

Section 23 Final DRAFT Guidelines for Field Protocol to Locate Mapped Divisions between Stream Types and Perennial Stream Identification

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INTRODUCTION

Under the forest practices rules, portions of streams containing fish habitat¹ receive greater riparian protection than streams lacking fish habitat. In non-fish-habitat waters, perennially flowing streams receive greater protection than seasonally flowing streams. Therefore, correctly identifying the appropriate water type and the associated division between water types is essential for determining the appropriate riparian protection. This manual section serves as the advisory technical supplement to the Water Typing System rule (WAC 222-16-030 and WAC 222-16-0301). More information on water typing forms, review and approval process can be found on the DNR website: www.dnr.wa.gov/forest-practices-water-typing.

Part 1: Provides guidance for identifying the water type break between Type F (fish habitat) and Type N (non-fish habitat) waters. It provides guidance for delineating the Anadromous Fish Floor (AFF), conducting an assessment for determining fish habitat using either default physical characteristics (DPCs) or the fish habitat assessment methodology (FHAM), and best management practices for conducting protocol surveys.

Part 2: Provides guidance for identifying Off-Channel Habitat for both channelized and non-channelized streams

Part 3: (*under development*) provides guidance for identifying the water type break between non-fish perennial (Type Np) and non-fish seasonal (Type Ns) waters.

Department of Natural Resources Water Type Map

The Department of Natural Resources (DNR) maintains a statewide water type map depicting stream layers and water type break points. Water type classifications are shown on the map as Type S (Shorelines of the State), Type F (Fish), Type N (Non-fish) or Type U (unknown), with asterisks (*) indicating the change from one type to another. The streams on the map are derived

¹ See WAC 222-16-010 for “fish” and “fish habitat” definitions

from a GIS-based model. Some streams are then field verified and updated through Water Type Modification Forms (WTMFs). The Forest Practices Application Mapping Tool (FPAMT) and the instructions for finding the area of interest are found on the Forest Practices Application Review System (FPARS) website: <https://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-application-review-system-fpars>

On the water type map, not all streams are depicted or have been field verified. All Forest Practices Application (FPA) applicants are required to verify that all waters within 200 feet of proposed forest practices are correctly depicted and classified on their FPA prior to conducting forest practices activities. Unless a WTMF is submitted and concurred this depiction and classification is not a permanent water type and may not be relied on in the future. Applicants not permanently typing, waters may only apply DPC to waters upstream of the anadromous fish floor (see Section 1.2). A stream modeled as Type F may not use less protective buffers than the Type F buffers without protocol survey information to support that decision. An applicant who is not interested or able to complete a protocol survey as part of their FPA approval timeline, may choose to maintain Type F riparian protections along the stream in question. If this applicant wishes to move the modeled F/N break using DPCs they will need to verify the AFF to ensure they are upstream of the AFF.

Proponents may propose changes to the DNR statewide water type map by submitting a WTMF. WTMFs are subject to a review process involving DNR, the Departments of Fish and Wildlife (WDFW) and Ecology (Ecology), affected tribes, and other interested parties. All applicable forms and instructions for proposing updates are found at: <https://www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and>

For streams containing a previous water type classified by the WTMF and concurrence process, often no additional assessment is necessary.

Water Typing on Adjacent Property Ownership.

Some streams flow across property lines, complicating or preventing authorized access to evaluate the stream's full extent. Every reasonable effort should be made to gain access to the entire stream reach. If access cannot be attained to perform a thorough fish habitat stream assessment, it may not be possible to establish the water type break. If proponents are able to provide sufficient information, they may submit a WTMF to verify the water type of a stream segment, without proposing a water type break. These type of WTMFs are still subject to review and concurrence before the change is accepted on the statewide water type map.

If proponents are not able to establish the water type break or verify the water type status, the applicable water type may be determined for the purpose of a FPA by applying the default physical characteristics (WAC 222-16-030) or through an ID team. As previously stated, water type determinations that do not undergo a WTMF concurrence process are not considered permanent water type changes.

PART 1. IDENTIFY AND LOCATE THE DIVISION BETWEEN TYPE F AND N WATERS

This guidance is a technical supplement to the water typing system rule which ensures that – at the landscape scale – the full extent of fish habitat is identified. Per WAC 222-16-010², fish habitat consists of those areas “used by fish at any life stage at any time of the year including potential habitat likely to be used by fish, which could be recovered by restoration or management and includes off-channel habitat.” To identify and locate the F/N break the water type system uses the AFF (Section 1.1), DPCs (Section 1.2), and FHAM(Section 1.3).

1.1 Anadromous Fish Floor (AFF)

The Anadromous Fish Floor (AFF) is a key component of the water typing system alongside FHAM and DPC. The AFF is a zone or segment of fish habitat streams and associated wetlands within which anadromous fish habitat and use are presumed (See *Appendix under development – Descriptions and Examples of Potential Fish Habitat in streams where fish are not present*). It is delineated on waters connected to saltwater using measurable physical stream characteristics³. While wholly within the total extent of Type F streams, the AFF is not necessarily coincident with the upstream extent of fish habitat nor is it always the upper most extent of anadromous fish habitat. Instead, the AFF is intended to provide regulatory certainty by designating and delineating a portion of fish habitat, presumed to be anadromous fish habitat. Once the AFF is delineated no surveys or stream assessments are allowed for stream typing purposes without a review by an interdisciplinary team (ID Team) and the related DNR concurrence process⁴.

The AFF extends from saltwater or another point of documented anadromous use to a point where there is a permanent, distinct and measurable change to in-stream physical characteristics of biological significance to the distribution of anadromous fish (Figure 1a). These changes are associated with underlying geomorphic conditions and may consist of:

- A permanent natural obstacle (e.g., non-vertical bedrock chute, vertical waterfall) that physically limits access of anadromous fish to upstream reaches
- A distinct measurable change in channel gradient that could physically limit access of anadromous fish to upstream reaches

1.1.1 WHEN TO DELINEATE THE AFF

The AFF serves a practical purpose in the water typing system. The upstream extent of the AFF is one potential starting point for FHAM (See Section 1.3). Additionally, proponents must verify the subject waters are upstream of AFF when using DPC to type waters (See Section 1.2).

If working on waters where the AFF has not been delineated proponents should follow the steps below to delineate the AFF. Proponents may not need to propose the uppermost extent for the AFF, if they are able to provide sufficient justification on the WTMF that their subject waters are

² WAC 222-16-010 Fish Habitat

³ WAC 222-16-0301

⁴ WAC 222-16-0301

upstream of the AFF. However, they should review the steps below to ensure that their justification is sufficient as justification is not appropriate in all cases.

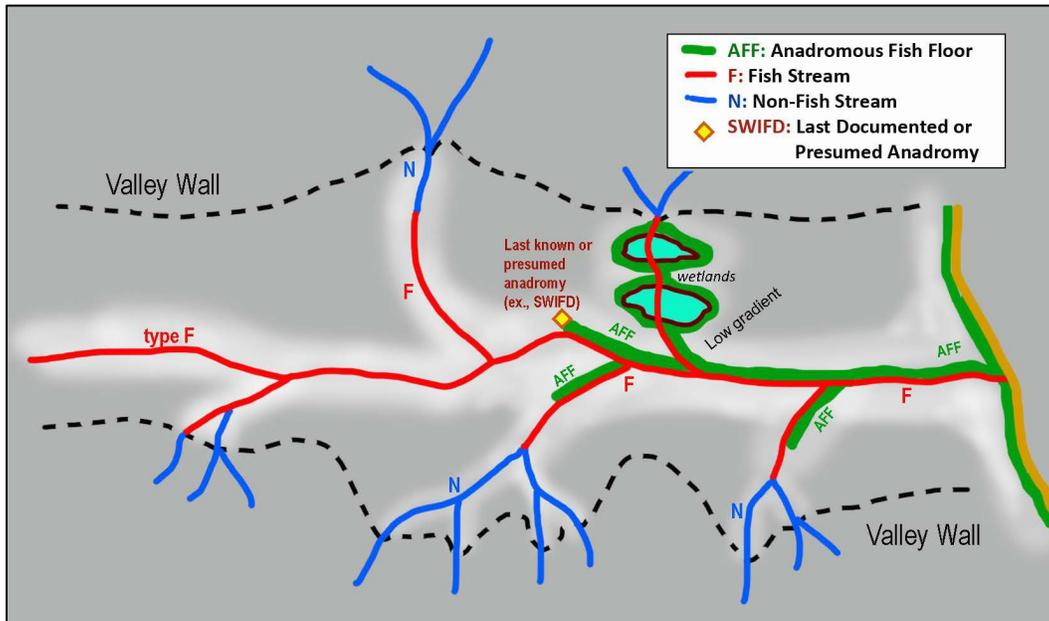


Figure 1a: Conceptual diagram of delineating AFF. The AFF extends upstream to a point of change in physical stream characteristics of biological significance to anadromous fish. This includes any associated wetlands.

1.1.2 HOW TO DELINEATE THE AFF

Measurable physical stream characteristics are used to delineate the upstream extent of the AFF. In some cases, the AFF may reach the full extent of Type F waters and can include off-channel habitat, or an associated wetland (See Part 2). Studies to validate the measurable physical stream characteristics used when determining the AFF have begun. Until these studies are completed, use the following guidance to delineate the AFF in the field.

To delineate the AFF, practitioners should rely on three key considerations:

- known anadromous fish data,
- physical stream characteristics of biological significance to anadromous fish movement, and
- consultation with DNR, WDFW, and Tribal biologists.

Proponents interested in typing streams should use the following guidance to delineate the AFF:

Step 1: In all cases:

1. Start with pre-survey planning to ensure that surveys or other stream assessments are based on the best data and information available to identify areas of anadromous fish habitat. Begin by consulting with WDFW and Tribal biologists for information on known fish distributions, flow seasonality, fish barriers, and status of fish populations to aid in the documentation of the AFF below a proposed survey area and for delineation of the AFF.

2. Refer to available WDFW, Tribal, and other publicly available fisheries databases and GIS products (see Appendix B) with information on the distribution of anadromous fish populations.
3. Review fish passage barrier information (see Appendix D for a list of resources).
4. Using the definition of “documented or presumed anadromous fish” found in SWIFD attributes look for uppermost point of documented or presumed anadromous fish data

If there is documented or presumed anadromous fish data as defined by SWIFD on the subject waters, proceed to Step 2a.

If there is not documented or presumed anadromous fish data as defined by SWIFD of the subject waters proceed to Step 2b.

Step 2a: On streams with documented or presumed anadromous fish data⁵:

1. Review the uppermost point of documented or presumed anadromous fish data reported in SWIFD or other data source (see Appendix B) for relevance and to determine/document in-stream limitations to upstream movement of anadromous fish. This review is needed to ensure the data point is not an error, or unverified, including data points above manmade barriers, and where property restrictions may prevent access.
2. If the uppermost point of documented or presumed anadromous fish data is associated with observable changes in channel conditions or permanent natural obstacles that are potentially biologically significant to anadromous fish it is the upstream extent of the AFF (Figure 1b). The AFF is delineated at this point.

