

Appendix G – Field Form Instructions and Sample Forms

All Forms

General Header Information:

- Ownership – Applicable land management agency
- District – Forest Ranger District; use applicable name for reaches on non-USFS land.
- Reach # - A five digit code. The first two digits are the forest number and the remaining three digits are sequential over time per forest, starting with 001 for the first reach surveyed.
- Observers – Enter each crew member's first initial and last name.
- Date: Record the single date or all dates each form was used.

Form 1 – Sensitive Reach Location and Layout

General Information:

Form 1 provides the sensitive reach overview. The required data may be recorded during or after the inventory. The sketch is drawn after all reach data have been collected. This form is numbered 1 because once the survey data are in a file it should be the first form to be viewed in order to provide the reader an understanding of the reach.

Take a full quad map along on the survey – it will help with required location features.

Header Information Unique to this Form:

- Stream Classification – Circle the appropriate stream classification that best represents the sensitive reach once the inventory is done. Record both of the classification systems whenever possible (see references).
- Directions to start of sensitive reach – Provide a short written narrative that will allow others to find the start of the sensitive reach. Include a supplemental map in the file if needed.

Data:

Sensitive Reach Layout Information

Record all applicable line items in a given reach using the abbreviation for the specific site (see list of abbreviations on the right side of the form). Record the distance from the start of the sensitive reach to each applicable line item. Record the GPS data for each applicable line item if the reach is being georeferenced.

SSR Data

Record the reference object (tree, boulder, etc.) and the benchmark type. Record the bearing and distance from the BM to the SSR (record bearing in degrees magnetic north. Be sure the compass is set to the correct declination (shown on quad map).

Sensitive reach sketch – Make sure to include all items in the instructions in the sketch box.

Photo Reminder

Photograph all applicable sites.

Sensitive Reach Location and Layout

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA* Observers: *A. DUMOS*

Stream: *PACIFIC CREEK* *A. ANDAZOLA, A. BURNS*

Reach #: *17025* Elevation (m) @ SSR: *2360* Date: *7/8-9/2004*

Stream Classification: Rosgen (circle 1 # and 1 letter) - *A B C D E F G 1 2 3 4 5 6*
 Montgomery & Buffington (circle 1) - *Response* Transport

Directions to Start of Sensitive Reach (continue on reverse): *Drive road 4N01 to trailhead of trail 20E01. Walk about 1/4 mile to stream crossing. SSR is about 150m downstream, near 36" DF on right bank about 25m from stream.*

	SSR	0	001	758618	4233193	10
	R1	10	002	758648	4233164	10
	R2	35	003	758697	4233144	10
	R3	57	004	758747	4233147	10
	R4	82	005	758763	2333144	10
	WD1	107	006	758823	4233150	10
	SSS	120	007	758875	4233094	10
	WD2	453	008	758974	4233137	10
	XS1	502	009	759043	4233144	10
	WD3	710	010	759070	4233140	10
11	WD4	765	011	759178	4233177	10
12	XS2	839	012	759228	4233183	10
13	WD5	920	013	759274	4233199	10
14	ESS	1120	014	759333	4233706	10
15	XS3	1231	015	759445	4233216	10
16	ESR	1428	016	759501	4233229	10

SSR - Start of Sensitive Reach
ESR - End of Sensitive Reach
SSS - Start of Survey Segment
ESS - End of Survey Segment
R1 to R4 - Macroinvertebrate Riffles
XS1 - Cross-sections (up to XS3)
WD1 - Width to Depth (up to WD5)
WP# - Way point Number
BM - Benchmark

SSR Data
Reference Object: <i>36" Doug fir</i>
Benchmark Type: <i>rebar w/yellow cap</i>
Bearing: BM to SSR <i>97°</i>
Distance: BM to SSR <i>27.4 m</i>
Note: record bearing in degrees magnetic north.

Sensitive Reach Sketch

Sketch stream pattern and indicate flow direction; show SSR benchmark, bearing and distance; show all applicable site locations and distances from SSR; show north arrow and adjacent location features (roads, trails etc.).

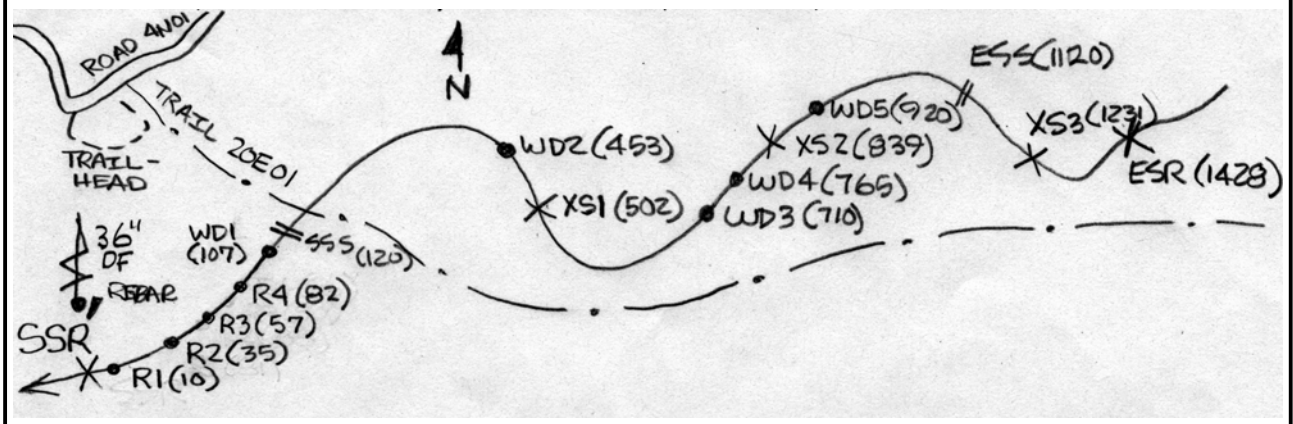


Photo Reminder! Photograph SSR and ESR (up and down stream, left and right bank), and SSS and ESS if there is a survey segment within the sensitive reach. Also photograph from SSR Benchmark to SSR and vice versa. Record on Photo Log (form #10)

Form 2 (Page 1) – Macroinvertebrate Data

General Information:

This form consists of two pages. The first page contains site measurement data and the second page contains sketches of each of the four sample riffles.

