Inspiring volunteers, improving Iowa's natural resources, and changing lives—what a fantastic way to get involved! Thanks for sponsoring project AWARE!

2010 Project AWARE Sponsorship Series

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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.

Photos by Colin Gordon (volunteer in mud, p. 3),
Melissa Jacobsen (volunteers in canoe, p. 4),
John Pearson (prairie skink, p. 3, thank-you sign, p. 4),
Lora Schwendinger (volunteer in water, p. 2,
volunteers in canoes, p. 3), and Iowa DNR staff

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

Water Fact Sheet 2011-1
January 2011

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

Printed on Recycled Paper

There is no syllabus, no textbooks, and no grades…and nothing about this "class" is easy. To be honest, it can be exhausting, dirty, and downright disgusting.

Ask any one of the 1,700-plus Iowans who have volunteered to clean up Iowa's rivers on Project AWARE and you'll surely hear about the sweltering summer heat, driving rainstorms, endless mud, sauna-like port-a-pots, and just about any other seemingly miserable vacation experience you can imagine. Whatever the malady, however, you're also guaranteed to hear one thing—Project AWARE is fun!

Project AWARE is an opportunity to clean up a river, play in the water, treasure hunt, listen to the birds, meet lots of people who care about Iowa's water and challenge every muscle in your body. It's a license to be a kid again with an adventure around every bend in the river.

—Carol Sweeting, 2-year Project AWARE veteran

Describing Project AWARE, which stands for A Watershed Awareness River Expedition, as a weeklong volunteer river cleanup event is like describing Goodwill as an organization that sells used clothes. It's certainly true, but it's only one element of a much larger effort to change lives and improve the environment.

Total strangers, some volunteering individually and others with families, converge on Project AWARE each year. Together, from the seats of their canoes, they embark on a mission to clean up garbage. This mission brings them together—strangers become friends, friends become family—and along the way they learn about watersheds.

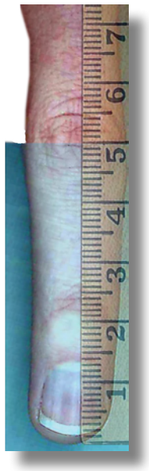
They don't look at an illustration or read a definition from a textbook. There's nothing scholarly about the process. They learn to read the landscape simply by traveling where the water flows.

The landscape is the school, the river the classroom, and the experience the teacher. The volunteers, of course, are the pupils…and the muscle.

It doesn't take a PhD in hydrogeomorphology to see there's a problem with dirt. From the land, evidence of soil erosion can be easily missed by passersby, but for those who follow the dirt down the watershed, they very quickly discover the dirty truth.

Five Centimeters

For volunteers looking for garbage on the Nishnabotna River in southwest Iowa in 2010, our rivers' problem with dirt was clear. With a median transparency measured during the week at five centimeters, volunteers could see it whenever they reached into the water and their fingertips disappeared into the murky depths. This condition, of course, made it awfully hard for them to find submerged trash…and makes it even harder for aquatic life to find food. In addition to visibility challenges, heavy sediment loads bury habitat in a suffocating soup of muck, literally rendering aquatic species homeless.



The Nishnabotna River is not alone in its fight against dirt. Statewide, changes to the landscape and ever-increasing drainage infrastructure bring more dirt to our streams. Additionally, the geology of southwest Iowa consists of highly erodible soils. In 2010, heavy precipitation compounded the erosion problem by causing river levels across Iowa to be above normal for most of the summer, with June being the wettest June on record.

While dirty water and higher-than-normal flows may have impeded trash collection efforts, they also helped teach valuable lessons. For example, slogging through waist-deep mud to save a pop can or remove a refrigerator doesn't simply improve riverine aesthetics; it also has a discernible impact on the volunteer garbage collectors who take on the challenge.

In 2010, the West Nishnabotna River Water Trail was created in Pottawattamie County, a designation that helps highlight this lazy meandering aquatic jewel in southwest Iowa. Whether it be on the West Nish or off the beaten path on the East Nishnabotna, both rivers offer miles of adventure…and opportunities to play in the mud. Sometimes we all need to get a little dirty before we can come clean.

I was amazed at the amount of sediment in the river and deposited along the riverbanks. As a water quality professional, I know that sediment is an issue for the waters of Iowa, but seeing the condition of the river brought the issue home for me in a new and profound way.

—Rick Cruse, Director of the Iowa Water Center

Project AWARE Accomplishments • Nishnabotna River • July 10–17, 2010

100 river miles covered
223 participants:
- youngest participant, 2 years old
- oldest participant, 75 years young
- average number of participants per day, 104

79 sponsors
18,600 lb. (9.3 tons) of total trash removed
54% of trash recycled

29 sites monitored:
- median pH, 8
- median transparency, 5 centimeters
- median phosphate, 2 milligrams per liter (mg/L)
- median nitrite-nitrogen, 0 mg/L
- median nitrate-nitrogen, 2 mg/L
- median chloride, less than 25 mg/L
- median dissolved oxygen, 6 mg/L
- median water temperature, 71°F
- median air temperature, 81°F

JOIN US THIS SUMMER • Little Turkey, Turkey, and Volga Rivers • July 9–16, 2011

For volunteers with a sense of adventure, the clear water, lively rivers, and spectacular scenery of northeast Iowa beckon. This summer, scores of volunteers from across Iowa will spend their vacations working as aquatic garbage collectors—cleaning up, learning about, and exploring nearly 90 miles of the Little Turkey, Turkey, and Volga rivers.

For more information about Iowa's national award-winning river cleanup project and to register for the 2011 Project AWARE, visit our Web site: www.iowaprojectaware.com.

AWARE 2010

Volunteer River Cleanup

Nishnabotna River

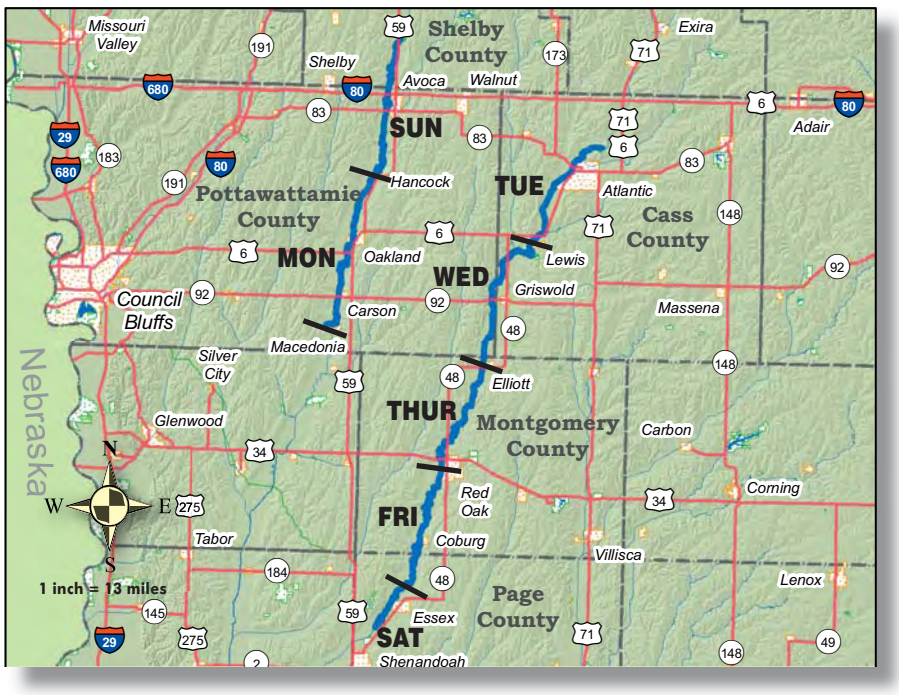
July 10-17, 2010

www.iowaprojectaware.com

Iowa Department of Natural Resources
www.iowadnr.gov

For safety reasons, knowing the water level before paddling is important. For complete real-time U.S. Geological Survey gaging station information, visit www.usgs.gov