⁵ “Documented” means “Aquatic stream habitat that is documented to be presently utilized by fish (based on reliable published sources, survey notes, first-hand sightings, etc.). This includes habitat used by any life history stage for any length of time. This designation is applied to all stream sections downstream of a documented sighting to the next “Documented” habitat section (or to marine waters), unless otherwise indicated by a formal review group.”; Presumed means “Aquatic habitat lacking reliable documentation of fish use where, based on the available data and best biological opinion/consensus, fish are presumed to occur. For migratory fish, such habitat will extend upstream to the end of the stream OR to the first known natural barrier (including sustained 12% stream gradient or small stream size). Best biological judgment includes consideration of suitable (species-specific) habitat availability, life history strategies, proximity and connectivity to adjacent “Documented” habitat sections or logical extrapolation of range from similar systems.” See dataset definitions here:

<https://www.arcgis.com/sharing/rest/content/items/4ed1382bad264555b018cc8c934f1c01/info/metadata/metadata.xml?format=default&output=html>

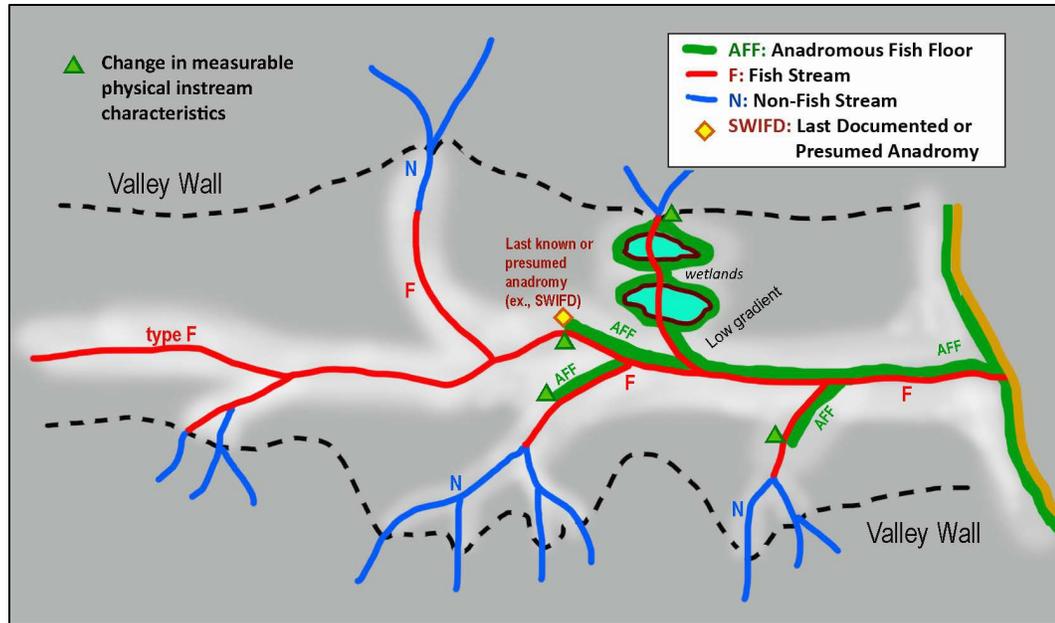


Figure 1b: When the documented or presumed anadromous fish data as defined by SWIFD is located at a change in measurable physical instream characteristics that point can be used to delineate the upstream extent of the AFF and begin stream assessment using DPC or FHAM.

3. If the uppermost point of documented or presumed anadromous fish data is **not** associated with observable changes mentioned above or is a database error, it is not the upstream extent of the AFF (See Figure 1c). The same is true for cases where the point cannot be field verified due to access issues. Proceed to Step 3.

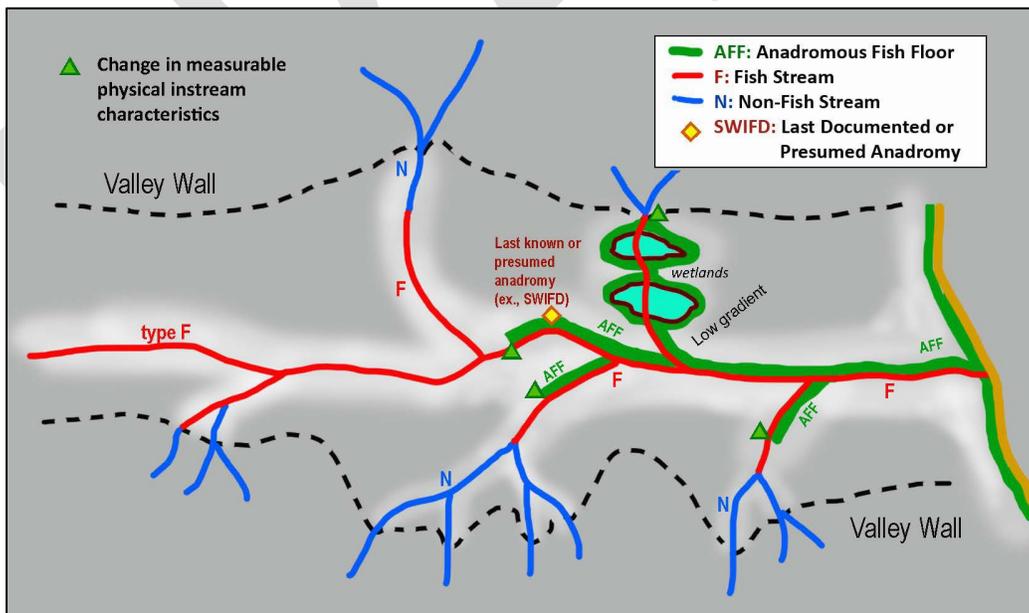


Figure 1c: Where the documented or presumed anadromous fish data as defined by SWIFD is not associated with a measurable physical instream characteristic, the AFF extends upstream beyond that point to where a physical stream characteristic of biological significance is encountered. Note the difference in where the change in measurable physical instream characteristics is located on the main stem between Figure 1b and Figure 1c.

Step 2b: On streams without anadromous fish data:

1. Where there is no known anadromous fish data for the subject waters (Figure 1d), proponents should either propose the upstream extent of the AFF or justify why their subject waters are upstream of the AFF. Proceed to Step 3.

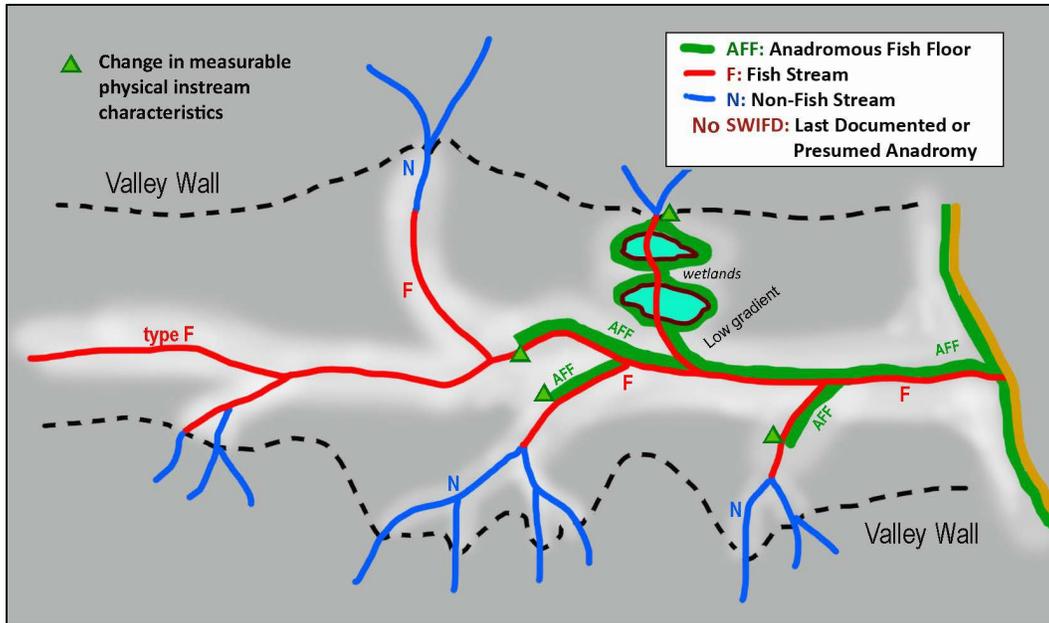


Figure 1d: Where there is no documented or presumed anadromous fish data as defined by SWIFD proponents determine the upstream extent of the AFF based on measurable stream characteristics or provide justification for why they are upstream of the AFF.

Step 3: Determining the upstream extent of the AFF

1. Proponents should propose the upstream extent of the AFF when applicable (See 4 below). They may not need to propose the upstream extent of AFF, if they are able to provide sufficient justification, their subject waters are upstream of the AFF as part of their WTMF.
2. The proposed upstream extent should be concurred, either by email or phone correspondence or by site visit where required, prior to conducting an FHAM survey or other stream assessment. Proponents should consult WDFW and Tribal biologists with local knowledge regarding seasonal fish use, anadromous fish abundance, seasonal flow patterns, or other local considerations that may affect the delineation of the AFF.
3. Proponents should provide good documentation for their proposed delineation of the AFF. This documentation should include information relevant to the upstream extent of AFF including fish distribution, existing type breaks, stream characteristics and consultation feedback. Including photographs is encouraged and could be very helpful in the review process.
4. In some cases, such as where property access is restricted or downstream reaches of the watershed contain well-known features restricting anadromous passage, remote

delineation of the AFF may be appropriate. In these instances, thorough documentation is especially important.

5. Thorough documentation and pre-survey consultation is equally important in cases where a proponent is not proposing an upstream extent of the AFF but providing justification for being upstream of the AFF. Providing justification for being upstream instead of proposing an upstream extent is not available in all cases. For example, in low-gradient systems or areas where the upstream extent of the AFF may be close to the proposed protocol survey or stream assessment proponents will need to propose an upstream extent for the AFF instead of providing justification. Providing justification may be appropriate in cases where the proposed survey area is upstream of a known and documented natural barrier to anadromous fish.

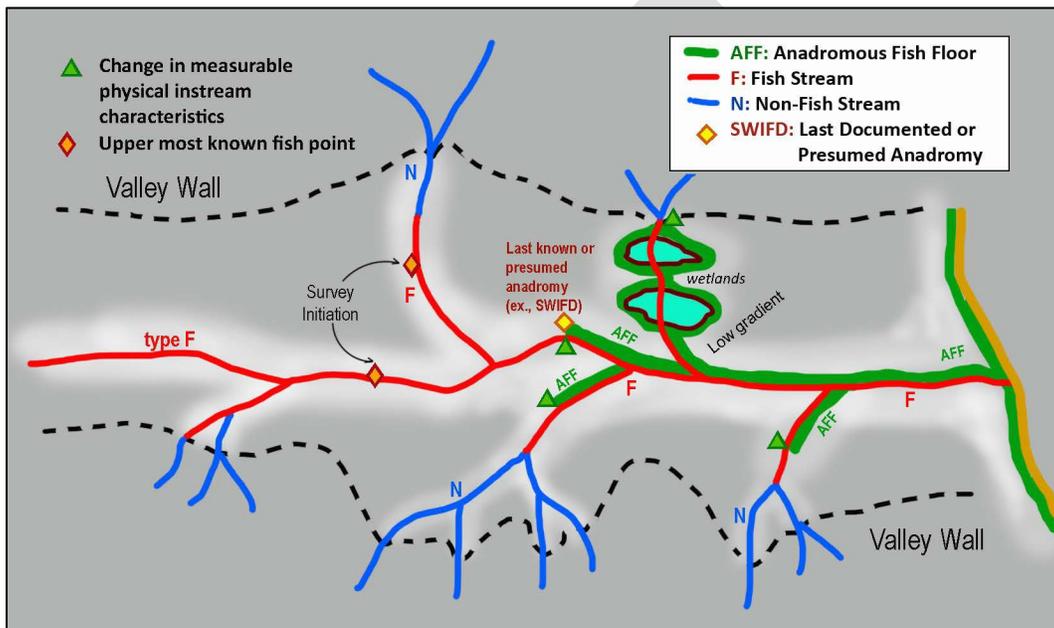


Figure 1e: If information about the uppermost known fish is upstream from the SWIFD data or known AFF that point becomes the survey initiation point (see section 1.3.1 Step 2). In this case delineating the AFF may not be necessary if proponents can show adequate justification that the survey initiation point is upstream of the AFF.

