of 8, while the May 2003 snapshot sampling had a median value of 9. Although the median value was higher in May of 2003, two sites in Linn County reported pH values of 6. Both of these sites had been monitored in the past, with one site (Prairie Creek) repeatedly reporting low values, and the other site (Hoosier Creek) having been sampled three times prior to the May 2003 snapshot reported the lowest pH value (6) during the May snapshot. Unfortunately, neither site was monitored during the October 2003 snapshot sampling.

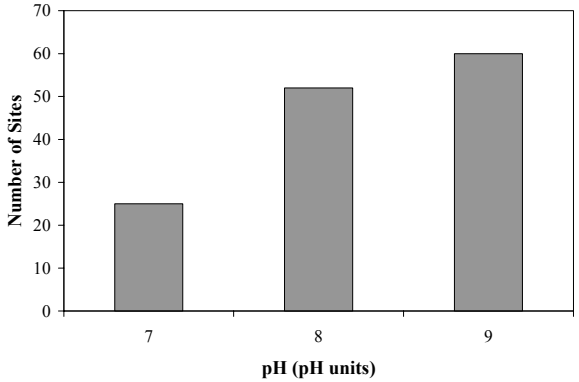

Figure 4. *Histogram of pH.*

Transparency

Transparency is a measure of water clarity and is affected by the amount of material suspended in water. As more material is suspended in water, less light can pass through the water, making it less transparent (or more turbid). These materials include soil, algae, plankton, and microbes.

Transparency, measured at 134 sites, ranged from 0 to greater than 60 centimeters (Table 1; Figure 5). The median transparency was 60 centimeters, higher than what it was for the May 2003 sampling (56 centimeters), but the same as the October 2002 (60 centimeters) snapshot sampling. Higher transparency readings were measured at streams in northeast Iowa, while 15 of the 18 sites in the Squaw Creek Watershed in Boone and Story counties reported transparency greater than 40 centimeters (see Appendix 1C). These results are similar to the May 2003 snapshot, at which 15 of the 17 sites in the Squaw Creek Watershed in Boone and Story counties reported transparency greater than 40 centimeters.

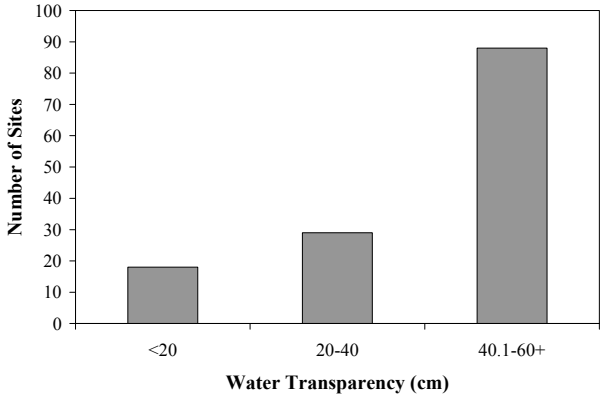

Figure 5. *Histogram of water transparency.*

Eighteen sites sampled in October had a transparency less than 20 centimeters, while a site in Iowa County and a site in Clay County were less than 10 centimeters. Of those two sites, the Clay County site had been tested for transparency before, and had transparency readings greater than 60 centimeters in September 2001 and October 2001, while in October 2000 transparency was measured at 6 centimeters. Three of the four samples reported for the Clay County site reported no precipitation 24 hours prior, while the September 2001 sample reported 0.1 inches of precipitation prior to being tested.

A total of 16 sites were sampled on Clear Creek, which begins in Iowa County and flows east through Johnson County to the Iowa River. Six of the eight sites clustered in the Clear Creek Watershed in Iowa County had low transparency measurements, while the majority of sites downstream in Johnson County had transparency measurements greater than 40. All five sites on the North Raccoon River in Dallas County had low transparency (less than 20 centimeters) during the May 2003 snapshot, and showed an increase in water transparency with values around 30 centimeters during the October 2003 snapshot.

Fifteen sites were sampled for transparency during all three snapshots. Ten of those sites had a transparency of 56 to 60 centimeters during all three snapshots, two sites reported a gradual increase in transparency throughout the snapshots, and for the remaining three sites, transparency was relatively similar for the October snapshots, but decreased for the May 2003 snapshot.

Dissolved Oxygen

Dissolved oxygen levels in a stream can be affected by a number of variables, including water temperature, season of the year, time of day, stream flow, presence of aquatic plants, dissolved or suspended solids, and human impacts. Oxygen enters a stream through diffusion from the surrounding air and as a product of photosynthesis from aquatic plants. Oxygen in a stream can be consumed through respiration by aquatic plants and animals, and by the decomposition of organic matter.

A total of 137 sites were sampled for dissolved oxygen, with a median of 8 mg/L (Table 1; Figure 6 and Appendix 1D). No sites had a value less than 3 mg/L. Five sites did report a value of 3 mg/L, including two sites in Black Hawk County, two sites in Wright County, and one site in Clarke County. All five of the sites have been sampled prior to the October 2003 sampling. However, the Clarke County site has only been sampled once before, and an unnamed creek in Wright County has been sampled twice before the October 2003 snapshot sampling. For four out of the five sites, 3 mg/L was the lowest dissolved oxygen reported for each of the sites. The Buttermilk Creek site in Wright County has recorded dissolved oxygen values as low as 1 mg/L. The highest dissolved oxygen values (greater than 10 mg/L) occurred at many of the streams in northern Iowa, including several sites in Sioux County, in northwest Iowa.

A total of 19 sites were sampled during all three snapshots. For most sites, dissolved oxygen concentrations slightly decreased throughout the three snapshot samplings. From October 2002 to October 2003 a general decrease in stream flow occurred due to drought conditions, which may have been the cause of a decrease in dissolved oxygen concentrations in Iowa streams. Four sites, however, did report a general increase. For three sites, dissolved oxygen concentrations remained unchanged. An exception to these trends was a site on Prairie Creek in Boone County and a site on the Wapsipinicon River in Buchanan County. The Prairie Creek site had a dissolved oxygen concentration of 10 mg/L in October 2002, greater than 12 mg/L in May 2003, then only 6 mg/L in October 2003. The Wapsipinicon site reported a decrease (8 mg/L to 6 mg/L) of dissolved oxygen concentration from the October 2002 snapshot to the May 2003 snapshot, and then an increase (6 mg/L to 8 mg/L) from the May 2003 snapshot to the October 2003 snapshot.

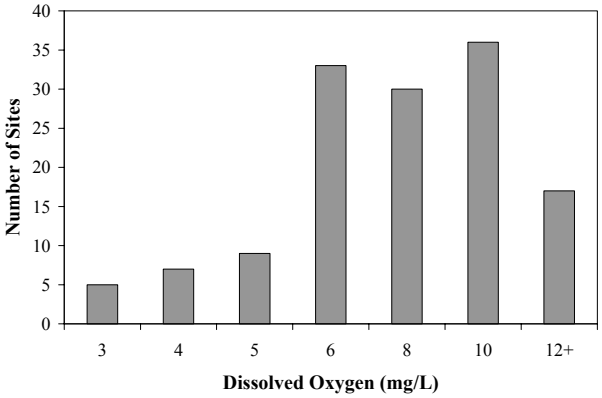

Figure 6. *Histogram of dissolved oxygen.*

Nitrite-N and Nitrate-N

Nitrogen is a necessary nutrient for plant growth, and includes both nitrite-nitrogen and nitrate-nitrogen. Too much nitrogen in surface waters, however, can cause nutrient enrichment, increasing aquatic plant growth and changing the types of plants and animals that live in a stream. Sources of nitrogen include soils; human and animal wastes; decomposing plants; and fertilizer runoff from golf courses, lawns, and cropland.

