QUALITY ASSURANCE PROJECT PLAN

For

IOWATER

QA/WM/01-02

Prepared by:

IOWATER Program
Iowa Department of Natural Resources
Watershed Monitoring and Assessment Program
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Prepared for:

U.S. Environmental Protection Agency Region 7
Environmental Services Division
901 N. 5th St.
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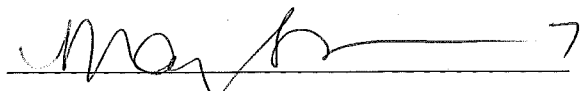
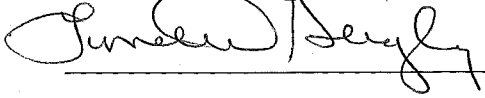
July 2010

A1. APPROVAL SIGNATURE PAGE

QUALITY ASSURANCE PROJECT PLAN
for

IOWATER
A program dedicated to developing citizen volunteer monitoring
of Iowa's streams and lakes

Approved by:

Iowa Department of Natural Resources		7/7/2010
IOWATER Program Coordinator:	Mary Skopec	Date
Iowa Department of Natural Resources		7/6/2010
IOWATER Quality Assurance Officer:	Lynette Seigley	Date
Iowa Department of Natural Resources		7/6/2010
DNR Quality Assurance Officer:	Bob Libra	Date

A2. TABLE OF CONTENTS

TABLES

FIGURES

REFERENCES

APPENDICES

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DOCUMENT CONTROL

This document has been prepared according to the United States Environmental Protection Agency publication EPA Requirements for Quality Assurance Project Plans, dated March 2001 (QA/R-5) with direction from Guidance for Quality Assurance Project Plans, dated December 2002 (QA/G-5). This Quality Assurance Project Plan (QAPP) will be reviewed annually and updated as needed. Updated versions of this QAPP will bear a new (x + 1) revision number. The IOWATER Program Coordinator will assume responsibility for archiving outdated versions of this QAPP, which will be retained for a minimum of ten years from the date of archival. Archived versions of the QAPP will be kept at the main office of the Iowa Department of Natural Resources.

SECTION A – PROJECT MANAGEMENT

A3. DISTRIBUTION LIST

Each person listed on the Approval Signature page and each person listed below will receive a copy of the final approved version of this Quality Assurance Project Plan as well as any subsequent revisions. A copy will also be placed on the IOWATER website.

IOWATER Advisory Committee Members
Iowa DNR Watershed Monitoring and Assessment Section Supervisor
IOWATER Staff
UHL Program Coordinator
IOWATER Volunteer Snapshot Event Coordinators

A4. PROJECT/TASK ORGANIZATION

The Iowa Department of Natural Resources (Iowa DNR) Watershed Monitoring and Assessment Program is funded by Iowa Infrastructure – Environment First Fund appropriations.

Originally, IOWATER was funded through the United States Environmental Protection Agency (USEPA) Project 319 grants, Sportfish Restoration Funds, and Resource Enhancement and Protection (REAP) grants. Today, however, the program is funded entirely through the Iowa Infrastructure – Environment First Fund. The IOWATER program receives ten percent of the annual infrastructure funds allocated to the Iowa DNR's Watershed Monitoring and Assessment Program.

The individuals participating in the project and their specific roles and responsibilities are discussed below. In addition to the project officers listed below, the program receives technical support from staff with the Iowa DNR Watershed Monitoring and Assessment Program and other sections within the Iowa DNR.

IOWATER Program Coordinator: The IOWATER Program Coordinator will oversee the project activities for the Iowa. The IOWATER Program Coordinator will assist in the analysis of data generated for the program. Specifically, he/she will:

- Assure that the IOWATER program conforms with DNR policies and procedures.
- Assure that the IOWATER program meets the goals and objectives of the Watershed Monitoring and Assessment Section in keeping with the Department's Strategic Plan.
- Oversee the work of the IOWATER Field Coordinator, Lakes Coordinator, Snapshot Coordinator, QA Officer, and IOWATER and STORET Database Manager.
- Provide funding for the program including the development of grants to help support staff and equipment.
- Coordinate with other state agencies to support and promote volunteer monitoring.
- Oversee the IOWATER, Project AWARE, snapshot, and DNR Lakes programs.
- Coordinate special events.
- Coordinate the development of new training materials.

- Provide customer assistance to volunteers.
- Assist with annual reports.
- Assist with newsletter development.
- Assist with planning and conducting IOWATER workshops.
- Assist with conducting IOWATER snapshot events.

IOWATER Field Coordinator:

- Plan and conduct IOWATER Level One and Advanced workshops.
- Build and maintain relationships with and assist locally led water monitoring groups and individuals.
- Maintain program budget.
- Maintain database of trained citizen volunteers.
- Field test IOWATER methods for QA/QC determination.
- Assists with the development of training documents for advanced training opportunities.
- Provide customer assistance to volunteers.
- Assist with the development of new biological training materials.
- Assist with revisions of current training materials and development of new training materials.
- Assist with newsletter development.
- Assist in data analysis.
- Assist with conducting IOWATER snapshot events.
- Assist with planning and conducting Project AWARE.
- Assist in the writing, review, and editing of reports.

IOWATER Lakes Coordinator:

- Assist with conducting IOWATER workshops.
- Plan and conduct Iowa DNR Lakes Program.
- Train DNR Lakes Program volunteers.
- Write Iowa DNR Lakes Program reports.
- Ensure that lab analyses are uploaded to IASTORET or the equivalent WQX database.
- Ensure that IOWATER collected data are entered in the IOWATER database.
- Assist with planning and conducting Project AWARE.
- Conduct side-by-side testing of IOWATER methods compared to professional methods.
- Review and edit reports.
- Assist with newsletter development.
- Provide customer assistance to volunteers.
- Assist in data analysis.
- Assist with conducting IOWATER snapshot events.
- Assist in the writing, review, and editing of reports.
- Assist with the development of new biological training materials.

IOWATER Snapshot Coordinator:

- Assist with conducting IOWATER workshops.
- Plan and conduct IOWATER snapshot events.
- Coordinate with labs for snapshot analyses.
- Conduct side-by-side testing of IOWATER methods compared to professional methods.
- Assist in the writing, review, and editing of reports.
- Assist with newsletter development.
- Provide customer assistance to volunteers.
- Assist with planning and conducting Project AWARE.
- Assist in data analysis.
- Write snapshot reports.
- Assist with the development of mapping products.

- Ensure that IOWATER snapshot results are entered into the IOWATER and STORET databases (or the equivalent WQX database).

IOWATER Quality Assurance (QA) Officer:

- Evaluate data collected as part of side-by-side testing of IOWATER methods compared to professional methods.
- Evaluate new test kit methods for incorporation into IOWATER Program.
- Analyze IOWATER data.
- Assist with annual reports.
- Compare IOWATER data to data collected professionally as part of Iowa's Ambient Watershed Monitoring and Assessment Program.
- Assist in the development of online database submission forms for IOWATER data.
- Perform QA/QC on the IOWATER database.
- Write and revise program QAPP

IOWATER and STORET Database Manager:

- Maintain IOWATER database on a SQL database.
- Maintain lab analyses on IASTORET or the equivalent WQX database.
- Ensure that IOWATER database is backed up on a regular basis.
- Maintain IOWATER shapefile for use in the Iowa Water Monitoring Atlas.
- Upload IOWATER data into IASTORET, Iowa's version of STORET (or the equivalent WQX database), which the Iowa DNR uses to manage Iowa's water quality data.

Des Moines Water Works Senior Chemist and Laboratory Supervisor:

- Conduct sample analysis and provide laboratory oversight for samples collected as part of the Polk County Snapshot.

Iowa Department of Natural Resources Water Lab Manager:

- Provide laboratory oversight for samples collected as part of snapshot events.

UHL Quality Assurance Officer:

- Oversee the activities performed by UHL staff for snapshot events and as part of the DNR Lakes Program.

UHL Project Coordinator:

- Ensure that water samples are analyzed for requested analytes.
- Ensure that water samples are received, tracked, and analyzed.
- Responsible for corrective actions related to sample analyses.
- Ensure that electronic results are provided to the Iowa DNR.

Volunteer Snapshot Event Coordinators:

- Work with IOWATER Snapshot Coordinator to organize the event.
- Assist in the selection of sampling sites and water quality parameters.
- Publicize the event.
- Identify and arrange for centralized locations where volunteers will meet the day of the event.
- Provide review of the spreadsheet data and lab results.
- Recruit volunteers for the event.
- Distribute snapshot results to volunteers.

IOWATER Advisory Group:

- Review IOWATER materials.
- Provide insight and suggestions for program development.

IOWATER Citizen Monitors and Watershed Groups:

- Educate and share water quality information with others.
- Contribute data to the IOWATER database.
- Encourage others to become involved in IOWATER.
- Participate in Project AWARE and IOWATER snapshot events.

The individuals participating in the project are as follows:

- **IOWATER Project Coordinator**
  Mary Skopec, Iowa City, IA

- **IOWATER Field Coordinator**
  Jacklyn Gautsch, Iowa City, IA

- **IOWATER Lakes Program Coordinator**
  Lisa Fascher, Des Moines, IA

- **IOWATER Snapshot Coordinator**
  Lynette Seigley, Iowa City, IA

- **IOWATER Quality Assurance (QA) Officer**
  Lynette Seigley, Iowa City, IA

- **IOWATER and STORET Database Manager** *(or the equivalent WQX database)*
  Joost Korpel, Iowa City, IA

- **Volunteer Snapshot Event Coordinators**
  Varies by snapshot

- **Des Moines Water Works Senior Chemist and Laboratory Supervisor**
  Gordon Brand and Chris Jones, Des Moines, IA

- **Iowa Department of Natural Resources Water Lab Manager**
  Jason McCurdy, Iowa City, IA

- **UHL Quality Assurance Officer**
  Stacy Freeburg, Iowa City, IA

- **UHL Project Coordinator**
  Mike Schueller, Iowa City, IA

- **IOWATER Advisory Committee**
  Area Education Agencies
  Community Colleges of Iowa
  Conservation Districts of Iowa (www.cdiowa.org)
  Hawkeye Fly Fishing Association (www.hawkeyeflyfishing.com)
  Iowa Association of Naturalists (www.ianpage.20m.com)
  Iowa Conservation Education Council
  Iowa Department of Agriculture & Land Stewardship
  Iowa Department of Natural Resources, Divisions of:
    Environmental Services
    Conservation and Recreation
  Iowa Division of the Izaak Walton League of America
  Iowa Drainage District Association
  Iowa Environmental Council (www.iaenvironment.org)

Iowa Farm Bureau Federation
Iowa Resource Conservation & Development Areas
Iowa State University Extension
Iowa Student Environmental Council
Iowa Water Pollution Control Association (www.iawpca.org)
Natural Resources Conservation Service (www.ia.nrcs.usda.gov)
Trees Forever
University Hygienic Laboratory – University of Iowa
Volunteer monitoring groups across Iowa

This QAPP covers water quality data collected for the following three components: (1) IOWATER Program; (2) IOWATER sponsored snapshot sampling events; and (3) the DNR Lakes Program through IOWATER.

A5. PROBLEM DEFINITION/BACKGROUND

A5.1 IOWATER Program

IOWATER, Iowa's citizen volunteer water quality monitoring program, was established in 1998. Its mission is to protect and improve Iowa's water quality by raising citizen awareness about Iowa's watersheds, supporting and encouraging the growth and networking of Iowa's volunteer water monitoring communities, and promoting water monitoring activities as a means of assessing and understanding Iowa's aquatic resources. The program is coordinated by the Iowa Department of Natural Resources Watershed Monitoring and Assessment Program, which also coordinates the ambient background monitoring of Iowa's water resources. IOWATER empowers citizens to take a proactive approach to watershed protection. By monitoring the aquatic resources in their backyards, they can ensure the protection, longevity, and productivity of high quality water resources, as well as evaluate, assess, and improve those of lower quality.

- IOWATER is a citizen-based program, directed by citizen monitors within local communities.
- IOWATER focuses on solutions, not problems.
- IOWATER is interested in results, not regulation.
- IOWATER is flexible, allowing local groups to design their own monitoring and action plans.
- IOWATER is committed to partnerships, developing local working partners and sharing information and resources within state and federal agencies.
- IOWATER concentrates on a watershed approach, integrating land use, soil concerns, and the water bodies involved.

IOWATER coordinates a statewide network of volunteers who collect useful water quality data on local water bodies. Data are used to document baseline conditions for water bodies that have in many cases never been monitored before, and through time, the data can be used to document trends in water quality.

Why is Monitoring Needed?

Many human activities have a significant impact on Iowa's watersheds. Point and non-point source pollution, from various urban and agricultural practices, contribute to the problems that we face. Iowa has nearly 72,000 miles of streams, 163,000 acres of lakes, reservoirs, and ponds, and 50,500 acres of marshes. While some professional monitoring of these aquatic resources occurs as part of Iowa's Ambient Watershed Monitoring and Assessment Program, many of these water bodies remain unmonitored. Volunteers have the opportunity to fill a critical need in providing baseline information on these previously unmonitored water bodies, and data they submit may identify areas in need of further monitoring.

IOWATER volunteers bring with them to the field a wide variety of experience and expertise – they may be schoolteachers, students, professional scientists, parents, mechanics, etc. – the bottom line is that they are all concerned citizens. Citizen monitors fulfill an important niche in water monitoring, as they are able to collect data on stream segments and water bodies that are normally never monitored, thus bridging gaps in the understanding of

Iowa's aquatic resources. Volunteers have an interest in water quality and are passionate about protecting Iowa's water quality. Serving as certified water quality monitors, IOWATER volunteers can bring about positive change to protect and improve Iowa's aquatic resources.

The IOWATER volunteer monitoring program provides baseline information about water conditions that help researchers, both educational and governmental, evaluate Iowa's water quality, and address water quality problems that may threaten it. Monitors also alert state officials about dangerous pollution discharges, fish kills, or public health hazards, and local law enforcement about criminal activity, such as discovering methamphetamine labs or any other evidence of illegal drug activity. Through their monitoring, locations may be identified that are in need of follow-up monitoring.

How is the Information Used?

During an IOWATER workshop, volunteers are trained and equipped to evaluate a variety of chemical, physical, habitat, and biological parameters that can be used to assess water quality. Volunteers are encouraged to choose their own sites, sampling frequency, and parameters of interest. Regular sampling schedules are recommended. Guidelines on sampling frequency are provided, but ultimately each volunteer monitor decides how often to monitor and what to monitor for. Part of this is determined by the question(s) the individual is trying to answer and whether he/she is involved with a monitoring group or watershed project.

IOWATER monitors can regularly submit data to a password-protected, internet-accessible database (www.IOWATER.net) which only they have access to. Anyone with internet access, however, can view and utilize the data. The data are presented and disseminated in a variety of formats by the IOWATER staff, including the IOWATER Status Report, the Annual Water Monitoring Conference, the IOWATER newsletter, public presentations, and IOWATER workshops.

The IOWATER data may be used to:

- Establish baseline conditions for determining stream health based on chemical, physical, biological, and habitat parameters.
- Analyze trends in water quality parameters over time.
- Identify water bodies in need of more detailed monitoring.
- Assess the health of a watershed and target areas within a watershed in need of water quality improvement.
- Assist local watershed councils and partners in making environmental management decisions in their local and regional watersheds.
- Enlist community involvement in their local watershed.
- Prioritize areas in a watershed for Best Management Practices (BMPs).
- Assess the condition of Iowa's waters as reported by Iowa's 305(b) report.

A5.2 IOWATER Snapshot Events

During a snapshot event, multiple sites throughout a geographic area are sampled within a short period of time (3 to 4 hours). The snapshot results provide a picture of water quality in time. The geographic area can be a county or a watershed of interest. Snapshot events are initiated by an individual or group at the local level interested in collecting additional water quality information. Goals for a snapshot event are diverse and can include any of the following:

- Engage IOWATER volunteers and the general public in a water monitoring event at the local level.
- Provide a water quality testing experience for individuals at the local level.
- Establish baseline conditions for determining stream health based on chemical, physical, habitat, and biological parameters for a county or watershed.
- Assess the health of the watershed and identify target areas within the watershed in need of water quality improvement.
- Identify sites or areas within the county or watershed in need of more detailed monitoring.

A5.3 IOWATER DNR Lakes Program

The DNR Lakes Program monitors water quality at multiple lakes throughout the state during the open water season. The program allows the DNR to gain additional information about Iowa's lakes by enlisting volunteers to collect samples. The volunteers choose the sites to monitor and the frequency that they monitor. These volunteers are interested in collecting additional water quality information on the lakes. Goals for the DNR Lakes Program include any of the following:

- Provide water quality information on lakes that are not monitored through other programs in Iowa.
- Improve the spatial characterization of the lakes by monitoring multiple sites on the lake.
- Obtain additional information on how the lakes change during different seasons by expanding the amount of time that the lakes are monitored.
- Provide a better characterization of water quality in the lake by increasing the frequency of monitoring compared to the state's ambient lake monitoring program.
- Supply essential information to DNR Fisheries staff and local groups that manage the lakes.
- Provide water quality information on lakes that are part of various research projects of the department.

A6. PROJECT/TASK DECRIPTION

A6.1 IOWATER Program

The IOWATER program has grown in scope and direction from its beginning in May of 1998. At that time, individuals who had long been striving for a statewide program gathered together to begin laying the framework for how such a program would work.

These initial organizations represented IOWATER's first advisory committee and included: Iowa Department of Natural Resources (Iowa DNR), United States Natural Resources Conservation Service, Iowa Environmental Council, Iowa Division of the Izaak Walton League, Iowa Farm Bureau, and the University Hygienic Laboratory (University of Iowa).

Citizen monitors initially complete a ten-hour workshop. When they have completed the workshop, they are considered Level 1 Certified and receive a certificate recognizing their accomplishments. Citizen monitors can then take additional Advanced Workshops that specialize in developing new monitoring skills. Current Advanced workshops include Bacteria Monitoring and Benthic Macroinvertebrate Indexing.

The mission of IOWATER is to protect and improve Iowa's water quality by raising citizen awareness about Iowa's watersheds, supporting and encouraging the growth and networking of Iowa's volunteer water monitoring communities, and promoting water monitoring activities as a means of assessing and understanding Iowa's aquatic resources.

Goals of the IOWATER Program include:

- Expand citizen volunteer water monitoring in Iowa.
- Develop a user friendly process for data collection to increase information on the state's water resources.
- Develop opportunities for citizens to discover the influence of the watersheds on water quality, and the relationship between land and water.
- Establish opportunities for citizens to become involved in local water resource issues through education and outreach on water resources.

Strategies of the IOWATER Program include:

- Promote IOWATER as a part of Iowa's conservation education curriculum.
- Establish an outreach program to increase citizen awareness of the importance of water quality monitoring.
- Facilitate partnerships and alliances throughout Iowa to support volunteer water quality monitoring.
- Support existing volunteer water quality monitoring groups.
- Assist new groups in designing and implementing water quality monitoring projects.
- Provide networking opportunities between volunteer groups and government agencies to promote sharing of data and resources.

- Establish a series of training programs available to volunteers that will improve the quality, quantity, and reliability of water quality data.

A6.2 IOWATER Snapshot Events

IOWATER snapshot events are initiated by an individual or group at the local level. In conjunction with the IOWATER snapshot coordinator, the Volunteer Snapshot Event Coordinator(s) determines the answers to who, what, when, where, why, and how for his/her particular snapshot. Who will be involved in the snapshot? What field parameters and lab analyses will be measured? What observations will be recorded for each site? What sites will be sampled? When will the snapshot occur? Why is the snapshot being done? How often will the snapshot occur? The IOWATER snapshot coordinator will coordinate with each Volunteer Snapshot Event Coordinator to design an appropriate field form, provide the necessary IOWATER field test kits, and supply the necessary bottles for lab analyses. Lab analyses available for a snapshot are also dependent on funds available through the Iowa Department of Natural Resources Watershed Monitoring and Assessment Program.

The water quality data collected as part of a snapshot are reviewed and then entered into an Excel spreadsheet. Field sheets are scanned, summary statistics generated, and maps and graphs of the results are provided to the Volunteer Snapshot Event Coordinator. Snapshot results are compared to available stream data statewide. Once the IOWATER snapshot coordinator has completed QA/QC on the data, results are entered into the IOWATER database and lab analyses uploaded to IASTORET or the equivalent WQX database. All of the data and information generated as part of a snapshot event are provided to the Volunteer Snapshot Event Coordinator for distribution to snapshot participants.

Measurement processes and techniques utilized for parameters sampled during a snapshot are outlined in Tables 1 through 6.

A6.3 IOWATER DNR Lakes Program

IOWATER DNR Lakes Program volunteers choose monitoring locations with the assistance of the IOWATER Lakes Coordinator. The IOWATER Lakes Coordinator and volunteers choose the laboratory parameters to be analyzed, while the volunteers choose the IOWATER Field Parameters and observations they measure and record. The volunteers also choose when and how often to sample with guidance from the IOWATER Lakes Coordinator. The IOWATER Lakes Coordinator designs appropriate field forms, provides the necessary equipment, and coordinates with the laboratory to provide the necessary bottles for lab analysis.

The water quality data collected as part of the IOWATER DNR Lakes Program are reviewed and entered into an Excel spreadsheet, the IOWATER database, and the STORET database (or the equivalent WQX database). A data report is prepared annually that summarizes results from the past year of monitoring.

A7. DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

A7.1 IOWATER Program

Measurement Range and Increments

Table 1 lists the measurement ranges and increments for pH, dissolved oxygen, nitrate-N, nitrite-N, ortho-phosphorus, chloride, water temperature, transparency, secchi disk depth, *E. coli* bacteria, and general coliform bacteria data collected by IOWATER volunteers. Table 2 lists the IOWATER parameters.

Table 1. Measurement range and increments of IOWATER parameters.

Sample Matrix	Parameter	Measurement Range	Increments
Surface Water	pH	4-9	4, 5, 6, 7, 8, 9
Surface Water	Dissolved oxygen	1-12 mg/L	1, 2, 3, 4, 5, 6, 8, 10, 12
Surface Water	Nitrate-N	0-50 mg/L	0, 1, 2, 5, 10, 20, 50

Surface Water	Nitrite-N	0-3.0 mg/L	0, 0.15, 0.3, 1, 1.5, 3
Surface Water	Orthophosphate	0-10 mg/L	0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1, 2, 3, 4, 5, 6, 7, 8, 10
Surface Water	Chloride	<25-650 mg/L	All whole numbers within range
Surface Water	Water temperature	35-125 degrees F	All whole numbers within range
Surface Water	Transparency	0-60 cm	All whole numbers within range
Surface Water	Secchi disk depth	0-30 m	Measured to the nearest tenth of a meter
Surface Water	*E. coli* bacteria	All whole numbers	All whole numbers
Surface Water	General coliform bacteria	All whole numbers	All whole numbers

Table 2. Parameter list for IOWATER parameters.

Analyte	Matrix	Sample Container	Preservative	Holding Time	Analytical Method
Chloride, Field	Water	None	None	Immediate	Hach® brand, silver nitrate titrant, Range: 30-600 mg/L
Nitrate Nitrogen, Field	Water	None	None	Immediate	Hach® brand, nitrate test strip, Range: 0-50 mg/L
Nitrite Nitrogen Field	Water	None	None	Immediate	Hach® brand, nitrite test strip, Range: 0-3 mg/L
Dissolved Oxygen, Field	Water	None	None	Immediate	Chemetric® brand test kit, Indigo Carmine Method, Range: 1-12 mg/L
E. coli Bacteria	Water	Presterilized liquid medium vial	None	Within 6 hours	Coliscan Easygel
pH, Field	Water	None	None	Immediate	Hach® brand, pH test strip, Range: 4-9
Phosphate, Ortho-, Field	Water	None	None	Immediate	Chemetric® brand test kit, Stannous Chloride Method, Range: 0-1 & 1-10 mg/L
Secchi Disk Depth, Field	Water	None	None	Immediate	20 cm diameter secchi disk with black/white pattern attached to a 30 m open reeled tape measure with steel quick link: 0 – 30 m.
Temperature, Field	Water	None	None	Immediate	Enviro-Safe® Armor-Case thermometer containing safe, non-mercury liquid with 1 or 2 degree Fahrenheit increments.
Total Coliform Bacteria	Water	Presterilized liquid medium vial	None	Within 6 hours	Coliscan Easygel
Transparency, Field	Water	None	None	Immediate	60 cm polycarbonate tube with 4.5 cm standard Secchi disk design in bottom.

cm – centimeter; mg/L – milligrams per liter

Representativeness

IOWATER volunteers are instructed at Level 1 and Advanced Workshops on how to select sampling sites on streams or lakes / ponds that are representative of the water body they are monitoring. For streams, volunteers are limited to available access points to the water. Site transects are selected at the most abundant stream habitat type (riffle, run, or pool). Site reaches (stream segment) are determined by the volunteer to include all major microhabitats available. For lakes / ponds, volunteers are instructed to sample at the deepest point if possible. It is noted on the Standing Water Assessment form as to whether the volunteer is sampling from the deepest point or the shore / dock. Sites that have been registered by IOWATER volunteers are shown in Figure 1.

IOWATER Snapshot Coordinators work with the IOWATER Snapshot Coordinator and other professional staff to select monitoring sites that best represent the water quality of the County or Watershed selected.

DNR Lakes Program monitors are instructed to select sampling sites on lakes that are representative of the water body they are monitoring. This location would be the deepest point in most Iowa lakes.

Comparability
IOWATER volunteers across the state are all trained using the same methods by IOWATER staff.

IOWATER snapshot volunteers across the state are all trained using the same methods by IOWATER staff or Snapshot Coordinators.

DNR Lakes Program monitors across the state are all trained using the same methods by DNR staff or IOWATER staff.

Completeness
There is no fraction of the planned data that must be collected in order to fulfill statistical criteria. The number of sites monitored and number of samples collected at each site is individually determined by IOWATER volunteers and monitoring groups. IOWATER staff recommend that each site be sampled monthly for chemical and physical assessments, once a year for habitat assessments, and no more that three times a year for biological assessments.

A7.2 IOWATER Snapshot Events

The goal of each snapshot is to design, initiate, and complete a snapshot survey that will collect water quality data throughout a geographic area that meets the objectives and goals as determined by each Volunteer Snapshot Event Coordinator. The data collected will determine baseline conditions for sites in the county or watershed; will provide an assessment of nutrient and bacteria levels; determine if the dissolved oxygen standard is violated; and the data will be compared to statewide numbers to provide perspective on whether results are similar or different from levels seen statewide.

Success of each snapshot will be determined or measured by the collection of data from sites identified throughout the watershed or county and completion of the frequency of monitoring desired as established by the Volunteer Snapshot Event Coordinator.

Measurement ranges and increments associated with the IOWATER field test kit methods are listed in Table 1. Sites that have been monitored as part of a snapshot event are shown in Figure 2. In addition to IOWATER field test kits, samples are also collected for lab analysis. For samples that are submitted to the Unvieristy of Iowa Hygienic Lab as part of snapshots, the ranges and increments for these parameters can be found in the University of Iowa Hygienic Laboratory Quality Assurance Project Plan and Standard Operating Procedures (2001, 2002, and 2003).

During many of the snapshot events, water samples are collected in the field for later analysis at the University of Iowa Hygienic Lab, Des Moines Water Works Lab, or the Iowa DNR Water Lab. The standards for precision, bias, accuracy, and sensitivity associated with those parameters can be found in Tables 3 through 5. The data quality objectives associated with those parameters are located in Tables 6 through 8.

A7.3 IOWATER DNR Lakes Program

The goal of the DNR Lakes program is to provide additional information on the quality of Iowa's lakes and provide information that meets the objectives and goals determined by each volunteer. The data collected are utilized to determine water quality condition of the lake; provide an assessment of nutrient, algae and suspended sediment levels; and provide resource managers with essential information. Sites that have been monitored as part of the IOWATER DNR Lakes Program are show in Figure 3.

Measurement ranges and increments associated with the IOWATER field test kit methods are listed in Table 1. In addition to IOWATER field test kits, samples are also collected for laboratory analysis. These samples are submitted to the University of Iowa Hygienic Laboratory. The ranges and increments for these parameters can be

found in the University of Iowa Hygienic Laboratory Quality Assurance Project Plan and Standard Operating Procedures (2001, 2002, and 2003).

Table 3. Parameter list for University of Iowa Hygienic Lab parameters.