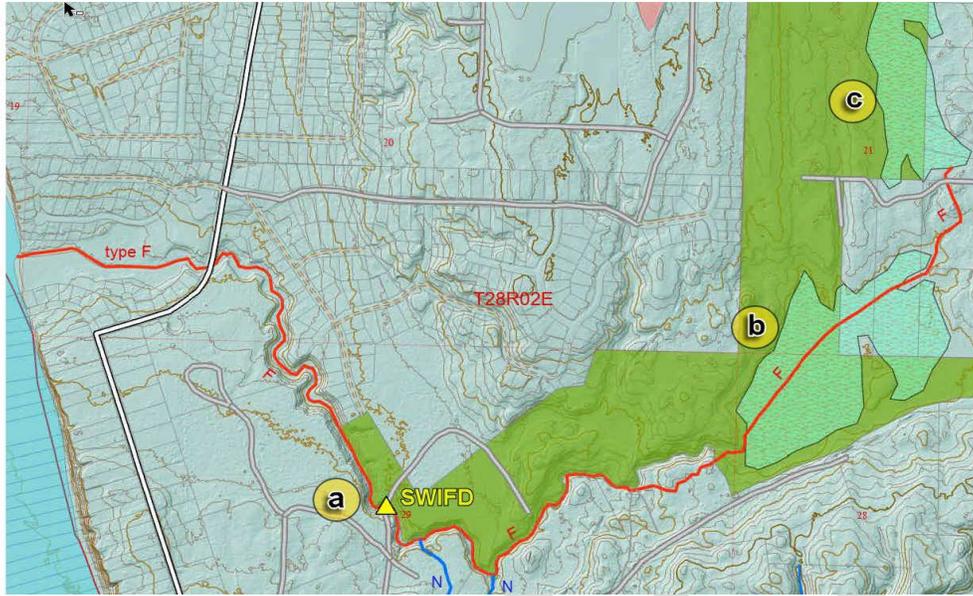


Figure 2: Example of a SWIFD point placed at a partially passable fish barrier (culvert at a trail crossing) (a). Habitat conditions are the same on either side of the culvert. (b) and (c) are examples of waters that are off-channel habitat important for rearing and survival of fish and accessible to fish during some portion of the year. Stream associated wetlands on non-channelized streams are also off-channel habitat and considered Type F waters. In this example, the AFF extends to (b) and (c) precluding the application of DPC or FHAM.

1.1.3 FISH SPECIES LIFE HISTORY

Anadromous fish distribution can expand and contract seasonally and annually. Knowledge of anadromous fish species life history can aid surveys and other stream assessments and help during pre-survey consultation. Appendix C provides an overview.

1.1.4 SMALL FOREST LANDOWNER ASSISTANCE

For technical assistance, small forest landowners can reach out to DNR regulation assistance foresters or DNR Small Forest Landowner Office fish and wildlife biologist.

1.2 Default Physical Characteristics for Type F Waters (DPC)

The default physical characteristics (DPC) described in WAC 222-16-030(2)(d)(i) are used to identify Type F water where fish use has not been determined. The DPC include stream width and gradient characteristics presumed to contain fish habitat⁶.

For the purposes of FPAs where fish use has not been determined the DPC may only be applied to waters upstream of the AFF.

The rules defining fish habitat differ slightly depending on which side of the Cascade Crest⁷ the activity is planned. The DPC for streams are as follows for each side of the state.

⁶ WAC 222-16-010 Fish habitat definition

⁷ WAC 222-16-010 Eastern Washington & Western Washington definitions

Western Washington

- stream segments having a bankfull width of 2 feet or greater and having a gradient of 16% or less;
- stream segments having a bankfull width of 2 feet or greater and having a gradient greater than 16% and less than or equal to 20% and having greater than 50 acres in contributing basin size based on hydrographic boundaries.

Eastern Washington

- stream segments having a bankfull width of 3 feet or greater and having a gradient of 16% or less;
- stream segments having a bankfull width of 3 feet or greater and having a gradient greater than 16% and less than or equal to 20% and having greater than 175 acres contributing basin size based on hydrographic boundaries.

The Water Type Classification Worksheet is a useful tool (similar to a dichotomous key) for determining water types based on a field assessment of physical stream characteristics. The worksheet is available for both Western and Eastern Washington here:

<https://www.dnr.wa.gov/node/973#watertyping>

1.3 Fish Habitat Assessment Methodology (FHAM)

The Fish Habitat Assessment Methodology (FHAM) described in WAC 222-16-0301 is used to conduct protocol surveys to identify the break between Type F and Type N waters.

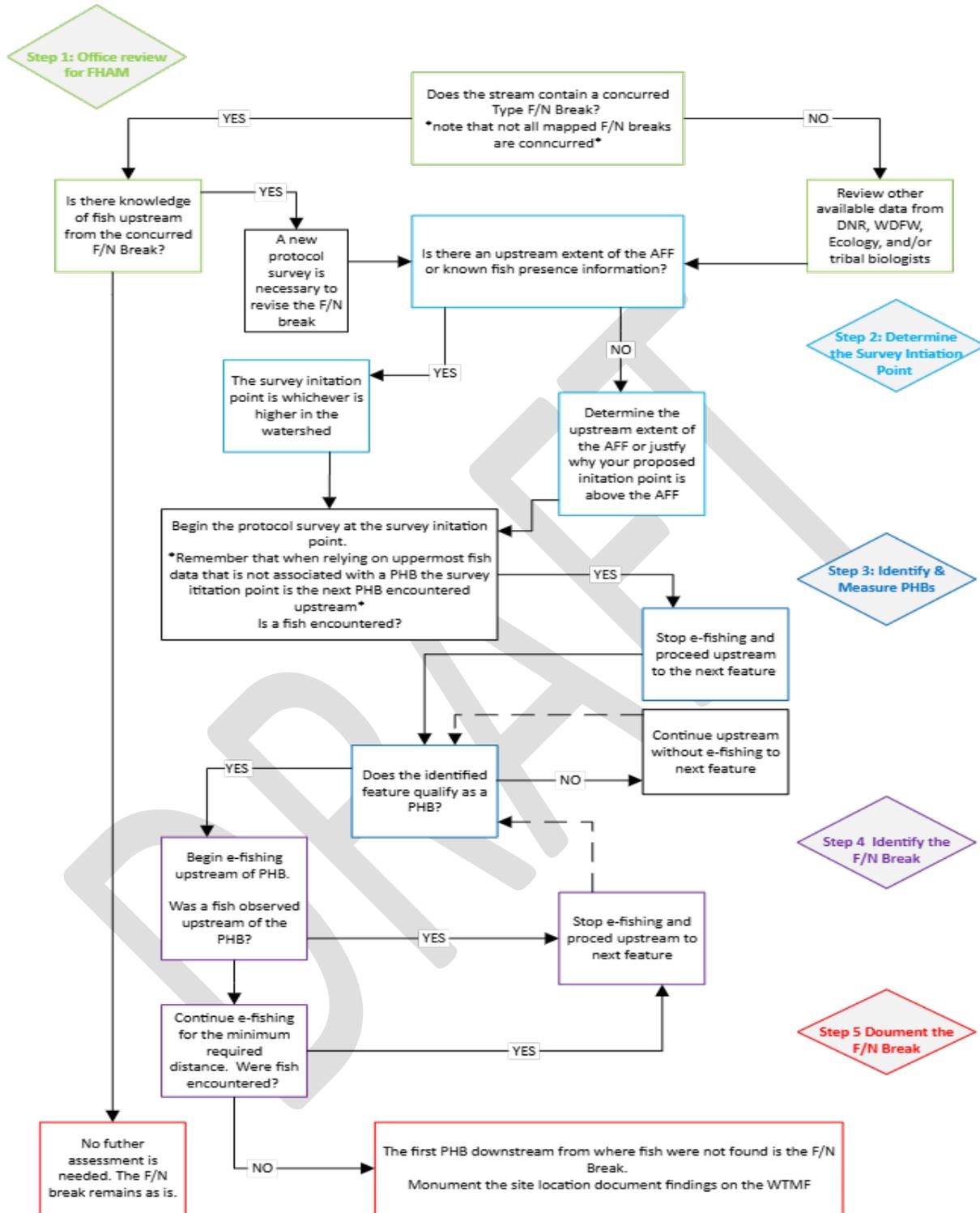


Figure 3: FHAM Flow Chart. Review the description in the document for a more complete explanation for applying FHAM.

1.3.1 FISH HABITAT ASSESSMENT METHODOLOGY STEPS

Step 1. Office review for FHAM

Pre-survey planning helps ensure the assessment is based on the best data and information available and helps identify potential fish locations for determining the appropriate starting point for the field assessment.

Review DNR water type map

Begin the office review by determining if the stream in question is identified on the DNR water type map to determine if a survey is necessary. Streams are labeled on the map with either a modeled water type or a field verified water type. In some cases, streams are shown in the wrong location or depicted in an area where streams do not exist, and some streams may not be depicted on the map at all.

Use the following as guidance when reviewing the water type map:

- If the subject water is mapped in the correct location, check for a previously concurred F/N break associated with a WTMF.
 - If there is no WTMF or the WTMF does not contain field verification of the modeled F/N break a survey will be necessary.
 - If there is a WTMF with a concurred F/N break there is no additional survey necessary.
 - If fish have been observed above a previously concurred F/N break then the previous break is no longer valid and should be reassessed
 - If there is a WTMF that relies on something other than a concurred F/N break (ex. property line) then a survey might be necessary.
- If the stream is not mapped, or is mapped in the wrong location, a water type modification form (WTMF) can be used to correct the error.

Streams that have been previously field-verified and concurred through DNR's review process are assigned an identifier (e.g., PC 27-YY-0276, NE-59-14-0074). This identifier refers to the WTMF number and the information/data corresponding to the survey. If the stream has a concurred WTMF that establishes or verifies an F/N break, no further assessment is necessary. (See Figure 4)

In situations where fish are observed upstream from a previously established F/N break, a stream assessment will be necessary to reflect the new information. The instructions for viewing and downloading Adobe PDF versions of previous WTMF information can be accessed at:

http://file.dnr.wa.gov/publications/fp_form_fpars_wt_data_dic.pdf

A known fish presence point, if upstream of the AFF, supersedes the AFF and becomes the survey initiation point. The survey initiation point may also be anywhere upstream of the AFF or known fish presence if the surveyor wishes to start higher in the watershed based on the office review and assessment of all data and information available.