More than half of the sites detected no nitrite-N, while most of the remaining sites had nitrite-N levels between 0.15 mg/L and 0.3 mg/L (Table 1; Figure 7 and Appendix 1E). Two sites had nitrite-N of 1 mg/L or greater, including a site in Buena Vista County and a site in Wright County. The site in Buena Vista County has been sampled once prior to October 2003. In August 2003, nitrite-N was 0.15 mg/L at this site. The Wright County site has been sampled more than 30 times, and nitrite-N concentrations have equaled or exceeded 1 mg/L on multiple occasions.

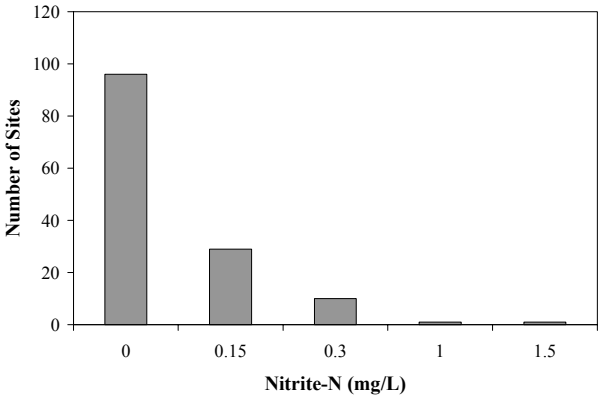

Figure 7. *Histogram of nitrite-N.*

A total of 137 sites were tested for nitrate-N, with a median nitrate-N concentration of 2 mg/L (Table 1; Figure 8 and Appendix 1F). Thirty-eight sites recorded 0 mg/L nitrate-N, including 13 sites in Boone and Story counties (Squaw Creek Watershed). All 13 sites have been tested before the October 2003 snapshot, with half the sites monitored more than 20 times previously. Eight of the 13 sites that reported 0 mg/L in the October 2003 snapshot, recorded nitrate-N concentrations of 10 and 20 mg/L in the spring and summer months prior to the October 2003 snapshot. In June 2002, a site on Long Dick Creek in Story County had a high nitrate-N concentration of greater than 50 mg/L. Based on the data collected for these sites, nitrate-N concentrations tend to be quite variable, with lower values generally occurring during the fall and winter months.

Three sites had nitrate-N concentrations of 10 mg/L or greater, including two sites on unnamed creeks (one each in Buena Vista and Sioux counties) and a site on Calmus Creek (Cerro Gordo County). All three sites have been tested at least once before and have previously reported high nitrate concentrations.

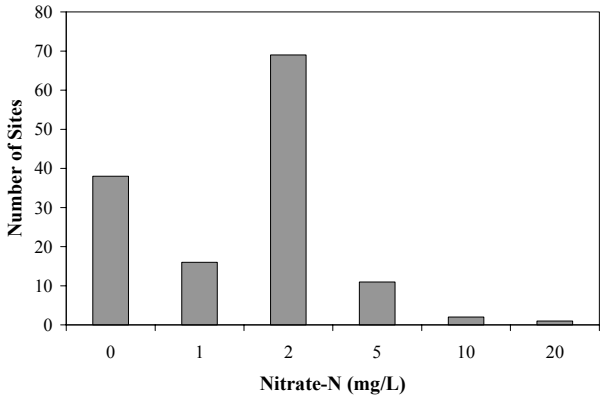

Figure 8. *Histogram of nitrate-N.*

Nineteen sites were sampled for nitrate-N during the October 2002, May 2003, and October 2003 snapshots. For the majority of sites, higher nitrate-N occurred in May 2003 (median nitrate-N of 5 mg/L for 19 sites) compared to October 2002 (2 mg/L) and October 2003 (2 mg/L). The same trend was true for streams sampled statewide as part of Iowa's Ambient Water Monitoring Program, with a higher median nitrate-N concentration occurring in May 2003 (9.9 mg/L) compared to October 2002 (3.4 mg/L) and October 2003 (1.5 mg/L).

Orthophosphorus

Orthophosphorus is a necessary nutrient for plant growth. Too much phosphorus in surface waters, however, can cause nutrient enrichment, increasing aquatic plant growth, and changing the types of plants and animals that live in a stream. Sources of orthophosphorus include certain soils and bedrock; human and animal wastes; detergents; decomposing plants; and runoff from fertilized lawns and cropland.

A total of 137 sites were sampled for orthophosphorus. Concentrations ranged from 0 to 10 mg/L, with a median of 0.2 mg/L (Table 1; Figure 9 and Appendix 1G). A concentration of zero was recorded at 10 sites, all scattered throughout the state. A concentration of 10 mg/L was recorded at one site, an unnamed creek in Sioux County, located downstream of Sioux Center. The Sioux County site has been sampled twice prior to the October 2003 snapshot event, and orthophosphorus concentrations of 10 mg/L have been reported each time. Also at this site, nitrate-N concentrations have ranged from 10 to 20 mg/L.

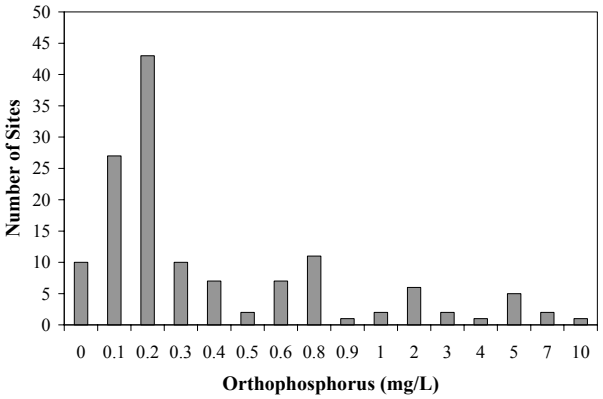

Figure 9. *Histogram of orthophosphorus.*

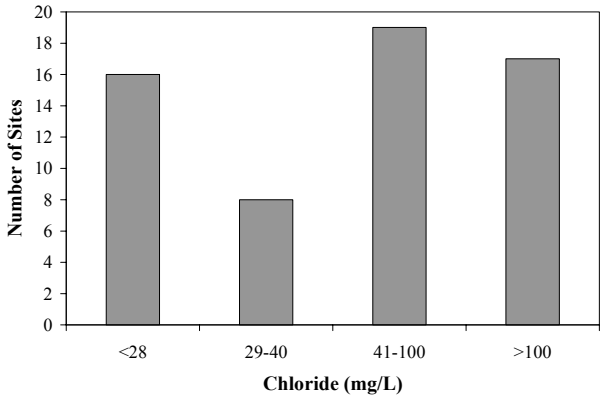

Figure 10. *Histogram of chloride.*

For comparison, streams monitored professionally during October 2003 reported a median concentration of 0.11 mg/L for total phosphorus and 0.02 mg/L for orthophosphorus.

Chloride

Chloride is a component of salt, and can indicate human or animal waste inputs to a stream. Potential sources of chloride to a stream include direct input from livestock, septic system inputs, and/or discharge from municipal wastewater facilities. During winter months, elevated chloride levels in streams may occur as a result of road salt runoff to nearby streams.

Chloride concentrations in Iowa streams are typically in the 20 to 40 mg/L range. A total of 70 sites were monitored for chloride. Concentrations ranged from less than 24 to 639 mg/L, with a median of 41 mg/L (Table 1; Figure 10 and Appendix 1H). In conjunction with the Johnson/Iowa County snapshot, a cluster of twenty five sites were monitored for chloride in Clear Creek, Old Mans Creek, and Rapid Creek watersheds three weeks after elevated chloride was noted during the September 2003 Johnson/Iowa County Snapshot. High values prompted re-sampling as part of the October 2003 snapshot sampling. For the Clear Creek sites, 66 mg/L was the lowest recorded chloride concentration, while two sites had a concentration of 639 mg/L. Old Mans Creek sites ranged from 42 to 149 mg/L. The upstream Muddy Creek site had a concentration of 25 mg/L, while the two downstream sites had concentrations of 326 mg/L. All the sites in conjunction with the Johnson/Iowa County snapshot had higher concentrations than the median chloride value for the fall 2003 snapshot.