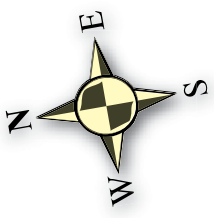
Printed on Waterproof Paper



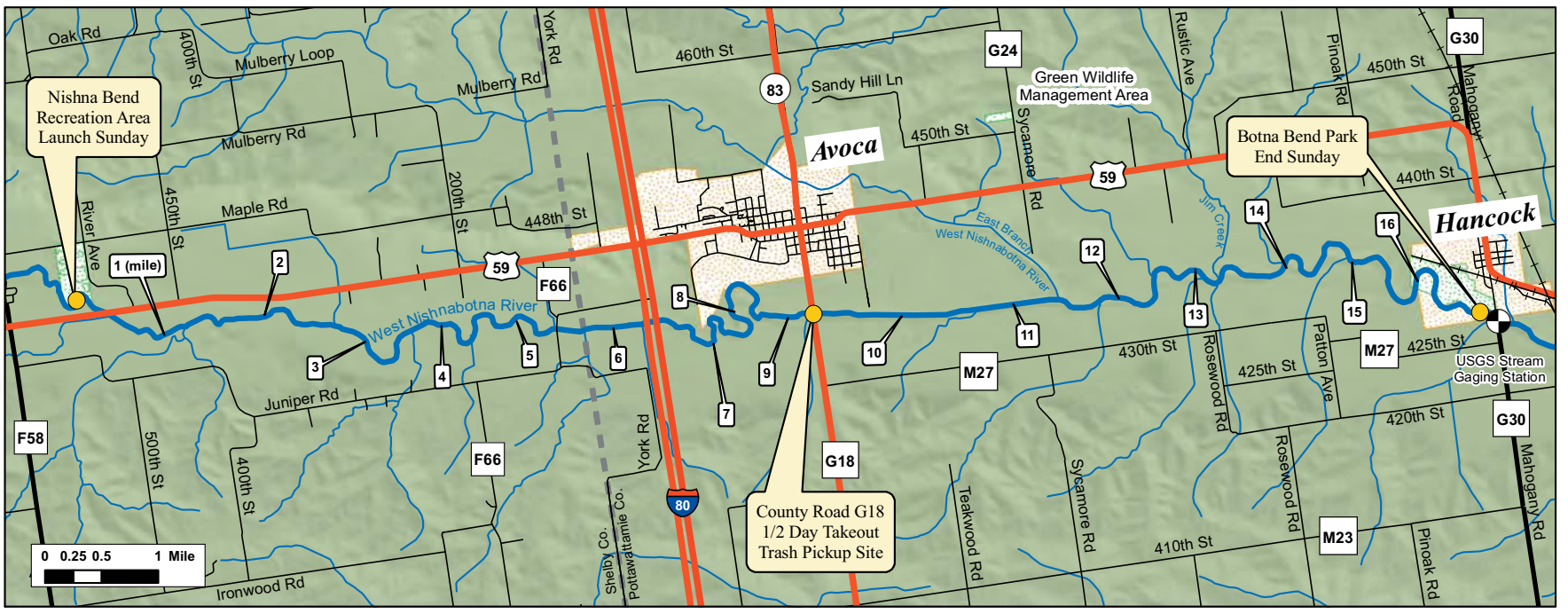
Sunday

July 11, 2010

West Nishnabotna River



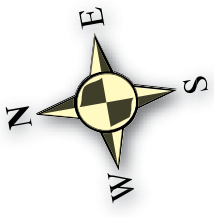
16.8 miles



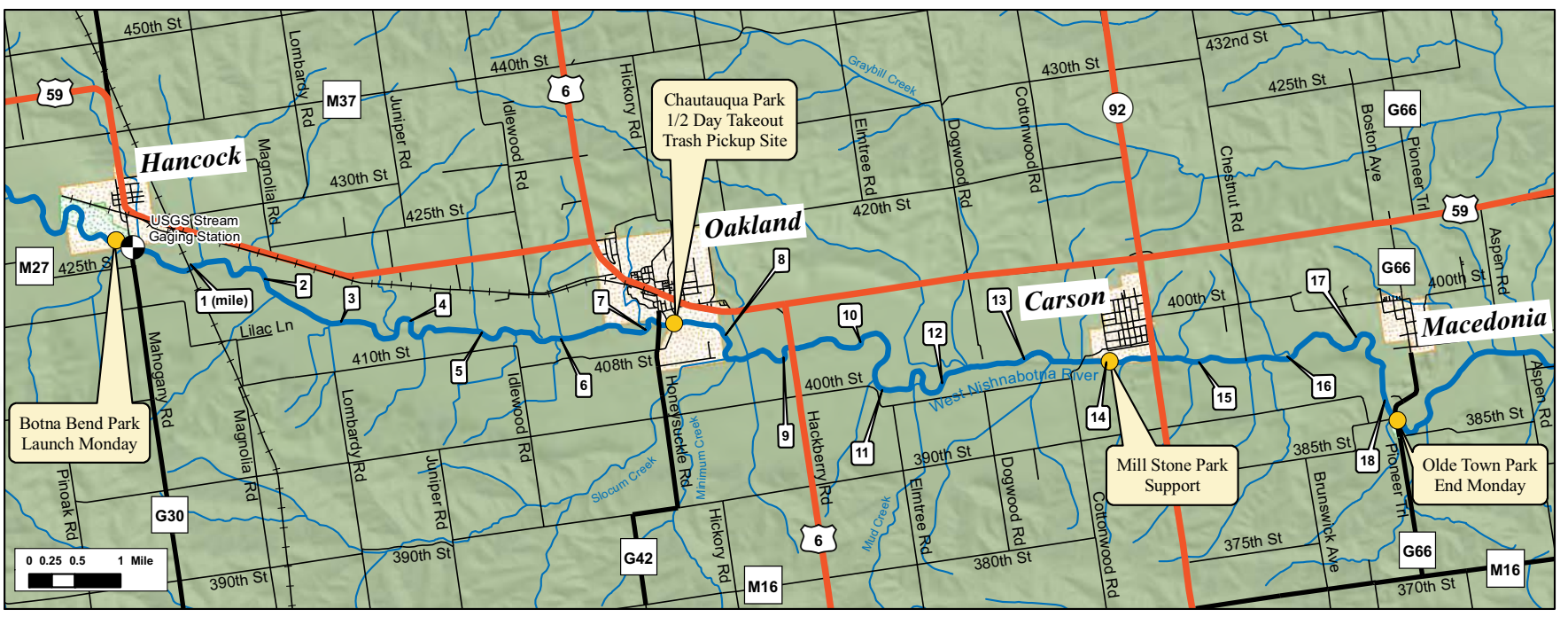
Monday

July 12, 2010

West Nishnabotna River



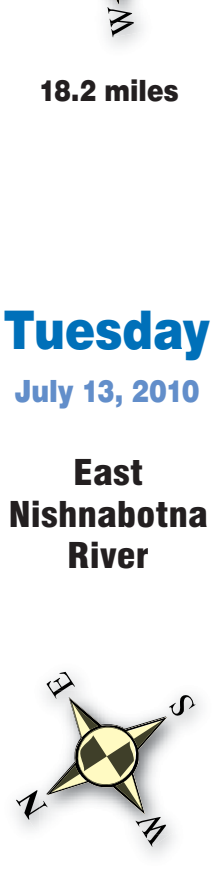
18.2 miles



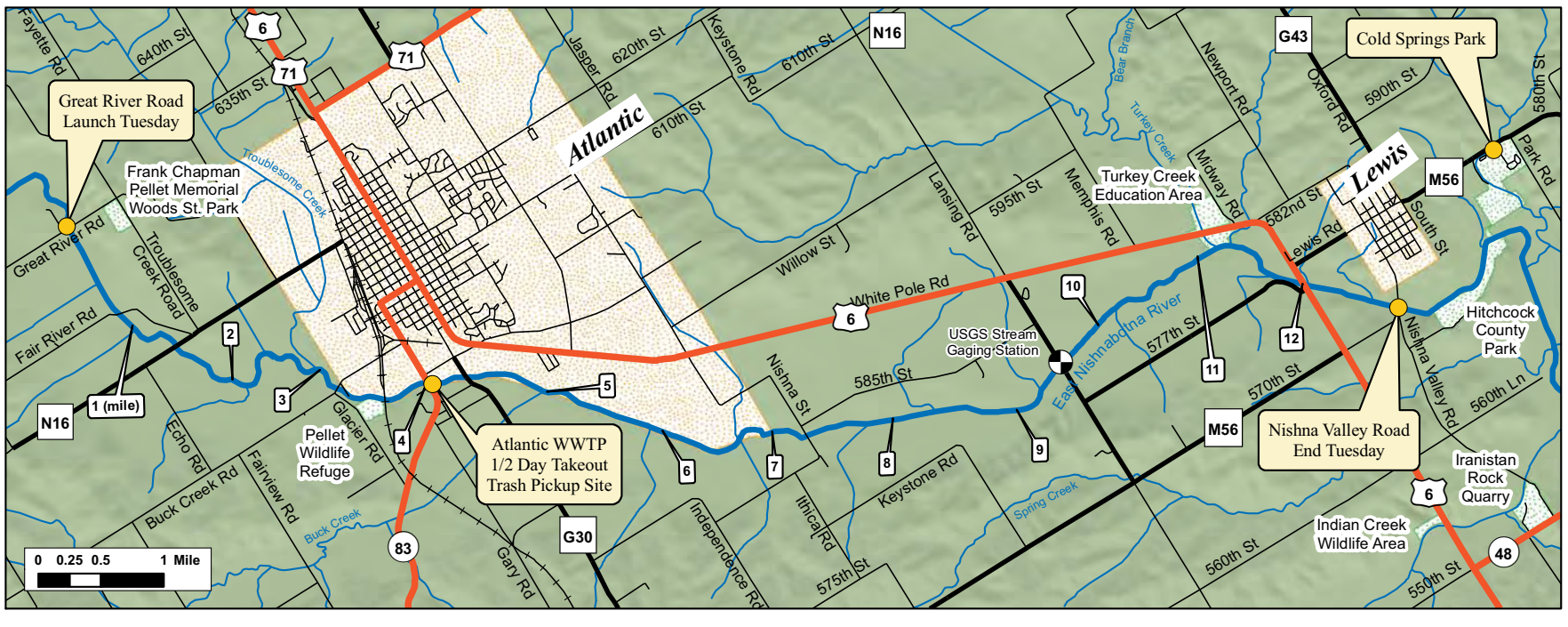
Tuesday

July 13, 2010

East Nishnabotna River



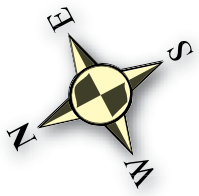
12.7 miles



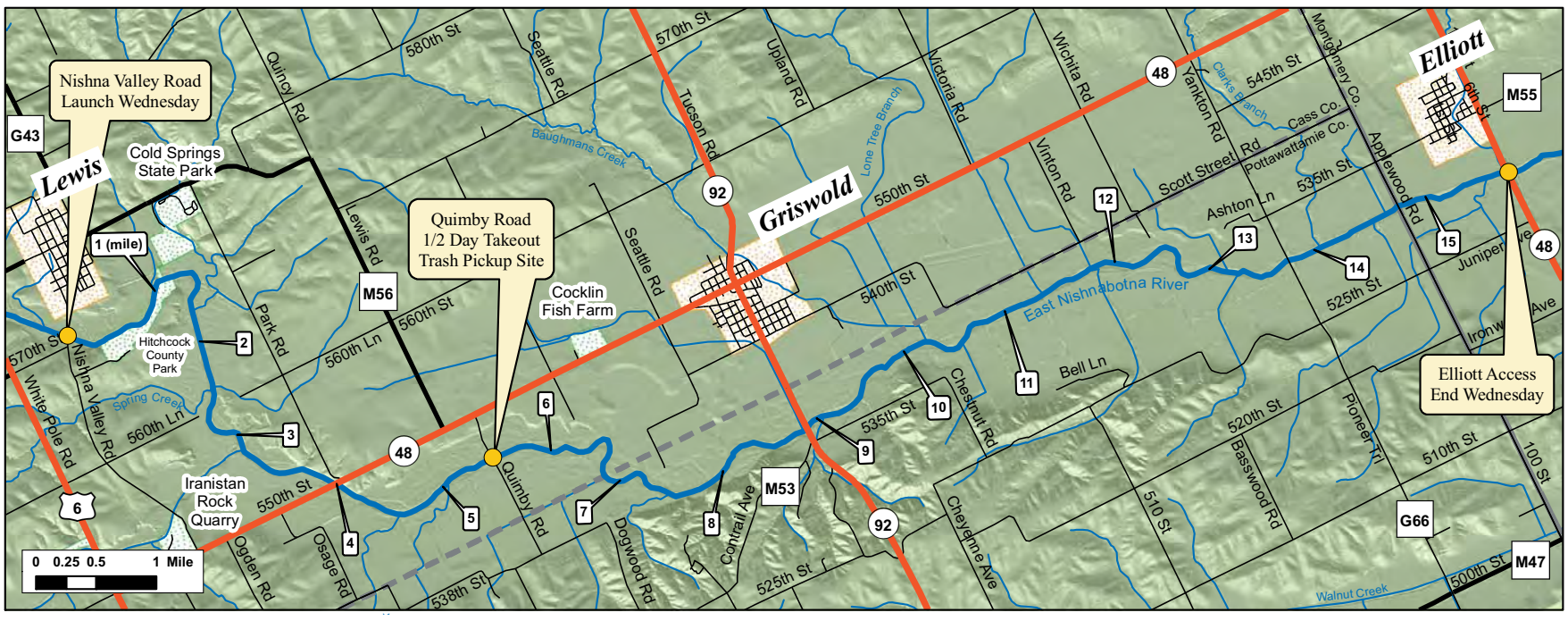
Wednesday

July 14, 2010

East Nishnabotna River



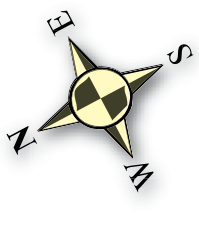
15.7 miles



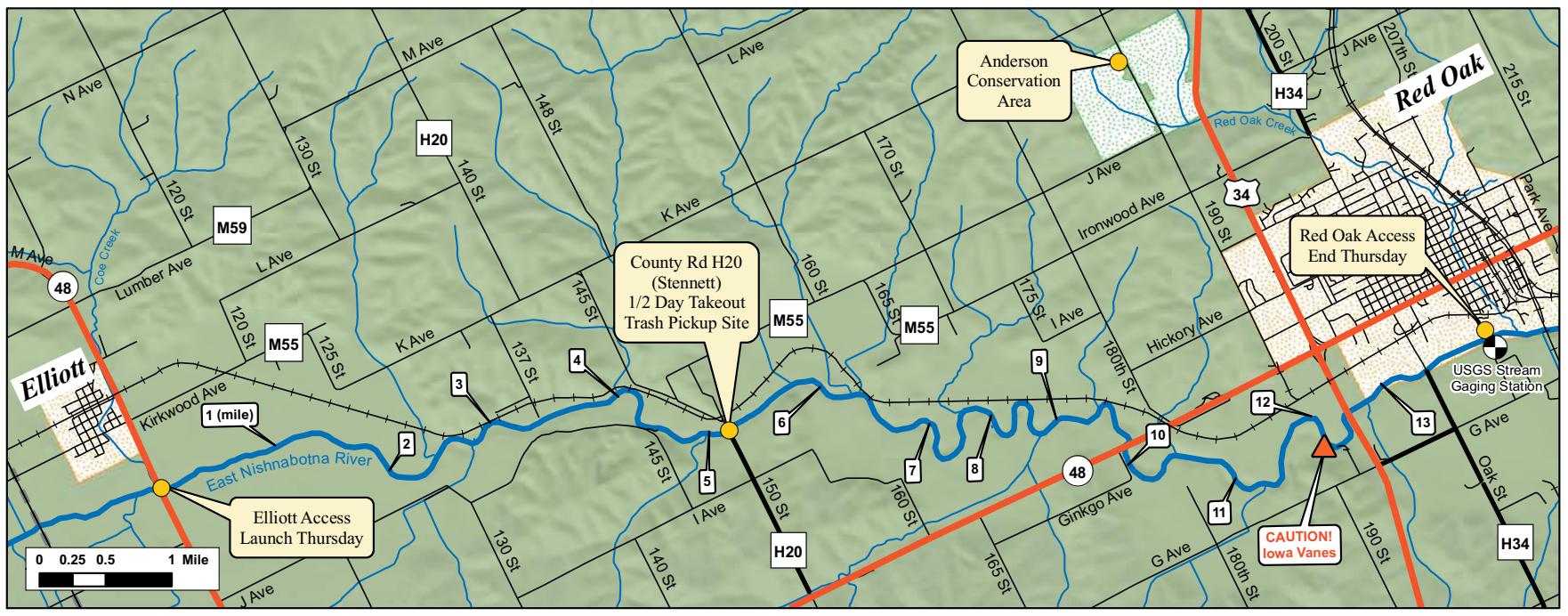
Thursday

July 15, 2010

East Nishnabotna River



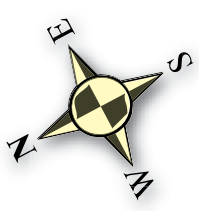
13.9 miles



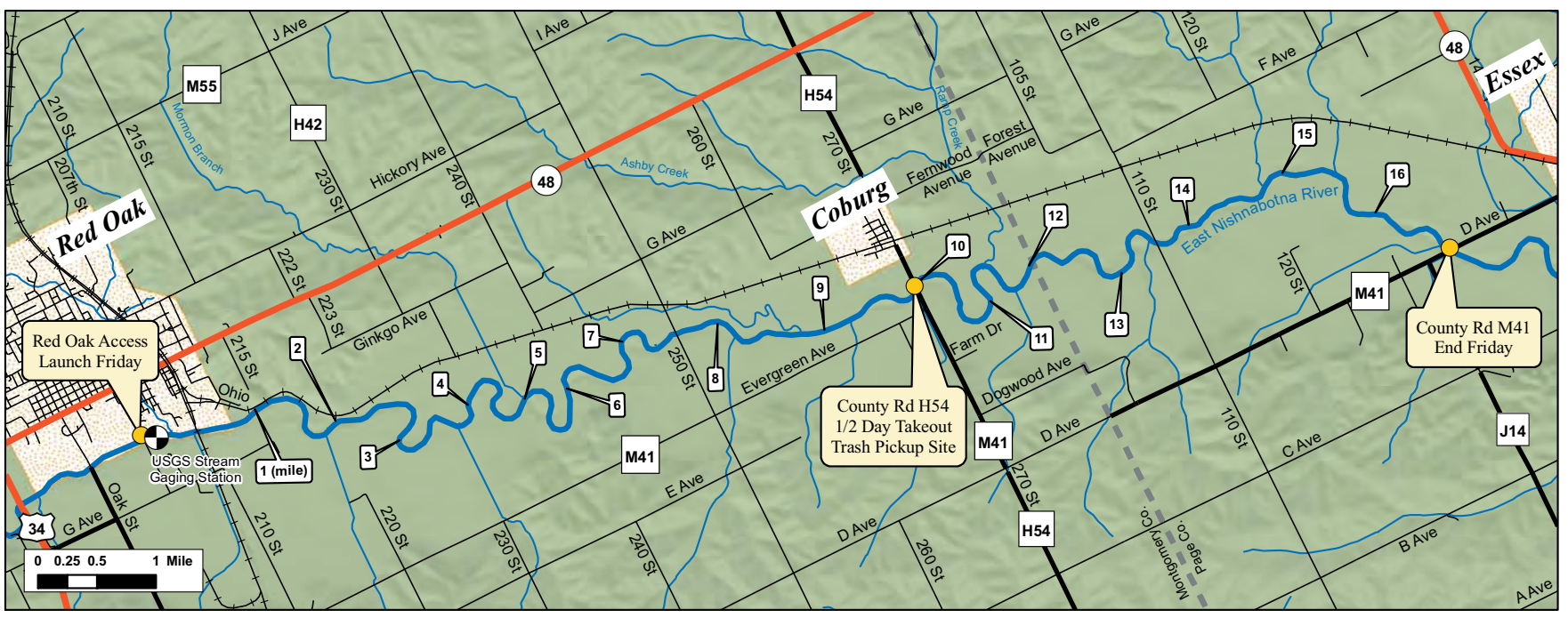
Friday

July 16, 2010

East Nishnabotna River



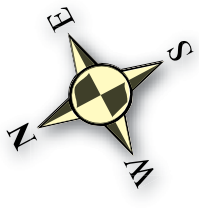
16.7 miles



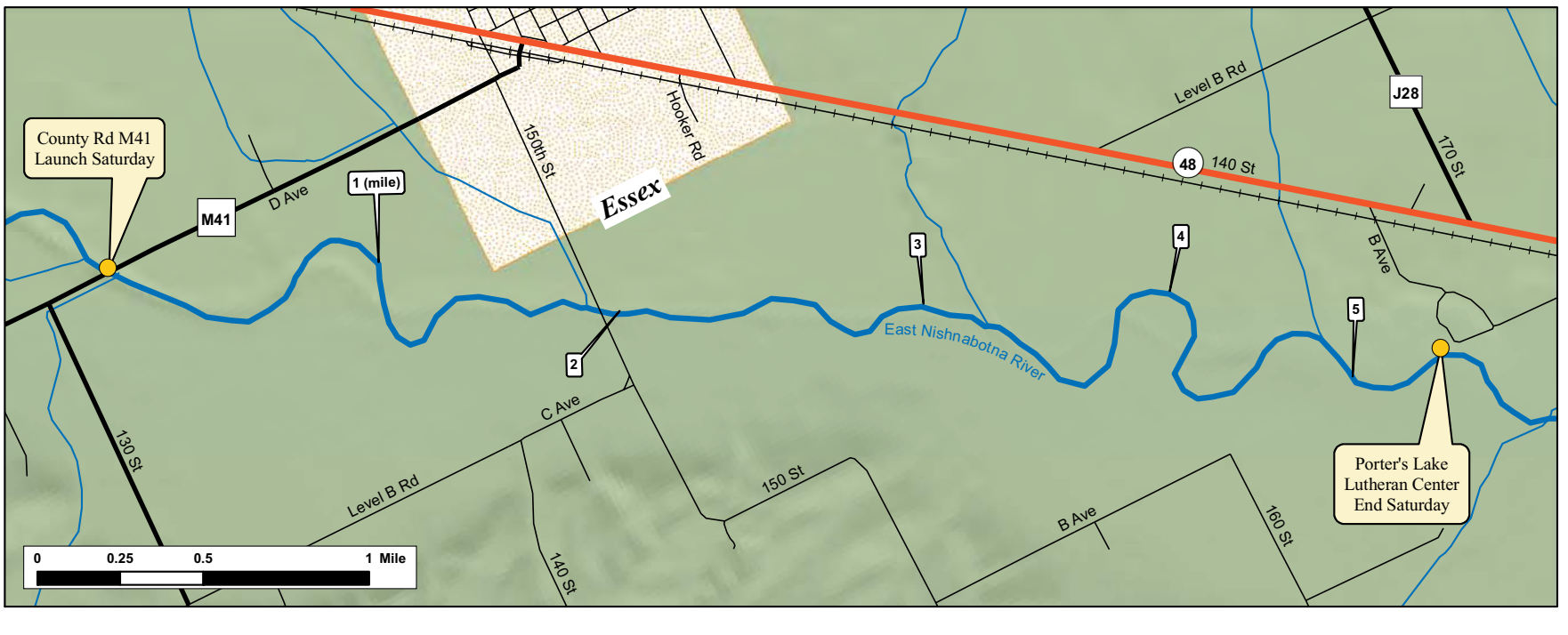
Saturday

July 17, 2010

East Nishnabotna River



5.3 miles



