Standard Operating Procedure EAP116, Version 1.3

Watershed Health Monitoring: Estimating Fish Cover

Purpose of this document

The Washington State Department of Ecology develops Standard Operating Procedures (SOPs) to document agency practices related to sampling, field and laboratory analysis, and other aspects of the agency's technical operations.

Publication information

This SOP is available on the Department of Ecology's website at https://fortress.wa.gov/ecy/publications/SummaryPages/1803221.html

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Contact information

For more information contact:

Communications Consultant
Environmental Assessment Program
P.O. Box 47600, Olympia, WA 98504-7600
Phone: 360-407-7680

Washington State Department of Ecology – https://ecology.wa.gov

Location of Ecology Office	Phone
Headquarters, Lacey	360-407-6000
Northwest Regional Office, Bellevue	425-649-7000
Southwest Regional Office, Lacey	360-407-6300
Central Regional Office, Union Gap	509-575-2490
Eastern Regional Office, Spokane	509-329-3400

Washington State Department of Ecology

Environmental Assessment Program

Watershed Health Monitoring: Standard Operating Procedures for Estimating Fish Cover

Version 1.3

Author –   Jill Lemmon
Date –

Reviewer -   Stephanie Estrella, George Onwumere, Glenn Merritt and Meghan Rosewood-Thurman
Date -

QA Approval - William R. Kammin, Ecology Quality Assurance Officer
Date -

EAP116

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 and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative 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 the Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

Revision Date	Rev number	Summary of changes	Sections	Reviser(s)
2/28/17	1.1	Changed title, removed draft dates, added footers, updated glossary terms and references, general edits and formatting	All	Meghan Rosewood-Thurman
	1.2	Simplified sentence 1 Reference layout for Wide Protocol Added sentence 2 Simplified Simplified Clarified Reference Hartman EAP105, NOT 106 Revised link	1.1 2.4 3.13 4.1 4.2 6.1.2 6.4.1 10.9	Glenn Merritt
3/9/17	1.3	Added Reviewers	Signature Page	Meghan Rosewood-Thurman

Environmental Assessment Program

Watershed Health Monitoring: Standard Operating Procedures for Estimating Fish Cover

1.0   **Purpose and Scope**

1.1   This document is the Environmental Assessment Program's (EAP) Standard Operating
           Procedure (SOP) for visually assessing fish cover in rivers and streams during a Data
           Collection Event (DCE) for the Watershed Health Monitoring (WHM) Program. It
           includes methods for both WHM protocols: the Narrow Protocol and the Wide Protocol.
           This SOP is also used in the Ambient Biological Monitoring Program.

2.0   **Applicability**

2.1   This SOP was adapted from field methods of the Environmental Protection Agency's
           Environmental Monitoring and Assessment Program-Western Pilot (Peck et al., 2005
           and 2006)

2.2   This SOP contributes to both WHM protocols: Narrow and Wide, which are used to
           complete data collection events (DCEs) for the WHM Program.

2.3   This SOP is applied to a defined wetted area within the main channel at all 11 major
           transects.

2.4   This SOP requires that site layout and verification have already been performed. See
           WHM SOP EAP106 (Merritt, 2017) or WHM SOP EAP105 (Hartman, 2017).

2.5   Data collected with the method outlined in this SOP are used to calculate physical
           habitat metrics that quantify the type and amount of fish cover at a site (Janisch, 2013).

3.0   **Definitions**

3.1   Bankfull Stage: This stage is delineated by the elevation point of incipient flooding,
           which is indicated by deposits of sand or silt at the active scour mark, break in stream
           bank slope, perennial vegetation limit, rock discoloration, and root hair exposure
           (Endreny 2003).

3.2   DCE: The *Data Collection Event* is the sampling event for the given protocol. Data for
           a DCE are indexed using a code which includes the site ID followed by the year, month,
           day, and the time (military) for the start time of the sampling event. For example:
           WAM06600-000222-DCE-YYYY-MMDD-HH:MM. One DCE should be completed
           within one working day, lasting 4-6 hours, on average.

3.3   EAP: Environmental Assessment Program

3.4   Ecology: The Washington State Department of Ecology

3.5   Fish Cover Types: See Table 1.

Table 1. Fish cover types.

