



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

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To: Carl Schroeder, Association of Washington Cities
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From: Justin Zweifel, WDFW Fish Passage Inventory and Assessment Unit Supervisor

Date: June 30, 2015

Subject: Final Report of City Fish Passage Inventory in Puget Sound, 2013 - 2015

We are pleased to provide the 2013 - 2015 Fish Passage City Inventory Final Report. This inventory and assessment effort began in June 2012 and continued through June 2015. We have provided progress reports during this period and this report provides the results for the inventory and assessment of road crossings in 47 Puget Sound cities between June 2012 and June 2015.

Detailed electronic reports were produced as a result of the inventory and assessment surveys. These will be provided to the Cities once our review for completeness and accuracy is completed in July.

We appreciate the opportunity to serve you and your partners and are available to continue to provide expert services in this field.

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Puget Sound Cities Fish Passage Inventory Final Report for

July 1, 2013 through June 30, 2015



In partnership with the Association of Washington Cities (AWC) and the Washington State Department of Transportation's Highways and Local Programs (HLP), the Washington Department of Fish and Wildlife (WDFW) inventoried, assessed, and prioritized fish passage barriers in anadromous waters associated with city streets in the Puget Sound region. The Puget Sound region is defined as watersheds that drain into the Puget Sound, Hood Canal, and Strait of Juan de Fuca. The project also included a reassessment and update of available city inventory data. The inventories and associated habitat surveys were conducted utilizing methods described in WDFW's Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual (WDFW 2009). This final report summarizes the results of the Puget Sound Cities Fish Passage Inventory work completed between June 1, 2012 and June 30, 2015. Detailed Fish Passage and Diversion Screening Inventory (FPDSI) database reports and Priority Index (PI) values will be provided directly to each city in Table 1.

METHODS

WDFW, HLP, and AWC selected cities within priority Puget Sound watersheds to conduct fish passage inventory and habitat assessment work. Inventory and assessment work was completed in four time phases, determined by the identification of high priority watersheds, coordination of other ongoing surveys, and available funding. Selected cities were contacted by phone and letter to inform them of the fish passage work that would occur in their city.

To prepare for inventory field work, maps were created that included city boundaries, stream crossings, road names, and existing FPDSI database records. WDFW field crews drove to all mapped anadromous stream crossings within the incorporated city boundaries to document, photograph, and take the necessary measurements to evaluate road crossings using the methodology described in the WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual (WDFW 2009). WDFW crews also visited previously inventoried road crossings to verify and update existing data in FPDSI, when necessary. Any unmapped anadromous stream crossings that were encountered while working within the incorporated city boundaries were also documented and evaluated.

Using a strategic approach, WDFW conducted stream habitat assessments on high priority streams to calculate PI values that may be used to prioritize city road crossings for future fish

passage barrier correction. This inventory was focused on anadromous streams and therefore required field crews to verify anadromous access prior to conducting upstream habitat surveys. The field crews documented any natural barriers that preclude upstream migration, such as waterfalls and high-gradient stream sections. If anadromous access was verified, the field crews took measurements of the quality and quantity of potential fish habitat and documented additional barriers within the stream.

DATA SUMMARY

Between June 1, 2012 and June 30, 2015, 722 newly inventoried crossings and 458 reassessed crossings were evaluated in 47 cities for a total of 1,180 fish passage barrier assessments on city roads. Five additional cities were determined to have no road crossings on anadromous streams. Of the 1,180 evaluated road crossings, 589 were determined to be fish passage barriers; 464 of the 589 fish passage barriers are barriers to anadromous salmon and steelhead. Stream habitat assessments for barrier prioritization were completed for 106 fish passage barriers. Table 1 summarizes the results of the road crossings inventoried for each city.

Some city road crossings were difficult to evaluate due to complex hydraulic conditions. Common examples include culverts that are several blocks long, culverts that are tied into stormwater or sewer systems, and culverts with an internal grade break. Other complex hydrologic field conditions included tidal influence, wetlands, or tributaries located immediately downstream of the road crossing that preclude Level B analysis. At these sites, barrier status is unknown and may require engineering review.