Analyte	Matrix	Sample Container	Preservative	Holding Time	Analytical Method
Acetochlor	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Alachlor	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Ametryn	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Ammonia Nitrogen as N	Water	250 ml plastic	H2SO4 to pH <2; Cool to 4 ◦C	28 days	LAC10-107-06-1J
Atrazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Bromacil	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Butylate	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Chlorophyll A SM17 10200 H 2	Water	1 liter plastic	Cool, 4°C	21 days on frozen filter	EPA 445.0 R 1.2
Cyanazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Diesel Fuel	Water	1 liter glass	Cool, 4°C	7 days	OA-2
Desethyl Atrazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Desisopropyl Atrazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Diazinon	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Dimethenamid	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
E. coli Bacteria (UHL)	Water	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	EPA 1603 (modified mTEC)
Enterococci Bacteria	Water	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	APHA-9230-C
EPTC	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Fecal Coliform Bacteria	Water	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	APHA-9222-D
Gasoline	Water	1 liter glass	Cool, 4°C	7 days	OA-2
Kjeldahl Nitrogen, Total	Water	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-107-06-2E
Metolachlor	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Metribuzin	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Mineral Spirits	Water	1 liter glass	Cool, 4°C	7 days	OA-2
Motor Oil	Water	1 liter glass	Cool, 4°C	7 days	OA-2
Nitrate+Nitrite-Nitrogen	Water	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	EPA 353.2
Organic Nitrogen	Water	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-107-06-2E
Orthophosphate, Filterable as P TIM 781-86T	Water	250 ml plastic	Filter immediately Cool, 4°C	48 hours	LAC10-115-01-1A
Pendimethalin	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Petroleum Hydrocarbons	Water	1 liter glass	Cool, 4°C	7 days	OA-2
Phosphate, Total	Water	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-115-01-1D
Prometon	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Propachlor	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Propazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Simazine	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507
Total Dissolved Solids EPA 160.1	Water	1 liter plastic	Cool, 4°C	7 days	SM 2540 C
Total Suspended Solids USGS I-3765-85	Water	1 liter plastic	Cool, 4°C	7 days	USGS I-3765-85
Total Volatile Suspended Solids	Water	1 liter plastic	Cool, 4°C	7 days	USEPA 160.1
Trifluralin	Water	1 liter glass	Cool, 4°C	14 days	USEPA 507

Table 4. Parameter list for Des Moines Water Works lab parameters.

Analyte	Matrix	Sample Container	Preservative	Holding Time	Analytical Method
Bromide	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Chloride	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
E. coli Bacteria	Water	120 ml, polystyrene with sodium thiosulfate as as preservative	None	24 hours	APHA-9223-B
Fluoride	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Nitrate-N	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Nitrite-N	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Orthophosphate as P	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Specific Conductivity	Water	500 ml HDPE	None	24 hours	APHA-2510B
Sulfate	Water	500 ml HDPE	None	24 hours	USEPA 300(A)
Total Coliform Bacteria	Water	120 ml, polystyrene with sodium thiosulfate as a preservative	None	24 hours	APHA-9223-B
Total Dissolved Solids	Water	500 ml HDPE	None	24 hours	APHA-2510A
Turbidity	Water	500 ml HDPE	None	24 hours	APHA-2130

Table 5. Parameter list for Iowa DNR Water Lab parameters.

Analyte	Matrix	Sample Container	Preservative	Holding Time	Analytical Method
E. coli Bacteria	Water	15 ml clear plastic	None	24 hours	SM 9223B

Table 6. Parameter objectives for Des Moines Water Works lab analyses.

Analyte	Matrix	Lab	Method Detection Limit	Estimated Accuracy of True Value **	Accuracy Protocol	Estimated Precision (Relative % Difference) ***
Bromide	Water	DMWW	0.031 mg/L	97%	±10%	2
Chloride	Water	DMWW	0.1551 mg/L	98%	±10%	2
E. coli Bacteria	Water	DMWW	1 MPN/100 mL	80%	None	20
Fluoride	Water	DMWW	0.014 mg/L	97%	±10%	3
Nitrate-N	Water	DMWW	0.009 mg/L	97%	±10%	1
Nitrite-N	Water	DMWW	0.004mg/L	96%	±10%	5
ortho-Phosphorous	Water	DMWW	0.068 mg/L	95%	±10%	1
Specific Conductivity	Water	DMWW	5 µS/cm	95%	±10%	3
Sulfate	Water	DMWW	0.137 mg/L	97%	±10%	1
Total Coliform Bacteria	Water	DMWW	1 MPN/100 mL	80%	None	20
Total Dissolved Solids	Water	DMWW	3 mg/L	97%	±10%	4
Turbidity	Water	DMWW	0.05 NTU	98%	±5%	5

MPN = Most Probable Number; mg/L – milligrams per liter; µS/cm = microsiemens per centimeter; NTU – Nephelometric Turbidity Units; NA – not applicable; RPD - Relative % Difference
DMWW – Des Moines Water Works
* Analytical Performance 4/2009
**Values presented are 1 Std Deviation (the average % difference) to Standard values).
***Percent differences are higher for analytes present at low concentrations (e.g. Nitrite and o-Phosphate).

Table 7. Parameter objectives for the University of Iowa Hygienic lab analyses.

Analyte	Matrix	Lab	Method Detection Limit	Estimated Accuracy of True Value	Accuracy Protocol	Estimated Precision (Relative % Difference)
Acetochlor	Water	UHL	0.1 µg/L	-13%	Bias on spikes	10.9% *
Alachlor	Water	UHL	0.1 µg/L	-13%	Bias on spikes	6.4%*

Ametryn	Water	UHL	0.1 µg/L	-28.1%	Bias on spikes	15.5% *
Ammonia Nitrogen as N	Water	UHL	0.05 mg/L	+ 14%	Recovery on spikes	RDP < 20%
Atrazine	Water	UHL	0.1 µg/L	-11%	Bias on spikes	7.4% *
Bromacil	Water	UHL	0.1 µg/L	-41%	Bias on spikes	15.3% *
Butylate	Water	UHL	0.1 µg/L	-14.2%	Bias on spikes	9.6% *
Chlorophyll A SM17 10200 H 2	Water	UHL	1 µg/L	+/- 10%	Standards, lab blanks, splits, duplicates	RPD <20%
Cyanazine	Water	UHL	0.1 µg/L	-29%	Bias on spikes	17.1% *
Diesel Fuel	Water	UHL	100 µg/L	-28%	Bias on spikes	10% *
Desethyl Atrazine	Water	UHL	0.1 µg/L	-51.8%	Bias on spikes	12.3% *
Desisopropyl Atrazine	Water	UHL	0.1 µg/L	-78.3%	Bias on spikes	15.9% *
Diazinon	Water	UHL	0.1 µg/L	+1.6%	Bias on spikes	6.5% *
Dimethenamid	Water	UHL	0.1 µg/L	-15.3%	Bias on spikes	7.3% *
E. coli Bacteria (UHL)	Water	UHL	10 CFU	NA	NA	Three-year Average = 0.21
Enterococci Bacteria	Water	UHL	10 CFU	NA	NA	Three-year Average = 0.24
EPTC	Water	UHL	0.1 µg/L	-15.6%	Bias on spikes	10.2% *
Fecal Coliform Bacteria	Water	UHL	10 CFU	NA	NA	Three-year Average = 0.23
Gasoline	Water	UHL	100 µg/L	-28%	Bias on spikes	10% *
Kjeldahl Nitrogen, Total	Water	UHL	0.1 mg/L	+/- 10%	Recovery on spikes	RPD <20%
Metolachlor	Water	UHL	0.1 µg/L	-12.6%	Bias on spikes	5.6% *
Metribuzin	Water	UHL	0.1 µg/L	-7.8%	Bias on spikes	6.2% *
Mineral Spirits	Water	UHL	100 µg/L	-28%	Bias on spikes	10% *
Motor Oil	Water	UHL	100 µg/L	-28%	Bias on spikes	10% *
Nitrate+Nitrite-Nitrogen	Water	UHL	0.05 mg/L	±0.1 low level	Recovery on spikes	RDP < 20%
Organic Nitrogen	Water	UHL	0.05 mg/L	± 20%	Recovery on spikes	RDP < 20%
Orthophosphate, Filterable as P TIM 781-86T	Water	UHL	0.02 mg/L	+/- 10%	Recovery on spikes	RPD <20%
Pendimethalin	Water	UHL	0.1 µg/L	-12.8%	Bias on spikes	10.6% *
Petroleum Hydrocarbons	Water	UHL	100 µg/L	-28%	Bias on spikes	10% *
Phosphate, Total	Water	UHL	0.02 mg/L	±5%	Recovery on spikes	RPD <20%
Prometon	Water	UHL	0.1 µg/L	-20.3%	Bias on spikes	12.2% *
Propachlor	Water	UHL	0.1 µg/L	-10.7%	Bias on spikes	6.3% *
Propazine	Water	UHL	0.1 µg/L	-11.1%	Bias on spikes	9.3% *
Simazine	Water	UHL	0.1 µg/L	-12.5%	Bias on spikes	17.3% *
Total Dissolved Solids EPA 160.1	Water	UHL	1 mg/L	+/- 10%	Concentration dependent	RPD <20%
Total Suspended Solids USGS I-3765-85	Water	UHL	1 mg/L	± 10%	EPA check samples	RPD <20%
Total Volatile Suspended Solids	Water	UHL	1 mg/L	± 20%	NA	RPD <20%
Trifluralin	Water	UHL	0.1 µg/L	-12%	Bias on spikes	11.1% *

CFU – Colony Forming Unit; mg/L – milligrams per liter; NA – not applicable; RPD - Relative % Difference
UHL = University of Iowa Hygienic Lab
* Estimated Standard Deviation of Spikes

Table 8. Parameter objectives for Iowa DNR Water Lab analyses.

Analyte	Matrix	Lab	Method Detection Limit	Estimated Accuracy of True Value	Accuracy Protocol	Estimated Precision (Relative % Difference)
E. coli Bacteria (DNR)	Water	DNR	10 *E. coli* / 100 ml at 1:10 dilution	NA	Analyst count verification (if necessary)	Precision criteria Established for 2008 = < 0.20

NA – not applicable; RPD - Relative % Difference

DNR = Iowa Department of Natural Resources Water Lab

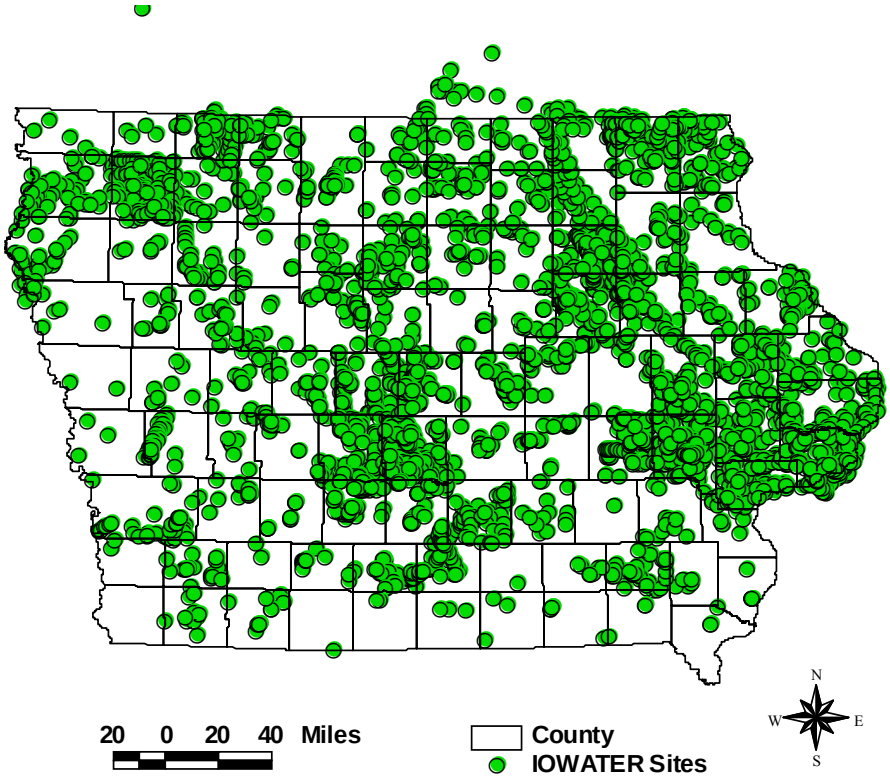

Figure 1. Monitoring sites registered by IOWATER monitors through April 2009.

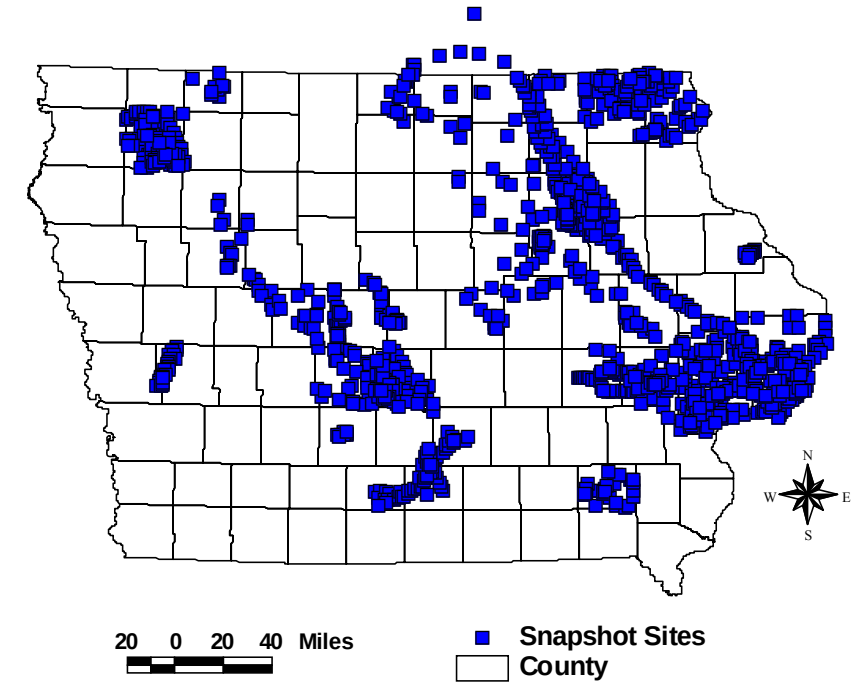

Figure 2. Sites monitored as part of IOWATER snapshot events through April 2009.

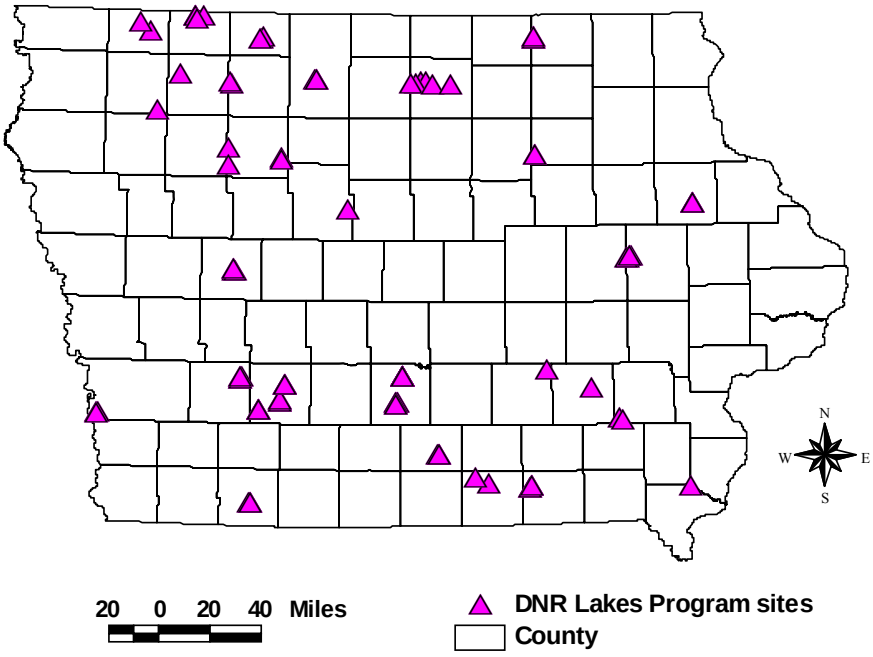

Figure 3. Lakes monitored as part of the Iowa DNR Lakes Program through April 2009.

A8. SPECIAL TRAINING/CERTIFICATION

A8.1 IOWATER Program

IOWATER volunteers initially attend a 10-hour Level 1 workshop where they learn how to monitor streams, lakes, and ponds. All IOWATER workshops are conducted by IOWATER staff. Upon completion of the Level 1 workshop, an individual becomes a certified Level 1 IOWATER monitor. The workshops include a variety of session settings, held both indoors and outdoors. The first half is conducted indoors in a classroom-type setting, while the second half is predominantly spent in a nearby stream where monitors have the opportunity to complete the four field assessment forms and to use the field test kits. The ten-hour workshop incorporates:

- An introduction to IOWATER's history and goals
- The importance of water quality with a focus on protecting Iowa's waters
- Education of, and hands-on training with, chemical, biological, habitat, and physical parameters
- Education of watershed dynamics
- A focus on the importance of teamwork, safety, liability, and credibility
- How to start and design a monitoring plan
- The "why-tos" and "how-tos" of water monitoring
- What to do with the data
- Networking with others concerned about water quality
- What to do if they find abnormal results, fish kills, toxic spills, or illegal activity

Once a volunteer has completed the Level 1 workshop they can expand their monitoring skill set by attending additional Advanced Workshops. Current Advanced Workshops include Bacteria Monitoring and Benthic Macroinvertebrate Indexing. At the Bacteria Workshop, volunteers learn how to monitor stream and lake / pond sites for *E. coli* and general coliform bacteria. At the Benthic Macroinvertebrate Indexing Workshop, volunteers expand their biological assessment methods to include identifying benthic macroinvertebrates to family or class level and count the individuals found.

IOWATER volunteers are encouraged to form monitoring teams. This helps insure that IOWATER methods are being conducted in the manner in which the volunteers were trained. Volunteers are also encouraged to attend a second IOWATER Level 1 workshop to refresh their monitoring skills.

A8.2 IOWATER Snapshot Events

IOWATER snapshot volunteers are trained to conduct snapshot monitoring before the snapshot event by the IOWATER snapshot coordinator or designee or the snapshot event coordinator. During the training, snapshot participants are instructed in sampling procedures, IOWATER test kit methods, proper collection of lab samples, and completetion of the snapshot field form. A liability waiver is signed by each participant. New volunteers are paired with experienced volunteers to increase the quality assurance of the collected data. Site location maps and contact information for questions or emergencies are provided to all volunteers. After data are collected as part of the snapshot, volunteers return to a central meeting location to transfer paperwork and samples. The IOWATER snapshotshot coordinator reviews the paperwork to ensure that everything has been properly sampled and recorded.

A8.3 IOWATER DNR Lakes Program

DNR Lakes program volunteers are trained to use the IOWATER methods, collect lab samples, and process samples for shipment at IOWATER Level 1 workshops, individually by IOWATER staff members, or at training workshops included in the statewide meeting of DNR Fisheries staff. All procedures are recorded in the DNR Lakes Monitoring Program training manual.

A9. DOCUMENTATION AND RECORDS

A9.1 IOWATER Program

IOWATER volunteers complete field assessment forms on-site at the time of sampling (see appendices 1 through 6), with the exception of bacteria data and benthic macroinvertebrate indexing counts, which are added when samples are read / identified indoors. Recorded on each field assessment form is the date and time of sampling, the IOWATER monitor's ID, other volunteers involved with the sampling, and a recording of how many adults and how many children took part in the sampling. When monitoring is completed, IOWATER volunteers then submit data to a password-protected, internet-accessible database (www.IOWATER.net) through which only IOWATER trained monitors can submit data. Anyone with internet access, however, can view and utilize the data.

IOWATER volunteers are instructed on completion of four different field assessment forms, which are Stream Habitat Assessment (Appendix 1), Biological Assessment (Appendix 2), Chemical/Physical Stream Assessment (Appendix 3), and the Standing Water Assessment (Appendix 4). An IOWATER Level 1 benthic key is provided to all volunteers to assist in the identification of benthic macroinvertebreates (Appendix 5). If a volunteer has completed the Bacteria Workshop, additional parameters of *E. coli* and General Coliform bacteria counts for three replicates, incubation temperature, incubation period and sample volume, are recorded on the bacteria assessment form (Appendix 6). When bacteria samples are collected, volunteers are encouraged to complete either the Chemical/Physical Stream Assessment form (Appendix 3) or the Standing Water Assessment (Appendix 4) form at the same time. In addition, volunteers who have completed the Benthic Macroinvertebrate Indexing Workshop have been instructed on the completion of the Benthic Macroinvertebrate Indexing field form (Appendix 7).

Volunteers retain paper copies of field assessment forms for their records. IOWATER volunteers transfer the data collected from the paper field assessment forms to the IOWATER database. The IOWATER database is a password-protected, internet-accessible database (www.IOWATER.net) and is maintained by the IOWATER Database Manager. Once data are submitted to the database, only the IOWATER Database Manager, Program Coordinator, Field Coordinator, and QA Officer can make changes to them. This is only done when the volunteer who submitted the data requests it or the data are found to be erroneous by IOWATER staff. The date and reason for all database changes are recorded in fields associated with each data record.

Access to submit data to the internet accessible database is limited to IOWATER volunteers who have completed Level 1 training. Volunteers are given a unique ID and password to enter the database. As a volunteer completes more advanced workshops, they are given additional rights to the database to submit the additional monitoring data. This volunteer workshop attendance information and contact information is also stored in the IOWATER database and is maintained by the IOWATER Field Coordinator and updated by the volunteers.

A9.2 IOWATER Snapshot Events

IOWATER Snapshot volunteers are instructed on completion of the Snapshot field form. A copy of this form is located in Appendix 8. IOWATER volunteers participating in a snapshot are instructed on how to properly complete the snapshot field form. This form is completed on-site at the time sampling occurs. Recorded on each field assessment form are the site number, date and time of sampling, weather conditions, visual observations of water color and odor, presence of animals or tile lines, stream bank conditions, adjacent land use, human use activities, results of field tests, and any other comments or observations the volunteer wants to record. These forms are submitted to the IOWATER Snapshot Event Coordinator for entry into the IOWATER database and a snapshot spreadsheet. Once entered, the data are reviewed for accuracy and completeness.

Data reports from the University of Iowa Hygienic Laboratory will be downloaded by the IOWATER Snapshot Coordinator through the Electronic Laboratory Information System (ELIS), the lab's web interface. Data reports can be downloaded in a PDF or Microsoft® Excel format. Data reports include site name, date and time of sample collected, name of the sample collector, comments associated with sampling in terms of holding time or sample temperature exceedances, concentration and quantitation limit, date analyzed, analyte method, analyst, and the initials of the person verifying the result. An electronic version of the lab data results will be retained during the length of the project by the Iowa DNR.

Data reports from the Iowa DNR Water Lab are downloaded by the IOWATER Snapshot Coordinator in a Microsoft® Excel format. Data reports include site name, date sample collected, DNR Lab number, comments associated with sampling in terms of holding time or sample temperature exceedances, date analyzed, dilution factor, and the result.

Data reports from Des Moines Water Works are sent to the IOWATER Snapshot Coordinator in a Microsoft® Excel format. Data include site name, date collected, parameter, and result.

Following review and validation of the field data and lab results collected as part of each snapshot event, the data are uploaded into the IOWATER database under the supervision of the IOWATER Snapshot Coordinator. The IOWATER database is a password-protected, internet-accessible database (www.IOWATER.net). The data are entered under a username specific to each snapshot. Once data are entered into the database, only the IOWATER Database Manager, IOWATER Field Coordinator, IOWATER Snapshot Coordinator, or the IOWATER Quality Assurance Officer can make changes to the data. This is only done if data are found to be erroneous by IOWATER staff. The date and reason for all changes to the database are recorded in fields associated with each data record. The lab results are also directly uploaded into STORET (or the equivalent WQX database) by the IOWATER Snapshot Coordinator with the assistance of staff at the Iowa DNR.

Once the field and lab data for a snapshot have been reviewed, watershed maps will be generated by the IOWATER Snapshot Coordinator to display the results for all parameters. Box plots will be generated to compare results from the snapshot to streams statewide that are sampled as part of Iowa's Ambient Watershed Monitoring and Assessment Program. All maps and graphs will be reviewed by the IOWATER Program Coordinator, the IOWATER Quality Assurance Officer, and the Volunteer Snapshot Event Coordinator. Finalized maps and graphs will be distributed through the IOWATER website or from the DNR's ftp site.

All versions of the IOWATER Quality Assurance Project Plan will be retained by the Iowa Department of Natural Resources. The most recent version of the QAPP will be available to project staff, volunteers and other interested parties in a PDF format online at www.IOWATER.net.

A9.3 IOWATER DNR Lakes Program

DNR Lakes Program volunteers are instructed on completion of the DNR Lakes field form during program training. A copy of this form is located in Appendix 9. This form is completed on-site at the time sampling occurs. Recorded on each field assessment form are the date, time, site name, STORET ID, volunteer name, DNR staff name, weather conditions, air temperature, precipitation over the last 24 hours, wind direction and speed, site location, Secchi depth, water temperature, water level, water odor, pH, nitrate concentration, nitrite concentration, dissolved oxygen concentration, phosphate concentration, chloride, water color, and expiration date information for field test kits. These forms are submitted to the University of Iowa Hygienic Laboratory and relevant field data are entered into the lab's Electronic Laboratory Information System (ELIS). Once entered, the data are reviewed for accuracy and completeness and field data sheets are transferred to the IOWATER Lakes Coordinator.

Data reports from the University of Iowa Hygienic Laboratory will be downloaded by the IOWATER Lakes Coordinator through the Electronic Laboratory Information System (ELIS), the lab's web interface. Data reports can be downloaded in a PDF or Microsoft® Excel format. Data reports include site name, date and time of sample collected, name of the sample collector, comments associated with sampling in terms of holding time or sample temperature exceedances, concentration and quantitation limit, date analyzed, analyte method, analyst, and the initials of the person verifying the result. An electronic version of the lab data results will be retained during the length of the project by the Iowa DNR.

DNR Lakes Program volunteers and the IOWATER Lakes Coordinator are responsible for entering data into the IOWATER database. The IOWATER database is a password-protected, internet-accessible database (www.IOWATER.net). The data are entered under a username specific to the DNR Lakes Program. Once data are entered into the database, only the IOWATER Database Manager, IOWATER Field Coordinator, IOWATER Snapshot Coordinator, or the IOWATER Quality Assurance Officer can make changes to the data. This is only done if data are found to be erroneous by IOWATER staff. The date and reason for all changes to the database are recorded in fields associated with each data record.

The lab results are directly uploaded into STORET (or the equivalent WQX database) by the IOWATER Lakes Coordinator with the assistance of staff at the Iowa DNR after review and validation by University of Iowa Hygienic Laboratory Staff and the IOWATER Lakes Coordinator.

SECTION B– DATA GENERATION AND ACQUISITION

B1. SAMPLING PROCESS DESIGN

B.1 IOWATER Program

During a Level 1 workshop, monitors are trained and equipped to assess water quality by completing four assessments: chemical, physical, habitat, and biological. IOWATER monitors can complete any or all of the assessments when sampling, or they can pick and choose the parameters of interest to them. A volunteer is encouraged to choose a site, sampling frequency, and a particular time of the day to sample, and encouraged to sample on a regular basis. Sampling can occur year round if weather and safety conditions permit. If a monitor has no site in mind, IOWATER staff will provide assistance in identifying a site to be monitored. Guidelines on sampling frequency are provided, but ultimately each volunteer monitor decides how often to monitor and what to monitor for. Sampling frequency is determined by the question(s) the individual is trying to answer through monitoring and whether he/she is involved with a watershed project.

The chemical assessment includes measurements of pH, dissolved oxygen, nitrate-N, nitrite-N, orthophosphorus, and chloride. Field test kits are used for these parameters. During the IOWATER workshop, IOWATER trainers discuss the variability of these chemical parameters and the impact that season, time of day, weather, biological and physical influences, and land use have on these parameters. The sampling frequency for chemical parameters will vary depending on why a person is monitoring. If an individual is interested in how water quality varies through time, monthly sampling would be appropriate. A monthly sampling frequency is also recommended for the data to be used in the state's 305(b) report. If an individual is only going to sample one or two times a year, it is recommended that sampling occur the same time each year. Some IOWATER monitors wish to target runoff events. In this case, they may establish a rainfall threshold before they sample the stream. Spring snowmelt events may also be targeted for sampling. If a volunteer has completed the Bacteria Workshop, they can also monitor for *E. coli* and general coliform bacteria with the chemical assessment.