Header Information Unique to this Form:

- Type of site - circle either test site (i.e., moderately or heavily managed watershed upstream) or reference site (unmanaged, minimally managed, or recovered watershed).
- Flow regime – circle one. Most streams will be perennial (flowing year round in all or nearly all years). Intermittent streams will have some dry period each year.
- Record the elevation of the riffle sampling area, in meters. To convert feet to meters multiply by .3048.
- Record the latitude and longitude of the riffle areas (in decimals), derived from a GPS unit in the field or by GIS in the office.
- Record sampler mesh size (i.e., 500 microns) and total area sampled (i.e., 8 square feet)

Site Measurements:

Riffle Dimensions and Location:

Note: Riffle 1 is the furthest downstream of the four riffles. The remaining riffles are numbered consecutively progressing upstream.

Record the length of each of the four riffles, along the longest axis of the riffle in the main flow direction of the stream.

Record the width of each riffle along the short axis of the riffle perpendicular to the main flow direction of the stream.

Record the distance from the start of the sensitive reach to the downstream end of the riffle.

Location of Macroinvertebrate Samples:

Record % and distance up from riffle bottom and from left edge.

Water Chemistry:

Record the total alkalinity and conductivity.

Photo Reminder:

Photograph each of the four riffles, viewing upstream. Also photograph an overview of the four-riffle area – upstream from the first riffle and downstream from the fourth riffle. In reaches where the riffles in the four-riffle area are not intervisible (i.e., meanders or vegetation interrupts a continuous view), supplementary photos should be taken so that the entire riffle area can be pictorially depicted.

**USDA Forest Service Pacific Southwest Region
Stream Condition Inventory (SCI)**

**Field Form #2
Page 1 of 2**

Macroinvertebrate Data (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Type of Site (circle one): **Test** or **Reference** and **Perennial** or **Intermittent**

Sampler Type: *SURBER*

Mesh Size (microns): *500*

Total area sampled (ft.²): *8*

Site Measurements								
Riffle Dimensions and Location	Riffle 1		Riffle 2		Riffle 3		Riffle 4	
Length (m)	15		14		10		20	
Width (m)	5		4		5		6	
Distance form Start of Sensitive Reach	10		35		57		82	
Location of Macroinvertebrate Samples	Riffle 1		Riffle 2		Riffle 3		Riffle 4	
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
% Up from Riffle Bottom	20	50	30	60	20	70	30	40
Distance Up from Riffle Bottom	3	12	4.2	8.4	2	7	6	8
% from Riffle Left Edge	50	20	70	60	20	30	70	30
Distance from Riffle Left Edge	2.5	1	2.8	2.4	1	1.5	5.6	1.8

Water Chemistry	
Total Alkalinity: <u>51.3</u> ppm CaCO ₃	Conductivity: <u>18.6</u> uS/cm ²

Photo Reminder! Photograph each riffle, looking upstream. Photograph overview of riffle area - upstream from 1st riffle, downstream from 4th riffle and other overview photos as desired. Record on Photo Log (form #10).

Field Form #2 - Version 5.0 - July 2005

Form 2 (Page 2) – Macroinvertebrate Sketches

Sketches:

Sketch the following information for each of the four riffles.

- The shape of the riffle to the channel – sketch the location of wetted edge and bankfull in relation to the riffle. Note: the wetted edge should either be at or outside the sketched riffle since macroinvertebrate samples are collected only in the wetted portion of the riffle. For example, if a portion of a riffle is in the wetted width but the edges of the riffle habitat are dry, the sampled portion of the riffle is the wetted part. The wetted part is defined as having depth in the water column – moist substrate lacking water depth is not sampled.
- The main flow direction of the channel and flow across the riffle (flow across riffles is sometime diagonal to the main flow).
- The locations of both macroinvertebrate samples.
- Sidewater features such as runs, edgewater (definitions?)
- Distinguishing features in or near the riffle (large boulders, bedrock, large woody debris, etc.)

Macroinvertebrate Sketches (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

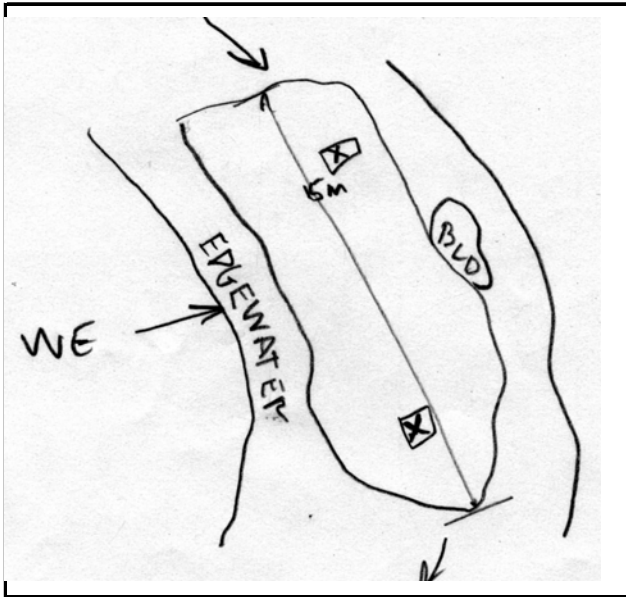
A. ANDAZOLA, A. BURNS

Reach #: *17025*

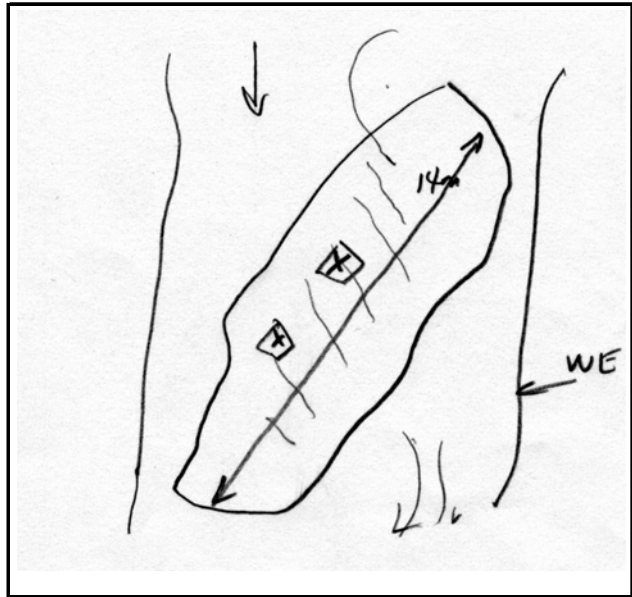
Date: *7/8-9/2004*

Sketch each riffle (show shape relative to channel, location of sample points and any other key features).