Initiating the Protocol Survey

If the survey initiation point is the upstream extent of the AFF or a defined PHB upstream of the AFF (see Identifying PHBs below) surveyors should begin their protocol survey at that point.

If the surveyor is initiating their survey based uppermost known fish presence, they should continue upstream from the uppermost known fish data point to the first PHB they encounter and use that as their survey initiation point.

If the surveyor is initiating their survey further upstream of the uppermost known fish presence based on their office review, they should continue upstream from their chosen point to the first PHB they encounter and use that as their survey initiation point. In this case, if fish are not detected at the initial starting point, surveyors may proceed to a different location further downstream where fish are more likely to be present provided, they can do so without going below the upstream extent of the AFF, the uppermost known fish, or other recoverable habitat.

Step 3. Identify PHBs for use in FHAM

Studies to validate what measurable changes to in-stream physical characteristics constitute a PHB have begun. Until the PHB characteristics are validated, this guidance should be used in the interim to determine PHBs in the field.

There are three categories of PHBs – gradient PHBs, bankfull width (BFW) PHBs, and permanent natural obstacle PHBs. Any one of the following are categories of PHBs and can be relied on for the application of FHAM. Only one of the individual criterion within any of these categories of PHB criteria must be met to qualify as a PHB.

Though one of the PHBs defined below may be present, the ability of fish to successfully navigate a PHB varies based on fish species that are present, underlying geomorphology, and other site-specific physical and biological factors. The surveyor and any reviewers should use their professional judgement to determine which criterion is appropriate at each specific site, based on their assessment of these factors, and should be able to justify the PHB criterion encountered and chosen to use to the Forest Practices forester and in the WTMF or the FPA.

Surveyors must provide detailed documentation of stream conditions in the WTMF or FPA to support the decision of which PHB criterion to use. This documentation should include a thorough description of the habitat characteristics observed, as well as any relevant measurements or other observations that support the identification of the PHB. Accurate reporting ensures the water type reviewers have sufficient information to evaluate the proposed water type.

PHB Criteria:

- 1- **Gradient:** See *Measuring Stream Gradient PHBs* below
 - a. Stream segments having a gradient increase equal to or greater than five percent
 - b. Stream segments having a gradient increase equal to or greater than ten percent
- 2- **Bankfull Width (BFW):** See *Measuring a Bankfull Width PHB* below
 - a. Stream segments having a BFW of two feet or less,
 - b. At a tributary junction, a downstream to upstream BFW decrease of twenty percent or more – full description below in *Measuring a Bankfull Width PHB*
- 3- **Permanent Natural Obstacles:** See *Measuring Obstacle PHBs* below
 - a. Vertical obstacle:
 - i. Obstacle with a height equal to or greater than the BFW but not less than three feet
 - ii. Obstacle with a height of three feet or greater
 - b. Non-Vertical obstacle
 - i. Step of 20percent gradient or more if the elevation increase is equal to or greater than the BFW upstream of the obstacle
 - ii. Step of 30 percent gradient or more, where the elevation increase is equal to or greater than two times the BFW upstream of the obstacle.

Unless otherwise specified, all gradient and BFW PHBs are measured across a distance equal to 20-times the BFW both upstream and downstream of the respective changes in gradient or BFW (See Section 1.3.2).

Step 4. Using FHAM to Identify the F/N break

Apply the protocol electrofishing survey at the survey initiation point. The first PHB encountered is not necessarily the F/N break. Part 1.4 and Part 1.5 provide best management practices for conducting electrofishing surveys.

If a fish is detected upstream from the qualifying PHB, discontinue electrofishing and proceed upstream to the next qualifying PHB. The stream reach between the location of a detected fish and the next qualifying PHB encountered upstream is presumed fish habitat. Repeat this process until fish are no longer detected upstream of a PHB.

- When a fish is detected in a stream reach that no longer meets DPCs (See section 1.2), and the channel gradient or width is sustained, continue to the next PHB and repeat until fish are no longer detected upstream of a PHB or the sustained channel gradient exceeds 20%, whichever is greater.

If fish are not detected by conducting a protocol electrofishing survey for at least the minimum distance upstream from the qualifying PHB, this PHB is the F/N break. The protocol electrofishing survey must continue:

- in all available habitat for a minimum of a ¼ mile beyond the PHB marking the potential F/N break,
- at least the full length of the stream within the proposed forest practice unit when the water type modification proposal is specific to an FPA, or

- until the stream no longer meets the DPCs(see Section 1.2), the channel characteristic that don't meet the DPCs are sustained, and no fish are being found.

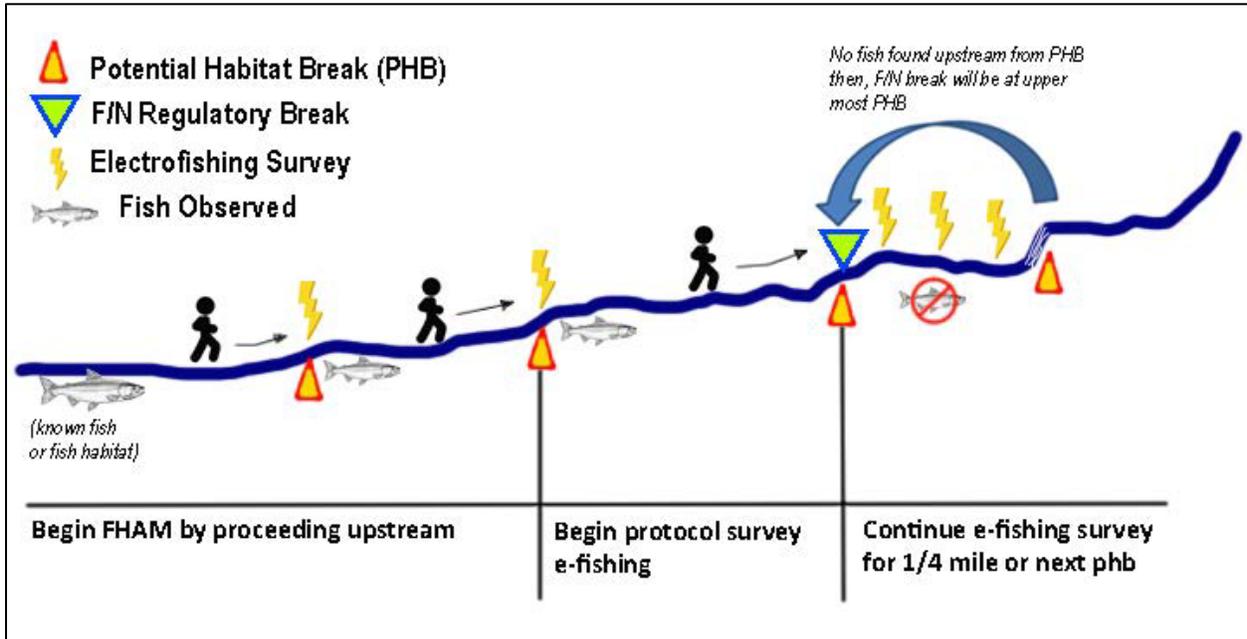


Figure 5: Once the survey initiation point has been identified begin the protocol survey. Once a fish is encountered stop electrofishing and proceed upstream to next PHB. Once fish are no longer encountered above a PHB continue for the minimum required distance.

Step 5: Establish and document the F/N break in the field

Accurate data collection and a detailed description of stream conditions on the WTMF will describe how FHAM was conducted and will assist reviewers when evaluating the proposed F/N break. Documentation of the proposed F/N break should include a description of the qualifying PHB feature, GPS reference points and pertinent photographs with scale where possible. Photographs aid reviewers in locating the proposed F/N break.

Record the proposed F/N break using GPS instruments and mark the location near the stream. The description of the F/N break location must be sufficient to ensure the point can be re-established on the ground if the monument is lost. Weather resistant material (e.g. plastic or aluminum placard) designed to last several years is sufficient.

1.3.2 MEASURING POTENTIAL HABITAT BREAKS

Measuring Permanent Natural Obstacle PHBs

When any obstacle is encountered, the surveyor should determine if the obstacle is deformable or a permanent obstacle.

Deformable obstacles

Obstacles that are deformable are temporary, transient, and/or potentially mobile, and do not qualify as PHBs. These features have the potential to change shape and may include log jams, sediment or wood steps, root entanglements, or beaver dams. While deformable features alone do not qualify as PHBs, some deformable obstacles may sit atop more permanent features, such as bedrock cascades. If this is the case, the underlying stream channel structure might constitute a PHB if that structure meets the qualifying criteria for a PHB (see measuring through deformable features below).

If a feature is determined to be deformable it does not qualify as a PHB, proceed upstream to the next PHB before resuming electrofishing.



Figure 6. example of deformable feature

Permanent Natural Obstacle

See Section 1.3.1- Step 3 – Identifying PHBs for PHB definitions.

Permanent natural obstacles may include vertical drops, steep cascades, bedrock sheets and bedrock chutes. These obstacles require feature-specific gradient, length/height and width measurements to qualify as a PHB. Measure the feature to determine if it meets the qualifying criteria for a PHB.

Vertical Obstacles

A vertical obstacle must physically limit fish access upstream in order to qualify as a PHB. See Section 1.3.1- Step 3 – Identifying PHBs for PHB definitions.

Measure and record (to include photographs where possible) the total vertical height of the feature and document its composition (e.g. bedrock or boulder) and characterization (e.g. waterfall). Measure the vertical obstacle height at the respective water surface elevations at the top and base of the feature to ensure that vertical height is consistently measured at different stream flows. For dry stream channels, use bankfull width elevation.



Figure 7. example of non-vertical obstacle

Non-Vertical Obstacles

See Section 1.3.1- Step 3 – Identifying PHBs for PHB definitions.

Measure non-vertical obstacle length (slope distance) and gradient at the respective water surface elevation at the top and base of the feature to ensure that elevation change is consistently measured at different stream flows. For dry stream channels, use bankfull width elevation.

Gradient measurements taken too far downstream or upstream of the actual feature’s inflection point will result in an inaccurate value (see Table 1).