Thirteen sites were monitored for chloride during the October 2002, May 2003, and October 2003 snapshots. Seven sites reported higher values during the October snapshots, three sites recorded higher values during the May snapshot, while three sites did not fluctuate.

E. coli Bacteria

E. coli bacteria are a type of coliform bacteria present in the gastrointestinal tract of warm-blooded animals. These bacteria are called "indicator bacteria" because by themselves, they do not cause illness, but their presence suggests that disease-causing organisms, or pathogens, may be present. As the number of indicator bacteria rises in water, so does the likelihood that pathogens are present. The most frequent sources of pathogens are sewage overflows, malfunctioning septic systems, animal waste, polluted stormwater runoff, and boating wastes. The presence of *E. coli* bacteria suggests that a pathway exists for a relatively fresh source of human or animal waste to enter the stream. *E. coli* bacteria are reported in Colony Forming Units per 100 milliliters (CFU/100 ml).

Iowa's water quality standard for *E. coli* bacteria applies to Class A swimmable waterbodies. The one-time maximum value is 235 CFU/100 ml or the geometric mean, a measure of five samples collected in a 30-day period, is 126 CFU/100 ml.

IOWATER monitors tested 14 sites for *E. coli* bacteria, with bacteria counts ranging from 0 to 150,000 CFU/100 ml (Table 1; Appendix 1I). Training for *E. coli* bacteria monitoring is done at advanced IOWATER workshops. Samples need to be incubated for 48 hours, and more time is involved in testing for this parameter, hence not as many

samples were collected. Ten of the 14 sites tested for *E. coli* bacteria were in the Squaw Creek Watershed (five sites – Story and Boone counties) and the upper Wapsipinicon River Watershed (five sites – Buchanan and Black Hawk counties).

All 14 sites had been previously tested for *E. coli* bacteria, except one site on Sevenmile Creek in Clarke County. *E. coli* results from the October 2003 snapshot sampling were similar to results reported previously for each site. The highest *E. coli* for the May 2003 (1,000 CFU/100 ml) and October 2003 (150,000 CFU/100 ml) snapshots occurred at Montgomery Creek in Boone County.

Water Odor

Water odor was recorded at 133 sites. All but three sites reported no odor to the water (Figure 11). All three sites have been monitored prior to the October 2003 snapshot sampling with odors noted in the past.

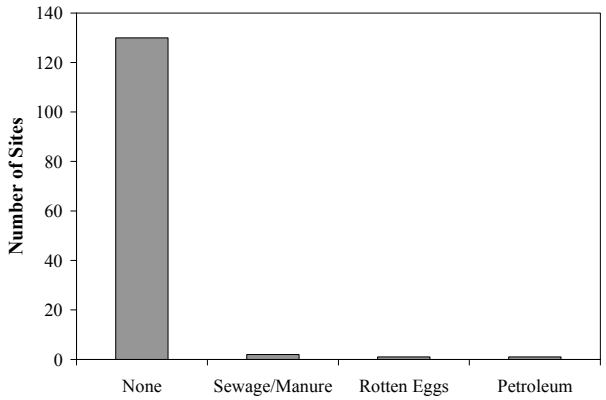

Figure 11. *Histogram of water odor. (Note: more than one odor category can be indicated for a site.)*

Water Color

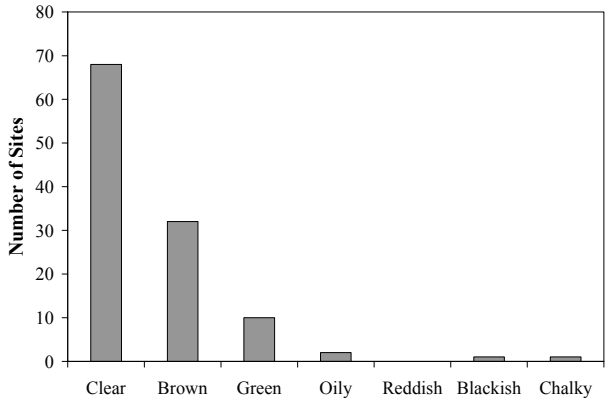

Figure 12. *Histogram of water color. (Note: more than one category can be indicated for a site.)*

Water color was recorded at 135 sites. Water was clear at 68 sites, brown at 32, and green at 10 (Figure 12). Oily, blackish, and chalky were also noted, but those colors were only identified at a total of four sites.

Biological Parameters

The most common method for assessing the biological health of a stream is to use benthic macroinvertebrates. Benthic macroinvertebrates are aquatic insects, clams, crustaceans, leeches, snails, and worms. Tolerances of these organisms to pollution have been established, therefore, the types of bugs present can be used as an indicator of stream health. For the snapshot sampling, the IOWATER Level 1 benthic macroinvertebrate key was used to identify bugs.

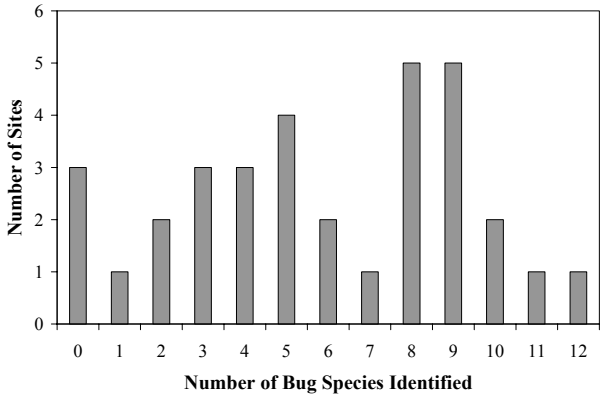

Figure 13. *Number of bug species identified.*

A total of 33 sites were monitored for benthic macroinvertebrates. The number of bug species identified at these sites ranged from zero to 12 (Figure 13; Appendix 2A). Three sites, including an unnamed creek (Louisa County), Clanton Creek (Madison County), and Squaw Creek (Story County) reported no bugs present. The sites in Louisa and Story counties have been monitored before for bugs, but the site in Madison County was monitored for benthic macroinvertebrates for the first time during the October 2003 snapshot. The last time the Story County site was monitored was in 2001, and only stoneflies, which are high quality bugs, were present. The Louisa County site was sampled two months prior to the snapshot sampling, at which time a variety of middle quality bugs were present. Four sites, including Turkey Creek (Johnson County), Sevenmile Creek (Clarke County), Willow Creek (Mitchell County), and Horton Creek (Bremer County) identified 10 or more bug species. Turkey

Creek and Sevemile Creek reported 10 bug species. Turkey Creek has been sampled a total of four times for biological parameters, while Sevenmile Creek has been sampled once prior in 2001; both reporting similar results to the October 2003 snapshot. Willow Creek identified 11 bug species, demonstrating similar results to the one other time the site was sampled for biological parameters in October of 2002 (10 bug species). Horton Creek identified 12 bug species, the most biologically diverse site sampled during the October 2003 snapshot. This site has been sampled once previously during the May 2003 snapshot, at which time only three types of bugs, a high quality, middle quality and low quality bug, were identified.

Figure 14 shows the quality of bugs collected from the 33 sites. The bar graph shows the percentages of high quality, medium quality, and low quality bugs present. For 14 sites, the bug population was comprised of an equal percentage of high, medium, and low quality bugs. For 16 sites, the bug population was dominated by medium quality bugs.

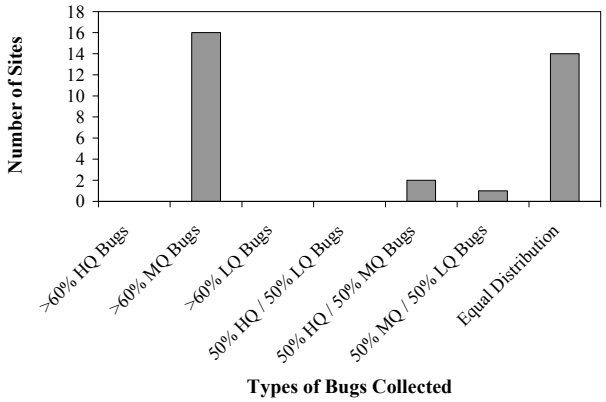

Figure 14. *Quality of bugs collected. HQ = High Quality; MQ = Medium Quality; LQ = Low Quality.*

For four sites, including Duck Creek (Scott County), Ralston Creek (Johnson County), Cedar River (Bremer County), and the Middle River (Madison County), only middle quality bugs were present.

