Washington State
Department of Fish and Wildlife

WSDOT FISH PASSAGE INVENTORY

Progress Performance Report

May 2007

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and
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Washington State
Department of Transportation

Washington State Department of Fish and Wildlife

HABITAT PROGRAM
TECHNICAL APPLICATIONS DIVISION

Progress Performance Report
For
WSDOT Fish Passage Inventory

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FISH PASSAGE BARRIER REMOVAL PROGRAM

This report is also available in a pdf format at: http://www.wsdot.wa.gov/environment/fishpass/state_highways.htm .
Additional data can be obtained by contacting Fish and Wildlife Biologist, Eva Wilder, e-mail wildeelw@dfw, phone: (360) 902-2411.

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Introduction

Restoration of declining salmon and trout populations ranks high in the development of management plans for streams, lakes, and wetlands in Washington State. One of the major problems facing salmon and trout populations is an inability to utilize their historic rearing and spawning grounds due to fish passage barriers that block access to upstream habitat. Realizing this, the Washington Department of Fish and Wildlife (WDFW) and the Washington Department of Transportation (WSDOT) have worked cooperatively since 1991 to inventory and correct fish barriers at state highway crossings.

Prior to 1991, WSDOT addressed the correction of fish passage barriers as required by hydraulics permits issued for highway construction and maintenance projects. In 1991, in cooperation with the Washington State Legislative Transportation Committee, WSDOT committed funding from its Highway Construction Program to develop an inventory of fish passage barriers to anadromous fish species at state highway crossings. WSDOT contracted with Washington Department of Fisheries (prior to the merger of Washington Departments of Fisheries and Wildlife) to conduct the inventory and habitat studies necessary to prioritize state route barriers for correction. Since 1991, WSDOT has spent over $45.5 million to inventory, conduct habitat studies, prioritize, and correct fish passage barriers in Washington streams. As a result of those combined efforts, access to over 1,779,549* square meters of salmonid habitat, or, over 772 linear kilometers (480 miles) once blocked by fish passage barriers has been restored.

This report summarizes fish passage inventory updates, fish passage reviews for upcoming WSDOT road projects and the WSDOT barrier correction plan. This report examines WSDOT barrier corrections completed in 2006, long-term scoping and planning for future barrier corrections, and fish use evaluations of planned and completed fish passage barrier projects.

Fish Passage Inventory

Prior to the merger of Washington departments of Fisheries and Wildlife in 1994, the WSDOT culvert inventory was salmon-centric; fish passage barrier assessments were conducted up to 7% stream gradient, which marked the upper limit of salmon habitat. Stream crossings located upstream of the point where the stream gradient exceeded the 7% gradient were not inventoried. Subsequent to the merger, fish passage barrier inventories were expanded. The first gradient changes were implemented in July 1995. Following these changes, all culvert evaluations and physical surveys were done for WSDOT stream crossings up to 12% gradient criteria (salmon and steelhead only). In February 1998, WDFW modified the gradient criteria from 12 to 20% to include resident fish and to adhere to the current forest practice rules. Under the new criteria, all fish bearing stream crossings (including drainage ditches) were to be assessed. These gradient changes occurred about midway in the comprehensive inventory of all state highway stream crossings. In 1998, the WSDOT contracted with the WDFW to commence an expanded inventory of barrier crossings using the current fish passage criteria (*WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* 1998, revised 2000).

* The amount of habitat once blocked by barriers was obtained by measuring the habitat during full physical surveys and by estimating it using the Geographic Information System (GIS) software.

To date, the expanded inventory has been completed on 10,140 kilometers (6,300 miles) of state routes, or 87% of the total WSDOT highway system. Figure 1 shows the progress of the expanded inventory in Washington State.

The results and estimates for the expanded WSDOT fish passage inventory are shown in Table 1.
The top row includes data collected to date for the fish passage inventory of 10,140 kilometers (6,300 miles) of WSDOT highways, since the start of the expanded inventory in 1998. The bottom row estimates the number of fish barriers for the entire 11,582 kilometers (7,197 miles) of WSDOT road system based on fish passage inventory results to date. The estimates were based on the reinventoried Watershed Resource Inventory Areas (WRIAs). The average number of barriers per mile of highway in the inventoried WRIAs was calculated and applied to the WRIAs that have yet to be inventoried. The estimates were performed separately for eastern and western Washington to account for regional differences in stream characteristics and density. In the past, the estimates for eastern WRIAs have varied due to a small sample size.

