



# Texas StreamTeam

## Quality Assurance Officer's Manual

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## INTRODUCTION

Texas Stream Team (TST) Quality Assurance Officers (QAOs) play a very important role in ensuring that data collected by TST volunteer water quality monitors (VWQMs) are of the highest quality possible. Data users must be confident that the data are of high quality for the data to be valuable. Without some form of quality assurance, there is no way to be certain that the data collected are valid. The role of the QAO is to ensure all VWQMs precisely follow the monitoring protocols covered in the VWQM training and reviewing data prior to submission in order to produce high quality data. This manual provides information about the TST quality assurance/quality control program and successfully planning and conducting Quality Control (QC) Sessions.

### The Importance of QAOs

Certified QAOs exhibit an exceptional level of commitment to the TST program by taking on the responsibility to ensure VWQMs report information of high quality. Volunteer QAOs promote the efficient functioning of the TST program by keeping track of the last date group members participated in QC sessions and conducting them annually. With an abundance of VWQMs in the State of Texas, it is very difficult for TST and partner agencies to conduct QC sessions for all VWQMs. Additionally, by taking on the role of reviewing the data, a QAO may be able to detect an anomaly due to a knowledge of “normal” conditions which TST or partner agency staff may not be able to detect without being intimately acquainted with the area, and if a water quality concern is being documented, a volunteer QAO may be able to detect this and report it to the group leader in less time than it would take the TST or partner agency QAO.

### QAOs in Monitoring Groups

Monitoring groups are a collaboration of local monitors generally located along the same water body or within the same watershed. TST encourages monitors to join monitoring groups where they are present and form groups where they do not currently exist. Organizing monitors into local groups creates a community and offers support to individual monitors. In addition, monitoring groups encourage consistent data collection across a number of sites in a watershed. Monitoring groups should have a group leader, a trainer, an equipment manager, and a QAO. The QAO is responsible for conducting annual QC sessions and reviewing data prior to submission.

### The Importance of VWQMs

VWQMs play a vital role in maintaining healthy watersheds by serving as the eyes and ears of their local water bodies, and communicating water quality concerns to appropriate organizations. Trained monitors supplement professional water quality data, identify nonpoint source (NPS) water pollution concerns, describe ambient water conditions, and assist with water quality projects. NPS water pollution by nature is episodic, difficult to predict, and emanates from many locations. Trained monitors are in a unique position to observe and report water quality concerns before they pose a risk to public health and wildlife. For these reasons, water management organizations at the local, regional, and statewide level need an actively engaged group of trained citizens to help protect the water resources we all depend upon.

### Quality Assurance Project Plan

The TST Quality Assurance Project Plan (QAPP) details every aspect of the data collection and distribution process. This includes information such as sampling methodology, detection limits, holding protocol, chain of custody, analytical methods, data management, and reports to management. The TST

QAPP is prepared in cooperation with the Texas Commission on Environmental Quality and the U.S. Environmental Protection agency in order to assure data users can enhance their understanding of water quality in Texas with confidence that the correct methodology was followed. **All TST QAOs must become familiar with the QAPP**, which can be found on the TST website at <http://txstreamteam.rivers.txstate.edu/publications.html> or by contacting the TST office at 512-245-1346. QAOs should review the TST QAPP on an annual basis because it is updated annually.

#### Quality Assurance/Quality Control

Quality assurance is the overall process implemented by TST to ensure all information collected by VWQMs is useful and reliable. Quality assurance guides the entire program from training the monitor to reporting the data. Quality control is a part of quality assurance and involves VWQMs recording certain information during monitoring, data review and validation, routine site visits and/or QA/QC workshops, online quality control modules, and any other activity intended to preserve and improve the quality of data.

#### TST Partners Program

TST builds collaborative watershed-based partnerships and networks to help VWQMs locate resources needed to collect and report environmental information. The TST Partners Program is the coordination with public and private entities to help train, equip, manage, and offer general support to the growing number of monitors across the state. TST fosters strong relationships between citizens, industries, river authorities, councils of government, water districts, municipalities, state and federal agencies, students, teachers, and private groups and foundations. TST and partner agencies support VWQMs by training them to collect precise water quality information, supplying equipment, assisting with site creation, serving as a liaison to governmental agencies, analyzing and reporting data, and holding regional and/or statewide meetings.

#### Becoming a QAO

QAOs must become familiar with the TST QAPP and this manual to qualify as a QAO. QAOs are not required to undertake a training process. When groups are selecting a QAO, they should consider if any member may be more experienced with TST methodology than the rest since this individual would be an ideal candidate for this position. The group coordinator must select the QAO in the online data entry system at <https://aqua.rivers.txstate.edu/> as both the QAO and data manager unless the group prefers that these positions be filled by different people. Please refer to the “QAOs and Data Managers” section for more information.

