

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedure for Counting Large Woody Debris for the Extensive Riparian Status & Trends Monitoring Program

Version 1.0

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Signatures on File

Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. Their primary purpose is for internal Ecology use, although SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure or process.

SOP Revision History

Revision date	Rev number	Summary of changes	Sections	Reviser(s)
5/22/2009	1	Numerous edits	All	Kevin Kennedy
7/10/2009	2	Numerous edits	All	Brian Engeness
8/26/2009	3	Numerous edits	All	Martha Maggi
10/5/2009	4	Numerous edits	All	Brian Engeness
11/17/2009	5	Removed underlining	All	Bill Kammin

Environmental Assessment Program

Standard Operating Procedure for Counting Large Woody Debris for the Extensive Riparian Status & Trends Monitoring Program

1.0 Purpose and Scope

- 1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for measuring large woody debris (LWD) in streams for use in the Extensive Riparian Status and Trends (ERST) monitoring program.
- 1.2 Large woody debris impacts stream channel structure and often provides quality habitat for fish and macroinvertebrates. Forest management activities may influence the amount of LWD in streams.

2.0 Applicability

- 2.1 This SOP is intended for use in determining the quantity of large woody debris within and above the bankfull zone of both fish bearing and non-fish bearing streams. It is applicable to small streams and large rivers.

3.0 Definitions

- 3.1 Bank: any land surface above the bankfull edges that adjoins a body of water and contains it except during large-scale flood events; banks form above the bankfull edges as a conglomeration of vegetation, roots, rocks, and other structures.
- 3.2 Bankfull edge: the line on the bank that coincides with the water's elevation during bankfull stage.
- 3.3 Bankfull stage: the point at which a river or stream completely fills its channel, just before water begins to flow into the flood plain; bankfull stage is defined by the flow during moderate-sized floods that occur an average of every 1.5 years.
- 3.4 Bankfull zone: the area between the channel's bankfull edges and along the streambed; bankfull zone can be seen as a two-dimensional plane at a transect or as a three-dimensional area along the stream.
- 3.5 Bole: the trunk of a tree.
- 3.6 Downed wood: all wood that meets the four criteria outlined in 3.6.1, and falls within the bankfull zone .
- 3.7 Large woody debris (LWD): in order to be counted as LWD the following criteria must be met:

- 3.7.1 The piece of wood cannot be a living tree.
- 3.7.2 Root system no longer supports the weight of the bole; rootwad is detached from the ground.
- 3.7.3 Must have a minimum diameter of 10 cm and a length of 2 m; rootwads must be at least 20 cm in diameter and less than 2 m in length.
- 3.7.4 At least 10 cm of LWD must intersect, or lay above, the bankfull zone to be counted in our survey.

- 3.8 Jams: ten or more pieces of LWD physically touching each other, or associated with a jam structure.

- 3.9 Rootwad: the root structure of a tree that is no longer attached to the ground.

- 3.10 Segment: a section of the stream whose start and end points are determined by consecutive transects; each site for the ERST project has five segments.

- 3.11 Site: the area in which the study is being conducted; determined by the location of the randomly selected point on the stream.

- 3.12 Suspended wood: logs and rootwads suspended above the channel, not touching water, above the bankfull zone.

- 3.13 Transect: a line which crosses perpendicular to stream flow across the bankfull channel; each site for the ERST project has six transects.

4.0 Personnel Qualifications/Responsibilities

- 4.1 Knowledge of the contents of all SOP's related to the ERST monitoring program.

- 4.2 Data collection: Staff members must understand the notations on the datasheets (Appendices A and B). Each staff member should be adequately trained to identify the bankfull zone and estimate the size of woody debris to determine if it qualifies as LWD, according to the criteria provided in 3.6.1.

- 4.3 The staff member's aptitude for field tasks is more important than job class.

