

REGION 6

Stream Habitat Inventory

Quality Assurance/Quality Control

Manual



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Pacific Northwest Region



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QUALITY CONTROL MANUAL FOR THE STREAM INVENTORY PROGRAM

INTRODUCTION

In the Chief's "A Natural Resource Agenda for the 21st Century", he identified four key areas of focus, and the top priority was to maintain and restore the health of our ecosystems and watersheds. To address this focus, we need to be able to describe the existing condition of our aquatic resources. We do that in part through the Pacific Northwest Stream Inventory Program. We have a defined stream inventory protocol (Level 1 and 2) that has an associated corporate and national database (Natural Resources Information System, Aquatic Inventory, Aquatic Biota (NRIS AI/AB)). The program began in 1989, with about 15,000 miles of stream surveyed over the past 13 years. This significant investment of time and money has led to an evaluation of the quality of the program.

Quality control and assurance (QC/QA) is an important part of any data collection. The Region 6 Stream Inventory Program is no exception, but no formal QA/QC procedures had ever been outlined. Recent checking and subsequent clean up of the data in the region has brought to light some problems that justified the need for a Quality Control manual. Recent reductions in budgets and the high profile of our stream inventory data made quality assurance, program efficiency and organizational structure a priority for the Hydrology and Fisheries program managers.

The Stream Inventory Quality Control Manual is a technical document that outlines specific procedures to guide stream inventory quality control coordinators and surveyors at the Forest scale in collecting the most accurate data possible and entering it into the NRIS AI/AB database. The manual explains procedures that will establish consistency and standardization to ensure the quality of data collected and entered into the database will be high.

Quality assurance consists of several facets necessary for ensuring high quality data collection and entry. Each component must be completed to meet the goal of providing a high quality database.

Study results tell us that training crews is the most crucial aspect in creating quality data. Crews need to have proper preparation and knowledge of the protocol before they can conduct surveys. A key component after the initial basic training is the use of a "test reach", where surveyors hone their skills before conducting field inventories.

Good quality control in field data collection will lead to higher quality data for entry into the NRIS database. However, training and QA/QC are also required for data entry personnel so they know enough about the database and the protocol in order to detect and correct errors in data entry.

Stream Inventory Objective

Provides defensible, quantitative characterization of physical and biological aquatic habitat conditions at the reach and watershed scales to support a variety of planning, analysis, monitoring, and evaluation activities.

Regional Quality Control and Quality Assurance Program Objective

Provide oversight and guidance to Forest Stream Inventory Programs with the goal of collecting and maintaining high quality stream inventory data.

Centralization of Stream Habitat Inventory Programs

To ensure the goal of consistency and standardization across the Region, each National Forest or province area, will develop and implement a centralized program, with one person assigned responsibility for coordinating and implementation. (See Appendix A for Province descriptions). The duties for the stream inventory coordinator are as follows:

- Main contact for questions about procedures and protocols;
- QA/QC contact and perform QA/QC checks on the surveyors throughout the season;
- Responsible for ensuring that quality data is collected and entered into the database;
- Typically responsible for hiring stream inventory crews or administering contract crews;
- In charge of Forest training, including a test reach.

Crew Supervision

Crews can be at the Districts but must check in weekly with the coordinator.

Standardized Reporting

A stream inventory report format will be developed for the Forest or Province so consistent reports are produced by each unit. Minimum completeness for these reports includes an overview, summary, reach summaries, and a survey map (see Appendix B for an example report).

R6 STREAM INVENTORY QUALITY CONTROL MANUAL

PROPER TRAINING

Proper training of field crews is an essential component of a QA/QC program. Forests must provide proper training for surveyors and coordinators by sending crews annually to R6 Stream Inventory Training (NR9) followed by training at the Forest. Follow-up training will include what was learned at NR9, with emphasis on local conditions through the use of test reaches. Emphasis should also be put on those items that were not covered during the NR9 training. The use of equipment specific to the Forest should also be covered.

- **Surveyors are required to attend the R6 Stream Inventory Training Session (NR9). If the surveyors are contractors they also must attend.**

Surveyors need to receive proper follow-up training at the Forest from experienced personnel to ensure comprehension and proper application of the regional inventory. Follow-up training must incorporate all aspects of stream inventory training, which includes the following:

Rosgen Delineation – Bankfull determination

Bankfull indicators and measurements are taught at NR9. This component needs follow-up at the Forest to familiarize surveyors with conditions in the area they will be surveying. A video/DVD is also available: *A Guide to Field Identification Bankfull Stage in the Western United States*. Consult the hydrologist at the forest for a copy of this video or they will have the information on where to obtain a copy.

Fish Identification and Sampling (electroshockers, etc.)

Additional training in fish identification is imperative for the individual locations because species differ by area. Training in the use and safety precautions of the electroshockers or other equipment used in identifying fish and capture is essential. The necessary precautions (along with any permitting or consultation) to be taken in streams with threatened and endangered species will also be covered at this time.

Riparian Vegetation – Identifying indicator species

This training should be completed to cover vegetation types and collection methodologies for the local area.

Habitat Identification

Although this attribute is covered extensively in NR9, Forests need to emphasize definitions by providing oversight in a field setting with surveyors to ensure consistency. The optional habitat subtypes are not covered in NR9, and training is the

Forest's responsibility.

Discharge Measurements – Use of Flow Meters

NR9 teaches the principle of discharge and demonstrates it in the field, but each Forest needs to train its surveyors how to use their particular flow meter. Training must also include procedures for taking discharge for discharge measurements and how to calculate flow.

Use and Deployment of Stream Temperature Monitors

If this is a task for the surveyors, than they must be trained in using and deploying the specific monitor being used. Temperature monitors must also be calibrated.

