

# **Coldwater River Watershed Monitoring**

## **Michigan Clean Water Corps (MiCorps) Volunteer Stream Monitoring Grant**

### **Quality Assurance Project Plan (QAPP)**

#### **Timberland RC&D Council**



**Submitted to**

**MiCorps**

This QAPP has been prepared to fulfill the requirements of the MiCorps Coldwater River Watershed Monitoring Project. The QAPP establishes the sampling procedures, quality control checks, data management, reporting, sampling frequencies, and analytical procedures consistent with requirements set forth in the monitoring plan provided by MiCorps. The section designations (e.g., A4) correspond with the QAPP requirements outlined by the MiCorps QAPP Review Checklist.



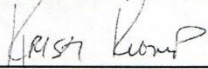
**SIGNATURE PAGE (A1)**

**A1. Title and Approval Sheet**

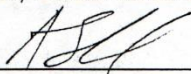
**Quality Assurance Project Plan for  
Coldwater River Watershed Monitoring**

Date: 10/13/2014  
Version # 1  
Organization: Timberland RC&D Council


QAPP Prepared by: Kristi Klomp  
Title: Executive Director, Timberland RC&D Council

Signature: 

Other responsible individual: Aaron Snell  
Title: Principal, Streamside Ecological Services, Inc.

Signature: 

(Other signatures may be added as necessary)

MiCorps Staff Use	
Tracking Number:	
MiCorps Reviewer:	<u>Paul Steen</u>
<input type="checkbox"/> Approved	<input type="checkbox"/> Returned for modifications
	11/21/2014
Signature of reviewer	Date

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**DISTRIBUTION LIST (A3)**

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Aaron Snell, Project Lead Ecologist

## PROGRAM DESCRIPTION AND QUALITY OBJECTIVES (A)

### PROGRAM ORGANIZATION (A4)

Timberland RC&D (TRCD) is responsible for project coordination with MiCorps and primary QA oversight. Streamside Ecological Services, Inc. (SES) is responsible for volunteer coordination and will assist with program management and QA oversight, data analysis and reporting. Table 1 lists specific personnel and summarizes their responsibilities.

Contact information for the main personnel is provided below:

Kristi Klomp, Executive Director Timberland RC&D 1345 Monroe NW, #243 Grand Rapids, MI 49505 phone: (616) 451-4844 email: timberlandrcd@gmail.com	Aaron Snell Streamside Ecological Services, Inc. 3940 Timpson Ave SE Lowell, MI 49331 Phone: (616) 238-7372 Email: snell@streamsideeco.com
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**Table 1. Personnel and Responsibilities**

Category	Personnel	General Responsibilities
TRCD Project Manager and QA Manager	Kristi Klomp	Project management and oversight of all tasks, review all work for quality assurance, determine corrective actions if necessary, and preparation of final report.
SES Project Lead Ecologist	Aaron Snell	Coordinate and oversee volunteer sampling and conduct quality assurance review of project data to verify compliance with the QAPP.
Coldwater River Watershed Council (CRWC) Sample Collection	Volunteers	Lead and assist team of trained volunteers to collect and assess macroinvertebrate samples.
Oakbrook Trout Unlimited (OTU) Sample Collection	Volunteers	Collect and assess macroinvertebrate samples.

## **PROBLEM DEFINITION/BACKGROUND (A5)**

The Coldwater River (HUC 040500070307) is located southeast of the City of Grand Rapids. The watershed covers approximately 120,737 acres and is dominated by agriculture (70.6%), forest (17.8%) and wetland (9%). The Coldwater River WMP, which was updated and approved to meet EPA's nine elements in 2009, lists the designated uses of partial and full-body contact recreation, coldwater fishery, and other indigenous aquatic life and wildlife as being impaired or threatened by *Escherichia coli* (*E. coli*) contamination, low DO levels, and anthropogenic and flow regime alterations (WMP p 1-3). The WMP identified excessive phosphorus and suspended sediment, and low dissolved oxygen as known or suspected pollutants/conditions impacting the coldwater fishery (p 23-29).

