

# Quality Assurance Project Plan for Grand Traverse Bay Stream Search

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Version # 2

Organization: Watershed Center Grand Traverse Bay

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Signature of reviewer	Date

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#### **A4. Project Organization**

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Project Coordinator  
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(231) 935-1514

##### **Project Manager**

Responsible for project oversight, grant reporting, corrective actions, documentation and records

##### **Kellie Ferguson**

Assistant Project Coordinator  
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##### **Project organizer/Quality Assurance Manager**

Responsible for project organization/execution, field sampling/data review oversight, primary QA oversight, QA Project Plan manager, reports to Project Manager

##### **Volunteer Roles:**

**Team Leader:** Responsible for field assessment and collection oversight, reports to Project Organizer

**Collectors:** Participates in field assessments/invertebrate collections, reports to team Project Organizer

## **A5. Problem Definition/Background**

The Grand Traverse Bay watershed is one of the premier tourist and outdoor recreation regions in the State of Michigan. Its natural resource base and beauty contribute significantly to the quality of life enjoyed by year round residents, and the area's continued growth and relative prosperity. However, with the rewards of economic achievement come the telling signs of environmental degradation. The same resource base that contributed to this region's desirability as a place to live and work is now under considerable pressure to support continued development.

The recently approved Grand Traverse Bay Watershed Protection Plan states that sediment and excessive nutrient loading are two of the highest priority pollutants that are threatening the cold water fishery, aquatic life, and other designated uses in the Grand Traverse Bay watershed. Other pollutants that threaten the watershed's designated uses include thermal pollution, toxins, changes in hydrologic flow, invasive species, pathogens, and loss of habitat. All of these nonpoint source pollutants degrade water quality, destroy aquatic habitat, and reduce the number and diversity of aquatic organisms. It is important to monitor the health of not only the larger streams in the watershed, like the Boardman River, but the small tributaries draining directly to the bay. These small tributaries, numerous as they are, have the potential to negatively effect water quality. This is especially important because many of these smaller streams run through residential and commercially built up areas, which increase the risk of pollution from storm water and other nonpoint source pollutants. We intend to monitor 10 of these small, wadable tributaries for this project. Macroinvertebrate monitoring is an excellent source of accurate information regarding the ecological health of a stream.

Data gathered from this project will enhance local land use planning efforts. Results from this project will provide residents and local planners a quick, baseline assessment of our area streams and essentially show us a 'snapshot' in time of stream health. Results will be distributed to local media and be posted on The Watershed Center's website. This "picture" of stream health will help to indicate which streams are degrading in water quality and what types of protection and restoration, if any, each stream may require. It is widely known that land uses affect water quality, and monitoring macroinvertebrates in a stream is one of the best ways to get an accurate assessment of the health of that particular stream. The Watershed Center will use results from our monitoring program to assist us with our ongoing protection efforts including stream restoration projects, BMP installation, and partnering with local governments, NGO's and residents for outreach and education purposes.

## **A6. Project Description**

Grand Traverse Bay Stream Search will provide valuable water quality data to track and detect early changes to a stream system. Stream Search also will serve as an important educational tool. It will be marketed as a community event where members can take ownership and pride in their local streams, while engaging them in a fun, hands-on program. It will provide education to adults and children alike on water quality indicators and issues. Most importantly, the goal is to

have Stream Search increase interest and awareness of watershed issues and stewardship of the resource among area residents and visitors. Volunteer participation is essential to Stream Search, and their involvement ensures the achievement of the above goals. Recruitment of volunteers will begin one month before the event date, and will include: e-mail to past team leaders and collectors, press releases to local media twice before the event, flyers posted in high visibility areas, advertisement in local newspapers, and face-to-face recruitment.

