Polk County Conservation
Water Quality Monitoring Program
QUALITY ASSURANCE PROJECT PLAN

September 2015

Prepared by:

Polk County Conservation
Water Quality Monitoring Program
12130 NW 128th Street
Granger, Iowa 50109

Project currently funded through the Polk County Water Land and Legacy Bond

Revised: September 2020

A1 - Approval Page

Quality Assurance Project Plan
For
Polk County Conservation
Polk County Conservation Water Quality Monitoring Program

A program dedicated to the study of the quality
of streams and creeks in the Polk County area.

Approved By:

PCCWQMP Coordinator Signature Ginny Malcomson

Name/Date 9/30/2020

PCCWQMP-QA Officer Signature

Name/Date 9/30/2020

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The following U.S. Environmental Protection Agency document was used extensively in the development of the template Quality Assurance Project Plan for Polk County Conservation Water Quality Monitoring Program. The Volunteer Monitor's Guide to Quality Assurance Project Plans, 1986.

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SECTION A - PROJECT MANAGEMENT

A3 - DISTRIBUTION LIST

The individuals and organizations that will receive a copy of the Quality Assurance Project Plan (QAPP) and any subsequent revisions include the Polk County Conservation Water Quality Monitoring Program (PCCWQMP) Coordinator, The PCCWQMP Quality Assurance Officer, PCCWQMP Field Monitors, PCCWQMP Volunteers, and Iowa Department of Natural Resources. A copy will also be placed on the Polk County Conservation website and will be available at the office of the Polk County Conservation for public viewing.

Table 1: PCCWQMP Staff Contact Information

Name/Title	Contact Information
PCCWQMP Coordinator – Ginny Malcomson	Phone Number: 515-323-5319 Email: Ginny.Malcomson@polkcountyiowa.gov
Quality Assurance Officer – Amanda Brown	Phone Number: 319-361-7514 Email: Amanda.Brown@polkcountyiowa.gov
Field Monitors/Volunteers	**See Project Coordinator
Iowa DNR – Steve Konrady	Phone Number: 515-725-8388 Email: Steven.Konrady@dnr.iowa.gov
Laboratory Contact	State Hygienic Lab: (515) 725-1600 Des Moines Water Works: (515) 283-8700

A4 - PROJECT ORGANIZATION

Polk County Conservation Water Quality Monitoring Program (PCCWQMP) is currently funded by the Polk County Water and Land Legacy Bond (PCWLL).

Personnel involved in the implementation of the PCCWQMP include the PCCWQMP Coordinator, Quality Assurance Officer, Field Monitors and PCCWQMP Volunteers. Data users may include the state of Iowa and the general public.

Polk County Conservation Water Quality Monitoring Coordinator will:

- Assure the PCCWQMP conforms to the PCCWQMP Quality Assurance Project Plan policies and procedures
- Identify monitoring parameters, to insure they conform to PCCWMPQ Quality Assurance Project Plan procedures
- Generate maps and field forms
- Generate monitoring kits and coordinate supplies
- Coordinate and upload the collection of data for Polk County Conservation and Environment Protection Agency from the field assessments
- Generate graphs, maps, and tables summarizing the data
- Write summary reports of the data as requested and maintain the official, approved version of this Quality Assurance Project Plan
- Train field monitors

- Provide customer assistance to field monitors
- Coordinate the development of any new training materials
- Maintain database of all field monitors that have completed the PCCWQMP Introductory Workshop
- Assist in data analysis
- Maintain program budget

Polk County Conservation Water Quality Monitoring Program Quality Assurance Officer will:

- Write and revise PCCWQMP QAPP
- Oversee the quality assurance plan to confirm the accuracy of the field testers
- Provide customer assistance to field monitors
- Evaluate new test kits/procedures for field use for PCCWQMP to improve monitoring and accuracy of data
- Analyze PCCWQMP data for integrity
- Assist in training new field monitors
- Assist in writing, editing and reviewing reports

Polk County Conservation Water Quality Monitoring Program Field Monitors:

- Attend PCCWQMP Introductory Workshop for water testing
- Collect samples and records data on pre-determined locations around Polk County Iowa
- Monitor data trends for any abnormalities
- Report data to the PCCWQMP Coordinator
- Attend scheduled trainings and annual meeting

Table 2: PCCWQMP Project Organization

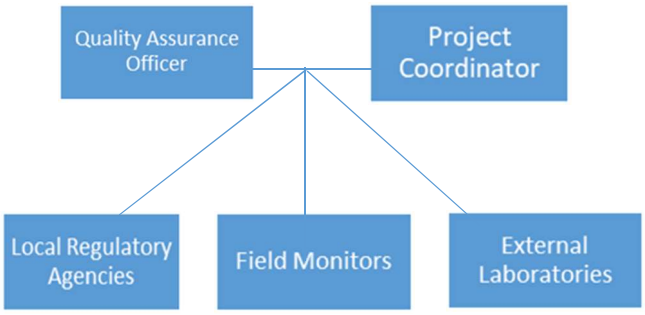
Name	Title	Organizational Affiliation
Ginny Malcomson	PCCWQMP Coordinator	Polk County Conservation
Amanda Brown	Quality Assurance Officer	Polk County Conservation
Various *See PCCWQMP Coordinator for List	Field Monitors	Various *See PCCWQMP Coordinator for List

Polk County Conservation has various resources they reach out to on an as needed basis for guidance and expertise. Below is a list of these resources:

- Mary Skopec - Lakeside Laboratory
- Polk County Conservation Board
- Iowa Department of Natural Resources
- Iowa Hygienic Lab at DMACC-Ankeny Campus
- Iowa State University
- Drake University

- Des Moines Water Works
- University of Iowa
- University of Northern Iowa
- Local Watershed Management Authorities
- Iowa Geological Survey

Figure 1: PCCWQMP Project Hierarchy



A5 - PROBLEM DEFINITION/BACKGROUND

The Polk County Conservation Board's mission is to provide the citizens of Polk County with quality outdoor recreation, conservation education, and long term protection of Polk County's natural heritage. To accomplish these goals it is important that Polk County Conservation has current and relevant information about the streams that flow into the watersheds of Polk County. In order to gain this knowledge, Polk County Conservation has established the PCCWQMP.

A5.1 – Problem Definition

Agricultural run-off has increased nutrient and sediment loads, posing risks for the Des Moines metro drinking water source as well as contributing to the Gulf of Mexico hypoxic zone. Due to increased development in the metro, the streams running through Polk County's urban areas are also becoming polluted. Increased impervious surfaces and less stream buffer has led to increased sediment and pollutant loads as well as extreme bank instability. This overall decline in stream health is leading to negative effects on local wildlife and plant diversity.

The goal of this monitoring is to design and implement a series of monitoring events that will assess the water quality of the watersheds within Polk County. This will give us an understanding of what water quality issues are present and pinpoint areas where we can reduce these issues.

A5.2 – Background

Stream monitoring has been going on for decades in the State of Iowa, which has led to an abundance of historical data. Our monitoring program is based off of one program in particular, IOWATER. This program was created in 1998 by The Iowa Department of Nature Resources (DNR). Since creating this program, trained volunteers monitored streams statewide and submitted data regularly. Monitoring consisted of chemical, physical, and biological parameters. In 2019, this program was eliminated, leading to gap in data. Polk County Conservation felt a need to fill this gap by creating a similar program with similar monitoring protocols.

The existing data from the IOWATER program can be found on the EPA WQX website. We will compare this data to that obtained through our program in order to get a broader picture of past stream health. For example: we will compare the historical data of one stream to the data we are obtaining to determine stream health. Because of the similar sampling protocols, we feel we can use this data for comparison within reason.

Intended Usage of the Data:

The historical data as well as the data collected through our program will be used in the following ways.

- establish baseline conditions that will be used to determine the health of the stream for Chemical/Physical, Biological, and Habitat parameters
- analyze any trends in the quality of the stream over time
- determine if restoration efforts are improving environmental conditions
- identify other streams/creeks that might benefit from the monitoring process
- increase other agency's understanding of the needs of the streams and watersheds

throughout Polk County
- determine areas that might be used by the public for education and wildlife programs, such as creating wetlands
- assess areas that have significant change from previous trend
- Use data to become aware of sudden changes in stream health that warrant immediate action (red flag network)

The data obtained through this program will be available to the public by request or on the EPA's website. The PCCWQMP Coordinator and the Quality Assurance Officer will work with local University professors to interpret and analyze the data obtained through this project. Other potential users of data include local, state, and federal government agencies, non-profits, and other local environmental groups.

A6 - PROJECT/TASK DESCRIPTION

In November 2012, Polk County received the Polk County Water and Land Legacy Bond. In part this bond allowed Polk County Conservation to start a water monitoring program to help assess the quality of our watersheds in Polk County, Iowa. This created the PCCWQMP in the spring of 2015. In a partnership between PCCWQMP employees, numerous city governments, and volunteers, assessments are conducted twice per month on 70 sites at various points on creeks, streams and drainage ditches. Originally, site locations were selected in partnership with IOWATER sites (32 total sites), but site locations have since been expanded. (See Table 1).

A6.1 – Project Objectives

Primary Parameters:
The primary purposes of the PCCWQMP is to monitor for "trends" of change over time and look for significant change in any particular stream. Physical, chemical, and biological parameters will be looked at and results will be compared over time.

Secondary Parameters:
The Habitat Assessment is the secondary purpose of testing. This is tested to see how the primary parameters affect the habitat of the streams. This will be compared year to year to see how changes in the primary parameters affected the living ecosystems of the water.

Specific objectives of this project are as follows:

- establish a baseline for determining stream health based on chemical, physical, habitat, and biological parameters
- assess the health of the local watersheds within Polk County and target areas in need of water quality improvement
- create partnerships with the public in order to grow our water monitoring program by enlisting volunteers to assist in expanding our collection sites
- develop a better understanding of the needs of our watershed system within Polk County

Overview of Sampling and Reporting:
Each sampling event includes chemical and physical assessments. The Chemical/Physical Assessment data will be collected twice a month and the data is reported to the Environmental Protection Agency (EPA) database. The collection windows are the first and third week of each month. Polk County Conservation will keep a data system for the monitoring data of the streams internally in order to self-monitor the streams.

Biological assessments are to be completed once per year, preferable mid-July. This will be used to monitor what types of benthic macroinvertebrates are present at the time of testing.

All testing results are compared to the history of the test site looking for changes and to

the PCCWQMP Guidelines and parameters.

Quarterly reports containing results from the past quarter will be generated four times per year. An annual report will also be generating with in depth narrative and graphs highlighting the data gathered throughout the past year.