IOWATER volunteers are also trained to conduct a physical assessment of their site, including observations about weather conditions at the time of sampling, water color, and water odor. Rainfall that has occurred in the watershed during the past 24 hours is estimated. Stream width, stream depth, and stream velocity are measured. Stream flow is then calculated from those measurements. If a volunteer does not want to measure stream flow, he/she can indicate if the stream flow is high, normal, low, or not sure when sampled. Water temperature and transparency are also measured. It is recommended that the physical parameters be conducted whenever any of the chemical assessments are completed.

The habitat assessment includes observations about habitat type, streambed, presence and types of microhabitats, conditions of stream banks, canopy cover, and riparian zone width. These observations need only be measured and recorded once a year unless there is some significant land use change within the stream's watershed that may affect stream characteristics in a very short period of time. Also recorded is information on adjacent land use, human use activities (these represent activities that the volunteer has participated in or witnessed at this site), and evidence of human use (these represent evidence of human use that the volunteer has witnessed at this site).

Along with the chemical, physical, and habitat assessments, IOWATER volunteers are also trained to conduct a biological assessment. During this assessment, monitors record the presence/absence of benthic macroinvertebrates to the class and order level. The presence/absence of microhabitats is noted, as well as the specific microhabitats that were sampled. The type of stream habitat sampled is recorded, and an estimate made of the amount of aquatic plants and algae present at the site. The volunteer also indicates the time spent sampling for benthic macroinvertebrates, the number of collection nets used, his/her confidence level in the identification of the benthic macroinvertebrates, and the stream reach length sampled. If the volunteer has completed the Benthic

Macroinvertebrate Indexing Workshop, they record the number of individuals collected and identify them to the order or family. The stream habitat type sampled is recorded as are the microhabitats sampled. Volunteers are encouraged to measure dissolved oxygen, water temperature, and transparency at the time a Benthic Macroinvertebrate Indexing assessment is completed. An estimate of stream flow (high, average, low) is also recorded.

Water Quality Parameters and Sampling Frequency for Lakes and Ponds

Many of the tests conducted for stream monitoring are modified for use in lakes/ponds. Point sampling, or sampling from a specific depth (~one-half meter) or point in the lake water column, is used to collect samples for chemical analyses. Chemical analyses may include pH, dissolved oxygen, nitrate-N, nitrite-N, orthophosphate, and chloride. If a volunteer has completed the Bacteria Workshop, they can also monitor for *E. coli* and general coliform bacteria. The habitat assessment, which includes a description of the lake banks and adjacent land use, is completed once a year. Physical conditions, such as weather conditions at the time of monitoring, air temperature, an estimate of rainfall during the past 24 hours, an assessment of wind direction and wind speed, where the sample was collected, a Secchi depth and/or transparency measurement, water temperature, water odor, and an indication of water level in the lake, are conducted whenever a chemical assessment is done. The biological assessment involves recording water color using a standardized water color chart and indicating if the volunteer observes an algal bloom. All observations are recorded on the IOWATER Standing Water Assessment form. Volunteers can also elect to record the presence/absence of benthic macroinvertebrates to the class and order level, the presence/absence of microhabitats and which microhabitats were sampled, and estimate the amount of aquatic plants and algae present at the site. These observations are recorded on the IOWATER Biological Assessment form.

The number and location of monitoring sites on a lake/pond is influenced by the goals and objectives of the IOWATER volunteer's monitoring program. A program designed primarily for public education, for example, may include sites for non-scientific reasons such as their proximity to residential neighborhoods or convenience of access such as a boat dock. Such a program may even include more monitoring sites in a lake than necessary for scientific goals so more volunteers can participate in monitoring. A program is designed to collect scientific data will focus on the most representative location of the lake for the monitoring site. In most cases, this will be in the deepest, open water area of the lake.

IOWATER recommends that volunteers conduct monthly lake monitoring from spring ice-out until fall freeze-over. Lake monitoring may be combined with stream monitoring, especially if a monitor is interested in knowing what the quality of water is in lake tributaries and lake outlets in relation to the quality of water in the lake. Monitoring tributaries and outlets may assist in identifying sub-watersheds that may be of concern.

B1.2 IOWATER Snapshot Events

The goals and objectives associated with snapshot events are unique to each snapshot. Monitoring is generally designed to collect baseline data throughout a geographic region within a 3 to 4 hour period of time. Sampling within a short period of time, especially under high-flow conditions, should minimize any variability casued by climatic conditions. For some snapshots, sampling occurs just once a year while for others, sampling occurs spring and fall, or spring, summer, and fall to measure seasonal differences in water quality. Each snapshot continues indefinitely based on the mutual interest of the Volunteer Event Snapshot Coordinator and the IOWATER Program and as funding through the IOWATER Program permits. Site to be monitored and parameters to be measured are determined in consultation between the Volunteer Event Snapshot Coordinator and the IOWATER Program.

Sites are selected by the Volunteer Event Snapshot Coordinator and represent areas of interest throughout the county or watershed. All of the monitoring sites are identified using Universal Transverse Mercator (UTM) coordinates which were obtained either in the field using a hand-held Global Positioning System (GPS) receiver or using the Iowa DNR Interactive Map. In some cases, multiple sites may be located on the same stream in order to provide an understanding of upstream to downstream changes in water quality or to evaluate the impact of potential point source impacts.

Information recorded on the IOWATER Snapshot Field Form can include any of the following: weather conditions, water color, water odor, presence of animals upstream of the site, presence of tile lines upstream of the site, stream bank conditions, adjacent land use, human use, evidence of human use, and safety of the site. Field parameters that can be measured using IOWATER methods include transparency, water temperature, pH, nitrate-N, nitrite-N, dissolved oxygen, orthophosphate, and chloride. The lab parameters will vary depending on the snapshot and the availability of funds through the IOWATER Program to cover analytical costs.

Data gathered during a snapshot will be used by the Volunteer Even Snapshot Coordinator, Iowa DNR, local watershed groups, IOWATER volunteers, and other concerned public and private organizations. Data collected as part of a snapshot will complement water quality information already being collected in the area by other IOWATER volunteers, as well as data being collected by other organizations in the watershed or county.

B1.3 IOWATER DNR Lakes Program

The DNR Lakes Program uses the same methods for assessing standing waters as the IOWATER volunteers with additional laboratory analysis for select parameters. Lakes are selected based on volunteer interest. Point sampling, or sampling from a specific depth (~one-half meter) or point in the lake water column, is used to collect samples for chemical analyses using IOWATER methods and chemical analysis completed by UHL. These chemical analyses may include pH, dissolved oxygen, nitrate-N, nitrite-N, orthophosphate, and chloride. The habitat assessment includes a description of the lake banks and adjacent land use is completed once a year. Physical conditions such as weather conditions at the time of monitoring, air temperature, an estimate of rainfall during the past 24 hours, an assessment of wind direction and wind speed, where the sample was collected, a Secchi depth or transparency measurement, water temperature, water odor, and an indication of water level in the lake are conducted whenever a chemical assessment is done. The biological assessment involves recording water color using a standardized water color chart and indicating if the volunteer observes an algal bloom. All observations are recorded on the Standing Water Assessment – DNR Lakes Program field form.

In addition to collecting samples for chemical analyses using IOWATER methods, DNR Lakes Program volunteers collect water samples for chemical analysis to be completed by UHL. These chemical analyses include: Total Phosphate, Orthophosphate, Nitrate + Nitrite Nitrogen, Ammonia Nitrogen, Total Kjeldahl Nitrogen, Total Suspended Solids, Volatile Suspended Solids, and Chlorophyll a.

IOWATER recommends DNR Lake monitors conduct monthly lake monitoring during the growing season. Ideally the sampling location is at the deep spot in the lake to be comparable with the statewide ambient lake monitoring program, however sites in other areas of the lake are also included to obtain a better spatial characterization of the lakes.

B2. SAMPLING METHODS

B2.1 IOWATER Program

B2.1.1 Equipment

Upon completion of an IOWATER Level 1 workshop, participants are provided with the equipment necessary to do the monitoring for which they have been trained. Equipment provided at the Level 1 workshop includes the following:

- IOWATER Program Manual (including Stream Habitat Assessment, Biological Assessment, Chemical / Physical Stream Assessment, and Standing Water Assessment field forms) – Appendices 1 through 6
- Laminated IOWATER Benthic Macroinvertebrate Key – Appendix 7
- IOWATER bag (for carrying testing equipment)
- Hach® test strips - pH (50 tests)
- Hach® test strips - nitrate-N / nitrite-N (25 tests)
- Hach® titrators – chloride (40 tests)
- Chemetrics® orthophosphate test kit (30 tests)
- Chemetrics® dissolved oxygen test kit (30 tests)

- Clear plastic tub
- Plastic forceps
- Aquatic dip net (4' wood handle and 1/32" mesh net)
- Magnifying cube
- Armored thermometer
- Open-reel fiberglass tape measure (100'/30m.)
- Transparency tube
- Tennis ball with attached 1-meter string
- Secchi disk
- Water color chart
- Meter stick
- Waste container

In addition, those volunteers who complete additional Advanced workshops are provided at no cost to them the equipment necessary to do the monitoring for which they have been trained. Equipment provided at the current Advanced workshops includes the following:

Bacteria Monitoring:

- Bacteria Monitoring manual (including Bacteria Monitoring field form – Appendix 6)
- Styrofoam® cooler
- Easygel® pretreated Petri dishes (10 dishes)
- Easygel® Coliscan® single dish growth medium bottles (10 bottles)
- Nightlight
- Sterile disposable pipettes (4-5)
- Permanent marker
- Clear tape
- Laminated Petri dish counting grid
- Meat thermometer
- Extension cord

Benthic Macroinvertebrate Indexing:

- Benthic Macroinvertebrate Indexing Manual (including Benthic Macroinvertebrate Indexing field form – Appendix 7)
- IOWATER Benthic Macroinvertebrate Key
- Guide to Aquatic Invertebrates of the Upper Midwest. (R.W. Bouchard, Jr. 2004)
- Ice cube tray or egg tray
- Spacemakers® pencil box
- Vial tray (4 3/8" X 7 5/16" X 1 5/8")
- 24 vials with poly-seal caps, 1 dram
- 12 vials with poly-seal caps, 2 dram
- 10X magnifying lens

IOWATER snapshot volunteers are provided with the equipment necessary to do the monitoring for which they have been trained. Equipment provided at the IOWATER snapshots includes the following:

- Sampling Instructions and Instructions for Field Equipment (including Snapshot Sampling field form – Appendices 8 and 10) and maps of sites to be monitored
- IOWATER bag (for carrying testing equipment)
- Hach® test strips - pH (50 tests)
- Hach® test strips - nitrate-N / nitrite-N (25 tests)
- Hach® titrators – chloride (40 tests)
- Chemetrics® orthophosphate test kit (30 tests)
- Chemetrics® dissolved oxygen test kit (30 tests)
- Transparency tube
- Armored thermometer
- Waste container

- Sterilized, pre-labeled bottles for lab analysis (*E. coli*, nitrogen and phosphate bottles contain preservatives)
- Sample Collection Device (plastic jug with rope attached)
- Cooler and ice/ice packs for lab samples

B2.1.2 Sampling Methods for Streams

Stream Reach and Stream Transect
Observations and parameters measured throughout the IOWATER stream assessments are done at two levels, the stream transect and the stream reach. A stream transect is the exact location across the stream that a monitor samples. This location is identified by UTM coordinates. The stream reach is defined as one set of riffle, run, and pool habitats. In cases where site locations do not have a set of riffle, run, and pool habitats, the stream reach is defined by the volunteer as a set distance upstream from the stream transect and a set distance downstream from the stream transect, generally 25 meters. Some observations or measurements are made at either the stream transect or the stream reach. The *Reporting Technique* for each parameter indicates which should be used.

B2.1.3 Stream Habitat Assessment
It is recommended that a habitat survey be completed annually, unless there is a major change in land use within the watershed. Appendix 1 includes the habitat assessment form. Appendix 5 lists the parameters measured or observed, including stream habitat type, streambed substrate, microhabitats, stream bank conditions, canopy cover, riparian zone width, riparian zone plant cover, adjacent land use, human use activities, and evidence of human use.

B2.1.4 Stream Biological Assessment
It is recommended that a biological assessment be completed no more than three times a year. If a volunteer is monitoring a High Quality Resource Stream (as defined in the Iowa Administrative Code), he / she is instructed to limit the collecting period to thirty minutes. Intense sampling may adversely impact populations of benthic macroinvertebrates in these streams. Appendix 2 includes the biological assessment form, and Appendix 5 lists the benthic macroinvertebrates.

Benthic Macroinvertebrates (Level 1):
Required Equipment: Aquatic dip net, clear plastic tub, magnifying box or lens, laminated IOWATER Benthic Macroinvertebrate Key, forceps, and Biological Assessment field form
Level 1 Benthic Macroinvertebrate monitoring will indicate quality, not quantity. Volunteers sample the entire stream reach in an attempt to collect an as diverse group of benthic macroinvertebrates as possible. Using benthic nets, benthic macroinvertebrates are collected from the stream and deposited into the clear plastic tub with a small volume of water. Volunteers are instructed to sample all of the microhabitats present in the stream reach. Volunteers then use the forceps, magnifying box, and laminated IOWATER Benthic Macroinvertebrate Key to identify the benthic macroinvertebrates to the phylum and/or order levels. Volunteers are also instructed to clean the dip net between samplings. The identified benthic macroinvertebrates are recorded on the Biological Assessment field form. Benthic macroinvertebrates on the Biological Assessment field form are divided into three general groups based on their tolerance to pollution. Benthic Macroinvertebrates that are recorded are identified in the high quality group (low tolerance), middle quality group (medium tolerance), or low quality group (high tolerance). Appendix 2 is the biological assessment form. Appendix 5 lists the benthic macroinvertebrates based on tolerance to pollution, as well as other parameters that are measured or recorded (benthic macroinvertebreate collection time, number of collection nets used, identification confidence level, stream reach length sampled, microhabitats present and sampled, stream habitat type sampled, aquatic plant cover of streambed, and algae cover of streambed).

Benthic Macroinvertebrate Indexing:
Required Equipment: Aquatic dip net, clear plastic tub, magnifying box or lens, IOWATER Benthic Macroinvertebrate Key, forceps, and Benthic Macroinvertebrate Indexing field form
Benthic Macroinvertebrate Indexing will indicate quality and quantity of benthic macroinvertebrates. Information for this assessment is recorded on the Benthic Macroinvertebrate Indexing field form located in Appendix 7. Volunteers sample the entire stream reach in an attempt to collect a diverse of a group of benthic macroinvertebrates as possible. Using benthic nets, benthic macroinvertebrates are collected from the stream and deposited into a clear plastic tub with a small volume of water. Volunteers are instructed to sample all of the microhabitats present in the

stream reach in the relative percentage that the habitat occurs. It is recommended to spend a consistent time collecting the organisms; IOWATER recommends 90 minutes. To improve metric accuracy, IOWATER recommends that volunteers collect at least 50 organisms. Volunteers then use the forceps, magnifying box and IOWATER Benthic Macroinvertebrate Key to identify the benthic macroinvertebrates to family and/or class levels. Identification may occur indoors rather than at the stream. If a volunteer wishes to identify the benthic macroinvertebrates indoors or at a later date they are instructed to preserve the sample in either ethyl alcohol or 91% isopropyl rubbing alcohol and to label the sample with date, location of collection (IOWATER site number), and those involved in the collection. Volunteers are also instructed to clean the dip net between samplings. The benthic macroinvertebrate identified and counts are recorded on the Benthic Macroinvertebrate Indexing field form. Benthic macroinvertebrates on the Benthic Macroinvertebrate Indexing field form are listed below with their tolerance values in parentheses. Tolerance values range from 0 to 10, with 0 representing high quality organisms and 10 being low quality organisms.

Ephemeroptera (mayflies)
Baetidae *(6)*
Baetiscidae *(4)*
Caenidae *(7)*
Ephemerellidae *(2)*
Ephemeridae *(6)*
Heptageniidae *(4)*
Isonychiidae *(4)*
Leptohyphidae *(4)*
Leptophlebiidae *(4)*
Metretopodidae *(2)*
Oligoneuriidae *(2)*
Polymitarcyidae *(2)*
Potamanthidae *(4)*

Plecoptera (stoneflies)
Capniidae *(3)*
Nemouridae *(3)*
Perlidae *(3)*
Perlodidae *(2)*
Pteronarcyidae *(0)*
Taeniopterygidae *(2)*

Megaloptera (alderflies, dobsonflies)
Corydalidae *(6)*
Sialidae *(4)*

Trichoptera (caddisflies)
Brachycentridae *(1)*
Glossosomatidae *(0)*
Helicopsychidae *(3)*
Hydropsychidae *(5)*
Hydroptilidae *(6)*
Leptoceridae *(4)*
Limnephilidae *(4)*
Philopotamidae *(4)*
Polycentropodidae *(6)*

Odonata (dragon/damselflies)
Aeshnidae *(3)*
Calopterygidae *(6*
Coenagrionidae *(8)*
Corduliidae / Libellulidae *(7)*
Gomphidae *(5)*

Diptera (flies)
Athericidae *(2)*
Chironomidae (6*)*
Empididae *(6)*
Simuliidae *(6)*
Syrphidae (*10)*
Tabanidae *(6)*
Tipulidae *(4)*

Pelecypoda (mussel / clam) *(7)*

Gastropod (snail)
Left Spiral (8)
Right Spiral *(6)*
Limpet/orbsnail *(6)*

Hemiptera (true bugs)
Belostomatidae *(9)*
Corixidae *(5)*
Gerridae/Veliidae *(6)*
Nepidae *(6)*
Notonectidae *(6)*

Coleoptera (beetles)
Curculionidae *(no value)*
Dryopidae *(5)*
Dytiscidae *(5)*
Elmidae *(5)*
Gyrinidae *(4)*
Haliplidae *(5)*
Hydrophilidae *(8)*
Psephenidae *(5)*
Scirtidae *(5)*

Other
Amphipoda (scud) *(6)*
Hirudinea (leech) *(8)*
Isopoda (sowbug) *(8)*
Turbellaria (flatworm) *(6)*
Oligochaeta *(8)*
Decapoda (crayfish) *(6)*
Hydrocarina (watermite) *(6)*

Based on the type of benthic macroinvertebrates identified, their tolerance values and the number of each counted, the following five metrics are calculated. When an IOWATER volunteer enters the counts from the Benthic Macroinvertebrate Indexing field form into the IOWATER database, these metrics are calculated automatically. The Benthic Macroinvertebrate Indexing Manual also explains how each metric is calculated.

- Taxa Richness (number of different families or taxa identified)
- EPT Taxa Richness (number of families identified in the Ephemeroptera, Plecoptera, and Trichoptera orders)
- % EPT (represents the percentage of the total organisms identified that belong to the EPT orders)
- MBI – Macroinvertebrate Biotic Index ([Σ count*tolerance value of all organisms identified]/total number of identified organisms)

- % 3 Most Dominant Taxa (sum of organisms in the tree most abundant taxa/total number of identified organisms)

Also as part of the benthic Macroinvertebrate indexing assessment, volunteers are encouraged to identify the stream habitat type sampled and stream microhabitats sampled; measure dissolved oxygen and water temperature; and identify flow as high, average, or low.

B.2.1.5 Stream Chemical Assessment
It is recommended that a chemical assessment be completed on a monthly basis if weather and safety conditions permit. Appendix 3 includes the chemical assessment form. Appendix 12 lists the parameters that can be measured as part of the assessment. Parameters that are measured include pH, nitrite-N, nitrate-N, dissolved oxygen, orthophosphate, and chloride. Monitoring procedures for the chemical assessment are performed at the individual monitor's stream transect, with the monitor facing upstream in the location of greatest discharge, and conducted in accordance with instructions provided by the manufacturer of each field test kit. Since all of the kits have various components that have expiration dates, an e-mail is sent to all volunteers in the spring to remind them to check their expiration dates on all of their equipment.

B.2.1.6 Stream Physical Assessment
It is recommended that a physical assessment be completed monthly if weather and safety conditions permit. Appendix 3 includes the physical assessment form. Appendix 13 lists the parameters that can be measured as part of the assessment. These include weather conditions, water color, water odor, air temperature, precipitation during the last 24 hours, transparency, water temperature, strem width, maximum stream depth, stream depth, and stream velocity.

B.2.1.7 Sampling Methods for Lakes / Ponds
Point sampling, or sampling from a specific depth (~one-half meter) or point in the lake water column, is used to collect samples for chemical analyses.

B.2.1.8 Lake / Pond Habitat Assessment
It is recommended that a habitat assessment be done once a year, preferably in July, unless a major land use change occurs.

Lake Banks:
Required Equipment: Standing Water Assessment field form
Volunteers give a written description of the lake banks on the Standing Water Assessment field form. Volunteers are instructed to include approximate relative distances, if possible.

Adjacent Land Use:
Required Equipment: Standing Water Assessment field form
Volunteers give a written description of the adjacent land use on the Standing Water Assessment field form (Appendix 4). Volunteers are instructed to include approximate relative distances and estimates of the percentage of each type of adjacent land use, if possible.

B.2.1.9 Lake / Pond Biological Assessment
It is recommended that a biological assessment be completed monthly if weather and safety conditions permit. As part of this assessment, the IOWATER volunteer determines if an algal bloom is present and identifies the color of the water. The volunteer can also conduct a biological assessment to identify the benthic macroinvertebrates present. The biological assessment or benthic Macroinvertebrate indexing field forms located in Appendices 2 or 7 should be completed for this. Appendix 14 provides additional information for this assessment.

B.2.1.10 Lake / Pond Chemical Assessment
It is recommended that a chemical assessment be completed monthly if weather and safety conditions permit. The Standing Water Assessment in Appendix 4 should be completed. To ensure consistency when conducting lake monitoring, a point sampling method (sampling from a specific depth) is used. Water samples are obtained from approximately ½ meter (elbow-depth) below the lake surface. To collect the water sample, volunteers rinse a plastic sampling cup three times in an area away from where they plan to collect a sample, and then submerge the sample

device upside-down into the water to elbow depth (1/2 meter), turn it right side up and let it fill, and gently lift the jug out of the water. Monitoring procedures for the chemical assessment are conducted in accordance with instructions provided by the manufacturer of each field test kit. Potential parameters that can be measured include pH, nitrite-N, nitrate-N, dissolved oxygen, orthophosphate, and chloride. Testing procedures for each parameter are listed below. Since all of the kits have various components that have expiration dates, an e-mail is sent to all volunteers in the spring to remind them to check their expiration dates on all of their equipment. Appendix 15 provides more information for this assessment.

B.2.1.11 Lake / Pond Physical Assessment

It is recommended that a physical assessment be completed monthly if weather and safety conditions permit. The Standing Water Assessment field form in Appendix 4 should be used. Potential parameters that can be observed or recorded include weather, air temperature, precipitation during the last 24 hours, wind direction, wind speed, sample site location, secchi disk depth, transparency, water temperature, water level (above normal, normal, below normal), and water odor. Additional information for these parameters can be found in Appendix 15.

B2.2 IOWATER Snapshot Events

Depending on the sampling site and stream flow conditions, samples will either be collected directly from the stream or in a container from a bridge. Prior to sample collection, each lab sample container is labeled in the field with a permanent waterproof marker. Lab sample container labels include site name, date and time of sample collections, and the collector's name.

Sampling will be conducted in a manner that minimizes the chances of contamination. Lab samples will be collected in sterile, unused sample containers provided by the University of Iowa Hygienic Laboratory, the Iowa DNR Water Lab, or Des Moines Water Works. Tables 3 through 5 list the type of container in which each analyte is collected. Sample collection personnel will be instructed not to touch the insides of the sample containers or caps. Lab sample containers will be filled without pre-rinsing the container. Some lab sample containers contain a preservative (Tables 3 through 5). When collecting samples in these containers, a small amount of air space will be left to ensure that the preservative is not lost or diluted.

Should the lab sample be taken directly from the stream, the sample will be collected where flow occurs, either in the middle of the channel or at its thalweg, deepest part of stream, while facing upstream. Samples will be collected directly into their respective lab sample container, immediately capped, and then stored on ice until delivered to the lab. Field parameters, including chloride, nitrate-N, nitrite-N, dissolved oxygen, orthophosphate, pH, transparency, and water temperature, are then measured. Chloride is measured using a Hach® Chloride QuanTab® test strip by collecting a water sample from the stream using the small plastic beaker provided. The small plastic beaker is to be triple rinsed with the stream water prior to collecting the sample. Nitrate-N and Nitrite-N is measured using a Hach® Nitrate-N and Nitrite-N test strip and allowing one second of contact with the water being sampled and then following test kit instructions. Dissolved oxygen present in the sample water is measured using a CHEMetrics® Oxygen Kit. Orthophosphate in the sample water is measured using a CHEMetrics® Orthophosphate Kit. A pH measurement is done using a Hach® pH test strip and dipping the test strip in the water and removing immediately. A transparency measurement is made using a 60 cm clear polycarbonate transparency tube. Water temperature is measured using a thermometer set in a water sample collected using the large plastic beaker provided. All measurements will be recorded on the IOWATER Snapshot Field Form (Appendix 8). See Appendix 10 for complete testing instructions using these field kits.

Should the lab sample be taken from a bridge, the sample will be collected on the upstream side of the bridge over the middle of the channel or where the flow is greatest. A water sampling device consisting of a collection container composed of a non-contaminating material, such as high density polyethylene (HDPE) plastic, fastened to a length of nylon rope will be rinsed a minimum of three times at the site before the samples are collected. Rinsing consists of lowering the container into the stream, allowing it to fill with water, and lifting the container back to the bridge where the contents are then poured out. Once rinsing is complete, the container is again lowered and filled with sample water, which is then poured directly into the lab sample bottles. Bottles are immediately capped and then stored on ice until delivered to the lab. The remaining water in the collection container is discarded. The container is lowered into the stream and refilled as often as needed to complete the field tests. Chloride is measured using a Hach® Chloride QuanTab® test strip by transferring 60 ml of water from the collection container to the small

beaker (triple rinsing the beaker prior to doing the test), then immersing the lower half of the strip in the sample water. Nitrate-N and nitrite-N are measured using a Hach® Nitrate-N and Nitrite-N test strip and allowing one second of contact with the water being sampled. Dissolved oxygen present in the sample water is measured using a CHEMetrics® Oxygen Kit. Orthophosphate in the sample water is measured using a CHEMetrics® Orthophosphate Kit. A pH measurement is acquired using Hach® pH test strips and dipping it in the water and immediately removing. A transparency measurement is made using a 60 cm clear polycarbonate transparency tube. Water is transferred from the collection container to fill the tube so the measurement may be taken from the bridge. Water temperature is measured using a thermometer set in water transferred from the collection container to the large plastic beaker provided. All measurements will be recorded on the IOWATER Snapshot Field Form (Appendix 8). See Appendix 10 for complete testing instructions using these field kits.

Grab Samples
Grab samples can be taken at selected sites in the container and volume appropriate for each particular analysis. In-stream samples will be collected at mid-depth level at or near the thalweg to ensure a well mixed sample of water. The method used for any particular sample depends on several factors including flow rate, stream depth and width, and accessibility. Regardless of the collection method, the grab sample is stored and transported in a clean, labeled container.

The variations of the grab sampling method utilized by IOWATER for snapshot events are described below.

Wading and Hand Collection
If the stream is safe to wade, the collector will ford to its center or the area where the greatest rate of flow exists. The sample collector should face upstream, taking care to ensure that any stream bottom debris disturbed by wading does not contaminate the sample. The lab sample bottle is then tipped at a 45° angle, allowing it to fill. If water levels or velocity cause concerns for safety, DO NOT WADE. Alternatively, if a suitable sampling area is accessible from the bank, water samples may be collected without entering the stream.

Bridge and Rope Collection
A grab sample may be collected from a bridge using a water sampling device consisting of a collection container composed of a non-contaminating material, such as HDPE plastic, fastened to a length of nylon rope. The water sampling device and rope should be kept off the ground to minimize contamination. The water sample collection container should be rinsed a minimum of three times at the site before samples are collected. Rinsing consists of lowering the collection container into the stream thalweg from the bridge deck, letting it fill with water, lifting the container back to the bridge, and then pouring out the contents. Once rinsing is complete, water is poured from the collection container directly into the lab sample bottles, which are immediately capped and then stored on ice until delivered to the lab.

Field Equipment
The following equipment is or can be used when collecting grab samples. Equipment use may vary slightly due to site differences and will vary from snapshot to snapshot depending on the IOWATER field methods selected and the lab(s) which will provide analysis of water samples collected.