5.0 Equipment and Supplies

- 5.1 1.5 meter graduated PVC pole or measuring tape
- 5.2 Hand clicker (for counting wood)
- 5.3 Waterproof "Channel Form, LWD, Discharge, Gradient, Tributaries" datasheet (Appendix A)
- 5.4 Waterproof information sheet (Appendix B)
- 5.5 Waterproof field notebook
- 5.6 Wading Boots and Chest Waders
- 5.7 Pencils

6.0 Summary of Procedure

- 6.1 Measure large woody debris within each of the five segments.
- 6.2 Identifying Bankfull Zone
 - 6.2.1 Using bankfull indicators, identify the bankfull edges on the left and right banks of Segment 1. See the Standard Operating Procedure for Determining Channel Dimensions in Streams and Rivers for the Extensive Monitoring Program.
- 6.3 Counting Large Woody Debris
 - 6.3.1 Walking upstream from transect 1 to transect 2, use the hand clicker to count the pieces of LWD according to the four criteria outlined in 3.6.1. Classify these pieces into one of three categories defined in sections 3.4, 3.6, and 3.9, downed wood, suspended wood, and jams, as you count. Record the data in the appropriate cell in the Large Woody Debris section on the “Channel Form, LWD, Discharge, Gradient, and Tributaries” datasheet (Appendix A).
 - 6.3.2 Do not count large woody debris on portions of the segment that are subsurface.
 - 6.3.3 If a piece of LWD falls within two segments, count it only for one of the two segments.
- 6.4 Repeat the procedure outlined in 6.1 for segments 2 through 5. Review the datasheet before leaving the site to make sure everything was entered.
- 6.5 It is usually best to designate one staff member to count LWD. LWD can be counted while simultaneously completing other tasks along the segments (channel form, discharge measurements, gradient measurements, tributaries, and storm damage assessment).

7.0 Records Management

- 7.1 Blank datasheets available to print are located in
Y:\SHARED Files\Engeness\ERST\Data Sheets
- 7.2 All completed datasheet hard copies from a specific site are filed together.
- 7.3 Datasheets are scanned and saved in folders according to year of survey and site type (Type N or Type F). These folders are located in:

Y:\SHARED Files\Engeness\ERST\Type F07E
Y:\SHARED Files\Engeness\ERST\Type F08W
Y:\SHARED Files\Engeness\ERST\Type N08W
Y:\SHARED Files\Engeness\ERST\Type N09E

7.4 Data is entered into Access Database tables. Databases are located in Y:\SHARED Files\Engeness\ERST\Database Stuff\ERST_DATABASES

8.0 Quality Control and Quality Assurance Section

8.1 Data collection

8.1.1 Select 10% of the total number of sites for QA and take all field measurements twice; the second time with a different staff member collecting data. Record the QA measurements on separate data sheets. For the sake of efficiency, reassess the site immediately after the first assessment.

8.1.2 Ensure data sheets are completely filled out.

8.2 Data entry: After transferring data to a database file, two staff members check each entry of each record. Alternatively, enter the data twice and compare the tables.

9.0 Safety

9.1 Safety Equipment

9.1.1 Hard hat

9.1.2 Field vest

9.1.3 Wading Boots / Chest Waders

9.1.4 Compass

9.1.5 Whistle

9.1.6 First aid kit

9.1.7 Weather protection (i.e., raingear, sun protection, extra clothing)

9.2 Field team must always consist of at least two staff members.

9.3 Applicable Ecology Safety Policies

9.3.1 Accessing Private Property: Follow Ecology Executive Policy 1-11.

9.3.2 Field work Notification Procedures: Follow procedure outlined in EAP Safety Manual on pages 1-19 through 1-22.

9.3.3 Working in Rivers and Streams: Follow procedure outlined on pages 1-35 and 1-36.

9.4 Use a CB radio to communicate with traffic on logging roads.

10.0 References

- 10.1 Ecology, 2006. Environmental Assessment Program Safety Manual. Olympia, WA.
- 10.2 Ehinger, W., McConnell, S., Schuett-Hames, D., Black, J. 2007. Study plan: Extensive Riparian Status and Trends monitoring program. Draft. Prepared for CMER's Riparian Scientific Advisory Group.
- 10.3 Moberg, J. 2006. A Field Manual for the Habitat Protocols of the Upper Columbia Monitoring Strategy,. Final Draft of 2006 Working Version. Prepared for Bonneville Power Administration's Integrated Status and Effectiveness Monitoring Program. Wauconda, WA: Terraqua, Inc. pgs 16-18