A6.2 - Study Area

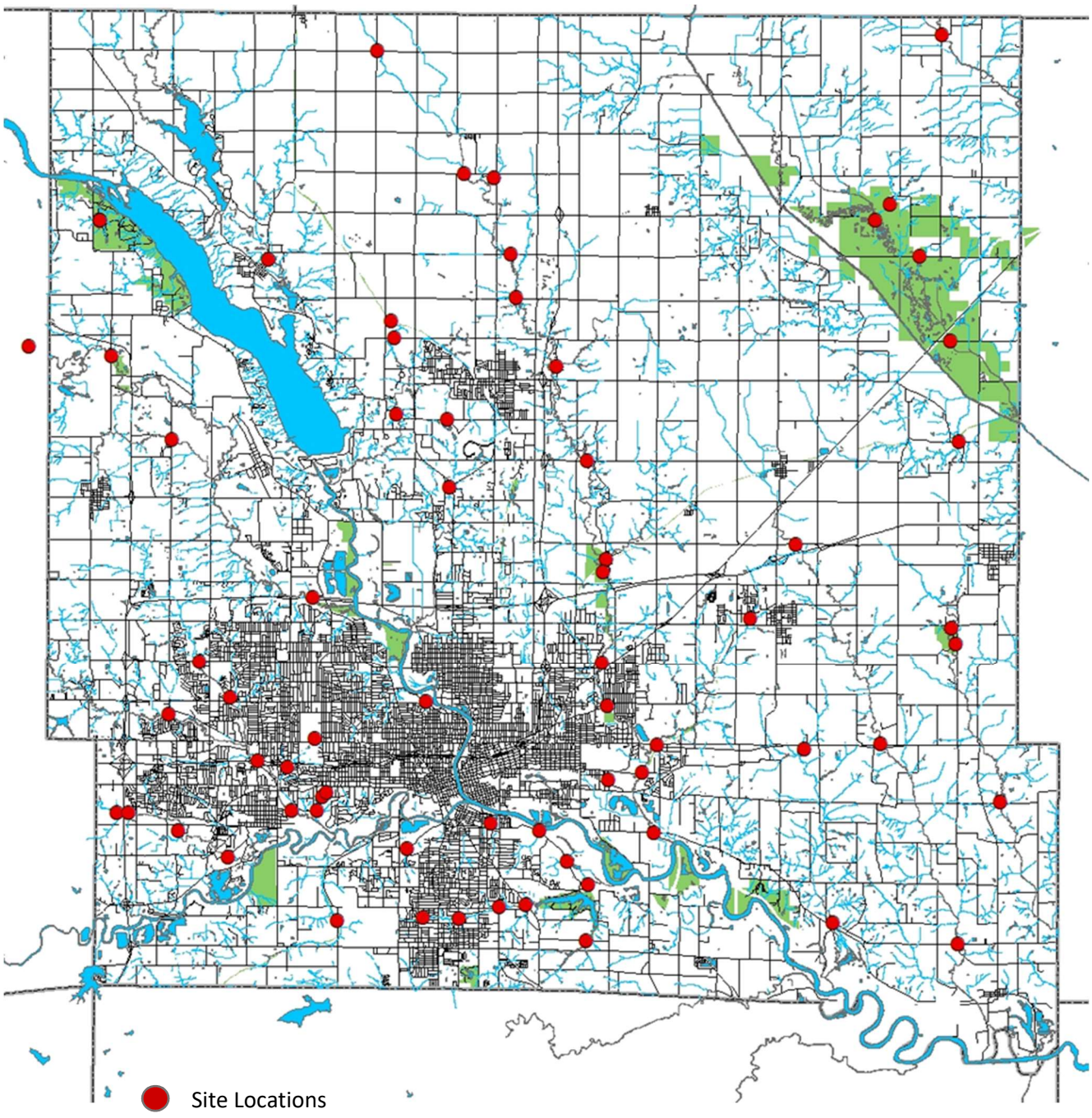
Currently 70 sites are monitored bimonthly throughout Polk County. Creeks currently being monitored include: Beaver, Big, Bluff, Camp, Carney, Des Moines Area, Fourmile, Jordan, Mud, Northeast Polk, Paw, Rock, Saylor, Spring, Walnut, and Yeader as well as Drainage Ditches 4 and 38. This is approximately 185 miles of water.

Table 3: PCCWQMP Site Locations

Site #	County	Site Name
925036	Dallas	Beaver Creek Snapshot (Site 18 - Beaver Creek)
977003	Polk	Yeader Creek
977012	Polk	"Unnamed Creek" - trib. to Grays Lake
977029	Polk	Jordan Creek
977043	Polk	Fourmile Creek
977066	Polk	Polk County Snapshot (Site CC1 - Camp Creek)
977067	Polk	Polk County Snapshot (Site CC2 - Camp Creek)
977072	Polk	Polk County Snapshot (Site FMC1 - Fourmile Creek)
977073	Polk	Polk County Snapshot (Site FMC10 - Fourmile Creek)
977075	Polk	Polk County Snapshot (Site FMC3 - Fourmile Creek)
977078	Polk	Polk County Snapshot (Site FMC6 - Fourmile Creek)
977079	Polk	Polk County Snapshot (Site FMC7 - Fourmile Creek)
977081	Polk	Fourmile Creek at Easton Avenue
977082	Polk	Frink Creek near GWT and SW 42nd
977085	Polk	Polk County Snapshot (Site JC1 - Jordan Creek)
977087	Polk	Laurel Hill Cemetery Stream
977099	Polk	Polk County Snapshot (Site NWC3 - North Walnut Creek)
977104	Polk	Polk County Snapshot (Site RC1 - Rock Creek)
977105	Polk	Polk County Snapshot (Site RC2 - Rock Creek)
977106	Polk	Polk County Snapshot (Site Saylor Creek)
977108	Polk	Polk County Snapshot (Site SC2 - Spring Creek)
977109	Polk	Golf Creek- Exiting Waveland Golf Course
977112	Polk	Polk County Snapshot (Site WC3 - Walnut Creek)
977117	Polk	Polk County Snapshot (Site YC2 - Yeader Creek)
977120	Polk	Beaver Creek Snapshot (Site 19 - Beaver Creek)
977121	Polk	Beaver Creek Snapshot (Site 20 - Little Beaver Creek)
977147	Polk	Walnut Creek at Colby Park
977150	Polk	Jordan Creek 2 - Barker Lemar
977152	Polk	Camp Creek/Thomas Mitchell Park
977160	Polk	Polk County Snapshot (Site Beaver Creek at Prairie Point)
977189	Polk	N of Prairie Trail at Magazine
977192	Polk	Big Creek – Through Polk City Park/Refuge
977196	Polk	Ankeny-Woodward bike trail & Rock Creek
977197	Polk	Walnut Creek at North Valley Drive
977242	Polk	Spring Creek (PH Site 6)
977252	Polk	North Walnut Creek - DS of tributary, N of Hickman Rd.
977257	Polk	North Walnut Creek - DS of trib (storm sewer), N of Univ. Blvd.
977270	Polk	Jordan Creek at Walking Trail Bridge
977273	Polk	Yeader Creek OP

Site #	County	Site Name
977275	Polk	Easter Lake Outlet
977300	Polk	Paw Creek
977301	Polk	Fourmile Creek
977302	Polk	Mud Creek North of Runnells
977303	Polk	Mud Creek - NE 62nd
977304	Polk	Mud Creek - NE 12th AVE
977305	Polk	Yeader Creek - S Union
977306	Polk	Bluff Creek - 118th
977307	Polk	Carney Creek at Buttonbush
977308	Polk	Fourmile Creek - Vandalia AVE
977309	Polk	Deer Creek
977310	Polk	Drainage Ditch 4 - Control Marsh
977311	Polk	Drainage Ditch 38
977312	Polk	Muchiknock Creek at Fourmile Creek
977313	Polk	Paw Creek - Golf Course Fork
977321	Polk	Little Fourmile Creek at E University in Pleasant Hill
977322	Polk	Santiago Creek at Bridge Near NE 82nd AVE
977323	Polk	"Unnamed Creek at Three Lakes Estates"
977324	Polk	Little Fourmile Creek at Altoona
977325	Polk	Crawford Creek at SE 9th
977326	Polk	Case Lake Inflow
977327	Polk	Indian Creek at NE 162nd Ave
977328	Polk	Prospect Park- Tributary of DSM River
977329	Polk	Unnamed Creek at Hartford Avenue and DSM River Trail
977330	Polk	Glendale Cemetery
977331	Polk	"Unnamed creek in Alleman Country Estates"
977332	Polk	Fourmile Creek west of Alleman Country Estates
977333	Polk	Greenwood Pond Inflow - West Side
977334	Polk	Greenwood Pond Inflow - East Side
977335	Polk	Greenwood Pond Outflow

Figure 2: 2019-2020 PCCWQMP Site Locations



A6.3 - Project Schedule/Timetable

Table 4: PCCWQMP Project Schedule

Activity	Projected Start Date	Anticipated Completion Date
Site Selection	Spring 2015	On going
Training	9/3/2015 - 2018 by Rich Leopold, Polk County Conservation Director	On going
	6/10/2016 – current Ginny Malcomson, PCCWQMP Coordinator 11/20/19 – current Amanda Brown, QC Officer	
Monitoring-Habitat Assessment	September 15, 2015	On going
Monitoring-Chemical/Physical Assessment	September 15, 2015	On going
Monitoring-Biological Assessment	July, 2016	On going
Data Input	Within one week of collection	On going
Report	Data analyzed monthly for changes and trend variations	On going

A7 - DATA QUALITY OBJECTIVES AND INDICATORS

A7.1 – Data Quality Objectives

The main objective for the PCCWQMP is to establish a knowledge of current conditions of the streams within Polk County, Iowa through various testing parameters and then determining solutions to overcome water quality issues we are seeing. A baseline will be created for the streams, allowing future changes to be identified as testing continues. The project will also serve as a red flag network, using the data to alert staff of potential contamination issues that need immediate attention (sewer leaks, fish kills…etc.).

As data is obtained and analyzed, decisions will be made based on findings as to what next steps should be taken to address poor water quality. Pollutant hot spots (areas with consistent high contaminants) will be mapped and potential actions will be explored to reduce these levels. If data shows that immediate action is needed, project leaders will take action to reach out to appropriate partners and address the issue.

A7.2 – Action Limits/Levels

The project will utilize certain limits within each testing parameter that will guide our decision to take action to address a water quality issue. See Table 5 for the list of parameters that have action limits for this project.