- Site Map and Directions
- Snapshot Field Form
- Field Form Instructions
- Brown Paper Bags
    - Pencils/Pens/Permanent Markers
    - Clipboard
    - First Aid Kit
    - Orange Safety Vests
    - Zip-Lock Bags (to group bottles by site)
    - Sterile, Labeled Sample Bottles (will vary by snapshot and by lab)

- IOWATER Bag, containing (will vary by snapshot) –
    - Rope/Sampling Device
    - Small Plastic Beaker
    - Large Plastic Beaker
    - Waste Bottle
    - CHEMetrics® Dissolved Oxygen Kit
    - CHEMetrics® Orthophosphate Kit
    - Hach® Chloride QuanTab® Test Strips
    - Hach® Nitrate and Nitrite Test Strips
    - Hach® pH Test Strips
    - Enviro-Safe® Thermometer
    - Transparency Tube
- Small Cooler w/ Ice Packs to chill water samples for the lab

Relevant Paperwork and Other Equipment (specifically for snapshot events)
The following paperwork and equipment is generally kept at each snapshot meeting location for use by IOWATER staff.

- Sign-In Sheet for Volunteers (includes cell phone numbers and site assignments)
- Group Sign-Up Sheet
- Liability Waiver
- Sample Check-In Sheet
- Chain of Custody Forms (Appendices 17 and 18)
- Large Coolers
- Ice and/or Ice Packs
- Extra Sample Bottles
- Extra Sampling Equipment

B2.3 IOWATER DNR Lakes Program

It is recommended that a DNR Lakes Program assessment be completed monthly if weather and safety conditions permit. To ensure consistency when conducting lake monitoring, a point sampling method (sampling from a specific depth) is used. Water samples are obtained from approximately ½ meter (elbow-depth) below the lake surface. To collect the water sample, monitors rinse a plastic sampling device three times in an area away from where they plan to collect a sample, and then submerge the sample device upside-down into the water to elbow depth (1/2 meter), turn it right side up and let it fill, and gently lift the device out of the water. Monitoring procedures for the chemical assessment are conducted in accordance with instructions provided by the manufacturer of each field test kit. Testing procedures for each parameter are listed below. Since all of the kits have various components that have expiration dates monitors are reminded check their expiration dates on all of their equipment on the Standing Water Assessment – DNR Lakes Program field form.

DNR Lake monitors are provided with the equipment necessary to do the monitoring for which they have been trained. Equipment provided to DNR Lake monitors includes the following:

- DNR Lakes Program Manual (including UHL Chain of Custody form – Appendix 18, and Standing Water Assessment – DNR Lakes Program field form – Appendix 9)
- IOWATER bag (for carrying testing equipment)
- Hach® test strips - pH (50 tests)
- Hach® test strips - nitrate-N / nitrite-N (25 tests)
- Hach® titrators – chloride (40 tests)
- Chemetrics® orthophosphate test kit (30 tests)

- Chemetrics® dissolved oxygen test kit (30 tests)
- Armored thermometer
- Waste container
- Open-reel fiberglass tape measure (100'/30m.)
- Secchi disk
- Water color chart
- Plastic sampling device
- Freezer pack and cooler
- Sterilized, pre-labeled bottles for lab analysis (nitrogen and phosphate bottles contain sulfuric acid as a preservative.)

B3. SAMPLE HANDLING AND CUSTODY

B3.1 IOWATER Program

Benthic Macroinvertebrate indexing samples can either be identified in the field or preserved and identified at a later time. If samples are to be identified later, they should be preserved in a bottle containing either ethyl alcohol or isopropyl alcohol. The samples should be labeled with the following: date, time, location of collection (IOWATER site number), and those involved in the collection.

For bacteria samples, a sterile pipette is used to collect a water sample directly from the stream and placed in each of the 3 Coliscan® Easygel® bottles. The same volume of water is added to each of the 3 bottles. All bacteria samples are to be labeled with the following during transport: date, location of collection (IOWATER site number) and sample number (Sample 1, 2, or 3). It is recommended that the samples be chilled on ice until you return indoors.

B3.2 IOWATER Snapshot Events

During IOWATER Snapshot Events, all water samples collected for lab analysis are collected in bottles provided by the lab (see Tables 3 through 5 for bottle specifications). Bottles are labeled with the following: date, site, snapshot name, time sample was collected and those involved in the collection. All samples are stored on ice until delivered to the IOWATER Snapshot Coordinator or his/her designee. Once IOWATER sponsored snapshot samples and paperwork have been returned to the central meeting location(s), the IOWATER Snapshot Coordinator, or the Coordinator's designee, will be responsible for the water quality samples and the chain of custody. For samples collected as part of a snapshot event, a chain of custody form is completed for the respective lab by the IOWATER Snapshot Coordinator or the Coordinator's designee (see Appendices 17 and 18 for chain of custody forms; Iowa DNR Water Lab; University Hygienic Lab; if a lab does not have a chain of custody form, a copy of the snapshot check in sheet is provided to the lab). Information included on the chain of custody forms includes the site name, date and time the sample was collected, collector's name and relevant contact information, sample matrix, and the analytes requested. The snapshot coordinator will be responsible for packing the samples on ice and ensuring their viability until they can be delivered to the lab. Each lab's data management system tracks progress of sample analyses and data quality. Samples are retained until analyses are completed, supported by method QC requirements, and approved by the QA officer or supervisory staff.

Information on field conditions, such as weather and adjacent land use, deviations from written procedures, operating condition of the equipment, and other unusual occurrences will be documented on the field sheets. It is important to be able to trace the path of a sample from collection in the field through laboratory analysis should any problems occur. Therefore, adequate field documentation is an indispensable quality assurance element of any successful monitoring program.

Laboratory Sample Handling
The University of Iowa Hygienic Laboratory, the Iowa DNR Water Lab, and Des Moines Water Works are accredited labs in the State of Iowa and the handling and analysis procedures used by both labs are accepted by the U.S. EPA. Each lab supplies the sample containers appropriate for the samples collected during a snapshot. The certifications and accreditations held by UHL include the American Industrial Hygiene Association, the Clinical

Laboratory Improvement Amendments, the Information Collection Rule-Environmental Protection Agency, Safe Drinking Water Act-Environmental Protection Agency and the National Environmental Laboratory Accreditation Program. The Iowa DNR Water Lab is EPA certified for surface water analysis through the state of Iowa's Laboratory Certification Program. The Des Moines Water Works Lab is certified and accredited by the Inforamtion Collection Rule-Environmental Protection Agency and Safe Drinking Water Act-Environmental Protection Agency. Des Moines Water Works is an accredited lab in the State of Iowa.

Field Information Sheets
Field data sheets are the primary and most effective method for documenting field activities and conditions. These sheets serve as an initial record of any field measurements and weather conditions at the time sampling occurred. A template of the IOWATER Snapshot Field Form that is modified for each IOWATER sponsored snapshot event can be found in Appendix 8 The Iowa DNR Water Lab chain of custody form will be completed and submitted with any samples delivered to the lab (Appendix 17). The University of Hygienic Laboratory chain of custody form that will be completed and submitted with any samples shipped or delivered to the lab can be found in Appendix 18.

Tables 3 through 5 list the methods associated with the analysis of each analyte. All methods are published in Standard Methods of Examination of Water and Wastewater (2005).

Field Notes
Field notes will document important information during sampling events and are entered onto the IOWATER Snapshot Field Forms with indelible ink. The IOWATER Snapshot Field Forms completed as part of each snapshot are reviewed by the IOWATER Snapshot Coordinator before being entered into an Excel spreadsheet and then entered into the IOWATER database. Once the Field Forms have been reviewed and entered, they are scanned in a PDF format and then transferred to the IDNR servers where they are made available to the Volunteer Event Snapshot Coordinators.

Sample Labeling
All sample containers must have labels attached and filled out in their entirety. Sample containers without labels or labels that are missing information are not to be accepted by the University of Iowa Hygienic Laboratory, Iowa DNR Water Lab, or Des Moines Water Works. The sample label should include the site name, location, date, time, initials of the sampler, and any other information required by the agencies involved or the laboratory.

B3.3 IOWATER DNR Lakes Program

All water samples collected as part of the DNR Lakes Program are labeled with the following: date, location, time sample was collected and those involved in the collection. Sample containers without labels or labels that are missing information are not to be accepted by the University of Iowa Hygienic Laboratory. These samples are sent in a cooler with a frozen ice pack to UHL via UPS for next day delivery. The samples are sent with a chain of custody provided by UHL (Appendix 18) and follow all sample preservation and transport policies of the laboratory.

B4. ANALYTICAL METHODS

B4.1 IOWATER Program

IOWATER protocols are outlined in the IOWATER Program Manual and in the above Sampling Method Requirements section.

B4.2 IOWATER Snapshot Events

The University of Iowa Hygienic Laboratory will have a document on file stating methods used to analyze samples. UHL follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Program Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Confirmation studies are

performed routinely. Table 3 lists the methods associated with each analyte. All the methods are published in Standard Methods for the Examination of Water and Wastewater (2005).

For analytes in which the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one month of the lab receiving the sample.

Laboratory supplies procurement policy for Des Moines Water Works is outlined in SECTION 1.5 of the DMWW Laboratory QAQC manual (Des Moines Water Works, 2008). Table 4 lists the methods associated with analytes measured by the lab as part of this monitoring. All supplies must meet method requirements. All collected water monitoring samples are delivered to the laboratory by either DMWW staff or the IOWATER Snapshot Coordinator or his/her designee. Upon delivery, selected samples are first distributed to the microbiology department to be processed for total coliforms and *E. coli* bacteria. All samples are then routed and distributed to the chemistry section for analyses of turbidity and anions. Laboratory staff review sample information and chain of custody forms for accuracy and completeness and log samples into LIMS (DMWW's information management system). Samples that do not meet sample QA requirements or fit into the project plan receive a note in the LIMS sample comment field regarding the variance. Analyses are performed on these samples for information but not queried for inclusion into reports. Each collected sample is given a unique number by LIMS and a user defined sample id according to the sample date and bottle label. (e.g. 19990506-28A).

DMWW chemistry staff process the samples in the following order:

1) A representative portion of each sample is analyzed for turbidity upon receipt according to Standard Methods 2130B.
2) A representative portion of each sample is poured into autosampler cups for anion analysis. These samples are analyzed according to EPA 300.0.
3) If required, the remaining sample is preserved with sulfuric acid to a pH of <2 and refrigerated. This portion of the sample is analyzed for ammonia-nitrogen within one week according to Standard Methods 4500-NH3 D

All samples that can not be processed upon receipt are stored at 4° C until analysis commences. Following analysis, sample and selected quality control data (duplicates, spikes, control samples) are entered into LIMS as part of a permanent data record.

Sample QA requirements for the project are consistent with the sample QA requirements for laboratory operations as outlined in SECTION 2.0 of the Laboratory QA manual (Des Moines Water Works, 2008).For analytes where the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one month of the lab receiving the sample.

The Iowa DNR Water Lab will have a document on file stating methods used to analyze samples. Table 5 lists the methods associated with analytes measured by the lab as part of this monitoring. For analytes in which the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one week of the lab receiving the sample.

B4.3 IOWATER DNR Lakes Program

The University of Iowa Hygienic Laboratory will have a document on file stating methods used to analyze samples. UHL follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Program Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Confirmation studies are performed routinely. Table 3 lists the methods associated with each analyte. All the methods are published in Standard Methods for the Examination of Water and Wastewater (2005).

For analytes in which the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one month of the lab receiving the sample.

B5. QUALITY CONTROL

B5.1 IOWATER Program

Addressing Abnormal Results
Water quality monitoring data can be influenced by many variables and can be challenging to interpret. A citizen monitor may measure water quality parameters and find values that are unusual or exceed water quality criteria. There are many factors that determine whether an actual water quality violation has occurred. In order to identify these factors, volunteers are encouraged to follow the procedures listed within the Abnormal Sampling Results Flow Chart (Appendix 19).

Monitors are encouraged to keep these things in mind:

- Many parameters will show seasonal shifts. For example, water temperatures on many prairie streams steadily increase through the summer and decrease again in the fall.
- Some parameters are quite sensitive to rain. A heavy overnight rain can cause dramatic changes in chemical levels.
- Dramatic change, as defined in the Abnormal Sampling Results Flow Chart (Appendix 19), refers to relatively short-term changes that would contradict what one would expect to find. For example, dramatic shifts in species make-up over a relatively short period of time should be reported.

IOWATER Code of Ethics
All IOWATER volunteers must follow the IOWATER Code of Ethics listed below:
We Carry Out Our Monitoring With Integrity

- We use proper scientific methodology.
- We fully document our technical observations.
- We accept the responsibility to report our data, our interpretations, and our conclusions, if we choose, so they can be reviewed.
- We truthfully answer questions about sampling techniques, frequency, and location.
- We make a good faith effort to include individuals with as many different interests and perspectives in our monitoring programs as possible.
- We Develop Good Relations with Private Landowners
- We request written permission from the landowner if access to private property is necessary in our monitoring plan.
- In contacting the landowner, we offer explanations about who we are, the purpose of our group, what the project entails, and the intended use of the data we collect.
- After receiving written permission, we contact the landowners in advance to let them know the exact date(s) of sampling.
- We do not harm private property.
- We take complete responsibility for our personal safety while on private property.
- We contact landowners after sampling to share the results.

Keys to Credibility
All volunteers are instructed to obtain the four keys to credibility:

- Confirmed – When submitting the data to the internet accessible database volunteers must confirm their data to ensure data reporting accuracy.
- Understood – Volunteers are instructed to make sure that when they are communicating with other volunteers, water quality professionals, land-owners or the general public that they are understood. This means that they do not use jargon and relate their ideas in simple, easy to understand language.
- Trained collectors – Volunteers that submit data to the internet accessible database must be trained Level 1 citizen monitors. Monitors can expand their monitoring skill set by attending additional Advanced Workshops. Volunteers are also encouraged to attend periodical IOWATER Level 1 workshops to refresh their monitoring skills.
- Objective – Volunteers are instructed to remain objective in their monitoring projects. This is also covered in the IOWATER Code of Ethics.

Team Building
Volunteers are encouraged to form monitoring teams. This helps insure that IOWATER methods are conducted in the manner that volunteers were trained.

Side-by-side Sampling
IOWATER staff conduct side-by-side sampling using IOWATER methods and Iowa DNR Water Monitoring Program methods. This sampling is done as often as possible on a monthly basis. Table 9 lists the parameters that are compared:

Table 9. Parameters compared between IOWATER methods and Water Monitoring Program methods.

Parameter	IOWATER method	Water Monitoring Program method
pH	Hach® pH test strip	pH meter
Dissolved Oxygen	Chemetrics® dissolved oxygen test kit	YSI meter
Nitrite-N	Hach® Nitrite-N+ Nitrate-N test strip	Lab analysis - UHL
Nitrate-N	Hach® Nitrite-N+ nitrate-N test strip	Lab analysis - UHL
Orthophosphate	Chemetrics® phosphate test kit	Lab analysis - UHL
Chloride	Hach® chloride titrator	Lab analysis - UHL
E. coli and General Coliform Bacteria	Coliscan Easygel Method	Lab analysis - UHL

B5.2 IOWATER Snapshot Events

All water samples collected during an IOWATER snapshot shall be collected in accordance with methods outlined by the respective lab's standard operating procedures (UHL, 2002; DNR, 2008a, 2008b, 2008c; Des Moines Water Works, 2008). Quality control for the sampling and monitoring methods of a snapshot event will be the responsibility of the IOWATER Snapshot Coordinator. Snapshot participants will be trained by the IOWATER Snapshot Coordinator and/or the Coordinator's designees in the measurement of field parameters, collection of water samples, and completion of paperwork. Any problems encountered during the snapshot event will be addressed by the IOWATER Snapshot Coordinator and/or the Coordinator's designees in consultation with the DNR QA officer.

The University of Iowa Hygienic Laboratory follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Project Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Other procedures include: daily calibration of instruments, interference checks, verification standards, assessment of extraction and sampling efficiencies. Confirmation studies are performed on a regular basis. Generally, at least one duplicate and one spike sample are prepared and analyzed for each set of ten to fifteen samples. A minimum of one reagent blank is prepared and analyzed for each complete set of samples.

The Iowa DNR Water Lab follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The laboratory standard operating procedures manual, methods manual, and field standard operating procedures documents (DNR, 2008a, 2008b, 2008c) includes protocols for sample custody, holding and extraction times, and detection limits. Confirmation studies are performed on a regular basis. Generally, at least one duplicate and one spike sample are prepared and analyzed for any set of greater than fifteen samples. A minimum of one reagent blank is prepared and analyzed for each complete set of samples.

The standard DMWW laboratory operations are outlined in Des Moines Water Works (2008). Analytical quality control procedures are performed according to the stated reference methodology and frequency. Spiked samples, calibration standards, and calibration check standards are analyzed at the frequency of every ten samples or fraction thereof for all anions and ammonia samples. Turbidity QC standards are analyzed daily prior to and after sample analyses. QC samples that do not meet QC specifications trigger LIMS to label all analyses in the worklist (analytical batch) suspect or out of range.

B5.3 IOWATER DNR Lakes Program

The University of Iowa Hygienic Laboratory follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Project Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Other procedures include: daily calibration of instruments, interference checks, verification standards, assessment of extraction and sampling efficiencies. Confirmation studies are performed on a regular basis. Generally, at least one duplicate and one spike sample are prepared and analyzed for each set of ten to fifteen samples. A minimum of one reagent blank is prepared and analyzed for each complete set of samples.

In addition to laboratory QA/QC procedures, a jug of blank (purified) water and an extra set of bottles will be randomly sent to volunteers for 10% of the laboratory samples sent to UHL for analysis. The purpose of these blanks is to measure the effectiveness of the field sampling and ensure accuracy of the data.

B6. INSTRUMENT/EQUIPMENT TESTING, INPSECTION, AND MAINTENANCE

B6.1 IOWATER Program

IOWATER volunteers are provided with a standardized set of equipment once they complete the Level 1 Workshop. In addition, those volunteers who attend an Advanced Workshop receive additional standardized equipment. A list of equipment is provided in the above Sampling Methods Requirements section. Volunteers are instructed to monitor expiration dates of equipment as outlined in the above Sampling Methods Requirements section. Volunteers are also instructed to inspect and maintain other sampling equipment to insure it is in good working order. Maintenance includes but is not limited to the rinsing of benthic dip nets, benthic collection tubs, transparency tubes, and sample collection cups.

B6.2 IOWATER Snapshot Events

Prior to a snapshot event, IOWATER volunteers and snapshot participants are provided with a standardized set of equipment at each central meeting location. A list of necessary equipment is provided in the Sampling Methods section (see B2.2). The IOWATER Snapshot Coordinator monitors the expiration dates of this equipment throughout the snapshot sampling season, and inspects and maintains the sampling equipment to ensure it is in proper working order. Maintenance includes, but is not limited to, the rinsing of sample collection devices, transparency tubes, and sample collection cups; ensuring that kits are complete; and confirming there are adequate test strips and ampoules for the sites to be sampled.

B6.3 IOWATER DNR Lakes Program

DNR Lakes Program volunteers are provided with a standardized set of equipment when they are trained to monitor. A list of equipment is provided in the above Sampling Methods Requirements section. The volunteer checks the expiration dates of equipment during each sampling event and writes this date on the field data form. The volunteer is also responsible for inspecting and maintaining the sampling equipment to insure it is in good working order. Maintenance includes but is not limited to the rinsing of sample collection devices, transparency tubes, and sample collection cups.

B7. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

B7.1 IOWATER Program

IOWATER volunteers are provided with a standardized set of equipment once they complete the Level 1 Workshop. In addition, those volunteers who attend an Advanced Workshop receive additional standardized equipment. A list of equipment is provided in the above Sampling Methods Requirements section (see B2.1.1). This equipment does not require calibration.

B7.2 IOWATER Snapshot Events

IOWATER Snapshot volunteers are provided with a standardized set of equipment at the snapshot event. A list of equipment is provided in the above Sampling Methods Requirements section (see B2.2). This equipment does not require calibration.

B7.3 IOWATER DNR Lakes Program

DNR Lake monitors are provided with a standardized set of equipment when they are trained to monitor. A list of equipment is provided in the above Sampling Methods Requirements section. This equipment does not require calibration.

B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

B8.1 IOWATER Program

IOWATER volunteers are provided with a standardized set of equipment once they complete the Level 1 Workshop. In addition, those volunteers who attend an Advanced Workshop receive additional standardized equipment. A list of equipment is provided in the above Sampling Methods Requirements section. All supplies and equipment are purchased under the supervision of the IOWATER Field Coordinator or the IOWATER Quality Assurance (QA) Officer. Tables 10 and 11 list the specifications for the equipment provided to IOWATER volunteers, IOWATER Snapshot volunteers, and IOWATER DNR Lakes Program monitors.

Table 10. Specifications for IOWATER equipment provided to volunteers.

Parameter	Equipment Used	Specifications
pH	Hach® pH test strip	Hach® brand, Range: 4-9
Dissolved Oxygen	Chemetrics® dissolved oxygen test kit	Chemetrics® brand, Indigo carmine method, Range: 1-12 mg/L
Nitrite-N	Hach® Nitrite-N+ Nitrate-N test strip	Hach® brand, Range: 0-3 mg/L
Nitrate-N	Hach® Nitrite-N+ Nitrate-N test strip	Hach® brand, Range: 0-50 mg/L
Orthophosphate	Chemetrics® phosphate test kit	Chemetrics® brand, Molybdenum blue/stannous chloride method, Range: 0-1 & 1-10 mg/L
Chloride	Hach® chloride titrator	Hach® brand, Silver nitrate titrant, Range: 30-600 mg/L
Air and Water Temperature	Enviro-safe® thermometer	Range: 25-125 °F, Armored
Stream Width	Open-reel tape measure	Range: 0- 30 m
Stream Depth	Meter stick	Range: 0 – 1 m
Stream Velocity	Tennis ball with 1 M string attached	String must = 1 m
Transparency	Transparency tube	60 cm transparency tube with rubber stopper and drain tube with clamp at bottom
Secchi disk depth	Secchi Disk with open-reel tape measure	Range: 0 – 30 m; measured to the nearest tenth of a meter
Benthic Macroinvertebrates	Aquatic dip net	4 ft wooden handle, 1/32” mesh, 16” X 12” steel frame, 7” depth bag
E. coli	Coliscan® Easygel® media and plates	Coliscan® brand, Coliscan (Red-gal with X-gluc differential chromogenic identification) pectin-gel method

cm – centimeters; F – Fahrenheit; mg/L – milligrams per liter; m = meter

B8.2 IOWATER Snapshot Events

All supplies and equipment used for water monitoring during a snapshot are purchased under the supervision of the IOWATER Field Coordinator or the IOWATER Quality Assurance Officer. The specifications for the equipment provided to IOWATER snapshot volunteers are listed in Table 10.

UHL, the Iowa DNR Water Lab, and Des Moines Water Works provide the necessary lab sample containers for the snapshot events. The IOWATER Snapshot Coordinator will be responsible for inspecting sample containers before distribution to volunteer monitors during each sampling event. Only new sample containers will be used. Sample containers are inspected for cracks, ill-fitting lids, and other obvious defects before use and are discarded if defects are present.

B8.3 IOWATER DNR Lakes Program

All supplies and equipment used for water monitoring as part of the IOWATER DNR Lakes Program are purchased under the supervision of the IOWATER Field Coordinator or the IOWATER Quality Assurance Officer. The specifications for the equipment provided to DNR Lakes Program volunteers are listed in Table 11.

UHL provides the necessary lab sample containers for the snapshot. The DNR Lakes program volunteers will be responsible for inspecting sample containers before use at a sampling event. Only new sample containers will be used. Sample containers are inspected for cracks, ill-fitting lids, and other obvious defects before use and are discarded if defects are present.

Table 11. Specifications for IOWATER equipment provided to DNR Lakes Program volunteers.

Parameter	Equipment Used	Specifications
pH	Hach® pH test strip	Hach® brand, Range: 4-9
Dissolved Oxygen	Chemetrics® dissolved oxygen test kit	Chemetrics® brand, Indigo carmine method, Range: 1-12 mg/L
Nitrite-N	Hach® Nitrite-N+ Nitrate-N test strip	Hach® brand, Range: 0-3 mg/L
Nitrate-N	Hach® Nitrite-N+ Nitrate-N test strip	Hach® brand, Range: 0-50 mg/L
Orthophosphate	Chemetrics® phosphate test kit	Chemetrics® brand, Molybdenum blue/stannous chloride method, Range: 0-1 & 1-10 mg/L
Chloride	Hach® chloride titrator	Hach® brand, Silver nitrate titrant, Range: 30-600 mg/L
Air and Water Temperature	Enviro-safe® thermometer	Range: 25-125 °F, Armored
Secchi disk depth	Secchi Disk with open-reel tape measure	Range: 0 – 30 m; measured to the nearest tenth of a meter

cm – centimeters; F – Fahrenheit; mg/L – milligrams per liter; m = meter

B9. DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

B9.1 IOWATER Program

Data obtained to supplement data collected by IOWATER volunteers include pollution tolerance values and metric calculation formulas supplied by Iowa DNR and University of Iowa Hygienic Lab professionals. To pinpoint site locations, Universal Transverse Mercator coordinates are also obtained by IOWATER volunteers using the Iowa DNR's Water Monitoring Atlas Interactive Mapping website (located at http://programs.iowadnr.gov/ims/website/water_monitoring/viewer.htm).

B9.2 IOWATER Snapshot Events

Stream data collected throughout Iowa by the DNR as part of Iowa's Ambient Watershed Monitoring and Assessment Program will be used for comparative purposes. Stream flow information from the U.S. Geological Survey website (http://ia.water.usgs.gov/) is used to determine flow conditions when each snapshot occurs. The

Iowa Environmental Mesonet (http://mesonet.agron.iastate.edu/) and information from the Climatology Bureau of the Iowa Department of Agriculture and Land Stewardship (http://www.iowaagriculture.gov/climatology.asp) are used to evaluate climatic conditions prior to each snapshot.

B9.3 IOWATER DNR Lakes Program

To pinpoint site locations, Universal Transverse Mercator coordinates are also obtained by DNR Lakes Program volunteers using the Iowa DNR's Water Monitoring Atlas Interactive Mapping website (located at http://programs.iowadnr.gov/ims/website/water_monitoring/viewer.htm). The Iowa Environmental Mesonet (http://mesonet.agron.iastate.edu/) and information from the Climatology Bureau of the Iowa Department of Agriculture and Land Stewardship (http://www.iowaagriculture.gov/climatology.asp) are used to evaluate climatic conditions when preparing the annual report on the DNR Lakes Program.

B10. DATA MANAGEMENT

B10.1 IOWATER Program

Data collected by IOWATER volunteers are stored in the IOWATER online database (located at www.iowater.net). This database is a standard query language database. It is maintained by the IOWATER Database Manager using Microsoft® Enterprise Manager.

Upon completing an assessment, IOWATER volunteers enter data into a password-protected website interface at www.iowater.net. Access to submit data to the internet-accessible database is limited to IOWATER volunteers who have completed Level 1 training. Volunteers are given a unique ID and password to enter the database. As a volunteer completes more advanced workshops, they are given additional rights to the internet-accessible database to submit the additional monitoring data. This volunteer workshop attendance information and contact information is also stored in the IOWATER database. This volunteer information portion of the database is maintained by the IOWATER Field Coordinator.

Data submission forms on the online database are designed to directly correspond to the assessment field forms. Volunteers transfer the data from the assessment field form to the online form. A confirmation page is viewed before final submission to double check the data for errors. If the data have errors, the volunteer returns to the online form, makes the appropriate changes, and views the confirmation page with the changes. When the data are free of errors, volunteers submit the data to the database. Once data are submitted, volunteers cannot make additional changes. Any additional changes need to be sent to the IOWATER Field Coordinator or Quality Assurance (QA) Officer. These changes are then made to the database through the administrative website interface, which is also password-protected. The date and reason for all database changes are recorded in fields associated with each data record.

B10.2 IOWATER Snapshot Events

Water samples collected and delivered to a lab for analysis will be logged into each lab's respective data management system. Once analyses are completed, results are entered into the database management system. All lab snapshot results are reported to the IOWATER Snapshot Coordinator within one month of sample collection.

Data from the IOWATER Snapshot Sampling Field Forms will be entered into a Microsoft® Excel spreadsheet by the IOWATER Snapshot Coordinator. Data quality assurance checks on Field Forms include scanning for apparent errors, measurement errors, and omissions. Response to such errors is a follow-up with the individual(s) who sampled the site, followed by consultation with the respective Volunteer Event Snapshot Coordinator to determine if the error or omission can be resolved. If so, the change to the data will be noted on the Field Form and in the Excel spreadsheet. If the error or omission can not be resolved, the data will not be entered into the Excel spreadsheet and the reason for the exclusion will be noted on the Field Form. Copies of both the Field Form and the Excel spreadsheet will be archived with the Iowa DNR and PDFs of the Field Forms as well as the Excel spreadsheet will be provided to the Volunteer Event Snapshot Coordinator. Values below the detection limit will be stored in STORET (or the equivalent WQWX database) as "< detection limit." For data analysis, the non-detectable values will be assigned a value equal to one-half the detection limit in accordance with standard procedures of the Water

Monitoring Program. Due to the variability in detection limit for the chloride QuanTab® test strips, a value of 10 will be assigned for statistical purposes.