Sampling will be conducted during a one-day Stream Search community event. Volunteers will meet at a local park and will be organized into teams, each team including one trained Team Leader. Each team will be assigned to a stream, with a specific location in the stream to be sampled. Some streams will have two monitoring sites associated. Each team will be outfitted with a Stream Search sampling kit. A Stream Macroinvertebrate Data Sheet (attached) will be used to record in the field the number and diversity of macroinvertebrates found in the streams, as well as what types of habitat were sampled. A Single Site Watershed Survey Data Sheet (attached) will be used to complete a habitat assessment of each site. Team Leaders will have attended at least one training session prior to the sampling event, where they will be trained in habitat assessment and invertebrate identification. After sampling is completed, teams will reconvene at the park to return sampling kits, data sheets, and collected invertebrates, and to discuss their findings and ask questions.

Tributaries to be sampled include (all tributaries drain to Grand Traverse Bay, except Kid's Creek, Miller Creek and Jack's Creek which drain to the Boardman River):

- Baker Creek (two road crossing sites)
- Mitchell Creek (two road crossing sites)
- Yuba Creek (one road crossing site)
- Acme Creek (one site upstream from outlet to Grand Traverse Bay, one road crossing site)
- Ptobego Creek (one site downstream of dam, one road crossing site)
- Kid's Creek (one commercial area site, one road crossing site)
- Brewer's Creek (one site near road crossing, one site near outlet to Grand Traverse Bay in park)
- Cedar Creek (one residential area site, one road crossing site)
- Miller Creek (one road crossing site)
- Jack's Creek (one road crossing site, one residential area site)

Criteria for site selection included: small, wadable tributaries within Traverse City or greater Grand Traverse region, near an outlet to Grand Traverse Bay or major river, and easy access (i.e. park, residence, road crossing). Maps of each site location are available if necessary.

### Stream Search Task Schedule

YEAR	2005			2006				2007	
QUARTER	3 <sup>rd</sup> Qtr Apr- Jun	4 <sup>th</sup> Qtr Jul- Sep	1 <sup>st</sup> Qtr Oct- Dec	2 <sup>nd</sup> Qtr Jan- Mar	3 <sup>rd</sup> Qtr Apr- Jun	4 <sup>th</sup> Qtr Jul- Sep	1 <sup>st</sup> Qtr Oct- Dec	2 <sup>nd</sup> Qtr Jan- Mar	3 <sup>rd</sup> Qtr Apr- Jun
<b>Task</b>									
<b>1. Project Management</b>	X	X	X	X	X	X	X	X	X
<b>2. Conduct Monitoring Tasks</b>									
A. Team Leader Training		X			X	X			X
B. Conduct Sampling Events			X		X		X		X
C. Develop QAPP	X	X							
D. Purchase sampling supplies		X							
<b>3. Event Planning and Volunteer Recruitment</b>									
A. Event Day Planning and Coordination		X	X		X	X			X
B. Volunteer Recruitment		X	X	X	X	X	X	X	X
<b>4. Evaluation</b>									
A. Compile and summarize all monitoring results			X			X	X		X
B. Report findings			X			X	X		X

Target sampling dates are the first Saturday of June and October, with team leader training to occur one Saturday prior. Sampling teams are formed the day of the event. Permission for access has been gained for all current sampling sites and for any additional future sites permission will be obtained two weeks prior to the sampling day. Staff changes, too few hours allotted for tasks, and internal financial changes may create constraints which could affect the execution of this program.

#### **A7. Data Quality Objectives**

Accuracy and Precision: Precision refers to the ability of a method to provide reproducible results from sample to sample, while accuracy refers to the method's ability to measure a known or actual value of the process being monitored. For macroinvertebrate monitoring, it is not possible to develop known samples, but it is important to develop methods to estimate accuracy.



Measures of precision and accuracy are critical to assuring that a program's data is credible and reflects actual conditions.