Table 5: Parameter Action Limits

Parameter	Normal Range	Action Limit	Source
pH	6.5 – 9	<6 or >9	Iowa DNR
Nitrate-N	6.5 – 9 mg/L	>20 mg/L	Iowa DNR
Nitrite-N	<0.3 mg/L	>0.3 mg/L	Iowa DNR
Dissolved Phosphate	<0.6 mg/L	>0.6 mg/L	Iowa DNR
Dissolved Oxygen	>5 mg/L	<5 mg/L	Iowa DNR
Chloride	<100 mg/L	>100 mg/L	Iowa DNR

Measurement Range and Increments

Table 3 illustrates the accuracy and measurement range for the components tested through this project (pH, air and water temperature, nitrate-N, and nitrite-N, dissolved phosphate, water transparency, dissolved oxygen measurements and chloride). All samples and testing is done immediately (no holding time) and uses no preservative.

Table 6: Measurement range and increments of PCCWQMP parameters

Sample Matrix	Parameter	Measurement Range	Increments	Analytical Method
Air	Temperature	25 to 125°F	All whole numbers within the range	Thermometer
Water	Temperature	25 to 125°F	All whole numbers within the range	Thermometer
Water	pH	4 to 9 units	4, 5, 6, 7, 8, 9	HACH® Field pH Test Strips
Water	Nitrate-N	0 to 50+ mg/L	0, 1, 2, 5, 10, 20, 50	HACH® Field Nitrate-N Test Strips
Water	Nitrite-N	0 to 3+ mg/L	0, 0.15, 0.3, 1.0, 1.5, 3.0	HACH® Field Nitrite-N Test Strips
Water	Dissolved Phosphate	0 to 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	CHEMetrics® Dissolved Orthophosphate Field Kit
Water	Transparency	0 to 60+ cm	All whole numbers within the range	Transparency Tube – Secchi disk
Water	Dissolved Oxygen	1 to 12+ mg/L	1, 2, 3, 4, 5, 6, 8, 10, 11, 12	CHEMetrics® Dissolved Oxygen Field Kit
Water	Chloride	27-607 mg/L	Quantab Units: 1.6 through 8.0 (every 0.2) which is convert to whole numbers.	Hach® Field Chloride Test Strips

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

There will be occasions local testing laboratories will be used to analyze data collected through the project. The PCCWQMP Coordinator and Quality Assurance Officer will decide when this is needed. Potential instances may include further testing to determine pollutant source and testing for accuracy of field samples. Tables 7 and 8 highlight the measurement range and accuracy of the two local laboratories that will be used.

Table 7: Parameter list and objectives for Des Moines Water Works Lab

Analyte	Sample Container*	Analytical Method	Method Detection Limit	Estimated Accuracy of True Value**	Accuracy Protocol	Estimated Precision (% Relative Diff.) ***
Bromide	500 ml HDPE	USEPA 300(A)	0.031 mg/L	97%	±10%	2
Chloride	500 ml HDPE	USEPA 300(A)	0.1551 mg/L	98%	±10%	2
E. coli Bacteria	120 ml, polystyrene with sodium thiosulfate as a preservative	APHA-9223-B	1 MPN per 100 mL	80%	None	20
Fluoride	500 ml HDPE	USEPA 300(A)	0.014 mg/L	97%	±10%	3
Nitrate-N	500 ml HDPE	USEPA 300(A)	0.009 mg/L	97%	±10%	1
Nitrite-N	500 ml HDPE	USEPA 300(A)	0.004 mg/L	96%	±10%	5
Orthophosphate as P	500 ml HDPE	USEPA 300(A)	0.068 mg/L	95%	±10%	1
Specific Conductivity	500 ml HDPE	APHA-2510B	5 µS/cm	95%	±10%	3
Sulfate	500 ml HDPE	USEPA 300(A)	0.137 mg/L	97%	±10%	1
Total Coliform Bacteria	120 ml, polystyrene with sodium thiosulfate as a preservative	APHA-9223-B	1 MPN per 100 mL	80%	None	20
Total Dissolved Solids	500 ml HDPE	APHA-2510A	3 mg/L	97%	±10%	4
Turbidity	500 ml HDPE	APHA-2130	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

Analytical Performance of Lab 4/2009

*Sample matrix collected: water with no preservative and 24 hour holding time.

**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).*Samples held for 24 hours with no preservative.

Table 8: Parameter list and objectives for University of Iowa Hygienic Lab

Analyte	Sample Container	Preservative	Holding Time	Analytical Method	Method Detection Limit	Est. Accuracy of True Value	Accuracy Protocol	Estimated Precision (Relative % Diff.)
Acetochlor	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-13%	Bias on spikes	10.9% *
Alachlor	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-13%	Bias on spikes	6.4%*
Ametryn	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-28.10%	Bias on spikes	15.5% *
Ammonia - Nitrogen as N	250 ml plastic	H2SO4 to pH <2; Cool to 4◦C	28 days	LAC10-107-06-1J	0.05 mg/L	14%	Recovery on spikes	RDP < 20%
Atrazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-11%	Bias on spikes	7.4% *
Bromacil	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-41%	Bias on spikes	15.3% *
Butylate	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-14.20%	Bias on spikes	9.6% *
Chlorophyll A SM17 10200 H 2	1 liter plastic	Cool, 4°C	21 days on frozen filter	EPA 445.0 R 1.2	1 µg/L	+/- 10%	Standards, lab blanks, splits, duplicates	RPD <20%
Cyanazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-29%	Bias on spikes	17.1% *
Diesel Fuel	1 liter glass	Cool, 4°C	7 days	OA-2	100 µg/L	-28%	Bias on spikes	10% *
Desethyl Atrazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-51.80%	Bias on spikes	12.3% *
Desisopropyl Atrazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-78.30%	Bias on spikes	15.9% *
Diazinon	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	1.60%	Bias on spikes	6.5% *
Dimethenamid	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-15.30%	Bias on spikes	7.3% *
E. coli Bacteria (UHL)	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	EPA 1603 (modified mTEC)	10 CFU	NA	NA	Three-year Average = 0.21
Enterococci Bacteria	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	APHA-9230-C	10 CFU	NA	NA	Three-year Average = 0.24
EPTC	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-15.60%	Bias on spikes	10.2% *
Fecal Coliform Bacteria	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<24 hours, <10°C for surface water	APHA-9222-D	10 CFU	NA	NA	Three-year Average = 0.23
Gasoline	1 liter glass	Cool, 4°C	7 days	OA-2	100 µg/L	-28%	Bias on spikes	10% *
Kjeldahl Nitrogen, Total	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-107-06-2E	0.1 mg/L	+/- 10%	Recovery on spikes	RPD <20%
Metolachlor	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-12.60%	Bias on spikes	5.6% *
Metribuzin	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-7.80%	Bias on spikes	6.2% *
Mineral Spirits	1 liter glass	Cool, 4°C	7 days	OA-2	100 µg/L	-28%	Bias on spikes	10% *
Motor Oil	1 liter glass	Cool, 4°C	7 days	OA-2	100 µg/L	-28%	Bias on spikes	10% *
Nitrate+Nitrite-Nitrogen	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	EPA 353.2	0.05 mg/L	±0.1 low level	Recovery on spikes	RDP < 20%
Organic Nitrogen	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-107-06-2E	0.05 mg/L	20%	Recovery on spikes	RDP < 20%
Orthophosphate, Filterable as P TIM 781-86T	250 ml plastic	Filter immediately Cool, 4°C	48 hours	LAC10-115-01-1A	0.02 mg/L	+/- 10%	Recovery on spikes	RPD <20%
Pendimethalin	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-12.80%	Bias on spikes	10.6% *

Petroleum Hydrocarbons	1 liter glass	Cool, 4°C	7 days	OA-2	100 µg/L	-28%	Bias on spikes	10% *
Phosphate, Total	250 ml plastic	Cool, 4°C H_2SO_4 to pH<2	28 days	LAC10-115-01-1D	0.02 mg/L	5%	Recovery on spikes	RPD <20%
Prometon	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-20.30%	Bias on spikes	12.2% *
Propachlor	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-10.70%	Bias on spikes	6.3% *
Propazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-11.10%	Bias on spikes	9.3% *
Simazine	1 liter glass	Cool, 4°C	14 days	USEPA 507	0.1 µg/L	-12.50%	Bias on spikes	17.3% *
Total Dissolved Solids EPA 160.1	1 liter plastic	Cool, 4°C	7 days	SM 2540 C	1 mg/L	+/- 10%	Concentration dependent	RPD <20%
Total Suspended Solids USGS I-3765-85	1 liter plastic	Cool, 4°C	7 days	USGS I-3765-85	1 mg/L	10%	EPA check samples	RPD <20%
Total Volatile Suspended Solids	1 liter plastic	Cool, 4°C	7 days	USEPA 160.1	1 mg/L	20%	NA	RPD <20%
Trifluralin	1 liter glass	Cool, 4°C	14 days	USEPA 507	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

A8 - TRAINING REQUIREMENTS/CERTIFICATION

All field monitors will complete the PCCWQMP Level I Workshop through PCCWQMP before they are allowed to complete testing for the PCCWQMP. This workshop is based on the IOWATER Level 1 Workshop that was designed by the Iowa DNR. Polk County Conservation employees, volunteers, and city government partner employees are required to attend a Level 1 workshop where they learn how to monitor streams, lakes, and ponds. Upon completion of the Level 1 workshop, an individual becomes a certified Field Monitor which enables them to monitor for PCCWQMP. 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 complete the habitat, chemical/physical, and biological field assessment forms using field test kits. The workshop incorporates:

- An introduction to program 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
- How the data is used
- Overview of benthic macroinvertebrates – includes key for identification
- Networking with others concerned about water quality
- What to do if they find abnormal results, fish kills, toxic spills, or illegal activity

The Level 1 workshop will be organized and administered by the PCCWQMP Coordinator and the Quality Assurance Officer. The workshop will be held on an as needed basis as new volunteers, city staff, and Polk County Conservation staff come on board.

In times when in person training is not recommended, such as during the COVID-19 pandemic, virtual training will take place. This training consists of online learning modules that are sent to the participant. The participant must watch these modules and then take an exam over the material. The answers to the exam will be sent to the PCCWQMP Coordinator. The PCCWQMP Coordinator will review the answers and decide if the participant has passed the training or if more training is needed. Once the participant passes the online training, they must go out to the field at least once with a PCCWQMP certified field monitor in order to go through the field portion of training.

Individuals trained through the virtual training are not allowed to complete biological/habitat monitoring without a PCCWQMP certified field monitor who has previously taken the in-person training.