Once the IOWATER snapshot data are reviewed, the data are entered into the IOWATER online database (located at www.iowater.net). This database is a standard query language database. It is maintained by the IOWATER Database Manager using Microsoft® Enterprise Manager.

All of the field test kit and lab data collected as part of an IOWATER Snapshot will be uploaded into STORET (or the equivalent WQX database). IOWATER field test kit results from IOWATER Snapshots that are entered into the IOWATER database are uploaded to STORET (or the equivalent WQX database) in the IOWATER organizational ID and with a project doe of IOWATER. Lab data collected as part of the IOWATER Snapshots will be uploaded into STORET (or the equivalent WQWX database) in the IASNAPST organizational ID and with a project code specific to each snapshot. Table 12 lists the project code for each snapshot. Table 13 matches the field test kit and lab analytes with the official standardized EPA STORET characteristic names for the parameters. When retrieving data from STORET (or the equivalent WQX database), the EPA STORET characteristic name must be used in order to access the relevant data. As a final quality check, the data in STORET (or the equivalent WQX database) will be compared to the Field Forms and the electronic data from each lab to ensure all values are the same.

Table 12. STORET project code for each snapshot.

Snapshot	Code	Snapshot	Code
Beaver Creek	BEAVRCRK	Johnson and Iowa County	JOHNIACO
Catfish Creek	CATFISH	Muscatine County	MUSCACO
Cedar County	CEDARCO	North Raccoon River Watershed	NRACCOON
Cedar River Watershed	CEDARRIV	O'Brien County	OBRIENCO
Cedar Lake	CEDRLAKE	Polk County	POLKCO
Central Iowa	CENIARIV	Scott County	SCOTTCO
Clinton County	CLINTNCO	Squaw Creek Watershed	SQUAWCRK
Coldwater Streams	COLDWATR	Upper Mosquito Watershed	UPPRMOSQ
Dickinson County	DICKINSN	Wapsipinicon River Watershed	WAPSI
Dry Run Creek	DRUNCRK	Whitebreast Watershed	WHITBRST
Jefferson County	JEFFCO		

Table 13. List of lab and IOWATER analytes and their corresponding EPA STORET characteristic names.

Lab/Field Analyte Name	EPA STORET Characteristic Name	Lab/Field Analyte Name	EPA STORET Characteristic Name
Acetochlor	Acetochlor	Total Kjeldahl Nitrogen as N	Nitrogen, Kjeldahl
Alachlor	Alachlor	Nitrate-N	Nitrogen, Nitrate (NO3) as N
Ametryn	Ametryne	Nitrite+Nitrate Nitrogen as N	Nitrogen, Nitrite (NO2)+Nitrate(NO3) as N
Atrazine	Atrazine	Nitrite-N	Nitrogen, Nitrite (NO2) as N
Bromacil	Bromacil	Organic Nitrogen as N	Nitrogen, organic
Butylate	Butylate	Motor Oil	Oil, Motor
Chloride	Chloride	Pendimethalin	Pendimethalin
Chlorophyll A	Chlorophyll a, free of pheophytin	pH	pH
Cyanzine	Cyanazine	Phosphate	Phosphate
Desethyl Atrazine	Desethyl atrazine	Total Phosphate as P	Phosphorus as P
Desisopropyl Atrazine	Desisopropyl atrazine	Orthophosphate	Phosphorus, orthophosphate as P
Diazinon	Diazinon	Prometon	Prometone
Diesel Fuel	Diesel fuel	Propachlor	Propachlor

Dimethenamid	Dimethenamid	Propazine	Propazine
Dissolved Oxygen	Dissolved Oxygen (DO)	Simazine	Simazine
EPTC	EPTC, Dispropylthiocarbamic acid S-ethyl ester	Total Dissolved Solids	Solids, Dissolved
E. coli	*Escherichia coli*	Total Suspended Solids	Solids, Total Suspended (TSS)
Membrane Fecal Coliform	Fecal coliform	Total Volatile Suspended Solids	Solids, Fixed Suspended
Fluoride	Fluorides	Conductivity	Specific Conductance
Gasoline	Gasoline	Sulfate	Sulfur, Sulfate (SO4) as SO4
Total Extractable Hydrocarbons	Hydrocarbons, Petroleum (unspecified mix)	Temperature, Water	Temperature, Water
Kerosene	Kerosene	Total Coliforms	Total Coliform
Metolachlor	Metolachlor	Transparency	Transparency, tube with disk
Metribuzin	Metribuzin	Trifluralin	Trifluralin
Mineral spirits	Mineral Spirits	Turbidity	Turbidity
Ammonia Nitrogen as N	Nitrogen, ammonia as N	Water Color	Water appearance (text)
		Weather	Weather Comments (text)

B10.3 IOWATER DNR Lakes Program

Field data collected by DNR Lakes Program monitors are stored in the IOWATER online database (located at www.iowater.net). This database is a standard query language database. It is maintained by the IOWATER Database Manager using Microsoft® Enterprise Manager.

Upon completing an assessment, monitors enter data into a password-protected website interface at www.iowater.net. Access to submit data to the internet-accessible database is limited to monitors who have been trained. Monitors with the DNR Lakes Program are given a group ID and password to enter the database.

All of the lab data collected as part of the DNR Lakes Program will be uploaded into STORET (or the equivalent WQX database). Lab data will be uploaded into STORET (or the equivalent WQX database) in the 21IOWA organizational ID and with a project code of LAKEDNR. As a final quality check, the data in STORET (or the equivalent WQX database) will be compared to the Field Forms and the electronic data from each lab to ensure all values are the same.

SECTION C – ASSESSMENT AND OVERSIGHT

C1. ASSESSMENT AND RESPONSE ACTIONS

C1.1 IOWATER Program

IOWATER volunteers all trained following the requirements outlined in the Training / Certification section of this document. Such training is evaluated by volunteers through the completion of an evaluation form. Copies of these evaluation forms are located in Appendices 20 through 22. Volunteers are encouraged to attend additional Level 1 workshops as refresher courses and to attend Advanced workshops to develop new monitoring skills.

Performance by IOWATER volunteers is evaluated by comparing IOWATER data to data collected by the Iowa DNR Watershed Monitoring and Assessment Program. This comparison shows how closely statewide trends are captured with IOWATER data and the Iowa DNR Watershed Monitoring and Assessment Program data.

C1.2 IOWATER Snapshot Events

The IOWATER Snapshot Coordinator will be responsible for all field activities, water sampling, and reporting to the Volunteer Event Snapshot Coordinators. Data will be sent from the labs to the Iowa DNR for entry into STORET (or the equivalent WQX database). This data will be available for review and follow-up for the duration of the project.

The Iowa DNR Quality Assurance Officer will accompany sample collection personnel periodically during the monitoring period to ensure proper sampling protocols are being followed. If any deviances are discovered, the Iowa DNR Quality Assurance Officer will instruct sample collection personnel in the proper method.

All of the labs involved in IOWATER Snapshot events participates in proficiency testing and performance evaluations programs.

C1.3 IOWATER DNR Lakes Program

Data will be sent from UHL to the Iowa DNR for entry into STORET (or the equivalent WQX database). This data will be available for review and follow-up for the duration of the project. UHL participates in proficiency testing and performance evaluation programs.

The IOWATER Lakes coordinator is responsible for coordination of sampling with the laboratory, data reporting, data entry into STORET (or the equivalent WQX database), training of volunteer monitors, conducting site visits, correction of deviances from proper sampling protocols, and review of the data.

C2. REPORTS TO MANAGEMENT

C2.1 IOWATER Program

The IOWATER Status Report will be written by IOWATER staff. This report summarizes IOWATER data and provides program highlights. The IOWATER Coordinator is responsible for the production and distribution of the Status Report. Reports are distributed to IOWATER volunteers and watershed / county groups, county, city, and federal governments, water quality professionals, IOWATER Advisory members, and made available on the IOWATER website.

C2.2 IOWATER Snapshot Events

The IOWATER Snapshot Coordinator will summarize the water quality data collected for each snapshot in graph, table, and map format, and these reports will be provided to each Volunteer Event Snapshot Coordinator. The results will be compared to results from previous snapshots and to data collected as part of the DNR's Ambient Stream Monitoring Program. As time permits, more detailed reports may be provided. The IOWATER Snapshot Coordinator is responsible for the production and distribution of the individual snapshot reports with the assistance of other IOWATER staff and individual snapshot coordinators. Reports are distributed to IOWATER snapshot volunteers and watershed / county groups, county, city, and federal governments, water quality professionals, IOWATER Advisory members, and made available on the IOWATER website.

C2.3 IOWATER DNR Lakes Program

The DNR Lakes Program reports written by the IOWATER Lakes Coordinator summarizes data collected as part of the DNR Lakes Program. The IOWATER Lakes Coordinator is responsible for the production and distribution of the DNR Lakes Program report. The report is distributed to DNR Lake monitors and watershed / county groups, county, city, and federal governments, water quality professionals, IOWATER Advisory members, and made available on the IOWATER website.

SECTION D– DATA VALIDATION AND USABILITY

D1. DATA REVIEW, VERIFICATION AND VALIDATION

D1.1 IOWATER Program

Data collected by IOWATER volunteers are reviewed by IOWATER and Iowa DNR staff to determine if the data meet the QAPP objectives. Decisions to reject or qualify data are made by the IOWATER Coordinator, the Iowa DNR Program Coordinator, and the IOWATER Quality Assurance (QA) Officer.

D1.2 IOWATER Snapshot Events

Data collected as part of a snapshot are reviewed by IOWATER Snapshot Coordinator to determine if the data meet the Quality Assurance Project Plan objectives. Decisions to reject or qualify data are made by the IOWATER Snapshot Coordinator, the Volunteer Event Snapshot Coordinator, and the IOWATER Quality Assurance Officer. The Microsoft Excel spreadsheet, as well as the STORET (or the equivalent WQX database) and IOWATER databases, will be checked for completeness and accuracy against the raw field data forms and lab data by the IOWATER Snapshot Coordinator. This may be done by randomly spot checking approximately 10% of the data. If 99% accuracy and 95% completeness are achieved in the spreadsheet and the databases, the IOWATER Quality Assurance Officer will then validate the data for use in analysis. All lab data are reviewed by the the respective laboratory according to procedures outlined in their standard operating procedures prior to it being released.

D1.3 IOWATER DNR Lakes Program

Data collected as part of the DNR Lakes Program are reviewed by IOWATER Lakes Coordinator to determine if the data meet the Quality Assurance Project Plan objectives. Decisions to reject or qualify data are made by the IOWATER Lakes Coordinator, the volunteer collecting the samples, and the IOWATER Quality Assurance Officer. The Microsoft Excel spreadsheet, as well as the STORET (or the equivalent WQX database) and IOWATER databases, will be checked for completeness and accuracy against the raw field data forms and lab data by the IOWATER Lakes Coordinator. This may be done by randomly spot checking approximately 10% of the data. If 99% accuracy and 95% completeness are achieved in the spreadsheet and the databases, the IOWATER Quality Assurance Officer will then validate the data for use in analysis. All lab data are reviewed by UHL according to procedures outlined in their standard operating procedures prior to it being released.

D2. VERIFICATION AND VALIDATION METHODS

D2.1 IOWATER Program

Volunteers who obtain sampling results that are outside of the norm are instructed to follow the IOWATER Abnormal Sampling Results Flow Chart as outlined in the Quality Control Requirements section of this document. IOWATER volunteers confirm or verify data submitted to the online IOWATER database at the time of data submission. The data is then viewed and validated by IOWATER staff while compiling data for the Status Report and while comparing it to data collected statewide as part of the Iowa DNR Water Monitoring Program.

D2.2 IOWATER Snapshot Events

Data, graphs, and maps collected and generated as part of a snapshot will be reviewed and accepted or qualified by the the Iowa DNR Quality Assurance Officer and the Volunteer Event Snapshot Coordinator.

D2.3 IOWATER DNR Lakes Program

Data, graphs, maps, and reports collected and generated as part of the DNR Lakes Program will be reviewed and accepted or qualified by the the Iowa DNR Quality Assurance Officer and the IOWATER Lakes Coordinator.

D3. RECONCILIATION WITH OTHER USERS

D3.1 IOWATER Program

Data that do not meet quality objectives outlined in the Data Quality Objectives for Measurement Data section of this document will be discarded or re-sampling will occur. If failure to meet the quality objectives is due to equipment (such as outdated or damaged equipment), the equipment will be updated and re-sampling can occur. If the failure to meet the quality objectives is due to volunteer error, the volunteer will be retrained before re-sampling occurs.

D3.2 IOWATER Snapshot Events

Data that do not meet the quality objectives outlined in the Data Quality Objectives for Measurement Data section of this document will be discarded. If failure to meet the quality objectives is due to equipment, such as outdated or damaged equipment, the equipment will be updated or replaced. If failure to meet the quality objectives is a result of volunteer error, said volunteer will be notified and the IOWATER Snapshot Coordinator will incorporate this into the brief refresher course done prior to each snapshot event.

D3.3 IOWATER DNR Lakes Program

Data that do not meet the quality objectives outlined in the Data Quality Objectives for Measurement Data section of this document will be discarded. If failure to meet the quality objectives is due to equipment, such as outdated or damaged equipment, the equipment will be updated or replaced. If failure to meet the quality objectives is a result of volunteer error, said volunteer will be notified and the IOWATER Lakes Coordinator will incorporate this into the brief refresher course done with the volunteer prior to additional sample collection.

REFERENCES

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Quality Assurance Project Plan for IOWATER, 2005. Iowa Department of Natural Resources. Document QA/WM/01-01.

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United States Environmental Protection Agency, 2002. Guidance for Quality Assurance Project Plans (EPA QA/G-5). EPA/240/R-02/009, 111 p.

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Appendix 1. IOWATER habitat assessment field form.

IOWATER
Volunteer Water Quality Monitoring

Habitat Assessment

*** Recommended frequency – yearly ***
*** Photographic documentation is recommended and strongly encouraged ***

Date _____ **Time** _____

IOWATER Monitor _____ **# of Adults** *(incl. you)* _____

Site Number _____ **# of under 18** _____

Other Volunteers Involved _____

Was the stream dry when it was monitored? Yes _____ **No** _____

Stream Habitat Type *(at transect – check one)*
Riffle _____ Run _____ Pool _____

Streambed Substrate *(along transect – estimate percentages)*

_____ %	Bedrock – large sheets of stone.
_____ %	Boulder – stones larger than 10 inches in diameter
_____ %	Cobble – stones, diameter between 2.5 and 10 inches
_____ %	Gravel – 0.1 to 2 inch diameter
_____ %	Sand – smaller than 0.1 inches
_____ %	Mud/Silt – dirt or soil deposited on bottom of the stream
_____ %	Other – organic material like leaf litter, tree limbs, etc.
100%	TOTAL

Microhabitats *(check all present in stream reach)*

____ Algae Mats	____ Sand	____ Undercut Banks
____ Logjams	____ Junk (tires, garbage, etc.)	____ Rip Rap
____ Root Wads	____ Leaf Packs	____ Overhanging Vegetation
____ Fallen Trees	____ Rocks	____ Other *(describe)* _____
____ Silt/Muck	____ Weed Beds	

Stream Banks *(at transect – check all that apply)*

Left Bank *(facing upstream)*	**Right Bank** *(facing upstream)*
_____ Cut Bank – Eroding	_____ Cut Bank - Eroding
_____ Cut Bank – Vegetated	_____ Cut Bank – Vegetated
_____ Sloping Bank	_____ Sloping Bank
_____ Sand/Gravel Bar	_____ Sand/Gravel Bar
_____ Rip/Rap	_____ Rip/Rap
_____ Constructed Bank (i.e., drainage ditch)	_____ Constructed Bank (i.e., drainage ditch)
_____ Other: _____	_____ Other: _____

Revised March 2006

Appendix 1. IOWATER habitat assessment field form.

Canopy Cover (*over transect – check one*)
0-25%_____ 25-50%_____ 50-75%_____ 75-100%_____

Riparian Zone Width (*at transect – check one for each bank*)

Left Bank (*facing upstream*)	**Right Bank** (*facing upstream*)
_____ 0-5 meters	_____ 0-5 meters
_____ 5-25 meters	_____ 5-25 meters
_____ Over 25 meters	_____ Over 25 meters

Riparian Zone Plant Cover (*at transect – estimate percentage of each*)

Left Bank (facing upstream)	**Right Bank (facing upstream)**
____ % Trees	____ % Trees
____ % Shrubs / Low Trees	____ % Shrubs / Low Trees
____ % Grass / Low Plants	____ % Grass / Low Plants
____ % Exposed Soil	____ % Exposed Soil
____ % Other (rip rap, concrete, etc.)	____ % Other (rip rap, concrete, etc.)
100% TOTAL	**100% TOTAL**

Adjacent Land Use (*along stream reach – check all that apply*)

___ Row Crop	___ Wetland	___ Boating Accesses	___ Rural Residential Areas
___ Pasture	___ Prairie	___ Nature Trails	___ Conservation Lands
___ Urban	___ Park	___ Fence	___ Animal Feeding Operations/Lots
___ Industrial	___ Playground	___ Steep Slopes	
___ Timber	___ Campground	___ Stairs/Walkway	___ Other _____

Human Use Activities (*along stream reach – check all that apply*)
Please check activities you've participated in or witnessed at this site.

___ Swimming	___ Wind Surfing	___ Wading	___ Fishing
___ Tubing	___ Canoeing/Kayaking	___ Rafting	___ Kids Playing
___ Water Skiing	___ Boating	___ Hunting/Trapping	___ Other _____

Evidence of Human Use (*along stream reach – check all that apply*)
Please check evidence of human use you've witnessed at this site.

___ Streamside Roads	___ Livestock Watering	___ Camping Sites	___ Evidence of Kid's Play
___ Footprints or Paths	___ ATV/ORV Tracks	___ Fire Pit/Ring	
___ Dock/Platform	___ Rope Swings	___ Fishing Tackle	___ Other _____

Record all other land use practices that potentially could affect the stream.

_____
_____
_____
_____
_____
_____

Revised March 2006

Appendix 2. IOWATER biological assessment field form.

IOWATER
Volunteer Water Quality Monitoring

Biological Assessment

*** Recommended frequency – no more than three times a year (Spring, Summer, and Fall) ***

Date _____ **Time** _____

IOWATER Monitor _____ **# of Adults (incl. you)** _____

Site Number _____ **# of under 18** _____

Other Volunteers Involved _____

Was the stream dry when it was monitored? Yes _____ **No** _____

Benthic Macroinvertebrates *(check all found)*

___ **Were Benthic Macroinvertebrates Found?** *(If yes, please check those benthics found. If no, please provide any relevant comments in the "Other Assessment Observations and Notes" section at the end of this form – why do you think critters are not present here?)*

High Quality Group *(pollution intolerant)*	**Middle Quality Group** *(somewhat pollution tolerant)*	**Low Quality Group** *(pollution tolerant)*
___ Caddisfly	___ Alderfly	___ Aquatic Worm
___ Dobsonfly	___ Backswimmer	___ Black Fly
___ Mayfly	___ Crane Fly	___ Bloodworm
___ Riffle Beetle	___ Crawdad	___ Flatworm
___ Snail (not pouch)	___ Crawling Water Beetle	___ Leech
___ Stonefly	___ Damselfly	___ Midge Fly
___ Water Penny Beetle	___ Dragonfly	___ Mosquito
	___ Giant Water Bug	___ Pouch Snail
	___ Limpet	___ Rat-tailed Maggot
	___ Mussels/Clams	___ Water Scavenger Beetle
	___ Orbsnail	
	___ Predaceous Diving Beetle	
	___ Scud	
	___ Sowbug	
	___ Water Boatman	
	___ Water Mite	
	___ Water Scorpion	
	___ Water Strider	
	___ Whirligig Beetle	

___ **Other** _____ **(no tolerance group assigned)**

(Over)

Revised November 2006

Appendix 2. IOWATER biological assessment field form.

Benthic Macroinvertebrate Collection Time (*check one*)
0-15 min. _____ 15-30 min. _____ 30-45 min. _____ More than 45 min. _____

Collection Nets (*How many nets are you using to collect critters?*)
1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6+ ___

Identification Confidence Level (*Are you confident that your identification is correct?*)
_____ I'm not sure
_____ I think they've been identified correctly
_____ Some are definitely correct, I'm not sure about others (*Please clarify in "Other Assessment Observations and Notes" section at the end of this form*)
_____ I'm fairly confident they've all been correctly identified
_____ I guarantee they have been identified correctly

Stream Reach Length (*How far along the stream did you search?*)
___ 0-25 meters ___ 25-50 meters ___ 50-75 meters ___ 75-100 meters ___ 100+ meters

Microhabitats (*check all present in stream reach, check if sampled*)

Algae Mats	Present __ Sampled __	**Leaf Packs**	Present __ Sampled __
Logjams	Present __ Sampled __	**Rocks**	Present __ Sampled __
Root Wads	Present __ Sampled __	**Weed Beds**	Present __ Sampled __
Fallen Trees	Present __ Sampled __	**Undercut Banks**	Present __ Sampled __
Silt/Muck	Present __ Sampled __	**Rip Rap**	Present __ Sampled __
Sand	Present __ Sampled __	**Overhanging Vegetation**	Present __ Sampled __

Junk (*tires, garbage, etc.*) Present __ Sampled __
Other (*describe*) _____ Present __ Sampled __

Stream Habitat Type (*check all types sampled in stream reach*)
Riffle _____ Run _____ Pool _____

Aquatic Plant Cover of Streambed (*at transect – check one*)
0-25% _____ 25-50% _____ 50-75% _____ 75-100% _____

Algae Cover of Stream Streambed (*at transect – check one*)
0-25% _____ 25-50% _____ 50-75% _____ 75-100% _____

Is sewage algae present in the stream?
No _____ Yes _____ *If yes, please submit a photographic record.*

Other Assessment Observations and Notes
_____
_____
_____
_____

Revised November 2006

Appendix 3. IOWATER chemical/physical assessment field form.

IOWATER

Volunteer Water Quality Monitoring

Chemical / Physical Assessment

*** Recommended frequency – monthly ***

Date _____ **Time** _____

IOWATER Monitor _____ **# of Adults** (*incl. you*) _____

Site Number _____ **# of under 18** _____

Other Volunteers Involved _____

Was the stream dry when it was monitored? Yes _____ **No** _____

Weather (*check all that apply*)
Sunny ____ Partly Sunny ____ Cloudy ____ Rain/Snow ____ Windy ____ Calm ____

Water Color (*check all that apply*)
Clear ___ Brown ___ Green ___ Oily ___ Reddish ___ Blackish ___ Milky ___ Gray ___

Water Odor (*check all that apply*)
None ___ Sewage/Manure ___ Rotten Eggs ___ Petroleum ___ Musky ___

Air Temperature _____ °Fahrenheit

Precipitation _____ inches over the last 24 hours

Transparency (*record whole numbers only – no tenths*)
_____ centimeters

pH
Expiration date on bottom of bottle _____
check one – **4** ____ **5** ____ **6** ____ **7** ____ **8** ____ **9** ____

Nitrite-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0** ____ **0.15** ____ **0.3** ____ **1.0** ____ **1.5** ____ **3** ____

Nitrate-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0** ___ **1** ___ **2** ___ **5** ___ **10** ___ **20** ___ **50** ___

Revised March 2006

Appendix 3. IOWATER chemical/physical assessment field form.

Dissolved Oxygen (*mg/l*)
Expiration date on back of color comparator _____
check one – **1** ___ **2** ___ **3** ___ **4** ___ **5** ___ **6** ___ **8** ___ **10** ___ **12** ___

Phosphate (*mg/l*)
Expiration date on back of color comparator _____
Expiration date on round color comparator _____
Expiration date on activator solution _____
check one – **0** ___ **0.1**___ **0.2**___ **0.3**___ **0.4**___ **0.6**___ **0.8**___
1 ___ **2** ___ **3** ___ **4** ___ **5** ___ **6** ___ **7** ___ **8** ___ **10** ___

Chloride
Expiration date on bottom of bottle _____
_____ mg/l – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Water Temperature
_____ °Fahrenheit

Stream Width
___.____ meters

Maximum Stream Depth (*along your transect*)
___._____ meters

Stream Flow (*along your transect*)
_____ high _____ normal _____ low _____ not sure

Stream Depth (*in meters*)

1st Spot ___._____	5th Spot ___._____	9th Spot ___._____	13th Spot ___._____
2nd Spot ___._____	6th Spot ___._____	10th Spot ___._____	14th Spot ___._____
3rd Spot ___._____	7th Spot ___._____	11th Spot ___._____	15th Spot ___._____
4th Spot ___._____	8h Spot ___._____	12th Spot ___._____	

Stream Velocity (*in seconds*)

1st Spot _____	5th Spot _____	9th Spot _____	13th Spot _____
2nd Spot _____	6th Spot _____	10th Spot _____	14th Spot _____
3rd Spot _____	7th Spot _____	11th Spot _____	15th Spot _____
4th Spot _____	8th Spot _____	12th Spot _____	

Other Stream Assessment Observations and Notes
_____
_____
_____
_____

Revised March 2006

Appendix 4. IOWATER standing water assessment field form.

IOWATER
Volunteer Water Quality Monitoring

Standing Water Assessment

*** Recommended frequency: monthly from ice-out to freeze-over ***

Date _____ **Time** _____

IOWATER Monitor _____ **# of Adults** (*incl. you*) _____

Site Number _____ **# of under 18** _____

Other Volunteers Involved _____

Physical Assessment

Weather (*check all that apply*)
Sunny ____ Partly Sunny ____ Cloudy ____ Rain/Snow ____ Windy ____ Calm ____

Air Temperature _____ °Fahrenheit

Precipitation _____ inches over the last 24 hours

Wind Direction (*check one*)
____ Not applicable
____ North
____ South
____ East
____ West
____ Northeast
____ Northwest
____ Southeast
____ Southwest

Wind Speed (*check one*)
____ Calm (0-5 mph, felt on face, leaves rustle)
____ Breezy (sustained 5-15 mph, small branches move)
____ Strong (sustained over 15 mph, small trees sway continuously, waves form)
____ Gusty (gust over 15 mph, small trees sway occasionally)

Site Location ____ Open Water ____ Shore or Dock

Secchi Disc Depth ____.____ meters
OR Transparency Tube _____ cm (*record whole numbers only – no tenths*)

Water Temperature ____ °Fahrenheit

Water Level (*check one*)
Above Normal ____ Normal ____ Below Normal ____
If lake is not at normal level, and you have means to measure, please specify:
inches above _____ or below _____ normal

Water Odor (*check all that apply*)
None ____ Sewage/Manure ____ Rotten Eggs ____ Petroleum ____ Fishy ____

Chemical Assessment

IMPORTANT: Use Point Sampling technique!

pH
Expiration date on bottom of bottle _____
check one – 4 ____ 5 ____ 6 ____ 7 ____ 8 ____ 9 ____

Revised March 2006

Appendix 4. IOWATER standing water assessment field form.

Nitrite-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0 ____ 0.15 ____ 0.3 ____ 1.0 ____ 1.5 ____ 3 ____**

Nitrate-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0 ___ 1 ___ 2 ___ 5 ___ 10 ___ 20 ___ 50 ___**

Dissolved Oxygen (*mg/l*)
Expiration date on back of color comparator _____
check one – **1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 8 ___ 10 ___ 12 ___**

Phosphate (*mg/l*)
Expiration date on back of color comparator _____
Expiration date on round color comparator _____
Expiration date on activator solution _____
check one – **0 ___ 0.1___ 0.2___ 0.3___ 0.4___ 0.6___ 0.8___**
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 10 ___

Chloride
Expiration date on bottom of bottle _____
_____ **mg/l** – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Biological Assessment

Water Color – Is there an obvious algal bloom? (algal mats present, water appears green or scummy) ____ No ____ Yes (*if yes, please submit a photo record*)

Water Color Scale (*check one nearest to color*)

1 ____	**5 ____**	**9 ____**	**13 ____**	**17 ____**
2 ____	**6 ____**	**10 ____**	**14 ____**	**18 ____**
3 ____	**7 ____**	**11 ____**	**15 ____**	**19 ____**
4 ____	**8 ____**	**12 ____**	**16 ____**	**20 ____**

Benthic Macroinvertebrate Assessment – Use the Biological Assessment Form to record benthic data.