Tyler Creek/Bear Creek (HUC 040500070306) and Pratt Lake Drain (HUC 040500070305) are listed as the highest priority subwatersheds in the WMP (Table 9, p 48; Figure 25). The Tyler Creek subwatershed covers 30,380 acres (Bear (18,943 acres) and Pratt (11,427 acres)) in southeast Kent and southwest Ionia Counties. A 2005 *E. coli* TMDL established by MDEQ (AUID 040500070307-03) addresses sources in the entire Tyler Creek subwatershed. Pollution in Tyler Creek gained much attention in 2006, when a large fish kill made local headlines. Subsequent analysis by an MSU laboratory found fecal matter in the gills of dead fish and later identified bovine feces as the primary source of *E. coli* bacteria (WMP p 23-24; Rose and Shibata, 2006).

A United States Environmental Protection Agency (EPA) Section 319 grant (#2011-0017) and a Michigan Department of Environmental Quality (MDEQ) Clean Michigan Initiative (CMI) grant (#2013-0516) are currently being implemented in the Tyler Creek subwatershed to source-track and reduce *E. coli* contamination and define the relationship between total suspended sediment (TSS) and *E. coli* within the watershed. The goals of these projects are to identify, monitor and restore areas where the designated uses of partial and full-body contact recreation, cold and warmwater fisheries and other indigenous aquatic life and wildlife are impaired (WMP p 54). To meet these goals, Timberland Resource Conservation and Development (TRCD) and project partners are using detailed stream inventory work to identify sources and causes of pollution, implementing physical best management practices (BMPs) at 14 sites, delivering an education and outreach program, and are using TSS and *E. coli* monitoring to pinpoint specific sources (overland runoff, tile lines, groundwater, etc) and locations for future implementation of BMPs.

Based upon the two seasons of monitoring under the 319 grant and the initial season of CMI monitoring, it is clear that *E. coli* remains to be a problem throughout the watershed. Of eleven surface water monitoring sites tested, ten consistently exceeded the water quality standards for *E. coli* (results have been submitted to DEQ, and are available upon request).



This MiCorps Volunteer Stream Monitoring project will provide a dataset of the macroinvertebrate community from seven locations within the Coldwater River watershed from which we can document changes in the subject streams, and will allow us to develop recommendations for long-term protection and enhancement of the Coldwater River and its tributaries.

## **PROGRAM DESCRIPTION (A6)**

The Timberland RC&D Area Council seeks to monitor macroinvertebrate and habitat conditions at seven sites in the Coldwater River and its tributaries, including Tyler and Duck Creeks and Messer Brook. The Coldwater River and many of its tributaries are designated trout streams and are highly appreciated by the local angling community, and others. A variety of data have been collected and projects completed in recent years. However, a serious effort at macroinvertebrate community analysis has been lacking. The CRWC received a start-up MiCorps grant in 2012 and has developed a macroinvertebrate sampling program to be implemented on the following goal and objectives. The long-term dataset will be used to benchmark changing conditions in the streams and to develop recommendations for long-term protection and enhancement of the river and its tributaries.

***Goal No. 1:** Compile a dataset to be used as a benchmark against past and, more importantly, future conditions, to document changes in the subject streams, and to develop recommendations for long-term protection and enhancement of the Coldwater River and its tributaries.*

***Objective No. 1:** Conduct macroinvertebrate sampling at seven locations in the Coldwater River and its tributaries, including Tyler and Duck Creeks, Messer Brook will be conducted twice a year; twice in the spring and twice in the fall.*

***Objective No. 2:** Complete habitat assessment at each of the macroinvertebrate monitoring sites. Habitat assessment will be conducted once a year during the project, unless changes are observed.*

## **DATA QUALITY OBJECTIVES (A7)**

This study has been designed to characterize the habitat and macroinvertebrate community of selected sites in the Coldwater River watershed. TRCD's objectives are to collect data that is accurate, representative, complete, comparable and relevant, recognizing that the precision of the data will be confined to the elements of natural and temporal variability along with bias associated with sampling and identification inconsistencies. In order to collect data that provides the best general characterization of the habitat and macroinvertebrate community for future comparison as stream restoration and best management practices (BMPs) are established in the Coldwater River watershed, we will attempt to minimize bias, increase precision, and control the quality of the data, to the degree that is attainable, as addressed herein.