		Bankfull Width (ft)																
		2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Channel Gradient (%)	20	10	13	15	18	20	23	25	28	31	33	36	38	41	43	46	48	51
	21	10	12	15	17	19	22	24	27	29	32	34	36	39	41	44	46	49
	22	9	12	14	16	19	21	23	26	28	30	33	35	37	40	42	44	47
	23	9	11	13	16	18	20	22	25	27	29	31	33	36	38	40	42	45
	24	9	11	13	15	17	19	21	24	26	28	30	32	34	36	39	41	43
	25	8	10	12	14	16	19	21	23	25	27	29	31	33	35	37	39	41
	26	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
	27	8	10	12	13	15	17	19	21	23	25	27	29	31	33	35	36	38
	28	7	9	11	13	15	17	19	20	22	24	26	28	30	32	33	35	37
	29	7	9	11	13	14	16	18	20	22	23	25	27	29	31	32	34	36
	30	7	9	10	12	14	16	17	19	21	23	24	26	28	30	31	33	35
	31	7	8	10	12	14	15	17	19	20	22	24	25	27	29	30	32	34
	32	7	8	10	11	13	15	16	18	20	21	23	25	26	28	30	31	33
	33	6	8	10	11	13	14	16	18	19	21	22	24	26	27	29	30	32
	34	6	8	9	11	12	14	16	17	19	20	22	23	25	26	28	30	31
	35	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30

36	6	7	9	10	12	13	15	16	18	19	21	22	24	25	27	28	30
37	6	7	9	10	12	13	14	16	17	19	20	22	23	24	26	27	29
38	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	27	28
39	6	7	8	10	11	12	14	15	17	18	19	21	22	23	25	26	28
40	5	7	8	9	11	12	13	15	16	18	19	20	22	23	24	26	27
41	5	7	8	9	11	12	13	14	16	17	18	20	21	22	24	25	26
42	5	6	8	9	10	12	13	14	15	17	18	19	21	22	23	25	26
43	5	6	8	9	10	11	13	14	15	16	18	19	20	22	23	24	25
44	5	6	7	9	10	11	12	14	15	16	17	19	20	21	22	24	25
45	5	6	7	9	10	11	12	13	15	16	17	18	19	21	22	23	24
46	5	6	7	8	10	11	12	13	14	16	17	18	19	20	22	23	24
47	5	6	7	8	9	11	12	13	14	15	16	18	19	20	21	22	24
48	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23
49	5	6	7	8	9	10	11	12	14	15	16	17	18	19	20	22	23
50	4	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21	22
51	4	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22
52	4	5	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22
53	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21
54	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21
55	4	5	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21
56	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
57	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
58	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
59	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
60	4	5	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19

Table 1. Table represents the minimum slope (channel) distance (in feet) required for a non-vertical barrier feature to qualify as a PHB. This table assumes a minimum barrier gradient of 20% and an overall vertical change in channel bed elevation associated with the feature with a height equivalent to at least one BFW (PHB criteria 3b).

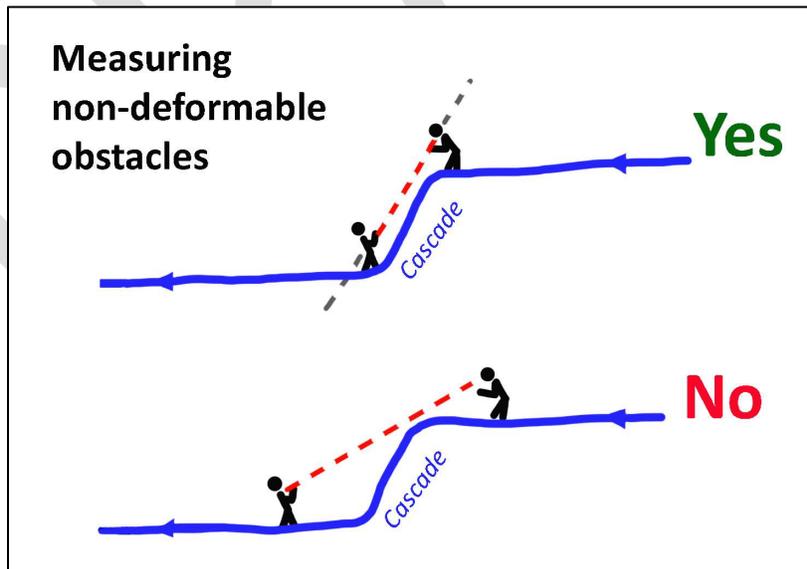


Figure 8. Measuring non-vertical obstacles

Look for potential side channels or alternate flow routes around both vertical and non-vertical features that might provide temporary upstream fish access at higher flows by allowing fish to bypass the obstacle, in which case the feature would not meet PHB criteria.

Measuring Stream Gradient PHBs

Find the gradient inflection point in the stream and “back-shoot” the profile to obtain the downstream gradient., Shoot the upstream gradient from that same location, then compare the two to obtain the effective gradient change.

To qualify as a gradient-based PHB, changes in stream gradient need to be sustained over a distance of at least 20 times the average BFW and measured accordingly. Both upstream and downstream respective reaches must meet the qualifying distance . These distances and gradients are typically measured with a laser level/rangefinder, clinometer and string box, or other device(s) that can accurately measure gradient and distance. Where line of sight over a 20-BFW distance is disrupted by channel meandering or vegetation, reasonable effort must be made to measure sub-reaches and compute the resulting gradient measurements over the required 20x BFW distance. Where a full 20 times BFW cannot possibly be measured (ex. top end of waterway, confluence within 20 times BFW) the full distance possible should be measured.

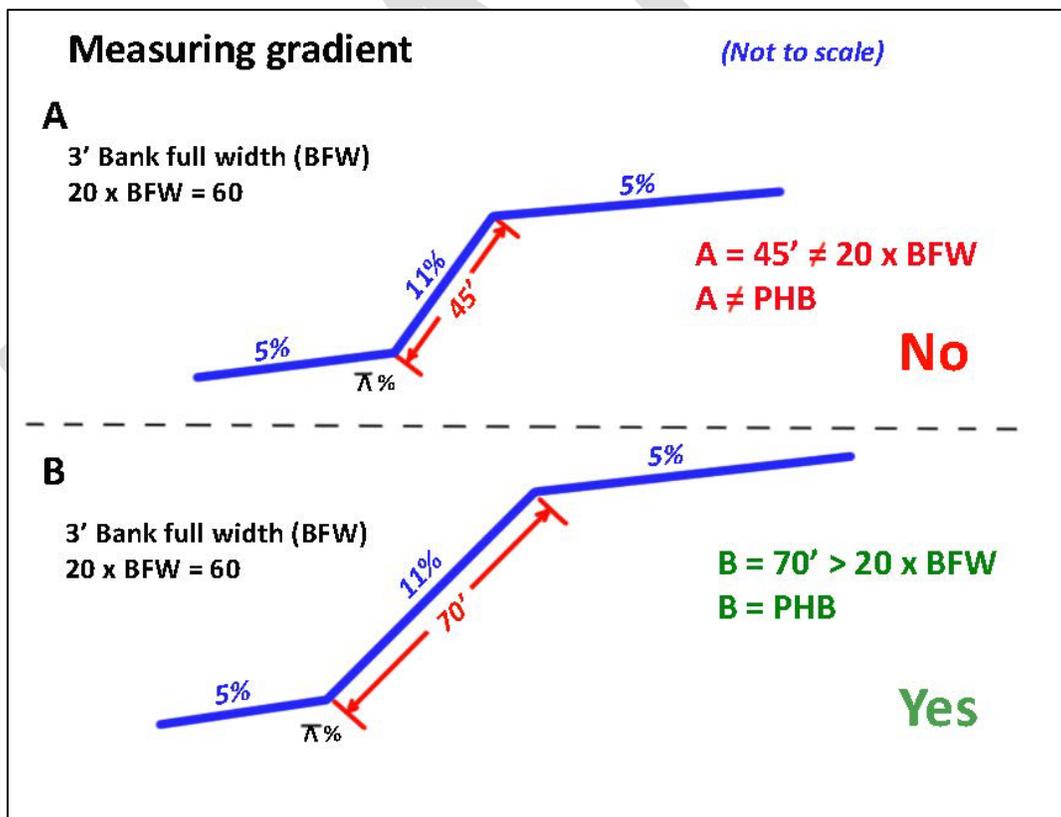


Figure 9. Measuring gradient, 20X BFW

Gradient changes under a deformable obstacle

The method for measuring underlying channel gradient through a deformable obstacle uses a different approach than measuring permanent natural obstacle PHBs. In this case, measurements should be taken standing far enough back (i.e., away from) the feature to capture the average underlying channel gradient that would exist in the absence of the deformable portion of the feature (Figure X). Gradient measurements should be taken from the water surface or BFW elevation above and below the deformable feature at a distance where the underlying gradient is not influenced by the deformable feature.

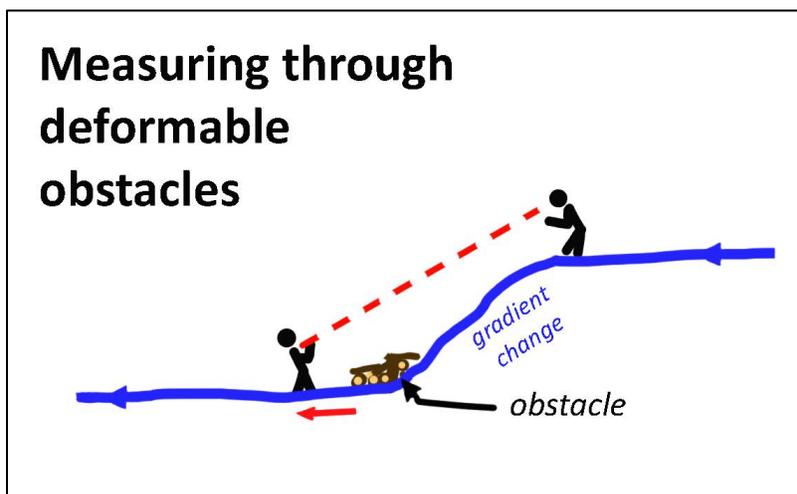


Figure 10. Measuring through deformable features

Measuring a Bankfull Width PHB

See Section 1.3.1- Step 3 – Identifying PHBs for PHB definitions.

The PHB criterion for BFW of two feet or less should be measured over 20 times the average BFW both upstream and downstream. Where line of sight over a 20-BFW distance is disrupted by channel meandering or vegetation, reasonable effort must be made to measure sub-reaches and compute the resulting gradient measurements over the required 20x BFW distance. Where a full 20 times BFW cannot possibly be measured (ex. top end of waterway, confluence within 20 times BFW) the full distance possible should be measured.

Tributary Junction PHBs

For tributary junctions (option 2b), BFW reduction alone should not be the sole determinant of a PHB. To ensure an accurate and biologically justified PHB determination, the use of this PHB should be considered alongside other site-specific habitat indicators, such as gradient shifts, substrate changes and notable reductions in flow conditions and bankfull depths. These changes in habitat conditions at qualifying tributary junctions commonly include, but are not limited to, stream segments with a bankfull width of 1–3 feet. Such streams are typically located in areas within small basins, contributing to conditions of reduced flow and bankfull depths. Fish habitat conditions in these areas are generally poor and often characterized by 1) greatly reduced or no pool habitat, 2) a reduction in gravel substrate and 3) the presence of medium to heavy in-stream native vegetation and other organic debris, all of which limits habitat suitability for fish.

At a tributary junction, measure BFW of the mainstem both downstream and upstream of the junction in a sufficient number of locations that best characterize the average BFW values for the reach with a tape measure or fixed measuring rod. Measure upstream along the tributary in a sufficient number of locations to determine the average BFW for the reach (See WAC 222-16-030(5)(f)). Determine over what distance the BFW reduction consistently persists to determine if the reduction in BFW meets scale reach requirement.

These distances and gradients are typically measured with a laser level/rangefinder, clinometer and string box, or other device(s) that can accurately measure gradient and distance. Where line of sight over a 20 times BFW distance is disrupted by channel meandering or vegetation, reasonable effort must be made to measure sub-reaches and compute the resulting gradient measurements over the required 20 times BFW distance. Where a full 20 times BFW cannot possibly be measured (ex. top end of waterway, confluence within 20 time BFW) the full distance possible should be measured.