Once a volunteer has completed the PCCWQMP Level 1 workshop they can expand their monitoring skill set by attending additional Advanced Workshops. Advanced Workshops may include Bacteria Monitoring and Benthic Macroinvertebrate Indexing and will be offered as they become available.

Field monitors are required to maintain the assigned schedule of assessments. If the Field Monitor (other than PCCB staff) fails to complete the assessments in the assigned times, they can be terminated from site(s). For the following requirements, weather and safety are considerations in determining if the failure to obtain samples will be considered excused or unexcused.

- Field Monitor fails to complete and report two consecutive assessments (unexcused)
- Field Monitor fails to complete and report more than three assessments in a given 12 month time period (unexcused)

PCCB staff field monitors must complete duties as above as well. Tasks are a part of their job duties and if they fail to complete above tasks, appropriate action will be taken by their supervisor.

If any field monitor is unable to complete the assessment, they are required to contact the PCCWQMP Coordinator with an explanation. It is the PCCWQMP Coordinator that may determine the status of the exclusion (excused or unexcused).

The PCCWQMP Coordinator will maintain a current list of all field monitors with their Level I date of completion and any advanced workshops completed.

All field monitors are required to attend the annual meeting as well as other meetings assigned as required by the PCCWQMP Coordinator or Quality Assurance Officer.

A8.1 – Specialized Experience

At times, laboratories may be utilized in order to test grab samples taken as part of the project.

A9 - DOCUMENTATION AND RECORDS

A9.1 – Field Data

PCCWQMP Field Monitors complete the field assessment forms on-site at the time of the sampling (see appendices 2-4). The forms include: Stream Habitat Assessment (Appendix 4), Biological Assessment (Appendix 2), and Chemical/Physical Stream Assessment (Appendix 3).

When monitoring is complete, the PCCWQMP Field Monitors will deliver completed forms to the PCCWQMP Coordinator. This can be either hard copy, fillable pdf, scanned copy via email, or fax. Forms should be submitted no later than the Monday following the test week. The PCCWQMP Coordinator will input data into Excel files and the EPA database. Forms will be maintained by Polk County Conservation until time allows to scan a digital copy into the Polk County Conservation's document management system.

Quality control checks, performed by the PCCWQMP Quality Assurance Officer, will follow this same protocol. The data from these checks will not be uploaded to the EPA, but will just be used as comparison of field sampling data. Hard copies will be uploaded to the Polk County Conservation's document management system by the PCCWQMP Coordinator and stored in a separate file.

A9.2 – Polk County Snapshot Data

The Polk County Snapshot may occur twice a year, once in the spring and once in the fall, and is coordinated by an outside party. Volunteers gather at a centralized meeting location in the morning and disperse in teams to complete chemical/physical stream assessment as assigned sites. Forms are completed in the field and returned to the PCCWQMP Coordinator who translates into a digital format, uploads data to the EPA and sends data to Snapshot Coordinator who compares to data from PCCWQMP sites.

A9.3 – Laboratory Data (chain of custody…etc.)

Samples may be sent to laboratories for future analysis on an as needed basis. Chain of custody forms may be submitted by the PCCWQMP Coordinator or Quality Assurance Officer and digital copies will be stored by PCCB staff. Lab results may be analyzed by PCCWQMP staff or outside sources. Results will be entered into the PCCWQMP database and stored by PCCB.

A9.4 – Issues/Problems Reports

The PCCWQMP Coordinator compiles issues and abnormal results reports the week following a sampling week (bi-monthly). These reports are distributed to the PCCWQMP Quality Assurance Officer for review. The documents are stored electronically in an Excel file indefinitely.

A9.5 – QAPP

The QAPP will be stored electronically in the Polk County Conservation's document management system. The Quality Assurance Officer will update the QAPP on a yearly basis and distribute to those individuals listed in section C2. A hard copy will also be kept by the Quality

Assurance Officer for viewing.

A9.6 – Seasonal and Annual Reports

Seasonal reports are prepared by the PCCWQMP Coordinator on a quarterly basis and annual reports are prepared on a yearly basis. These reports are distributed to the field monitors and program staff and are also available for public viewing. Completed documents are stored in the Polk County Conservation's document management system.

A9.7 – Data assessment records

Program data is assessed by the PCCWQMP Quality Assurance Officer as well as partner organizations. Records of the data assessment are archived at Polk County Conservation.

A9.7 – Miscellaneous Documents/Records

Not applicable

SECTION B - DATA GENERATION AND ACQUISITION

B1 - SAMPLING PROCESS DESIGN

Surface water quality samples are collected, analyzed and recorded following this PCCWQMP QAPP. Site selection was completed with the collaboration of Polk County Conservation, IOWATER, city governments, and the Iowa DNR.

B1.1 Rationale for Selection of Sampling Sites

The PCCWQMP selects testing sites with consideration of the need factors around them, including accessibility of the site, proximity to activities that may alter water quality, and ability to contribute to measuring an overall ambient baseline condition. PCCWQMP discusses site options that will impact Polk County watersheds with IOWATER, city governments, and the Iowa DNR to determine locations which provide the most benefit to all groups for the betterment of the Polk County.

B1.2 Rationale for Sampling Methods

The sample methods used for this project were based off of the protocol used in the Iowa Department of Natural Resources IOWATER program. It consists of field monitors sampling at each site without any holding time – data is collected in the field at the time of sampling. Frequency, timing, and parameters to be measured for all locations is summarized in the table below. Actual sampling locations can be found in Table 3 in section A6.

Table 9: Types and Frequency of Sampling Parameters

	Type of Sample or Parameter	Sampling Frequency	Sampling Period

IOWATER Level 1 Biological	Identification of Benthic Macroinvertebrates	July	Yearly
	Aquatic Plant Cover	July	Yearly
	Algae Cover	July	Yearly
PCCWQMP Level 1 Chemical/Physical	Weather	Twice per month	1st and 3rd week of the month
	Air Temperature	Twice per month	1st and 3rd week of the month
	Precipitation	Twice per month	1st and 3rd week of the month
	pH	Twice per month	1st and 3rd week of the month
	Dissolved Oxygen	Twice per month	1st and 3rd week of the month
	Nitrite-N	Twice per month	1st and 3rd week of the month
	Nitrate-N	Twice per month	1st and 3rd week of the month
	Dissolved Orthophosphate	Twice per month	1st and 3rd week of the month
	Water Color	Twice per month	1st and 3rd week of the month
	Water Odor	Twice per month	1st and 3rd week of the month
	Stream Width	Twice per month	1st and 3rd week of the month
	Stream Depth	Twice per month	1st and 3rd week of the month
	Stream Velocity	Twice per month	1st and 3rd week of the month
	Water Temperature	Twice per month	1st and 3rd week of the month
	Transparency	Twice per month	1st and 3rd week of the month
	Chloride	Twice per month	1st and 3rd week of the month
PCCWQMP Level 1 Habitat Assessment	Stream Habitat Type	July	Yearly
	Streambed Substrate	July	Yearly
	Microhabitats	July	Yearly
	Stream Banks	July	yearly
	Canopy Cover	July	Yearly
	Riparian Zone Width	July	Yearly
	Riparian Zone Plant Cover	July	Yearly
	Adjacent Land Use	July	Yearly
PCCWQMP Benthic Macroinvertebrate Indexing Module	Stream Habitat Type	July	Yearly
	Dissolved Oxygen	July	yearly
	Water Temperature	July	Yearly
	Transparency	July	Yearly
	Flow	July	Yearly
	Benthic Macroinvertebrate ID	July	Yearly

B1.3 Quality Control of Sampling

The PCCWQMP Quality Assurance Officer will complete quality control of the sampling for the project. The officer will collect quality control check samples at random at each site once per year. The samples will be taken during the designated sampling weeks and utilizing the same methods as the field monitors. Results from the quality control checks and the field monitors data will be compared once both individuals have completed sampling.

B2 - SAMPLING METHODS REQUIREMENTS

B2.1 Equipment

Upon completion of the PCCWQMP Level 1 Workshop, the PCCWQMP Field Monitors will receive the PCCWQMP test kit. Some kits are shared among staff. The PCCWQMP will be responsible for re-supplying the consumable supplies in the kits for all PCCWQMP sites. Table 10 lists all parameters to be sampled and the equipment required. All materials will be provided following the workshop by the PCCWQMP. If field monitors are no longer participating in the program, all equipment must be returned to the PCCWQMP Coordinator within 60 days of notifying PCCWQMP staff.

Table 10: PCCWQMP Parameters to be Sampled and Required Equipment

	Parameter	Sampling Equipment
PCCWQMP Level 1 Biological	Identification of Benthic Macroinvertebrates	Field Observation
	Aquatic Plant Cover	Field Observation
	Algae Cover	Field Observation
	Depth/Width	Meter stick
PCCWQMP Level 1 Chemical/Physical	Weather	Field Observation
	Air Temperature	Thermometer
	Precipitation	NA
	pH	HACH® Field pH Test Strips
	Dissolved Oxygen	CHEMetrics® Dissolved Oxygen Field Kit
	Nitrite-N	HACH® Field Nitrite-N Test Strips
	Nitrate-N	HACH® Field Nitrate-N Test Strips
	Dissolved Orthophosphate	CHEMetrics® Dissolved Orthophosphate Field Kit
	Water Color	Field Observation
	Water Odor	Field Observation
	Stream Velocity	NA
	Water Temperature	Thermometer
	Transparency	Transparency Tube
	Chloride	Hach® Field Chloride Test Strips
PCCWQMP Level 1 Habitat Assessment	Stream Habitat Type	Field Observation
	Streambed Substrate	Field Observation
	Microhabitats	Field Observation
	Stream Banks	Field Observation
	Canopy Cover	Field Observation
	Riparian Zone Width	Field Observation
	Riparian Zone Plant Cover	Field Observation
	Adjacent Land Use	Field Observation
	Human Use Activities	Field Observation
	Evidence of Human Use	Field Observation
	Location of Water Sampling	Longitude/Latitude Coordinates

B2.2 Sampling Methods

Stream Reach and Stream Transect

Observations and parameters measured throughout the PCCWQMP 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 Universal Transverse Mercator (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 protocol for each assessment indicates which should be used.

Stream Habitat Assessment

PCCWQMP conducts a habitat survey annually, in July, unless there is a major change in land use within the watershed at which point additional habitat surveys are completed, as necessary. The habitat assessment is completed along the stream transect at each site with exception to a few observations which request completion along the stream reach. The habitat assessment form will be utilized by the field monitor when completing the assessment (Appendix 4). Parameters observed or measured include: 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. An updated location (longitude/latitude coordinates) for the monitoring site will also be sent with the data. Detailed protocol on how to complete the habitat assessment can be found in Appendix 9.