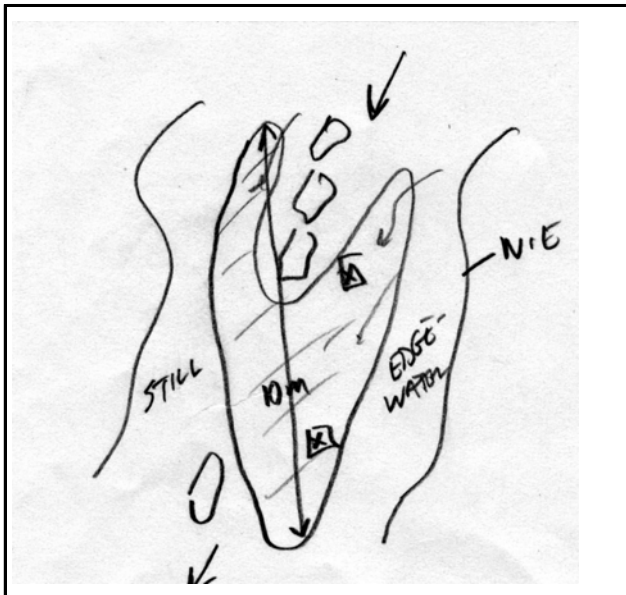
Riffle 1



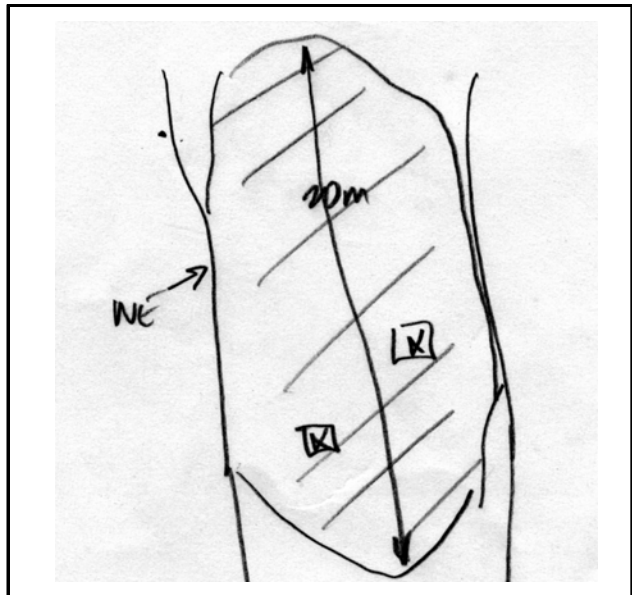
Riffle 2



Riffle 3



Riffle 4



Field Form #2 - Version 5.0 - July 2005

Form 3 – Particle Count

Streambed Particle Count:

Record 100 particles in each of the four riffles sampled for macroinvertebrates. If macroinvertebrates are not sampled, riffles should still be selected per protocol instructions so that the particle count can be conducted.

Layout 10 systematically spread transects across each riffle between bankfull on both banks.

- Collect 10 evenly spaced particles along each transect. The minimum spacing between particles must be greater than the largest diameter particle in the riffle. (Note: where an anomalously large particle is present use the largest dominant particle size in the riffle. For example, if a riffle is 70% gravel and 30% cobble but has one very large boulder, use the largest cobble as the minimum spacing guide).
- Record each particle by size class shown on the form as either “wet” (within the wetted area) or “dry” (between wetted edge and bankfull stage). “Wet” is defined as the portion of the stream that has depth in the water column. “Dry” is defined as not having water column depth, (including moist substrate without water depth).

It is strongly recommended that a gravel template be used. For particles larger than 180 mm or any particles that cannot be picked up, use the gravel template or a metric ruler to estimate the particle size class. Do not avoid particles that cannot be picked up – they must be included in the count if they are encountered along each transect. Circle all estimated particle sizes.

- On the bottom line of the form tally the count in each column to insure that 100 particles have been counted in each riffle.
- On the right two columns of the form sum the number of wet and dry particles for all four riffles for each particle size class.

**USDA Forest Service Pacific Southwest Region
Stream Condition Inventory (SCI)**

Field Form #3

Particle Count (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Particle Size Class			Streambed Particle Count								Row Sum					
			Riffle 1		Riffle 2		Riffle 3		Riffle 4							
			mm	Class	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry		
Fines	< 2	1		☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐		☐☐☐☐☐☐	☐☐☐☐☐☐	4	15		
Gravels	2 - 2.8	2		☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐		☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	13	11	
	2.8 - 4	3	☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐		☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	18	7	
	4 - 5.6	4	☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	30	9	
	5.6 - 8	5	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐☐☐	38	8	
	8.0 - 11	6	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	29	15
	11 - 16	7	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	29	6
	16 - 22.6	8	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	34	5
	22.6 - 32	9	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	18	8
	32 - 45	10	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	34	6
	45 - 64	11	☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	18	3
Cobbles	64 - 90	12	☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐						☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	13	0
	90 - 128	13	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	13	4	
	128 - 180	14		☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐			☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	6	3	
	180 - 256	15					☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐					☐☐☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐☐☐	2	1
Boulders	256 - 512	16														
Bedrock	> 512	17														
Column Tally			☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		Total Wet	Total Dry				
			☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		299	101				
			☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		☐☐☐☐☐☐☐☐☐☐		Total	400				

Note: Circle all estimated values.

Field Form #3 - Version 5.0 - July 2005

Form 4 – Cross-section and Width-to-depth Candidate Sites and Large Woody Debris (LWD)

Candidate Sites:

Progressing along the sensitive reach, enter the number of the survey flag and the distance from the start of the sensitive reach for each candidate site (i.e., 1@78 m, 2@140 m). Record this information on lines 1 and 2. (Candidate sites are fast water habitat units in straight sections typical of the sensitive reach).

When all candidate sites have been identified at the end of the sensitive reach, randomly select three of the sites for cross-section locations. Record the selected sites on line three by placing a number for each selected site, starting with the site nearest the start of the sensitive reach (i.e., 1@502 m, 2@839 m, 3@1231 m).