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River Rescue Sponsors: Aero Rental and Party Shoppe • B4 Brands • Barker Lemar Engineering Consultants • Boone County Landfill • Boy Scout Troop 242 • Casey's General Stores, Inc. • Cass County Mormon Trails Association • Cedar Valley Paddlers • Central Iowa Paddlers • Connie Struve • CrawDaddy Outdoors • Des Moines Area Community College • Des Moines Chapter Izaak Walton League • Environmental Advocates • Golden Hills RC&D • Hawkeye Fly Fishing Association • Hitchcock House Advisory Board • Howard & Phyllis Ciha • Humanities Iowa • Iowa Conservation Education Coalition • Iowa Natural Heritage Foundation • Iowa Rivers Revival • Iowa Waste Systems, Inc. • Iowa Whitewater Coalition • Mark Bohner • Marne & Elk Horn Telephone Co. • Metro Waste Authority • MidAmerican Energy Company • Montgomery County Family YMCA • Muscatine Chapter - Izaak Walton League of America • Nishnabotna Yacht Club • Page County Landfill & Recycling • Prairie Winds RC&D • Rubber Duck Outfitters • Seatasea Watersports Center • Shenandoah Community School District • Snyder & Associates, Inc. • Springbrook Conservation Education Center • Stine Seed Company • Sue Caley • The Dental Practice • The Nature Conservancy • Touch the Earth - University of Iowa Recreational Services • UNI Outdoors • Wilton Steel Processing, Inc.