Stream Biological Assessment

PCCWQMP conducts a biological assessment annually, in July, unless this a major change in land use within the watershed at which point additional habitat surveys are completed, as necessary. The biological assessment form will be used by the field monitor to complete the biological assessment (Appendix 2). A benthic macroinvertebrate key will be provided in order to assist in species identification (Appendix 6). The biological assessment is completed in each microhabitat along the stream reach. Stream depth and width will also be taken at this time. Detailed protocol on how to complete the biological assessment can be found in Appendix 10.

Stream Chemical Assessment

PCCWQMP conducts chemical assessments during the first and third full-weeks of each month, year-round if weather and safety conditions permit. The chemical assessment form will be used to record data (Appendix 3). 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. Detailed protocol for chemical assessment can be found in Appendix 8.

Stream Physical Assessment

PCCWQMP conducts physical assessments during the first and third full-weeks of each month,

year-round if weather and safety conditions permit. The physical assessment form will be used to record data (Appendix 3). Parameters recorded include weather conditions, water color, water odor, air temperature, precipitation during the last 24 hours, transparency, water temperature, ~~stream width, maximum stream depth, stream depth,~~ and stream velocity. Parameters will be sampled at the streams transect. Detailed protocol for physical assessment can be found in Appendix 7.

Bridge and Rope Collection
In special circumstances, chemical and physical sampling may be completed from a bridge. The field monitor must request to use this sampling method BEFORE sampling takes place. Requests must be sent to the PCCWQMP Quality Assurance Officer and the PCCWQMP Coordinator. Reasons for bridge sampling may include but are not limited to high water level and unsafe stream access.

If approved, bridge sampling is conducted on the upstream side of the bridge by 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, the container is again lowered and filled with sample water. The filed monitor completes their physical and chemical assessment utilizing the water within the bucket. The container is lowered into the stream and refilled as often as needed to complete the field tests

Quality Control Samples
Chemical and Physical Assessment quality control samples will be taken by the PCCWQMP Quality Assurance Officer at each site once per year utilizing the same sampling methods stated above.

B3 - SAMPLE HANDLING AND CUSTODY REQUIREMENTS

PCCWQMP does not collect any samples or water, living or nonliving material for processing for the purpose of data collections. Samples are only contained long enough to identify and then released or disposed of per directions.

If there is an event that creates a cause for collection, Iowa DNR Field Office 5 will be notified. It will be at the discretion of Iowa DNR Field Office 5 if the PCCWQMP staff shall collect the sample or if Iowa DNR will collect the samples.

Laboratory Sample Handling
When instances arise where samples must be taken and sent into the lab, the chain of custody forms found in Appendices 11 and 12 will be used by the field monitors. Cases that may warrant the need for laboratory testing include but are not limited to Polk County Snapshot events and source tracking. The following laboratories will be utilized: The University of Iowa Hygienic Laboratory, the Iowa DNR Water Lab, and Des Moines Water Works.

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 when needed. 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 Information 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 assessment forms are the primary and most effective method for documenting field activities and conditions. These forms serve as an initial record of any field measurements and weather conditions at the time sampling occurred. The assessment forms used for this project are found in Appendix 2, 3, and 4.

Each site has a unique six digit code used as an identifier. This code will be listed on the top of each field assessment sheet used at the site. When transferred to a digital format, the file name will also contain this unique identifier.

All data and notes are entered onto these documents at the time of sampling in inedible ink. The date, time, and field monitor's name are also entered. Once sampling is complete, the data is submitted to the PCCWQMP Coordinator who then enters it into an excel spreadsheet and then onto the EPA WQX database.

B4 - ANALAYTICAL METHODS REQUIREMENTS

In the PCCWQMP all of the parameters monitored (Table 10) are done so utilizing the protocols found in section B3. Most of the analytical methods used for the project are completed as on-site field measurements.

Once assessment forms are submitted and entered into an excel spreadsheet by the PCCWQMP Coordinator, further analysis may be completed by the PCCWQMP Coordinator and the Quality Assurance Officer. This analysis serves as a screening process for the data – looking at pollutants to determine if source tracking or other further testing is warranted.

Laboratory analysis may be completed on an as needed basis. Examples when this may be needed is during Polk County Snapshot events and source tracking a pollutant. The laboratory sampling protocol will be used in these cases which is found in section B3.

In some cases, the PCCWQMP Coordinator and Quality Assurance Officer may work with

outside partner organizations to complete further analysis of sampling data. This may include but is not limited to universities, non-profits, or local environmental groups.

B5 - QUALITY CONTROL REQUIREMENTS

B5.1 Quality Control Checks

The PCCWQMP will also conduct individual quality assurance tests at each site once per year to test the accuracy of the test results from the individual monitors. This test will include a second test by the Quality Assurance Officer, using their own testing supplies. The PCCWQMP quality assurance test results will be compared to the test results submitted by the test site's monitor. The PCCWQMP Quality Assurance Officer is responsible for making sure that each test site is quality tested. Ideally the quality assurance test would be conducted by the PCCWQMP Quality Assurance Officer, however, he or she may assign some quality assurance sites to other personnel as needed. Any additional quality assurance personnel must be approved by the Director of Polk County Conservation and must be an employee of Polk County Conservation.

The PCCWQMP Quality Assurance Officer will compare the Field Monitor's test for the given week to the QA test from the same week, and look for variances that would be considered inconsistent enough to question the quality of either the Field Monitor's results or the quality assurance test results.

If there is a significant discrepancy of the quality assurance test data to the Field Monitor's data, the PCCWQMP Quality Assurance Officer will go and take a second set of test samples to compare and the PCCWQMP Quality Assurance Officer will work with the Field Monitor to determine the quality of supplies and monitoring methods. For example are there expired test strips or other supplies that might be affecting their tests? Are they rinsing containers after each test? The stream in question will then be retested and compared again. If there is a large discrepancy in data, the Field Monitor and the Quality Assurance Officer will need to conduct the field test together, going over each step and seeing where something might be going askew. If needed, the PCCWQMP Field Monitor could be asked to retake a PCCWQMP Level 1 Workshop or similar training.

B5.2 Addressing Abnormal Results

Water quality monitoring data can be influenced by many variables and can be challenging to interpret. A field 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, water quality monitors are encouraged to follow the procedures listed within the Abnormal Sampling Results Flow Chart (Appendix 5). Field 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.

B6 - INSTRUMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

PCCWQMP Field Monitors use the equipment that provided by the PCCWQMP. This is checked by the PCCWQMP Coordinator before going to the field to guarantee the following: all is in working order, nothing is broken, ample supplies are available, and test strips and ampoules have not expired. If additional equipment is needed, contact the PCCWQMP Coordinator.

Equipment provided by PCCWQMP after completion of PCCWQMP Level I Workshop include, but not limited to:

a. Program manual developed by the IOWATER program and updated by the PCCWQMP (including Habitat Assessment, Biological Assessment and Chemical/Physical Assessments)
b. Container for carrying testing equipment
c. Hach® test strips- pH (50 tests)
d. Hach® test strips- nitrate- N /nitrite N (25 tests)
e. Hach® titrators- chloride (40 tests)
f. Chemetrics® orthophosphate test kit (30 tests)
g. Chemetrics® dissolved oxygen test kit (30 tests)
h. Armored thermometer
i. Open-reel fiberglass tape measure (100'/30m.)
j. Transparency tube (with secchi disk)
k. Meter stick
l. Bucket and rope for bridge collection (if deemed necessary)

In addition to the equipment and testing supplies, each PCCWQMP Field Monitor will receive a plastic tub, waste containers, and a set of PCCWQMP quick reference guide cards for the steps of sampling each type of assessment (Appendix 1). A PCCWQMP binder that will have blank assessment forms, IOWATER Benthic Macroinvertebrate Key, quick assessment guides on personal safety information including but not limited to, tick identification, poison ivy care, and heat care.

Additional equipment PCCWQMP Field Monitors have access to during the annual Biological and Habitat Assessments include:

- aquatic dip net
- ice cube tray
- forceps
- plastic tub
- magnifying glass

Maintenance by the Field Monitor should be as follows:

- monitor expiration dates of equipment each time it is used and report any outdated supplies to the PCCWQMP Coordinator
- inspect and maintain all sampling equipment is in good working order each time it is used

- rinse dip nets, collection tubs, transparency tubes and sample collection cups with clear water after assessments are complete
- do not leave sampling equipment outdoors to reduce risk of freezing and/or overheating which would cause equipment to lose accuracy

The PCCWQMP Coordinator will keep a supply of monitoring equipment in order to provide replacements when necessary.

B7 - INSTRUMENT CALIBRATION AND FREQUENCY

PCCWQMP Field Monitors will have a standardized kit of equipment made available after they complete the PCCWQMP Level I Workshop. This equipment will not require calibration.

B8 - INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES

All supplies needed to complete field monitoring for the PCCWQMP are listed in Table 10 and in section B6. The PCCWQMP Coordinator will inspect the supplies before distributing to the Field Monitors. It is the Field Monitors responsibility to inspect supplies before it is used each time they go to the field to sample. Excess supplies will be stored at the Polk County Conservation office and distributed by the PCCWQMP Coordinator on an as needed basis.

B9 - DATA ACQUISITION REQUIREMENTS

Various data is obtained from other agencies to supplement the data collected by Polk County Conservation.

- Stream flow information from the U.S. Geological Survey website (http://ia.water.usgs.gov/) is used to determine flow conditions for available streams.
- The reported amount of precipitation an area receives is verified through Iowa Environmental Mesonet, (http://mesonet.agron.iastate.edu/) provided by Iowa State University or Iowa Flood Information System available at http://ifis.iowafloodcenter.org/ifis/app/.
- To pinpoint site locations, latitude and longitude coordinates are found using Google Earth and ArcMap programs.

Polk County Conservation will continue to look for valid and reliable associations to obtain testing information.

Bl0 - DATA MANAGEMENT

Data collected by PCCWQMP Field Monitors is recorded on the individual assessment sheet at the site then delivered to the PCCWQMP Coordinator. This is entered into the PCCWQMP database by the PCCWQMP Coordinator. The database is maintained by Polk County Conservation and the storage of the database is maintained by Polk County Information Technology department. The data is also uploaded to the EPA database via the Internet using a

Polk County Conservation computer. During data entry to the EPA database, a "verify" page allows the opportunity to check that the data being entered is correct. Once data is submitted to the EPA database, any corrections to the data are submitted through the Quality Assurance Officer who then makes the change(s).