If there are more than three candidate sites, select up to five for conducting width-to-depth and entrenchment ratio measurements. If there are more than five to choose from, select them randomly. If fewer than five, number them sequentially starting at the site nearest the start of the sensitive reach (i.e., 1@207 m, 2@453 m).

The designation of the selected sites establishes the order of measurements in the next survey pass.

Bankfull Width:

Enter the estimated bankfull width for the reach. The estimate should represent the average for the reach, with bankfull widths having been observed at several locations during the reconnaissance pass. Find a typical width site and measure it – do not visually estimate it because it can be different enough from a measured value to affect the length, and thus the amount, of the LWD tallied for the reach.

Minimum Debris Length:

Divide bankfull width by two to determine the minimum length to be counted.

Woody Debris Tally:

Single Pieces:

Progressing along the sensitive reach, dot or mark-tally each individual piece of woody debris that meets the minimum length of $\frac{1}{2}$ bankfull width. Sum the total number of single pieces at the end of the sensitive reach.

Aggregate Tally:

Tally pieces that are part of an aggregate. (An aggregate is four or more pieces contacting one another with each piece meeting the minimum length). Remember to count only those pieces in an aggregate that are at least the minimum length – some pieces in aggregates are shorter and are not counted.

Record the number of pieces in each aggregate in the space provided (i.e., 5, 12). Sum the total number of pieces in aggregates at the end of the sensitive reach.

Root Wad Tally:

Enter a tally mark or dot for each root wad encountered in the sensitive reach.

Identification of Survey Segment:

Enter the sensitive reach length (A). If $A > 1,000$ m subtract 1,000 (B) and randomly select a number between 0 and B (C). Enter survey segment start and end-points (D).

**USDA Forest Service Pacific Southwest Region
Stream Condition Inventory (SCI)**

Field Form #4

Cross-section and Width-to-depth Candidate Sites
and Large Woody Debris (LWD) (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

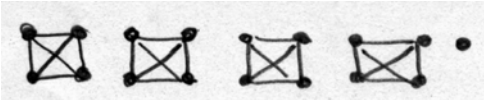
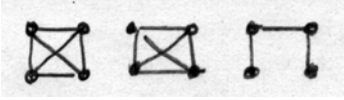
Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Candidate Sites (randomly select 3 x-section sites and up to 5 W/D sites)												
Candidate Site #	1	2	3	4	5	6	7	8	9	10		
Distance from SR Start	82	107	211	453	502	710	765	839	920	1231		
Selected x-section #					1			2		3		
Selected W/D #		1		2		3	4		5			

Woody Debris Tally (Dead and Downed Wood)			
Bankfull Stage Width:	<i>8 m</i>	Min. Debris Length (=1/2 average bankfull width):	<i>3 m</i>
Number of Pieces			
Single		Aggregate ¹	
			
		Number of pieces in each aggregate	<i>8, 4, 15</i>
Sum of Single Pieces		<i>41</i>	Sum of Aggregate Pieces
			<i>27</i>

1 - An aggregate is 4 or more pieces of connected woody debris that are each greater than 1/2 bankfull width.

Number of Rootwads ²	Tally: 	Sum: <i>4</i>
---------------------------------	--	---------------

2 - A root wad is the base of a tree whose bole is about the same length or shorter than the diameter of the root mass.

Identification of Survey Segment	
A.	Sensitive Reach Length (m) <i>1428</i> B. A minus 1000m <i>428</i> (if A is greater than 1000m)
C.	Random # between 1 and B <i>120</i>
D.	Survey Segment lies between C (Survey Segment Start) <i>120</i> and 1000+C (Survey Segment End) <i>1120</i>

Comments:

Field Form #4 - Version 5.0 - July 2005

Form 5 – Cross-section Data and Water Surface Gradient

Note: bankfull stage cross-sectional area should be consistently similar at all cross-section and width-to-depth sites in the reach. If not, bankfull stage may not have been correctly identified at some sites. Compare the bankfull stage cross-sectional area measurements in the field as each site is measured to assure consistency. Width and mean depth will vary from site to site but the cross-sectional area should be similar.

Header Information Unique to this Form:

- Cross-section # - Record a 1, 2 or 3 as noted on Form 4.
- Distance from start of sensitive reach – Record distance as noted on Form 4.
- String Height (distance below top of pin) – record the distance below the top of the left and right pin that the level-string is attached, to the nearest .01 m. (It does not have to be the same on both pins). This data is essential for future cross-section remeasurement.

Cross-section Data:

Distance from Station Start

This is the horizontal distance from the left pin, facing downstream. The LP is always zero.

Total Depth

This is the vertical distance down from string height to ground surface (both in and out of water). Note that if the string line is established above ground level on the left or right pin the total depth will be greater than zero. (The total depth may be different on each pin).

Bankfull Depth

Enter the depth from bankfull stage to ground surface. It is the difference between total depth and bankfull depth.

Undercut Width

Record the depth at the top and bottom of undercut banks and measure enough undercut widths to depict the undercut shape. Record the undercut widths at each undercut depth measured. See cross-section diagram on sample Form 6 and SCI Figure 1 for illustrations.

Water Surface Gradient

Refer to the Water Surface Gradient protocol for instructions.

Width-to-depth Ratio

From cross-section data table, enter bankfull width in A. Calculate mean bankfull depth from bankfull depth column in the cross-section data table and enter in B. Calculate mean bankfull depth by summing all bankfull depth measurements and dividing by the number of measurements plus 1 to average both “0” depth end-points. Calculate the width-to-depth ratio by dividing A by B and record in the bottom line of the box.

Entrenchment Ratio

Record bankfull width and maximum bankfull depth (thalweg) in A and B. Calculate C. Measure the width at this depth (2x maximum bankfull depth) and enter in D. Measure using a tape, or by pacing in wide valleys where measurement is difficult. Do not visually estimate – it can be substantially inaccurate. Calculate entrenchment ratio by dividing D by A and record in the bottom line of the box.

Photo Reminder

Take photos as required on the bottom of this form. Log on Form 10.