Wood Size Class Determination

Although covered in NR9, follow-up training on the Forest is required. Emphasize taking actual tape measurements of woody material to calibrate the surveyors' eyes to conditions that will be encountered in the field. Counting woody material should also be covered, especially wood counts in debris jams. Assure that the surveyors are counting wood only in the bankfull channel and are also counting live trees that may have boles in the bankfull.

Remarks

Note taking is a critical part of the inventory. Conditions that are not captured in data collection are recorded here. Good notes are important for writing good stream survey reports. Some of the conditions that surveyors should note:

- Unstable banks on nonmeasured units
- Activities, such as grazing, timber sale, roads in riparian areas, rock quarries, recreational uses near the stream (trails, campgrounds)
- Fish presence
- Plugged culverts
- Possible fish barriers
- Type of harvest methods, buffer size, Sequence Order (SO) where harvest unit begins and ends
- Debris jam locations, size and effect on stream dynamics, such as side channel formation
- Wildlife sightings
- Channel gradient, valley floor width, and valley slopes
- Existing instream structures

Test Reach

All crews must survey a test reach to evaluate their knowledge and readiness for fieldwork. For more detailed information on how to set up and run a test reach, see

Bank Stability

This attribute is covered in NR9. It needs to be stressed that bank stability is recorded above bankfull, and it needs to be looked at in conjunction with the natural and manmade conditions for the area.

Any additional attributes collected by the Forest

If a Forest chooses to collect optional attributes from the R6 protocol or they collect additional attributes not covered under the protocol, they must be taught at the Forest (Province).

PRE-SURVEY WORK (LEVEL I)

Pre-survey work consists of gathering as much information about the stream to be surveyed as possible, including map preparation (USGS, 1/24,000 scale map), aerial photos, and completing preliminary field forms. This work provides a base to start from, identifying safety hazards, access points, and difficult terrain before going to the field.

Quality Control Starts with having the Right Tools Before Starting the Survey

Completion of the Survey Form and Preliminary Reach Forms is vital to having efficient and well-prepared crews. Items such as aerial photos and good field maps also promote safety for the crew. The following items and forms must be completed before surveying:

Survey Form

This form documents historical information for the stream to be surveyed to assist surveyors by providing a snapshot of conditions in the field.

Preliminary Reach Form

This form identifies preliminary stream reaches from topographic maps (USGS, 1/24,000 scale map) and aerial photos.

We recommend to mapwheel the river miles for field ready maps, and copy the maps onto write-in-the-rain paper.

Color copies of aerial photos that cover the stream and the adjoining road network.

Any reports from previous surveys.

Tip: Sending out a Stream Information Request Form to the person that requested the stream survey will help you define important aspects when completing the Survey Form and Preliminary Reach Forms (see Appendix C for an example).

Pre-survey Checklist

The checklist in Appendix D aids in preparing the stream folders.

TEST REACH PROCEDURE

This is a mandatory procedure consisting of a stream segment previously surveyed by an experienced team. Results of the test reach are evaluated against test reach data from experienced teams. Dependent on the evaluation, procedures are corrected and the test reach re-surveyed. Surveyors that meet minimum standards do not have to resurvey the test reach. The test reach results are a tool for QA/QC coordinators to determine if surveyors are ready to begin actual surveying. It will also show areas that may need improvement.

****A copy of the test reach results must be sent to the Regional QA/QC Coordinator each year. If a forest is contracting out the survey work the contractors must also be tested.****

Setting up a Test Reach (QA/QC Coordinators)

1. Select a stream that is easily accessible. Length of stream segment should be at least ¼ mile.
2. The stream segment selected should consist of a variety of habitat units; try to include special features, culverts, and woody debris. It is recommended that at least 12 pieces of wood be in the test reach. This may not be possible in all locations.
3. An experienced team will survey the stream segment prior to use as a test reach, and accomplish the following:
 - Flag the beginning and the end of the test reach. Also flag the habitats where surveyors are to perform bankfull and floodprone measurements and the Wolman pebble count.
 - Each channel unit will be measured (length, average width, and maximum depth).
 - In-channel woody debris within the unit will be measured with a diameter tape if possible and recorded. Countable live woody debris will be estimated.
 - Bank instability, if present, will be measured at designated measured units.

Running the Test Reach (Stream Surveying Crews)

1. Be sure crews have been through proper training and are comfortable with the protocol (pg. 3-4. Proper Training). They should have spent time training in the field prior to the test reach exercise.

2. Assign crews as they will be paired for the summer stream survey season. Before starting the test reach, discuss the actions they will take before they enter the test reach (as if they were doing an actual survey). Following are some of the items crews should have or refer to:
 - Correct survey forms (Channel Unit Form, Special Cases Form, Remarks Form, -
 - Wolman Forms) and a sufficient number of copies for a days' work (on write-in -
 - the-rain). Necessary equipment (a cheat sheet in the form of a checklist on the
 - clipboard will help complete this task. See Appendix E for an example).
 - Surveyors' calibrate eye (if estimating).
 - Necessary field maps and aerial photos.
 - Selecting random number for measured units (can be different for slow water
 - units and fast water units).
3. Each crew can start in a different spot (they would cycle back to the beginning of the reach and end where they started) or the start times can be staggered but the entire test reach must be completed. Give plenty of distance between crews so that they have adequate time to survey at their own pace. As crews are surveying have them reference the handbook for answers to their questions. Make them work through the problem and address it after the test reach is completed.
4. The QA/QC Coordinator fills out the Test Reach checklist in Appendix F. These checklists help to highlight areas that need work and will also highlight areas where surveyors are doing a good job. Positive reinforcement is an important part of this process and can be conveyed verbally and through the comments section. **A copy of this checklist will be sent to the Regional QA/QC Coordinator.**
5. After the test reach is completed, go through any pressing questions. It may be good to walk through the test reach as a group to cover major questions that come up. Take the data and compare it to the master data that was collected. This is the time to address any major problems or errors in data collection, if any.
6. After running the data through analysis (see Appendix F) sit down with each crew and discuss ways to improve the data collection and possibly go back to the test reach for discussion. Successful completion of the test reach will mean that crews have completed the test reach and all collected attributes are within a range of acceptable accuracy. See Appendix F, Test Reach Summary Form.
7. After successful completion of the test reach make sure any points that were not covered in the test reach are covered in the field at a later date, these include but aren't limited to:

Special Features

- Falls** – Each forest is responsible for establishing criteria for a falls.
 - Is there a minimum height?
 - Must it be a permanent feature or can debris jam or spanner log be the

cause?