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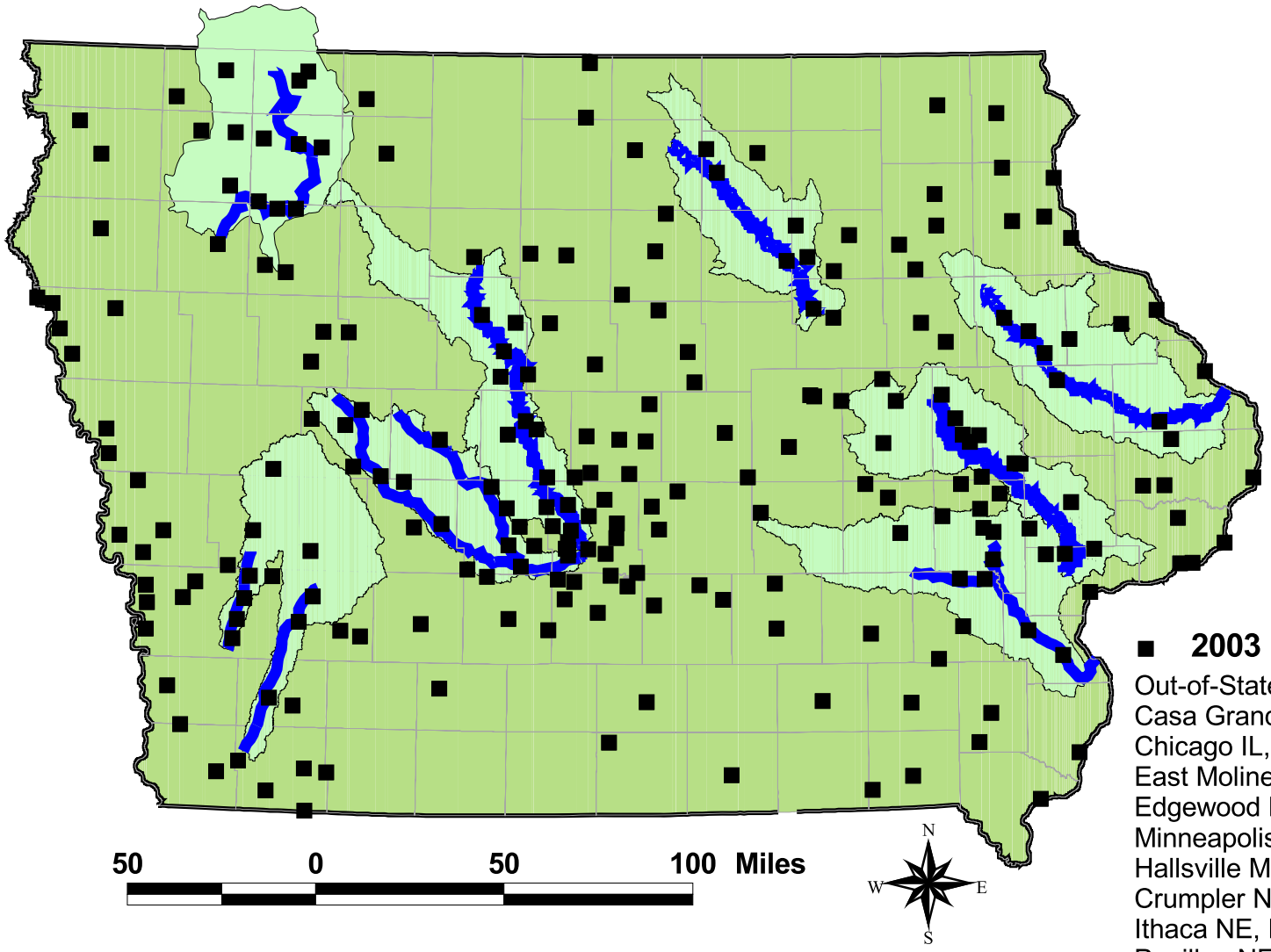
Project AWARE Volunteers -- Where Do They Come From?



■ **2003 - 2010 Volunteers**

Out-of-State Volunteers:
Casa Grande AZ, Eloy AZ, Sacaton AZ,
Chicago IL, Des Plaines IL, East Dubuque IL,
East Moline IL, Garrett IN, Indianapolis IN, Larwill IN,
Edgewood KY, Bloomington MN, Grand Marais MN,
Minneapolis MN, Springfield MN, Columbia MO,
Hallsville MO, Maryville MO, Springfield MO,
Crumpler NC, Bellwood NE, Elkhorn NE,
Ithaca NE, North Sioux City NE, Omaha NE,
Papillon NE, Plattsmouth NE, West Salem OH,
Mission SD, Sioux Falls SD, Seattle WA,
Madison WI

Results from Water Quality Monitoring Conducted during Project AWARE 2010 on the East and West Nishnabotna Rivers

Lynette Seigley
Iowa Department of Natural Resources
Watershed Monitoring and Assessment Program
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Jim Urban and Bailey Bergthold
Project AWARE 2010 Volunteers

October 2010

Abstract: From July 10-17, 2010, 223 volunteers participated in Project AWARE 2010 (A Watershed Awareness River Expedition), a weeklong river cleanup on the East and West Nishnabotna rivers in southwest Iowa. Project AWARE is a 7-day, 7-night canoe trip down an Iowa river that allows volunteers to participate in a river cleanup, water quality monitoring, and evening educational programs. A total of 9.27 tons of trash were removed from the 100 miles of the East and West Nishnabotna rivers through Shelby, Pottawattamie, Cass, Montgomery, and Page counties. A total of 54% of the trash was recycled. Project AWARE is an initiative of the Iowa Department of Natural Resources IOWATER and River programs, and 2010 represented the eighth year of the event. The event was made possible through the financial and in-kind support of 79 sponsors.

In addition to trash removal, 29 stream and lake/pond sites along the canoe route and at overnight camping locations were monitored for a variety of water quality parameters using IOWATER methods. The event and monitoring occurred during above normal stream flow conditions for both the East and West Nishnabotna rivers. For most of the parameters, concentrations at these sites during Project AWARE differed from levels measured in streams statewide for July 2010. Results from the Project AWARE sites showed that water temperatures were similar for the Project AWARE sites and streams statewide; dissolved oxygen, nitrate/nitrite-N, and pH were lower compared to statewide values; and phosphate was higher for Project AWARE sites. Chloride concentrations could not be directly compared, as all of the chloride results for the Project AWARE sites were below the test strip detection limit of 29 mg/L, whereas chloride concentrations for the streams statewide ranged from 4 to 28 mg/L. Dissolved oxygen results for six of the Project AWARE sites were at or below the 5 mg/L water quality standard.

This report summarizes the water quality results for sites monitored during Project AWARE 2010. For more information on Project AWARE, go to *www.iowaprojectaware.com*.

Introduction

Project AWARE, which stands for **A W**atershed **A**wareness **R**iver **E**xpedition, is the Iowa Department of Natural Resources' weeklong volunteer river cleanup event during which hundreds of Iowans spend anywhere from a day to an entire week improving Iowa's waterways by removing trash. In addition to trash removal, participants on Project AWARE learn about water quality, wildlife conservation, recycling, and other topics related to Iowa's natural and cultural resources. Project AWARE 2010 represents the 8th year of this annual event. Previous Project AWARE events paddled and cleaned up stretches of the Maquoketa River in northeast Iowa; the Des Moines River watershed in north-central Iowa; the Little Sioux River in northwest Iowa; the Iowa and English rivers in southeast Iowa; the Middle and North Raccoon rivers in west-central Iowa; the Winnebago, Shell Rock, and the upper Cedar rivers in northeastern Iowa; and the middle Cedar River in eastern Iowa.

Water monitoring using IOWATER methods was conducted at 29 sites along the Project AWARE 2010 route.

Project AWARE 2010 began with two days on the West Nishnabotna River, paddling 35 miles from Nishna Bend Recreation Area just south of Harlan in Shelby County to Olde Town Park outside of Macedonia in Pottawattamie County. The remaining five days were on the East Nishnabotna River, from just north of Atlantic in Cass County down to Porter's Lake Lutheran Center on the north edge of Shenandoah in Page County, a distance of just over 64 miles.

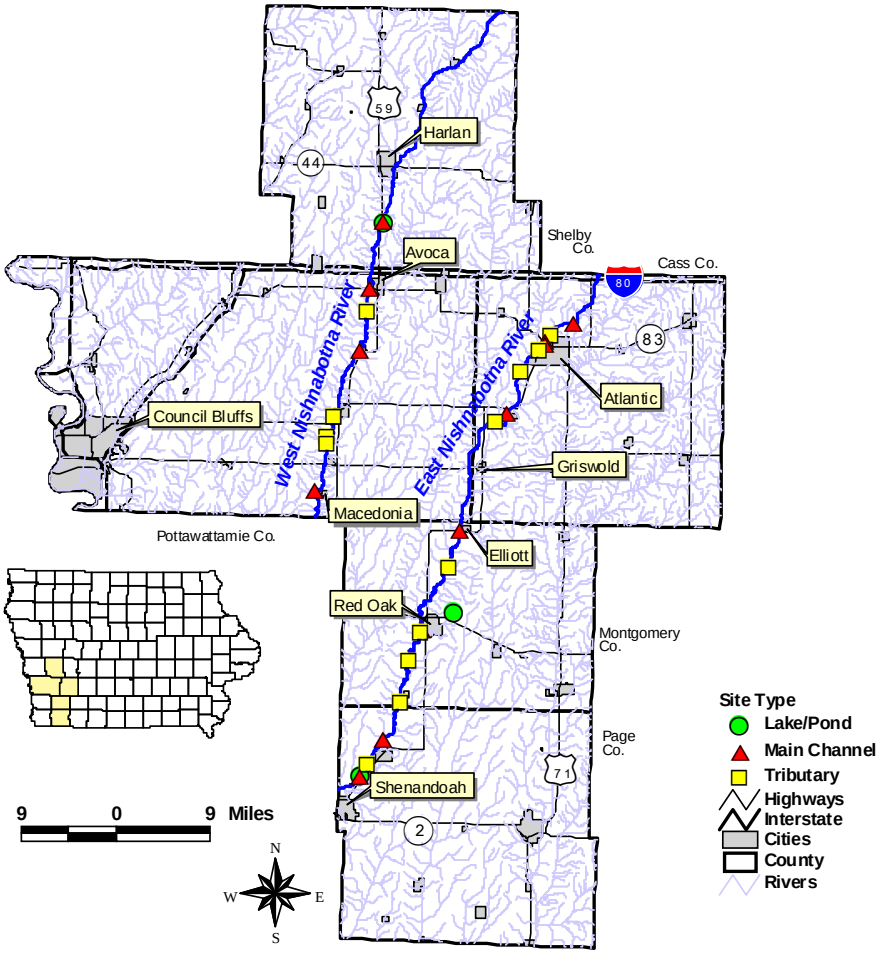

Figure 1. Location of sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

For each day of Project AWARE, Jim Urban and Bailey Bergthold conducted water testing at pre-determined sampling locations both along the route and at overnight camping locations. Prior to the event, potential monitoring sites were identified by Project AWARE staff. Sites were selected based on starting, half-way, and take-out points for each day of Project AWARE; location of major tributaries entering the West Nishnabotna and East Nishnabotna rivers; and other locations of interest (e.g., sites near known point sources or water bodies at overnight camping locations). A total of 29 sites were sampled (Figure 1), including 12 on the main channels, 14 tributaries, and 3 lake/pond sites. All of the lake/pond sites were located at our camping locations.