Of the bugs identified at all sites, 59 percent were classified as medium quality bugs, while only 18 percent were high quality bugs. (Figure 15).

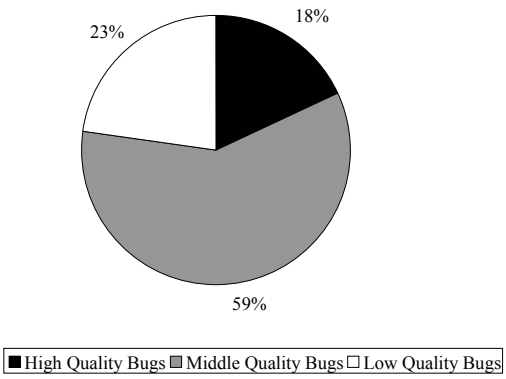

Figure 15. *Pollution tolerance of bugs identified.*

Habitat Parameters

Stream habitat is the space that can be occupied by living organisms. With the IOWATER habitat assessment, observations are made on the vegetation that occurs in and around the stream, as well as the types of rocks and sediments on the stream bottom. These habitat characteristics can affect the biological communities in the stream, as well as affect chemical measurements made at a stream.

Stream Banks

The stream's riparian zone is the area of land directly connected to the stream. This zone is important to the health and protection of the stream. The riparian zone width is distinguished by left versus right bank while looking upstream.

Figure 16 shows the riparian zone width for 41 sites monitored. For 39 percent of the sites, the left bank riparian zone width was greater than 25 meters, while for 35 percent of the sites, the right bank was greater than 25 meters wide. Twelve sites (29 percent) had greater than 25 meters riparian zone width on both sides of the stream, while eight sites (20 percent) had greater than 5 meters on both sides; similar to findings during the May 2003 snapshot.

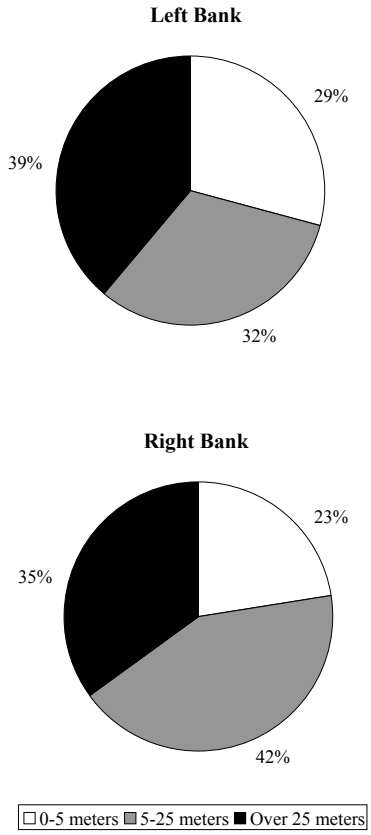

Figure 16. *Riparian zone width at 41 stream sites.*

Canopy Cover

Canopy cover controls the amount of light that filters through overhead tree branches and leaves to a stream. Canopy cover is estimated as the percentage of area above the stream that is covered by tree branches, leaves and/or grasses. For 73 percent of the 42 sites monitored, canopy cover ranged from 0 to 25 percent (Figure 17).

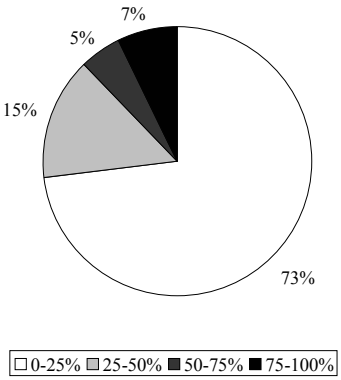

Figure 17. *Canopy cover at 42 stream sites.*

Aquatic Plant Cover

Aquatic plant cover includes all plants that grow in the water or wet soils. These plants provide habitat and stabilize substrate during high flow conditions, produce oxygen, and take contaminants out of the sediment via root absorption. Aquatic plant cover is calculated at the stream transect as the percent of streambed covered by aquatic plants. This is recorded in increments of 25 percent. Of the 27 sites where aquatic plant cover was estimated, all but three of the sites had 25 percent or less aquatic plant cover (Figure 18).

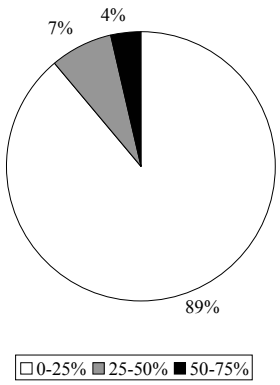

Figure 18. *Aquatic plant cover in the stream at 27 sites.*

Algae Cover

Algae are commonly found in slower moving waters attached to rocks or other streambed substrates. Excess algae can be caused by excess nutrient concentrations in the stream and can lead to oxygen depletion. Algae cover, estimated at the stream transect, is quantified as the percentage of stream or streambed covered with algae in increments of 25 percent. The majority of sites sampled (82 percent) had very little algae cover present, with IOWATER monitors reporting 0 to 25 percent algae cover at most sites (Figure 19).

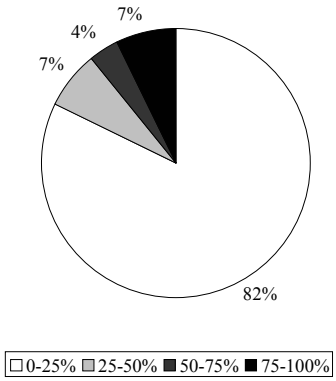

Figure 19. *Algae cover in the stream at 28 sites.*

Streambed Substrate

The characteristics of the stream bottom are very important to habitat quality and the type of aquatic life you may find. The materials that compose the stream bottom are called substrate. At the stream transect, the percent area covered by the different substrate categories was estimated. The categories include bedrock, boulder, cobble, gravel, sand, mud/silt, and other (organic material). Figure 20 shows the type of streambed substrate present at the 41 sites monitored for substrate. The streambed substrate at the majority of sites was comprised of mud/silt. Mud/silt substrate can be an indication of sedimentation, which leads to lack of habitat due to spaces between rocks and pools filling in with sediment, thus making it difficult for some benthic macroinvertebrates and fish to survive.

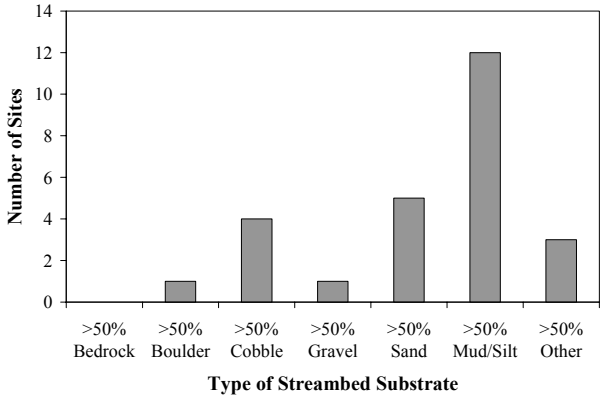

Figure 20. *Type of streambed substrate present at each site.*

Standing Water Assessment

As part of the October 2003 snapshot, a total of five sites were monitored in three Iowa counties (Figure 1). Table 2 summarizes the results from the sampling. Since this is the first time lakes have been sampled during an Iowa statewide snapshot, there is no comparable data.