Chutes – Follow definition (see pg 95 in the Stream Inventory Handbook).

Dams – This is a man-made feature; a beaver dam is **not** considered a special feature under this protocol.

Marshes – If marshes take up an area greater than ½ mile in length they should be broken into a separate reach.

Culverts – Look at the dimensions and how each is measured. If possible visit different culvert types. The Special Cases Form has all the attributes that need to be collected. Remember when a culvert with multiple pipes is encountered; choose the one with the best passage for fish.

Braids – Follow definition (see pg 39 in the Stream Inventory Handbook).

Vegetation – How this is collected depends on individual forests. The methodology that each forest follows and vegetation identification needs to be a part of follow-up training.

Test Reach Checklist

The checklist in Appendix F covers the multiple aspects of stream inventory. Each checklist has only a simple check off of Pass or Needs Work. A comments section is available to elaborate on any problems or good points that may come up during the test reach. These checklists should be filled out during and after the test reach and then shared with survey crews. They will be completed by the QA/QC coordinator.

A few of the items on the checklist may not be used at the time of the test reach but during other field exercises such as: culvert identification, special feature identification, and discharge measurements.

The test reach summary sheet has the main areas surveyors will be tested on. This sheet will aid in the comparison of the control data with the surveyors data.

If a stream survey crew does not pass the test reach more training is needed. The Forest coordinator will spend more time with the crew in the field identifying channel units and emphasizing problem areas that occurred during the test reach. Another test reach will be performed. Once the crew is deemed ready to survey the Forest coordinator should plan to spend extra time with the crew to insure proper techniques are being followed.

PROCEDURE FOR QUALITY CONTROL CHECKS DURING THE FIELD SEASON

Quality control field checks consist of two parts to be done by the Forest QA/QC Coordinator or a designated alternate with experience in the stream survey protocol: 1) Accompanying the crew early in the season to ensure that the methodology and procedures are understood 2) surveying a segment of stream that has already been done by the crew and comparing it to the QC crew data (need two people for this QA survey).

Regional involvement will consist of periodic visits by the QA/QC regional coordinator (RC) to the forests. The RC will perform a resurvey of a segment of stream that has already been surveyed by a forest or contract crew. They will then compare the data to determine the precision of the crew. The RC will also review any previous QA/QC checks done by the forest. (Action to be determined after review of the data)

***A copy of two pages from the crew's first survey must be sent to the Regional QA/QC Coordinator for review. This procedure can help detect errors or misunderstandings of the protocol.**

QA/QC Guidelines for Surveyors

The surveyors are a major link in the end product. A quality product starts with the surveyors as the first line of quality control.

1. Every channel unit length is measured. Average widths can be estimated but it is recommended they be measured also. If not, surveyors must calibrate their eyes before starting the survey. This can be done in increments of their choice (i.e. 10', 25', or 50'). It may be good to use the average width as a calibration unit as this is usually the hardest estimate to make. A surveyor should not try to estimate a distance more than 50' long. Calibration should be done throughout the day especially when encountering changing channel types. A clicker can be used to track measurements so the surveyor will not lose track of the total measurements on long units. Unit lengths should be limited to 500 feet.
2. When choosing a sampling frequency be sure to select a number that will ensure that 10% (or 10 habitats which ever is greater) of slow water units **and** 10% (or 10 habitats which ever is greater) of fast water units will be measured. In addition, **at least** 10 slow water units and 10 fast water units must be measured. For example: If the stream is small, choose a lower number such as 1 in 3 (measuring 1 slow water unit for every 3 slow water units), this will provide you with a higher sampling frequency, therefore measuring more often, to meet the requirement. Fast water units can be done the same way or given a different frequency depending on stream conditions. Once you have 10 slow water units and 10 fast water units measured, the sampling frequency can be changed to the minimum of 1 in 10. Remember if the stream distance is short every fast water unit and slow water unit may need to be measured to meet the minimum requirements.

3. Check SO's, channel unit numbers, and data fields **AFTER EACH FIELD DAY** to ensure all sequenced numbers are right. If information is missing, fill in or explain why it is absent. SO's should be checked throughout the day, such as at lunch or while waiting for a measured unit to be completed. Frequent data checking results in less work later. If any errors are found, make sure that the SO's are corrected on all corresponding data sheets.
4. If bankfull information cannot be collected due to large river or glacial systems, an estimate should be written down. Note in the comments section that this is an estimate and write down the reason for not taking actual measurements.
5. Complete the reach break characterization (Final Reach Form) explaining why the reach was ended before beginning the survey of the upstream reach.
6. Check all data sheets for legibility.

Initial Visit (Informal Project Supervision)

The QA/QC Coordinator will accompany each team for 1 to 3 days to ensure methodology and procedures are understood and being followed. The team leader should answer all questions at this time before doing a formal QA/QC check as described below (See Appendix G for QA/QC Field Evaluation Forms). The initial visit will consist of the following:

1. Generalized question and answer session and written test before beginning hike/survey (See Appendix G for QA/QC Test).
2. Check field forms for completeness and legibility.
3. Complete the QA/QC Field evaluation forms.
4. The Forest QA/QC Coordinator should also evaluate safety during this phase of the visit.

