

Draft Guidance

Ranking Puget Sound Streams for Low Flow Enhancement A Watershed Based Methodology

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Washington Department of
FISH and WILDLIFE

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Ranking Puget Sound Streams for Low Flow Enhancement A Proposed Watershed Based Methodology

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This document provides for the current status of guidance being developed to support the selection of stream areas for watershed based low stream flow enhancement. It suggests a two stage process and describes a methodology for the first stage, ranking of streams based primarily on their relative need for low flow enhancement and its potential to benefit salmonids. Results from this first stage may then be used to inform subsequent low flow project prioritization and selection processes within a watershed. Salmonid recovery and other watershed goals would, we expect, become important components of this next step and of final project design and goals.

The proposed process and methodology have been developed with the support of stream flow staff from Washington Departments of Fish and Wildlife (WDFW) and of Ecology and with cooperative input by staff from a range of Puget Sound entities. Pilot testing and further evaluation and refinement of the methodology is being scheduled and is expected to be completed mid- 2007.

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I. Background

A process and guidance for identifying and selecting stream reaches for low flow enhancement is a key component for the development of stream flow restoration programs for Puget Sound salmonids. In response, WDFW and Ecology staff have initiated work to develop criteria and outline a process for meeting this need.

A two stage, Water Resource Inventory Area (WRIA) based process is proposed. The first stage provides a method for ranking streams within WRIs. Rankings (high to low) are intended to reflect the hydraulic need and relative expected fish benefit to be achieved with low flow enhancement in individual streams or reaches.

First stage ranking could be completed by a watershed or regional committee, an agency, consultant, or others. Results of first stage ranking would be used to inform the subsequent second stage of project prioritization and selection. Watershed specific local or regional social, political, and practical overlays (e.g. funding, opportunity, project design goals, etc.) would be applied during this second stage. Specific salmonid recovery and other watershed goals would,

we expect, also become important components of final project selection, design and goals. An existing watershed planning or other local or regional salmon recovery group or other interest could also complete this second stage.

This document describes a process and methodology for ranking of streams for watershed based low flow enhancement. A multi-salmonid species benefit approach is recommended. While in most cases, other actions (including high flow restoration) to protect and restore impacted stream flow regimes will also continue to be needed, the proposed methodology does not address these. Some of these other activities also include:

- Wetland and aquifer recharge area protection programs;
- Water right permit review;
- Water law enforcement and compliance;
- Adoption or implementation of instream flow protection programs;
- Instream flow agreements such as FERC agreements, tribal agreements, or Hips;
- Water conservation and efficiency programs;
- Implementation of existing basin or stream closures; and
- Adaptive management of reservoir storage and stream flow management.

Specifically, the proposed first stage ranking methodology is intended to:

- indicate where salmonids are most likely to benefit from low flow enhancement;
- be transparent, objective, and easily understood;
- be adaptable to current and best locally available data sources and method options;
- inform but not provide for second stage stream flow enhancement project prioritization;
- inform but not replace the need for implementation of other activities and programs to protect and achieve flows for fish.

II. Stream and Reach Ranking Methodology

Low flow restoration or enhancement is likely to have the greatest benefit where (1) there is a substantial potential fish community or fish community with species in strong need of restoration, (2) where other habitat conditions are of a quality sufficient to support increased fish production if flow is restored or enhanced, and (3) where relatively greater amounts of habitat will be improved for the action. In addition, flow restoration can also (4) restore access to upstream habitat in cases where low flow currently restricts fish passage.

Based on these four considerations, four separate sub-ratings are determined: (1) relative fish potential, (2) habitat value, (3) hydrology, and (4) passage. Thus a stream reach will have four separate, independent scores. A stream or reach with high rankings in all four will be a stream that has high potential for fish benefits if flow restoration occurs.

Many streams or stream reaches in Puget Sound WRIAs where low flows are currently believed

to limit salmonid populations have been identified through basin planning and other processes. Streams or reach designations for potential enhancement should generally be bounded by either natural or artificial features. These might be such things as significant diversions, tributaries, barriers, changes in slope, or changes in valley type. However, where other stream or reach designation protocols are already defined or preferred by a WRIA group they may be used instead, as appropriate. A general recommendation and guiding principle is to keep methods used as simple, transparent, and straight forward as possible.