Table 2. *Standing Water chemical/physical parameter results for the IOWATER Statewide Snapshot Sampling – October 18, 2003.*

Parameter	Unit	Number of Samples	Min Value	Percentiles			Max Value
				25th	50th	75th	
Water Temperature	degrees F	5	39	44	51	56	60
pH	pH units	5	7	7	8	8	8
Dissolved Oxygen	mg/L	5	4	5	6	8	10
Nitrite-N	mg/L	5	0	0	0	0	0.15
Nitrate-N	mg/L	5	0	0	0	1	2
Secchi Depth	meters	2	1.7	1.8	1.9	1.9	2
Transparency	centimeters	3	31	40	49	50	50
Orthophosphorus	mg/L	5	0	0	0.1	0.1	0.6

Future Statewide Snapshots

The IOWATER program would like to thank all IOWATER monitors who sampled their sites as part of the fall 2003 IOWATER Snapshot Sampling. This report reflects your continued efforts in collecting water quality information on Iowa's water resources. This biannual snapshot event is changing to a triannual snapshot event, and will continue in 2004 with three statewide snapshots scheduled for May 15, July 17, and October 16, 2004. Additional copies of this report can be obtained by contacting Brian Soenen (brian.soenen@dnr.state.ia.us) or by accessing the summary on the IOWATER website (*www.iowater.net*).

Acknowledgements

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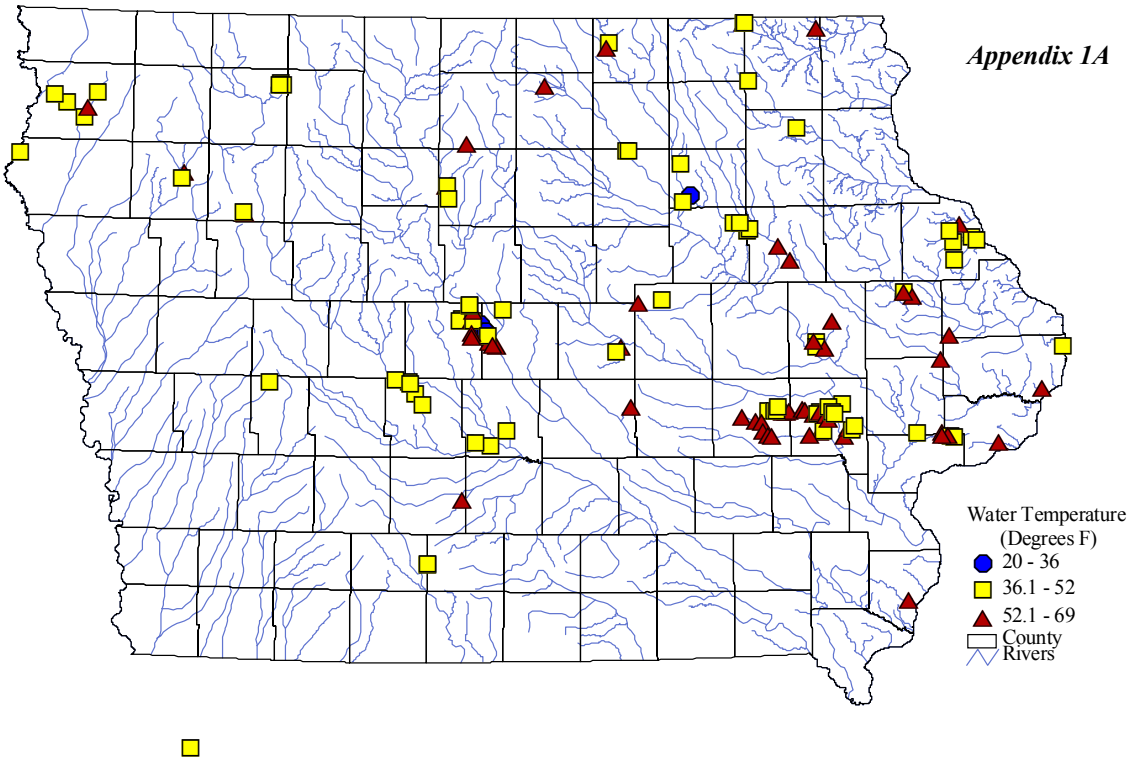
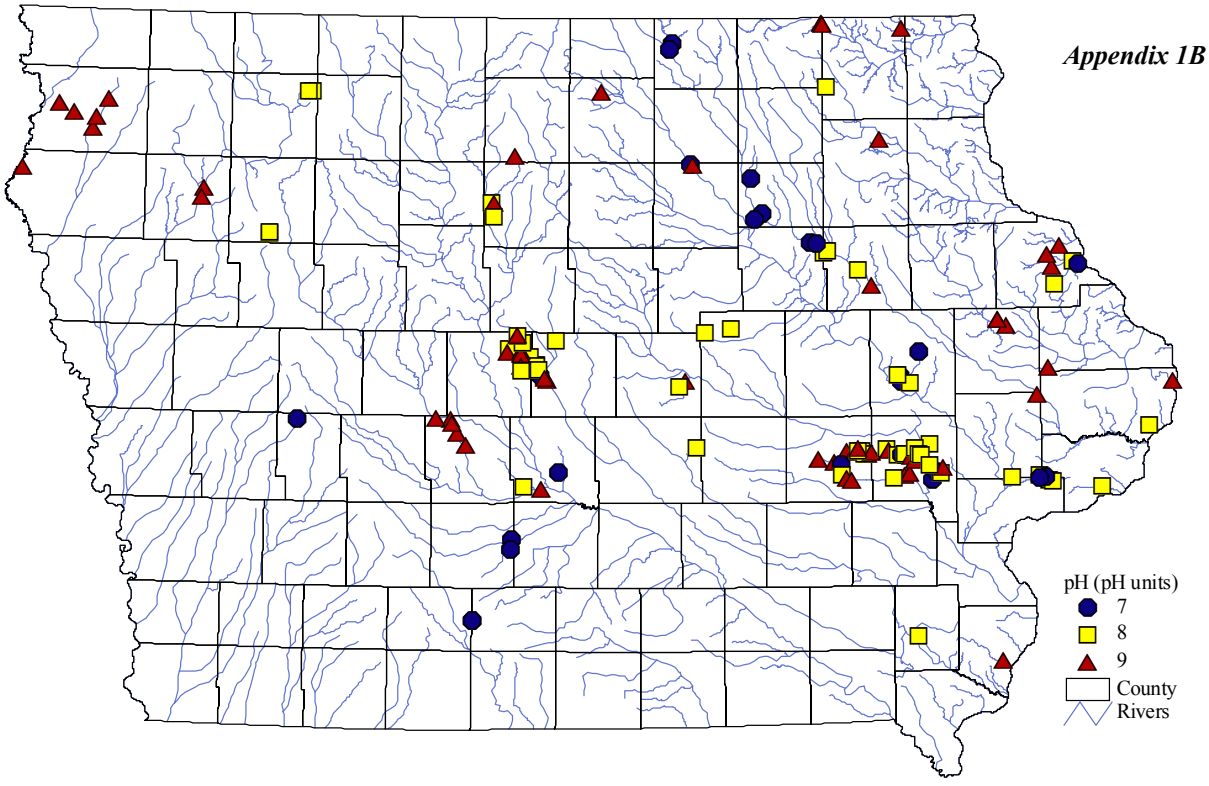
On October 18, Iowa Public Television videotaped IOWATER monitors as part of the snapshot sampling. The episode aired in December 2003 as part of the *Living in Iowa* series. Special thanks to the following individuals for their involvement: Tom Cuvelier, Tony Zelinskas, and other members of the Catfish Creek Coalition; Bill and Margaret Walser; Lynette Seigley; Nancy Heather, Steve Carns, and the rest of the *Living in Iowa* staff.