Did they do tailgate stretches and safety sessions?

Did they talk about possible hiking hazards before they began hiking in? Is a clear route to the stream identified? Are possible routes identified for leaving the stream?

Do they have the proper equipment with them such as good working maps, aerial photos, compass, first aid kit, food, and appropriate clothing? (see checklist in Appendix E).

Do they have a Job Hazard Analysis (JHA) in the vehicle?

Formal QA/QC Visit

An experienced Forest quality control crew will select a stretch of stream that has already been surveyed to resurvey. Using landmarks such as roads, special features etc. to start a resurvey will aid in following the survey crews data sheets when doing comparisons later. Each crew must be evaluated at least once during the season.

Experienced crew will survey the selected segment of stream

- Segment of stream should be from ¼ to ½ mile long.
- Measure the length, width, and depth of every habitat unit.
- Measure wood with a diameter tape where possible.
- Take detailed notes.
- Bankfull measurements should be taken in at least two locations to compare to the survey crews measurements.
- A pebble count should be performed in a representative fast water unit.
- Include a reach break if possible.
- Try to choose a stream segment that has woody debris.

Compare the survey crew data to the quality control data through analysis. Graph the two surveys.

After data comparison share results with the survey crew. Address any problems and also praise good work by survey crews.

Regional Involvement

The Regional Office sets direction for QA/QC. The Regional Quality Control Coordinator (RC) will designate forests each year to visit and do QA/QC reviews. Forests can also request a visit for assistance. The RC will not only be evaluating the crews but will also be reviewing the team leader to ensure that QC is being carried out per direction. The RC will evaluate crews performance by surveying a selected area of stream (with local assistance) and comparing results.

POST SURVEY

Post survey QA/QC work consists of gathering all data sheets and checking for errors. This task is done immediately following a finished survey. Another survey will not start until these items have been accomplished. By doing a post survey QA/QC immediately after the survey is completed ensures information is fresh in the surveyors mind, which will help to expedite data entry.

1. All data sheets will be checked and corrected if needed. All numbers should correspond on all data sheets. Channel Unit Form SO's and channel unit numbers should be the same on the Channel Unit Form, Special Cases Form, and Remarks Forms. This becomes especially important if an error was corrected earlier.

2. A post survey checklist with the list of all the forms that need to be completed and tasks that need to be accomplished will be given to the crews to use for follow-up (see Appendix H).

Survey Map

A detailed survey map will be completed on each surveyed stream. These maps should include the following items:

- Reach Breaks.
- Identify tributary locations.
- Location of fish migration barriers.
- Location of timber harvest units with description of buffer size and type of harvest method.
- Impact areas such as campgrounds, road crossings, quarries, mining activity, diversion structures, and grazing.
- Fish sightings (spawning activity, fish presence, habitat utilization).
- UFO or Bigfoot sightings.
- Natural occurrences that are of significant interest such as; large debris jams, beaver dams, large slide areas, and riparian blow down.
- Road crossings with problems (culvert plugged, barrier culvert, erosion, road damage, etc.).

DATA ENTRY

Data entry requires training specific to the database used to store the data. Regardless of what database is selected for initial data entry, all field data must finally reside in the NRIS Aquatic Surveys (AqS) database. It is the role of the Forest QA/QC coordinator to insure that all survey data is entered into NRIS AqS, and that the data accurately represents the field survey.

The person or persons entering the data should be familiar with the database and stream survey field procedures and is required to attend a training session for NRIS AqS Data Entry. Individual or group training on the NRIS AqS database can be arranged through the Regional Office.

Once the field data has been collected and checked for errors and anomalies, it is ready for entry into the database. Certain checks will be conducted on the data during and after the data entry process by the Forest QA/QC coordinator. It is critical that the data be entered during the field season while the crews are still available if any questions should arise.

Data entry is the point at which the majority of QC problems emerge. Problems in field data collection not identified and corrected in the field will now emerge.

Data and Data Entry Preparation

Performing the following items before the start of data entry will reduce the chances of errors being made during data entry.

1. Clean up all data sheets
 - a. Make sure SO numbers are correct.
 - b. Check all data sheets to see that SO numbers correspond on all data sheets.
 - c. Mark the ending SO of every reach with a prominent colored line. This will keep you from entering SO's in the wrong reach.
 - d. Make sure all writing on the sheets is legible. Take care of problems before data entry begins.
2. Read the *NRIS AqS Data Entry Quick Guide for Region 6 Stream Inventory Data*. This guide will help troubleshoot many questions you may have regarding data entry. It also has some reference items that can be cut out and taped near your work area to assist during data entry.

During Data Entry

NRIS AqS treats each reach as a separate survey. It does not keep track of the SO's for you as you enter the data for your reach. It will not prompt you to start the next reach when the last SO in your reach is entered. Be sure to mark the reach endpoints well on your data sheets to avoid having to delete channel units from the database.

The SO numbers do not sequence automatically. Care must be taken to insure that the right sequence is maintained. No channel unit numbers will be entered. This is used only for the field copies for keeping track of measured unit frequency.

1. Please refer to the *NRIS AqS Data Entry Quick Guide for Region 6 Stream Inventory Data* and the *User Guide for NRIS AqS* for guidance while entering data.
2. Data must be entered during the field season so field crews can be utilized to answer any questions about data problems. Data should be entered after each survey.
3. "River Miles" refers to the actual river mile at which you started. For Example, if you began your survey at the Forest Boundary which was 1.5 miles up from the mouth, your river miles would begin at 1.5 miles and progress up from there.
4. If data looks suspicious, check the field notes or ask the crews to validate the

data. If there are any errors in number sequencing on the data sheets, return these to the field crews for corrections.