Cross-section Data and Water Surface Gradient (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: <i>HIGH SIERRA</i>	Observers: <i>A. DIMOS</i>
Stream: <i>PACIFIC CREEK</i>	<i>A. ANDAZOLZ, A. BURNS</i>
Reach #: <i>17025</i>	Date: <i>7/8-9/2004</i>
Cross-section #: <i>1</i>	Distance From Start of Sensitive Reach: <i>502 m</i>

String height distance below top of: LP *0.05* RP *0.05* (cm)

Cross Section Data				
Dist. From Station Start	Total Depth	Bankfull Depth	UCW	Notes*
<i>0</i>	<i>0.04</i>			<i>LP</i>
<i>1.0</i>	<i>0.22</i>			
<i>2.0</i>	<i>0.50</i>			
<i>3.0</i>	<i>0.63</i>			
<i>4.0</i>	<i>0.80</i>			
<i>5.0</i>	<i>0.91</i>			
<i>6.0</i>	<i>0.93</i>			
<i>7.0</i>	<i>0.95</i>			
<i>8.0</i>	<i>1.00</i>	<i>0</i>		<i>BFL</i>
<i>8.2</i>	<i>1.10</i>		<i>0</i>	<i>TUC</i>
<i>8.0</i>	<i>1.20</i>		<i>0.20</i>	
<i>7.9</i>	<i>1.40</i>		<i>0.30</i>	<i>WEL</i>
<i>8.0</i>	<i>1.60</i>		<i>0.20</i>	
<i>8.2</i>	<i>1.70</i>	<i>0.70</i>	<i>0</i>	<i>BUC</i>
<i>9.0</i>	<i>1.80</i>	<i>0.80</i>		<i>T</i>
<i>10.0</i>	<i>1.75</i>	<i>0.75</i>		
<i>11.0</i>	<i>1.65</i>	<i>0.65</i>		
<i>12.0</i>	<i>1.60</i>	<i>0.60</i>		
<i>13.0</i>	<i>1.50</i>	<i>0.50</i>		
<i>14.0</i>	<i>1.40</i>	<i>0.40</i>		<i>WER</i>
<i>15.0</i>	<i>1.25</i>	<i>0.25</i>		
<i>16.0</i>	<i>1.00</i>	<i>0</i>		<i>BFR</i>
<i>17.0</i>	<i>0.95</i>			
<i>18.2</i>	<i>0.91</i>			
<i>19.5</i>	<i>0.83</i>			
<i>20.5</i>	<i>0.60</i>			
<i>22.0</i>	<i>0.20</i>			
<i>23.0</i>	<i>0.08</i>			<i>RP</i>

Gradient				
		Set Up	Set Up	Set Up
Downstream End		1	2	3
a.	Instrument or Rod Height	2.25	1.50	
b.	Water Surface Height	0.25	0.10	
A.	a minus b	2.00	1.40	
Upstream End		1	2	3
c.	Instrument or Rod Height	1.55	1.00	
d.	Water Surface Height	0.20	0.20	
B.	c minus d	1.30	0.90	
C.	Elevation Change A to B	0.70	0.50	
Length (downstream-upstream)		80	40	
Total Elevation Change =			1.20	
Total Length =			120	
Gradient = Total Elevation Change/Total Length X 100 = %		1.00%		

Width to Depth Ratio		
A.	Bankfull Width	8.0
B.	Mean Bankfull Depth	0.52
Width:Depth Ratio = A/B		
Width: Depth Ratio = 15.4		

Entrenchment		
A.	Bankfull Width	8.0
B.	Maximum Bankfull Depth	0.8
C.	2 x Max Bankfull Depth	1.6
D.	Width at C	21.0
Entrenchment Ratio = D/A		
Entrenchment Ratio = 2.6		

*Notes: Enter These Only....

- BFL = Bankfull Stage Left
- BFR = Bankfull Stage Right
- WEL = Water's Edge Left
- WER = Water's Edge Right
- LP = Left Pin
- RP = Right Pin
- T = Thalweg
- TUC = Top of Undercut
- BUC = Bottom of Undercut
- UCW = Undercut Width

Photo Reminder! Photograph cross-section facing upstream, downstream, left and right bank. Photograph from BM to LP and RP, and LP and RP to BM. Photograph natural features that help site reference.

Form 6 – Cross-section Diagram and Location Sketch

Header Information Unique to this Form:

- Cross-section # - Record a 1, 2, or 3 as noted on Form 4.
- Distance from start of sensitive reach – record distance as noted on Form 4.

Cross-section Diagram:

After recording the cross-section measurements on Form 5, diagram the cross-section on this form before removing the cross-section set-up in the field. If Form 5 data are not recorded accurately the sketch will appear incorrect. If so, this allows correction of cross-section measurements while the site is still set up.

The sketch template on this form allows scale flexibility for the vertical and horizontal axes. Note the left and right bank indicators above the template.

Cross-section Location Sketch:

Sketch the cross-section site area, recording all features noted in the top of the sketch template. In addition, record all requested information in the boxes below the sketch.

Cross-section Diagram and Location Sketch (collected from sensitive reach)

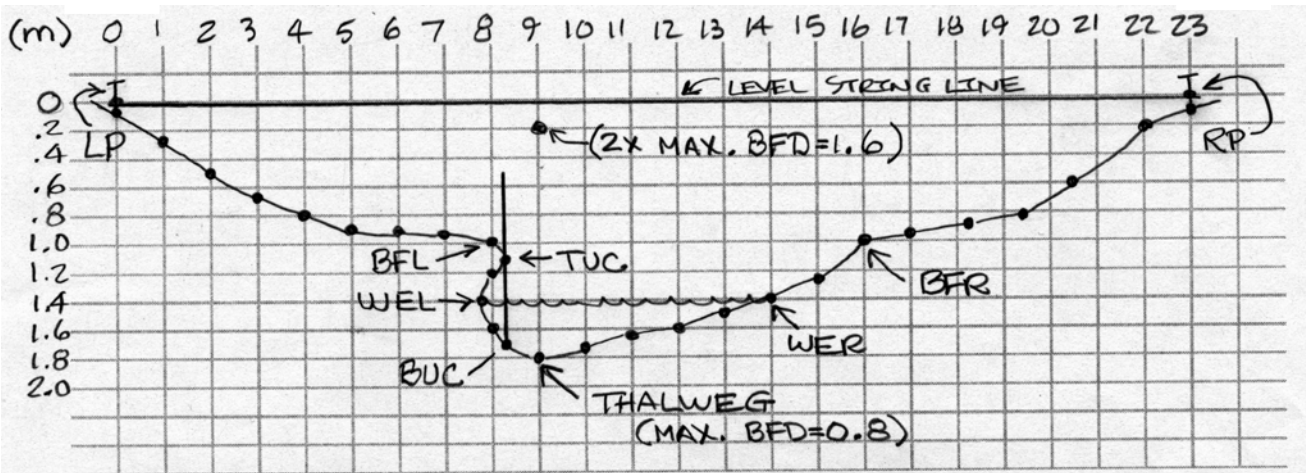
Forest/National Park/Other Ownership: *TAHOE N.F.*