Fish Cover Type	Potential Cover for Any Size Fish or Amphibian
Filamentous Algae	Streaming filaments of microscopic algal cells that often occur in eutrophic water. Not to be confused with macrophytes and flowering aquatic plants; filamentous algae have no distinct leaves.
Artificial Structure	Human-introduced objects.
Macrophytes	Floating, submerged, or emergent water loving plants and wetland grasses. This category excludes mosses.
Boulders	Rocks ≥ 25 cm diameter (≥ basketball-size)
Brush	Dead wood pieces that are smaller than large woody debris (smaller than 10 cm diameter and below 2 m long (western Washington), or below 1 m long (eastern WA)).
Bryophytes	Non-vascular plants that reproduce using spores (e.g., mosses).
Live trees or Roots	Overhanging or submerged roots or base of tree trunks of live trees (originating from the stream bank). It may also be live trees such as alder growing within the wetted channel.
Undercut banks	Banks (at the wetted margin) that extend over deeper water. Fish cover assessment is by surface area of stream covered, rather than length of the undercut bank. Therefore undercut banks rarely provide more than 20% cover.
Woody Debris	Large woody debris. Pieces of dead or dying wood that must be in the stream or perched above the wetted channel, within 1 m of the wetted surface, and larger than brush (see above)
Overhanging Vegetation	Vegetation that hangs within 1 m of the water surface. Higher vegetation does not count because it could serve as perches for kingfishers or other predators.

3.6   Index station: The distinct point location mapped by the site coordinates obtained from the Washington Master Sample List. The index station is called "X" and is generally located at major transect F; however the point may occur at any elevation in the stream between transects A and K.

3.7   Main Channel: Channels in a stream are divided by islands (dry ground that rises above bankfull stage). Main channels contain the greatest proportion of flow.

3.8   Major transect: One of 11 equidistant transects across the length of a site. These transects run perpendicular to the thalweg and are labeled as follows: A (furthest downstream), B, C, D, E, F, G, H, I, J, and K (furthest upstream).

3.9   Narrow Protocol: The set of Watershed Health Monitoring SOPs that describe data collection at wadeable sites with an average bankfull width of less than 25m at the index station.

3.10   Protocol: A collection of SOPs used to accomplish a DCE. Watershed Health Monitoring uses two protocols: The *Narrow Protocol* is used for sampling wadeable streams that are less than 25m average bankfull width. The *Wide Protocol* is used for rivers or streams that are wider than 25m average bankfull width or too deep to wade.

3.11   Side channels: Channels in a stream are divided by islands (dry ground that rises above bankfull stage). Side channels are those that contain less flow than the main channel.

3.12   Site: A site is defined by the coordinates provided to a sampling crew and the boundaries established by the protocol's site layout method: SOP EAP105 (Hartman, 2017) for the Wide Protocol, and SOP EAP106 (Merritt, 2017) for the Narrow Protocol. Typically, a site is centered on the index station and equal in length to 20 times the average of 5 bankfull width measurements. Sites cannot be longer than 2km or shorter than 150m. Narrow protocol sites range from 150m to 500m long. Wide Protocol sites are up to 2 km long and are most frequently longer than 500m . The most downstream end of a site coincides with major transect A; the most upstream end coincides with major transect K.

3.13   Wetted width: Farthest horizontal distance between water edge on the left and right sides of a channel. We do NOT subtract width of mid-channel bars when measuring wetted width.

3.14   WHM: Watershed Health Monitoring. A status- and trend-monitoring program within the Environmental Assessment Program at the Washington State Department of Ecology.

3.15   Wide Protocol: The set of WHM SOPs that describes the sample and data collection at non-wadeable sites or sites wider than 25m bankfull width. It is an abbreviated version of the Narrow Protocol, and is typically accomplished by use of rafts.

4.0   **Personnel Qualifications/Responsibilities**

4.1   This SOP pertains to any field staff in Ecology's Environmental Assessment Program who are using WHM protocols.

4.2   All field staff must comply with the requirements of the EAP Safety Manual (Ecology, 2017).

4.3   All field staff must have completed the annual WHM Program field training session and be familiar with the set of SOPs that combine to describe a full DCE for the WHM Program. This includes a briefing on project objectives, details of the project Quality Assurance Monitoring Plan (QAMP) (Cusimano et al., 2006), and all WHM protocols.

