UPSAG Perennial Stream Survey
DRAFT 2001 Quality Control Replicate Survey Method

The Perennial Stream Survey protocols, Section 4.4.5 (version 1.21), recommend conducting independent replicate surveys to document "between crew" variability on stream sites collected during the 2001 field season as part of an overall quality assurance project plan[1]. Quality control (QC) replicate surveys are a necessary part of the plan to provide essential variability information needed to guide study design development for the 2002 field season. This document provides rationale and guidelines for conducting QC replicate surveys for this study.

Background on TFW QC Replicate Surveys

The primary goal of the Timber/Fish/Wildlife (TFW) Monitoring Program was to provide survey methods that reliably detect changes in stream channel conditions and characteristics over time (Pleus 1994). That is, changes detected in stream channel parameters between surveys represent actual changes and are not the result of differences associated with crew application of the methods.

The replicate survey is a process developed to examine crew variability associated with the application of a standard stream survey. The testing hypothesis of the replicate survey is that variability is not significant between two independent crews (C_1 and C_2) when identifying and measuring stream channel conditions using the same established survey methods. Stated as a formula, H_0: $C_1 = C_2$; where the results of C_2 (QC crew) are considered the baseline from which C_1 (field crew) variability is determined. The assumption for this test is that the field crew has been trained in the method, but has an unknown competency, and is compared to the QC crew that represents the most thorough knowledge and consistency in application of the method. This is necessary where the survey method has not been statistically tested to determine baseline variability.

Same day replicate surveys were initiated in 1993 to increase the resolution in analysis of variability on clearly identified locations and to facilitate discussions of found variability factors with the original crew while it was still fresh in their minds. The bias introduced by crews knowing they were being tested (on their "best behavior") was judged to be less a factor than the variability caused by day-to-day changes in stream low-flow discharge,

[1] The terms quality assurance and quality control are defined according to the USEPA (1995) as follows:

Quality Assurance (QA) – "an integrated system of activities involving quality planning, quality control, quality assessment, quality reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence."

Quality Control (QC) – "the overall system of technical activities whereby the purpose is to measure and control the quality of a procedure or service so that it meets the needs of users. The aim is to provide quality data that is satisfactory, adequate, dependable, and economical. One example of a quality control element for biological sampling is taking replicate samples to ensure consistency among and within sampling crews."

differences in start and stop points, and ability of field crews to recall what caused specific variability. Using the assumption that crews always collect data to the best of their abilities/training/support, analysis of TFW replicate survey data collected between 1993 and 1999 provided abundant and useful variability information (Pleus 1995; 1998 unpublished).

Recommended Changes to Version 1.21 Replicate Survey Protocols

Due to the late season start and other concerns/limitations, QC sites will be pre-selected, QC crews will be taken to the survey site by the field crew to be tested, and QC crews will replicate field crew surveys the same day. The objective of the QC crew is to determine whether the field crew applied the methods according to the version 1.21 protocol. The primary focus of the field crews this pilot season is to collect data on as many sites as possible before the fall rain begins. It is important to facilitate this by allowing the crews to collect relevant data on the day of the QC replicate survey. QC crews will strive to conduct replicate surveys on up to 10% of the study sites, within limitations of time, weather, and funding. Participating Tribes will utilize the services of a trained consultant as the QC crew to provide a consistent baseline of comparison.

The ability of various field crews to adequately provide explicit driving and survey access directions is a separate variability question of concern for any survey and should not be added on to this survey. The location of many of these sites is remote and already requires a large time commitment just to get there. Providing a complete set of access directions would take additional time and be problematic. Therefore, there is no justification for spending additional time and money to test this aspect of the survey.