This program is primarily concerned with measuring the total diversity (D) of macroinvertebrate taxa and the Stream Quality Index (SQI) score, along with other non-quantitative information. For the first macroinvertebrate sampling event by each new team or team leader, a designated Project Expert (usually the Project Organizer, but other qualified personnel are acceptable) will perform an independent collection (duplicate sample) no less than a week after the team's original collection and no more than two weeks later. Team leaders will be observed at training sessions to evaluate [1] collecting style (must be thorough and vigorous), [2] habitat diversity (must include all habitats and be thorough in each one), and [3] the transfer of collected macroinvertebrates from the net to the sample jars (thoroughness is critical). Resulting measures of D and SQI by the teams will be compared to expert results and each should have a relative percent difference (RPD) of less than 40%. This statistic will be measured using the following formula:

$$RPD = [(X_e - X_v) / (\text{mean of } X_e \text{ and } X_v)] \times 100,$$

where  $X_e$  is the expert measurement and  $X_v$  is the volunteer measurement for each parameter.

The Project Organizer will also verify all identifications made by the volunteer teams. An error rate should be calculated for each identified sample using the same statistic as above. The RPD of identifications should be less than 5%.

Volunteer teams that meet quality standards will be allowed to conduct future field collection without expert rechecks, though they will still be required to attend the training sessions once per year. Teams that do not meet quality standards will be retrained in the relevant methods at the next training session and the Project Organizer will re-evaluate their collection during the subsequent sampling event.

Additionally, MiCorps staff will conduct a method validation review with the designated Project Organizer to ensure his or her expertise, preferably prior to the first training session held by the Project Organizer. (Note that this must be conducted with each new qualified personnel added to a MiCorps monitoring program.) This review will consist of a joint duplicate sampling event, with MiCorps sorting and identification. All cases of collecting deficiencies will be promptly followed (during that visit) by additional training in the deficient tasks and a subsequent method validation review may be scheduled for the following collecting season.

Precision concerns regarding correct site sampling is addressed via detailed site identification and naming. For example, in the case of streams with two road crossing sites to be sampled, each site will be identified by the name of the road under which the stream crosses.

Bias: Bias is a measure of systematic error. Bias can be introduced by the methods used in all sampling events or by individual samplers or teams. The above examinations should serve to measure bias in the methods of the program. Procedures must be in place to detect bias in sampling teams.

Sites will be sampled by different teams at least once every two years to examine the effects of bias in individual collection styles. An RPD between the new measure and the mean of past

measures should be less than 40% for all parameters. Sites not meeting this DQO will be evaluated as above by the Project Organizer.

Completeness: Completeness is a measure of the amount of valid data obtained from the monitoring program compared to the amount that was expected to be obtained. Completeness combines the results from all teams to give the manager a measurement of how the program is functioning overall. Not all data generated in a study is automatically acceptable for use in addressing the objectives of the study since data may fail QA/QC reviews.

Following a QA/QC 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 95%. 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.

Comparability: To ensure comparability, all volunteers in the watershed will follow the same sampling and site selection methods and use the same units of reporting. The methods are based on MiCorps standards, which increase comparability with other MiCorps programs. Periodic reviews of sampling events by the Project Organizer will ensure adherence to these standard methods.

For each sampling event, monitoring by volunteers will be completed within the same two week period each year. 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 on the event day, the teams will return to the meeting place and the Project Organizer and the monitoring team will attempt to reschedule the sampling. If this is not feasible, the Project Organizer will be responsible to see that the site is monitored if possible, and, if not, the site will not be sampled and there will be a gap in the data.

All macroinvertebrate data are considered critical and will be tracked over time. Habitat data to be considered critical and tracked over time include substrate and stream corridor information, whereas other habitat data are considered subjective and for context information.

Different team leaders and volunteers sampling may vary depending on experience. Much of the habitat data is subjective and will vary from team to team. Rotating team leaders among all streams will help to give a broader picture of variables.

Numbers and types of macroinvertebrates can help determine water quality by providing a “snapshot in time” of stream health. Results should be used as a guideline to point to where problems may exist and further research may be necessary. Habitat assessments may also be used to determine why numbers and types of macroinvertebrates may be found at particular sites, but is somewhat subjective.