4.4   All field staff must be familiar with the electronic data recording tablet and the WHM web-based field forms. See SOP EAP125, *Standard Operating Procedures for Managing Electronic Data Form Functionality for Watershed Health Studies* (Janisch, 2017).

4.5   All field staff must comply with Standard Operating Procedures to Minimize the Spread of Invasive Species (Parsons et al., 2016).

5.0   **Equipment, Reagents, and Supplies**

5.1   Field tablet (charged), electronic field forms

5.2   Clip board with blank paper data forms and pencils (contingency)

5.3   Measuring Rod or 50-m tape (cm, m)

5.4   Polarized sunglasses to see beneath water surface

5.5   Access gear (boats, or waders and boots). These should be pre-cleaned to avoid the spread of invasive species (See Parsons et al., 2016)

6.0   **Summary of Procedure**

6.1   <u>Pre-Sampling Preparation</u>

6.1.1   File an Ecology Field Plan. Forms are available and should be posted on the EAP SharePoint site: http://teams/sites/EAP/Field%20Schedules/Forms/AllItems.aspx.

6.1.2   Determine the appropriate protocol for the DCE: Wide Protcol or Narrow Protocol. See site verification and layout procedures here in SOP EAP105 (Hartman, 2017) or here SOP EAP106 (Merritt, 2017).

6.1.3   Follow the methods outlined in this SOP only after completing site verification and layout procedures.

6.2   <u>General Considerations and Cautions</u>

6.2.1   Never compromise your personal safety or that fo field partners to complete a DCE. Always plan ahead to avoid falling and drowning hazards.

6.2.2   Be aware of wildfire activity. It may pose a safety threat or may change or limit access to certain areas.

6.3   Fish Cover method for the *Narrow Protocol*

6.3.1   At each major transect, visually establish the boundaries of the plot in the wetted channel. The plot is centered on the major transect and extends 5 meters upstream and 5 meters downstream (Figure 1).

6.3.2   At each major transect, visually assess the amount of cover (percentage of the water surface) in the plot (6.3.3) provided by each of the ten fish cover types (Table 1). Estimate fish cover even if the stream is flowing through a culvert or under a bridge. If the plot is dry, fish cover = 0. Consider cover for any size of fish or amphibian. Exclude vegetation more than a meter above the water surface (potential predator perches).
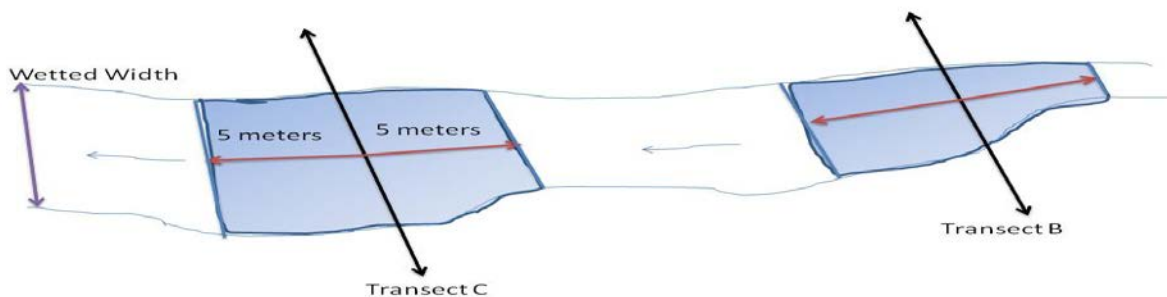
Figure 1. Diagram of fish cover plots at 2 of the 11 major transect of the main channel for the *Narrow Protocol.* Assess fish cover within the wetted width (shaded areas).

6.3.3   Navigate to the Fish Cover Page. At each major transect, record your estimates for each cover type on the Fish Cover Form (Figure 2) as **Absent**, **0 to <10%**, **>10% to 40%, >40% to 75%**, or **>75%**.