Variability Types

Between crew variability is a compilation of crew, method, and background components (Pleus 1995). The reason is that each component requires a different solution to rectify. Crew variability is defined as variability associated with crew deviation from established standard methods. Examples of crew variability are bias and improper method training. Method variability is defined as variability associated with proper application of methods. Examples of method variability include protocols that can be broadly interpreted and parameters using inaccurate measurement techniques. Background variability is defined as variability associated with physical channel complexity. Examples include measurement obstructions caused by heavily brushed streams or methods not applicable with highly disturbed channels.

QC Replicate Survey Method

The scope of the replicability survey will focus on the main thread survey and the area of stream encompassed by the 200 meter continuous flow downstream and dry channel upstream criteria. It will look for discrepancies and causes in variability related to:

- Flow category changes and locations;
- Same flow category random selection process;
- Tributary junction flow/channel categories and locations;
- Feature associated with flow category changes;
- Mean segment dominant channel type category;
- Mean segment bankfull width;
- Mean segment bankfull depth;
- Mean segment gradient;
- Mean segment dominant substrate; and
- Field form/site location documentation review

The method for the QC replicate survey is as follows:

1. Establish starting point of survey

2. Participant field crew conducts survey as normal using standard Form B and waits at survey end until QC crew finishes their survey.

3. QC crew starts their survey as normal using standard Form B after the field crew is out of sight/sound and maintains this buffer, stopping if necessary to let the field crew keep well ahead. The QC crew will vary from standard protocols as follows
   a. QC crew will have a variety of colored flagging so that it does not match the field crew flagging when used. It is important that the QC crew ignores the evidence of the previous field crew such as hip chain line, flagging, footprints, etc.
   b. Every third segment (random start) collect intensive data on bankfull width, bankfull depth, flow category, channel category, gradient (elevation gain from last/nearest segment break or transect), and dominant substrate on Form PIP QC 1.1 (Appendix A). Randomly select the starting segment number (1, 2, or 3 using a single die, three scraps of paper, or other random method). The bankfull width line is used as the transect for collecting all other information related to conditions immediately under it. Segments that are 15 meters or less in length will have transects established every 2.5 meters. Segments greater than 15 meters will have transects established every 5.0 meters. For example, a 30 meter segment would have transects at 5.0, 10.0, 15.0, 20.0, and 25.0 meter intervals. Measurements are not take at segment breaks.
   c. Note identification and location differences in field crew flagging in the notes section.

4. After both crews have finished, the QC crew will complete Form PIP QC 1.2 (Appendix B). This form provides an important format for identifying discrepancies

between surveys, especially lumping and splitting issues. This information is best determined and discussed with both crews re-walking stream. The QC crew will document the type and cause of discrepancies. Any QC crew errors will be noted and not counted against field crew

5. Participant crews will provide copies of their field forms to QC crew in a timely manner for review and comment on their completeness of header information, legibility/completeness of data, flow category random selection process, and any other of importance.

Within one month, participant crews will provide copies of maps that identify the location of the uppermost flow and their calculated basin area [*Darin Cramer, DNR?*]. Included with the maps will be a description of rationale/methods used to determine the mapped location and the method used to calculate the basin area.

Data Analysis

Replicate surveys will be analyzed [*Need to identify lead*] to estimate the field variability for the following attributes:

1. Identification of the uppermost point of spatially intermittent flow
2. Application of the segmenting protocols
3. Measurement of cumulative distance
4. Identification of flow categories
5. Identification of channel categories
6. Random selection of same flow tributaries
7. Measurement of mean segment bankfull width
8. Measurement of mean segment bankfull depth
9. Measurement of mean segment gradient
10. Identification of mean segment dominant substrate category
11. Identification of flow category change features
12. Identification of tributary junctions, flow and channel categories

In addition to analysis of field data, variability will be estimated for:

1. Form A and B legibility, completeness, and errors
2. Mapping the location of the uppermost point of spatially intermittent flow [How to test?]
3. Calculating the basin area of the mapped point correctly

Replicate Survey Report

A post-season report will be generated [Need to identify lead] that includes a summary of the replicate survey findings with copies of the replicate survey forms and relevant information attached as appendixes. The report will include results of data analysis and technical recommendations for changes to the Perennial Stream Survey protocol for the

2002 field season. To provide the best analysis, CMER should make available the study design rationale for each parameter for which data was collected. This report will be submitted to CMER and distributed to survey participants and interested parties.