For all sites sampled during Project AWARE 2010, water quality data were collected using IOWATER field methods as described in the IOWATER Quality Assurance Project Plan (2010). Field data were recorded on waterproof paper field sheets. This report summarizes the water quality from the Project AWARE 2010 sampling of 29 sites (Figure 1), and includes chemical and physical results (Table 1).

Where possible, water quality results from Project AWARE were compared to a network of 75 streams statewide that are monitored on a monthly basis as part of the Iowa Department of Natural Resources (DNR) Watershed Monitoring and Assessment Ambient Stream Monitoring Program. Data from this network have been collected since 2000 and provide perspective on typical stream concentrations statewide for the various parameters. In this report, this statewide stream network will be referred to as the DNR statewide stream network. The July 2010 data from the DNR statewide stream network were also compared to Project AWARE results to determine relative concentrations for the same time period. In some instances, results are compared to data for specific sites on the East Nishnabotna River (near Shenandoah in Fremont County) and the West Nishnabotna River (near Malvern in Mills County) which are part of the DNR statewide stream network.

Table 1. Monitoring results from Project AWARE 2010.

	Unit	Method	# of samples	Min Value	Percentiles			Max Value
					25th	50th	75th	
Chloride	mg/L	IOWATER test strip	28	<25	<25	<25	<25	<25
Dissolved Oxygen	mg/L	IOWATER field kit	27	1	6	6	6	10
Nitrite-N	mg/L	IOWATER test strip	28	0	0	0	0.15	0.3
Nitrate-N	mg/L	IOWATER test strip	28	0	2	2	5	10
Phosphate	mg/L	IOWATER field kit	25	0.1	0.4	0.4	0.6	0.8
pH	pH units	IOWATER test strip	26	6	7	8	8	9
Temperature, Air	degrees F	Thermometer - Field	8	63	73	81	89	94
Temperature, Water	degrees F	Thermometer - Field	27	65	68	71	75	93
Transparency	centimeters	IOWATER transparency tube	20	1	3	5	13	60

mg/L = milligrams per liter (or parts per million - ppm)
F = Fahrenheit

Precipitation and Stream Flow Conditions

Precipitation and stream flow conditions affect water quality, and in 2010, both caused river levels in the East and West Nishnabotna rivers to be above normal for most of the summer (Figure 2). Iowa experienced unusually wet months during June and July, although southwest Iowa was not as wet as some parts of the state. June 2010 was the wettest June among 138 years of state records maintained by the Iowa Department of Agriculture and Land Stewardship (Harry J. Hillaker, State Climatologist; http://www.iowaagriculture.gov/climatology/weatherSummaries/2010/pms201006.pdf). USGS data (www.usgs.gov) indicate that water levels for the East and West Nishnabotna rivers were above the long-term normal levels for these rivers during the summer months of 2010 (Figure 2). Flow for the West Nishnabotna River at Hancock varied from 143 to 632% of normal during the week of Project AWARE, while the East Nishnabotna River gaging station near Atlantic ranged from 210 to 411% of normal, and the East Nishnabotna River at Red Oak ranged from 290 to 662% of normal. Air temperatures were slightly above normal for July 10-17. In most of the watershed, the maximum daily temperature exceeded 85 degrees 5 of the 7 days volunteers were on the river. The highest maximum daily temperature was 97 degrees. Rain fell a few times during the week, including a large storm that passed through the town of Elliott on July 14. Rainfall amounts for the week ranged from 1.1 inches in Red Oak and Atlantic to 1.71 inches in Shenandoah (source: Iowa Environmental Mesonet, http://mesonet.agron.iastate.edu/).

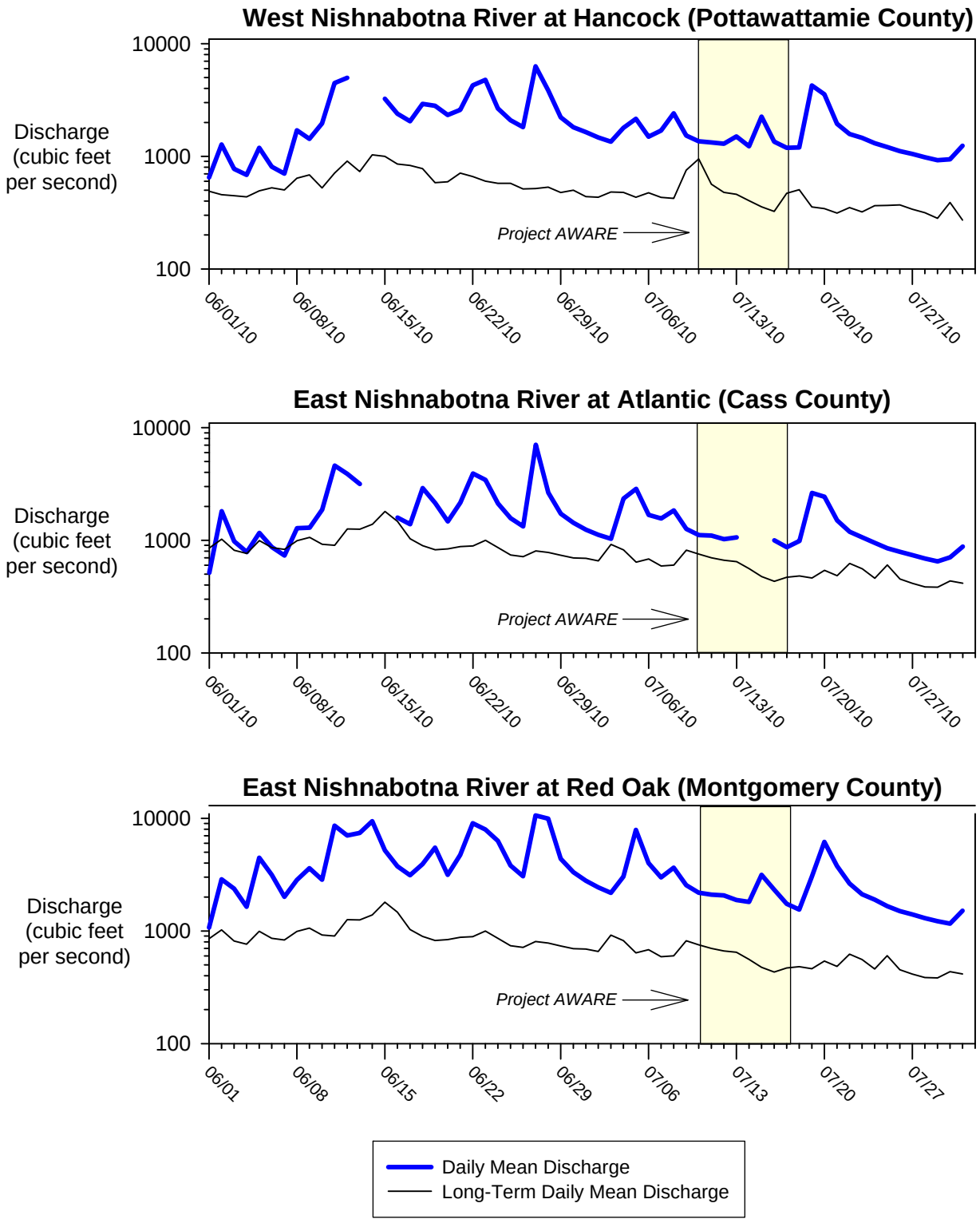

Figure 2. Discharge for the East and West Nishnabotna rivers for June 2010 through July 2010. The yellow shaded area represents when Project AWARE occurred from July 10-17, 2010. Data from http://ia.water.usgs.gov.

Chemical and 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 temperature was measured at 27 sites during Project AWARE 2010 and varied from 65 to 93 degrees Fahrenheit (Table 1; Figure 3). The warmest temperatures occurred at the three pond/lake sites at Nishna Bend near Harlan (86 °F), Anderson Conservation Area pond near Red Oak (88 °F), and Porter's Lake Lutheran Center pond near Shenandoah (93 °F). In addition to having the highest water temperature, the pond at Porter's Lake also had the overall highest phosphate (0.8 mg/L) and lowest dissolved oxygen level (1 mg/L).

Figure 4 compares the results of selected parameters from Project AWARE to the DNR statewide stream network. Water temperatures for sites monitored on Project AWARE were more variable and had a greater range than for streams monitored statewide during July 2010. Part of difference was likely caused by the fact that all of the sites in the DNR statewide stream network are flowing water sites whereas some of the Project AWARE sites were lakes/ponds (standing waters), and these particular sites had the highest water temperatures of all sites sampled during Project AWARE.

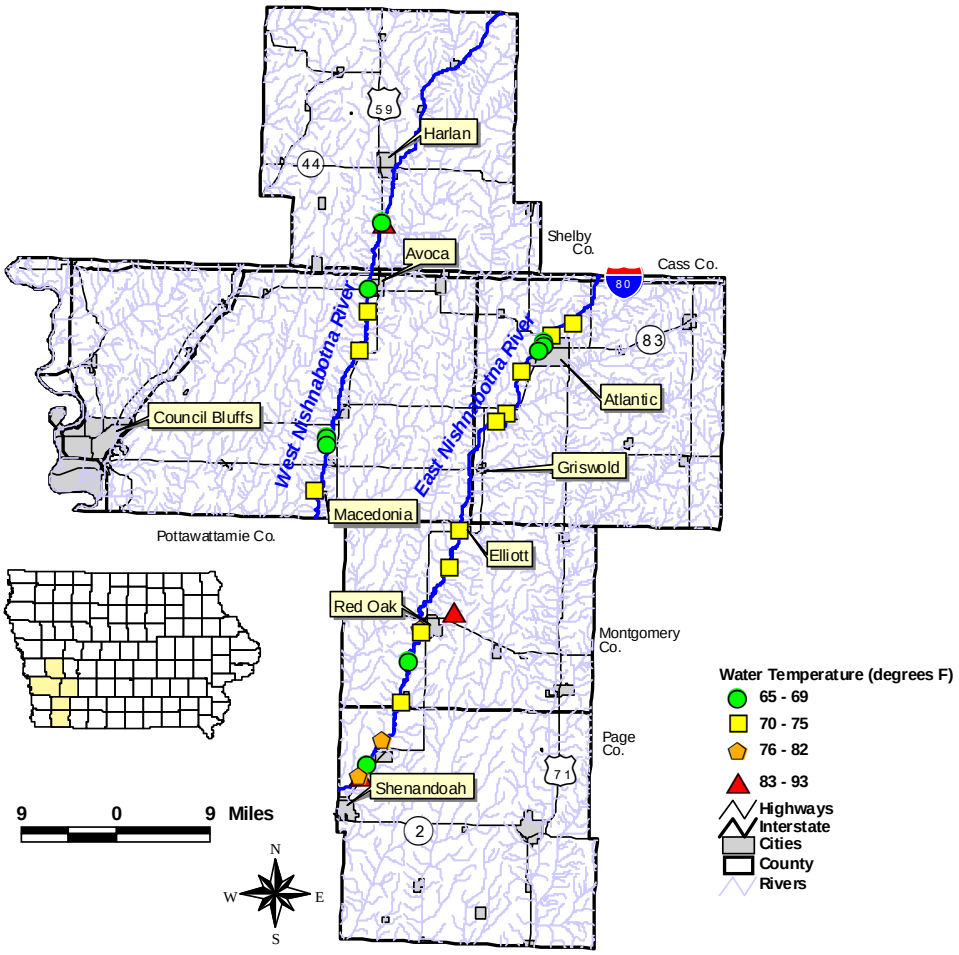

Figure 3. Water temperature (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

pH

pH is a measure of water's acid/base content. 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. pH levels ranged from 6 to 9 using the IOWATER test strip (Table 1; Figure 5). pH values of 6 were reported at three locations: East Branch of the West Nishnabotna, a tributary to the West Nishnabotna; Troublesome Creek, a tributary to the East Nishnabotna; and the East Nishnabotna on the southern edge of Atlantic below the city's wastewater treatment facility. None of the other water quality results for these three sites were out of the ordinary when compared to results for the other sites. The pH levels measured at sites sampled as part of Project AWARE were more variable and lower than those measured as part of the DNR statewide stream network for July 2010 (Figure 4). For both the East Nishnabotna River site near Shenandoah and the West Nishnabotna River near Malvern that are sampled as part of the DNR statewide stream network, the median pH for those sites based on monthly data collected since 2000 is 8.3.