Table 1. Estimated Number of Fish Bearing Crossings and Barrier Crossings Requiring Fish Passage Repair Based on the WSDOT Expanded Fish Passage Inventory.

Source	Fish-bearing Stream Crossings	Fish Passage Barriers	Barriers with Significant Habitat Gain	Barriers with Limited Habitat Gain[1]	Barriers with Habitat Threshold Gain Not Determined	Barriers Fixed[2]
WDFW 2007 Fish Passage and Diversion Screening Inventory Database	3,142	1,676	1,266	363	47	205
Extrapolated[3] data Total	3,238	1,758	1,328	382	48	

[1] Barriers that do not meet current WDFW threshold habitat gain criteria to justify correction using dedicated funding until higher priority barriers are corrected.
[2] Two hundred and five WSDOT fish passage barriers have been reported as replaced or retrofitted for fish passage; however, 45 of those require additional work to meet current fish passage criteria (See Tables 3 and 4).
[3] Estimated statewide numbers based upon inventories conducted through March 2007.

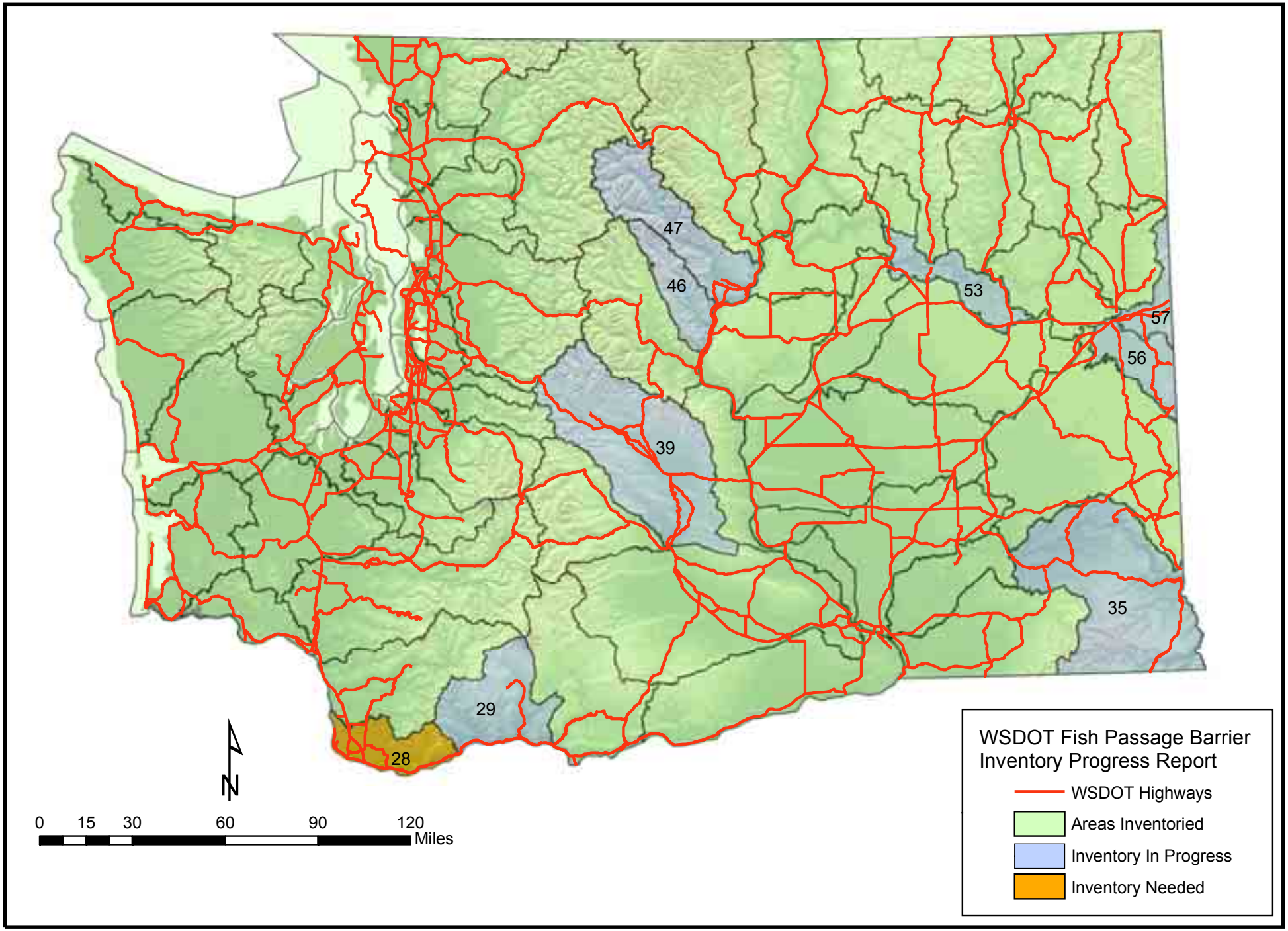

Figure 1. WRIAs inventoried during the Expanded Fish Passage Barrier Inventory since 1998.

Fish Passage Inventory Updates

During the ongoing WSDOT inventory, 6,210 crossings in natural drainages have been inspected; 3,142 have been identified as fish bearing. Approximately 53% (1,676) of the examined fish bearing crossings were identified as barriers (Table 1). Additionally, 322 crossings require further analysis to determine fish passage barrier status. Seventy-five percent of known barriers (1,266) have a significant habitat gain (at least 200 m) and will be prioritized for near-term correction using dedicated fish passage barrier correction funds, while 363 barriers with limited habitat gain (less than 200 m) will be considered for correction once the high priority barriers are corrected, or they may be corrected during road maintenance or Safety and Mobility projects. Another 47 fish passage barrier crossings are scheduled for verification of significant habitat gain. A complete list of all the WSDOT-owned fish passage barriers is included in Appendix I.