Habitat Assessment

*** Conduct only once per year, preferably in July, or if a major land use change occurs ***

Describe Lake Banks_____
_____
_____
_____

Describe Adjacent Land Use _____
_____
_____

Other Observations and Notes:
_____
_____
_____

Revised March 2006

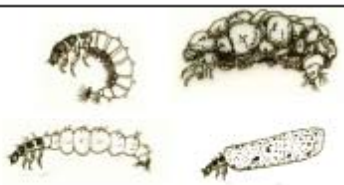
Appendix 5. IOWATER Level 1 benthic key.

IOWATER

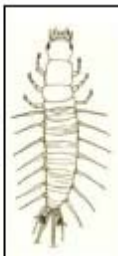
IOWATER; 109 Trowbridge Hall; Iowa City, IA 52242; www.iowater.net

IOWATER BENTHIC MACROINVERTEBRATE KEY

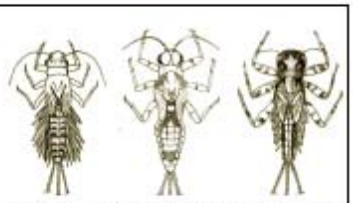
Pollution Intolerant (High Quality Group)



Caddisfly: 6 hooked legs on upper body, 2 hooks on end, may have stick, rock or leaf case, 2-40 mm in length.



Dobsonfly: 6 legs, 8 pairs of feelers and gill tufts on lower half of body, short antennae, 25-90 mm in length.



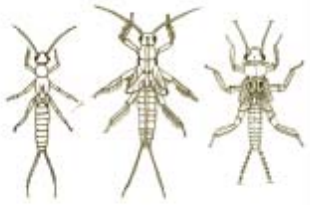
Mayfly: 6 legs, feathery or oval-shaped gills on lower body, 2 to 3 long tails, 3-30 mm in length.

Riffle Beetle: Adult has 6 legs, body covered with tiny hairs, walks slowly underwater, 1-8 mm in length.

Larva has hard plates on each segment, 2-60 mm in length.

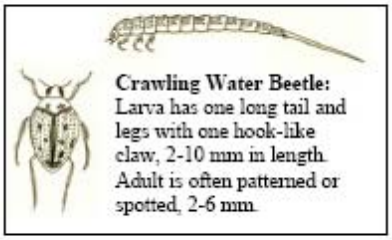
Snail (not pouch): When opening is facing you, shell opens on right, operculum (flap over opening) present.

Water Penny Beetle: Flat saucer-shaped body, 6 tiny legs and gills on underside, 4-6 mm.

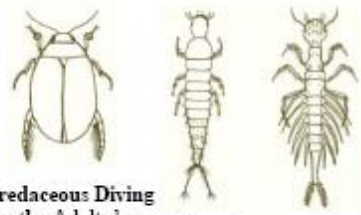


Stonefly: 6 legs with hooked tips, antennae, 2 tails, gill tuffs under legs or no visible gills, 5-60 mm in length.

Somewhat Pollution Tolerant (Middle Quality Group)

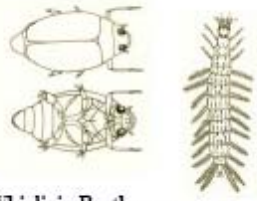


Crawling Water Beetle: Larva has one long tail and legs with one hook-like claw, 2-10 mm in length. Adult is often patterned or spotted, 2-6 mm.



Predaceous Diving Beetle: Adults have an oval streamlined body, longer antennae than Whirligig Beetle, 1-80 mm in length.

Larva has many hairs on body, two feathery tails, large head, 5-70 mm in length.

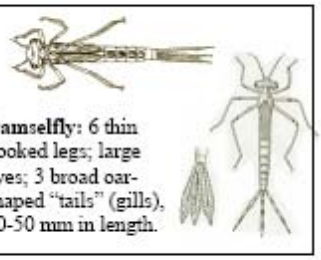


Whirligig Beetle: Flattened oval body, short, clubbed antennae, erratic swimmer, 3-15 mm.

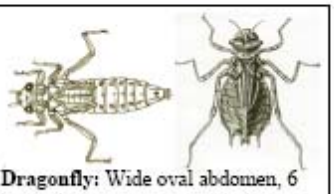
Larva has many hairs on body, short tail or no tail, up to 30 mm in length.

Backswimmer: Forelegs not as spoon-shaped as Water Boatman's, swims upside-down, body is V-shaped, 5-17 mm in length.

Water Boatman: Forelegs spoon-shaped and shorter compared to Backswimmer, 3-11 mm in length.

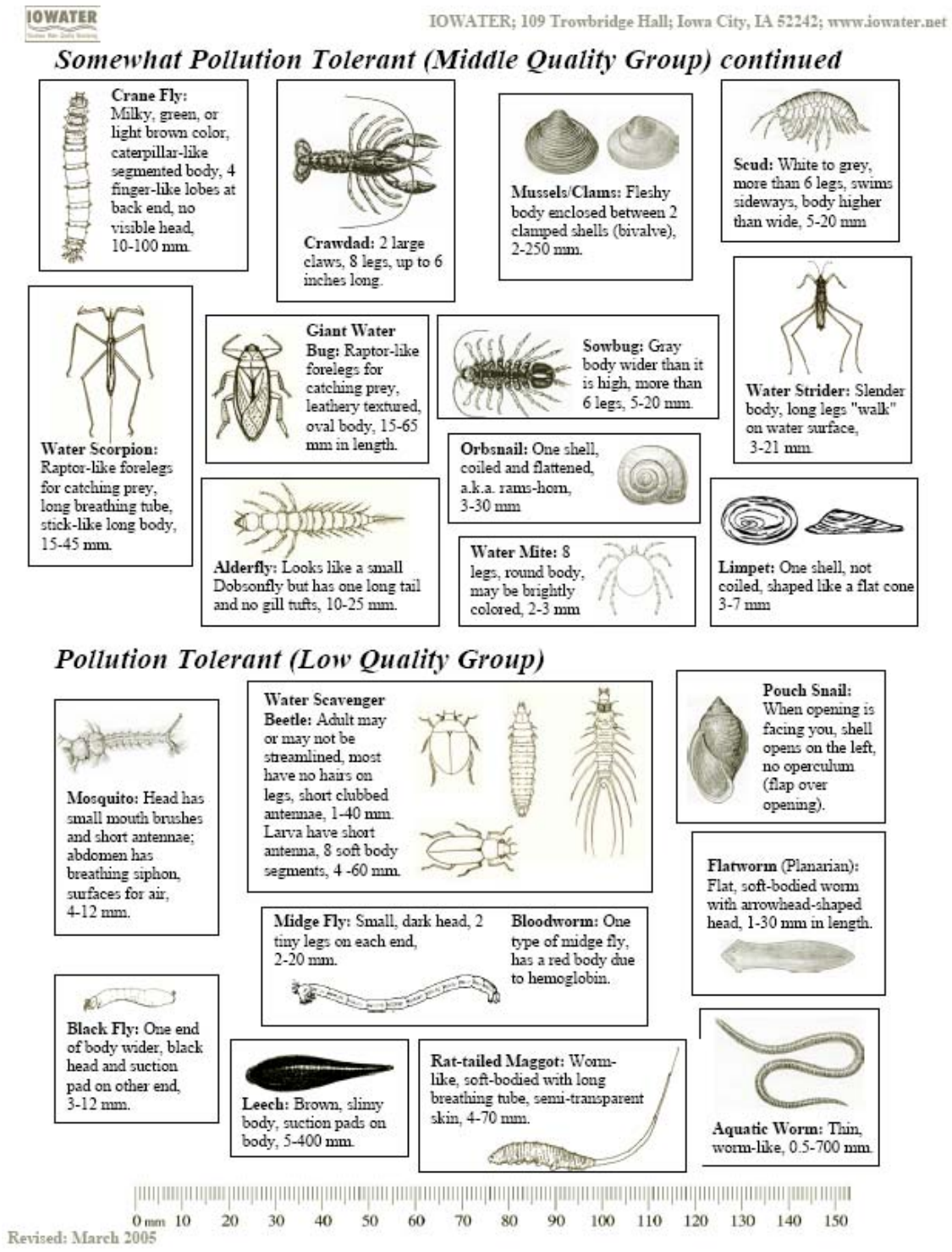


Damselfly: 6 thin hooked legs; large eyes; 3 broad oar-shaped "tails" (gills), 10-50 mm in length.



Dragonfly: Wide oval abdomen, 6 hooked legs, large eyes, 10-60 mm in length.

Appendix 5. IOWATER Level 1 benthic key.



Appendix 6. IOWATER bacteria assessment field form.

IOWATER
Volunteer Water Quality Monitoring

IOWATER Bacteria Monitoring

Date _____ Time _____

IOWATER Monitor _____Site Number_____

Other Volunteers Involved

_____

_____

# of Adults (incl. yourself) _____ # of Children _____

Note: It is recommended that a Level 1 Chemical/Physical Stream Assessment form also be completed.

Other Stream Assessment Observations and Notes

_____

_____

_____

Bacteria Numbers	*E. Coli* Bacteria (count) (dark blue-purple)	General Coliform Bacteria (count) (pink)
Replicate 1		
Replicate 2		
Replicate 3		

Volume of Water Sampled for each replicate (ml) _____

Incubation Start Time _____ Incubation End Time _____
Bacteria Incubation Period (hours) _____

Bacteria Incubation Temperature _____ °Fahrenheit

Revised April 2005

Appendix 7. IOWATER benthic indexing field form.

IOWATER
Volunteer Water Quality Monitoring

Benthic Macroinvertebrate Indexing

Date _____ **Time** _____ **# of Adults** *(incl. you)* _____ **# of under 18** _____

IOWATER Monitor _____ **Site Number** _____

Other Volunteers Involved _____

Was the stream dry when it was monitored? Yes _____ No _____

Stream Habitat Type Sampled *(check all that apply)*
Riffle _____ Run _____ Pool _____

Stream Microhabitats Sampled *(check all that apply)*

____ Algae Mats	____ Sand	____ Undercut Banks
____ Logjams	____ Junk (tires, garbage, etc.)	____ Rip Rap
____ Root Wads	____ Leaf Packs	____ Overhanging Vegetation
____ Fallen Trees	____ Rocks	____ Other (*describe*) _____
____ Silt/Muck	____ Weed Beds	

Dissolved Oxygen *(mg/l)*
Expiration date on back of color comparator _____
check one – 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 8 ___ 10 ___ 12 ___

Water Temp. ____ °Fahrenheit **Transparency** *(whole numbers only – no tenths)* _____ cm

Flow *(check one)* _____ High _____ Average _____ Low

Count	Tolerance Value (TV)	MBI value (count x TV)
Ephemeroptera (mayflies)		
_____	Baetidae (6)	_____
_____	Baetiscidae (4)	_____
_____	Caenidae (7)	_____
_____	Ephemerellidae (2)	_____
_____	Ephemeridae (6)	_____
_____	Heptageniidae (4)	_____
_____	Isonychiidae (4)	_____
_____	Leptohyphidae (4)	_____
_____	Leptophlebiidae (4)	_____
_____	Metretopodidae (2)	_____
_____	Oligoneuriidae (2)	_____
_____	Polymitarcyidae (2)	_____
_____	Potamanthidae (4)	_____
Megaloptera (alderflies & dobsonflies)		
_____	Corydalidae (6)	_____
_____	Sialidae (4)	_____

Count	Tolerance Value (TV)	MBI value (count x TV)
Odonata (dragon/damselflies)		
_____	Aeshnidae (3)	_____
_____	Calopterygidae (6)	_____
_____	Coenagrionidae (8)	_____
_____	Corduliidae/Libellulidae (7)	_____
_____	Gomphidae (5)	_____
Plecoptera (stoneflies)		
_____	Capniidae (3)	_____
_____	Nemouridae (3)	_____
_____	Perlidae (3)	_____
_____	Perlodidae (2)	_____
_____	Pteronarcyidae (0)	_____
_____	Taeniopterygidae (2)	_____

(over)

Revised February 2007

Appendix 7. IOWATER benthic indexing field form.

Count	Tolerance Value (TV)	MBI value (count x TV)
Trichoptera (caddisflies)		
_____	Brachycentridae (1)	_____
_____	Glossosomatidae (0)	_____
_____	Helicopsychidae (3)	_____
_____	Hydropsychidae (5)	_____
_____	Hydroptilidae (6)	_____
_____	Leptoceridae (4)	_____
_____	Limnephilidae (4)	_____
_____	Philopotamidae (4)	_____
_____	Polycentropodidae (6)	_____
Coleoptera (beetles)		
_____	Curculionidae (no value)	N.A.
_____	Dryopidae (5)	_____
_____	Dytiscidae (5)	_____
_____	Elmidae (5)	_____
_____	Gyrinidae (4)	_____
_____	Haliplidae (5)	_____
_____	Hydrophilidae (8)	_____
_____	Psephenidae (5)	_____
_____	Scirtidae (5)	_____
Hemiptera (true bugs)		
_____	Belostomatidae (9)	_____
_____	Corixidae (5)	_____
_____	Gerridae/Veliidae (6)	_____
_____	Nepidae (6)	_____
_____	Notonectidae (6)	_____

Count	Tolerance Value (TV)	MBI value (count x TV)
Diptera (true flies)		
_____	Athericidae (2)	_____
_____	Chironomidae (6)	_____
_____	Empididae (6)	_____
_____	Simuliidae (6)	_____
_____	Syrphidae (10)	_____
_____	Tabanidae (6)	_____
_____	Tipulidae (4)	_____
Gastropod (snail)		
_____	Left Spiral (8)	_____
_____	Limpet (6)	_____
_____	Orbsnail (6)	_____
_____	Right Spiral (6)	_____
Pelecypoda (bivalves)		
_____	Clam/Mussel (7)	_____
Other		
_____	Amphipoda (scud) (6)	_____
_____	Decapoda (crayfish) (6)	_____
_____	Hirudinea (leech) (8)	_____
_____	Hydrocarina (water mite) (6)	_____
_____	Isopoda (sowbug) (8)	_____
_____	Oligochaeta (segmented worm) (8)	_____
_____	Turbellaria (flatworm) (6)	_____
_____	Unidentified (no value)	N.A.
	Total Number of Identified Organisms*	_____

* More than 80 organisms are needed to calculate reliable metrics.

Tolerance values: 0 = very low tolerance to pollution (high quality organisms); 10 = very high tolerance to pollution (low quality organisms).

Metrics

1. _____ Taxa Richness (*Number of different families or taxa identified overall*)
2. _____ EPT Taxa Richness (*Number of families identified in Ephemeroptera, Plecoptera, Trichoptera orders – EPT*)
3. _____ % EPT (*total number of organisms in EPT orders/total number of organisms identified*)
4. _____ MBI – Macroinvertebrate Biotic Index [(*Sum of count x tolerance value of all organisms = sum of MBI values column*) / (*total number of identified organisms*)]
5. _____ % 3 Most Dominant Taxa (*sum of organisms in the three most abundant taxa/total number of identified organisms*)

Definition of Stream Reach – Other Stream Assessment Observations

_____

_____

_____

_____

Revised February 2007

Appendix 8. IOWATER snapshot field form.

FOR OFFICE USE ONLY
When data are checked and entered, initial here:

Any County Snapshot – October 11, 2008

Field Information (to be completed by the volunteer)

Site #: _____ Site Name: _____

Sampler Name(s) (print): _____

Date: 10/11/2008 Time: _____ AM PM

Weather (*circle all that apply*)

Sunny Partly Sunny Cloudy Rain/Snow Windy Calm

Visual Observations

1) WATER ODOR (*circle all that apply*)

None Sewage/Manure Rotten Eggs Petroleum Musky

2) WATER COLOR (*circle all that apply*)

Clear Brown Green Oily Sheen Reddish Blackish Milky Gray

3) Are there animals in the water upstream (i.e., cows, ducks, geese)? Yes / No
If yes, what type and how many? _____

4) Are there any tile lines or pipes of any sort that are visible along the river upstream? Yes / No
If yes, how many? _____ Are the tiles flowing? Yes / No

5) Stream Banks – using the categories below, check those that best describe the condition of the stream banks. (*check all that apply*)

Left Bank (*facing upstream*)
_____ Cut Bank – Eroding
_____ Cut Bank – Vegetated
_____ Sloping Bank
_____ Sand/Gravel Bar
_____ Rip/Rap
_____ Constructed Bank (i.e., drainage ditch)
_____ Other: _____

Right Bank (*facing upstream*)
_____ Cut Bank - Eroding
_____ Cut Bank – Vegetated
_____ Sloping Bank
_____ Sand/Gravel Bar
_____ Rip/Rap
_____ Constructed Bank (i.e., drainage ditch)
_____ Other: _____

Other comments

_____

_____

(over ⇒)

Appendix 8. IOWATER snapshot field form.

FOR OFFICE USE ONLY
When data are checked and entered, initial here:

Adjacent Land Use (*along stream reach – check all that apply*)

___ Row Crop	___ Wetland	___ Boating Accesses	___ Rural Residential Areas
___ Pasture	___ Prairie	___ Nature Trails	___ Conservation Lands
___ Urban	___ Park	___ Fence	___ Animal Feeding Operations/Lots
___ Industrial	___ Playground	___ Steep Slopes	
___ Timber	___ Campground	___ Stairs/Walkway	___ Other _____

Record all other land use practices that potentially could affect the stream

_____

Human Use Activities (*along stream reach – check all that apply*) **None observed**___

Please check activities you've participated in or witnessed at this site.

___ Swimming	___ Wind Surfing	___ Wading	___ Fishing
___ Tubing	___ Canoeing/Kayaking	___ Rafting	___ Kids Playing
___ Water Skiing	___ Boating	___ Hunting/Trapping	___ Other _____

Evidence of Human Use (*along stream reach – check all that apply*) **None observed**___

Please check evidence of human use you've witnessed at this site.

___ Streamside Roads	___ Livestock Watering	___ Camping Sites	___ Evidence of Kid's Play
___ Footprints or Paths	___ ATV/ORV Tracks	___ Fire Pit/Ring	
___ Dock/Platform	___ Rope Swings	___ Fishing Tackle	___ Other _____

Transparency (*record whole numbers only – no tenths*) _____ centimeters

Water Temperature ____ °Fahrenheit

pH (*check one*) 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___

Nitrite-N (*mg/l; check one*) 0 ___ 0.15 ___ 0.3 ___ 1.0 ___ 1.5 ___ 3 ___

Nitrate-N (*mg/l; check one*) 0 ___ 1 ___ 2 ___ 5 ___ 10 ___ 20 ___ 50 ___

Dissolved Oxygen (*mg/l; check one*)
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 8 ___ 10 ___ 12 ___

Phosphate (*mg/l; check one*) 0 ___ 0.1___ 0.2___ 0.3___ 0.4___ 0.6___ 0.8___
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 10 ___

Chloride _____ **mg/l** – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Where did you collect the water samples? (*check one*)

Directly from the Stream _____ From a bridge _____ Other (describe) _____

Please comment on safety of this site – is it in area of high traffic/was access a safety concern?

_____

Revised October 2008

Appendix 9. IOWATER DNR Lakes Program field form.

IOWATER
Volunteer Water Quality Monitoring

Standing Water Assessment – DNR Lakes Program

*** Recommended frequency: monthly from ice-out to freeze-over ***

Date: _____ **Time:** _____ **# of Adults (incl. you):** _____ **# of under 18:** _____

Site Name (Lake Name + County + Site #): _____
STORET ID #:_____
Other Volunteers Involved: *(When submitting data, please type in both names and use the following format)*
Monitor: _____ *DNR Staff:* _____

Physical Assessment

Weather (*check all that apply*)
Sunny ____ Partly Sunny ____ Cloudy ____ Rain/Snow ____ Windy ____ Calm ____

Air Temperature _____ °Fahrenheit

Precipitation _____ inches over the last 24 hours

Wind Direction (*check one*)		**Wind Speed** (*check one*)
____ Not applicable	____ Northeast	____ Calm (0-5 mph, felt on face, leaves rustle)
____ North	____ Northwest	____ Breezy (sustained 5-15 mph, small branches move)
____ South	____ Southeast	____ Strong (sustained over 15 mph, small trees sway
____ East	____ Southwest	continuously, waves form)
____ West		____ Gusty (gust over 15 mph, small trees sway occasionally)

Site Location ____ Open Water ____ Shore or Dock

Secchi Disc Depth ____.____ meters

Water Temperature ____ °Fahrenheit

Water Level (*check one*)
Above Normal ____ Normal ____ Below Normal ____
If lake is not at normal level, and you have means to measure, please specify:
inches above _____ or below _____ normal

Water Odor (*check all that apply*)
None ____ Sewage/Manure ____ Rotten Eggs ____ Petroleum ____ Fishy ____

Chemical Assessment

IMPORTANT: Use Point Sampling technique!

pH
Expiration date on bottom of bottle _____
check one – 4 ____ 5 ____ 6 ____ 7 ____ 8 ____ 9 ____

Revised December 2005

Appendix 9. IOWATER DNR Lakes Program field form.

Nitrite-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – 0 ____ 0.15 ____ 0.3 ____ 1.0 ____ 1.5 ____ 3 ____

Nitrate-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – 0 ___ 1 ___ 2 ___ 5 ___ 10 ___ 20 ___ 50 ___

Dissolved Oxygen (*mg/l*)
Expiration date on back of color comparator _____
check one – 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 8 ___ 10 ___ 12 ___

Phosphate (*mg/l*)
Expiration date on back of color comparator _____
Expiration date on round color comparator _____
Expiration date on activator solution _____
check one – 0 ___ 0.1___ 0.2___ 0.3___ 0.4___ 0.6___ 0.8___
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 10 ___

Chloride
Expiration date on bottom of bottle _____
_____ **mg/l** – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Biological Assessment

Water Color – Is there an obvious algal bloom? (algal mats present, water appears green or scummy) ____ No ____ Yes (*if yes, please submit a photo record*)

Water Color Scale (*check one nearest to color*)

1 ____	5 ____	9 ____	13 ____	17 ____
2 ____	6 ____	10 ____	14 ____	18 ____
3 ____	7 ____	11 ____	15 ____	19 ____
4 ____	8 ____	12 ____	16 ____	20 ____

Habitat Assessment

*** Conduct only once per year, preferably in July, or if a major land use change occurs ***

Describe Lake Banks_____
_____
_____
_____

Describe Adjacent Land Use _____
_____
_____

Other Observations and Notes:
_____
_____
_____

If you are not participating in UHL laboratory analysis, please mail this form to:
Brandon Harland – IOWATER, 502 E. 9th Street, Des Moines, IA 50319

Appendix 10. General IOWATER snapshot instructions for field parameters.

Water Temperature

1. Place the aquatic thermometer directly into the stream.
2. Hold thermometer under water in the main flow of the stream (not in a pool) for two minutes. Read immediately and record temperature on the Field Form.

pH

1. Dip the test strip in the water and remove immediately.
2. Hold strip level for 15 seconds.
3. Compare test pad to color chart on test strip bottle. Estimate pH and record results on the Field Form.
4. Dispose of test strip in waste container provided.

Dissolved Oxygen

1. For use with the CHEMetrics® Oxygen Kit.
2. Fill sample cup to 25 mL mark, mixing water with air as little as possible!
3. Place ampoule in sample cup, tilting so tip is wedged in corner of cup bottom.
4. Straighten ampoule. This will break off tip and ampoule will fill with water.
5. Mix water by inverting it slowly several times. Bubble will mix contents.
6. Two minutes from tip break-off, compare to color standards.
7. Estimate and record results on the Field Form.

*Ampoule may be disposed of in waste container provided. Avoid breaking ampoule open, as contents are mild skin and eye irritants. Liquid in the ampoule is light sensitive so avoid leaving the ampoule in direct sunlight.

Nitrate-N/Nitrite-N

1. Dip the test strip in the water for one second and remove.
2. Hold the strip level for 30 seconds.
3. Compare the inner test pad to the nitrite-nitrogen color chart on test strip bottle; estimate the amount of nitrites in mg/L. Record the nitrite-nitrogen concentration on the Field Form.
4. Wait 30 more seconds (total 60 seconds).
5. Compare the outer test pad to nitrate-nitrogen color chart on test strip bottle. Estimate the amount of nitrate-nitrogen in mg/L. Record on the Field Form. Dispose of test strip in waste container provided.

Phosphate

1. Fill sample cup to 25 mL mark. Add 2 drops of A-8500 Activator Solution
2. Place black cap on sample cup and shake to mix the contents.
3. Put on safety glasses
4. Place ampoule in sample cup, tilting so the tip is wedged in corner of cup bottom
5. Straighten ampoule. This will break off tip and ampoule will fill with water.
6. Mix water by inverting ampoule slowly several times. Bubble will mix contents.
7. **Two Minutes** from tip break-off, compare to color standards.
8. Based on the color of your sample, use the appropriate color comparator to determine the level of phosphate. The high-range comparator in the lid of the kit measures from 1 to 10 mg/L. Hold the high range comparator in a nearly horizontal position while standing directly beneath a bright source of light. Place the CHEMetrics ampoule between the color standards moving it from left to right along the comparator until the best match is found. Record your result on the Field Form. The low-range circular comparator measures from 0 to 1 mg/L.

   To use the circular comparator, place your ampoule, flat end down into the center tube. Direct the top of the comparator up toward a source of bright light while viewing from the bottom. Rotate the comparator until the color standard below the CHEMetrics ampoule shows the closest match. Record your result on the Field Form.

   Dispose of ampoule and waste water in waste container. Avoid breaking ampoule open, as contents are mild skin and eye irritants.

Appendix 10. General IOWATER snapshot instructions for field parameters.

Chloride

1. Fill sample cup to 60 mL mark.
2. Remove a titrator from bottle and replace cap immediately.
3. Insert the lower end of titrator into sample cup. Do not allow the yellow completion string located at the top of the titrator to become submerged in the water sample.
4. Allow water sample to completely saturate wick of titrator. Reaction is complete when yellow string turns dark. This will take 5-10 minutes.
5. Note where the tip of the white chloride peak falls on the numbered QuanTab® scale. This represents the QuanTab® unit value.
6. Refer to the table on the QuanTab® test strip bottle to convert the QuanTab® units into a chloride concentration and record results.
7. If the QuanTab® unit is below 1.0, report the chloride concentration as less than the detection limit (i.e. <30).
8. QuanTab® test strips may be disposed of in waste container provided.

Transparency

1. Collect a fresh water sample by placing the transparency tube horizontal in the water, just below water level. Avoid disturbing any bottom sediment.
2. Place the tube upright on a flat surface
3. Pour sample water into the transparency tube until it is full.
4. With your back to the sun, look directly into the tube and release water through the small hose, regulating the flow with the finger clamp, until you are able to just begin to distinguish the black and white pattern (secchi pattern) on bottom of the tube. When you can first distinguish the patter, close the clamp.
5. Read the number on the outside of the tube that is closest to the water line. Record your reading in centimeters (cm).

Appendix 11. IOWATER stream physical assessment parameters.

Weather:
Required Equipment: Chemical / Physical Stream Assessment field form and armored thermometer
Volunteers are instructed to report the weather conditions at the time of the assessment. Weather conditions volunteers can record are: sunny, partly sunny, cloudy, rain / snow, windy, and / or calm. Volunteers use an armored thermometer to measure air temperature. Precipitation during the previous 24-hour period is estimated by the use a rain gauge or by contacting a local radio, newspaper or website. Weather conditions, air temperature, and precipitation during the previous 24-hour period are recorded on the Chemical / Physical Stream Assessment field form.

Water Color:
Required Equipment: Chemical / Physical Stream Assessment field form
Volunteers indicate the water color at their stream transect. Colors volunteers can record on the Chemical / Physical Stream Assessment field form are: clear, brown, green, oily, reddish, blackish, chalky.

Water Odor:
Required Equipment: Chemical / Physical Stream Assessment field form
Volunteers indicate the water odor at their stream transect. Odors volunteers can record on the Chemical / Physical Stream Assessment field form are: none, sewage / manure, rotten eggs, petroleum.

Stream Width:
Required Equipment: Chemical / Physical Stream Assessment field form and Open-reel fiberglass tape measure (30m)
Volunteers measure the width of the stream at their stream transect, in meters, with an open-reel fiberglass measuring tape and record on the measurement on the Chemical/Physical Stream Assessment field form. Stream width is measured at the transect, from where the water meets the left bank (left and right are determined when the monitor faces upstream) to where the water meets the right bank.

Stream Depth:
Required Equipment: Chemical / Physical Stream Assessment field form, Open-reel fiberglass tape measure (30m) and meter stick
Volunteers measure stream depth, in meters, at 1-meter intervals, along their stream transect from left bank to right bank using an open-reel fiberglass measuring tape to indicate the intervals and meter stick to measure depth. The measurements are recorded on the Chemical/Physical Stream Assessment field form.