#### The Texas Stream Team and Partner Agency QAOs

There are two types of QAOs in the TST program: volunteer and professional. The TST and partner agency QAOs are responsible for overseeing the activity of the volunteer QAOs and providing support as needed. The TST QAO is responsible for annually updating the QAPP to ensure it accurately depicts to current state of programmatic information collection. Volunteer QAOs are responsible for conducting annual site visits and reviewing data before submission. The TST and partner agency QAO will occasionally conduct a site visit with the volunteer to ensure it is being conducted correctly and will also check the reviewed data occasionally to see if anything was missed. It is their role to ensure volunteer QAOs receive the support they need to perform their tasks correctly.

#### QAOs and Data Managers

Some monitoring groups may wish to have different individuals review the data and conduct QC sessions. For that reason, group coordinators can select different individuals for each position in the

online data entry system at <https://aqua.rivers.txstate.edu/>. However, it is preferable that the QAO and the data manager be the same person since the necessary skills overlap. If the QAO and Data Manager are the same person, the group coordinator should select this individual for both positions in the online data entry system. If the datamanager field is left blank, the QAO will not be able to verify the data online.

## DATA REVIEW AND VALIDATION

QAOs will either review paper forms and electronically submitted forms using the online data entry system at <https://aqua.rivers.txstate.edu/>. The protocol for reviewing information will slightly vary for each method of review. Therefore, QAOs reviewing paper monitoring forms need to complete an additional checklist provided below. If errors are found on the paper forms, they should be circled in red pen before submitting to TST or partner agency, so they will be flagged when entered into the database. If errors are found on the online data entry system, the box next to the field should be selected, which will cause the data to be flagged when submitted. If a problem is detected in the data, the QAO should contact the VWQM to explain the error and provide instructions regarding how to correctly record or report the data at the next monitoring event. Videos demonstrating the proper procedures are available on the TST website at <http://txstreamteam.rivers.txstate.edu/monitors/videos.html>.

### Data Management Checklist

- Sample depth is either 0.3 m or half of the total depth.
- All fields for conductivity meter calibration are filled out with the following exceptions. "Meter Adjusted To" may be left blank when calibration is not necessary. "Post Test Reading" may also be left blank.
- Conductivity meter was calibrated within 24 hours of monitoring.
- Conductivity standard temperature is less than 32°C.
- Conductivity meter is calibrated to the value of 10 closest to the standard value.
- Conductivity values are reported in microSiemens per centimeter ( $\mu\text{S}/\text{cm}$ ), not milliSiemens per centimeter ( $\text{mS}/\text{cm}$ ).
  - Values in  $\text{mS}/\text{cm}$  will typically be recorded in waterways with high conductivity when the monitor is either using the dual range meter or the high range meter and will typically be less than 10  $\text{mS}/\text{cm}$ .
- Temperature values are reported in Celsius.
  - 38°C is roughly equal to 100°F. Consider what time of year it is to gauge whether or not the measurements are valid.
- Secchi depth values equal to total depth include the ">" symbol.
- Secchi depth and total depth values are recorded in meters.
- All relevant fields are filled in.
- Data Quality Review Checklist is completed (for *E. coli* bacteria data only).

When reviewing paper forms, QAOs need to use the following checklist in addition to the general checklist:

- Group ID, Station ID, Monitor's Name, and Site Description are recorded and are correct.
  - Monitor's Name must be one person's name, and it must include the first and last name recorded on the training packet during the training. Avoid using nicknames or the name of your group because it must be verified that the name on the form matches the name of the person trained.
- Type of conductivity meter is checked.
- Two dissolved oxygen values are within 0.5 mg/L of each other.
- Average dissolved oxygen value is correct.
- Certified monitor signed and dated the form.
- Field blank yielded no bacterial growth (for *E. coli* bacteria data only).
- Average *E. coli* bacteria value is correct.

## QUALITY CONTROL SESSIONS

QC sessions are designed to ensure that data collected by VWQMs accurately represents environmental conditions at the time of monitoring. These may be conducted as a site-visit where the QAO meets a VWQM at the monitoring location or as a workshop with a maximum of 12 people. Results of these sessions show how precisely and accurately VWQMs make their measurements. Monitors must bring their monitoring kits and equipment to be checked to ensure all safety equipment is available, all reagents are up-to-date, and the equipment is functioning properly.

At each QC session, VWQMs perform their routine sampling procedures and compare their values to those produced by the QAO. The TST QC Record is provided to assist QAOs with identifying potential errors (see Appendix A). Please note that the water temperature and dissolved oxygen will change as the sample sits in the bucket. Therefore, **water temperature and dissolved oxygen observations must be performed simultaneously**. Completed QC record forms must be submitted to TST, so the TST database can be updated to indicate successful completion of the QC session. This information is used to verify data quality.

### Texas Stream Team Quality Assurance Objectives

Data quality objectives (DQOs) are values which are used to verify the accuracy, precision, and completeness of the data collected by VWQMs. The monitor's values must meet the DQOs to successfully complete the QC session. The duplicate precision column shows what values are acceptable when the test is performed twice. With TST methodology, this only applies to the dissolved oxygen tests because it is the only test which is performed twice with the exception of the *E. coli* bacteria test, which is not performed twice to achieve duplicate precision but rather to achieve a more comprehensive understanding of potential bacterial contamination.