Relative fish potential

The relative fish potential score is based on the sum of salmonid stocks in, or potentially in, a reach. Stream reaches can be grouped within WRIAs, which are mapped in the Salmonid Stock Inventory (SaSI), "<http://wdfw.wa.gov/fish/sasi/>" for salmon and steelhead, "<http://wdfw.wa.gov/fish/sassi/bulldolly.htm>" for native charr [tabular data only], and "<http://wdfw.wa.gov/fish/sassi/cutthroat.htm>" for cutthroat trout [tabular data only]. Each salmonid stock's population is rated by SaSI as critical, depressed, healthy, unknown, or extinct. For each stock potentially in a reach, 1 point should be added to the score for a healthy stock, 2 points for a depressed or unknown stock, and 3 points for a critical stock. In addition, if a stock is listed under the federal Endangered Species Act as endangered or threatened, 1 extra point should be added to the score. For streams where an attempt is being made to re-establish an extinct stock, 2 points should be added to the score.

For example, if Issaquah Creek were the stream of interest, SaSI shows stock designations, for which we would ascribe points as follows:

- Chinook salmon – healthy and ESA (1 + 1)
- Coho salmon – depressed (2)
- Sockeye salmon – healthy (1)
- Winter steelhead - critical (3)

Coastal cutthroat are not mentioned in SaSI for the Lake Washington drainage, but they are reported to be thriving in suburban streams in the absence of competitors, so 1 point could be added to the score for them (subject to annotation). The score for Issaquah Creek would then be 8 or 9 (if cutthroat are included).

If a reach is above a non-flow-dependent fish passage barrier, then anadromous fish can only be listed in the reach if a fish passage measure, such as a fish ladder or trap-and-haul program, is in place. If a fish passage measure is not now in place at an artificial barrier such as a dam, then the fish score for anadromous species should be cut in half, reflecting future potential to restore passage. However, if a barrier is expected to be removed in the very near future, this can be taken into account. If the barrier is natural (e.g., a waterfall) anadromous fish stocks should not be considered in the fish score.

Habitat value

The habitat value score is a product of reach length, watershed condition, and channel condition. This score is open-ended because of reach length. Reach length is simply the number of miles in the stream or reach. If an artificial barrier to passage that is not flow-dependent exists in the reach, that portion of reach length upstream of the barrier will be weighted by one-fourth; flow in an inaccessible reach has value to downstream fish populations.

The qualitative ratings of watershed condition are:

- 1- heavily urbanized;
- 2- heavy suburban;
- 3- light suburban;
- 4- rural agriculture; and
- 5- rural forest.

Channel condition ratings should be made by a fish habitat biologist familiar with the stream reach. Where existing methodologies or protocols for this are in use, these may be assessed and used as appropriate. In the case of Issaquah Creek, several different reaches would cover heavy suburban, light suburban, rural agriculture, and rural forest. A long reach with clean gravel, off-channel habitat, floodplain connectivity, healthy riparian vegetation, and abundant forest cover would score high. The channel condition ratings are based on desirable attributes, including off-channel habitat, floodplain connectivity, riparian condition, cover and substrate condition (clean gravel) and are:

- 1- poor;
- 2- fair;
- 3- good; and
- 4- excellent.

Hydrology

Stream reaches that have been depleted either by water withdrawal or diversion or as a result of impervious surfaces are good hydrologic candidates for flow restoration or augmentation. Although functional stream ecosystems require natural hydrology, with seasonal high flows and peak flows as well as low flows, ranking in this case is, again, directed at low flow enhancement needs. In the Puget Sound region, the low flow season also coincides with the period of high water use demand. Percent flow depletion is the hydrology index of interest for low flow enhancement need.