After Data Entry

See Appendix I for specific instructions and checklists for QA/QC procedures for data entered into NRIS AqS.

1. When data entry is completed, a Channel Unit Form Dump must be run. A separate dump will have to be run for each reach. **Queries to check the following items are available through NRIS AqS.** Also check the following parameters by hand:

Length – Shorter than width (OK in plunge pools).

Width – Longer than length.

Depth – Look for misplaced decimals and unusually deep units.

Average Depth (if collected) – Is it less than the max depth?

Pool Crest Depth – Is it less than max depth?

Check to see if measured units correspond with estimates.

Look at unusual wood numbers – Tally marks interpreted as a number.

Check SO's to make sure they are in the right reaches.

2. Correct any errors found and then reports can be run through NRIS AqS GI tool.
3. Regional coordinator will begin to run periodic checks from the Regional Office at the end of January. Error reports will be sent to the respective forests and given a specific timeline for correction. These areas will be checked again to ensure that corrections have been made.
4. Stream Inventory Data will be entered by the end of December each calendar year.

APPENDIX A

PROVINCE DESCRIPTIONS

W.WA MBS/OLY/GIP

NW.OR MTH/WIL/SIU/CRSA

SW.OR SIS/ROR/UMP

Blues UMA/WAW/MAL

NE.WA WEN/OKA/COL

SE.OR DES/WIN/FRE/OCH

APPENDIX B

SAMPLE STREAM SURVEY REPORT

**SEE QA/QC Section in Binder for two sample Stream
Inventory Reports**

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APPENDIX C

**STREAM
INFORMATION
FORM**

Stream Inventory Program
Stream Inventory Request Form

District:

Stream Name / Mileage:

Location of Start Point (township,range, section):

GPS Coordinates of Start Point (if available):

Reasons for your request for survey this year:

1)

2)

3)

Management activities influencing the basin:

1)

2)

3)

Future Project Plans:

Knowledge of Fish Presence, Historical Presence, Barriers, etc.:

Access Problems:

Identify special habitat or problem areas:

Past stream surveys or other studies conducted on this stream:

APPENDIX D

**PRE-SURVEY
CHECKLIST**

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APPENDIX E

CLIPBOARD CHEAT SHEET

Field Gear Checklist and Cheat Sheet

DAILY CHECKLIST

- *Boots and socks
- *Clipboard
- *Lunch
- *Pencils
- *Radio
- *Staff
- *Vest
- *Watch
- *Drinking Water

****LIGHTS OFF****

CLIPBOARD

- *Aerials
- *Channel Unit Forms
- *Special Case Forms
- *Maps
- *Pebble Count Forms
- *Vegetation Keys

OTHER

- *Lunch and Extra Food
- *Extra Water
- *Extra Clothing
- *Bug Dope
- *Sunscreen
- *Toilet Paper

VEST

- *Camera
- *Extra Film
- *Abney Level
- *Compass
- *Emergency Blankets
- *First Aid Kit
- *Flagging
- *Measuring Tape
- *Field Notebook
- *Pencils
- *Radio and Batteries
- *Ruler
- *Solar Pathfinder
- *Solar Pathfinder Forms

- *Staff
- *Stakes and Clips
- *Thermometer

CLOTHING

- *Hardhat
- *Gloves
- *Neoprene Waders
- *Rain Gear
- *Sunglasses
- *Watch

HABITAT DATA REQUIREMENTS

(SO = Sequence Order)

Side Channels: Gets an SO, Est. Length, Width, and Max. Depth (can also record wood as Forest option)

Tributaries: Gets an SO. Record Bank Orientation (dwnstrm), % Contrib. to Flow, Grad., temp, time.

Dry Channel: SO, Channel Length and Dom. Substrate

Special Cases: SO, Fill out the Special Cases Form for Braids, Falls, Chutes, Marshlands, Dams, and Culverts

Marshlands: SO, Est. Length, Average Width, Dom. Substrate, Woody Debris, and Temp.

INDICATORS OF BANKFULL

- Perennial Veg. End Point
- Scour Points in Bank
- Exposed Tree Roots
- A Break in Slope / Change in Particle Size
- High Point on Depositional Bars
- Staining of Rocks

Bankfull Width to Depth Ratio (W:D) = bankfull width / average bankfull depth

Entrenchment Ratio (ER) = floodprone width / bankfull width

WOODY DEBRIS SIZE CLASSES

- Woody Debris must be within bankfull width to be counted.
- Diameters are measured at required length from large end.

Westside

- Small = Diam. >12 in. at 25 ft.
- Medium = Diam. >24 in. at 50 ft.
- Large = Diam. >36 in. at 50 ft

Eastside

- Small = Diam. > 6 in. at 20 ft.
- Medium = Diam. >12 in. at 35 ft
- Large = Diam. >20 in. at 35 ft

EXCEPTIONS

If wood does not meet the length requirements, but is longer than 2X the bankfull channel width, then count the piece in the appropriate size class based on minimum width criteria.

PLANT COMMUNITY CLASS CODES

- NV** = No vegetation
- GF** = Grasses and Forbs
- SS** = Seedling Shrub (1.0-4.9 in. dbh)
- SP** = Sapling/Pole (5.0 – 8.9" dbh)
- ST** = Small Tree (9.0 – 20.9" dbh)
- LT** = Large Tree (21.0 – 31.9" dbh)
- MT** = Monster Trees (>32.0" dbh)

APPENDIX F

TEST REACH
CHECKLIST

QA/QC Checklist for Test Reach, etc.