TST QAOs should refer to the accuracy column of the DQOs to see the desirable range for results. Because TST methodology cannot achieve 100% precision, this column shows the acceptable range for results to be counted as quality assured based on the limited precision of the TST equipment. Please note that the pH test has different accuracy ranges for the two methods: meter and color comparator. Also, the conductivity test has different accuracy ranges for ranges of observed values: low, medium,

and high. The low and medium ranges are shown in  $\mu\text{S}/\text{cm}$ , and the high range is shown in  $\text{mS}/\text{cm}$ . The completeness column refers to how complete a data set must be for it to be considered comprehensive. For example, a VWQM must sample 11 months out of a year (92%) for that data set to be considered representative of the year.

### Texas Stream Team Quality Assurance Objectives

VARIABLE	METHOD / RANGE	UNITS	DUPLICATE PRECISION	ACCURACY	METHOD SENSITIVITY	COMPLETENESS
Temperature	Thermometer -5.0 to 45.0	Degrees Celsius ( $^{\circ}\text{C}$ )	+/- 0.5 $^{\circ}\text{C}$	+/- 1.0 $^{\circ}\text{C}$	0.5 $^{\circ}\text{C}$	90%
pH	Meter	Standard pH units (su)	+/- 0.1 su	+/- 0.2 su	0.1 su	90%
	Color Comparator 3.0–7.0, 7.0–10.5	Standard pH units (su)	+/- 0.25 su	+/- 0.5 su	0.1 su	
Specific Conductance	Meter 0–1990	$\mu\text{mho}/\text{cm}$ ( $\mu\text{S}$ )	+/- 10 $\mu\text{S}$	Low +/- 30 Med +/- 130 High +/- 0.5	10 $\mu\text{S}$	90%
	0–19.90	$\text{mmho}/\text{cm}$ (mS)	+/- 0.1 mS		0.1 mS	
Salinity	Hydrometer 0.0 to 42.8	Parts per thousand (ppt)	+/- 1.0 ppt	+/- 2.0 ppt	0.1 ppt	90%
Dissolved Oxygen	Modified Winkler Titration	Milligrams per liter (mg/l)	+/- 0.5 mg/l	+/- 1.0 mg/l	0.1 mg/l	90%
Clarity	Secchi Disk	Meters (m)	+/- 0.1 m	+/- 0.2 m	0.01 m	90%
E. coli	Easy Gel 1–20,000	cfu/100 ml	NA	NA	1 cfu/100 ml	90%

#### Online Quality Control Modules

In some situations, it may be impractical for QAOs to schedule QC session either because VWQMs are spread out over large distances or scheduling conflicts cannot be mediated. For this reason, TST has developed online QC modules which may be completed in lieu of QC sessions. **Please note these QC modules should only be conducted when extreme conditions make a QC session impractical.**

The QC modules involve going through a series of questions regarding proper methodology. If a VWQM does not achieve a 100% grade, the module must be re-done. Trainer refresher videos and links to the Water Quality Monitoring Manual are displayed in the modules to assist those who did not get 100% of questions correct. The VWQM should e-mail the results to [txstreamteam@txstate.edu](mailto:txstreamteam@txstate.edu), so the database can be updated to show the completion of a QC session. The TST QC modules can be found on the TST website at <http://txstreamteam.rivers.txstate.edu/monitors/quality-control-self-assessment.html>.

**APPENDIX A**



# Quality Control Record

Texas Stream Team QA Officer Name: \_\_\_\_\_ Date: \_\_\_\_\_

Site Name and Number: \_\_\_\_\_ Monitor Name: \_\_\_\_\_

PARAMETER	Monitor Value	QAO Value	Accuracy + / -	Meet DQO (Y/N)
Time sample drawn			N/A	
Air temperature (° C)			1°C	
Water temperature (° C)			1°C	
Dissolved oxygen (mg/L)			1 mg/L	
pH (standard pH units)			0.5 su	
Conductivity (µS/cm)			30 µs/cm	

Is the conductivity read with the meter a ½ inch of the bottom and sides? Y      N

Does the monitor stir the conductivity meter for two minutes? Y      N

Is the thermometer placed in shade for air temperature? Y      N

Is the thermometer used for air temperature before water temperature? Y      N

Are supplies rinsed twice with sample water/solution before tests? Y      N

Are supplies rinsed twice with deionized water after tests? Y      N

Are bottles filled so bottom of the meniscus is resting on the line? Y      N

Are dissolved oxygen bottles capped under water? Y      N

Are reagent bottles completed inverted when adding drops? Y      N

Is the titrator filled correctly? Y      N

Is the pH test tube blue cap removed before viewing? Y      N

Is the pH test tube held up to a white background? Y      N

Knowledge of QC Procedures:            0            1            2            3            4            5

Record Keeping:                            0            1            2            3            4            5

Comments/ Follow Up: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Texas Stream Team QAO Signature \_\_\_\_\_ Date \_\_\_\_\_