## **A8. Special Training/Certifications**

Kellie Ferguson, Project Organizer, completed MiCorps training in June 2005. Sarah U'Ren, Project Manager, has completed a team leader training given by the West Michigan Environmental Action Council's Stream Search program (Fall 2002), for the past two years has led Stream Search training with Don McNew and has used the habitat assessment sheets extensively for field work in her past 5 years of work experience.

Team leader volunteers are required to attend a one day training session conducted by The Watershed Center staff and Don McNew, Biologist with the Great Lakes Environmental Center.

After introductions and a brief overview of program goals and safety protocols, the morning session will be conducted in the field at an area stream where the following topics will be covered:

1. Description of equipment and sampling kit. – *TWC staff*
2. Explanation of field data sheets – Stream Macroinvertebrate Data Sheet; Single Site Watershed Survey Data Sheet. Team leaders will fill out the Watershed Survey sheet in the field as a group after explanation. This gives volunteers an opportunity to “get their feet wet” and to ask questions that may not have occurred in the classroom setting. – *TWC staff and Don McNew*
3. Explanation/demonstration on how to use sampling equipment. Team leaders will then collect invertebrate samples to identify back in the classroom that afternoon.– *TWC staff and Don McNew*

During the second half of the day, participants will receive training on how to identify benthic invertebrates to Order using a dichotomous key. After a brief explanation and general introduction regarding invertebrates, participants will be asked to identify a reference collection using the key. Volunteers will also identify the specimens they collected in the field that morning and practice filling out the Stream Macroinvertebrate Survey Data Sheet. Don McNew will lead this portion of the training.

An electronic and hard copy list of all team leaders who have completed training will be maintained by the project organizer in perpetuity, to be updated for each training session.

## **A9. Documentation and Records**

Volunteers will complete the volunteer stream survey and benthic macroinvertebrate inventory forms during each site visit. Information includes the stream name, station number, location (road crossing if applicable), county, township, date, time, and name(s) of the investigator(s), as well as habitat and benthic invertebrate data and scores. All data sheets will be returned to the Project Organizer, at the completion of sampling activities. Data sheets will be entered into The Watershed Center's online stream health database ([www.gtbay.org/streamsummary.asp](http://www.gtbay.org/streamsummary.asp)), as well as entered into the MiCorps database. The field data sheets will be stored at The Watershed

Center office for 5 years. All records in the database are maintained and backed up on a server held by the Land Information Access Association.

Volunteers will collect and preserve (in jars with 70% ethanol, sealed with poly-seal caps) specimens of all invertebrate taxa found at a site for laboratory identification (if necessary) and verification purposes. These jars will be clearly labeled, identifying the stream name and location, collection date and time, and the name(s) of the volunteer(s) that collected the data. Specimens will be stored and maintained for 3 years by the Project Manager, at The Watershed Center office.

## **B1. & B2. Study Design and Methods**

The Grand Traverse Bay watershed sites are sampled twice per year, once in the first two weeks June and once in the first two weeks of October. A sampling visit includes an assessment of stream habitat quality and the collection and identification of benthic macroinvertebrates. There is a place on the field data sheet to note event conditions and days since rain. Sites were chosen with consideration of accessibility and reasonably broad coverage of the watershed. As more volunteers are recruited, additional sites will be chosen to further widen the scope of investigation or in response to specific issues or concerns. For example, if a new road is planned, then a site will be selected to measure potential impacts. If cattle access to the stream is noted, then a nearby site may be selected to document the extent of the problem. If a farm implements BMPs, then a nearby site will be chosen to document improvements in stream quality. This site selection process will ensure that volunteer monitoring provides both an overview of water quality in the Grand Traverse Bay watershed and information about suspected or known stressors.

Volunteers will meet at a predetermined site, usually a local public park, and will be organized into teams, each team including one Team Leader. Each team will be assigned to a stream or streams, with a specific location in the stream to be sampled. Some streams may have two monitoring sites associated. Each team will be outfitted with a sampling kit consisting of:

- Clipboard
- Single Site Watershed Survey Data Sheet
- In stream Survey Data Sheet (Macroinvertebrate Inventory Sheet)
- White tray
- 1 large and 2 small magnifying glasses
- Plastic cup (for net rinsing)
- Turkey baster (for more precise net rinsing)
- Eye dropper
- Collection jar with ethanol
- 2 forceps (sharp/dull)
- Ice cube tray
- 3 laminated identification sheets
- 2 pencils
- Insect repellent

Sampling kits and all sampling equipment is stored at The Watershed Center office.