### *Precision and Accuracy*

Efforts will be made to address data quality standards by using established MiCorps protocols for habitat and macroinvertebrate sampling.

The following techniques will be reviewed during training and in retraining of team leaders every three years: [1] collecting style (must be thorough and vigorous), [2] habitat diversity (must include all habitats present and be thorough in each one), and [3] the transfer of collected macroinvertebrates from the net to the sample jars (thoroughness is critical). Since there is inherent variability in accessing the less common taxa in any stream site and program resources do not allow program managers to perform independent (duplicate) collections of the sampling sites, our goal for quality assurance is conservative. A given site's Stream Quality Index (SQI) score or total diversity (D) measure across macroinvertebrate taxa will be noted as "preliminary" until three spring sampling events and three fall sampling events have been completed. At least two of these six measures will be collected by different volunteer teams. The resulting measures of D and SQI for each site will be compared to the composite (median) results and each should be within two standard deviations of the median.

In addition, the Program Manager will seek opportunities to compare results with those from an external sampling group, such as MDEQ. Sample results that exceed quality control standards will be noted as "outliers" and examined to determine if the results are likely due to sampling error or a true environmental variation. If sampling error is determined the data point should be removed from the data record. Volunteer teams that generate more than one outlier should be observed by the Program Manager at the next sampling event and be considered for retraining.

The Program Manager will make the final identifications for each sample. MiCorps staff will conduct a method validation review with the designated Program Manager to ensure his or her expertise, preferably prior to the first training session held by the Program Manager. This will be conducted with each new Program Manager added to a MiCorps monitoring program. This review will consist of a joint sampling event, with MiCorps staff jointly collecting, sorting and identifying the macroinvertebrates with the Program Manager. Any monitoring issues will be addressed on site. If no major concerns remain, the Program Manager will be considered "certified" by MiCorps.

### *Bias*

Sites will be sampled by different team leaders at least once every three years in each season (two events among six sampling events, if conducted twice per year) to examine the effects of bias in individual collection styles. The new measure should be within two standard deviations of the median of past measures. Sites not meeting this DQO will be evaluated as above by the Program Manager.

### *Completeness*

Following a QA review of all collected and analyzed data, data completeness will be assessed by dividing the number of measurements judged valid by the number of total measurements performed. The data quality objective for completeness for each parameter for each sampling event is 90%. If the program does not meet this standard, the Program Manager will consult with MiCorps staff to determine the main causes of data invalidation and develop a course of action to improve the completeness of future sampling events.

### *Representativeness*

Study sites are selected to represent the full variety of stream habitat types available locally, emphasizing the inclusion of riffle habitat. All available habitats within the study site will be sampled and documented to ensure a thorough sampling of all of the organisms inhabiting the site. Resulting data from the monitoring program will be used to represent the ecological conditions of the contributing subwatershed. Since not enough resources are available to allow the program to cover the entire watershed, some subwatersheds will not initially be represented. Additional subwatershed sites will be added as resources and volunteers allow.

### *Comparability*

To ensure data comparability, all volunteers in the watershed will follow the same sampling and site selection methods and use the same units of reporting. Program directors and trainers will learn the standard MiCorps monitoring methods at annual trainings by MiCorps staff and will train their volunteers to follow those methods to ensure comparability of results among all MiCorps programs. To the extent possible, the monitoring of all study sites will be completed on a single day.

For each sampling event that is not completed on a single day, monitoring by volunteers will be completed within the same two week period. If a site is temporarily inaccessible, such as due to prolonged high water, the monitoring time may be extended for two additional weeks. If the issue concerning inaccessibility is continued beyond the extended dates, then no monitoring data will be collected during that time and there will be a gap in the data. If a team is unable to monitor their site during the specified time, the Team Leader will contact the Program Manager as soon as possible and no later than the end of the first week in the sampling window in order for the Manager to arrange for another team to complete the monitoring. If no team is available, the Program Manager will, if feasible, sample the site. Otherwise, the site will go unmonitored for that season.