Data that is transferred to other organizations for analysis will be sent electronically by the PCCWQMP Coordinator upon request.

SECTION C - ASSESSMENT AND OVERSIGHT

Cl - ASSESSMENT AND RESPONSE ACTIONS

All PCCWQMP Field Monitors shall be required to attend the PCCWQMP Level I training. They will be required to perform the sampling procedures in front of the Quality Assurance Officer and PCCWQMP Coordinator prior to commencement of training. The Quality Assurance Officer and PCCWQMP Coordinator will determine if the procedures were completed correctly and if the field monitor is certified. Field monitors are encouraged to attend a "refresher" course as needed and required to attend the annual meeting to verify they are still using current procedure and their equipment is up to date.

The PCCWQMP will use the protocols in Quality Control Requirements section to assess the sampling data. This includes quality control checks completed by the Quality Assurance Officer at each site once per year. The data will also be compared to the Iowa DNR Watershed Monitoring and Assessment program data and state trends.

C2 - REPORTS TO MANAGEMENT

The PCCWQMP Coordinator will generate reports highlighting the abnormal results the week following a scheduled monitoring week. A report showing issues (sites that were not monitored, incomplete assessments…etc.) will also be generated. These reports will be send to the Quality Assurance Officer for review.

Seasonal reports comparing month to month trends will be compiled by the PCCWQMP Coordinator. These reports will be completed 4 times per year – December, March, June, and September.

The PCCWQMP Coordinator will also generate an annual report highlighting trends for year for each site as well as overall trends for Polk County each year. This will be completed and distributed by March.

All reports will be made available to the following:

- PCCWQMP staff
- PCCWQMP Field Monitors
- Iowa DNR
- Polk County Conservation Website

The PCCWQMP Coordinator will generate reports concerning the trends of the testing sites at various times throughout the year. As time and technology allows, additional detailed reports may also be generated.

SECTION D - DATA VALIDATION AND USABILITY

D1 - DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

Incoming data shall be reviewed by the PCCWQMP Coordinator to make sure that it meets the PCCWQMP Quality Assurance Project Plan. Discussion between the PCCWQMP Coordinator and the PCCWQMP Quality Assurance Officer will occur to determine if data is valid or rejected.

The PCCWQMP Quality Assurance Officer shall verify the PCCWQMP database on completeness and accuracy prior to seasonal and annual reports. This may be completed by comparing 10% of the data to the actual raw data forms. If it is 99% accurate and 95% complete, then the PCCWQMP Quality Assurance Officer shall declare the data valid and acceptable for analysis. The data must include all entries from the field data form in order to be complete and must match the data form exactly to be considered accurate. For a list of items that must be included, please refer to the field data forms in the Appendix.

If the data does not meet this criteria, it will be rejected. The Quality Assurance Officer will work with the PCCWQMP Coordinator to determine ways to improve data validity in the future. This may include more frequent checks or new methods for entering data.

D2 - VALIDATION AND VERIFICATION METHODS

PCCWQMP Field Monitors will verify their field data is accurate and complete before delivering it to the PCCWQMP Coordinator. The field assessment forms are then viewed and verified by PCCWQMP Coordinator while inputting information into the database, when generating the seasonal/annual reports, and again when comparing it to the data collected on comparable streams throughout the state.

The Quality Assurance Officer will compare data from their in-field quality control checks to the data submitted by the Field Monitor for each site once per year. The quality control checks will be performed during the same monitoring week and utilizing the same procedures as the Field Monitors. If the data is similar, then it will be deemed valid and acceptable for input. If there are distinct differences in the data obtained, the Quality Assurance Officer will reach out to the Field Monitor to determine a cause and the data will be rejected. Additional one-on-one training may be completed by the Quality Assurance Officer or the PCCWQMP Coordinator to verify proper sampling procedures are being followed.

Field Monitors and employees that obtain sampling results outside the norms detailed in this QAPP or outside the norms for their sites follow the PCCWQMP Abnormal Sampling Results Flow Chart as outlined in the Quality Control Requirements section.

Data that does not meet the quality objectives outlined in the Data Quality Objectives of Measurement Data section of this document will be discarded. If possible, a sample of the questionable data will be re-tested and results will be reported to the PCCWQMP Coordinator. If

the failure to meet the quality objectives is due to the damaged equipment or outdated supplies, the equipment will be either replaced or updated. If the failure stems from the a Field Monitor's error, then the said Field Monitor will be contacted and the PCCWQMP Quality Assurance Officer will arrange a brief refresher course with said Field Monitor prior to said Field Monitor completing any additional sample collections.

Lab data will be validated and verified utilizing the chain of custody forms in the Appendix and following the plan set forth in the individual lab's quality assurance plan.

D3 - RECONCILIATION WITH DATA QUALITY OBJECTIVES

Sample results will be analyzed and evaluated to determine if data quality objectives of the project were met by looking at a percentage of rejected data occurred at the end of each sampling year. If 99% of the data was accepted, than the data quality needs of the project will have been met. If less than this amount was accepted, the PCCWQMP Coordinator and Quality Assurance Officer will work to determine the cause and find a solution. This may include additional training, new field assessment forms, or more accurate data entry methods.

REFERENCES

IOWATER Quality Assurance Project Plan. 2010. Iowa Department of Natural Resources. QA/WM/01-02. 94 p.

The Volunteer Monitor's Guide to Quality Assurance Project Plans, 1996, EPA 84 l-B- 96-003, 5.

APPENDICES

APPENDIX 1: PCCWQMP QUICK REFERENCE CARDS

In order to record accurate results, **REMOVE SUNGLASSES** during monitoring.

Conduct all testing along transect with greatest flow for best accuracy in water quality monitoring.

POLK COUNTY CONSERVATION
515-323-5300

Safety First
Use caution when entering a stream, making sure the current is not too strong and bottom will support you.

Stream Water Temperature (Biweekly)

Record temperature after 2 minutes.

pH (Biweekly)

Facing upstream, dip test strip and remove immediately, do not shake. Read in 15 seconds. Record data. Dispose in trash.

Typical range: 8.0-8.4
Retest if < 6

Nitrite

Typical range:

Nitrate

Typical range:
3 to 8.5 mg/L (rivers);
IA ave. = 5.8 mg/L (rivers);
Retest if Nitrate >20 mg/L

Chloride

Typical range: 16 – 29 mg/L
IA ave.= 22 mg/L (rivers)
Retest if > 100 mg/L

Nitrate/Nitrite (Biweekly)

Facing upstream, dip test strip and remove immediately, do not shake. Hold strip level, pad side up for **30 seconds**. Record **NITRITE** (pad on right) and record **NITRATE** reading (pad on tip of strip). Dispose in trash.

Chloride (Biweekly)

Facing upstream, rinse 25 ml sample cup **3 times**. Fill cup to 25 ml mark. Remove a titrator strip from bottle. *Replace cap immediately*. Insert bottom of titrator into CL sample cup. Do not allow the yellow string at top to become submerged. Allow titrator wick to become completely saturated. There is no time limit– the reaction is complete when yellow string turns dark-**about 5-10 min.**

Dissolved Oxygen

Typical range: 8.7-12.9 mg/L;
IA ave. 10.5 mg/L
Retest <5mg/L (warm streams)

Phosphate

Typical range: 0.11-0.34 mg/L (rivers);
0.05 -0.13 mg/L (lakes)
IA ave. = 0.2 mg/L (streams);
0.08 mg/L (lakes)
Retest if > 0.6 mg/L

Dissolved Oxygen and Phosphate (Biweekly)

For both: Facing upstream, rinse 25 ml sample cup **3 times**. Lower cup to wrist depth while holding it upside down. Turn the opening downstream so cup backfills. Turn upstream and remove water sample from stream. Gently pour off excess water. *** **Place ampoule** in correct cup and snap off tip. Allow ampoule to fill with water. **Slowly mix** ampoule water. Compare color **after 2 minutes**. Record data in mg/L. Dispose water in household drain and ampoule in trash.

*** For the phosphate only: In cup, **add 2 drops** of Activator Solution, **cap and shake**. Break ampoule and continue as directed.

NOTE: KEEP SUPPLIES OUT OF SUN.

Water Observations

Abnormal Results Check

APPENDIX 2: BIOLOGICAL ASSESSMENT FIELD FORM

Water Quality Monitoring
Biological Assessment

Date: _____ **Time:** _____ **Site #:** _____

PCCWQMP Monitor: _____ **# of participants:** _____

Others Involved: _____

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

If stream was not dry but no benthic macroinvertebrates were found, please record any relevant comments in the Notes/Comments section below.

Biological assessment area: Stream width: _____._____m Stream length: _____._____m
Maximum stream depth (along transect): _____._____ meters

Benthic Macroinvertebrates (BMI)

High Quality Group *Pollution intolerant*			Middle Quality Group *Somewhat pollution tolerant*			Low Quality Group *Pollution tolerant*		
Tally	# Found	Species	Tally	# Found	Species	Tally	# Found	Species
		Caddisfly			Alderfly			Aquatic Worm
		Dobson Fly			Backswimmer			Black Fly
		Mayfly			Crane Fly			Bloodworm
		Riffle Beetle			Crawdad/Crayfish			Flatworm
		Snail (not pouch)			Crawling Water Beetle			Leech
		Stone Fly			Damselfly			Midge Fly
		Water Penny Beetle			Dragonfly			Mosquito
Total:					Giant Water Bug			Pouch Snail
					Limpet			Rat-tailed Maggot
					Mussels/clams			Water Scavenger Beetle
					Orb Snail	Total:		
					Predaceous Diving Beetle			
					Scud			
					Sowbug			
					Water Boatman			
					Water Mite			
					Water Scorpion			
					Water Strider			
					Whirligig Beetle			
			Total:					

Notes/Comments:

Collection time (Select ONE): ☐ **0-15 minutes** ☐ **15-30 minutes** ☐ **30-45 minutes** ☐ **45+ minutes**

Identification confidence level (How confident are you that your identification is correct?):

___ I guarantee they are correct
___ I'm fairly confident they are correct
___ I think they are correct
___ I am not sure
___ Some are correct; I am not sure of others
(Please clarify this in the notes section)

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APPENDIX 3: CHEMICAL/PHYSICAL ASSESSMENT FIELD FORM

Water Quality Monitoring
Chemical & Physical Assessment

POLK COUNTY
WATER QUALITY
MONITORING PROGRAM

Date: _____ **Time:** _____ **Site #:** _____

PCCWQMP Monitor: _____ **# of participants:** _____

Others Involved: _____

_____

Weather (Select ALL that apply):