The following is a list of the descriptions of the contents in Table 1:

- **Newly Inventoried Crossings:** These crossings were newly inventoried by WDFW and were entered into FPDSI during the contract period (June 1, 2012 – June 30, 2015).
- **Reassessed Crossings:** These crossings were already included in FPDSI, due to an earlier assessment, and were updated in FPDSI during the contract period.
- **Fish Passage Barriers Assessed During Contract:** These crossings block passage to resident or anadromous salmonids and were assessed during the contract period.
- **Fish Passage Barriers Total:** These are all sites in FPDSI that block passage to resident or anadromous salmonids.
- **Salmon & Steelhead Barriers Assessed During Contract:** These are fish passage barriers assessed during the contract period that inhibit access to at least one of the following species with an anadromous life history: chum salmon (*Oncorhynchus keta*), pink salmon (*O.*

gorbuscha), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chinook salmon (*O. tshawytscha*), or steelhead trout (*O. mykiss*).

- **Salmon & Steelhead Barriers Total:** These are all sites in FPDSI that inhibit access to at least one of the following species with an anadromous life history: chum salmon (*Oncorhynchus keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chinook salmon (*O. tshawytscha*), or steelhead trout (*O. mykiss*).
- **Unknown Barrier Status Assessed During Contract:** These are sites assessed during the contract period where complex hydrological conditions exist and standard protocols could not determine passability. Examples of this include wetland to wetland culverts or tidally influenced culverts.
- **Unknown Barrier Status Total:** These are all sites in FPDSI where complex hydrological conditions exist and standard protocols could not determine passability. Examples of this include wetland to wetland culverts or tidally influenced culverts.
- **Salmon & Steelhead Barriers Prioritized During Contract:** These sites were prioritized during the contract period using the habitat assessment protocols outlined in the WDFW publication “*Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual*” (WDFW 2009) and they inhibit access to at least one of the following species with an anadromous life history: chum salmon (*Oncorhynchus keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chinook salmon (*O. tshawytscha*), or steelhead trout (*O. mykiss*).
- **Salmon & Steelhead Barriers Prioritized Total:** Total sites in FPDSI that have been prioritized using the habitat assessment protocols outlined in the WDFW publication “*Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual*” (WDFW 2009) and inhibit access to at least one of the following species with an anadromous life history: chum salmon (*Oncorhynchus keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chinook salmon (*O. tshawytscha*), or steelhead trout (*O. mykiss*).
- **Man-made Fish-Bearing Sites:** Total sites in FPDSI that are in fish bearing streams as determined by at least one of the following methods: average scour line width greater than 2 feet in Western Washington, streams identified as fish habitat (Type “F”) by Washington State Department of Natural Resources (DNR), documented salmonid use, or listed as fish bearing in *SalmonScape* (<http://wdfw.wa.gov/mapping/salmonscape/>).

Table 1. Puget Sound Cities Fish Passage Inventory: June 1, 2012 – June 30, 2015

City	Newly Invented Crossings ¹	Reassessed Crossings	Fish Passage Barriers Assessed During Contract	Fish Passage Barriers Total	Salmon & Steelhead Barriers Assessed During Contract	Salmon & Steelhead Barriers Total	Unknown Barrier Status Assessed During Contract ²	Unknown Barrier Status Total ²	Salmon & Steelhead Barriers Prioritized During Contract	Salmon & Steelhead Barriers Prioritized Total	Man-made Fish-bearing Sites
Phase I											
WRIA 7 - Snohomish											
Duvall	7	15	15	15	14	14	1	1	5	14	22
Gold Bar*				1		1		1			6
Issaquah	28	16	22	22	18	18	1	1	12	14	46
Sammamish	42		15	15	9	9	9	9	9	9	35
Skykomish*											
Snohomish	21		14	14	14	14	2	2	14	14	20
WRIA 12 - Chambers/Clover											
DuPont	5		3	3	3	3	1	1	2	2	5
Fircrest	3		2	2	2	2			2	2	3
Lakewood	9	2	1	1	1	1	1	1			10
Ruston	1		1	1	1	1					1
Stellacoom	10		6	6	6	6	1	1	6	6	8
University Place	6	1	3	3	3	3			3	3	7
Phase II											
WRIA 3 - Lower Skagit											
Burlington	5	4	3	3			5	6			10
Hamilton	1	2					2	2			3
La Conner*											
Mount Vernon	35	33	17	17	16	16	14	14	14	14	53
Sedro Woolley	4	9	2	2	1	1	4	4			14
WRIA 10 - Puyallup/White											
Bonney Lake	1						1	1			1
Buckley		3	2	3	2	3					4
Enumclaw	24		1	1			11	11			22