## **SPECIAL TRAINING/CERTIFICATIONS (A8)**

The Project Manager (K. Klomp, TRCD) and the Project Lead Ecologist (A. Snell, SES) have had considerable experience with aquatic macroinvertebrate sampling. Both have received the MiCorps training, as has one of the CRWC volunteers, Dick Smith. The two groups (CRWC, OTU) consist of several seasoned stream volunteers. Most of the individuals have participated in

past invertebrate sampling events associated with MiCorps, MDEQ-319, or other monitoring efforts. Training will be provided to each volunteer participating in the project. We will demonstrate proper procedure with the volunteers and oversee any new volunteers until properly trained.

During sampling events, each sampling group will have an experienced streamside leader. This leader will be responsible for making sure data sheets are filled out properly, samples labeled, and assure that all representative habitats are sampled. New volunteers will start out as streamside assistants and pickers (taking measurements, transporting samples to expedite the instream volunteers, and sorting samples).

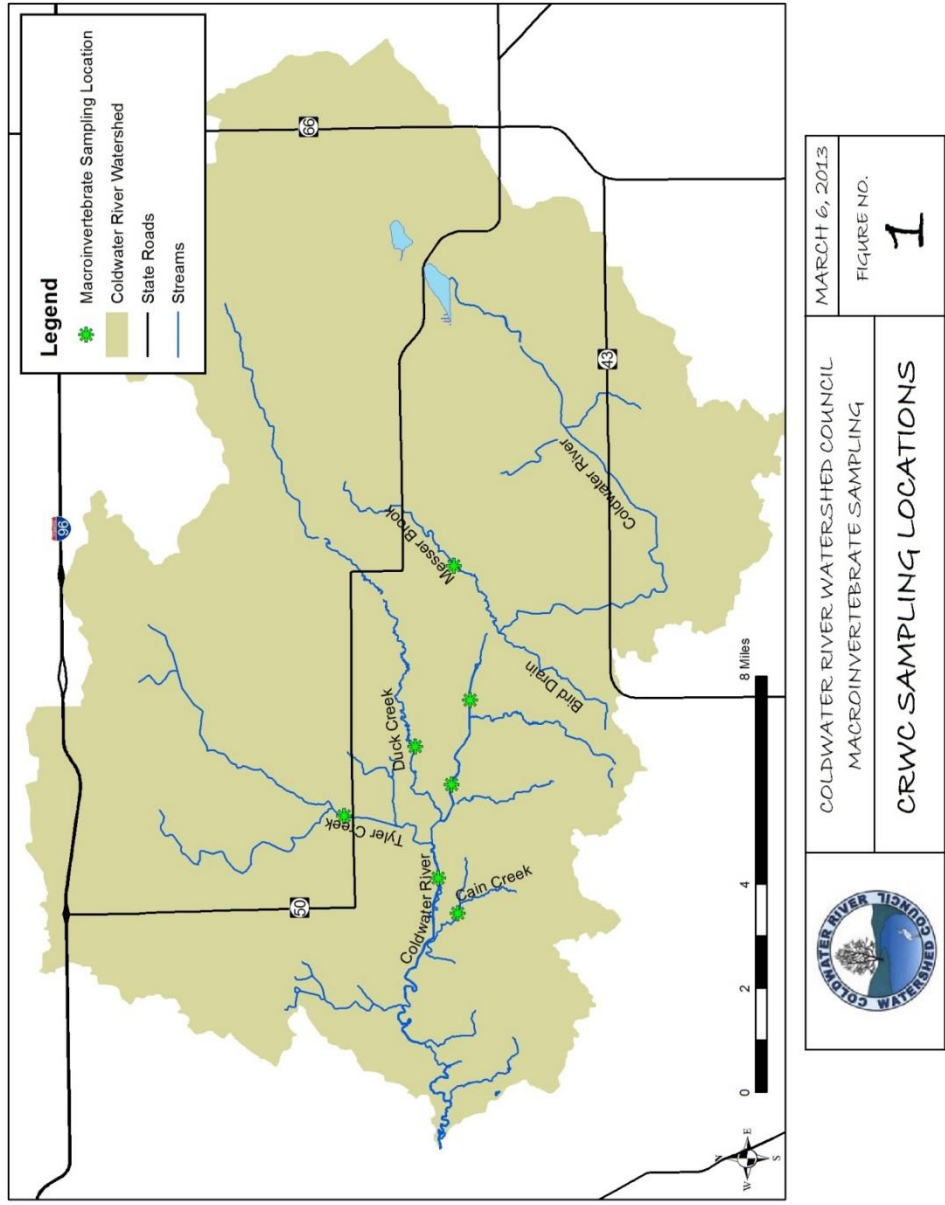
## **PROGRAM DESIGN AND PROCEDURES (B)**