References

Pleus, A.E. 1994. Quality assurance module. *IN* Schuett-Hames, D., A. Pleus, L. Bullchild, and S. Hall, 1994. Timber-Fish-Wildlife ambient monitoring program manual. TFW-AM9-94-001. WADNR #

Pleus, A.E. 1995. Variability associated with salmon habitat identification and water surface area measurements. Thesis for Masters of Environmental Studies. The Evergreen State College. Olympia, Washington.

Pleus, A.E. 1998. Draft Timber/Fish/Wildlife Monitoring Program Report: Variability associated with bankfull width, bankfull depth, and canopy closure measurements. Unpublished. Northwest Indian Fisheries Commission. Olympia, Washington.

USEPA, 1995. Generic quality assurance project plan guidance for programs using community level biological assessment in wadable streams and rivers. Office of Water (4503F). EPA 841-B-95-004. July.

Appendixes

Appendix A: Form PIP QC 1.1 – Intensive Segment Measurements Copy Master & Completed Example

Appendix B: Form PIP QC 1.2 – Matched Segments Copy Master & Completed Example

Appendix F

2001 Perennial Stream Survey
Training, Field Assistance, and Quality Control Reports

Centralized Service Provided to Tribal Cooperators
Through the
Northwest Indian Fisheries Commission

Contract Services Provided By
Ecological Landscape Services, Longview

2001 Training Reports

Note: Several tribes that participated in the trainings did not subsequently collect data.

August 27: Skagit System Cooperative
Report not available

August 30: Port Gamble S'Klallam, Skokomish, and Suquamish Tribes
September 5: Colville, Spokane, and Kalispel Tribes
September 6: Yakama Nation
The following is a summary from the training visits on the above dates.

Comments/questions with survey protocol:

- Need to clarify where to take representative measures (e.g. bankfull width, depth, dominant substrate, and gradient) in each segment. The Colville survey crew measured anywhere along the segment that appeared to be representative; whereas the Yakima survey crew more or less measured the representative portion of the stream at each segment break.
- May be inherent bias in the starting point with the upstream survey method.
- Why are there two measures for gradient – upstream and downstream?
- Need to clarify channel width definition.
- Is it necessary to take average of 3 readings for channel depth measurement?
- Need to define some of the associated features, such as spring, wet site, and wetland.
- Need to differentiate between channel categories – are some naturally or artificially defined? For instance, is livestock damage to stream bank categorized as a PCD or MC? (The manual seems to suggest an MC in this situation, but it isn't clear.)

Useful tips for survey crews:

- May be helpful to investigate the basin before beginning the survey.
- Essential to start survey from an easily mappable spot such as a road crossing, bridge, confluence of tributary, etc. Need to mark start point as permanently as possible – flagging, aluminum tree tags, GPS location, compass bearing work well. Starting/ending points must be marked on a topography map. Distance and bearing from a mappable spot to start/end point should be recorded.
- Aerial photos are very helpful to gauge length of wetlands, dry channels, and other features encountered in the field.
- Note on data form whether survey is upstream or downstream.
- Consider doing a downstream survey by noting tributaries and flow changes as move upstream, and starting survey 200 m above the perennial initiation point (if channelized). Then work downstream to record measurements at each segment.
- Document what is observed on the surface for the dominant substrate of each segment. Note a secondary substrate in the notes section if recorder is uncomfortable with identifying only one, dominant substrate. Additionally, the recorder may