Stream Velocity:
Required Equipment: Chemical / Physical Stream Assessment field form, Open-reel fiberglass tape measure (30m), tennis ball with one meter string attached and stop watch
Volunteers measure stream velocity, in seconds, at 1-meter intervals, along their stream transect using an open-reel fiberglass measuring tape to indicate the intervals and a tennis ball with one meter string attached to estimate the speed it takes to float an object one meter. The speeds are recorded on the Chemical/Physical Stream Assessment field form.

Stream Width, Depth and Velocity are used to estimate Stream Flow. Instructions for calculating stream flow are provided in the appendix in the IOWATER manual. When volunteers enter stream width, depth, and velocity measurements in the IOWATER database; total flow, average stream depth, and average stream velocity are calculated.

Water Temperature:
Required Equipment: Chemical / Physical Stream Assessment field form and armored thermometer.
Volunteers are instructed to place an armored thermometer directly into the stream at the stream transect, holding it underwater in the main flow. Hold it there two minutes to allow time for the temperature to stabilize and read immediately. Water temperature is recorded in degrees Fahrenheit on the Chemical / Physical Stream Assessment field form.

Appendix 11. IOWATER stream physical assessment parameters.

Water Transparency:
Required Equipment: Chemical / Physical Stream Assessment field form and transparency tube
Volunteers are instructed collect a fresh water sample in the transparency tube while facing upstream in the main stream flow. Holding the tube upright, and shading the tube with either the environment or their bodies, volunteers are instructed to look directly into the tube from the open top and release water through the small hose, regulating the flow with the finger clamp, until the black and white pattern (Secchi pattern) on bottom of the tube is visible, at which time they close the finger clamp and read the number on the outside of the tube that is closest to the water line. Results are recorded in centimeters (cm) on the Chemical / Physical Stream field form.

Other Assessment Observations and Notes:
Required Equipment: Chemical / Physical field form
Volunteers are instructed to use this area to provide any additional comments about the stream site or sampling that may provide additional information to data users. The comments are recorded on the Chemical / Physical Stream Assessment field form.

Appendix 12. IOWATER stream chemical assessment parameters.

pH:

Required Equipment: Chemical / Physical Stream Assessment field form, Hach® pH test strips, and waste container

1. Check the expiration date on the bottom of the bottle. If expired, **DO NOT USE**.
2. Dip the test strip in the water and remove immediately. Hold strip level for **15 seconds**. **DO NOT SHAKE** excess water from the test strip.
3. Estimate pH by comparing test pad to color chart on test strip bottle (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 15 seconds.***
4. Record results on the IOWATER Chemical / Physical Stream Assessment field form.
5. Dispose of test strip in garbage.

STORE AT ROOM TEMPERATURE

Dissolved oxygen:

Required Equipment: Chemical / Physical Stream Assessment field form, Chemetrics® dissolved oxygen test kit, waste container, and safety glasses

1. Check the expiration date on the back of the color comparator. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.
2. Remove the 25ml sample cup from the kit and rinse it three times with stream water.
3. Fill the sample cup to 25 ml mark, mixing the water and air as little as possible.
   - Lower the sample cup down to wrist depth while holding it upside down. Turn the opening downstream so that the cup backfills with water, then turn the cup upstream and carefully remove cup and water sample from stream.
   - ***GENTLY*** tip the sample cup to pour off excess water.
4. Place the ampoule in the sample cup, tilting it so the tip is wedged in the corner of cup bottom.
5. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
6. Remove the ampoule from the cup and mix the water by inverting the ampoule several times. Be careful not to touch the broken end as it will be sharp.
7. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
8. Hold the comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking the ampoule open, as the contents may be mild skin and/or eye irritants. ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. **STORE IN THE DARK AT ROOM TEMPERATURE.**

Nitrite-N and Nitrate-N:

Required Equipment: Chemical / Physical Stream Assessment field form, Hach® nitrate-N / nitrite-N test strips, and waste container

1. Check the expiration date on the bottom of the Nitrite-N/Nitrate-N bottle. If expired, **DO NOT USE**.
2. Dip the test strip into the water for one second and remove. **DO NOT SHAKE** excess water from the test strip.
3. Hold the strip level, with pad side up, for **30 seconds.**
4. Compare the NITR**I**TE (lower) test pad to the nitrite-nitrogen color chart on test strip bottle, estimate the nitrite concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 30 seconds.***.
5. At **60 seconds** (or 30 seconds after estimating nitrite concentration), compare the NITR**A**TE (upper) test pad to the nitrate-nitrogen color chart on test strip bottle, estimate the nitrate concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 60 seconds.***.

   STORE AT ROOM TEMPERATURE

Orthophosphate:

Required Equipment: Chemical / Physical Stream Assessment field form, Chemetrics® orthophosphate test kit, waste container, and safety glasses

Appendix 12. IOWATER stream chemical assessment parameters.

1. Check the expiration date on the back of the color comparator in the lid, on the round color comparator, and on the activator solution. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup and its black lid three times with stream water.
3. Fill the sample cup to 25 ml mark, mixing the water and air as little as possible.
   - Lower the sample cup down to wrist depth while holding it upside down. Turn the opening downstream so that the cup backfills with water, then turn the cup upstream and carefully remove cup and water sample from stream.
   - ***GENTLY*** tip the sample cup to pour off excess water.
4. Add 2 drops of A-8500 Activator Solution, place black cap on sample cup, and shake to mix the contents.
5. Place an ampoule in the sample cup, tilting it so tip is wedged in corner of cup bottom.
6. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
7. Remove the ampoule from the cup and mix the water in the ampoule by inverting it slowly several times. Be careful not to touch the broken end as it will be sharp.
8. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
9. Based on the color of your ampoule, use the appropriate color comparator to estimate the orthophosphate concentration.

a) The low-range circular comparator measures concentrations ranging from 0 to 1 mg/L. To use the circular comparator, place your ampoule, flat end downward, into the center tube. Direct the top of the comparator up toward a good light source while viewing from the bottom. Rotate the comparator to match your ampoule to the standards, and record your results on the IOWATER field form.
   OR
b) The high-range comparator in the lid of the kit measures concentrations ranging from 1 to 10 mg/L. Hold the high range comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking ampoule open, as contents can be mild skin and eye irritants. Sample water should be disposed of by pouring down household drain, not back into the stream. **STORE IN THE DARK AT ROOM TEMPERATURE**

If a volunteer notices that the ampoule color result is more green or brown than blue, and they have a difficult time matching it to the standards, they are given additional equipment to filter water samples to remove excess algae and/or sediment before running the test. Procedures for filtration are as follows.

How to Filter Water for the IOWATER Orthophosphate Test

1. Rinse the sample cup, syringe, *and filtering apparatus* **three times** with stream water before conducting the test.
2. Collect 30 ml of water in your sample vial to ensure that you have enough filtered water for your test.
3. Unscrew the filter apparatus and remove it from the syringe. Place a piece of filter paper in the filter apparatus (***NOTE*:** The **filter paper is white;** the spacers are blue) over the white "O" ring (these are easy to lose, so there's an extra one in your kit). The "O" ring needs to be sitting flat when the filtering apparatus is reassembled, or it will leak.
4. Reassemble the filtering apparatus.
5. Remove the plunger from the syringe and fill with water from the sample cup.
6. Screw the filtering apparatus onto the bottom of the syringe.
7. Slowly apply pressure to the plunger until the sample cup is filled with 25 ml of filtered water.
8. Complete the orthophosphate test in accordance with the instructions in the kit.
9. Throw away the used filter paper and rinse the filter apparatus with distilled water.

Chloride:

Appendix 12. IOWATER stream chemical assessment parameters.

Required Equipment: Chemical / Physical Stream Assessment field form, Hach® chloride titrators, Sample cup from the Chemetrics® dissolved oxygen test kit, and waste container

1. Check the expiration date on the bottom of the chloride bottle. If your equipment is expired, **DO NOT USE**.
2. Rinse the 25ml Dissolved Oxygen Kit sample cup three times with stream water.
3. Fill the sample cup up to the 25ml mark with stream water.
4. Remove a titrator from bottle and replace cap immediately.
5. Insert the lower end of titrator into sample cup. Do not allow the yellow completion string located at the top of the titrator to become submerged in the water sample.
6. Allow water sample to completely saturate wick of titrator. There is no time limit for this test – the reaction is complete when yellow string turns dark (this may take a few minutes).
7. Note where the tip of the white chloride peak falls on the numbered Quantab® scale. This represents the Quantab® unit value.
8. Refer to the table on the Quantab® test strip bottle to **convert the Quantab® units into a chloride concentration** and record results on the IOWATER field form.
9. If the Quantab® unit is below 1.0, report the chloride concentration as < (less than) the lowest concentration listed on the test strip vial.
10. Quantab® test strips may be disposed of with household trash. Sample water can be disposed of in the field.

STORE AT TEMPERATURES NOT TO EXCEED 86°F

E. coli & General Coliform Bacteria:

Required Equipment: Bacteria Monitoring Assessment field form, Styrofoam® cooler, Easygel® pretreated Petri dishes (3 dishes per site, samples are collected in triplicate at each site), Easygel® Coliscan® brand single dish media bottles (3 bottles per site), nightlight, sterile disposable pipette, permanent marker, clear tape, laminated Petri dish counting grid, meat thermometer, extension cord, and bleach bottle

Volunteers use the following instructions:

Incubator Preparation

1. Select a location for the incubator indoors where the air temperature remains constant.
2. Plug the nightlight into the extension cord and the extension cord into a working electrical outlet.
3. Place the nightlight into the Styrofoam® cooler with the cord wedged between the lid and the bottom.
4. Pearce the lid of the Styrofoam® cooler with the meat thermometer in order to monitor the inside temperature without having to constantly open the lid. Place the thermometer in the far corner, away from the nightlight.

Sample Preparation

1. All bacteria sampling equipment should be handled carefully to avoid contamination. *Avoid contact with the inside of the Petri dish and the tip of the eyedropper*.
2. Prepare incubator (cooler) by making sure the inside is clean and dry.
3. Check expiration dates on Coliscan® Easygel® media bottles. If expired, **DO NOT USE**.
4. Label the bottom of three Petri dishes along the edge using a permanent marker. This label should include the IOWATER site number, date and time of sample collection, volume of water collected, and sample number (you will be collecting three samples per site, so label them Sample 1, Sample 2, Sample 3.)
5. Tape the lid of the Petri dish to the bottom in any one location, creating a hinge.

Sample Collection

1. Using a sterile pipette (eyedropper), collect a sample of water from your transect, from slightly below the water's surface while facing upstream in the main flow.
2. Collect water samples in increments of 0.5 ml, with 0.25 ml being the minimum and 5 ml being the maximum. For most samples, one ml of water is recommended. If you suspect high levels of bacteria, or if you have had high numbers of bacteria in the past, you may want to collect 0.5 ml of water.
3. Place the sample water directly into the bottle of Coliscan® Easygel® media. This is Sample 1 – label the bottle as such.
4. Using the same pipette, repeat procedure for Sample 2 and Sample 3. The same volume of water needs to be collected for all three samples.
5. Chill your samples on ice in the bottles until you return indoors.

Sample Incubation

1. Swish the Coliscan® Easygel® bottles to mix the contents and pour each bottle into the already labeled Petri dishes. Gently swirl the mixture in the Petri dish, making a figure eight on the tabletop with the dish until the mixture is evenly distributed, being careful not to splash over the side or on the lid.

2. Tape the other side of the lid to the bottom of the Petri dish.
3. Place the Petri dishes on a level location out of direct sunlight for up to 45 minutes. The mixture will solidify on bottom of Petri dish.
4. Once the mixture is solid incubate the Petri dishes at 85- 99°F for 48 hours. Petri dishes can be stacked in the incubator. Petri dishes should be placed upside down with the lid facing down to avoid condensation on the lid. Place the Petri dishes opposite the light source, allowing space between the Petri dishes and the sides of the incubator. Avoid placing the thermometer next to the light.
5. Monitor the incubator temperature for the first hour after placing the Petri dishes in it. Keeping the temperature between 85 and 99 °F is very important. If necessary, the temperature can be lowered by opening the Styrofoam® lid a crack. If the temperature is not reaching the minimum 85 °F, place an additional night light in the incubator.

Sample Count

1. After the incubation period (48 hrs), count all the dark blue-purple spots or "colonies" on the Coliscan® Petri dish. Record the colony count on the Bacteria Monitoring field form under "*E. coli* Bacteria."
2. When counting bacteria, use the laminated grid provided. You only need to count to 100, if more than 100 colonies are present record the colony count as 100.
3. Count all the pink spots or "colonies" on the Coliscan® Petri dish with the methods described above. Record the colony count on the Bacteria Monitoring field form under "General Coliform Bacteria."
4. Repeat above procedure for other two samples Petri dishes.
5. Record on the Bacteria Monitoring field form the volume of water collected of each sample, the incubation time or period and the incubation temperature.
6. The counts will be converted to Colony Forming Units per 100 ml when the data are entered into the database.

Sample Disposal

1. Carefully place about a teaspoon of straight household bleach onto the surface of the Coliscan® Easygel® of each plate.
2. Allow to sit at least five minutes.
3. Place in watertight bag and discard in normal trash.
4. Allow the Styrofoam® cooler to air dry before storing. Avoid using the cooler for other uses. A dilute solution of bleach can be used to clean the cooler.

Note: Coliscan® Easygel® media has a shelf life of one year and must be kept frozen until used, but may be refrigerated up to two weeks. Check expiration dates frequently! Petri dishes do not expire as long as open packages are resealed after use.

Appendix 13. Stream habitat assessment parameters.

Stream Habitat Type:
Required Equipment: Stream Habitat Assessment field form
Volunteers indicate on the Stream Habitat Assessment field form what the stream habitat type is at the stream transect. Volunteers select from Riffle, Run, or Pool.

Streambed Substrate:
Required Equipment: Stream Habitat Assessment field form
Volunteers estimate the percentage of each streambed substrate located at the stream transect on the Stream Habitat Assessment field form. Volunteers can provide estimates for the following streambed substrates:

- Bedrock - large sheets of stone
- Boulder - stones larger than 10 inches in diameter
- Cobble - stones with a diameter between 2.5 and 10 inches
- Gravel - 0.1 to 2 inch diameter
- Sand - smaller than 0.1 inches in diameter
- Mud / Silt - dirt or soil deposited on the bottom of the stream
- Other - organic material like leaf litter, tree limbs, etc.

Microhabitats:
Required Equipment: Stream Habitat Assessment field form
Volunteers record all of the different types of microhabitats that are present in the stream reach. Volunteers are instructed to give an indication of estimated numbers of each microhabitat and their sizes. A partial listing of microhabitats that may be recorded are:

- Algae mats
- Undercut banks
- Weed beds
- Leaf packs
- Logjams
- Rock piles
- Root wads

Stream Banks:
Required Equipment: Stream Habitat Assessment field form
Volunteers record the condition of both left and right stream banks as they face upstream at the stream transect. Conditions volunteers can record are as follow:

- Cut bank – eroding
- Cut bank – vegetated
- Sloping bank
- Sand / Gravel bar
- Rip-Rap (or other constructed bank)
- Other

Canopy Cover:
Required Equipment: Stream Habitat Assessment field form
Canopy coverage is observed at the stream transect by estimating the percentage of the area above the stream that is covered by tree branches, leaves and/or grasses and is recorded on the Stream Habitat Assessment field form. Estimates are recorded in 25 percent increments.

Riparian Zone Width:
Required Equipment: Stream Habitat Assessment field form
Volunteers face upstream and estimate the width of the riparian zones along the left bank and right bank in increments of 0-5 meters, 5-25 meters, and over 25 meters. Riparian zone width is recorded on the Stream Habitat Assessment field form. The riparian zone is defined as the water's edge plant community.

Riparian Zone Plant Cover:

Appendix 13. Stream habitat assessment parameters.

Required Equipment: Stream Habitat Assessment field form
Volunteers estimate the percentage of each type of plant cover in the left and right bank (facing upstream) riparian zones. Riparian zone plant cover is recorded on the Stream Habitat Assessment field form. Volunteers can provide estimates for the following plant cover types:

- Trees
- Shrubs / low trees
- Grass / low plants
- Exposed soil
- Other (such as rip-rap, concrete, etc.)

Adjacent Land Use:
Required Equipment: Stream Habitat Assessment field form
Volunteers indicate all land uses in the area adjacent to the riparian zones in a checklist. Volunteers also record all other land use practices that potentially could affect the stream. Adjacent land use is recorded on the Stream Habitat Assessment field form. A partial listing of land uses that may be recorded are:

- Row Crop
- Timber
- Pasture
- Wetland
- Urban
- Prairie
- Industrial
- Other

Appendix 14. IOWATER stream biological assessment parameters.

High Quality Group (low tolerance)	Middle Quality Group (medium tolerance)	Low Quality Group (high tolerance)
• Caddisfly	• Alderfly	• Aquatic worm
• Dobsonfly	• Backswimmer	• Black fly
• Mayfly	• Crane fly	• Bloodworm
• Riffle beetle	• Crawdad	• Flatworm
• Snail (not pouch)	• Crawling water beetle	• Leech
• Stonefly	• Damselfly	• Midge fly
• Water Penny Beetle	• Dragonfly	• Mosquito
	• Giant water bug	• Pouch snail
	• Limpet	• Rat-tailed maggot
	• Mussel / Clam	• Water scavenger beetle
	• Orbsnail	
	• Predaceous diving beetle	
	• Scud	
	• Sowbug	
	• Water boatman	
	• Water mite	
	• Water scorpion	
	• Water strider	
	• Whirligig beetle	

Microhabitats:
Required Equipment: Biological Assessment field form
Volunteers record on the Biological Assessment field form the microhabitats that are present in the stream reach and the microhabitats sampled for benthic macroinvertebrates.

Stream Habitat Type:
Required Equipment: Biological Assessment field form
Volunteers record on the Biological Assessment field form the stream habitats in the stream reach for benthic macroinvertebrates.

Aquatic Plants:
Required Equipment: Biological Assessment field form
Volunteers are instructed to estimate the percent of streambed covered with aquatic plants in increments of 25% at the stream transect. Percentages are recorded on the Biological Assessment field form.

Algae Cover:
Required Equipment: Biological Assessment field form
Volunteers are instructed to estimate the percent of stream or streambed covered with algae in increments of 25% at the stream transect. Percentages are recorded on the Biological Assessment field form.

Other Assessment Observations and Notes:
Required Equipment: Biological Assessment field form
Volunteers are instructed to use this area to provide any additional comments about the stream site or sampling that may provide additional information to data users. The comments are recorded on the Biological Assessment field form.

Appendix 15. IOWATER lake assessment parameters.

Water Color:

Required Equipment: Standing Water Assessment field form Secchi disk, Open-reel fiberglass tape measure (30m) and IOWATER water color chart

Volunteers are instructed to lower the Secchi one-half the Secchi depth into the water on the shaded side of the boat/dock, hold the Color Chart just above the surface of the water near one of the disk's white quadrants, compare the color of the white quadrant with the various colors on the Color Chart, and record the corresponding number on the Standing Water Assessment field form. Volunteers are also asked to indicate on the Standing Water Assessment field form if there is an obvious algal bloom and are encouraged to document it with photographs.

Benthic Macroinvertebrates (Level 1):

Required Equipment: Aquatic dip net, clear plastic tub, magnifying box or lens, laminated IOWATER Benthic Macroinvertebrate Key, forceps, and Biological Assessment field form

Level 1 Benthic Macroinvertebrate monitoring will indicate quality, not quantity. Volunteers sample the lake / pond shore. Using benthic nets, benthic macroinvertebrates are collected from the lake / pond shore and deposited into a clear plastic tub with a small volume of water. Volunteers are instructed to sample all of the microhabitats present along the lake / pond shore. Volunteers then use the forceps, magnifying box, and laminated IOWATER Benthic Macroinvertebrate Key to identify the benthic macroinvertebrates to the phylum and/or order levels. Volunteers are also instructed to clean the dip net between samplings. The identified benthic macroinvertebrates are recorded on the Biological Assessment field form. Benthic macroinvertebrates on the Biological Assessment field form are divided into three general groups based on their tolerance to pollution. Benthic macroinvertebrates that are recorded are:

High Quality Group (low tolerance)

- Caddisfly
- Dobsonfly
- Mayfly
- Riffle beetle
- Snail (not pouch)
- Stonefly
- Water Penny Beetle

Middle Quality Group (medium tolerance)

- Alderfly
- Backswimmer
- Crane fly
- Crawdad
- Crawling water beetle
- Damselfly
- Dragonfly
- Giant water bug
- Limpet
- Mussel / Clam
- Orbsnail
- Predaceous diving beetle
- Scud
- Sowbug
- Water boatman
- Water mite
- Water scorpion
- Water strider
- Whirligig beetle

Low Quality Group (high tolerance)

- Aquatic worm
- Black fly
- Bloodworm
- Flatworm
- Leech
- Midge fly
- Mosquito
- Pouch snail
- Rat-tailed maggot
- Water scavenger beetle

Microhabitats:

Required Equipment: Biological Assessment field form

Volunteers record on the Biological Assessment field form the microhabitats that are present along the lake / pond shore and the microhabitats sampled for benthic macroinvertebrates.

Aquatic Plants:

Required Equipment: Biological Assessment field form

Volunteers are instructed to estimate the percent of lake / pond shore covered with aquatic plants in increments of 25%. Percentages are recorded on the Biological Assessment field form.

Appendix 15. IOWATER lake assessment parameters.

Algae Cover:
Required Equipment: Biological Assessment field form
Volunteers are instructed to estimate the percent of lake / pond surface and lake / pond shore covered with algae in increments of 25%. Percentages are recorded on the Biological Assessment field form.

Other Assessment Observations and Notes:
Required Equipment: Standing Waters Assessment field form
Volunteers are instructed to use this area to provide any additional comments about the lake / pond or sampling that may provide additional information to data users. The comments are recorded on the Standing Water Assessment field form.

Benthic Macroinvertebrate Indexing:
Required Equipment: Aquatic dip net, clear plastic tub, magnifying box or lens, IOWATER Benthic Macroinvertebrate Key, forceps, and Benthic Macroinvertebrate Indexing field form
Benthic Macroinvertebrate Indexing will indicate quality and quantity of benthic macroinvertebrates. Volunteers sample the lake / pond shore in an attempt to collect an as diverse of group of benthic macroinvertebrates as possible. Using benthic nets, benthic macroinvertebrates are collected from the lake / pond shore and deposited into a clear plastic tub with a small volume of water. Volunteers are instructed to sample all of the microhabitats present in the relative percentage that the habitat occurs. It is recommended to spend a consistent time collecting the organisms; IOWATER recommends 90 minutes. To improve metric accuracy, IOWATER recommends that volunteers collect at least 50 organisms. Volunteers then use the forceps, magnifying box and IOWATER Benthic Macroinvertebrate Key to identify the benthic macroinvertebrates to the family and/or class levels. Identification may occur indoors and not lake / pond side. If a volunteer wishes to identify the benthic macroinvertebrates indoors or at a later date they are instructed to preserve the sample in either ethyl alcohol or 91% isopropyl rubbing alcohol and to label the sample with date, location of collection (IOWATER site number), and those involved in the collection. Volunteers are also instructed to clean the dip net between samplings. The benthic macroinvertebrate identity and counts are recorded on the Benthic Macroinvertebrate Indexing field form. Benthic macroinvertebrates on the Benthic Macroinvertebrate Indexing field form are listed below with their tolerance values in parentheses.

Appendix 15. IOWATER lake assessment parameters.

Ephemeroptera (mayflies)
Baetidae *(6)*
Baetiscidae *(4)*
Caenidae *(7)*
Ephemerellidae *(2)*
Ephemeridae *(6)*
Heptageniidae *(4)*
Isonychiidae *(4)*
Leptohyphidae *(4)*
Leptophlebiidae *(4)*
Metretopodidae *(2)*
Oligoneuriidae *(2)*
Polymitarcyidae *(2)*
Potamanthidae *(4)*

Plecoptera (stoneflies)
Capniidae *(3)*
Nemouridae *(3)*
Perlidae *(3)*
Perlodidae *(2)*
Pteronarcyidae *(0)*
Taeniopterygidae *(2)*

Megaloptera (alderflies, dobsonflies)
Corydalidae *(6)*
Sialidae *(4)*

Trichoptera (caddisflies)
Brachycentridae *(1)*
Glossosomatidae *(0)*
Helicopsychidae *(3)*
Hydropsychidae *(5)*
Hydroptilidae *(6)*
Leptoceridae *(4)*
Limnephilidae *(4)*
Philopotamidae *(4)*
Polycentropodidae *(6)*

Odonata (dragon/damselflies)
Aeshnidae *(3)*
Calopterygidae *(6*
Coenagrionidae *(8)*
Corduliidae / Libellulidae *(7)*
Gomphidae *(5)*

Diptera (flies)
Athericidae *(2)*
Chironomidae (6*)*
Empididae *(6)*
Simuliidae *(6)*
Syrphidae (*10)*
Tabanidae *(6)*
Tipulidae *(4)*

Gastropod (snail)
Left Spiral (8)
Right Spiral *(6)*
Limpet/orbsnail *(6)*

Pelecypoda (mussel / clam) (7)

Coleoptera (beetles)
Curculionidae *(no value)*
Dryopidae *(5)*
Dytiscidae *(5)*
Elmidae *(5)*
Gyrinidae *(4)*
Haliplidae *(5)*
Hydrophilidae *(8)*
Psephenidae *(5)*
Scirtidae *(5)*

Other
Amphipoda (scud) *(6)*
Hirudinea (leech) *(8)*
Isopoda (sowbug) *(8)*
Turbellaria (flatworm) *(6)*
Oligochaeta *(8)*
Decapoda (crayfish) *(6)*
Hydrocarina (watermite) *(6)*

Appendix 15. IOWATER lake assessment parameters.

Based on the type of benthic macroinvertebrates identified, their tolerance values and the number of each counted, the following five metrics are calculated. When an IOWATER volunteer enters the counts from the Benthic Macroinvertebrate Indexing field form into the IOWATER database, these metrics are calculated automatically.

- Taxa Richness (number of different families or taxa identified)
- EPT Taxa Richness (number of families identified in the Ephemeroptera, Plecoptera, and Trichoptera orders)
- % EPT (represents the percentage of the total organisms identified that belong to the EPT orders)
- MBI – Macroinvertebrate Biotic Index (Σ count*tolerance value of all organisms identified/total number of identified organisms)
- % 3 Most Dominant Taxa (sum of organisms in the tree most abundant taxa/total number of identified organisms)

pH:

Required Equipment: Standing Water Assessment field form, Hach® pH test strips, stop watch, sample cup from the Chemetrics® dissolved oxygen test kit and waste container

1. Check the expiration date on the bottom of the pH bottle. If your equipment is expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Dip the test strip in the water and remove immediately. Hold strip level for **15 seconds**. **DO NOT SHAKE** excess water from the test strip.
5. Estimate pH by comparing test pad to color chart on test strip bottle (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 15 seconds.***
6. Record results on the IOWATER field form.
7. Dispose of test strip in garbage.
   STORE AT ROOM TEMPERATURE

Dissolved oxygen:

Required Equipment: Standing Water Assessment field form, Chemetrics® dissolved oxygen test kit, stop watch, waste container, and safety glasses

1. Check the expiration date on the back of the color comparator. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.
2. Remove the 25ml sample cup from the kit and rinse it three times with lake water from the sampling container.
3. ***GENTLY*** fill the sample cup up to the 25ml mark with water from your sampling container.
4. Place the ampoule in the sample cup, tilting it so the tip is wedged in the corner of cup bottom.
5. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
6. Remove the ampoule from the cup and mix the water by inverting the ampoule several times. Be careful not to touch the broken end as it will be sharp.
7. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
8. Hold the comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking the ampoule open, as the contents may be mild skin and/or eye irritants. ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. **STORE IN THE DARK AT ROOM TEMPERATURE.**

Nitrite-N and Nitrate-N:

Required Equipment: Standing Water Assessment field form, Hach® nitrate-N / Nitrite-N test strips, sample cup from the Chemetrics® dissolved oxygen test kit stop watch, and waste container

1. Check the expiration date on the bottom of the Nitrite-N/Nitrate-N bottle. If expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.

3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Dip the test strip in the water for one second and remove. **DO NOT SHAKE** excess water from the test strip.
5. Hold the strip level, with pad side up, for **30 seconds.**
6. Compare the NITR**I**TE (lower) test pad to the nitrite-nitrogen color chart on test strip bottle, estimate the nitrite concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 30 seconds.***.
7. At **60 seconds** (or 30 seconds after estimating nitrite concentration), compare the NITR**A**TE (upper) test pad to the nitrate-nitrogen color chart on test strip bottle, estimate the nitrate concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 60 seconds***.