District: <i>HIGH SIERRA</i>	Observers: <i>A. DUMOS</i>
Stream: <i>PACIFIC CREEK</i>	<i>A. ANDAZOLA, A. BURNS</i>
Reach #: <i>17025</i>	Date: <i>7/8-9/2004</i>
Cross Section #: <i>1</i>	Distance From Start of Sensitive Reach: <i>502 m</i>

Cross-section Diagram

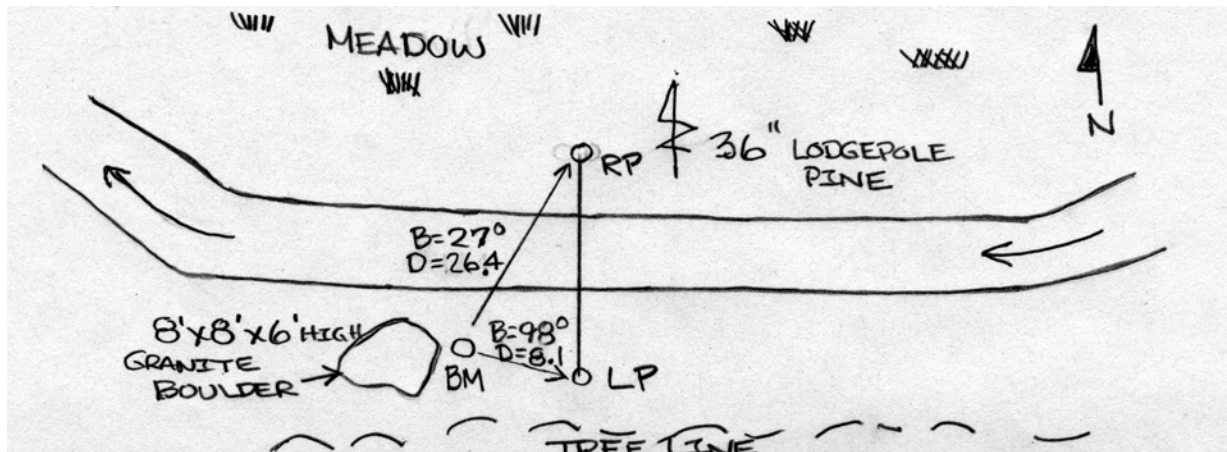
Left Bank

Right Bank



Cross-section Location Sketch

Sketch stream channel and flow direction; benchmark location, left and right pin location, north arrow, and natural features that help ID site (i.e., large boulders or large trees). Record benchmark and pin data below sketch. Record bearings in degrees magnetic north.



BM Type: <i>rebar w/yellow cap</i>	Bearing: BM To LP <i>98°</i>	Distance: BM to RP <i>26.4 m</i>	BM: UTMN <i>759043</i>
LP Type: <i>rebar w/yellow cap</i>	Distance: BM to LP <i>8.1 m</i>	Distance: LP to RP <i>23.0 m</i>	BM: UTMN <i>4233144</i>
RP Type: <i>rebar w/yellow cap</i>	Bearing: BM To RP <i>27°</i>	BM: Way pt.# <i>009</i>	BM: Zone <i>10</i>

Form 7 – Width-to-depth Ratio and Entrenchment Ratio

Note:

Bankfull stage cross-sectional area should be consistently similar at all cross-section and width-to-depth sites in the reach. If not, bankfull stage may not have been correctly identified at some sites. Compare the bankfull stage cross-sectional area measurements in the field as each site is measured to assure consistency. Width and mean depth will vary from site to site but the cross-sectional area should be similar.

Measurements:

Width-to-depth #:

Record the number of the site as noted on Form 4.

Distance from SSR:

Record the distance of this site from the start of the sensitive reach as noted on Form 4.

Distance from BFL:

Once bankfull stage has been located, begin measurements of width and bankfull depth starting at the left bank. Record these measurements to the nearest .01 m.

Be sure to record the locations of all the abbreviations in the notes below the measurement tables.

Calculations:

Bankfull Width:

Record the last number in the “Dist from BFL” in the measurement table.

Mean Bankfull Depth:

Sum all depth measurements and divide by the number of measurements plus 1. (The “plus 1” is to account for the depth between both end and next-to-end stations in the Bankfull depth column). Where multiple thread channels are encountered, sum the depths in all channels and divide by the number of measurements, plus the number of channels (e.g., two for double thread, three for triple thread).

Floodprone Area Width:

At a height twice the maximum bankfull stage depth, measure the valley width until ground surface is encountered. Take measurement with a level tape. Where the width is so great that a tape is not practical make a paced estimate. Avoid making a visual estimate since that is often substantially inaccurate.

W/D Ratio:

Calculate the ratio by dividing A by B.

Entrenchment Ratio:

Calculate the ratio by dividing C by A.

Width-to-depth Ratio and Entrenchment Ratio (collected from sensitive reach)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Measurements								
Width-to-Depth #: 1			Width-to-Depth #: 2			Width-to-Depth #:		
Distance From SSR: 107			Distance From SSR: 453			Distance From SSR:		
Dist from BFL	Bankfull Depth	Notes ¹	Dist from BFL	Bankfull Depth	Notes ¹	Dist from BFL	Bankfull Depth	Notes ¹
0	0	BFL	0	0	BFL			
0.10	0.46		0.15	0.46				
0.35	0.56	WEL	0.35	0.50	WEL			
1.00	0.70		1.10	0.60				
1.50	0.65		1.60	0.65				
2.00	0.71		2.00	0.61				
2.50	0.73		2.55	0.70				
3.00	0.69		3.10	0.59				
3.50	0.67		3.45	0.62				
4.00	0.69		4.10	0.63				
4.85	0.76	T	4.85	0.66				
5.00	0.74		5.30	0.71				
5.50	0.57		5.55	0.55	T			
6.00	0.66		6.15	0.60				
6.40	0.56	WER	6.40	0.56				
6.75	0.36		6.80	0.36	WER			
7.00	0.20		7.05	0.25				
7.30	0.15		7.50	0.22				
7.45	0	BFR	7.95	0.20				
			8.10	0.15				
			8.55	0.05				
			8.75	0	BFR			
Calculations								
A Bankfull Width	7.45		A Bankfull Width	8.75		A Bankfull Width		
B Mean Bankfull Depth ²	0.55		B Mean Bankfull Depth ²	0.46		B Mean Bankfull Depth ²		
C Floodprone Area Width ³	18.5		C Floodprone Area Width ³	23.5		C Floodprone Area Width ³		
W/D Ratio = A/B	13.51		W/D Ratio = A/B	19.02		W/D Ratio = A/B		
Entr. Ratio = C/A	2.5		Entr. Ratio = C/A	2.7		Entr. Ratio = C/A		