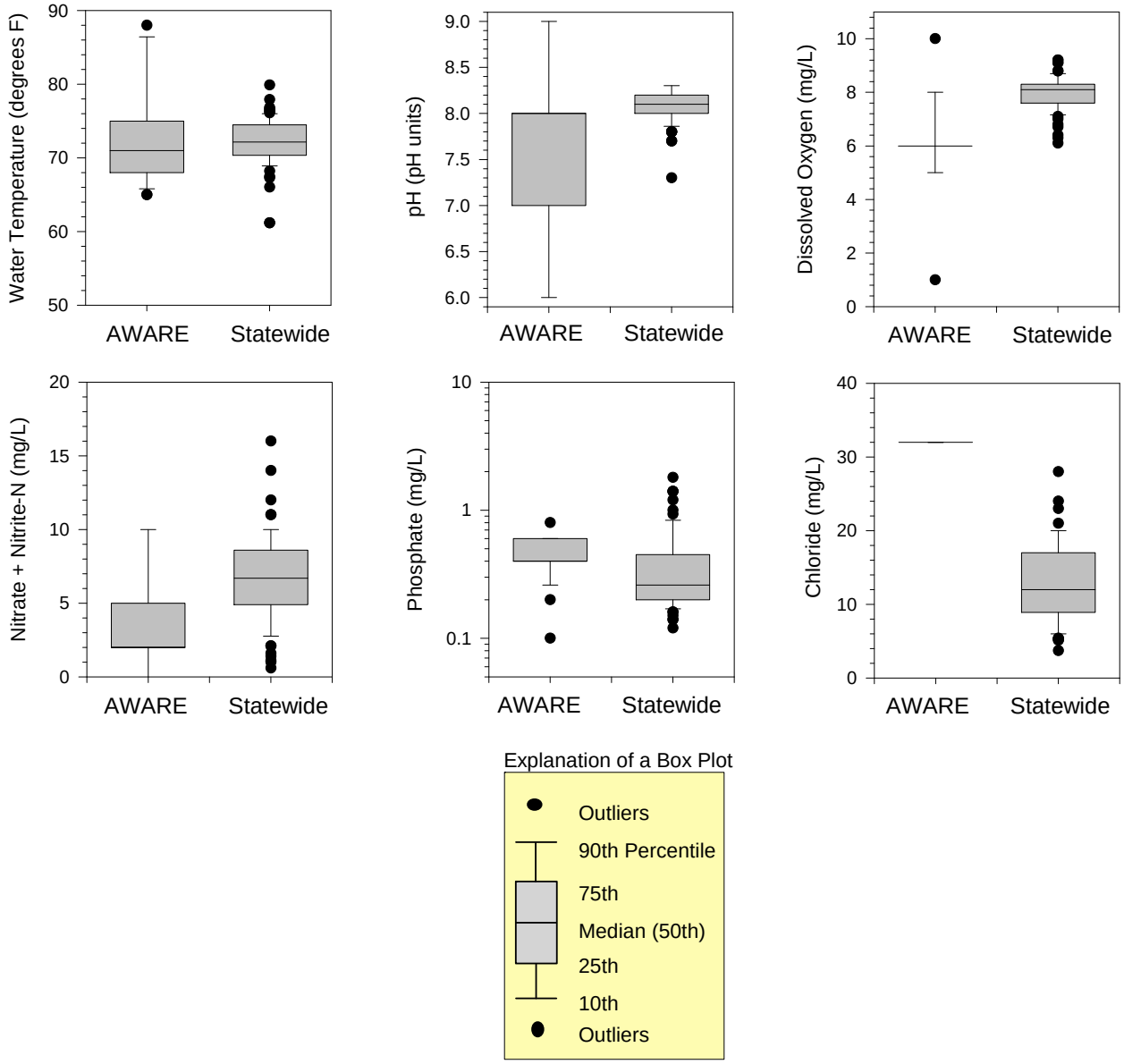

Figure 4. Box plots comparing water quality results for sites sampled during Project AWARE 2010 to the DNR statewide stream network for July 2010.

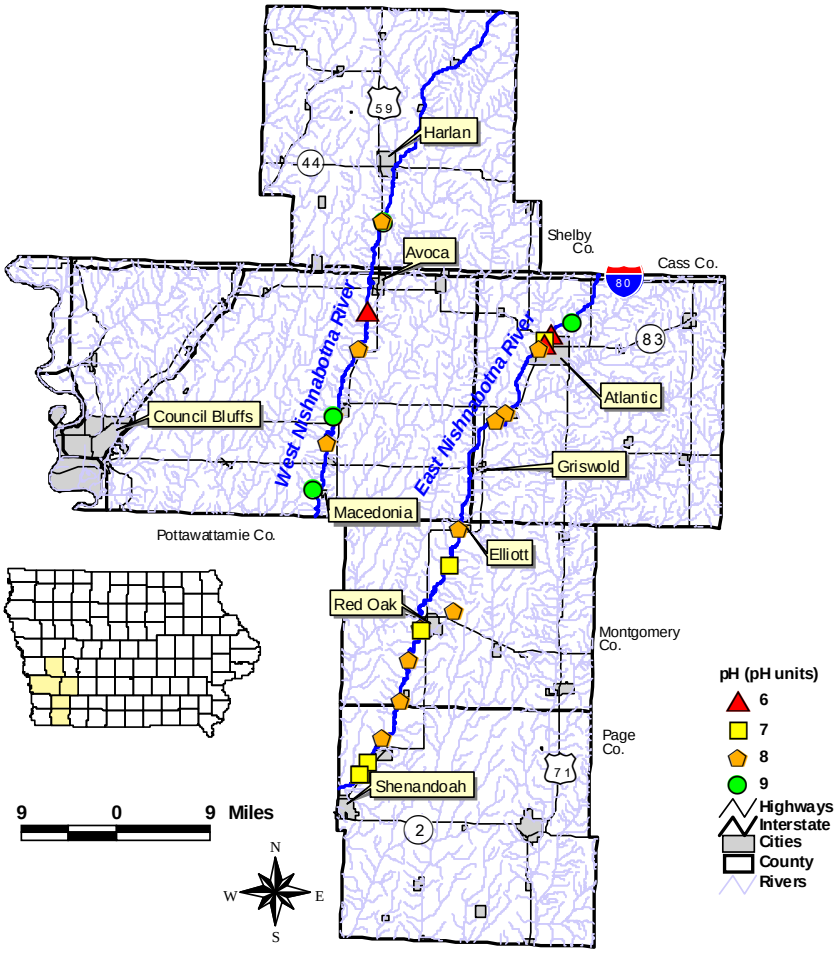

Figure 5. pH (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

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 ranged from 1 to 60 centimeters (cm) for all Project AWARE sites (Table 1; Figure 6). Transparency was only measured at 20 of the 29 sites, as the transparency tube was lost late in the week, and another tube was not available until the last day of the event. Transparency varied from 1 to 6 cm for sites on the main stem and ranged from 3 to 60 cm for tributary sites. The only lake where transparency was measured (Nishna Bend Park Pond) had a level of 19 cm. Overall, transparency levels were very low, especially compared to transparency levels measured during previous Project AWARE events. The overall median transparency for sites sampled was 5 cm. One site, a tributary to the East Nishnabotna River, had a transparency of 60 cm, while the next highest level was 19 cm. The site with a transparency of 60 cm is an anomaly when compared to the other sites. This site may have been fed by a tile(s) line that was discharging a short distance from the East Nishnabotna River

and may have appeared to be a small tributary entering the main channel. Or the high transparency may just have been an irregularity when compared to the other sites.

While transparency is not measured as part of the DNR statewide stream network, turbidity is. Turbidity measures how much light is scattered by suspended particles using NTUs (Nephelometric Turbidity Units). If both transparency and turbidity were to be measured, low transparency would equate to high turbidity numbers. Turbidity levels for the East Nishnabotna near Shenandoah and West Nishnabotna River near Malvern for July 2010 were 980 NTU and 360 NTU, respectively. These levels were elevated based on 10 years of monthly monitoring at these sites. Both values were at or greater than the 90th percentile for each site. Given this information, it's not surprising that the transparency values reported for Project AWARE were as low as they were.

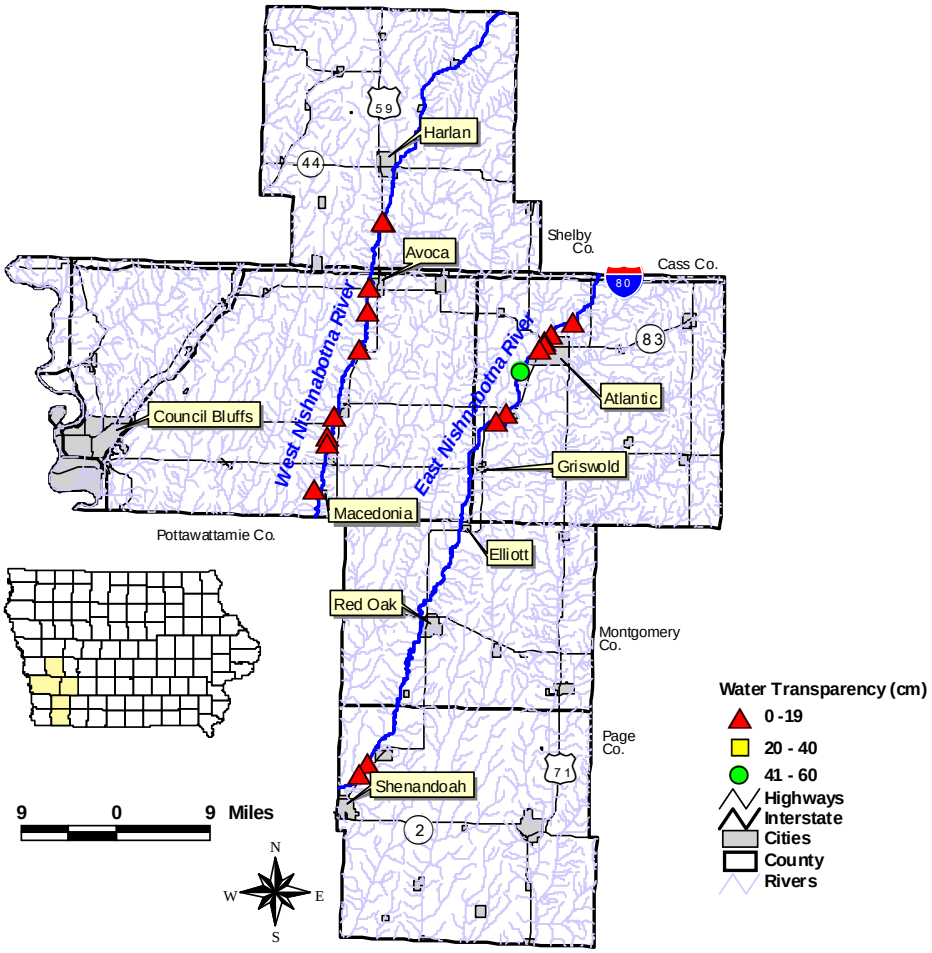

Figure 6. Water transparency (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

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. Iowa has a water quality standard minimum of 5 mg/L of dissolved oxygen for warm water streams.