Volunteers will carpool to their assigned stream site(s). Although none of the road stream crossing sites are on the same road, a detailed local map is given to each team, with sampling locations clearly marked, and teams are given detailed verbal directions prior to dispatch. A Single Site Watershed Survey Data Sheet will be used to complete a habitat assessment upon arrival at each site. This sheet will record background information on the stream, as well as information regarding the physical appearance, substrate, in-stream cover, river morphology, stream corridor and potential sources of pollution to the stream. The data sheets also provide space for notes with regard to weather differences and/or flow condition differences. Next, multiple samples will be taken using a D-frame net, sampling any habitat type present, including leaf pack, undercut banks, riffles, rocks, stream bottom, etc. Kick nets will be held on the stream bottom with the net opening facing up stream. The collector will kick into the substrate in front of the net, dislodging any cobble, stones, etc., in order to release and catch macroinvertebrates. The nets will also be used under undercut banks to dislodge any invertebrates located in this habitat. Sampling will occur for approximately 20 minutes. Invertebrates will then be transferred to white trays for collection and identification. Identification will occur in the field with the assistance of the Team Leader and two types of identification guides included in the collection kits. Each invertebrate found will be preserved in a collection jar with ethanol and each jar will be labeled with stream name, location, and date. All invertebrates found will be preserved with the exception of the presence of more than 11 of one type.

After 11, a specimen is considered common, and it is not necessary to continue counting. A Stream Macroinvertebrate Data Sheet will be used to record in the field the number and diversity of macroinvertebrates found in the streams, as well as what types of habitat were sampled. This sheet breaks down invertebrates into sensitive, somewhat sensitive, and tolerant groups (classified down to Order). Stream sites where greater numbers and types of 'sensitive' insects are found will score higher on the ranking system than at sites where lower numbers or more 'tolerant' insects are found. Team Leaders will have attended a Team Leader training session prior to the sampling event, to be trained in habitat assessment and invertebrate identification.

Prior to leaving a site, volunteers are instructed to wash and pick the kick nets and remove any invertebrates that may remain on the net, as well as any other collection equipment. After sampling is completed, teams will reconvene at the park to return sampling kits, data sheets, and collected invertebrates, and to discuss their findings and ask questions.

Stream Search is held rain or shine. In the case of water level problems, teams will continue on to their next site (if they have one), or will return to the meeting point. In this case, teams will be asked if they are able to return the following week to make another attempt. If not, staff will attempt to sample the site within 2 weeks, if possible. If not the site will not be sampled and there will be a gap in the data.

Should problems with the program arise, the Project Manager, Project Organizer and the Executive Director of The Watershed Center will meet to discuss and formulate corrective

measures/actions to be taken. Any corrective measures/actions will be documented and reported in quarterly reports.

### **B3. Sample Handling and Custody**

The only samples that are brought back to the office are benthic invertebrates. Jars will be clearly labeled in the field, with a label written in pencil including information about sample location (stream and site number) and date. It will be stressed that labels are to be placed INSIDE the corresponding jar. Samples will then be returned directly to the Project Organizer who will transport the samples to The Watershed Center office for storage and spot checking if necessary. Upon return from the field, each team's jar and data sheets will be reviewed for completeness and legibility and jars will be checked for labels and to ensure a tightly fitting lid. Before each sampling day, the past sampling event's jars will be checked for ethanol level and filled if necessary. Samples will be stored at The Watershed Center for a period of 3 years. After 3 years samples will be disposed of in a manner that employs safety precautions to ensure that proper methods of disposal are used.