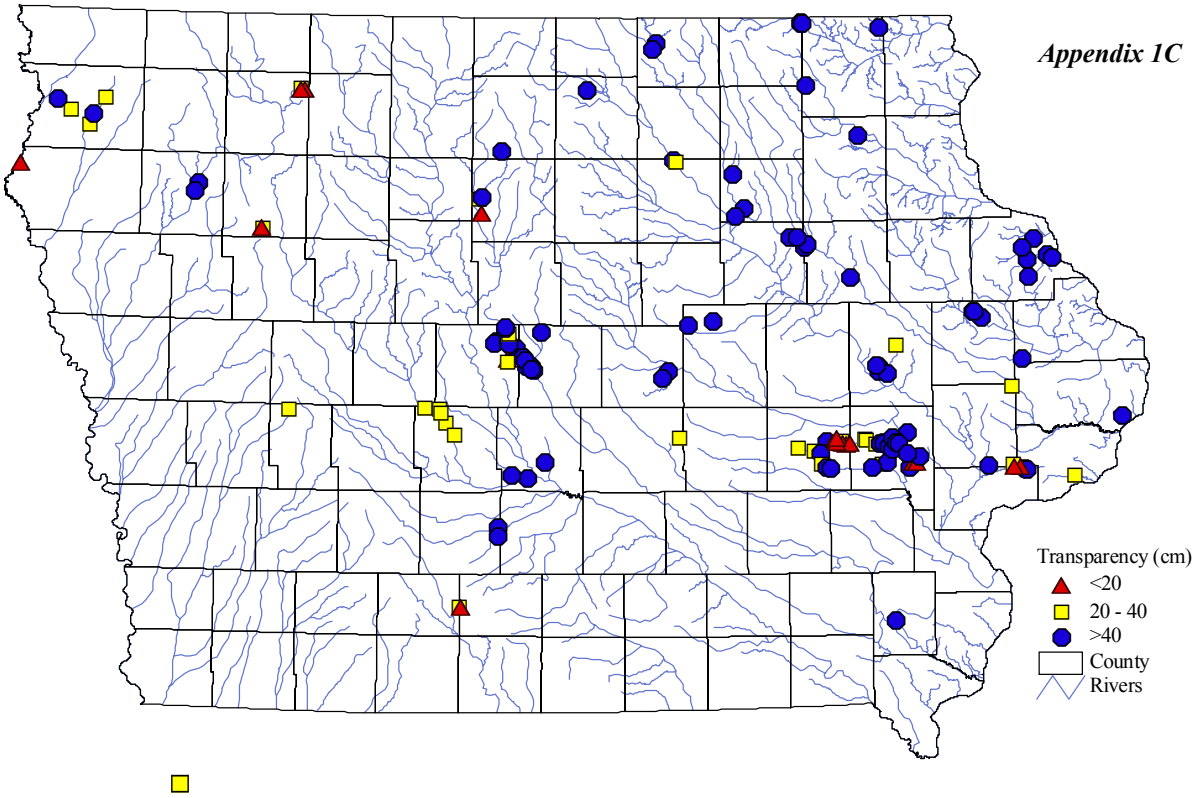
Written: March 2004



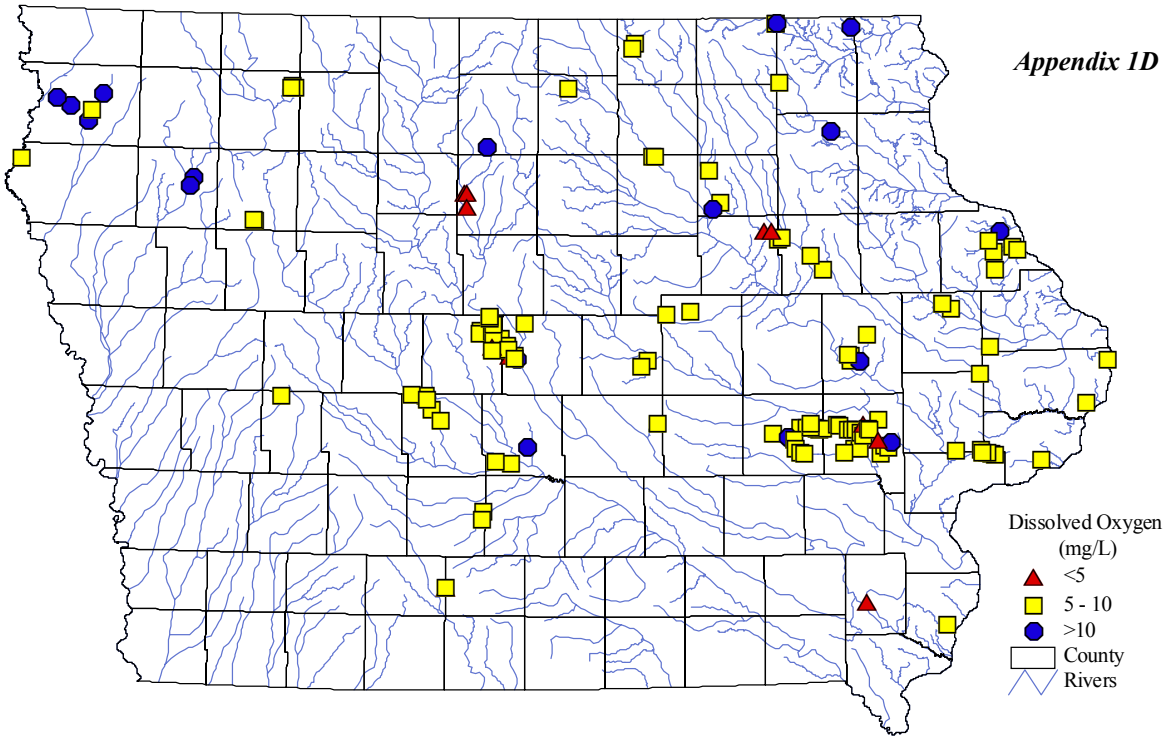
Appendix 1A



Appendix 1B



Appendix 1C



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