Figure 2: Example of a Fish Cover Form recorded at Transect A.

6.4   Fish Cover Method for the *Wide Protocol*

6.4.1   At each major transect, beach the raft at the appropriate bank identified during site layout for SOP EAP105 (Hartman, 2017).

6.4.2   At each major transect, visually establish the boundaries of the littoral plot in the wetted channel. The littoral plot is within a 10x20m wetted area (Figure 3). It is centered on the major transect and extends 10m upstream and 10m downstream of the transect. The width extends from the wetted margin of the bank where you beached the raft, horizontally into the water for 10m.
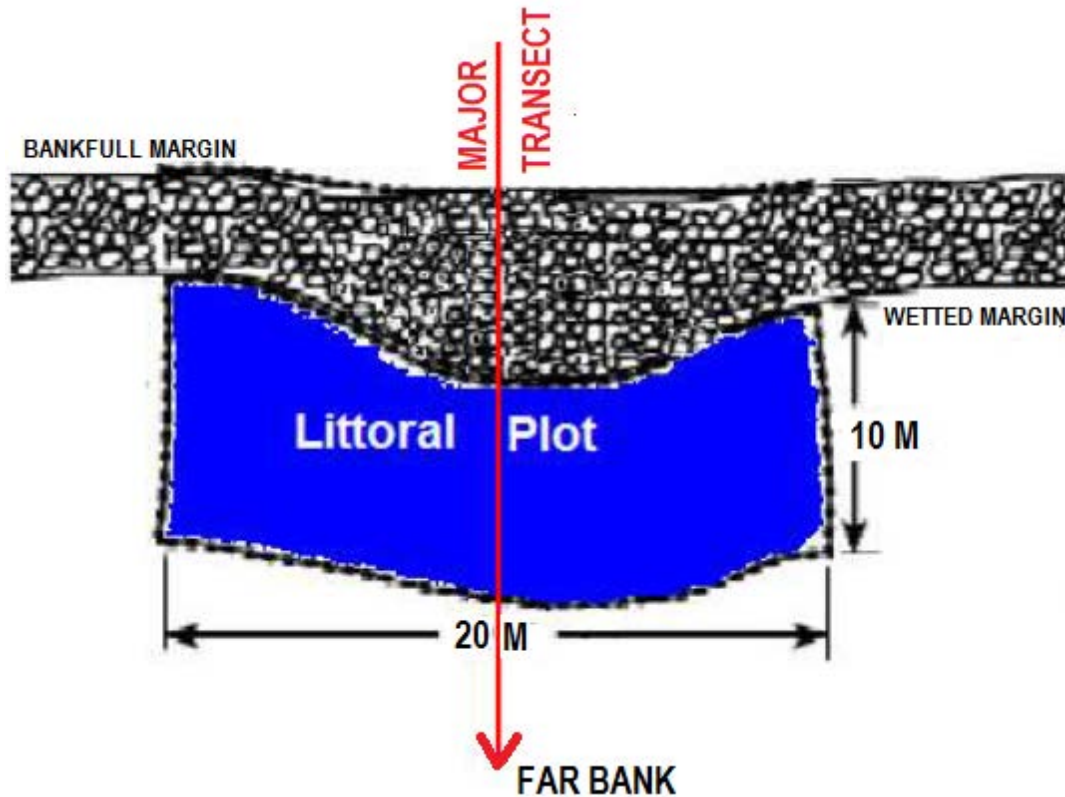
Figure 3: The Littoral Plot for assessing fish cover when using the *Wide Protocol*

6.4.4   At each major transect, visually assess the amount of cover (percentage of the water surface) in the littoral plot provided by each of the ten fish cover types (Table 1). Do the assessment at only one bank per transect.

6.4.5   At each major transect, record your estimates for each cover type on the Fish Cover Form (Figure 2) as **Absent**, **0 to <10%, >10% to 40%, >40% to 75%**, or **>75%**.

7.0   Records Management

7.1   Refer to SOP EAP125, *Standard Operating Procedures for Managing Electronic Data Form Functionality for Watershed Health Studies* (Janisch, 2017). It describes the process for validating, loading, and committing completed WHM electronic field forms to the WHM database.