document additional information in the notes section that may be useful to the tribe, but not analyzed by CEMR.
- Base left bank and right bank directions on downstream direction, but coin toss for tributaries based on upstream direction.
- Need to document results of coin toss and tributary chosen in notes section.
- Measure bankfull width to the nearest 0.5 m, depth to the nearest 0.1 m, and gradient to the nearest 1%.
- For gradient, both people should be at the same place in the reach, e.g. both in the channel or both on the bank. Alternatively, a flag tied at eye level can be used to measure gradient.
- Document upon which bank the associated feature occurs in the notes column.
- Draw sketch of perennial initiation point on back of data form. Sketch should include direction of stream and other important features.
- Note if observe any fish or amphibians during the survey at the appropriate distance along the channel.

September 10: Hoh Tribe

The tribal crew (Jill Silver and Mike Haggerty) performed an upstream survey on Rock Creek. Mike and Jill noted that many of their streams are a Type 2/Type 4 break and thought that it would be more accurate to base the stream randomization on nonfish-bearing versus fish-bearing streams, rather than only Type 3/Type 4 streams. They would prefer the nonfish-bearing versus fish-bearing method of selecting streams.

The crew was precise in collecting segment data. Flow and channel categories, dominant substrate, bankfull width, and bankfull depth were well defined and fairly easy to assess in Rock Creek. Mike and Gerry used a hip chain for segment length and a stadia and meter tape for measuring width and depth. Gradient was more difficult because of the stream's steepness; the crew was concerned about gradient accuracy and spent much time measuring gradient. Rock Creek had extensive areas of dry channel, >> 5 m in length, with continuous flow upstream and downstream of the dry areas. The crew was concerned about the value of collecting data on large areas of dry channel.

Additional questions and notes raised by the crew:
- Should wood be added as a dominant substrate? Rock Creek had much large, downed woody debris in the stream channel.
- When considered an associated feature, it is okay to define seeps as flowing water or dry in the flow category column?
- Is it appropriate to include dry islands within the bankfull width measurement, or should these areas be subtracted out of the width?
- What is the definition of a covered channel? It is on the bottom of the data form B, but is not defined in the protocol.
- What is the scientific basis for 200 m of continuous flow downstream of the starting point? Both Jill and Mike felt that 200 m continuous flow is long for a Type 4 stream in their area.

- For a downstream survey, the tributaries are assumed to be flowing and are randomly selected *ahead* of time based on the mapped tributaries. Although the crew didn't perform a downstream survey, we were trying to determine what you would do if an unmapped side tributary of the same flow category was encountered during a downstream survey. We decided that the unmapped side tributaries should be ignored in terms of selecting a tributary (because the tribs are pre-selected), but noted in the data sheet.

September 27: Tulalip Tribe
Report not available

2001 Field Assistance Reports

September 13: Suquamish Tribe
Both streams (tributary to Lost Creek, Site Number 10 and tributary to Wildcat Creek) were difficult to access because of dense vegetation and lack of nearby roads. The streams themselves had dense vegetation that obscured the channel, making it challenging for the crew to accurately measure variables. Consequently, bankfull width and depth may not be as accurate as less brushy streams. The tribal crew (Dawn Pucci and Allison O'Sullivan) measured segment length with a meter tape to avoid leaving hip chain string in streams; width and depth were measured with the same meter tape. One measurement was taken for the average depth.

Both streams were dry most of their entire length and only had short segments near the mouth that flowed. Additionally, the gradient of the flowing segments were low and few to no side tributaries or side channels were encountered along the surveyed length.

Neither stream had 200 m of continuous flow to the mouth, but flow was observed from the mouth into the Type 3 stream. At the Lost Creek Tributary, a short segment of dry channel (slightly > 5 m) near the mouth interrupted a segment of flowing water, which was flowing from the PIP. Is the survey invalid where the flow is not continuous to the mouth, but the water clearly empties into a Type 3 stream?