### **B4. Analytical Methods**

The habitat and benthic macroinvertebrate assessment methods used have been developed by the MDEQ for volunteer monitoring programs and are attached to this QAPP ("Volunteer Monitoring Procedures"). These methods are consistently used by volunteer organizations throughout Michigan. Macroinvertebrate identifications will be spot checked for accuracy by the Quality Assurance Manager, prior to data being entered into the MiCORPS or Watershed Center databases. Should an error be found, the specimen will be removed from the specimen jar and the correction will be noted on the inventory sheet. Team leaders must attend team leader training before each Stream Search event, therefore misidentifications will be addressed at ensuing training sessions to help eliminate future misidentifications.

### **B5. Quality Control**

All Stream Search team leaders will convene twice a year for a training session and conduct a site assessment at the same location. The purpose of this activity is to ensure that team leaders are following proper procedures and to evaluate variability among individual assessments. If a team leader is not following recommended procedures (as demonstrated in MiCORPS training sessions/materials), then the problem(s) will be pointed out and the proper procedure will be explained and/or demonstrated. The habitat evaluations by volunteers will be compared to past year evaluations for accuracy and variability. If variability between years is high (based upon best professional judgment since habitat assessments are not quantitative), then the project manager will attempt to determine the reasons for the variability (e.g. whether it is spread among all variables, or is confined to one or a couple of variables). These issues will be addressed at the next training session. It is anticipated that variability among volunteers will decrease as they gain more experience and confidence in the monitoring procedures.

Collections that do not meet data quality objectives will be discarded, and, when possible, the Project Organizer will resample the site. Should resampling be impossible, the site data will not be included in that event's data set.

Resulting measures of D and SQI by the teams will be compared to expert results and each should have a relative percent difference (RPD) of less than 40%. This statistic will be measured using the following formula:

$$RPD = [(X_e - X_v) / (\text{mean of } X_e \text{ and } X_v)] \times 100,$$

where  $X_e$  is the expert measurement and  $X_v$  is the volunteer measurement for each parameter.

The Project Organizer will also verify all identifications made by the volunteer teams. An error rate should be calculated for each identified sample using the same statistic as above. The RPD of identifications should be less than 5%.

If variability is greater than above percentages, then the Project Manager will determine whether differences are caused by different sampling efficiency among volunteers and/or by problems with invertebrate identifications. Once the cause of the variability is determined, it will be addressed at the next training session.

### **B6/B7. Instrument/Equipment Testing, Inspection, and Maintenance/Calibration**

Kick nets will be inspected for tears/holes in the mesh by the project manager prior to each sampling event. Nets with holes will be repaired or, as a last resort, replaced. Volunteers are required to thoroughly rinse and clean kick nets prior to returning from the field. Nets will be stored at The Watershed Center office. Specimen jars also will be inspected by the Project Manager for cracks prior to sample collection.

### **B8. Inspection/Acceptance for Supplies and Consumables**

Supplies will be inspected after each sampling event by the Quality Assurance Manager, and records will be kept of any damage encountered. Supplies will be replaced in 20 years unless damaged. Hip boots will be replaced in 10 years unless damaged. Any damages supplies or equipment will be replaced as soon as is feasible, at least one month before the next sampling event. (Supplies list attached.) The Quality Assurance Manager is responsible for all inspections and corrections.

### **B9. Non-direct Measurements**

### **B10. Data Management**

The field data sheet is reviewed by volunteers prior to leaving a site to ensure that the forms are fully completed and that nothing is left blank (unless there is a specific reason). The Project Organizer also will examine the data sheets for completeness when submitted by volunteers. At

that time, volunteers will be questioned about any omissions or possible errors. The Project Manager will spot check the invertebrate score calculations to ensure accuracy. The Project Organizer will inspect collections to ensure that they are properly labeled, and any necessary corrections/additions will be made. Data will be entered into the MiCorps database per instruction received by the Project Organizer in June 2005. The quality of data entry will be evaluated by comparing 100% of the data sheets to the appropriate database records. If multiple errors are found, then all data sheets will be compared with their database records, and steps will be taken to address the source of the data entry errors. In addition, data will be entered into The Watershed Center's online stream health database ([www.gtbay.org/streamsummary.asp](http://www.gtbay.org/streamsummary.asp)) Software used in The Watershed Center database is Microsoft Excel. Data sheets will be filed at The Watershed Center office for at least five years, specimen jars will be stored for three years. Data sheets are located in the office of the Project Manager, in the top drawer of the file cabinet to the right of the computer as one faces the wall. Specimen jars are stored in the Watershed Center's work room closet, on the right hand side, in a box labeled "Stream Search Bugs".