11.0 Appendices

11.1 Appendix A. Channel Form, LWD, Discharge, Gradient, Tributaries Datasheet

ERST TYPE N F Westside MM/DD _____ 2009 CREW _____ Site ID # _____

Channel Form, LWD, Discharge, Gradient, Tributaries

SEG.	CHANNEL FORM				LARGE WOODY DEBRIS			DISCHARGE MEASUREMENTS:					
	SC	BW	W	Morph	Downed	Suspended	Jams	Transect ____ intersects discharge reach at ____ m.					
1	Y N	Y N	Y N					Distance of discharge reach = ____ m.					
2	Y N	Y N	Y N					Gradient of discharge reach = ____ %.					
3	Y N	Y N	Y N					MANNING'S N ESTIMATE					
4	Y N	Y N	Y N					N0 =		N2 =		N4 =	
5	Y N	Y N	Y N					N1 =		N3 =		M5 =	
SEG.	GRADIENT MEASUREMENT NOTES						%	TRIBS	Dis.(m)	BFW	% Flow	Side of Stream	
1								Trib 1:				RL	RR
2								Trib 2:				RL	RR
3								Trib 3:				RL	RR
4								Trib 4:				RL	RR
5								Trib 5:				RL	RR

Notes:

Morph codes: (BR, CO, CA, SP, PB, PR, DR, FA, DR). For Channel Form codes, circle Y if present and N if absent.

SC=Side Channel, BW=Back Water, W=Wetland. Con=Coniferous, Dec=Deciduous. Classify dominant morph code, or use two if 50/50.

<p>Reach Length Determination:</p> <p>Measure bankfull width at random point to get X meters. Go upstream X meters and measure BFW. Go up another Xm and measure BFW again. Repeat procedure downstream of random point. Divide by 5 to get an average BFW, then multiply times 30 to get reach length. Divide reach length of 30X by 5, to determine segment length.</p>		<p>Large Woody Debris (LWD):</p> <p>LWD is to be counted for each of the 5 segments. In order to be counted, LWD has to meet the following criteria:</p> <ol style="list-style-type: none"> 1) The piece of wood cannot be a living tree. 2) Root system no longer supports the weight of the bole; rootwad is detached from the ground. 3) Must have a minimum diameter of 10cm and length of 2m. Rootwads must be at least 20cm diameter and < 2m. 4) At least 10cm of LWD must intersect bankfull channel. <p>Downed Wood: this category is where most wood encountered falls in. This includes all wood that meets the 4 criteria and falls within the bankfull zone.</p> <p>Suspended Wood: logs and rootwads suspended above the channel, not touching water, above the bankfull zone.</p> <p>Jams: Ten or more pieces of LWD physically touching each other, or associated with jam structure.</p>																									
<p>Morphology Codes:</p> <table border="1"> <tr><td>BR</td><td>Bedrock</td></tr> <tr><td>CO</td><td>Colluvial</td></tr> <tr><td>CA</td><td>Cascade</td></tr> <tr><td>SP</td><td>Step Pool</td></tr> <tr><td>PB</td><td>Plane Bed</td></tr> <tr><td>PR</td><td>Pool Riffle</td></tr> <tr><td>DR</td><td>Dune Ripple</td></tr> <tr><td>FA</td><td>Falls</td></tr> <tr><td>DR</td><td>Dry Channel</td></tr> </table> <p>Channel Form:</p> <table border="1"> <tr><td>SC</td><td>Side Channel</td></tr> <tr><td>BW</td><td>Backwater</td></tr> <tr><td>W</td><td>Wetland</td></tr> </table>		BR	Bedrock	CO	Colluvial	CA	Cascade	SP	Step Pool	PB	Plane Bed	PR	Pool Riffle	DR	Dune Ripple	FA	Falls	DR	Dry Channel	SC	Side Channel	BW	Backwater	W	Wetland	<p>Canopy Closure</p> <p>Hold densiometer at elbow height above water level. Up means to face upstream while counting number of occupied cells. Left means facing the Left Bank, etc.. There are a total of 24 squares in the densiometer. If the entire square is occupied by foliage, count it as 4. If half of a square is occupied by vegetation, count it as 2. Add up the scores for all 24 cells and enter the total on the data sheet. The total number of quarter cells (single points) equals 96. So 96 = 100% canopy coverage. Another good way to determine the number of occupied quarter cells is to count the number of gaps (where no vegetation exists) and subtract from 96. This works best when there are few gaps to count.</p>	
BR	Bedrock																										
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