Additional questions and notes raised by the crew:
- Dawn and Allison noted that 200 m of continuous flow is long for streams in their area.
- Is it necessary to collect data on the 200 m of dry channel *above* the PIP? Or can this 200 m of dry channel simply be documented in data form B.

September 14: Skagit System Cooperative (SSC)
The upper reaches of the stream had alternating piped channels, side channels, and seeps that made it difficult to determine the PIP. Larry Peterson (SSC crew) was an expert in using his "best professional judgment" in the tricky situations. Additionally, he has good

knowledge of the streams and associated features. Because SSC is performing the stream surveys solo, gradient measures may be less accurate if a flag is not tied downstream at eye level (Larry was estimating without a flag). Larry used a hip chain for the segment length and a logging tape for the width and depth. One measurement was taken for the average depth.

Additional questions and notes raised:

- For an upstream survey, is it necessary to collect data for the 200 m of continuous flow downstream of the start point? Larry has been collecting these data.
- How to deal with a dis-tributary? The protocol doesn't specify anything.

September 19: Hoh Tribe

The Hoh Tribe crew (Jill Silver and Mike Haggerty) and trainers spent much time verifying the location of the stream (Unnamed tribs to Dry Creek - #322 and #323) we were surveying because the Forest Practices Base Map differed from what was present on the ground. Mike thinks that the most important parts of the survey is to accurately locate the perennial initiation point and to make certain that the stream you're surveying is the one you've randomly chosen.

Mike has completed about seven surveys to date. He uses a meter tape with a large eye bolt on the end to secure on one bank for measuring bankfull width, and a second measuring tape for depth. Gradient is measured by tying flags at eye level. Mike has been measuring the variables at increments favorable to measuring gradient, e.g. typically less than 30 m even if no flow change. The data can be adjusted later for the 30 m increments specified in the protocol. Additionally, Mike has found it easier to measure distance, flow category, channel category, and gradient working upstream. On his way back downstream, he then gathers the bankfull width, depth, and dominant substrate.

The second tributary surveyed was problematic because it was actually a confluence of three Type 4 streams. We used a hat and three pieces of paper to randomly select which tributary to survey. Additionally, beaver activity has created extensive ponding and obscured most of the channel. We located the start point and measured distance to the end point, but no other data were collected because the channel was nearly impossible to locate and extended into a ponded wetland area that covered approximately three acres. Jill and Mike stated that large wetland areas, such as the one we encountered, were typical for the Hoh and therefore we shouldn't consider it an unusual situation and merely abandon the survey.

Additional questions and notes raised by the crew:

- Would it be possible to organize a training workshop for PIP surveys this winter? Two training sessions - one for east side, one for west side - would be useful.
- It is highly important to provide detailed driving directions to each site.
- Mike suggested that NWIFC develop a standard spreadsheet with look-up tables for distances so all the data are entered in the same format.

- The bankfull width definition doesn't work for the Hoh because organic matter, such as mosses, is common within the active channel.
- The last part of the pocket water definition states that "In those situations where both the upstream and downstream segment has 'Flowing water, 'Standing water, or 'Dry' for over 5 meters, the FP or SP unit can be as short as 0.1 meters." Does the flow category have to be the same both upstream and downstream?
- Does the field crew map the basin area for the PIP in the field?
- How is a channel affected by beaver activity categorized and surveyed?

September 24: Suquamish Tribe
The tribal crew (Dawn Pucci and Alison O'Sullivan) determined that the randomly selected stream (unknown stream near Point No Point) was not suitable for the perennial stream survey because the upper reaches of the stream flow through private areas with agricultural use, mainly livestock grazing. According to the protocol, land adjacent to the stream must be subject to Forest Practices. The land adjacent to the subject stream was not currently subject to Forest Practices.

The section of the stream that flowed through the agricultural area was ditched along what appeared to be property boundaries. The dense vegetation along the ditched portions made it difficult to determine flow category. The flow categories would have not been as accurate to assess as a more open stream. Dawn learned from a landowner that the stream flow upstream of the ditched section was regulated by the water district. We were unsure of how this would affect the stream survey (and this is something that the protocol should address).