### **C1. Assessments and Response Actions**

As mentioned previously, all team leaders will convene once per year at team leader training sessions with the Project Organizer and Project Manager to assess performance and variability. Problems will be corrected by demonstrating proper techniques to individuals not following recommended sampling and assessment procedures. Team leaders are required to attend annual refresher training sessions, which will help to ensure that proper procedures are consistently followed. Identifications of specimens will be checked annually for accuracy, and volunteers that appear to be having difficulty will receive additional instruction from the Project Organizer or Manager. Team leaders will monitor for adherence to quality assurance methods and will report any problems to the Project Organizer which may affect data quality. Should it be found that data quality has been compromised, that sample will be discarded and another sample taken if feasible. If this is not possible, then there will remain a gap in the data. Internal system and performance audits will occur internally at the completion of each sampling event. These audits will be completed by the Project Manager, Project Organizer and the Executive Director of The Watershed Center. External performance and system audits will be conducted through project oversight and quarterly reports to the Great Lakes Commission and Michigan Department of Environmental Quality. Any problems affecting data quality will be reported to MiCorps by the Project Manager in conjunction with submission of quarterly reports.

### **C2. Reporting**

The Project Manager will produce an annual report summarizing the Grand Traverse Bay Watershed monitoring results from the previous field season (spring and autumn sampling). This report, to be completed each February, will be distributed to all volunteers, project participants, and any others who request it. In addition to the monitoring results, the report will describe any notable achievements, how the data were used by federal, state, and local agencies, a list of monitored sites, and the names of volunteers and future project sponsors. Data also will be



compared to those collected in previous years to establish water quality trends in the Grand Traverse Bay watershed.

All information reported above, and additionally, problems that may have occurred, QA results, problems affecting data quality and volunteer assessments and progress will be reported to MiCorps by the Project Manager in quarterly reports.

### **D1. Data Review, Verification and Validation**

All data collected during this project will be reviewed by the Project Manager to determine whether the QA objectives are met. Final data and QA reports will be reviewed and validated by the Project Manager. The Project Manager will decide whether data are accepted, rejected, or qualified. The main reason for rejecting data is likely to be poor identification of invertebrates. See Section A7 for a description of criteria that should be used for accepting, rejecting, or qualifying project data. Two months after each sampling event, data collected will be entered into the MiCorps and Watershed Center databases by the Project Manager or Project Organizer. Within 1 month of data entry, entries will be spot checked by whichever person above did NOT do the initial entry. Data review will occur when results are out of the ordinary. The Watershed Center does not have an entomologist on staff, nor does it have the time, money or resources to recheck each invertebrate sample. There is significant confidence placed in the Team Leaders, who are trained yearly and are often repeat participants.

### **D2. Reconciliation with Data Quality Objectives**

During the annual QA monitoring effort, the benthic macroinvertebrate index scores will be compared to assess variability among volunteers within one month of collection. If the RPD is greater than 40%, then corrective steps will be taken. This may involve additional training in sampling procedures and/or taxonomic identifications. It is expected that variability will decrease as volunteers gain more experience and confidence in the methods. Differences in the habitat assessments will also be analyzed to determine whether interpretation problems exist. The Project Organizer and Project Manager will decide whether to discard data and the remedial actions that are necessary to improve the quality of volunteer data. Data assessment statistics will be included in data reports, and a discussion of data limitations will be included in annual reports submitted by the Project Manager.