¹Notes: BFL= Bankfull Stage Left, BFR = Bankfull Stage Right, WE = Water's Edge, T = Thalweg, UC = Undercut Bank

²Mean Bankfull Stage Depth = Sum of Depths/Number of Depths + 1

³Total distance at 2 times maximum bankful stage depth.

Form 8 – Pools and Pool Tail Surface Fine Sediment

Note:

Record all applicable measurements within the survey segment only. Do not record data for any portion of a fast or slow water habitat unit that extends upstream or downstream of the survey segment, whether the segment is shorter or longer than 1,000 m. For example, if a survey segment begins 15 m upstream from the start of a 30 m fast water unit, record only the 15 m length that is within the survey segment. If the survey segment begins 15 m upstream of the start of a 30 m slow water unit, record the 15 m of the pool that lies within the segment and record any of the other pool features that lie within the survey segment part of the pool. In this case, the pool tail crest would not be within the segment, and the maximum pool depth and, if present, a wood-formed feature may or may not lie within the survey segment. If a survey segment ends in a portion of a fast or slow water unit, again record only the data for the portion of the unit that lies within the survey segment.

Habitat Measurements:

Station Start, End and Unit Length:

Begin recording the first habitat unit as zero and measure the distance upstream to the end of the habitat type. Record that distance as well as the length of the unit. For example, 0 to 13.8 m is the start and end of the unit and thus the unit length is 13.8 m. The start of the next unit begins with the same number as the end of the previous unit (13.8 m in this case), and if the end of this second unit is 25.9 m then the unit length is 12.1 m. Continue measuring and recording habitat types until the end of the survey segment is reached. This will be 1,000 m if the sensitive reach exceeds that length, or less than 1,000 m if the sensitive reach is shorter than that length.

Pool Depth Measurements:

Locate the maximum depth of the pool with the depth rod and record it to the nearest .01 m (e.g., .97 m). Locate the deepest point across the crest of the pool tail (the thalweg) and record that depth as the pool tail crest depth to the nearest .01 m.

Wood formed?

Record a “Y” if wood is a factor in pool formation. This can be at the tail or head of the pool. Record an “N” if wood is not a factor in pool formation.

Pool Tail Fine Sediment Measurements:

Throw the grid at the three locations described and illustrated in the protocol. If the stream is too small for three throws, do two throws, or even one if only one will fit in the pool tail area. Do not overlap tosses in any case because it may recount particles. For each throw, count how many times fines (2 mm or less) are encountered at the 50 intersections on the grid. Multiply by 2 (“Points x2” as shown on the form) and enter that number in the column for that throw. Note that the fines count on the form must always be an even number.

If the grid toss is impossible due to vegetative or other obstructions at the pool tail, conduct a particle count in the pool tail area as described in the protocol. Enter the actual number of fines encountered in the Throw 1 column.

In any case where fewer than three columns are used to record pool tail substrate, enter an N/A in the remaining column(s) to verify that no data were collected. Do not leave a blank column.

**USDA Forest Service Pacific Southwest Region
Stream Condition Inventory (SCI)**

Field Form #8

Pools and Pool Tail Surface Fine Sediment (collected from survey segment)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Habitat Measurements							Pool Tail Fine Sediment		
Habitat Type	Station Start ¹	Station End ¹	Habitat Unit Length	Max. Depth ²	Pool Tail Crest Depth ²	Wood Formed ?	Throw 1 Points x2	Throw 2 Points x2	Throw 3 Points x2
Fast	0	25.5							
Slow	25.5	36.5	11	0.61	0.11	N	12	4	6
Fast	36.5	70							
Slow	70	87	17	0.89	0.20	N	10	6	14
Fast	87	143.5							
Slow	143.5	165	21.5	1.12	0.22	Y	10	32	26
Fast	165	181							
Slow	181	190	9	0.78	0.13	N	14	18	14
Fast	190	199.5							
Slow	199.5	203	3.5	0.49	0.10	N	2	4	12
Fast	203	240							
Slow	240	254	14	0.83	0.14	N	4	2	10
Fast	254	281							
Slow	281	302.5	33.5	1.07	0.21	N	14	12	2
Fast	302.5	320							
Slow	320	330	10	0.94	0.17	Y	30	24	8
Fast	330	378							
Slow	378	386	8	0.45	0.12	N	44	20	8
Fast	386	429							
Slow	429	454	25	1.14	0.22	Y	4	14	0
Fast	454	515							
Slow	515	524	9	0.65	0.13	N	12	10	0
Fast	524	568.5							
Slow	568.5	576.5	8	0.63	0.13	N	6	0	10
Fast	576.5	630							
Slow	630	641	11	0.67	0.10	N	2	8	12
Fast	641	680							
Slow	680	703	25	1.52	0.20	N	32	22	24
Fast	703	763							
Slow	763	778.5	15.5	1.28	0.20	N	12	20	20
Fast	778.5	810							
Slow	810	828	18	0.81	0.15	N	20	8	0
Fast	828	879							
Slow	879	888	9	0.79	0.16	Y	4	10	18
Fast	888	925							
Slow	925	951	26.5	1.31	0.19	N	8	10	16
Fast	951	1000							

¹Measurements are to the nearest 0.1 m (e.g. 3.6 m)

²Measurements are to the nearest 0.01 m (e.g. 3.65 m)

Note: Circle all estimated values.