☐ Sunny ☐ Partly Sunny ☐ Cloudy ☐ Rain ☐ Snow ☐ Windy ☐ Calm

Water color (Select ALL that apply):

☐ Clear ☐ Foamy ☐ Muddy ☐ Scum ☐ Oily (place stick test results in comment section)

☐ Milky ☐ Green ☐ Tea-colored (clear with tannins) Other/comments_____

Water odor (Select ALL that apply):

☐ None ☐ Chemical ☐ Fishy ☐ Sewage ☐ Petroleum Other: _____

Stream flow along transect: (Select ONE)

☐ Dry ☐ Stagnant ☐ Slow ☐ Moderate ☐ Fast ☐ Torrent

Air temperature: _____ °F

Precipitation over the last 24 hours: _____ inches

Transparency (whole numbers only): _____ cm

pH: _____ Expiration date pH: _____

Nitrite-N: _____ mg/L **Nitrate-N:** _____ mg/L Expiration date N: _____

Dissolved Oxygen: _____ mg/L Expiration date of DO color comparator: _____

Phosphate: _____ mg/L Expiration date of P activator solution: _____

Expiration date on P color comparator: _____

Expiration date on P round comparator: _____

Chloride: _____ Quantab units Converts to _____ mg/L Expiration date Cl: _____

Water Temperature: _____ °F

Comments:

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APPENDIX 4: HABITAT ASSESSMENT FIELD FORM

Polk County Water & Land Legacy Bond

Water Quality Monitoring
Habitat Assessment

POLK COUNTY
WATER QUALITY
MONITORING PROGRAM

Date: _____ **Time:** _____ **Site #:** _____

PCCWQMP Monitor: _____ **# of participants:** _____

Others Involved: _____

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

Canopy cover over transect (select ONE):

☐ 0-25% (Open) ☐ 25-50% (Partly Open) ☐ 50-75% (Partly Shaded) ☐ 75-100% (Shaded)

Predominant surrounding land use (rank top 2): (state the top two uses using a 1 for the largest land use and 2 for the second)

_____ Agriculture (Farming, Row Crops)
_____ Commercial (Businesses)
_____ Field (Conservation Lands, Pasture, Prairie, Wetlands)
_____ Forest (Timber)
_____ Industrial (Factories)
_____ Residential (Playground, Stairs, Suburban, Urban, Walkway
_____ Other (Boating, Campground, Nature Trails, Parks, Steep Slopes)

Evidence of human use (select either Yes or No):

☐ Yes ☐ No Boating (boating, canoeing, dock, kayaking, rafting, tubing, water skiing)

☐ Yes ☐ No Fishing (fishing, tackle)

☐ Yes ☐ No Other (ATV tracks, camping sites, fire pit/ring, footprints, graffiti, hunting, evidence of kids playing, litter, rope swings, trapping)

☐ Yes ☐ No Swimming (swimming, wading)

Riparian zone width at transect (select ONE for EACH bank):

Left Bank (facing upstream)
☐ 0-6m ☐ 6-12m ☐ 12-18m ☐ 18+ m

Right Bank (facing upstream)
☐ 0-6m ☐ 6-12m ☐ 12-18m ☐ 18+ m

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**

Stream habitat type at transect (select ONE): ☐ Riffle ☐ Run ☐ Pool

Stream Banks at transect (select ALL that apply):

Left Bank (facing upstream)		**Right Bank** (facing upstream)	
☐ Cut bank-eroding	☐ Sloping bank	☐ Cut bank-eroding	☐ Sloping bank
☐ Cut bank-vegetated	☐ Sand/gravel bar	☐ Cut bank-vegetated	☐ Sand/gravel bar
☐ Constructed bank (drainage ditch)	☐ Rip rap	☐ Constructed bank (drainage ditch)	☐ Rip rap
Other: _____		Other: _____	

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 inches in diameter
_____%	Sand – smaller than 0.1 inches in diameter
_____%	Silt/mud – dirt or soil deposited on bottom of the stream
_____%	Detritus – organic material like leaf litter, tree limbs, etc.
100%	Total

Microhabitat (select ALL present in stream reach):

☐ Algae mats	☐ Sand	☐ Undercut banks	☐ Junk (tires, garbage, etc.)
☐ Logjams	☐ Root wads	☐ Leaf packs	☐ Overhanging vegetation
☐ Rip rap	☐ Fallen trees	☐ Rocks	☐ Silt/muck
☐ Wood beds	Other (describe): _____		

Aquatic Plant Cover of Streambed at transect (select ONE):

☐ 0% ☐ 1-20% ☐ 21-40% ☐ 41-60% ☐ 61-80% ☐ 81-99% ☐ 100%

Algae Cover of Streambed at transect (select ONE):

☐ 0% ☐ 1-20% ☐ 21-40% ☐ 41-60% ☐ 61-80% ☐ 81-99% ☐ 100%

Invasive species (select ALL found): ☐ Yes ID: _____ ☐ No

Notes/Comments: _____

Latitude: _____ **Longitude:** _____ **Upstream and downstream photos submitted**___

Describe how you access your site? _____

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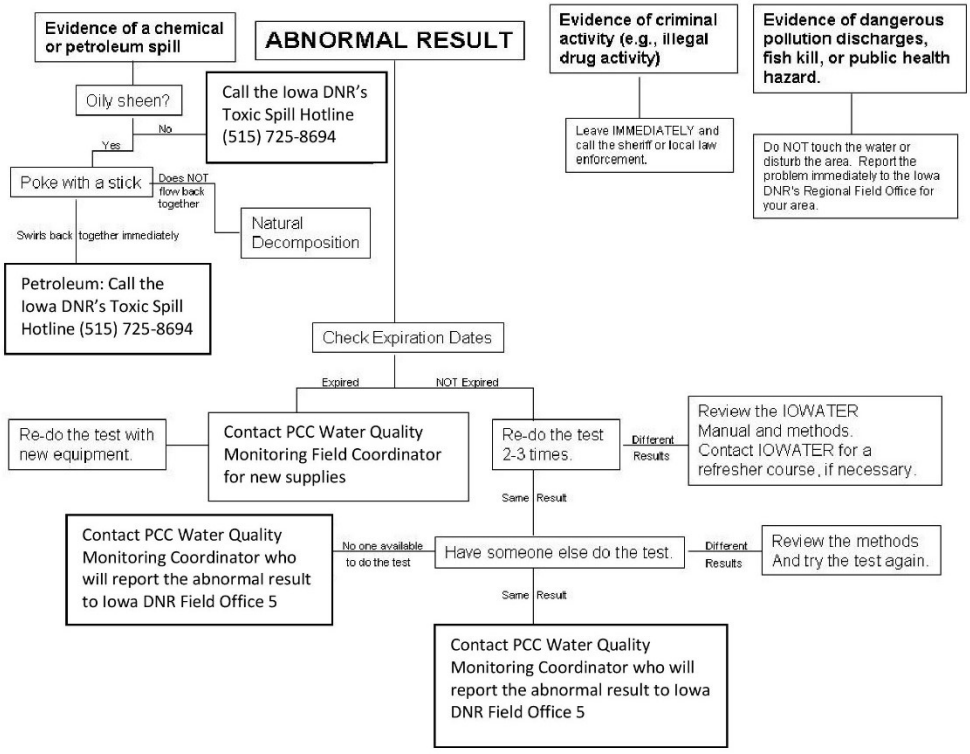
APPENDIX 5: PCCB ABNORMAL RESULTS PROCEDURE

PCCB Abnormal Results Procedure

Water quality is affected by many variables and can be challenging to interpret. Included in this section is a flow chart of steps to take when you think you have an abnormal result. While the values below might not be abnormal for your site, they are some guidelines as to what could be considered abnormal for each of the chemical/physical parameters:

- Nitrite values of 0.3 or greater (0.3, 1.0, 1.5, & 3.0 mg/L)
- Nitrate values of 20 or greater (20 or 50 mg/L)
- Phosphate values of 0.6 or greater (0.6, 0.8, 1.0-8.0, 10 mg/L)
- Dissolved Oxygen values of 5 or less (1-5 mg/L)
- pH values of 6 or less (4, 5, 6)
- Chloride values of 100 or greater (100 - >600 mg/L) – ">" means "greater than"



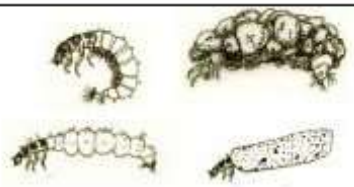
APPENDIX 6: IOWATER LEVEL I BENTHIC KEY

IOWATER

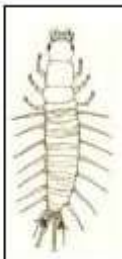
IOWATER; 109 Trowbridge Hall; Iowa City, IA 52242; www.iowater.net

IOWATER BENTHIC MACROINVERTEBRATE KEY

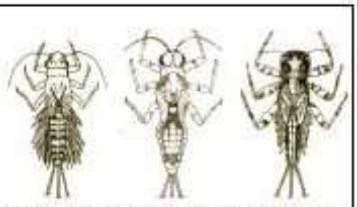
Pollution Intolerant (High Quality Group)



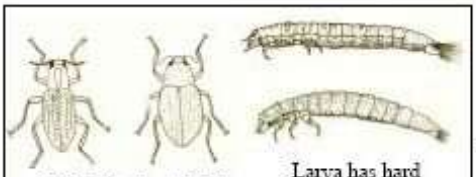
Caddisfly: 6 hooked legs on upper body, 2 hooks on end, may have stick, rock or leaf case, 2-40 mm in length.



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.

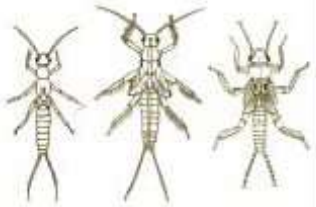


Riffle Beetle: Adult has 6 legs, body covered with tiny hairs, walks slowly underwater, 1-8 mm in length.

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

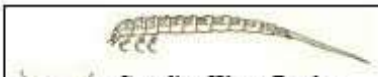
Snail (not pouch): When opening is facing you, shell opens on right, operculum (flap over opening) present.

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

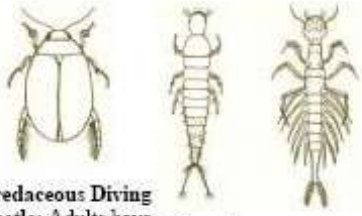


Stonefly: 6 legs with hooked tips, antennae, 2 tails, gill tuffs under legs or no visible gills, 5-60 mm in length.