PLACEHOLDER FOR IMAGE

Figure 11: measuring a tributary PHB

1.4 Conducting Protocol Electrofishing Surveys in Conjunction with FHAM

This information is provided for conducting protocol electrofishing surveying using backpack electrofishing equipment in conjunction with FHAM. The survey will determine whether fish are present in the stream segment upstream from the PHB above locations where fish use is known to occur and upstream of the AFF

Careful attention to electrofishing techniques minimizes the risks to individual fish and increases the probability of fish detection in sampled streams. Accurately documenting the stream's habitat characteristics and the presence of natural or artificial features that affect fish movements and distribution on the WTMF help the water type team's review and increase the likelihood of concurrence with survey results.

1.4.1 STATE AND FEDERAL PERMITS

Washington Department of Fish and Wildlife (WDFW) regulations require protocol electrofishing surveyors to obtain a current Scientific Collection Permit (WAC 220-200-150). To ensure the safe handling of fish, WDFW requires permit applicants and anyone conducting activities under the permit (sub-permittees) provide a statement of their qualifications and experience conducting surveys. It is the responsibility of surveyors and trained staff to follow the requirements contained in the permit. Information on WDFW Scientific Collection Permit program can be found at <http://wdfw.wa.gov/licensing/scp/>.

For proposed surveys and studies that have the potential to affect ESA-listed species, contact the National Marine Fisheries Service at: <https://apps.nmfs.noaa.gov/index.cfm>.

1.4.2 CONSULTATION

Resource professionals from DNR, WDFW or tribal biologists often have local knowledge regarding fish presence or potential habitat and can help determine appropriate survey efforts. Pre-consultation is recommended for maximizing efficiency in the review process and increasing the likelihood of concurrence under the following situations:

- To determine appropriate survey timing for anticipating when fish will be seasonally present
- When unfamiliar with the stream system or the life history of expected fish species
- Prior to conducting a survey during a state drought emergency declaration or during low flow conditions (refer to Section 1.5.5)
- Where streams show recent channel disturbances (debris flows, fire events)
- Prior to conducting a protocol electrofishing survey above an artificial barrier or where an artificial barrier has been replaced to determine the re-distribution of fish.
- Where wetland habitats are connected to the stream network.

1.5 Electrofishing Survey Best Management Practices

1.5.1 STREAM RECONNAISSANCE PRIOR TO ELECTROFISHING

Visual methods such as walking the stream bank, snorkeling, or using power bait may help determine fish presence and reduce the need for some electrofishing. Under the right conditions, direct observation can be achieved with practice and improved using polarized glasses. Visual detection in small streams can be especially difficult when fish populations are small, the water is turbulent or turbid or vegetation cover is thick. For bottom-dwelling species such as sculpins or lampreys typically found in upper reaches in western Washington, visual observations may be virtually impossible.

While visual observation is an acceptable method to document fish presence, it *cannot* be used for documenting fish absence. Providing evidence that supports the absence of fish upstream from a PHB must be supported by a protocol electrofishing survey.

1.5.2 SURVEYING IN LARGER STREAMS

The electrofishing protocol in this manual was developed primarily for small, wadable streams. Larger streams have a larger cross-sectional area and typically deeper water column that may require more electrofishing effort to increase the probability of detection or that may render electrofishing ineffective. A typical electrofishing crew consists of at least one experienced crew leader and additional netter. In most cases, one backpack electrofisher unit and one netter is sufficient in streams with a wetted width less than 10 feet. Additional crew members are necessary in streams with a wetted width greater than 10 feet to maximize fish detection probability.

Consult with WDFW area habitat biologists and affected tribes prior to conducting surveys in streams with a wetted width larger than 10 feet. The purpose of this consultation is to preview survey plans and cooperatively determine techniques to improve the reliability of the survey and increase the likelihood for concurrence.

1.5.3 ELECTROFISHING SURVEY TIMING

Survey information collected to determine fish use, or the maximum upstream extent of habitat utilization must be collected during the time window when the fish species in question are most likely to be present. The time at which salmonid fry have emerged from the gravels and are distributing to rearing areas is the most appropriate time. In most cases, this period is between March 1 to July 15 when water is most likely to be present in the channel. Surveys performed too early may miss post-emergence distribution; those performed too late may underestimate distribution as headwater flows recede through the summer (see Stream Flow Considerations).

The March 1 to July 15 survey window may not be the appropriate time in all cases, and alternate timing may be more appropriate. For example:

- Coho may overwinter in low-gradient habitats that may be dry during the standard survey period. In this case, a winter survey may be more appropriate.
- Char and brown trout are fall spawners. In this case, a late summer or early fall survey may be more appropriate.

To account for potential seasonal variability in fish presence, survey timing should be determined in consultation with WDFW and affected tribes.

1.5.4 STREAM FLOW CONSIDERATIONS

Stream flow conditions are important factors affecting the extent of available habitat occupied by fish and/or the detectability of fish within those habitats.

- *Low flow considerations:*
Periods of low flow can be an effective time to conduct an electrofishing survey due to there being more fish per unit channel area and clear water conditions. However, in cases of considerable low flow conditions, survey efforts may be compromised when stream depth is too shallow for full electrode submersion, water temperatures are too high or when seasonally occupied reaches are dry. In these cases, the lack of or decreased flow can reduce or eliminate the opportunity to detect fish and thereby impair survey effectiveness.

Seasonal weather patterns can create situations where normal flow patterns are disrupted, and subsurface flow can be affected by different lithology or local hydrology.

Additionally, some stream reaches that are dry during the survey provide important habitat during fall and winter and spring seasons. In these cases, late June and July may be too late to conduct a protocol survey due to lack of flowing water. In watersheds without snowmelt, it may be too late to conduct surveys in April and May.

The absence of flowing water alone is not an indicator of a habitat break and will not solely be used to justify the F/N break. Type F waters may be perennial or seasonal. Flowing reaches upstream from segments with intermittent flow that meet the default physical characteristics should be assessed for isolated fish populations and fish habitat. Dry reaches and associated lateral tributaries will be assumed habitat upstream until the

channel no longer meets the default physical characteristics for presumed fish habitat or until dry segments can be resurveyed during sufficient flow for the species most likely to use the habitat when it is available.

When a surveyor encounters a sustained dry stream reach before the protocol electrofishing survey is completed, the surveyor should document the stream characteristics where the stream went dry and continue to take stream measurements up to the point until the electrofishing effort is complete. Additional survey effort may be necessary to conduct electrofishing when the stream segment has adequate flow to increase the likelihood of concurrence with survey results.

- *High flow considerations:*

High flow conditions that impact the efficacy of a survey are generally not an appropriate time to conduct surveys. Furthermore, there is a high flow threshold where surveys should not be conducted due to potentially difficult (and unsafe) sampling conditions resulting from increased water volume and depth, higher stream velocity, higher stream turbidity, and/or reduced fish response to the electrical field. These conditions may result in reduced likelihood of detecting fish, which could result in “false negatives” (e.g., the inability to detect fish when they are in fact present).

On small seasonal streams connected to headwater wetlands, however, high flows may be the only appropriate time to conduct survey.

1.5.5 STREAM FLOW FORECAST AND DECLARED DROUGHT CONDITIONS

Near the beginning of each year, proponents should review current water supply forecast resources for the upcoming survey season, with particular attention toward drought conditions in any planned survey areas. The Governor, or Ecology on behalf of the governor, can issue a drought advisory or declare a drought emergency at any time, based on conditions.

Surveys conducted during drought conditions may not accurately represent the full extent of fish habitat utilization. Fish distribution may contract with reduced flows, resulting in misidentification of the correct F/N break. If drought conditions exist within the basin during the time a survey was conducted, proponents of the water type change are required to provide adequate information explaining how and why fish use and/or the F/N break location were unaffected by the drought conditions.

To ensure surveyors have adequate information prior to conducting a survey and to increase the likelihood of WTMF concurrence or FPA approval:

- Consult the most recent forecast information for specific requirements applicable for a given year
- Check the status of the specific basin(s) using the stream flow resources below
- Consult with DNR forest practices foresters, WDFW habitat biologists, Ecology forest practices specialists, and tribal biologists

Proponents and interested parties can find information on water supply, snowpack, drought declarations, and drought effects in specific basins by reviewing the following water supply forecast and stream flow resources:

- For drought status under the Washington State definition, as well as information about the state drought declaration process, review Ecology’s drought information:
<http://www.ecy.wa.gov/drought/index.html>
Statewide Conditions: <https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Statewide-conditions>
- Department of Ecology provides links to a variety of water supply data and forecasting resources at this page:
<https://ecology.wa.gov/Water-Shorelines/Water-supply>
- For details regarding whether or not drought may affect a specific basin, please review the Northwest River Forecast Center (NWRFC) “*Ensemble Streamflow Prediction (ESP) Water Supply Forecast as Percent of Average*”: <http://www.nwrfc.noaa.gov/ws/>
- Please review stream flow conditions prior to conducting surveys in areas that may be affected by low flow. Review flows of specific Washington locations at:
 - Freshwater DataStream data map:
<https://fortress.wa.gov/ecy/eap/flows/regions/state.asp>
 - WA Current Streamflow Summary (USGS & Dept. of Ecology):
<https://waecy.maps.arcgis.com/apps/Viewer/index.html?appid=832e254169e640fba6e117780e137e7b>
- The Natural Resource Conservation Service *Current Water Supply Outlook Reports: Washington | Snow Survey & Water Supply Program | Natural Resources Conservation Service*
- The United States Geologic Survey (USGS) provides water data and streamflow information on Washington’s rivers. While most stream gauges are located on major rivers, the information for the appropriate basin could provide insight into the status of tributary streams: <https://www.usgs.gov/centers/wa-water>
- Stream flow data and water resource information for the central and northern portion of the Kitsap Peninsula can be found on the Kitsap Public Utility District website.
<http://kpudhydrodata.kpud.org/>
- Washington State Statute and Rules:
[Chapter 43.83B \(400-901\) RCW](#)
[Chapter 173-166 WAC](#)

1.5.6 SURVEYING IN STREAMS WITH RECENT DISTURBANCES

Fish presence and distribution can be affected by stream disturbances such as mass wasting events, channel scouring by debris flows, or fire. Fish populations may be locally or temporarily extirpated from the stream channel.

If a proponent chooses to conduct FHAM for such streams, documentation on the WTMF should include:

- A description of the disturbance, including estimated time of occurrence, length of stream affected, and how the potential habitat has been modified (aggradation, subsurface flows, isolated pools, loss of gravel, increased sediment, scouring to bedrock, etc.).
- How the disturbance factors might affect the upstream extent of fish distribution or habitat utilization.
- How the disturbance factors and channel conditions might affect the ability to detect fish.
- How the proposed F/N break encompasses the full extent of potential or recoverable fish habitat.

Where recent disturbances have the potential to affect the ability to detect fish or determine the appropriate F/N break using FHAM, DPC can be used for determining the upper extent of fish habitat for the purposes of FPA approval. Proponents may also request an interdisciplinary team review for determining the appropriate survey protocol.