STORE AT ROOM TEMPERATURE

Orthophosphate:

Required Equipment: Standing Water Assessment field form, Chemetrics® orthophosphate test kit, stop watch, waste container, and safety glasses

1. Check the expiration date on the back of the color comparator in the lid, on the round color comparator, and on the activator solution. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Add 2 drops of A-8500 Activator Solution, place black cap on sample cup, and shake to mix the contents.
5. Place an ampoule in the sample cup, tilting it so tip is wedged in corner of cup bottom.
6. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
7. Remove the ampoule from the cup and mix the water in the ampoule by inverting it slowly several times. Be careful not to touch the broken end as it will be sharp.
8. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
9. Based on the color of your ampoule, use the appropriate color comparator to estimate the orthophosphate concentration.

a) The low-range circular comparator measures concentrations ranging from 0 to 1 mg/L. To use the circular comparator, place your ampoule, flat end downward, into the center tube. Direct the top of the comparator up toward a good light source while viewing from the bottom. Rotate the comparator to match your ampoule to the standards, and record your results on the IOWATER field form.

OR

b) The high-range comparator in the lid of the kit measures concentrations ranging from 1 to 10 mg/L. Hold the high range comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking ampoule open, as contents can be mild skin and eye irritants. Sample water should be disposed of by pouring down household drain, not back into the stream. **STORE IN THE DARK AT ROOM TEMPERATURE**

If volunteers notice that their ampoule color result is more green or brown than it is blue, they need to filter their sample before running the test (See Stream Chemical Assessment for filtration protocol).

Chloride:

Required Equipment: Standing Water Assessment field form, Hach® chloride titrators, Sample cup from the Chemetrics® dissolved oxygen test kit, and waste container

1. Check the expiration date on the bottom of the chloride bottle. If your equipment is expired, please contact IOWATER, **DO NOT USE**.
2. Rinse the 25ml Dissolved Oxygen Kit sample cup three times with lake water from the sampling container.

3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Remove a titrator from bottle and replace cap immediately.
5. Insert the lower end of titrator into sample cup. Do not allow the yellow completion string located at the top of the titrator to become submerged in the water sample.
6. Allow water sample to completely saturate wick of titrator. There is no time limit for this test – the reaction is complete when yellow string turns dark (this may take a few minutes).
7. Note where the tip of the white chloride peak falls on the numbered Quantab® scale. This represents the Quantab® unit value.
8. Refer to the table on the Quantab® test strip bottle to **convert the Quantab® units into a chloride concentration** and record results on the IOWATER field form.
9. If the Quantab® unit is below 1.0, report the chloride concentration as < (less than) the lowest concentration listed on the test strip vial.
10. Quantab® test strips may be disposed of with household trash. Sample water can be disposed of in the field.

STORE AT TEMPERATURES NOT TO EXCEED 86°F

E. coli & General Coliform Bacteria:

Required Equipment: Bacteria Monitoring Assessment field form, Styrofoam® cooler, Easygel® pretreated Petri dishes (3 dishes per site, samples are collected in triplicate at each site), Easygel® Coliscan® brand single dish media bottles (3 bottles per site), nightlight, sterile disposable pipette, permanent marker, clear tape, laminated Petri dish counting grid, meat thermometer, extension cord, and bleach bottle

Volunteers use the following instructions:

Incubator Preparation

1. Select a location for the incubator indoors where the air temperature remains constant.
2. Plug the nightlight into the extension cord and the extension cord into a working electrical outlet.
3. Place the nightlight into the Styrofoam® cooler with the cord wedged between the lid and the bottom.
4. Pearce the lid of the Styrofoam® cooler with the meat thermometer in order to monitor the inside temperature without having to constantly open the lid. Place the thermometer in the far corner, away from the nightlight.

Sample Preparation

1. All bacteria sampling equipment should be handled carefully to avoid contamination. *Avoid contact with the inside of the Petri dish and the tip of the eyedropper*.
2. Prepare incubator (cooler) by making sure the inside is clean and dry.
3. Check expiration dates on Coliscan® Easygel® media bottles. If expired, **DO NOT USE**.
4. Label the bottom of three Petri dishes along the edge using a permanent marker. This label should include the IOWATER site number, date and time of sample collection, volume of water collected, and sample number (you will be collecting three samples per site, so label them Sample 1, Sample 2, Sample 3.)
5. Tape the lid of the Petri dish to the bottom in any one location, creating a hinge.

Sample Collection

1. Using a sterile pipette (eyedropper), collect a sample of water from your transect, from slightly below the water's surface while facing upstream in the main flow.
2. Collect water samples in increments of 0.5 ml, with 0.25 ml being the minimum and 5 ml being the maximum. For most samples, one ml of water is recommended. If you suspect high levels of bacteria, or if you have had high numbers of bacteria in the past, you may want to collect 0.5 ml of water.
3. Place the sample water directly into the bottle of Coliscan® Easygel® media. This is Sample 1 – label the bottle as such.
4. Using the same pipette, repeat procedure for Sample 2 and Sample 3. The same volume of water needs to be collected for all three samples.
5. Chill your samples on ice in the bottles until you return indoors.

Sample Incubation

1. Swish the Coliscan® Easygel® bottles to mix the contents and pour each bottle into the already labeled Petri dishes. Gently swirl the mixture in the Petri dish, making a figure eight on the tabletop with the dish until the mixture is evenly distributed, being careful not to splash over the side or on the lid.
2. Tape the other side of the lid to the bottom of the Petri dish.
3. Place the Petri dishes on a level location out of direct sunlight for up to 45 minutes. The mixture will solidify on bottom of Petri dish.

4. Once the mixture is solid incubate the Petri dishes at 85- 99°F for 48 hours. Petri dishes can be stacked in the incubator. Petri dishes should be placed upside down with the lid facing down to avoid condensation on the lid. Place the Petri dishes opposite the light source, allowing space between the Petri dishes and the sides of the incubator. Avoid placing the thermometer next to the light.
5. Monitor the incubator temperature for the first hour after placing the Petri dishes in it. Keeping the temperature between 85 and 99 °F is very important. If necessary, the temperature can be lowered by opening the Styrofoam® lid a crack. If the temperature is not reaching the minimum 85 °F, place an additional night light in the incubator.

Sample Count

1. After the incubation period (48 hrs), count all the dark blue-purple spots or "colonies" on the Coliscan® Petri dish. Record the colony count on the Bacteria Monitoring field form under "*E. coli* Bacteria."
2. When counting bacteria, use the laminated grid provided. You only need to count to 100, if more than 100 colonies are present record the colony count as 100.
3. Count all the pink spots or "colonies" on the Coliscan® Petri dish with the methods described above. Record the colony count on the Bacteria Monitoring field form under "General Coliform Bacteria."
4. Repeat above procedure for other two samples Petri dishes.
5. Record on the Bacteria Monitoring field form the volume of water collected of each sample, the incubation time or period and the incubation temperature.
6. The counts will be converted to Colony Forming Units per 100 ml when the data are entered into the database.

Sample Disposal

1. Carefully place about a teaspoon of straight household bleach onto the surface of the Coliscan® Easygel® of each plate.
2. Allow to sit at least five minutes.
3. Place in watertight bag and discard in normal trash.
4. Allow the Styrofoam® cooler to air dry before storing. Avoid using the cooler for other uses. A dilute solution of bleach can be used to clean the cooler.

Note: Coliscan® Easygel® media has a shelf life of one year and must be kept frozen until used, but may be refrigerated up to two weeks. Check expiration dates frequently! Petri dishes do not expire as long as open packages are resealed after use.

Weather:

Required Equipment: Standing Water Assessment field form and armored thermometer

Volunteers are instructed to report the weather conditions at the time of the assessment. Weather conditions volunteers can record are: sunny, partly sunny, cloudy and / or rain / snow. Wind direction and wind speed are also estimated. Wind Speed is estimated using the following criteria: Calm (0-5 mph, felt on face, leaves rustle), Breezy (sustained 5-15 mph, small branches move), Strong (sustained over 15 mph, small trees sway continuously, waves form), or Gusty (gust over 15 mph, small trees sway occasionally). Volunteers use an armored thermometer to measure air temperature. Precipitation during the previous 24-hour period is estimated by the use a rain gauge or by contacting a local radio, newspaper or website. Weather conditions, air temperature, and precipitation during the previous 24-hour period are recorded on the Standing Water Assessment field form.

Site Location:

Required Equipment: Standing Waters Assessment field form

Volunteers are instructed to indicate on the Standing Waters Assessment field form if they are sampling from the open water or the shore / dock.

Secchi Disk Depth:

Required Equipment: Standing Waters Assessment field form, Open-reel fiberglass tape measure (30m), 3 clothes pins and Secchi disk or transparency tube

Volunteers are instructed to do the following:

1. Travel to your monitoring site. Remove sunglasses.
    a. If monitoring from a boat, carefully lower an anchor over the side until it reaches the bottom. The force of the anchor hitting the lake bottom will disrupt a certain amount of bottom sediment. Let

out plenty of anchor line so that the boat drifts away from the sediment plume that may have been kicked up by the anchor.

2. Attach the Secchi disk to the rope or tape measure (recent workshop participants receive a tape measure that connects directly to the Secchi disk. Lean over the shaded side of the boat/dock and slowly lower the Secchi disk into the water until it is no longer visible. Volunteers are given the following instruction when encountering two special circumstances:
    a. Circumstance 1: In some shallow lakes, it is impossible to get a Secchi disk reading because the disk hits the bottom before vanishing from sight. This means the true Secchi disk reading is greater than the depth of the lake in that location. In this case, use a transparency tube to get a reading of water clarity and record results on the Standing Water field form.
    b. Circumstance 2: Sometimes the Secchi disk is lost from view because it "disappears" into the dense growth of rooted aquatic plants. Try moving a few feet away to improve sight of the Secchi disk through the vegetation. If this doesn't work, use a transparency tube to get a reading of water clarity and record the results.
3. If the special circumstances do not apply, volunteers are instructed to mark the rope / tape measure with a clothespin at the depth that the Secchi disk is no longer visible.
4. Lower the disk a few more feet in the water, slowly raise it back towards the surface. When the disk reappears, mark the rope / tape measure at the water level with a clothespin. Bring the rope and disk back into the boat.
5. Form a loop between the two clothespins. Use a third clothespin to mark the center of the loop. This marks the "average" of the two readings and is considered to be the Secchi depth. Record the results on the IOWATER Standing Water Assessment field form.

Water Temperature:
Required Equipment: Standing Water Assessment field form, armored thermometer and stop watch
Volunteers are instructed to place an armored thermometer directly into the water to elbow depth. Hold it there two minutes for the reading to stabilizes and record the results in degrees Fahrenheit on the Standing Water Assessment field form.

Water Level:
Required Equipment: Standing Water Assessment field form
Volunteers are instructed to estimate the water level in relation to normal conditions. Volunteers can also indicate on the Standing Water Assessment field form how much above or below normal the level is in inches, if they have a way to measure this (outlet pipe, overflow, etc).

Water Odor:
Required Equipment: Standing Water Assessment field form
Volunteers indicated the water odor present. Odors volunteers can record on the Standing Water Assessment field form are: none, sewage / manure, rotten eggs, petroleum, or fishy.

Appendix 16. DNR Lakes Program lake assessment parameters.

Secchi Depth and Water Color:

Required Equipment: Standing Water Assessment – DNR Lakes Program field form, UHL Chain of Custody form, Open-reel fiberglass tape measure (30m), 3 clothes pins and Secchi disk.

Monitors are instructed to do the following:

Step 1: Proceed to the monitoring site.

Step 2: Carefully lower the anchor over the side of the boat until it reaches the bottom of the lake. The force of the anchor hitting the lake bottom will disrupt a certain amount of bottom sediment. Since this sediment "plume" wasn't in the water before, make sure the data will not be affected by this re-suspended sediment. This is especially important with shallow water depths or soft "muck" sediments. Let out plenty of anchor line so that the boat drifts away from the sediment plume that may have been kicked up by the anchor. If in doubt, carefully pull up the anchor, move away a short distance, and try again.

Step 3: Remove sunglasses (leave on tinted corrective lenses). Lean over the shaded side of the boat and slowly lower the Secchi disk into the water until it can no longer be seen.

Step 4: At the depth that the disk can no longer be seen, mark the measuring tape at the water level with a clothespin.

Step 5: Lower the disk a few more feet in the water, but don't touch the bottom! Then, slowly raise it back towards the surface. When the disk reappears, mark the measuring tape at the water level with another clothespin. Bring the tape and disk back into the boat.

Step 6: Form a loop between the clothespins, and using a third clothespin, mark the center (the top) of the loop. This marks the "average" of the two readings and is considered to be the Secchi depth.

Step 7: Record the Secchi depth (in **meters**) on the Standing Water Assessment – DNR Lakes Program field form.

Step 8: To use the Color Chart, lower the Secchi disk (on the shaded side of the boat) to ½ the Secchi depth. Hold the Color Chart just above the surface of the water near one of the disk's white quadrants. Compare the color of the white quadrant with the various colors on the Color Chart and record the corresponding number on the Standing Water Assessment – DNR Lakes Program field from.

Sample Collection for Chemical Parameters analyzed by UHL:

Required Equipment: Freezer pack, cooler, permanent marker, UHL Chain of Custody form, Sterilized, pre-labeled bottles and plastic sampling device

Monitors are instructed to do the following:

Step 1: Make sure the freezer pack from the University Hygienic Lab (UHL) cooler is frozen.

Step 2: Using a permanent marker, label all the bottles with the following information:

a. Location (Lake Name (Descriptor) – County – Site #)
b. Date
c. Time
d. Name of Collector

Step 3: Rinse the sampling device, its cap, and arms ***three times*** on the side of the boat opposite of where you plan to collect your sample.

Step 4: Using sampling device, collect water sample from elbow depth (point sampling).

Step 5: Carefully remove lid to the nutrient bottle (skinny bottle with the sulfuric acid warning sticker), shake up the water in the sampling device to ensure a representative sample, and fill the bottle with water from the sampling device. Nutrient bottles have an acid preservative in them – ***do not overfill!*** They only need to be filled to the shoulder.

Step 6: Replace nutrient bottle lid and place in the cooler.

Step 7: One at a time, carefully remove lid(s) from the TSS/VSS and Chlorophyll-α bottles, shake up water in sampling device to ensure a representative sample, and fill the bottles up to their shoulders, leaving a little headroom so the samples may be frozen.

Step 8: Replace lids and place bottles in the cooler.

pH:

Required Equipment: Standing Water Assessment field form, Hach® pH test strips, stop watch, sample cup from the Chemetrics® dissolved oxygen test kit and waste container

1. Check the expiration date on the bottom of the pH bottle. If your equipment is expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.

4. Dip the test strip in the water and remove immediately. Hold strip level for **15 seconds**. **DO NOT SHAKE** excess water from the test strip.
5. Estimate pH by comparing test pad to color chart on test strip bottle (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 15 seconds.***
6. Record results on the IOWATER field form.
7. Dispose of test strip in garbage.
   STORE AT ROOM TEMPERATURE

Dissolved oxygen:

Required Equipment: Standing Water Assessment field form, Chemetrics® dissolved oxygen test kit, stop watch, waste container, and safety glasses

1. Check the expiration date on the back of the color comparator. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.
2. Remove the 25ml sample cup from the kit and rinse it three times with lake water from the sampling container.
3. ***GENTLY*** fill the sample cup up to the 25ml mark with water from your sampling container.
4. Place the ampoule in the sample cup, tilting it so the tip is wedged in the corner of cup bottom.
5. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
6. Remove the ampoule from the cup and mix the water by inverting the ampoule several times. Be careful not to touch the broken end as it will be sharp.
7. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
8. Hold the comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking the ampoule open, as the contents may be mild skin and/or eye irritants. ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. **STORE IN THE DARK AT ROOM TEMPERATURE.**

Nitrite-N and Nitrate-N:

Required Equipment: Standing Water Assessment field form, Hach® nitrate-N / Nitrite-N test strips, sample cup from the Chemetrics® dissolved oxygen test kit stop watch, and waste container

1. Check the expiration date on the bottom of the Nitrite-N/Nitrate-N bottle. If expired, **DO NOT USE**.
2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Dip the test strip in the water for one second and remove. **DO NOT SHAKE** excess water from the test strip.
5. Hold the strip level, with pad side up, for **30 seconds.**
6. Compare the NITR**I**TE (lower) test pad to the nitrite-nitrogen color chart on test strip bottle, estimate the nitrite concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 30 seconds***.
7. At **60 seconds** (or 30 seconds after estimating nitrite concentration), compare the NITR**A**TE (upper) test pad to the nitrate-nitrogen color chart on test strip bottle, estimate the nitrate concentration in mg/L, and record your reading on the IOWATER field form (remove sunglasses before reading the strip). ***The pad will continue to change color, so make a determination immediately after 60 seconds***.

STORE AT ROOM TEMPERATURE

Orthophosphate:

Required Equipment: Standing Water Assessment field form, Chemetrics® orthophosphate test kit, stop watch, waste container, and safety glasses

1. Check the expiration date on the back of the color comparator in the lid, on the round color comparator, and on the activator solution. The ampoules do not expire as long as they are kept in the dark. If your equipment is expired, **DO NOT USE**.

2. Rinse the 25ml Phosphate Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Add 2 drops of A-8500 Activator Solution, place black cap on sample cup, and shake to mix the contents.
5. Place an ampoule in the sample cup, tilting it so tip is wedged in corner of cup bottom.
6. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
7. Remove the ampoule from the cup and mix the water in the ampoule by inverting it slowly several times. Be careful not to touch the broken end as it will be sharp.
8. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. ***Read the ampoule right at two minutes as the ampoule will continue to change color.*** Remove your sunglasses before making a determination.
9. Based on the color of your ampoule, use the appropriate color comparator to estimate the orthophosphate concentration.

a) The low-range circular comparator measures concentrations ranging from 0 to 1 mg/L. To use the circular comparator, place your ampoule, flat end downward, into the center tube. Direct the top of the comparator up toward a good light source while viewing from the bottom. Rotate the comparator to match your ampoule to the standards, and record your results on the IOWATER field form.

OR

b) The high-range comparator in the lid of the kit measures concentrations ranging from 1 to 10 mg/L. Hold the high range comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the IOWATER field form.

Note: ***Keep color comparator and unused ampoules away from direct sunlight***, as they will change to a blue color and are no longer usable. The ampoule and ampoule tip may be disposed of in your household trash – be careful of the broken glass. Avoid breaking ampoule open, as contents can be mild skin and eye irritants. Sample water should be disposed of by pouring down household drain, not back into the stream. **STORE IN THE DARK AT ROOM TEMPERATURE**

If volunteers notice that their ampoule color result is more green or brown than it is blue, they need to filter their sample before running the test (See Stream Chemical Assessment for filtration protocol).

Chloride:

Required Equipment: Standing Water Assessment field form, Hach® chloride titrators, Sample cup from the Chemetrics® dissolved oxygen test kit, and waste container

1. Check the expiration date on the bottom of the chloride bottle. If your equipment is expired, please contact IOWATER, **DO NOT USE**.
2. Rinse the 25ml Dissolved Oxygen Kit sample cup three times with lake water from the sampling container.
3. Fill the sample cup up to the 25ml mark with water from your sample container.
4. Remove a titrator from bottle and replace cap immediately.
5. Insert the lower end of titrator into sample cup. Do not allow the yellow completion string located at the top of the titrator to become submerged in the water sample.
6. Allow water sample to completely saturate wick of titrator. There is no time limit for this test – the reaction is complete when yellow string turns dark (this may take a few minutes).
7. Note where the tip of the white chloride peak falls on the numbered Quantab® scale. This represents the Quantab® unit value.
8. Refer to the table on the Quantab® test strip bottle to **convert the Quantab® units into a chloride concentration** and record results on the IOWATER field form.
9. If the Quantab® unit is below 1.0, report the chloride concentration as < (less than) the lowest concentration listed on the test strip vial.
10. Quantab® test strips may be disposed of with household trash. Sample water can be disposed of in the field.

STORE AT TEMPERATURES NOT TO EXCEED 86°F

Water Temperature:

Required Equipment: Standing Water Assessment – DNR Lakes Program field form and armored thermometer

Monitors are instructed to place an armored thermometer directly into the water to elbow depth. Hold it there two minutes for the reading to stabilizes and record the results in degrees Fahrenheit on the Standing Water Assessment – DNR Lakes Program field form.

Water Level:
Required Equipment: Standing Water Assessment – DNR Lakes Program field form
Monitors are instructed to estimate the water level in relation to normal conditions. Monitors can also indicate on the Standing Water Assessment – DNR Lakes Program field form how much above or below normal the level is in inches, if they have a way to measure this (outlet pipe, overflow, etc).

Appendix 17. DNR chain of custody form.

Iowa Department of Natural Resources Snapshot Sample Information/Chain of Custody Bench Sheet/Results	**Report To** Lynette Seigley **Agency/Company** Iowa Department of Natural Resources **Project Code** Snapshots
DNR Version 1, Revised 4/10/2008	

Snapshot Name: _____

Collection Site	Date Collected	Time	DNR Lab Number	Date Analyzed	Dilution Factor	*E. coli* Small	*E. coli* Large	*E. coli* MPN

Chain of Custody — Temp Upon Receipt:

Relinquished by:	Date:	Time:
Received by:	Date:	Time:
Analyzed by:	Date:	Time:

Appendix 18. UHL chain of custody form.

Hygienic Laboratory

The University of Iowa

CHAIN-OF-CUSTODY

Contact Name	Phone	Analysis Requested	Purchase Order #
Company	**Fax**		**Project Name and/or Number**
Address			**Collector's Phone #**
City	**State** / **Zip**		**Print Collector's Name**
			Collector's Signature

Sample ID/Description	Date	Time	Sample Matrix W	S	Other	Comments/UHL Sample Number
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

Relinquished by	Date	Time	Comments
Relinquished by	**Date**	**Time**	**Comments**
Sample receiving custodian	**Date**	**Time**	**Sample Receipt Comments**

102 Oakdale Campus, #H101 OH
Iowa City, Iowa 52242-5002
319/335-4500 Fax: 319-335-4555

http://www.uhl.uiowa.edu

H.A. Wallace Building
900 E. Grand Ave., Des Moines, Iowa 50319-0034
515/281-5371 Fax: 515/243-1349

Yellow - UHL Copy
Blue - Client Copy
27919/11-01

Appendix 19. Abnormal sampling results.

Question 1. Is there evidence of criminal activity such as illegal drug activity (e.g., meth labs)?

Yes – Leave IMMEDIATELY and call the sheriff or local law enforcement.

No – Go to question 2.

Question 2. Is there evidence of dangerous pollution discharges, fish kills, or public health hazards?

Yes. Immediately report to the Iowa DNR's Environmental Services Division Regional Field Office for your area (see appendix). Be sure to note location and visual information, but DO NOT DISTURB THE AREA OR EVIDENCE. Besides possibly distorting useful information, you may be in physical danger if you touch or move these items.

No. Go to question 3.

Question 3. Are your abnormal results dealing with biological parameters (benthic macroinvertebrates, algae, etc.), chemical parameters (nitrate, phosphate, etc.), or physical parameters (color, odor, temperature)?

Biological – Go to question 4.

Chemical – Go to question 5.

Physical – Go to question 6.

Question 4. Has there been a dramatic shift in the make-up of your stream's benthic macroinvertebrates?

Yes – Call your regional Iowa DNR Environmental Services Division field office during regular business hours with results and concerns.

No – You may want to report your findings to the IOWATER or continue sampling regime to document long-term trends.

Question 5. Do you know that your sample value for a given parameter exceeds water quality standard limits?

Yes – Always double check unusual results. Make sure your test strips (or reagents) are viable. Have another person run the test to make sure the process was done correctly. Call your regional Iowa DNR Environmental Services Division field office during regular business hours with results and concerns.

No – Contact IOWATER.

Question 6. Is there evidence of excess chemical or petroleum inputs?

Yes – If the input could result in immediate hazard, call the Iowa DNR's Toxic Spill Hotline at (515) 281-8694. Otherwise, report to your regional Iowa DNR's Environmental Services Division field office.

No – Go to question 7.

Question 7. Has there been a steady shift in other physical parameters, such as water color, odor, or temperature?

Yes – Contact IOWATER.

No – Continue your sampling regime to document long-term trends

EVALUATION FORM – please complete and return at the end of the training

IOWATER Level One

1. Based on the following scale, how would you rate the quality of this training? (Please circle one)

1=I should have stayed home.
5=This experience was somewhat worthwhile.
10=Outstanding! I will recommend it to others!

1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

2. How did you hear about our program? (Check all that apply)

☐ Conference/Event that I attended ☐ Internet/Web ☐ Friend
☐ Newsletter ☐ E-mail list ☐ Newspaper/TV/Radio
☐ At work ☐ Other (list) _____

3. Did you find the following sessions interesting and/or informative? (Please circle Yes or No)

Yes / No Introduction to IOWATER & Water Quality in Iowa
Yes / No In the stream – Chemical Physical Instruction
Yes / No In the stream – Habitat Biological Instruction
Yes / No Going over the parameters in the classroom
Yes / No Lake Monitoring
Yes / No Mapping and Site Registration
Yes / No Submitting Data and Retrieving Data
Yes / No The Professional Ambient Monitoring Program
Yes / No Going through the Abnormal Results Flow Chart
Other sessions we should include: _____
_____

4. Please rate the following:

	Poor	No Opinion	Great
Monitoring Equipment:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		
Handouts:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		

Appendix 20. Evaluation form – IOWATER level 1.

Additional handouts or equipment you would suggest:

_____

_____

5. What types of additional workshops or trainings would you be interested in?

☐ Data Interpretation ☐ Forming a Watershed Group
☐ Quality Assurance Project Plan Writing
☐ Additional Benthic Macroinvertebrate Identification
☐ Flow Event Monitoring ☐ Designing a Monitoring Plan
☐ Advanced Chemical Parameters, such as _____

_____

_____

☐ Groundwater/Well Monitoring ☐ Wetlands ☐ Geology/Ecoregion
☐ Refreshers in Level One ☐ Side-by-side with professional check-ups

Any other workshop or training suggestions:

_____

_____

_____

6. How did the logistics of this workshop work for you? Please rate the following:

	Poor	No Opinion	Great
Day of week:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		
Time of year:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		
Location:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		
Cost:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10		

7. Additional comments:

Appendix 21. Evluation form – IOWATER benthic indexing.

EVALUATION FORM – please complete and return at the end of the training
IOWATER Benthic Indexing

1. Based on the following scale, how would you rate the quality of this training? (Please circle one)

1=I should have stayed home.
5=This experience was somewhat worthwhile.
10=Outstanding! I will recommend it to others!

1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

2. How did you hear about our program? (Check all that apply)

☐ Conference/Event that I attended ☐ Internet/Web
☐ Friend ☐ Newsletter ☐ E-mail list
☐ Newspaper/TV/Radio ☐ At work
☐ Other (list) _____

3. Did you find the following sessions interesting and/or informative? (Please circle Yes or No)

Yes / No Introduction to Benthic Macroinvertebrate Life History
Yes / No Going over the Methods in the classroom
Yes / No Submitting Benthic Macroinvertebrate Data
Yes / No Practice with the dichotomous key and reference collection

4. Please rate the following:

	Poor Opinion Great
Monitoring Equipment:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Handouts:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10.

Additional handouts or equipment you would suggest:
_____
_____

5. How did the logistics of this workshop work for you? Please rate the following:

	Poor No Opinion Great
Day of week:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Time of year:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Location:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Cost:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

6. Additional comments on the back please.

EVALUATION FORM – please complete and return at the end of the training
IOWATER Bacteria Monitoring

1. Based on the following scale, how would you rate the quality of this training? (Please circle one)

1=I should have stayed home.
5=This experience was somewhat worthwhile.
10=Outstanding! I will recommend it to others!

1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

2. How did you hear about our program? (Check all that apply)

☐ Conference/Event that I attended ☐ Internet/Web
☐ Friend ☐ Newsletter ☐ E-mail list
☐ Newspaper/TV/Radio ☐ At work
☐ Other (list) _____

3. Did you find the following sessions interesting and/or informative? (Please circle Yes or No)

Yes / No Introduction to Bacteria Monitoring
Yes / No Going over the Assessment in the classroom
Yes / No Practice Counting Bacteria with printed examples
Yes / No Practice Counting Bacteria with plated examples
Yes / No Practice labeling plates and plating bacteria
Yes / No Submitting Data and Retrieving Data

4. Please rate the following:

	Poor Opinion Great
Monitoring Equipment:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Handouts:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10.

Additional handouts or equipment you would suggest:
_____
_____

5. How did the logistics of this workshop work for you? Please rate the following:

	Poor Opinion Great
Day of week:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Time of year:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Location:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
Cost:	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

6. Additional comments on the back please.