The hydrology score is an indicator of how much the hydrology has been modified by human activities, either directly or through landscape modification (e.g., impervious surface). If the hydrology is largely unmodified from natural, then flow restoration or enhancement may not be needed. Low flows are known to be a limiting factor for stream rearing salmonids in lowlands of

western Washington and they can also affect spawning and passage of early fall returning adults. For this reason, an estimate of natural September mean flow is used as a reference. Although median may be a better indicator of “typical” flows for the period, mean is much easier to determine for ungaged streams. September flow is usually the lowest monthly mean in the year; it overlaps with summer rearing and the beginning of fall spawning migration; and is a good indicator of low flow conditions in a stream.

The hydrology score is expressed as the percent reduction of flow from the natural mean September flow. The percent reduction in flow can be derived from a.) an estimate of the “degree of depletion” compared to the natural mean September flow or b.) from a comparison of the recent 10 year mean September flow to the natural mean September flow.

The “degree of depletion” can be derived from either the sum of water use (based on estimated use or derived from water rights), or from estimates of depletion resulting from impervious surfaces or other landscape modifications. The sum of water use can provide for a fairly straightforward estimate of flow depletion. And, although absolute estimates of water use can differ with the method used to derive them, comparisons within a basin using the same methodology will be relative and valid for developing a hydrology score. Flow depletion from impervious surfaces can be estimated using a comparison of the mean post development September flow to mean September flows for an appropriate predevelopment period (accounting for variables such as changing climate patterns, etc.). Whether one, the other, or a combination (with precautions against double counting) of methods for calculating the hydrology score is used depends on the conditions and availability of data in the watershed of interest. In watersheds where data to perform the above calculations are not available, alternative methods or models should be explored.

Flow and Passage

Fish passage may be impaired or blocked by low flow (too shallow or dry all the way across the channel), by structures (dams, culverts, etc.), by water quality (which may be flow-related), or by natural features (waterfalls, naturally losing reaches, or, rarely, log jams). Improvement of fish passage blockages resulting from low flow are a priority for flow enhancement. On the other hand, other types of blockages may diminish the value of flow restoration by reducing the reach length where benefits would accrue and should be considered.

When low flows impair passage they affect fish use of all upstream habitat, including some reaches upstream from the reach in question; affected stream length may exceed the length of the reach as used in Habitat value (above). Degree of passage impairment may vary from minor to total and has a temporal component; this is a subjective judgment that must be made by a fish biologist familiar with the stream reach in question. The passage score is a product of the length (including tributaries) affected by the low flow passage block, the number of months during which passage is impaired (when fish would naturally migrate), and the degree of blockage (total blockage - 3, major blockage - 2, minor blockage - 1, no blockage - 0).

Reach Scores and Ranking

Four independent numeric scores will result for the categories (fish, habitat, hydrology, and flow passage) for each reach. Two (habitat and passage) are open-ended, with upper bounds dependent on stream length; larger values will occur in larger watersheds, but overlap will occur. We propose ranking each category for each reach as high, medium or low relative to the same category for other streams in the WRIA. This means that the numerical top 1/3 of scores for a category in the WRIA would be designated as high (H), the middle 1/3 as medium (M), and the lowest 1/3 as low (L). This will result in four score designations (one for each category) for each reach. Because of the disparate nature of the four categories quantitative or additive scoring is not appropriate between them. Certainly, as many ranks may be developed as there are combinations. However, we propose a four tiered ranking output (and associated recommendations for reaches with that rank) as per the following table:

Reach Score Groups*	Rank	Recommendation
H,H,H,H	I	Highest likelihood of benefit to salmonids
H,H,H,M or H,H,M,M	II	High likelihood of benefit to salmonids
H,M,M,M or M,M,M,M	III	Good to fair likelihood of benefit to salmonids
Any with low (L) score	IV	Lowest likelihood of benefit to salmonids

* No ordering of categories is intended within reach score groups. For example, for “H,M,M,M” the “H” score can be from any one of the four categories.

As previously discussed, stream rankings from this first stage are intended to inform the second stage of the process. As discussed also, that second stage will apply local knowledge, needs, goals, opportunity, and other considerations and values to prioritize ranked streams or reaches for flow enhancement action.