Crew Members _____ **Date** _____

Habitat Dimensions	Status	Comments/Notes
Lengths		
Widths		
Depths		
Pool Tail Crests		
Channel Unit Calls	Status	Comments/Notes
Fast Water		
Slow Water		
Special Cases		
Side Channels		
Tributaries		
Dry Channel		
Culverts		
Wood Size Diameters		
Wood Counts		
Appropriate wood classes		
Form Completion	Status	Comments/Notes
Good Notes		
Forms filled out		
Forms readable		
SO sequencing correct		
Pebble Counts	Status	Comments/Notes
Transects done correctly		
Bankfull to bankfull		
Randomly selecting rocks		
At least 100 rocks		
Form filled out completely		
Understand procedures		
Bankfull and Floodprone Measurements	Status	Comments/Notes
Bankfull located properly		
Bankfull measured properly		
Bankfull depths measured properly		
Max bankfull depths measured properly		
Floodprone width measured properly		
Overall bankfull procedures understood		
Calculations for bankfull w/d ratio and entrenchment ratio done correctly		
Discharge	Status	Comments/Notes
Location		
Form completed		
Calculations done correctly		
Misc	Status	Comments/Notes

A **■** in the **Status** column indicates the procedure was done correctly and to the satisfaction of the tester. An **X** in the **Status** column indicates the procedure needs work and was not done to the satisfaction of the tester.

QA/QC Checklist for Test Reach, etc.

Crew Members _____

Date _____

TEST REACH SUMMARY

Range of Accuracy	Criteria	QA/QC Team	Team 1	Dev.	Team 2	Dev	Team 3	Dev.	Team 4	Dev.
±10%	Total Survey Length (ft)									
	# Channel Units									
	# Slow Water Units									
	Fast Water Length (ft)									
	Slow Water Length (ft)									
	Average Wetted Width (ft)									
±10%	Pools/Mile									
±10%	Pool/Riffle Ratio*									
±10%	Bankfull W/D Ratio									
±10%	Entrenchment Ratio									
±10%	D50									
Wood Tally ±25%	Small									
	Medium									
	Large									

Dev. = This is the % deviation compared with the QA/QC Team

***Pool/Riffle ratio is calculated using % slow water area divided by % fast water area**

APPENDIX G

**QA/QC TEST,
FIELD
EVALUATION
FORM**

STREAM INVENTORY QUALITY CONTROL QUIZ

1. The minimum sampling frequency of both fast water units and slow water units required for statistical validity is _____.
 - a. 10 units per reach or 10% of each channel unit type, whichever is less.
 - b. 10 slow water and 10 fast water units per stream or a 10% sampling of each habitat type, whichever sample size is greater.
 - c. 10% of each habitat type.

2. What variables do you record at a side channel?

3. The Survey Form and Preliminary Reach Form should always be filled out before surveying because they offer the surveyor information on the following:
 - a. Potential reach break locations.
 - b. Past history.
 - c. Access points.
 - d. All of the above.

4. Where side channels (SIDE) enter the mainstem they are assigned the _____ SO from the channel unit they flow into.
 - a. Same
 - b. Next incrementally higher
 - c. Doesn't matter

5. Pool crest depth is the mean depth across the point where the water surface slope of a pool breaks into the slope of the downstream unit.
T or F.

6. You have taken all the bankfull and floodprone measurements at a measured fast water unit. You have to make a determination in the field for the Rosgen channel type. **T or F.**

7. What variables do you record at a dry channel?

8. In order to reduce chances of numbering errors, what columns should you fill out on the Channel Unit Form for a measured unit?
9. If access to a mile long stretch of private land is denied, you give the area a separate reach with one SO. **T or F.**
10. Which of the following indicators is least important in searching for the bankfull level along a stream bank?
- Changes in bank substrate particle size.
 - The point at which annual vegetation ends.
 - Undercut banks.
 - Areas of bank scour.
 - Scoured out and exposed tree roots.
11. Bankfull is defined as the high stream flow event occurring on average every _____ years.
- 5
 - 2.5
 - 1.5
 - 100
12. Two stream surveyors are surveying a fast water habitat unit. They observed three pieces of wood in the unit of varying lengths. The bankfull width of the stream is 20 feet wide. PICK ONE ANSWER BELOW FOR EACH OF THE PIECES OF WOOD.
- Small-sized wood
 - Medium-sized wood
 - Large-sized wood
- Write the correct wood classes in the space provided for each piece of wood for the westside:
- 38" x 52' _____
- 25" x 38' _____
- 12" x 40' _____
13. Using the Region 6 eastside guidelines for categorizing large and medium-sized woody debris, the width criteria refers to the diameter 50 feet up the log from the base of the tree. **T or F.**

14. When a downed and completely uprooted tree (root swell and bole are within bankfull) of 40" diameter x 60' long spans the 25 foot wide channel and rests on the opposite bank above the water surface, using westside criteria, we refer to it as:
- a. Large-sized, in-channel wood.
 - b. Uncounted wood.
 - c. Small-sized, in-channel wood.
15. Wood is counted only when it is within the _____.
- a. Wetted width.
 - b. Bankfull width.
 - c. Area that would be beneficial to the riparian zone.
16. If you had a 10% pool sampling frequency and randomly selected the number 7 as the sampling start point, the following slow water channel units have paired measurements:
- a. 10, 20, 30, etc.
 - b. 7, 17, 27, etc.
 - c. 1, 7, 14, etc.
17. What must you do when changing your sampling frequency:
- a. End your current reach.
 - b. Count the number of units measured to that point.
 - c. Conduct random starts to determine your next measured units.
 - d. Roll dice in order to chose a new frequency.
18. Why should the recorder not tell the estimator of an upcoming measured unit?
19. Additional information, more than that provided on the Channel Unit Form, is required for falls, chutes, marshes, culverts, and dams (fill out _____ Form).