For Project AWARE sites, dissolved oxygen ranged from 1 to 10 mg/L (Table 1; Figure 7). All but one of the sites monitored had dissolved oxygen concentrations that met the water quality standard minimum of 5 mg/L for warm bodies of water. The lowest dissolved oxygen (1 mg/L) was measured at the pond located at Porter's Lake Lutheran Center just north of Shenandoah. The pond is part of an old oxbow associated with the East Nishnabotna River. In addition to low dissolved oxygen, this site had the highest water temperature (93 °F), an elevated phosphate (0.8 mg/L), and a green color. Dissolved oxygen concentrations measured during Project AWARE were lower than levels measured in streams statewide for July 2010 (Figure 4). For the two Nishnabotna River sites monitored as part of the DNR statewide stream network, dissolved oxygen was 7.7 mg/L for the East Nishnabotna River in July 2010 and 8.6 mg/L for the West Nishnabotna River.

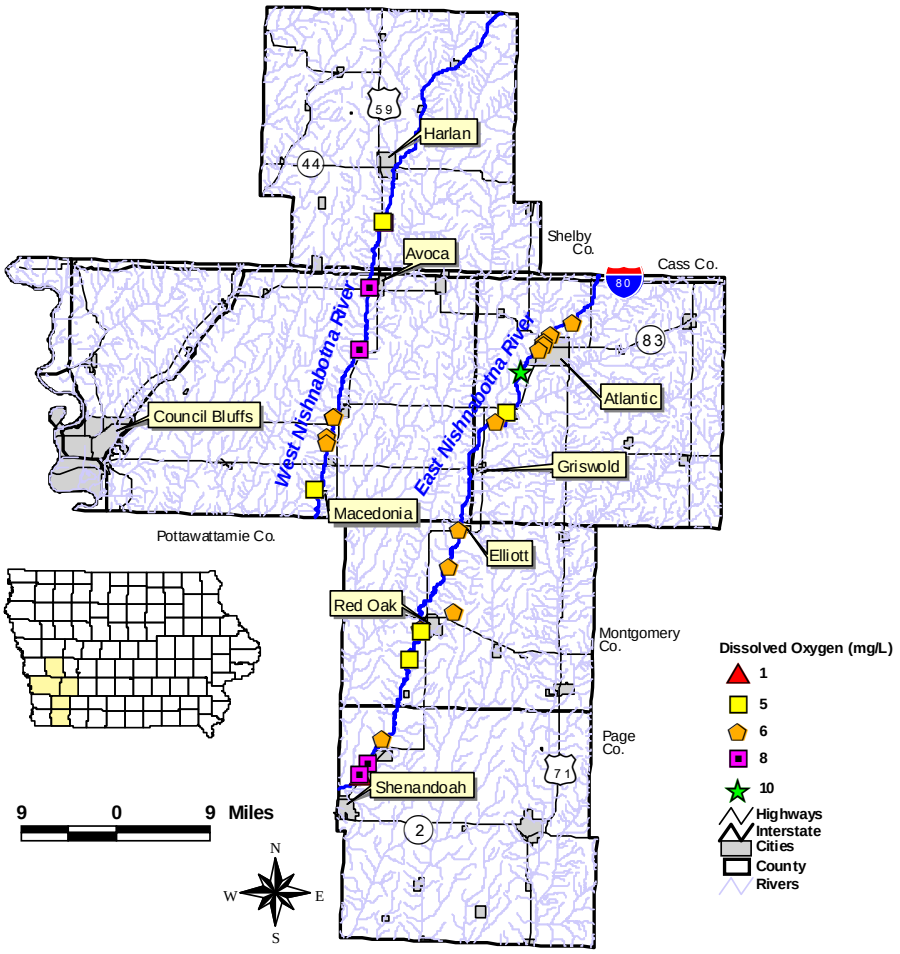

Figure 7. Dissolved oxygen (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

Nitrite-N and Nitrate-N

Nitrogen is a necessary nutrient for plant growth, and includes both nitrite- 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. Typical nitrate+nitrite-N concentrations for Iowa streams range from 2.9 to 8.7 mg/L, with higher concentrations generally occurring in the

late spring/early summer. Nitrite-N and nitrate-N are not measured separately as part of the DNR statewide stream network, rather it is measured as nitrate+nitrite-N.

Nitrite-N was measured at Project AWARE sites using the IOWATER method (Table 1; Figure 8). Concentrations ranged from 0 to 0.3 mg/L. Eight of the 28 sites had measurable levels of nitrite-N of 0.15 or 0.3 mg/L. It is not known why these particular sites had detectable levels of nitrite-N.

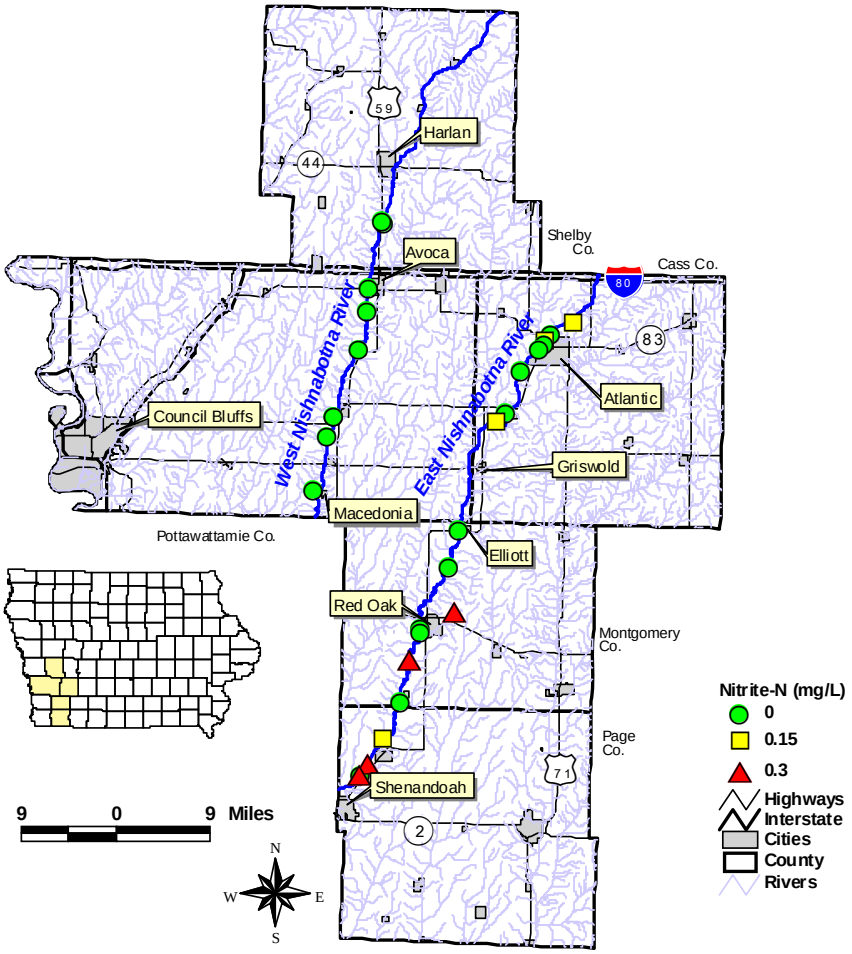

Figure 8. Nitrite-N (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

Nitrate-N ranged from 0 to 10 mg/L (median of 2 mg/L; Table 1; Figure 9). The lowest nitrate-N concentration was 0 mg/L and occurred at two of the three lakes monitored (Nishna Bend Park Pond south of Harlan and Porter's Lake Pond near Shenandoah) and at Red Oak Creek, a tributary entering the East Nishnabotna River in the town of Red Oak. The highest concentration was 10 mg/L and occurred at five locations, all tributary sites. Two were tributaries to the West Nishnabotna River while the other three were tributaries to the East Nishnabotna River. For the five sites with elevated nitrate-N concentrations, none of the other water quality results for these sites were out of the ordinary.

Nitrate-N concentrations varied from 0 to 10 mg/L for the tributary sites, 2 to 5 mg/L for sites on the main stem of the East Nishnabotna and West Nishnabotna Rivers, and 0 to 2 mg/L for lake/pond sites. The overall median concentration for all sites was 2 mg/L. Based on monthly data collected from DNR's statewide stream network, the median nitrate+nitrite-N concentration for July 2010 was 6.7 mg/L. Nitrate-N results for the Project AWARE sites were lower than levels reported statewide for July 2010 (Figure 4). For the two Nishnabotna River sites from the DNR statewide stream network, nitrate+nitrite-N concentrations were 4.6 mg/L for the East Nishnabotna River in July 2010 and 7.7 mg/L for the West Nishnabotna River. Overall, nitrate+nitrite-N levels tend to be higher for the West Nishnabotna relative to the East Nishnabotna. For the East Nishnabotna River, 4.6 mg/L was similar to the

median for this site based on 10 years of monthly monitoring. For the West Nishnabotna River, 7.7 mg/L was close to the 75th percentile for this site.