City	Newly Invented Crossings ¹	Reassessed Crossings	Fish Passage Barriers Assessed During Contract	Fish Passage Barriers Total	Steelhead & Salmon Barriers Assessed During Contract	Steelhead & Salmon Barriers Total	Unknown Barrier Status Assessed During Contract ²	Unknown Barrier Status Total ²	Steelhead & Salmon Barriers Prioritized During Contract	Steelhead & Salmon Barriers Prioritized Total	Man-made Fish-Bearing Sites
WRIA 10 - Puyallup/White											
Orting*											
Puyallup	26	41	37	39	32	33	8	8	28	28	63
Wilkeson	1	5	4	4	4	4				3	6
Phase III											
WRIA 1 - Nooksack											
Bellingham	42	89	79	80	56	56	17	17	3	18	133
Everson	1										1
Ferndale	8	7	6	6	3	3	4	4		1	14
Sumas		1									5
WRIA 3 - Lower Skagit											
Arlington	26	4	7	7	6	6	6	6			30
Marysville	14	51	32	33	32	33	12	14		4	62
Stanwood	5	1	4	4	4	4	1	1			6
WRIA 7 - Snohomish											
Everett	28	7	20	26	6	10	11	11		8	50
Granite Falls	4		4	4	2	2	1	1			5
Lake Stevens	23	1	11	11	9	9	6	6			28
WRIA 15 - Kitsap											
Bremerton	7	8	13	18	12	17			3	9	22
Gig Harbor	20	4	14	14	4	4	7	8			24
Port Orchard	5	18	22	22	18	18	1	1		18	23
Phase IV											
WRIA 1 - Nooksack											
Lynden		5	3	7	3	6		2	2	2	13
WRIA 3 - Lower Skagit											
Anacortes	15	3	10	10	9	9	4	4		1	18

City	Newly Inventoried Crossings ¹	Reassessed Crossings	Fish Passage Barriers Assessed During Contract	Fish Passage Barriers Total	Salmon & Steelhead Barriers Assessed During Contract	Salmon & Steelhead Barriers Total	Unknown Barrier Status Assessed During Contract ²	Unknown Barrier Status Total ²	Salmon & Steelhead Barriers Prioritized During Contract	Salmon & Steelhead Barriers Prioritized Total	Man-made Fish-Bearing Sites
WRIA 8 - Cedar/Sammamish											
Mercer Island	37		29	29	24	24	6	6			37
WRIA 11 - Nisqually											
Eatonville	8		4	4	2	2	1	1			8
Roy	2										2
Yelm	4		3	3	2	2					7
WRIA 12 - Chambers/Clover											
Tacoma**	56	2	27	29	27	28	23	23	3		62
WRIA 13 - Deschutes											
Lacey		6	1	1	1	1	4	5			7
Olympia	20	39	26	29	23	26	20	20			66
Rainier*											
Turnwater	25	15	20	21	20	20	10	10			41
WRIA 14 - Kennedy/Goldsborough											
Shelton	6	11	2	2	1	1	12	12			16
WRIA 15 - Kitsap											
Bainbridge Island	47	36	57	63	28	31	12	13			86
Poulsbo	10	1	4	5	3	4	1	2			14
WRIA 17 - Quilcene/Snow											
Sequim	56	5	23	23	23	23	13	13			61
WRIA 18 - Elwha/Dungeness											
Port Angeles	24	10	20	20	20	20	5	5			34
Totals	722	458	589	623	464	488	238	248	106	210	1214

¹ Some of the newly inventoried crossings were determined to be non fish-bearing.

² Barriers with unknown status represent complex hydrological conditions where Level A analysis cannot determine fish passage. Level B assessment can frequently model conditions at these sites and determine passability. These sites with unknown status represent a portion of the population that are either waiting for data analysis or are too complex for Level B analysis (wetland to wetland culverts, tidal culverts).

* Inventories in the cities of Goldbar, Skykomish, La Conner, Orting, and Rainier were conducted however no culverts were identified in anadromous streams within their incorporated urban growth area (UGA).

** Inventory field efforts have been completed for the City of Tacoma, however data entry was not completed by June 30, 2015.

Detailed FPDSI database reports and PI values will be provided directly to each city in Table 1.

REFERENCE

Washington Department of Fish and Wildlife. 2009. Fish Passage and Surface Water Diversion Screening Assessment and Prioritization Manual. Washington Department of Fish and Wildlife. Olympia, Washington.