20. If the flow of your stream is dwindling and you anticipate it drying up within a $\frac{1}{4}$ mile, and you have measured only 6 slow water units; you want to (increase or decrease) your sampling frequency from the original 10% for pools and conduct a _____ in order to assure that no bias was introduced in choosing the first pool to be measured upstream of that point.
21. It is possible to change the estimator midway through a reach as long as you conduct a random start. **T or F.**
22. A surveyor breaks one long fast water units into two shorter fast water units. Do the two shorter fast water units get the same SO? **Y or N.**
23. When measuring the width of the habitat – you should measure :
- Widest wetted width.
 - Bankfull width.
 - Average wetted width
24. Two stream surveyors were surveying. At the end of the surveyed stream they reviewed their estimated and measured lengths. Below is the data:

	Est.	Measured							
Observer #1	20	30							
	55	44	24	35	80	71			
Observer #2	25	40	37	54	82	95	35	48	

- Observer #1 has a correction factor of 1.0 and observer #2 has a correction factor of 1.3. Which data has greater validity?
- Observer #1
 - Observer #2

Why?

25. The Final Reach Form should be completed:
- a. After each Reach is surveyed.
 - b. At the end of the stream survey.
 - c. End of the season.
26. River miles:
- a. Are determined in the office.
 - b. Start at 0.0 miles and begin at the stream mouth.
 - c. Start at 0.0 miles and begin at the point where the stream survey begins.
 - d. A and B
 - e. A and C
27. In order to consider a channel unit as a unit for the R6 Level II survey:
- a. The channel unit must be at least 20 feet long.
 - b. The channel unit length must be 4 times greater than the habitat width.
 - c. The channel unit wetted length must be greater than the wetted width (except for plunge pools).
28. The width of a dry MAIN channel should be measured:
- a. At the wetted width marks.
 - b. Where the vegetation starts.
 - c. Record as 0; measure only length.
29. The percentage (%) of flow a tributary contributes to the mainstem is not important and should not be recorded on the comment form. **T or F.**
30. Bankfull width and depth measurements are taken at the following channel unit types:
- a. Fast Water Units
 - b. Slow Water Units
 - c. Measured fast water units only
 - d. Measured slow water units only

31. The measured fast water unit you are on does not have clear bankfull indicators, what do you do?
32. Reach 1 of your stream is 0.7 miles long. The elevation at the mouth was 2200 feet and the elevation at the end of the reach was 2390 feet. Calculate the gradient for the reach.
33. What data is collected on a dry side channel?
- a. Length and width.
 - b. Substrate
 - c. None, data is not collected on dry side channels.

Evaluation Form for Field Visits

Observer: _____ Recorder: _____

Date of Field Visit: _____

Location of Field Visit: _____

Evaluator: _____

SURVEY PROCEDURES				
Procedure Item	Prepared	Completeness	Skill/Knowledge	Other
General Survey Procedures				
--Channel Unit Typing				
--Special Cases				
--Reach Changes				
--Equip. Use				
--Note Taking				
General Morphology Procedures				
Pebble Count Procedures				

SAFETY				
Item	Recognized Hazards for that Day	Took Precautionary Measures to Avoid Hazards	Dealt with Incidents in a Safe Manner	Other
Driving Safety				
Hiking Safety				
In-Stream Safety				

Comments: _____

Use a 1-3 rating. 1 = did not meet expectations, 2 = met expectations, 3 = exceeded expectations

APPENDIX H

**POST SURVEY
CHECKLIST**

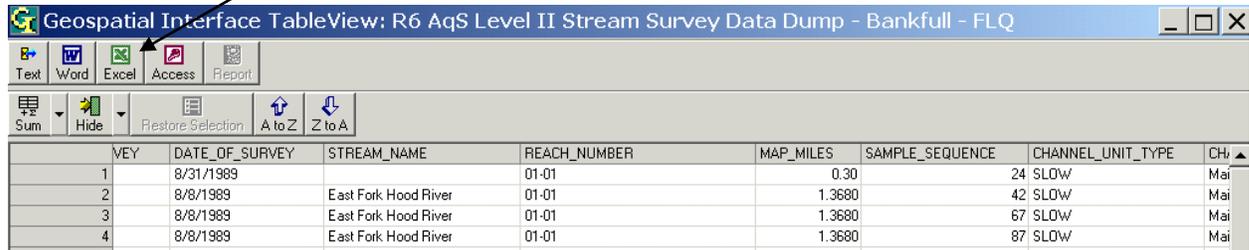
APPENDIX I

Data Entry QA/QC Instructions and Checklist for NRIS AqS Data Queries

AQUATIC SURVEY DATA QA/QC CHECK INSTRUCTIONS

No specific queries have been written to check your data. You are responsible for checking through your data and this document will give you some suggestions on how to accomplish this task. All query results are exported into Excel. This document assumes you have some basic knowledge of Excel and creating simple formulas. A suggestion for saving your data in Excel once you run your queries:

When you run a query in the GI you get a spreadsheet which can be exported to Excel by using the Excel button indicated below:



Your data is exported into an Excel spreadsheet where if you choose you can save it to the T drive. If you would like to save it directly to your hard drive you will have to copy and paste the data into another Excel spreadsheet. Place your cursor in any cell with data and press Shift/Control * (asterisk or 8). This will select only the cells with data. Right click and copy, open an Excel spreadsheet (this is Excel on your desktop, not the Excel you are currently in) and click the uppermost left corner cell, right click and paste the data. You now have a working Excel file you can save on your Hard Drive. You can do this with all your queries and save them to separate worksheets in one Excel workbook to keep individual files to a minimum.