8.0	**Quality Control and Quality Assurance Section**

8.1	Project QA/QC are discussed in the QAMP (Cusimano et al., 2006), which is currently being updated.
8.2	SAMPLING PRECISION: Repeat the sampling for 10% of all sites per year per Status and Trends Region. Timing of replicates should be several weeks or more later than initial samples (as far apart in time as possible but within the same index period).
8.3	SAMPLING ACCURACY: Persons using this SOP must either attend the annual training event (June) or be trained by someone who did.

9.0	**Safety**

9.1	All field staff must comply with the requirements of the EAP Safety Manual (Ecology, 2017).

10.0	**References**

10.1	Cusimano, R., G. Merritt, R. Plotnikoff, C. Wiseman, C. Smith, and WDFW. 2006. Status and Trends Monitoring for Watershed Health and Salmon Recovery: Quality Assurance Monitoring Plan. http://ecyapfass/Biblio2/documents/0603203.pdf
10.2	Ecology, 2015. Environmental Assessment Program Safety Manual. Washington State Department of Ecology. Olympia, WA. http://teams/sites/EAP/Pages/safety.aspx
10.3	Endreny 2003. Fluvial Geomorphology Module, UCAR COMET Program and NOAA River Forecast Center, Syracuse, NY. http://www.fgmorph.com
10.4	Hartman, C. 2017. Watershed Health Monitoring: Standard Operating Procedures for GIS-Based Verification, Layout, and Data Collection (Wide Protocol). SOP EAP105. Washington State Department of Ecology, Environmental Assessment Program, Olympia. http://www.ecology.wa.gov/programs/eap/quality.html
10.5	Janisch, J. 2013. Dictionary of Metrics for Physical Habitat: Definitions and Calculations Used for Watershed Health Monitoring and Related Studies. Washington State Department of Ecology. https://fortress.wa.gov/ecy/publications/publications/1303033.pdf
10.6	Janisch, J. 2017. Watershed Health Monitoring: Standard Operating Procedures for Managing Electronic Data Forms with a Mobile Data-Collection Device. SOP EAP125. Washington State Department of Ecology, Environmental Assessment Program, Olympia. http://www.ecology.wa.gov/programs/eap/quality.html

10.7	Merritt, G. 2017. Watershed Health Monitoring: Standard Operating Procedures for Verification and Layout of Sites (Narrow Protocol) SOP EAP106. Washington State Department of Ecology, Environmental Assessment Program, Olympia. http://www.ecology.wa.gov/programs/eap/quality.html
10.8	Parsons, J., D.Hallock, K.Seiders, B.Ward, C.Coffin, E.Newell, C.Deligeannis, and K. Welch 2016. *Standard Operating Procedures to Minimize the Spread of Invasive Species*, SOP EAP 070 Version 2.1 http://www.ecology.wa.gov/programs/eap/quality.html
10.9	Peck, D.V., Herlihy, A.T., Hill, B.H., Hughes, R.M., Kaufmann, P.R., Klemm, D.J., Lazorchak, J.M., McCormick, F.H., Peterson, S.A., Ringold, P.L., Magee, T., and Cappaert, M.R. 2006. Environmental Monitoring and Assessment Program-Surface Waters, Western Pilot Study, Field Operations Manual for Wadeable Streams. EPA/620/R-06/003. U.S. Environmental Protection Agency, Washington, D.C. https://publicaccess.zendesk.com/attachments/token/diLwQbRYeH9MHTOw1MHAX K7Ns/?name=EPA+620-R-06-003+%28PB2010-106544%29+-+Surface+Waters+- +Western+Pilot+Study+-+Field+Operations+Manual+for+Wadeable+Streams.pdf
10.10	Peck, D. V., Herlihy, A. T., Hill, B. H., Hughes, R. M., Kaufmann, P. R., Klemm, D. J., Lazorchak, J. M., McCormick, F. H., Peterson, S. A., Ringold, P. L., Magee, T. & Cappaert, M. R. 2005. Environmental Monitoring and Assessment Program - Surface Waters Western Pilot Study: Field Operations Manual for WadeableStreams. EPA Report EPA 600/R-05/xxx, U.S. Environmental Protection Agency.