1.5.7 ELECTROFISHING SURVEYS ABOVE ARTIFICIAL BARRIERS

Artificial fish passage barriers⁸, such as impassable culverts, can preclude fish access to upstream reaches and limit the distribution of fish. In situations where the presence of an artificial barrier influences fish abundance and/or species composition above the barrier, and where this influence could potentially affect the upstream distribution of fish, electrofishing surveys are not appropriate. The presence of an artificial barrier alone is not sufficient to establish the F/N break.

The applicability of electrofishing surveys upstream of a barrier is determined by the status of the fish populations in the reach upstream relative to the population downstream. Examples include when permanent natural barriers exist below the proposed survey reach and upstream from the barrier.

Above artificial barriers, physical stream characteristics are used to determine the presumption of fish use unless otherwise approved by DNR following a site-specific consultation with WDFW, Ecology, and affected tribes. Consultation will address necessary information and review expectations prior to initiating the protocol survey above artificial barrier. The WTMF must provide habitat and fish population conditions above and below the barrier for concurrence consideration. ID Team review may be necessary to make F/N break determinations in these situations.

⁸ A fish passage barrier means any artificial in-stream structure that impedes the free passage of fish, WAC 222-16-010.

1.5.8 SURVEYING IN LENTIC HABITAT

Lentic habitat, including ponds, lakes, and wetlands, provide refuge and rearing areas for fish populations. Surveyors should attempt to locate such features and other potential habitats during office and field reconnaissance. The presence of fish at these locations, or in other upstream reaches indicates downstream fish use.

Determining fish use in water bodies such as ponds and wetlands can be difficult. While electrofishing surveys can be effective under some circumstances (small, shallow ponds or larger pools with good water clarity) electrofishing surveys in larger water bodies is not an acceptable method for determining absence of fish use. Furthermore, some lentic habitats may only be used for a few days per year during the wintertime. Absence of fish in these habitats during a survey doesn't necessarily indicate a type N designation.

Other sampling methods such as minnow trapping, seining, snorkeling, gillnetting, hook and line sampling, environmental DNA, or a combination of sampling techniques may be more appropriate for detecting fish or documenting fish absence in ponds and wetlands. However, there is no standard sampling methodology that is appropriate for all lentic environments and survey techniques must be determined on a case-by-case basis in consultation with WDFW area habitat biologists and local tribal staff for proper survey techniques. Pre-consultation will increase the likelihood of concurrence.

1.5.9 ADDITIONAL BEST MANAGEMENT PRACTICES

Conducting surveys using techniques that result in low risk to fish populations and high probability of detection requires careful adherence to the protocols listed in this Board Manual guidance. In addition, NOAA electrofishing guidelines for ESA-listed fish and WDFW Scientific Collection Permit conditions must be followed. The following additional surveying techniques will help improve the effectiveness of the survey effort:

- Sample all accessible habitat types (riffles, pools, banks with draped vegetation or undercut, etc.) wherever fish (not just salmonids) can hold or hide according to FHAM protocols.
- In debris jams, undercut banks or around instream structures, insert the uncharged anode into the debris or undercut bank, depress the electrofisher switch and slowly move the anode into open water. Fish will often be pulled from the cover for observation.
- In deep water pools, fish can be difficult to detect. Chase fish into shallow water by sweeping the charged anode across the channel while moving it up and down in the water column in a downstream direction. Fast water can be best sampled by moving the anode downstream at approximately the same velocity the water is flowing.
- Position netters appropriately downstream (usually within about three feet below the anode) for observing fish and minimizing fish egress.
- Except for deep water pools and runs, the anode should be submerged at all times and held just below the water surface to help draw the attracted fish to the anode.
- Surveyors should be cognizant of the cathode at all times to ensure it is submerged and in the proper location relative to the anode to create an effective electrical field.
- If the stream splits into separate channels, each channel needs to be individually surveyed.

PART 2 IDENTIFYING OFF-CHANNEL HABITAT

Off-channel habitats are side channels, wall-based channels, riverine and floodplain ponds, swales, and other aquatic features that are used by fish, and include periodically inundated areas of associated wetlands. Off-channel habitats provide areas of productivity, refuge from predators or peak flows and rearing areas to fish in streams of all sizes. Additionally, the feature must be connected to a Type S (Shorelines of the State) or Type F (fish habitat) water and be accessible to fish at some time of the year. Temporary blockages such as wood jams may not be considered to limit fish accessibility unless they occur in tandem with permanent conditions related to stream geomorphology.

The riparian management zone (RMZ) for Type S and F waters begins at the outer edge of the bankfull width, the outer edge of a channel migration zone (CMZ), or the external extent of off-channel habitat (refer to Board Manual Section 7 for more information on RMZ requirements). Therefore, correctly identifying the extent of off-channel habitat is necessary for protecting these unique features. The edge of the off-channel habitat is determined by the following:

- For waters where BFW can be identified (channelized streams): the edge of off-channel habitat is determined based on the outer edge of inundation of the stream at the bankfull elevation flow and includes those aquatic features on the floodplain that are below bankfull elevation that are accessible to fish;
- For waters where BFW cannot be identified (non-channelized streams): The edge of off-channel habitat is the outer edge of the area periodically inundated at the ordinary high water line, which includes those portions of wetlands and other aquatic features periodically inundated at the ordinary high water line.

Prior to identifying off-channel habitat, determine whether channel migration is present. Use Board Manual Section 2 *Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones*, Part 2 Channel Migration Zones to make this determination. If channel migration is present, follow guidance under Board Manual Section 2, Part 2.3 to delineate the CMZ. However, off-channel habitat can extend beyond the edge of a CMZ, and side tributaries or wetlands must be investigated to verify connectivity to the main channel. If channel migration is not present, follow the guidance below to identify the edge of off-channel habitat:

2.1 Identifying Off-Channel Habitat where Bankfull Width can be Identified

Board Manual Section 2, Part 1.2 provides guidance on how to identify bankfull width and bankfull depth. The bankfull width of a stream at various points along its course must be determined in order to establish the bankfull elevation for a particular stream reach.

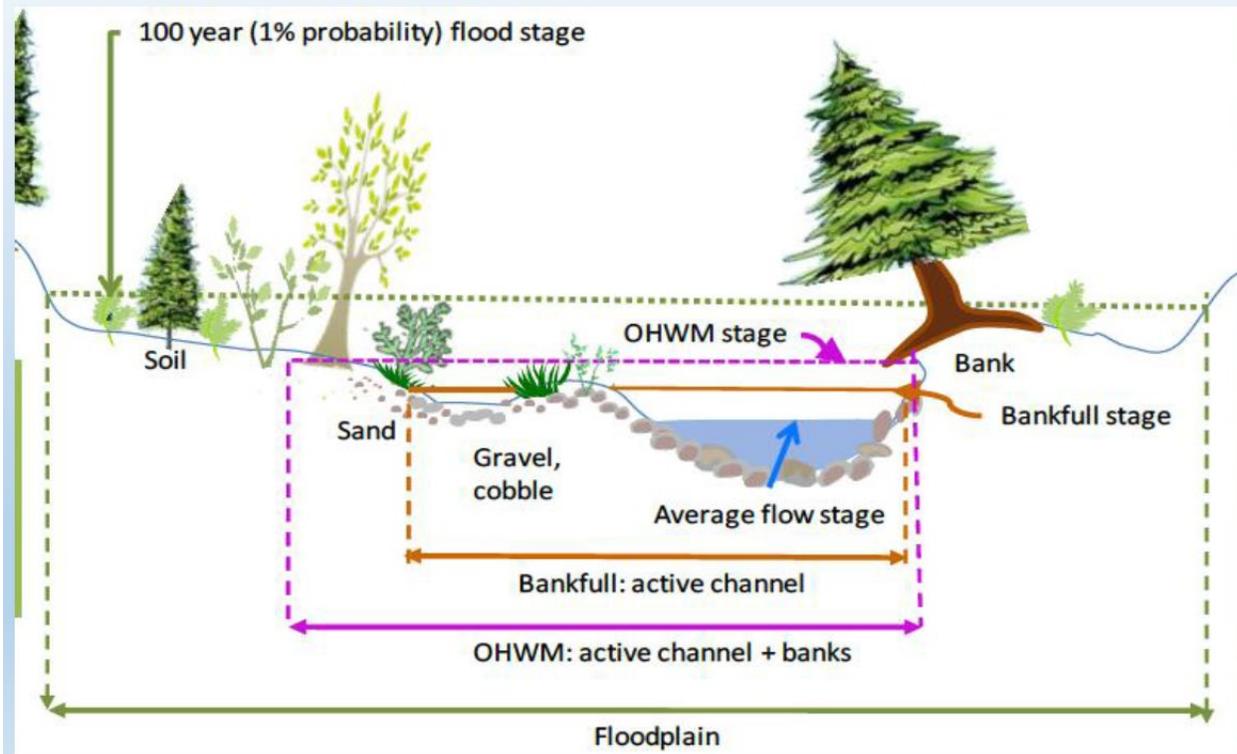


Figure 12. Waters where bankfull width can be identified

Once bankfull elevation has been established, a determination of whether or not off-channel habitat is present can be made. Where BFW is identified, off-channel habitat equates to those areas outside the bankfull channel at or below the bankfull elevation. Off-channel habitat is accessible to fish at bankfull flow.

Using this standard, measuring the full extent of off-channel habitat begins by establishing the correct bankfull elevation of the associated stream. Streams that are confined or channelized will contain a bank or edge which typically corresponds to a flow that fills the natural channel to the top of its banks and at a point where the water begins to overflow onto the active floodplain. Under normal conditions, this consistent morphological indicator is the appropriate point to use for determining bankfull elevations and for determining if an area is accessible during bankfull flows. Therefore, any feature at or below bankfull elevation is assumed to be accessible to fish.

Bankfull elevation can be projected laterally (perpendicular to the stream) using a simple forestry tool (such as a clinometer, laser level/ rangefinder, relaskop) set at the 0 degree or percent (flat) scale, utilizing a range pole or temporary target, for foresight or backsight to the initial bankfull elevation point. Regardless of the tool choice, begin by establishing the bankfull elevation from the bank with the known edge. The goal is to project the water elevation at bankfull flow to an opposite bank or feature at the same elevation.

Multiple bankfull elevations may need to be taken along a pertinent stream reach within a harvest unit in order ascertain the presence or absence of off-channel habitat along channelized streams.

2.2 Identifying Off-Channel Habitat where Bankfull Width cannot be Identified

Ordinary high water line (OHWL) means the mark on the shores of all waters, which will be found by examining the beds and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation. Provided that in any area where the OHWL cannot be found, the ordinary high-water line adjoining saltwater shall be the line of mean high tide, and the ordinary high-water line adjoining freshwater shall be the line of mean high-water (WAC 222-16-010).