A habitat assessment is conducted for all identified WSDOT fish passage barriers to prioritize them for fish passage restoration. Three methods of habitat assessment have been used; Full Physical Surveys (FS), Threshold Determinations (TD), and Expanded Threshold Determinations (ETD), per the *WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (August 2000, located on the Internet at: http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm). The Full Physical Survey and ETD are used to qualify and quantify habitat, while the TD verifies the existence of a significant reach of habitat without a gradient or a natural barrier either downstream or upstream of a fish passage barrier crossing. To expedite the prioritization process, all habitat assessments since 2005 have been performed using a Reduced Sampling Full Physical Survey (RSFS). The only difference between the FS and the RSFS is the number of samples collected per stream reach. Only one sample per reach is taken during a RSFS regardless of the reach length, provided that the habitat characteristics remain unchanged throughout the reach.

Regional Statistics

WSDOT has six geographic management regions: Northwest, North Central, Olympic, Southwest, South Central, and Eastern (See Figure 2). Within the geographical area of the Northwest Region, WSDOT also has the Urban Corridors Office (UCO) that develops, designs, and delivers a multi-billion dollar program of Seattle area projects. Barrier culverts identified for UCO projects are not listed separately, but are included within the Northwest region inventory. In the past, the re-inventory process has been focused on the western part of the state; over 94% of western Washington has been reinventoried using the updated barrier assessment protocols (See Figure 1 and Table 2). Inventories in the last year were primarily concentrated in eastern Washington; to date 83% of the eastern part of the state has been reinventoried.

Table 2. Fish barrier assessment in six WSDOT regional management areas.

WSDOT Region	% Re-inventoried	Fish-bearing Crossings	Fish Passage Barriers	Barriers with Significant Habitat Gain	Barriers with Limited Habitat Gain[1]	Barriers with Habitat Threshold Gain Not Determined	Crossings Repaired[2]
Northwest	100	946	509	350	134	25	96
North Central	88	183	100	75	21	4	13
Olympic	100	926	566	430	127	9	61
Southwest	80	662	315	246	64	5	22
South Central	86	136	37	29	5	3	4
Eastern	80	289	149	136	12	1	9
Total	87	**3,142**	**1,676**	**1,266**	**363**	**47**	**205**

[1] Barriers that do not meet WDFW current, 200 m, threshold habitat gain criteria to justify correction using dedicated funding until higher priority barriers are corrected.