### **STUDY DESIGN AND METHODS (B1)**

Seven monitoring sites within the watershed have been selected; three sites are located along the main branch of the Coldwater River, the other four sites are located along the tributaries, Messer Brook, Duck, Cain, and Tyler Creeks. Each site will be sampled four times over the two year project. Monitoring events are planned for the Fall of 2014, spring and fall of 2015, and spring of 2016.

Each site/team will be supplied with the following supplies:

- (1) 5 gal. buckets
- (2) D-Nets
- (1) measuring stick for depth measurement
- (2) sorting trays
- (4) forceps
- (4) 2 oz. jars with lids prefilled with ethanol for specimens
- (1) water bottles for rinsing specimens
- (1) 100' reel-style measuring tape
- (2) pencils
- Pre-made labels with site number printed
- Disposable gloves
- waders (limited supply, most volunteers have their own)
- Map of site, data sheets, clipboard, pencils, flagging



*Sampling the Benthic Community:* Each site will be assigned a Streamside Leader, someone who has some experience with the methodology and who is familiar with the area. The Streamside Leader will ensure that multiple collections will be taken from each habitat type present at each site, including riffle, rocks or other large objects, leaf packs, submerged vegetation or roots, and depositional areas, while wading and using a D-frame kicknet. Samples will be carefully transferred from the D-frame kicknet into white buckets. The buckets will be transported by the instream Collector to a common area where the Project Manager will take and maintain custody of the samples (any deviation of custody will be recorded on the data sheet).

Under the guidance of the Project Manager and Project Lead Ecologist, samples will be sorted at a common streamside area, by volunteers into white ice cube trays. The organisms will be identified on-site by the Project Manager and verified by the Project Lead Ecologist. Samples will be preserved in jars of 70% ethyl alcohol for later verification (if needed). Any organism that cannot be positively identified in the field, will be isolated for later identification from expert colleagues or the MiCorps Program Manager. All invertebrate sample jars will be labeled inside the jar, in pencil with jar number, site location, name of collector, and number of jars containing the collection from this site. Jar numbers will be recorded on site data sheets for cross-referencing.

The trained Streamside Leader will record the number of locations sampled within the monitored reach in each habitat type and note the locations sampled on a site map. The trained Collector will transfer the material from the net into buckets. During the collection, the Collector will provide information to the team Streamside Leader in response to questions on the data sheet that review all habitats to be sampled, the state of the creek, and any changes in methodology or unusual observations. The streamside leader will instruct and assist other team members in detecting and collecting macroinvertebrates, including looking under bark and inside of constructions made of sticks or other substrates. Each streamside leader will be provided with cell phone contacts of Project Leaders in case of potential problems or if a deviation in standard operating procedures needs to be discussed. Potential sources of variability such as weather, stream flow differences, season, and site characteristic differences will be noted for each event and discussed in study results. (See APPENDIX I for data sheets.)