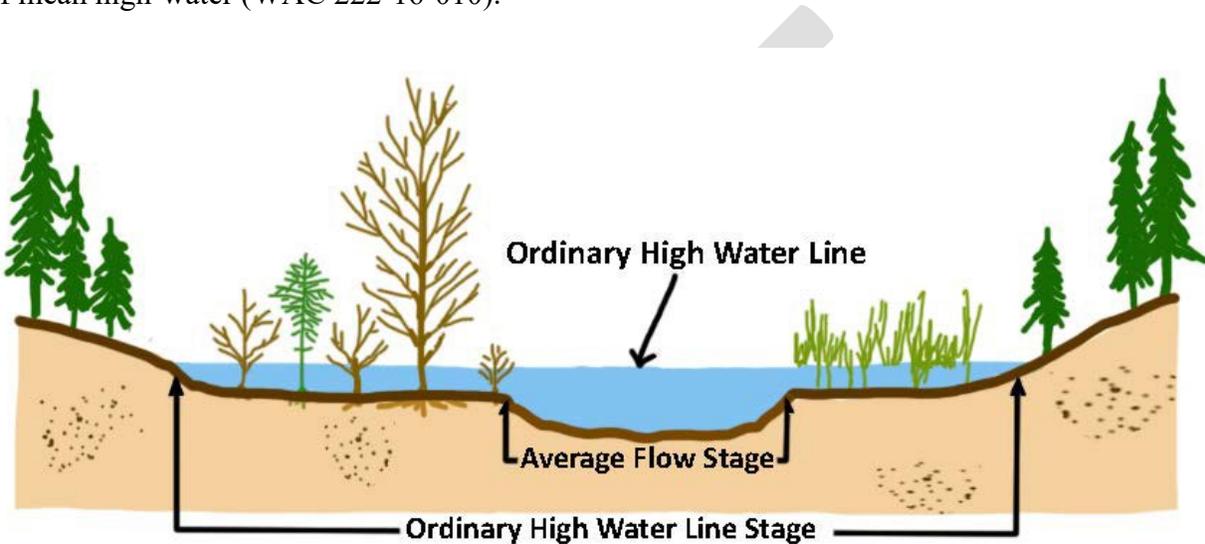


Figure 13. Waters where bankfull width cannot be identified

For waters where bankfull width cannot be identified, off-channel habitat equates to those areas that are at or below the elevation of the ordinary high-water line. This includes the portions of stream associated wetlands periodically inundated at the ordinary high-water level. Although OHWL is generally used to define regulatory shoreline boundaries, the same indicators for identifying high water levels can be used to establish the boundary of fish habitat in smaller drainage systems and wetland areas.

The identification of OHWL should correspond with physical features that occur with regularity of the high-water mark. The OHWL can sometimes be identified by physical scarring along the bank or shore and the action of water so common that it leaves a natural line impressed on the bank. OHWL and wetland delineation are similar in that both rely on the presence of water for determining the characteristics of the upland vegetation.

Where a 'line' is not visible on solid objects, soil characteristics or seasonal vegetation may make identifying the precise high-water level difficult. Several locations and indicators should be observed to ascertain the approximate location. In some places, the OHWL can be observed as a narrow zone and in other places it can be a gradual change from season to season. This line may be indicated by erosion, benching, change in soil characteristics, lack of terrestrial vegetation (or in many cases, bare areas with evidence of ponding and no vegetation), or the presence of flow-

scoured vegetation litter or woody debris. The assessment should rely on current observations, past physical characteristics, and professional judgement.

Physical indicators for interpreting the OHWL may include:

- Areas on the floodplain devoid of vegetation, indicating frequent ponding
- Deposited litter and debris accumulated after recent flow events may indicate the spatial extent of high water
- Water staining or discoloration on solid objects, such as rocks, indicate recent or prolonged water levels
- Leaf litter or pine needles removed or disturbed can show where recent flows have transported material
- Abandoned pollen rings or algae staining can provide indicators where high water levels occurred, particularly after spring runoff
- Change in plant community transitioning from hydrophytic vegetation (e.g. reed grasses, sedges, rushes) to terrestrial vegetation (e.g. sword fern, salal)
- Communities of flood-tolerant terrestrial vegetation like salal may all have the lowest leaves missing throughout a stream-adjacent area that floods seasonally.

No single indicator necessarily proves an exact elevation, but a combination of several indicators can help locate where water levels typically reach.

2.3 Off Channel Habitat References

1 - Lichvar, R.W., S McColley. 2008. A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual. ERDC/CRREL TR-08-12. Hanover, NH: U.S. Army Engineer

2 - Lichvar, R.W., and J.S. Wakeley, ed. 2004. Review of Ordinary High Water Mark indicators for delineating arid streams in the southwestern United States. ERDC/CRREL TR-04-1. Hanover, NH: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory.

3 - Rosgen, D. 1996. Applied river morphology. Pagosa Springs, CO: Wildland Hydrology.

4 - Olson, P. and E. Stockdale. 2010. Determining the Ordinary High Water Mark on Streams in Washington State. Second Review Draft. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.

Cole 2006 was referenced in the e-fish report – which one used for single visit???

Cole, M.B. and J.L. Lempke. 2006. Annual and seasonal variability in the upper limit of fish distribution in Eastern Washington streams. Final report. Prepared for Washington DNR.

Cole, M.B., D.M. Price, and B.R. Fransen. 2006. Change in the upper extent of fish distribution in Eastern Washington streams between 2001 and 2002. Transactions of the American Fisheries Society. 135:634-642.

**PART 3. IDENTIFY AND LOCATE THE DIVISION BETWEEN
TYPE NP AND NS WATERS** (*under development*)

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Appendix A – Descriptions and Examples of potential fish habitat in streams where fish are not present.

Under development

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Appendix B - Fish Data Information

Collecting information on confirmed water type breaks (e.g., changes from Type-F to Type-N), stream locations, modeled (unconfirmed) water type designations (e.g., S, F, N, U), documented fish presence and species locations, and known natural and anthropogenic obstacles and barriers, can be a critical step for surveyors in determining where and when to most efficiently and effectively implement water typing surveys.

When using information from these sources, surveyors should do due diligence in determining the type and accuracy of the information, where possible. For example:

- Check the metadata on layers that document the upstream extent of fish presence to verify if the point represents a confirmed water type break or if it represents something else (e.g., end of survey at a property line, end of spawner survey, lack of flow or dry stream channel at time of survey, etc.).
- Check modeled stream locations against LiDAR to determine if they appear to be correct. Models can mistype roads or dry drainages as streams. They can also miss part or all of shallow streams in flat topography.
- Confirm the stream segment on which water type breaks apply. Type breaks that appear to be on a mainstem channel may actually be located on a lateral tributary. This can often be clarified by looking at the metadata.
- Confirm the kind of information on the layer. Do the points and water type designations represent modeled water type, water type based on the application of DPC, confirmed or documented fish presence (e.g., direct observation of a fish, fish in hand), etc.
- Take note of the date when data was collected and consider the potential for seasonal variability in fish use, connectivity, flow, and pool depth.

The list below, though not exhaustive, includes commonly used resources where this information may be available. While the information provided by the resources below may or may not always have regulatory significance, it can be used as a critical piece to the survey pre-planning process (Board Manual 23, Section 1.3.1, Step 1).

- Statewide Integrated Fish Distribution (SWIFD). The Northwest Indian Fisheries Commission provides a web map showing general fish distribution for western Washington associated with the DNR Water Type Map. <https://geo.nwifc.org/SWIFD/>

- Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP). Joint managed (Washington Treaty Tribes and WDFW) program providing regional, watershed and stock-level habitat information for comparing habitat conditions and prioritizing salmon recovery activities. <https://nwifc.org/about-us/habitat/sshiap/>
- Salmonid Stock Inventory (SaSi). Joint tribal and WDFW documents that include the original 1992 stock inventory for salmon and steelhead along with updated descriptions of life history, stock identification and status (by Water Resource Inventory Area) for bull trout/Dolly Varden, coastal cutthroat trout and salmon species. <https://wdfw.wa.gov/conservation/fisheries/sasi/>
- Salmonscape: A WDFW interactive map providing statewide distribution, stock status, habitats and recovery evaluations for steelhead, bull trout and salmon species. <http://apps.wdfw.wa.gov/salmonscape/>
- Washington State Fish Passage (WDFW): <https://geodataservices.wdfw.wa.gov/hp/fishpassage/index.html>
- WSDOT Fish Passage Inventory: <https://wsdot.maps.arcgis.com/apps/webappviewer/index.html?id=c2850f301118480fbb576f1ccfda7f47>
- WDFW contact information: Website providing contact information for WDFW district and area biologists. https://wdfw.wa.gov/sites/default/files/2021-11/wdfw_fish_district_bios.pdf
- Pacific States Marine Fisheries Commission provides an interactive map as a range-wide assessment for coastal cutthroat trout observations, data and distribution. <http://www.coastalcuthroattrout.org/sample-page/cct-interactive-map>
- Kalispel Tribe's Geospatial Database Viewer. A comprehensive database for natural resource data (wildlife, fisheries, aquatic habitat, forestry). Contains additional data from WDFW, Colville Tribes, and the Spokane Tribe on fish distribution and water quality for tributaries and lakes in the upper Columbia River area in Washington (area above Chief Joseph Dam). <http://gis.knrd.org/knrdgisviewer/>
- Wild Fish Conservancy state-funded water type assessment results including georeferenced photos, habitat, and fish data. [WFC Watertyping Surveys Map \(wildfishconservancy.org\)](http://wildfishconservancy.org)

Appendix C – Fish Life History

Survey information collected to determine fish use or the maximum upstream extent of habitat utilization should be collected during the time window when the fish species in question are likely to be present and using protocols capable of detecting any fish species present.

Throughout Washington, the uppermost fish detected during protocol electrofishing surveys is most often a salmonid, and in around 90% of cases the uppermost fish is a cutthroat trout *Oncorhynchus clarki* (D. Collins, Washington Department of Natural Resources, unpublished data; Fransen et al. 2006). Other salmonid species that have been documented at uppermost fish locations on water type modification forms across Washington include rainbow trout *O. mykiss*, brook trout *Salvelinus fontinalis* (an introduced non-native that has become established in many Washington streams), and (rarely) bull trout *S. confluentus*. In headwater reaches that are accessible to anadromous fishes, coho salmon *O. kisutch* juveniles have been reported on occasion as the uppermost fish. Of the non-salmonid species documented at uppermost fish sites on WTMFs in western Washington, sculpins *Cottus* spp. were most prevalent, followed by brook lamprey *Lampetra* spp., and less commonly dace *Rhinichthys* spp., three-spine stickleback *Gasterosteus aculeatus*, and Olympic mudminnow *Novumbra hubbsi*. The only uppermost non-salmonid fish species recorded in east-side Washington streams were sculpins.

Given the variety of fish species and/or life histories that could potentially be encountered during a protocol electrofishing survey, surveyors should refer the following for detailed life history information on any of these species.

- Forest Practices Habitat Conservation Plan, Chapter 3. The link for the PDF of that chapter is provided here: https://www.dnr.wa.gov/publications/fp_hcp_09ch3.pdf
- Wydoski, R.S. and R.R. Whitney. 2003. *Inland fishes of Washington* (revised and expanded; co-published with American Fisheries Society). University of Washington Press, Seattle.

Appendix D – Fish Passage Barrier Resources

- WDFW fish passage barrier maps – an interactive map identifying artificial barriers where a fish passage inventory has been conducted.
https://wdfw.wa.gov/conservation/habitat/fish_passage/data_maps.html
- Washington State Department of Transportation fish passage inventory – an interactive map provides data for corrected and uncorrected barriers statewide.
<http://www.wsdot.wa.gov/Projects/FishPassage/default.htm>
- DNR Forest Practices Activity Mapping Tool – an interactive map showing fish barrier status based on road maintenance and abandonment plans. [Forest Practices Application Mapping Tool \(FPAMT\) \(wa.gov\)](#)