[2] Two hundred and five WSDOT fish passage barriers have been replaced or retrofitted, however, 45 of those require additional work to meet current fish passage criteria (See Tables 3 and 4).

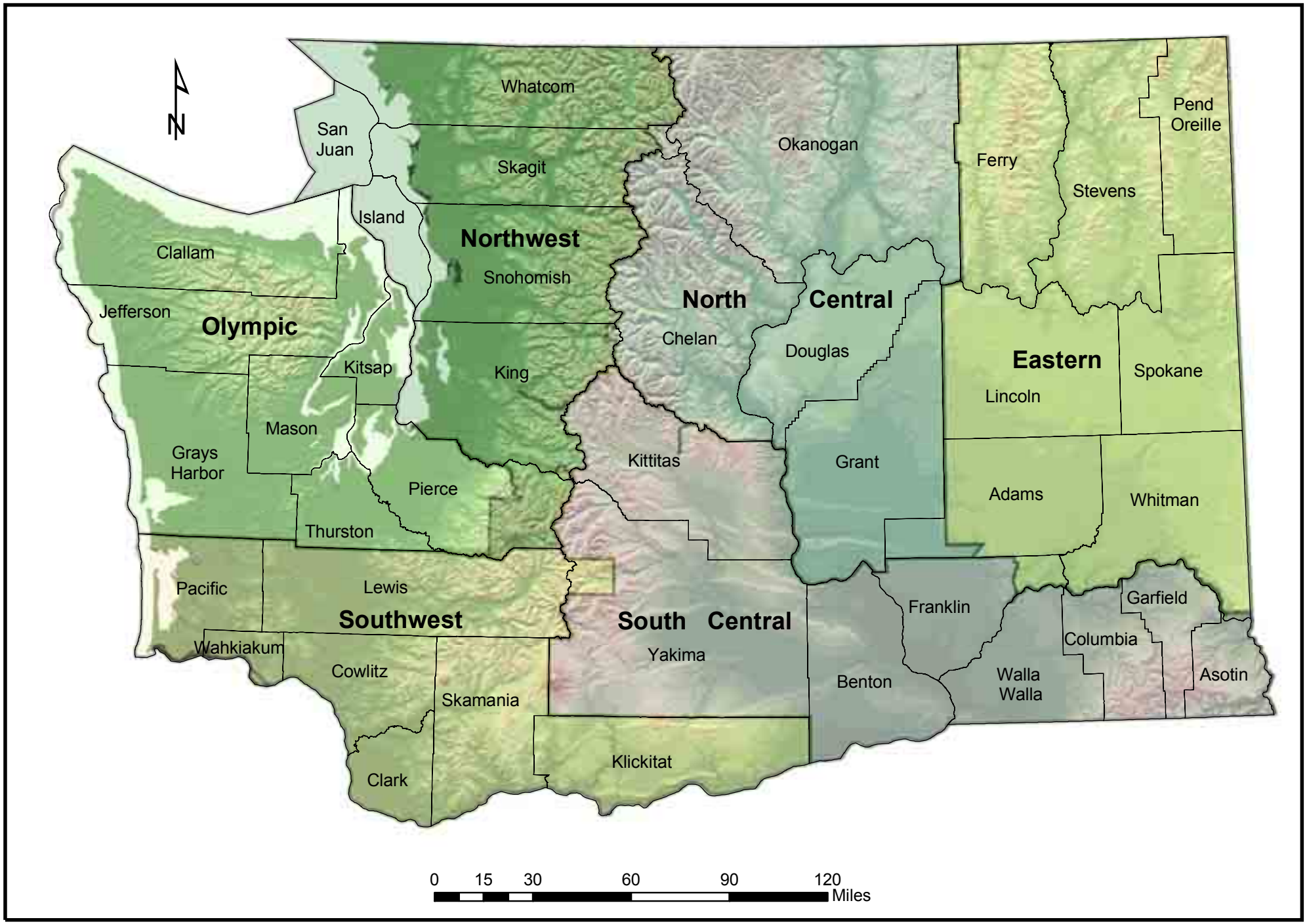

Figure 2. WSDOT Regions.