Field Form #8 - Version 5.0 - July 2005

Form 9 – Streambank Stability, Stream Shading, Streamshore Water Depth, Streambank Angle and Aquatic Fauna

General Information:

Form 9 is a two-page form where all SCI “transect data” are measured and recorded in the survey segment only. All measurements are conducted at 50 evenly spaced transects within the survey segment. Note that streambank angle and streamshore water depth are measured only on streams where the gradient is less than 2% and the stream has fine textured streambanks.

Header Information Unique to this Form:

On the line provided, record the interval between transects to the nearest meter. The interval will be 20 m for all sensitive reaches 1,000 m or longer. The interval will be less if the sensitive reach is shorter than 1,000 m. For example, if the sensitive reach is 800 m the interval between transects will be 16 m.

Transect Data

Streambank Stability:

Enter code 1, 2, or 3 for the left and right banks at each transect (see codes at the bottom of the form).

Stream Shading:

Enter percent shade using the August path on the Solar Pathfinder. Remember to take the measurement at mid-wetted width of the stream about 0.3 m above the water surface.

Streamshore Water Depth:

Measure the depth at the shoreline on the left and right banks. Record the depth as zero if the bank angle is greater than 90 degrees.

Streambank Angle:

Measure the dominant angle of both the left and right banks. See the protocol for definition of “dominant angle.”

Aquatic Fauna:

Be observant for aquatic fauna while approaching each transect. Note any fauna observed at or close to each transect. Record fauna by species code as listed in Appendices C (herptofauna) and D (fish). Aquatic fauna noted during other survey passes should be recorded on Form 10 under comments.

**USDA Forest Service Pacific Southwest Region
Stream Condition Inventory (SCI)**

**Field Form #9
Page 1 of 2**

Streambank Stability, Stream Shading, Streamshore Water Depth,
Streambank Angle and Aquatic Fauna (collected from survey segment)

Forest/National Park/Other Ownership: *TAHOE N.F.*

District: *HIGH SIERRA*

Observers: *A. DUMOS*

Stream: *PACIFIC CREEK*

A. ANDAZOLA, A. BURNS

Reach #: *17025*

Date: *7/8-9/2004*

Transect Interval (m): *20*

Bank	L	R	L	R	L	R	L	R	L	R
Transect #	1		2		3		4		5	
Stability Rating ¹	1	3	1	1	1	3	2	1	1	1
Shading ²	24		17		38		19		16	
Shore Depth ³	0.26	0	0	0.33	0	0	0	0.09	0.17	0
Bank Angle ⁴	80	120	110	75	122	160	115	83	73	126
Aquatic Fauna ⁵	<i>RAMU-1 ADULT</i>									
Transect #	6		7		8		9		10	
Stability Rating	1	1	1	1	1	1	1	1	1	1
Shading	10		6		5		5		5	
Shore Depth	0	0	0.41	0.03	0.17	0.25	0	0	0	0
Bank Angle	155	110	80	68	75	90	120	125	110	103
Aquatic Fauna			<i>RAMU-12 TADS</i>		<i>THSI-1 ADULT</i>					
Transect #	11		12		13		14		15	
Stability Rating	2	3	1	1	1	1	3	1	1	1
Shading	5		6		4		9		10	
Shore Depth	0.3	0	0.45	0	0	0	0	0	0	0
Bank Angle	85	140	55	150	120	103	93	117	103	91
Aquatic Fauna										
Transect #	16		17		18		19		20	
Stability Rating	1	1	1	1	2	3	1	1	1	1
Shading	6		7		17		8		9	
Shore Depth	0	0	0	0	0	0.26	0	0.17	0	0.31
Bank Angle	170	101	160	98	110	58	113	85	125	90
Aquatic Fauna									<i>26-1 ADULT</i>	
Transect #	21		22		23		24		25	
Stability Rating	1	1	3	3	1	1	1	1	1	1
Shading	14		28		35		17		10	
Shore Depth	0.07	0	0.24	0	0	0	0	0	0	0
Bank Angle	81	120	83	122	150	99	170	103	120	118
Aquatic Fauna										

1 - Stability Rating: #1 >75% cover, #2 >75% cover with instability elements (cracking, bank failure, etc.), #3 <75% cover.

2 - Record to nearest percent (i.e., 38)

3 - Record only on reaches with gradient < 2%, to nearest 0.01 m (i.e., 0.12). If bank angle is > 90 degrees, shore depth is zero.

4 - Record only on reaches with gradient < 2%, to nearest degree (i.e., 75, 120)

5 - Record 4-character code for herptofauna (Apx. E) and numeric code for fish (Apx. F). Put remarks on Form 10.

Note: circle all estimated values.

Field Form #9 - Version 5.0 - July 2005

Form 10 – Sensitive Reach Photo Log and Comments

General Information:

Record photos and comments sequentially throughout the survey. For example, the sample form lists and describes photos 1-6 at the start of the sensitive reach. The next item is a comment regarding an amphibian sighting where no photos could be taken before the individuals disappeared. Denote comments in the left column with either a “C” or “—” to show no photo was taken. Where comments are made that are suitable for a non-required photo, record both the photo number and the comment.

Photo Log:

Record all the required, optional or additional photos taken along the sensitive reach. Photos are required while filling out forms 1, 2, and 5 (see the bottom of each of those forms). Optional photos may be taken while filling out these same forms as well. Additional photos that help characterize the reach are recommended.

Note the camera type (35 mm, digital, etc.) and the roll #, if applicable, in the spaces provided.

List and describe each photo taken. For example, the four required photos at the start of the sensitive reach could be listed as #1 – Upstream at SSR, #2 – Left bank at SSR, etc.

The objective is to record all photos taken so that they can be matched to the data file. This is both a field and office follow-up task requiring adequate attention to detail. Photos are a key element of the survey because they not only depict stream features but they can be retaken at intervals over time to denote changes in stream condition.

Digital cameras can make the job easier and more difficult at the same time. More photos are likely to be taken but careful description of the site at which each photo is taken must be carefully recorded in the field to match with the photo in the office after the survey. Make sure to catalog all photo sites as soon as possible after returning to the office.

While still photos are required, video recording of the reach may also be done. It has the advantage of audio if the recorder wishes to describe features along the reach.

Comments:

Observations may be made during the survey that cannot be recorded on Forms 1-9 due to space limits, etc. Other useful observations may not relate to forms but should be recorded. Use Form 10 for both cases. It is important to note as much as reasonably feasible.

Describe comments by noting location, date, applicable, form(s), etc. Make sure to clearly describe all observations.