Somewhat Pollution Tolerant (Middle Quality Group)

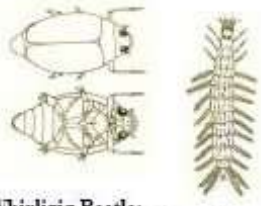


Crawling Water Beetle: Larva has one long tail and legs with one hook-like claw, 2-10 mm in length. Adult is often patterned or spotted, 2-6 mm.



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.

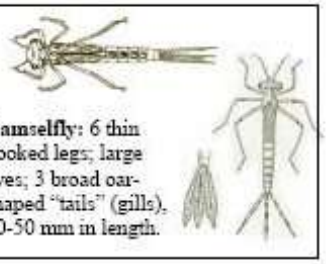


Whirligig Beetle: Flattened oval body, short, clubbed antennae, erratic swimmer, 3-15 mm.

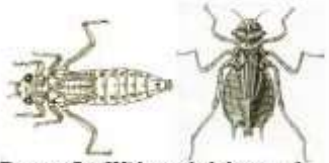
Larva has many hairs on body, short tail or no tail, up to 30 mm in length.

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

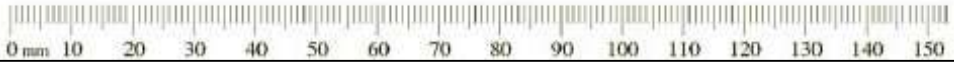
Water Boatman: Forelegs spoon-shaped and shorter compared to Backswimmer, 3-11 mm in length.



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

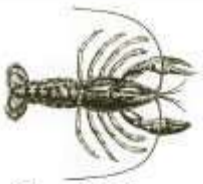


Dragonfly: Wide oval abdomen, 6 hooked legs, large eyes, 10-60 mm in length.



Somewhat Pollution Tolerant (Middle Quality Group) continued

Crane Fly: Milky, green, or light brown color, caterpillar-like segmented body, 4 finger-like lobes at back end, no visible head, 10-100 mm.



Crawdad: 2 large claws, 8 legs, up to 6 inches long.

Mussels/Clams: Fleshy body enclosed between 2 clamped shells (bivalve), 2-250 mm.

Scud: White to grey, more than 6 legs, swims sideways, body higher than wide, 5-20 mm

Water Scorpion: Raptor-like forelegs for catching prey, long breathing tube, stick-like long body, 15-45 mm.

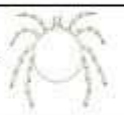
Giant Water Bug: Raptor-like forelegs for catching prey, leathery textured, oval body, 15-65 mm in length.

Sowbug: Gray body wider than it is high, more than 6 legs, 5-20 mm.

Water Strider: Slender body, long legs "walk" on water surface, 3-21 mm.

Alderfly: Looks like a small Dobsonfly but has one long tail and no gill tufts, 10-25 mm.

Orbsnail: One shell, coiled and flattened, a.k.a. rams-horn, 3-30 mm

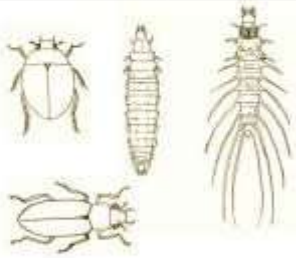


Water Mite: 8 legs, round body, may be brightly colored, 2-3 mm

Limpet: One shell, not coiled, shaped like a flat cone 3-7 mm

Pollution Tolerant (Low Quality Group)

Mosquito: Head has small mouth brushes and short antennae; abdomen has breathing siphon, surfaces for air, 4-12 mm.



Water Scavenger Beetle: Adult may or may not be streamlined, most have no hairs on legs, short clubbed antennae, 1-40 mm. Larva have short antenna, 8 soft body segments, 4 -60 mm.

Pouch Snail: When opening is facing you, shell opens on the left, no operculum (flap over opening).

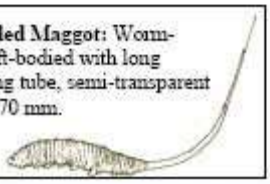
Black Fly: One end of body wider, black head and suction pad on other end, 3-12 mm.

Midge Fly: Small, dark head, 2 tiny legs on each end, 2-20 mm.

Bloodworm: One type of midge fly, has a red body due to hemoglobin.

Flatworm (Planarian): Flat, soft-bodied worm with arrowhead-shaped head, 1-30 mm in length.

Leech: Brown, slimy body, suction pads on body, 5-400 mm.



Rat-tailed Maggot: Worm-like, soft-bodied with long breathing tube, semi-transparent skin, 4-70 mm.

Aquatic Worm: Thin, worm-like, 0.5-700 mm.

Revised: March 2005

APPENDIX 7: PHYSICAL STREAM DATA COLLECTION PROTOCOLS

Water Transparency

Required Materials: Transparency Tube

1. Collect a fresh water sample while facing upstream 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).

Weather, Air Temperature, and Precipitation

Required Equipment: Armored thermometer

Water quality monitors are instructed to report the weather conditions at the time of the assessment. Weather conditions monitors can record are: sunny, partly sunny, cloudy, rain / snow, windy, and / or calm. Water quality monitors 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. Record results.

Water Color

Required Equipment: None

Water quality monitors indicate the water color at their stream transect. Colors monitors can record on the Chemical / Physical Stream Assessment field form are: clear, brown, green, oily, reddish, blackish, chalky. If the water is oily, please follow the abnormal procedures found in Appendix 5 of the QAPP.

Water Odor

Required Equipment: None

Water quality monitors indicate the water odor at their stream transect. Odors that monitors can record on the Chemical / Physical Stream Assessment field form are: none, sewage / manure, rotten eggs, petroleum.

Stream Velocity

Water quality monitors will take a visual assessment of stream velocity. When making this visual assessment, compare the current stream flow to what is “normal” for the site.

Water Temperature

Required Equipment: Armored thermometer

Water quality monitors 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.

Other Assessment Observations and Notes

Required Equipment: Chemical / Physical field form

Water quality monitors 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 8: CHEMICAL STREAM DATA COLLECTION PROTOCOLS

For all chemical tests, check expiration dates on equipment. If expired, DO NOT USE. Be sure to remove sunglasses before reading any testing strips to determine values of reading. All materials should be stored in the dark at room temperature.

pH:

Required Equipment: Hach® pH test strips, and waste container

1. 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.
1. Estimate pH by comparing test pad to color chart on test strip. The pad will continue to change color, so make a determination immediately after 15 seconds.
2. Record results on the PCCWQMP Chemical / Physical Stream Assessment field form.
3. Dispose of test strip in dry waste container/garbage.

Dissolved oxygen:

Required Equipment: Chemetrics® dissolved oxygen test kit, waste container, and safety glasses

1. Remove the 25ml sample cup from the kit and rinse it three times with stream water.
2. 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.

3. Place the ampoule in the sample cup, tilting it so the tip is wedged in the corner of cup bottom.
4. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
5. 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.
6. 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.
7. 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.

Nitrite-N and Nitrate-N:

Required Equipment: Hach® nitrate-N / nitrite-N test strips, and waste container

1. Dip the test strip into the water for one second and remove. DO NOT SHAKE excess water from the test strip.
2. Hold the strip level, with pad side up, for 30 seconds.

3. Compare the NITRITE (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. The pad will continue to change color, so make a determination immediately after 30 seconds.
4. At 60 seconds (or 30 seconds after estimating nitrite concentration), compare the NITRATE (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. The pad will continue to change color, so make a determination immediately after 60 seconds.

Orthophosphate:
Required Equipment: Chemetrics® orthophosphate test kit, waste container, and safety glasses

1. Rinse the 25ml Phosphate Kit sample cup and its black lid three times with stream water.
2. 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.
3. Add 2 drops of A-8500 Activator Solution, place black cap on sample cup, and shake to mix the contents.
4. Place an ampoule in the sample cup, tilting it so tip is wedged in 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 in the ampoule by inverting it slowly 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.
8. Based on the color of your ampoule, use the appropriate color comparator (low range or high range) 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.
   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.
1. 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.

Chloride:

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

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.

APPENDIX 9: STREAM HABITAT DATA COLLECTION PROTOCOLS

Stream Habitat Type
Water quality monitors indicate on the Stream Habitat Assessment field form what the stream habitat type is at the stream transect. Water quality monitors select from Riffle, Run, or Pool.

Streambed Substrate
Water quality monitors estimate the percentage of each streambed substrate located at the stream transect on the Stream Habitat Assessment field form. Water quality monitors 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:
Water quality monitors record all of the different types of microhabitats that are present in the stream reach. Water quality monitors 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:
Water quality monitors record the condition of both left and right stream banks as they face upstream at the stream transect. Conditions water quality monitors 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
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
Water quality monitors 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
Water quality monitors 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. Water quality monitors 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
Water quality monitors indicate all land uses in the area adjacent to the riparian zones in a checklist. Water quality monitors 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

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
- Orb snail
- 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
Water quality monitors 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
Water quality monitors record on the Biological Assessment field form the stream habitats in the stream reach for benthic macroinvertebrates.

Aquatic Plants
Water quality monitors 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
Water quality monitors 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
Water quality monitors 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 10: BIOLOGICAL ASSESSMENT PROTOCALS

Stream Width

Required Equipment: Open-reel fiberglass tape measure (30m)

Water quality monitors measure the width of the stream at their stream transect, in meters, with an open-reel fiberglass measuring tape and record on the measurement. 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: Meter stick

Water quality field monitors measure stream depth along their stream transect with a meter stick to find maximum depth. Record measurement.

Benthic Macroinvertebrates (Level 1):

Level 1 Benthic Macroinvertebrate monitoring will indicate quality, not quantity. Water quality monitors 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. Water quality monitors are instructed to sample all of the microhabitats present in the stream reach. Water quality monitors then use the forceps, magnifying box, and laminated IOWATER Benthic Macroinvertebrate Key to identify the benthic macroinvertebrates to the phylum and/or order levels. Water quality monitors 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 macroinvertebrate 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).

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

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.. 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

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) IOWATER QA/WM/01-02 Page 25 Jul-10
- % 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.

APPENDIX 11: DNR CHAIN OF CUSTODY FORM

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

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 12: UHL CHAIN OF CUSTODY FORM

Hygienic Laboratory

The University of Iowa

CHAIN-OF-CUSTODY

Contact Name | Phone | Analysis Requested | Purchase Order #

Project Name and/or Number

Company | Fax | Collector's Phone #

Address | Print Collector's Name

City | State | Zip | Collector's Signature

Sample ID/Description	Date	Time	Sample Matrix W	S	Other	Analysis Requested															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

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