NOTE: Any errors found in these spreadsheets need to be corrected directly in NRIS AqS. Correcting them only on the spreadsheets is not sufficient.

DATA CHECKING

After you have entered your data and done the steps in the Post Data Entry Checklist (perform these checks directly in the AqS database) you should run 3 queries before any other. Under each query you will find ways to use these queries to error check your data. Two other queries are also suggested. In order to perform these checks use your Excel spreadsheet and use the Filter button  under the Data Tab. This will give you the ability to filter on each column:

R6 AqS Level II Stream Survey Data Dump - Bankfull - FLQ: This query will dump all data entered into the Bankfull Measures button. Data checks with this query:

Check Methods for Blanks

Check the Length_Method and Avg_Wet_Width_Method for blanks. This field should not be blank for any habitat unit.

Check UOM

All UOM should be Ft.

Check CHANNEL_UNIT_TYPE

CHANNEL_UNIT_TYPE must be a fast water type unit.

Floodprone Width > Bankfull (BF) Width

In Excel, highlight column W, right click and insert one column. In the top row (W2), enter the following formula and click enter: =V2-L2. You can then drag this formula down through all of your rows. Look for negatives to indicate errors.

Max BF Depth ≥ Avg BF Depth

Visually inspect these measurements to look for errors.

Max BF Depth ≥ all 3 BF Depths

Visually inspect these measurements to look for errors.

BF Width > Wetted Width (You will need the Channel Unit Dump to check this)

Visually inspect these measurements to look for errors. You will need to print off the Bankfull Data Dump and compare it to the respective channel units on the Channel Unit Dump.

R6 AqS Level II Stream Survey Data Dump - Channel Unit - FLQ: This dumps all data entered into the Channel Unit Tab. Data checks with this query:

Check Methods for Blanks

Check the Length_Method and Avg_Wet_Width_Method for blanks. This field should not be blank for any habitat unit.

Check Side Channels and Tributaries methods are Ocular (unless you measure side channel lengths and widths).

Check for Blanks in SO's, Channel Unit Types, and Channel Position

Check for blanks in all of these rows.

Check UOM

All UOM should be Ft.

Length \geq Wetted Width

In Excel, highlight column O, right click and insert one column. In the top row (O2), enter the following formula and click Enter: =K2-N2. You can then drag this formula down through all of your rows. Look for negatives to indicate errors.

For the next two formulas highlight column T and U, right click and insert column (this should give you 2 columns).

Max depth > Avg. Depth

In the top row (T2), enter the following formula and click Enter: =Q2-R2. You can then drag this formula down through all of your rows. Look for negatives to indicate errors.

Max Depth > Pool Tail Crest

In the top row (U2), enter the following formula and click Enter: =Q2-S2. You can then drag this formula down through all of your rows. Look for negatives to indicate errors.

Unstable Banks

If you collect unstable banks on all mainstem channel units check to see 0's are entered on all channel units if no unstable banks were identified.

Check Gradient Type for Correct Values

Gradient Type should be STRUCTURE for culverts and WTRSLOPE for all other channel units.

Check Gradient Method

Gradient_Method should be BackCalc for all units where gradient was entered unless specifically measured using a rise/run formula to calculate the gradient. GRADIENT_DIST should be 100.

Check Date/Time and Temperature

Check to make sure WATER_TEMP_CELCIUS has a corresponding SAMPLE_DATE_TIME and vice versa.

R6 AqS Level II Stream Survey Data Dump - Wood - FLQ: This query will dump all the raw wood numbers. Data checks with this query:

Check all wood numbers to look for anomalies

R6 AqS Level II Stream Survey Data Dump - Comments - FLQ: This query will dump all the comments from the Comment Button from the Channel Unit Sample Tab. Data checks with this query:

Check to see formatting of Riparian Vegetation is correct

R6 AqS Level II Stream Survey Data Dump - Substrate - FLQ: If you collect streambed substrate by visually estimating the percent of each size class for individual channel units enter the data under this button this query dumps all substrate data entered into the Substrate Button in the Channel Unit Sample Tab. Data checks with this query:

All percentages entered correctly

All percentages add up to 100%

Forest Names		COMMENTS
BEFORE RUNNING QUERIES		
Side channel to Ocular		
Trib Methods to Ocular		
Tribes as CHUNITs		
Tribes with L, W, and D Of 0		
PTC in correct location		
Check for blanks in PTC		
Pools have Formed by's		
Avg Depths in correct location		
Look for blanks in Avg Depths		
UOM's in Ft		
Dry channel boxes checked (if needed)		
If Dry Channels (Needs length, width and depth = 0)		
Unstable Banks (0's if collected)		
AFTER RUNNING QUERIES		
REACH LOCATION QUERY		
Check Protocols		
RM Froms and To's are completed		
SO's match from reach to reach		

CHANNEL UNIT DUMP QUERY		
Blank SO's		
Blank Channel Unit Types		
Blank Chanl_Position		
Missing Data		
All UOM are in Ft		
Check Depths		
Check Widths		
Length > Width (with exceptions)		
Max > Avg		
Max > PTC		
Times/Temps/Dates		
Gradients with correct type/method/data		
Gradients on WF, Tribs, culverts		
BANKFULL DUMP QUERY		
Channel Unit Type - Fasts Only		
Chanl_Position (Main Channel)		
BFW_Method (Direct Measure)		
Width and Depth UOM is Ft		
BF Depth Method (Direct Measure)		
FPW Method is Direct Measure (May be Ocular if estimated)		
FPW > BFW		
Max BFD >= all 3 BF Depths		
Max BFD >= Avg BF Depth		
BF Width > WW		
OTHER QUERIES		
Check Wood numbers		
Correct Method for Substrate		
Substrate = 100		