The stream crossed many private properties and Dawn and Alison had to take much time asking permission to survey from the landowners. The landowners generally were receptive about the stream survey and had many questions. At least one was concerned about how his property rights would be affected. Two of the landowners, including the one concerned about property rights, made plans to accompany Dawn and Alison on a future stream survey.

2001 Quality Control Survey Reports

September 25: Hoh Tribe
The tribal crew (Mike Haggerty and Jill Silver) performed and upstream survey on an unnamed left bank tributary to Dry Creek (#325). The QC crew (Allen Pleus - NWIFC, Mara McGrath and Steffanie Taylor - ELS) performed replicate survey on nearly 100 meters of stream surveyed by the field crew. We opted to end the QC portion of the survey at 100 meters because of time constraints and the need to compare and discuss matched segments with the field crew.

The QC crew used a metal stadia and meter tape firmly secured with pins for measuring bankfull width and depth. The stadia was also used for upstream gradient and elevation gain. All variables were collected at each segment moving upstream. In contrast, the field crew used a meter tape with an eye bolt at the end and a second "seamstress" meter tape for measuring bankfull width and depth. Upstream and downstream gradient were measured by aiming, at eye level, at the other person. The field crew measured segment length, gradient, flow category, channel category, and other variables moving upstream. Bankfull width and depth were measured moving downstream.

Most segments between the field crew and the QC crew were matched. We noted discrepancies in interpreting side channels, and defining flowing water versus flowing pocket water. Additionally, the QC crew overlooked a > 5 m section of dry channel.

Additional questions and notes raised by the crews:

- What is the difference between a seep and a stream? Jill noted that they are sometimes difficult to distinguish in the field.
- How to measure bankfull width and depth if channel is a MC because of a culvert? The QC crew measured the culvert width; depth and substrate were n/a. This should be added to the protocol.
- Need to clarify definitions for FP and SP. They can be difficult to distinguish in the field.
- The QC crew encountered a segment that ended 1 m less than a 30 m segment break because of a change in flow category. The protocol doesn't specify if you should "round-up" to the next segment, e.g. 30 m, or stop precisely where the flow category changes, e.g. 29.5 m. In this situation, the QC crew decided to round-up to the next segment break.
- When flowing water is audible beneath a channel covered with organic debris, the protocol specifies to record the flow category as FW. However, when the flow category is FP both upstream and downstream of the covered section, shouldn't this section be recorded as FP and not FW?
- The protocol doesn't specify how to record the bankfull width, depth, substrate, and other variables for a PC or O channel.
- The QC crew only measured the upstream gradient. Are two gradient measures necessary?
- Need to establish a standard for assessing the dominant substrate. The current method is subjective.
- In an MC, can the segment be less than 5 m? This is not clearly stated in the protocol.

September 26: Yakama Nation

The tribal crew (Jim Matthews and Elroy Shavehead) performed an upstream survey on an unnamed right bank tributary to the west fork of Bear Creek. The QC crew performed replicate survey on approximately 1000 feet of stream surveyed by the field crew. We opted to end the QC portion of the survey at 1000 feet because of time constraints and the

need to compare and discuss matched segments with the field crew. The lack of time to compare the two surveys seems to be a problem. The QC replicate survey takes longer and therefore, holds up the field crew. We will need to decide how to perform the replicate survey (or a portion of the survey) and still have enough time to discuss the matched segments.

Both crews collected variables moving upstream. All measurements were made in English units. The QC crew used a PVC rod in tenths and measuring tape in tenths for measuring bankfull width and depth. The PVC rod was also used for upstream gradient and elevation gain. The field crew used a logging tape in inches and measuring tape in tenths for measuring bankfull width and depth. Upstream and downstream gradient were measured by aiming at a flag tied at eye level.