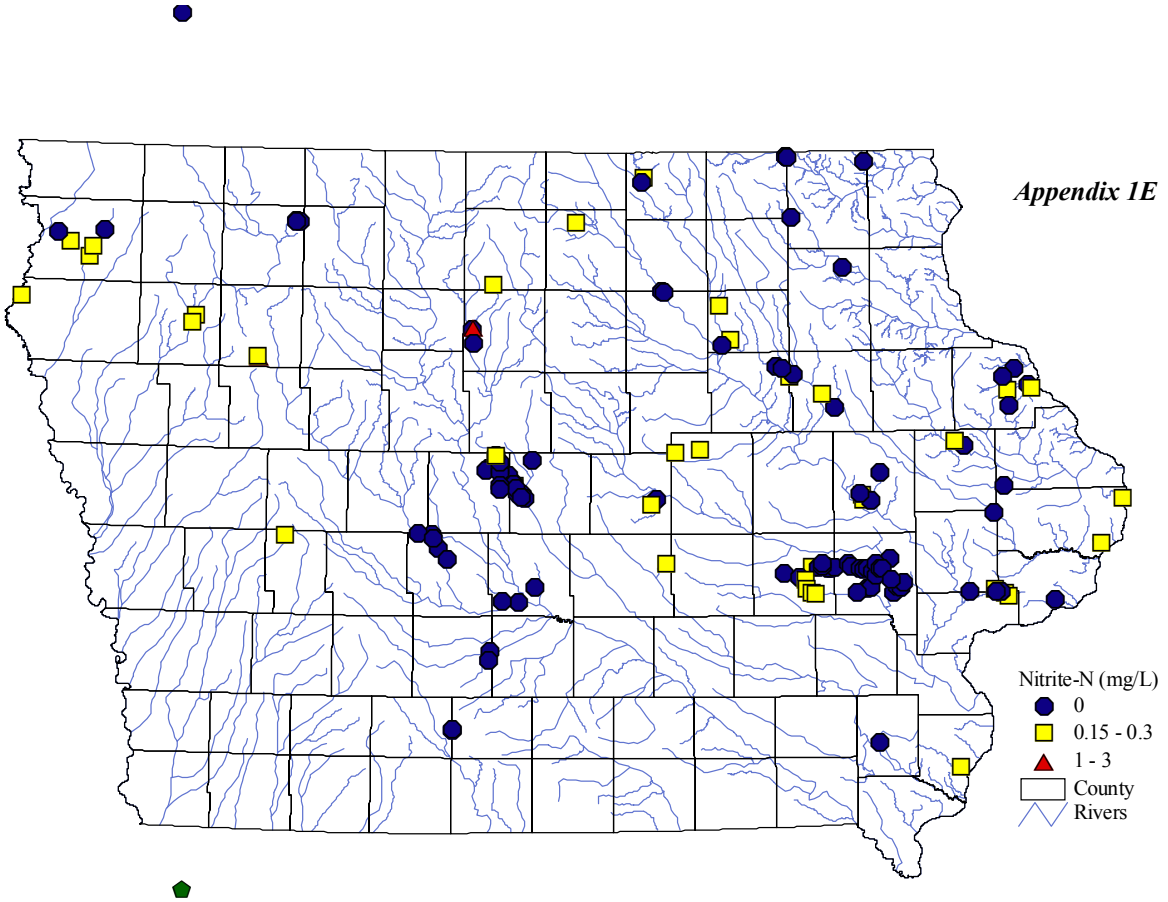
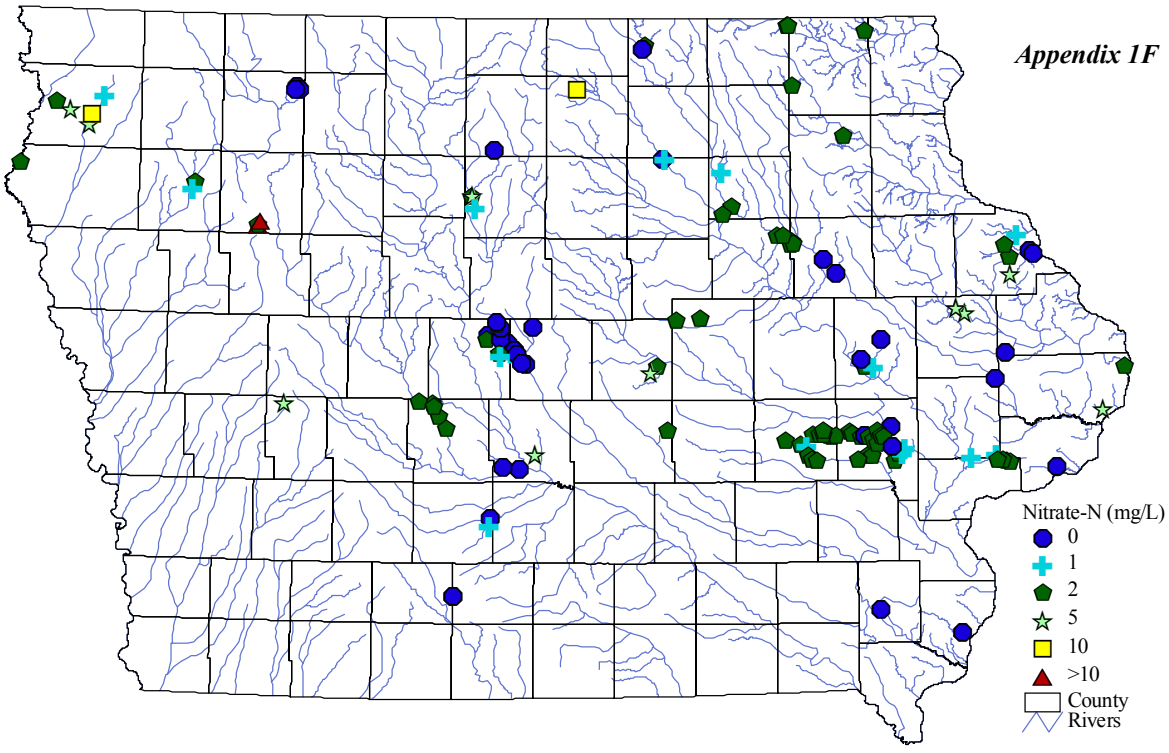
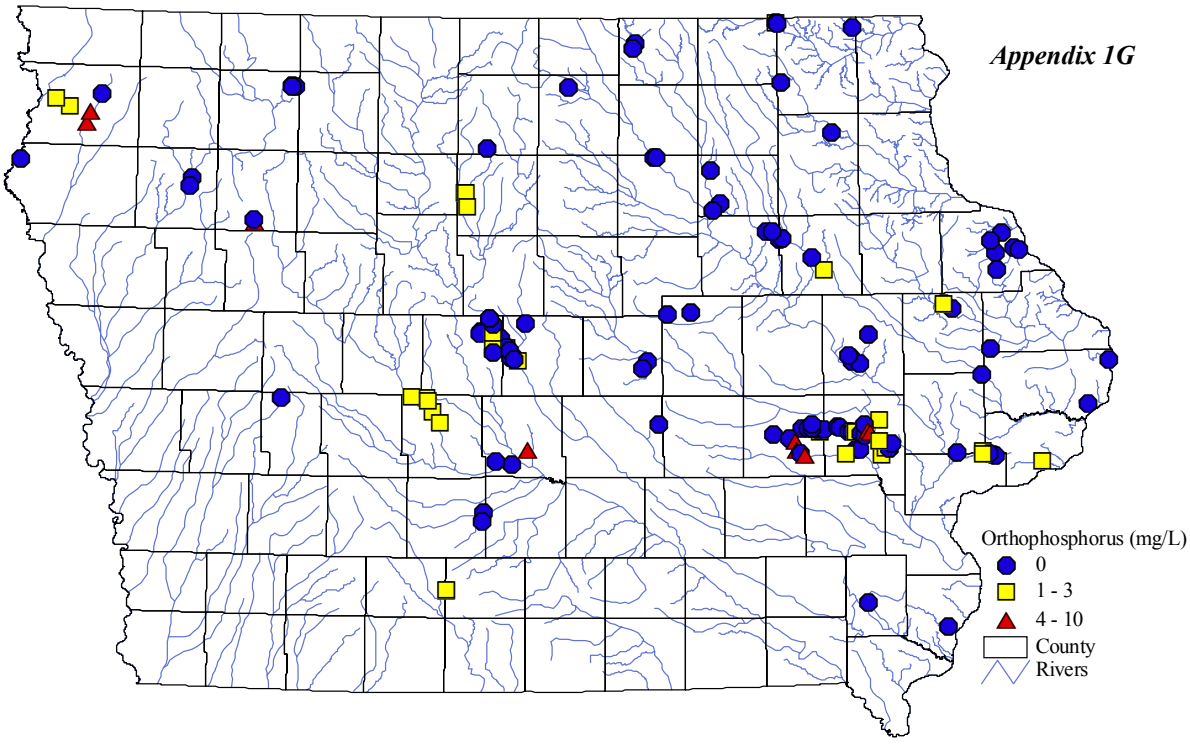
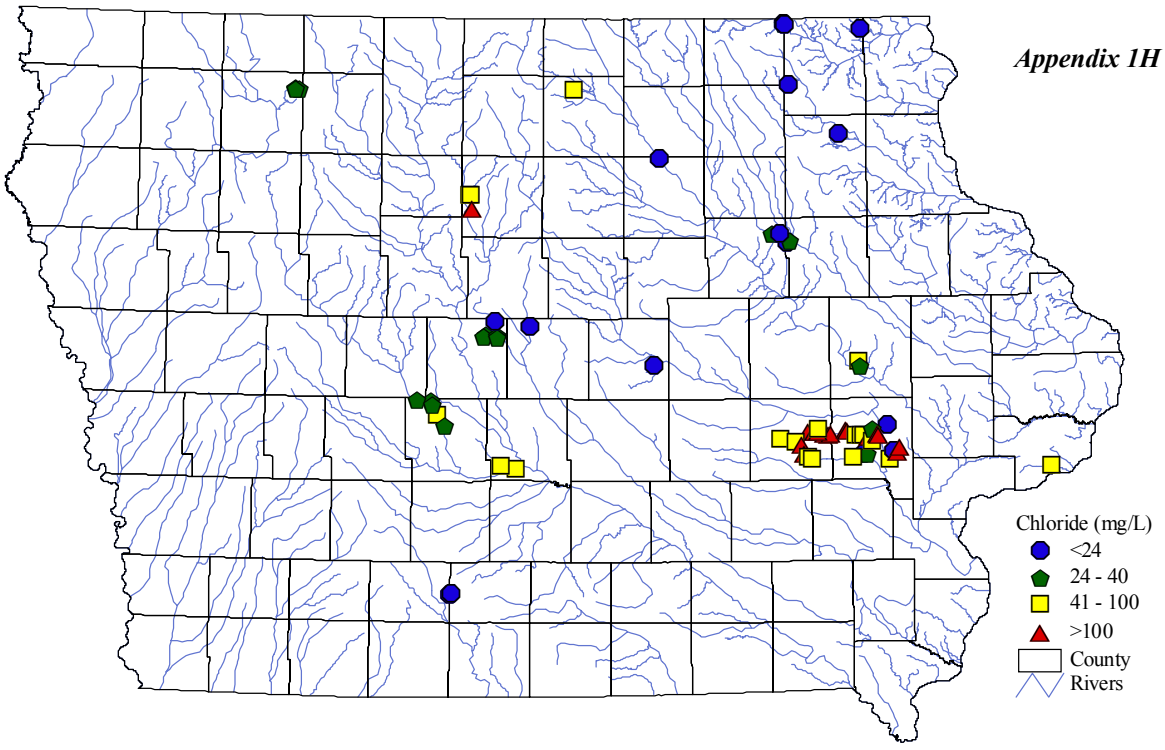