The buckets will be transported by the Collector to a common area where the Project Manager will take and maintain custody of the samples (any deviation of custody will be recorded on the data sheet). Under the guidance of the Project Manager and Project Lead Ecologist, samples will be sorted at a common streamside area, by volunteers into white ice cube trays. The organisms will be identified on-site by the Project Manager and verified by the Project Lead Ecologist. All samples will be preserved in jars of 70% ethyl alcohol for later verification (if needed). Any organism that cannot be positively identified in the field, will be isolated for later identification from expert colleagues or the MiCorps Program Manager. All invertebrate sample jars will be labeled inside the jar, in pencil with jar number, site location, name of collector, and number of jars containing the collection from this site. Jar numbers will be recorded on site data sheets for cross-referencing.

Upon return to the TRCD office building, the collections will be checked for labels, the data sheets checked for completeness and for correct information on the number of jars containing the collection from the site, and the jars are secured together with a rubber band and site label and placed together in one box. They will be stored at the TRCD office in a cool, dry, storage area at room temperature. The alcohol will be monitored and carefully changed as needed. The data sheets will remain on file indefinitely.

*Parameters and Timing:*

- Macroinvertebrate community will be monitored and identified to family level.

Literature references used for identification include:

**Merritt, R.W. and K.W. Cummins** (editors). 1996. *An introduction to the aquatic insects of North America, 3rd ed.* Kendall/Hunt Publishing Company, Dubuque, Iowa.

**Pennak, R.W.** 1989. *Freshwater invertebrates of the United States, 3rd ed.* J. Wiley & Sons, New York.

Monitoring events will occur in the Fall of 2014, Spring and Fall of 2015, and Spring of 2016. Efforts will be made to confine the sampling event within a two week period in May and October.

- Habitat will be monitored once a year for the duration of this project, and at least every five years in the spring or fall. See Section B5 for monitoring procedures and methods of metric computation.

A check list will be used to ensure quality control procedures for use with equipment maintenance, field activities, and data analysis, such as listed below:

*Equipment & Field Procedures Quality Control:*

- Check to make sure equipment is in working order and not damaged
- Clean equipment before and after taking it into the field usage
- Check the expiration date of chemical reagents prior to each use
- Check the batteries of all equipment that requires them
- Make sure equipment is calibrated appropriately before sampling
- At least once every three years in each season: change the composition of the field crews to maintain objectivity and minimize individual bias
- Review field records before submitting for analysis to minimize errors

*Quality Assurance Frequency:*

Since our evaluation is based on the diversity in the community, we attempt to include a complete sample of the different groups present, rather than a random sub-sample. We do not assume that a single collection represents all the diversity in the community, but rather we consider our results reliable only after repeated collections spanning at least three years. Our results are compared with other locations in the same river system that have been sampled in the same way. All collectors attend an in-stream training session, and most sites are sampled by different collectors at different times to diminish the effects of bias in individual collecting styles. Samples where the diversity measures diverge substantially from past samples at the same site are resampled by a new team within two weeks. If a change is confirmed, the site becomes a high priority for the next scheduled collection. Field checks include checking all data sheets to make sure each habitat type available was sampled, and the team leader examines several picking trays to ensure that all present families have been collected. All lab sorting is rechecked by the Program Manager before completing identification.

## **INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE (B2)**

All equipment will be checked prior to usage to make sure it is in working order and will be sanitized before and after taking it into the field.

Waders – If any waders are reported damaged after use they will be replaced. Waders will be stored in TRCD’s designated storage area, where temperature and humidity are regulated. Volunteers will be alerted to maintain and sanitize their waders before and after sampling.

Nets – Nets will be inspected and sanitized after each use. Nets will also be stored in a designated storage room, where temperature and humidity are regulated. Volunteers will be alerted to maintain and sanitize their nets after sampling.

Small equipment – Forceps, droppers, etc. will be stored in this same store room.

Large equipment – Buckets, sorting trays, tarps, etc. will be stored at SES.