The QC crew noted three major differences with the field crew:

1. The field crew measured segments at standard, 100-foot intervals, regardless of flow change. The variables at flow category changes outside of the 100-foot intervals were not measured.
2. A difference in defining the minimum length required for flow categories. For example, the field crew split out several D and SP segments. The QC crew lumped these segments into FW because they did not meet the minimum length criterion specified in the protocol. It appeared that the field crew might be recording any change in flow category, regardless of the length as specified in the protocol, or that there was a discrepancy in measuring distance between the two crews.
3. Need to clarify how to categorize wetlands. The field crew categorized a wetland area as D and NC, whereas the QC crew categorized the wetland area as WE. Neither crew measured bankfull width or depth of the wetland area.

Additional questions and notes raised by the crews:

- The field crews need to make copies of any maps or photos for the QC crew. Ideally, the QC crew would have these in advance of the replicate survey.
- Field crews should recon the streams for the replicate survey in advance to make certain of suitability for surveying.
- What is the flow category of bedrock that is dripping/sheeting with water? Is this considered FW?
- For the intensive QC survey, is the flow categorized as what is present directly beneath the bankfull width line (even if it differs from the rest of the segment)? How do you categorize the flow when two different flow categories are present beneath the bankfull width line, e.g. a section of FW and a small section of D?
- Jim has questions about calculating the basin area—is it based on the end point of FW or can it be any other flow category such as SP or FP?

October 2: Colville Confederated Tribes

The field crew (Ruby Peone, Eric Krausz, Jim Priest) performed a downstream survey on Rock Creek 01 (tributary to Loup Loup Creek). They located the perennial initiation

point and worked downstream until the stream entered into a lake. They then investigated upstream of the pip and noted two wetlands connected by a dry channel segment. Both the field crew and QC crew made measurements in metric. The field crew used a hip chain for segment length, and PVC rod for width and depth. The QC crew also used a hip chain for segment length, but used a metric tape for width and PVC rod for depth. The QC crew used the PVC rod for gradient and elevation gain. The QC crew failed to note how the field crew measured gradient.

The field crew surveyed the stream at standard 30 m intervals, whereas the QC crew broke segments at changes in flow category (no side tributaries were present). The field crew noted changes in flow category in the notes section, but did not consider a change in flow category a segment break unless it corresponded to a 30 m interval. Consequently, we found it difficult to compare the field crew data and the QC crew data on the matched segments form. Our discrepancies appeared to be most pronounced in determining segment breaks, determining channel category, and measuring bankfull width. The field crew categorized most of the stream a DC - "defined channel," whereas the QC crew categorized most of the stream a PDC - "poorly defined channel" because of the livestock damage. Bankfull width was difficult to measure because of extensive cow damage to the sides of the stream and the varying widths of the stream.
Additional questions and comments raised by the field crew:

- The field crew thought it would be more efficient to document that 200 m of dry channel is present above a pip, but not collect segment data.
- How should you deal with a stream that flows into a lake? Can you assume that flow is continuous to the mouth? The stream we surveyed entered into a lake approximately 200 m downstream of the pip. However, flow was not continuous into the lake.
- Eric thinks it is illogical to label the start point as 200 m upstream of the pip if a dry channel is present. He suggested labeling the pip as the start point and labeling segments above with a D for "dry"plus a number and segments below with F for "flow" plus a number to more accurately indicate the starting point of the survey.
- Jim would like all the tribes involved in the survey to have input on the final protocol.
- How do you deal with a wetland that is present above a pip? In Rock Creek 01, two wetlands were located above the pip, with a short dry channel connecting the two wetlands.
- Eric had a stream from an earlier survey that apparently originated in a lake. A dry channel was present above the lake and flowing water was present below the lake. Do you assume that the pip is located in the lake? Or is this an unacceptable stream to survey?