Appendix 1E
Nitrite-N (mg/L)
0
0.15 - 0.3
1 - 3
County
Rivers

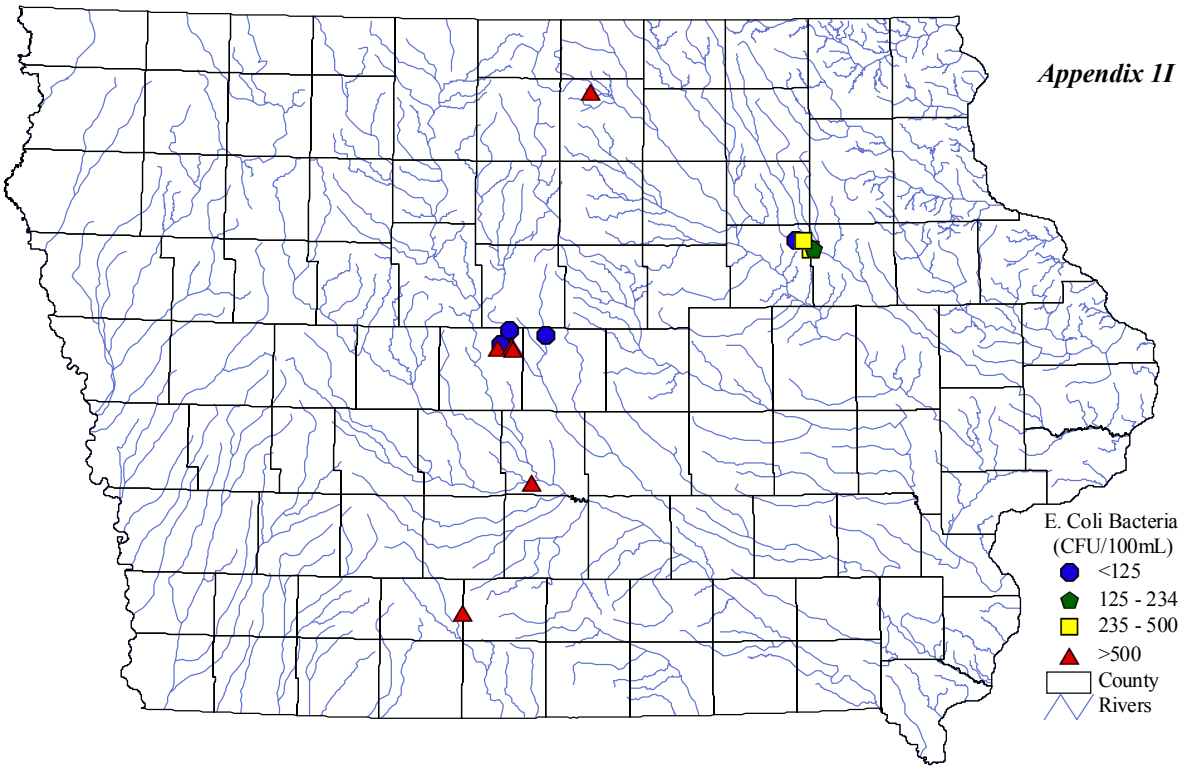

Appendix 1F
Nitrate-N (mg/L)
0
1
2
5
10
>10
County
Rivers



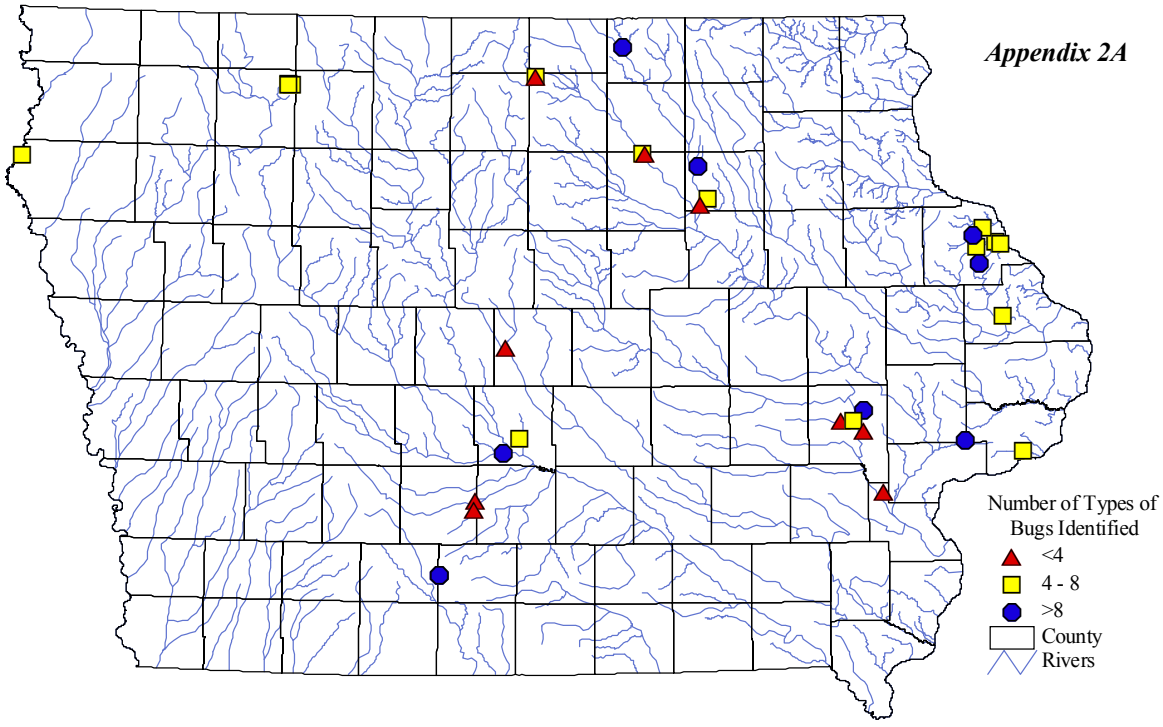
Appendix 1G



Appendix 1H



Appendix 1I



Appendix 2A