### **INSPECTION/ACCEPTANCE FOR SUPPLIES AND CONSUMABLES (B3)**

Supplies such as Ethanol, glass jars with poly seal lids, etc. will be inspected after each sampling date. Low supplies will be replenished immediately after sampling date to insure they will be ready for the next event. All supplies will be stored in the designated TRCD storage area.

### **NON-DIRECT MEASUREMENTS (B4)**

Not applicable.

### **DATA MANAGEMENT (B5)**

Include copies of all data collection forms and a description of the qualifications of volunteer data collectors.

Example:

Raw data will be entered and managed in Microsoft Excel workbooks. All data is backed up bi-weekly and a copy is kept off premises. Computer passwords will be used to provide data security. All data will be double-checked for accuracy and correctness.

- Data will be entered from data sheets into the online MiCorps database by a single trained volunteer, intern, or TRCD personnel for storage within the MiCorps data exchange system. Data sheets will be filed at TRCD’s office for a period of at least five years.

- Data will be entered by the data manager into a database (e.g. Excel) for long-term storage. All new data will be exported to a MiCorps compatible format and sent to MiCorps for inclusion in their data exchange system. Data sheets will be filed at TRCD’s office for a period of at least five years.

Data will be summarized for reporting into four metrics: All taxa, insects, EPT (Ephemeroptera + Plecoptera + Trichoptera), and sensitive taxa. Units of measure are families counted in each metric. The MiCorps Stream Quality Index (SQI) will also be computed.



Habitat: specific measures are used from habitat surveys to investigate problem areas at each site. The percentage of stream-bed composed of fines (sand and smaller particles) is calculated and changes are tracked over time as an indicator of sediment deposition.

## **SYSTEM ASSESSMENT, CORRECTION AND REPORTING (C)**

### **SYSTEM AUDITS AND RESPONSE ACTIONS (C1)**

- Side-by-side sampling took place on September 23, 2014 with the Project Manager and Dr. Paul Steen. Dr. Steen evaluated the Project Manager for procedural adherence and offered suggestions as necessary.
- Data sheets will incorporate essential QAPP procedures, such as properly labeled specimen jars and the number of net samples taken from each type of habitat.
- Volunteer team leaders trained by MiCorps will monitor that quality assurance protocols are followed and report any issues possibly affecting data quality.

The total diversity reported by each team must equal at least 70% of the diversity previously found at the site. Sites with results less than 70% will be re-sampled by experts to verify or discard such unusual results, which could be the result of less-than-thorough sampling.

If deviation from the QAPP is noted at any point in the sampling or data management process, the affected samples may be deleted from the data set. Re-sampling will be conducted if warranted and feasible, given that the deviation is noted soon after occurrence and volunteers are available. Otherwise, a gap may be left in the monitoring record. All corrective actions, such as above, will be documented and communicated to MiCorps.

### **DATA REVIEW, VERIFICATION, AND VALIDATION (C2)**

For benthic macroinvertebrate collections, volunteer team leaders and collectors will receive training in completing field data sheets thoroughly and accurately. Volunteers performing habitat assessments will also receive training. Macroinvertebrate and habitat data sheets will be double checked in the field. All data sheets will be reviewed by TRCD and SES staff for thoroughness and clarity. Data entered into the database will be checked against the respective hard copy of the data sheet. If new data deviate from previous records, outliers will be identified, and the site may be resampled by the Project Manager, or the data will be thrown out. The Project Manager has primary responsibility for identifying questionable data and taking corrective action.

### **RECONCILIATION WITH DATA QUALITY OBJECTIVES (C3)**

We will review our data within one week after sampling. If a sample deviates from previously state data quality objectives, the parameter will be re-sampled if it is feasible to do so within a two week period to maintain consistency of environmental conditions. Any limitations discovered in the data will be identified and reported to MiCorps and data users.

### **REPORTING (C4)**

Reporting will be a key component to the success of this project. Many reports between volunteers and the project managers will be informal, and will be completed over email, telephone, or in person. These informal reports will help ensure the continued success of the sampling/identification events. The Project Manager will also report to the MiCorps program in a more formal way on a regular basis in the form of quarterly reports. Any issues in quality control will be included in these reports.