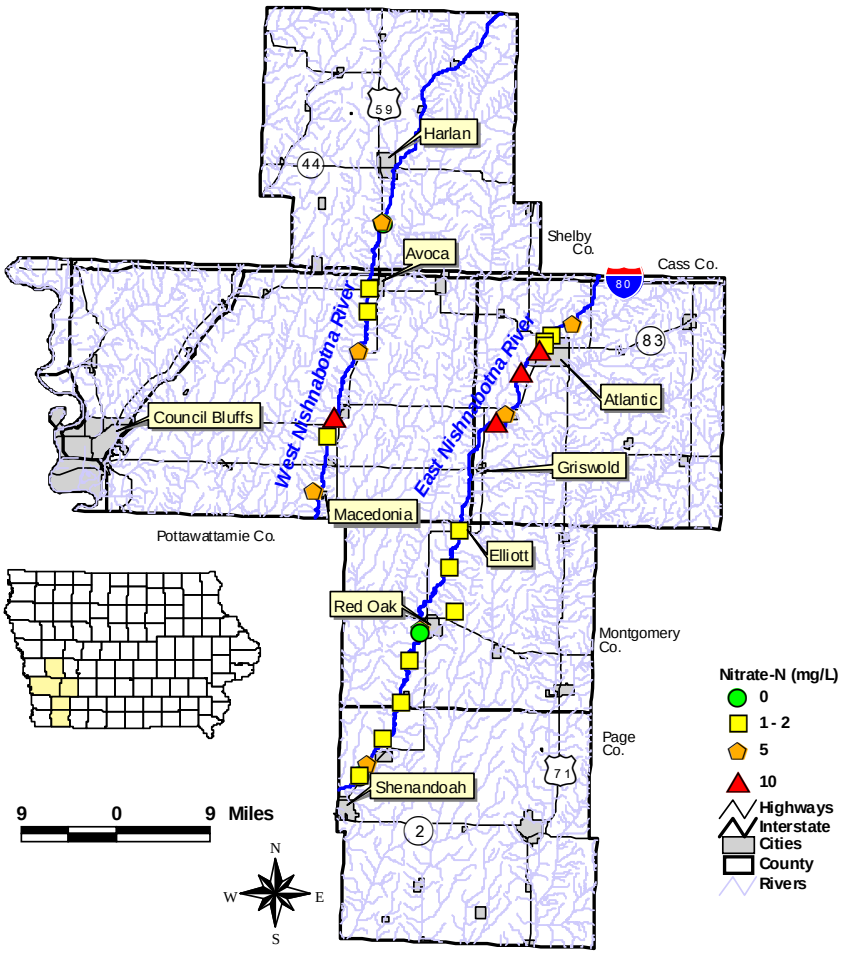

Figure 9. Nitrate-N (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

Phosphorus

Phosphorus 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 phosphorus include certain soils and bedrock; human and animal wastes; detergents; decomposing plants; and runoff from fertilized lawns and cropland. Typical concentrations of phosphate in streams statewide vary from 0.11 to 0.34 mg/L, with a median of 0.20 mg/L.

IOWATER phosphate results for the Project AWARE sites ranged from 0.1 to 0.8 mg/L, with a median of 0.4 mg/L (Table 1; Figure 10). The highest phosphate result (0.8 mg/L) occurred at the lake sampled at Porter's Lake. In addition to having the highest phosphate, this site had the lowest dissolved oxygen, highest water temperature, and a distinct green color to the water. Of the sites sampled throughout the week, it was the only site where green water color was noted. Phosphate results from Project AWARE were higher than levels in streams statewide during July 2010 (Figure 4). The median phosphate for Project AWARE sites was 0.4 mg/L versus 0.26 mg/L for streams statewide.

For the two Nishnabotna River sites from the DNR statewide stream network, phosphate was 1.8 mg/L for the East Nishnabotna River in July 2010 and 1.0 mg/L for the West Nishnabotna River. Both results were near the 90th percentile for their respective river based on 10 years of monthly monitoring.

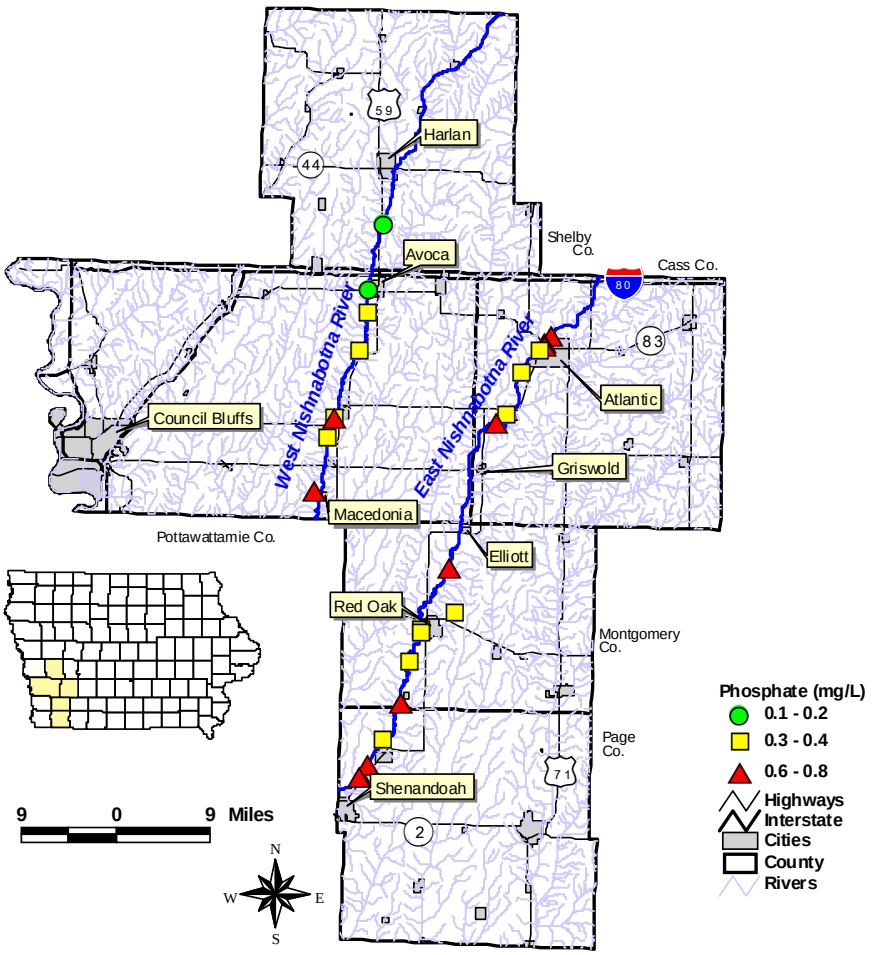

Figure 10. Phosphate (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

Chloride

Chloride is a component of salt and is a measure of 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. Typical concentrations of chloride in Iowa streams range from 17 to 30 mg/L, with a median of 23 mg/L, with higher concentrations occurring during winter months.

For Project AWARE sites, IOWATER chloride concentrations were all below the test strip detection limit of 29 mg/L (Table 1; Figure 11). Given that all of the chloride concentrations were below the detection limit, it is difficult to directly compare chloride results to levels in streams statewide for July 2010 (Figure 4).

For the two Nishnabotna River sites from the DNR statewide stream network, chloride was 7.4 mg/L for the East Nishnabotna River in July 2010 and 12 mg/L for the West Nishnabotna River. Both of these were below the 10th percentile for their respective sites based on 10 years of monitoring. Overall, chloride levels tend to be slightly higher for the West Nishnabotna versus the East Nishnabotna.

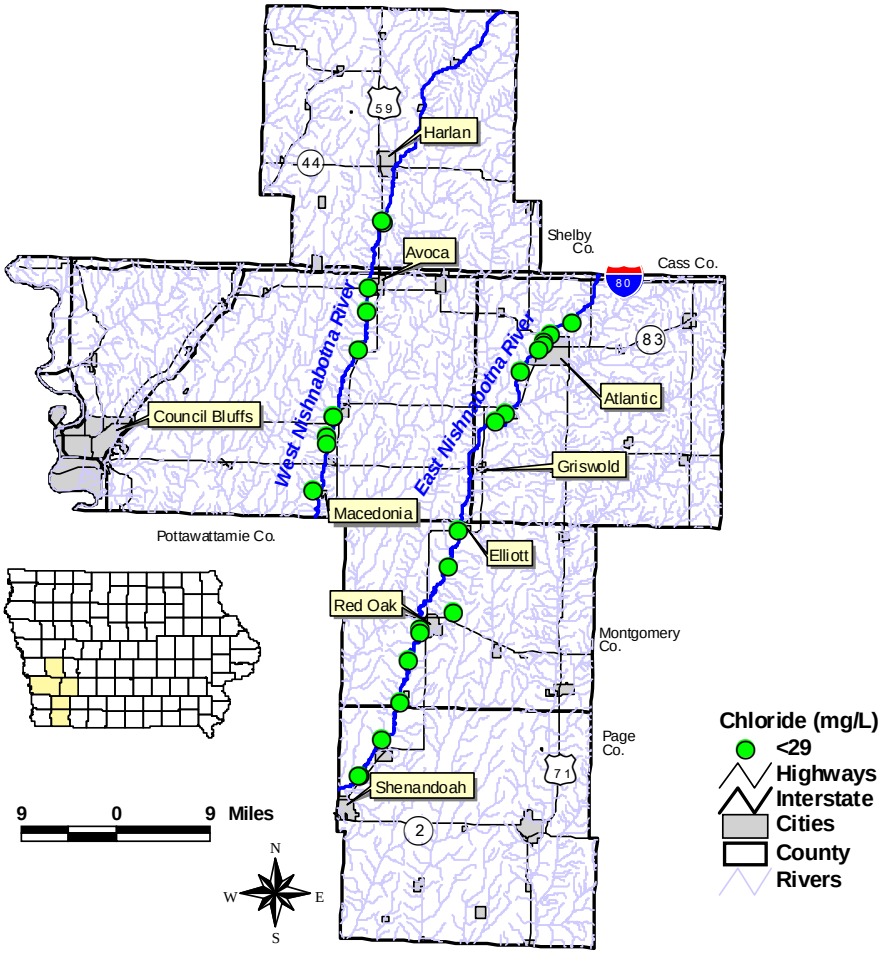

Figure 11. Chloride (IOWATER method) for sites sampled as part of Project AWARE 2010 on the East and West Nishnabotna rivers.

Summary

In addition to 9.27 tons of trash being removed during Project AWARE 2010, a total of 29 sites were monitored for a variety of field parameters using IOWATER methods. Below are some observations from the data.

- Project AWARE occurred from July 10-17, 2010, during above normal stream flow conditions. Flow for the West Nishnabotna River varied from 143 to 632% of normal during the week of Project AWARE, while the East Nishnabotna River gaging station near Atlantic ranged from 210 to 411% of normal, and the East Nishnabotna River at Red Oak ranged from 290 to 662% of normal. Air temperatures were slightly above normal for this time of year. In most of the watershed, the maximum daily temperature exceeded 85 degrees 5 of the 7 days volunteers were on the river.
- Water temperature for Project AWARE sites sampled ranged from 65 to 93 degrees Fahrenheit. These temperatures were similar to levels measured in streams statewide during July and also displayed a slightly greater range in values.
- pH ranged from 6 to 9. Overall, pH was lower and more variable than levels measured in streams statewide for July 2010.

- Transparency ranged from 1 to 60 centimeters. Transparency tended to be slightly lower for main channel relative to tributary sites. Overall, these transparency results were the lowest ever measured as part of water monitoring conducted during Project AWARE.
- Dissolved oxygen concentrations varied from 1 to 10 mg/L. All but one of the sites monitored had dissolved oxygen concentrations that met the water quality standard minimum of 5 mg/L for warm bodies of water. Results were lower than levels measured statewide during July 2010.
- Nitrite-N concentrations ranged from 0 to 0.3 mg/L with 8 of the 28 sites having detectable levels of nitrite-N.
- Nitrate-N concentrations ranged from 0 to 10 mg/L with the highest concentrations occurring at tributary sites. Overall, concentrations were lower compared to levels reported in streams statewide for July 2010.
- Phosphate ranged from 0.1 to .8 mg/L, with a median concentration of 0.4 mg/L. The highest concentration occurred at a pond sampled at Porter's Lake. This particular site also had the highest water temperature, lowest dissolved oxygen, and the water color was green. Phosphate levels from Project AWARE sites were higher than those for streams across Iowa for July 2010.
- Chloride concentrations were all below the test strip detection limit of 29 mg/L.

Acknowledgements

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Written: November 2010

References

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