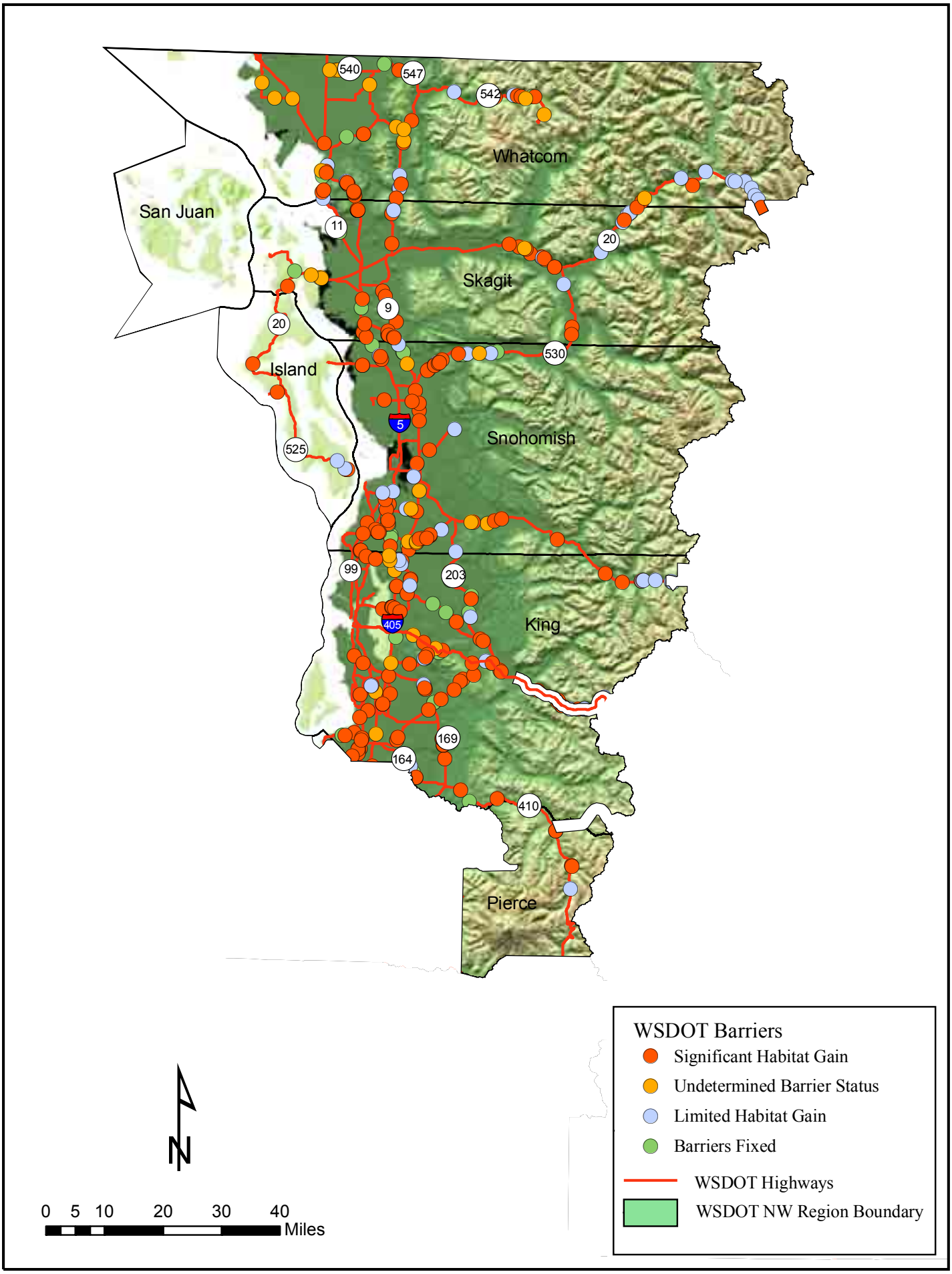

Figure 3. Northwest Region Fish Passage Barriers, March 2007.

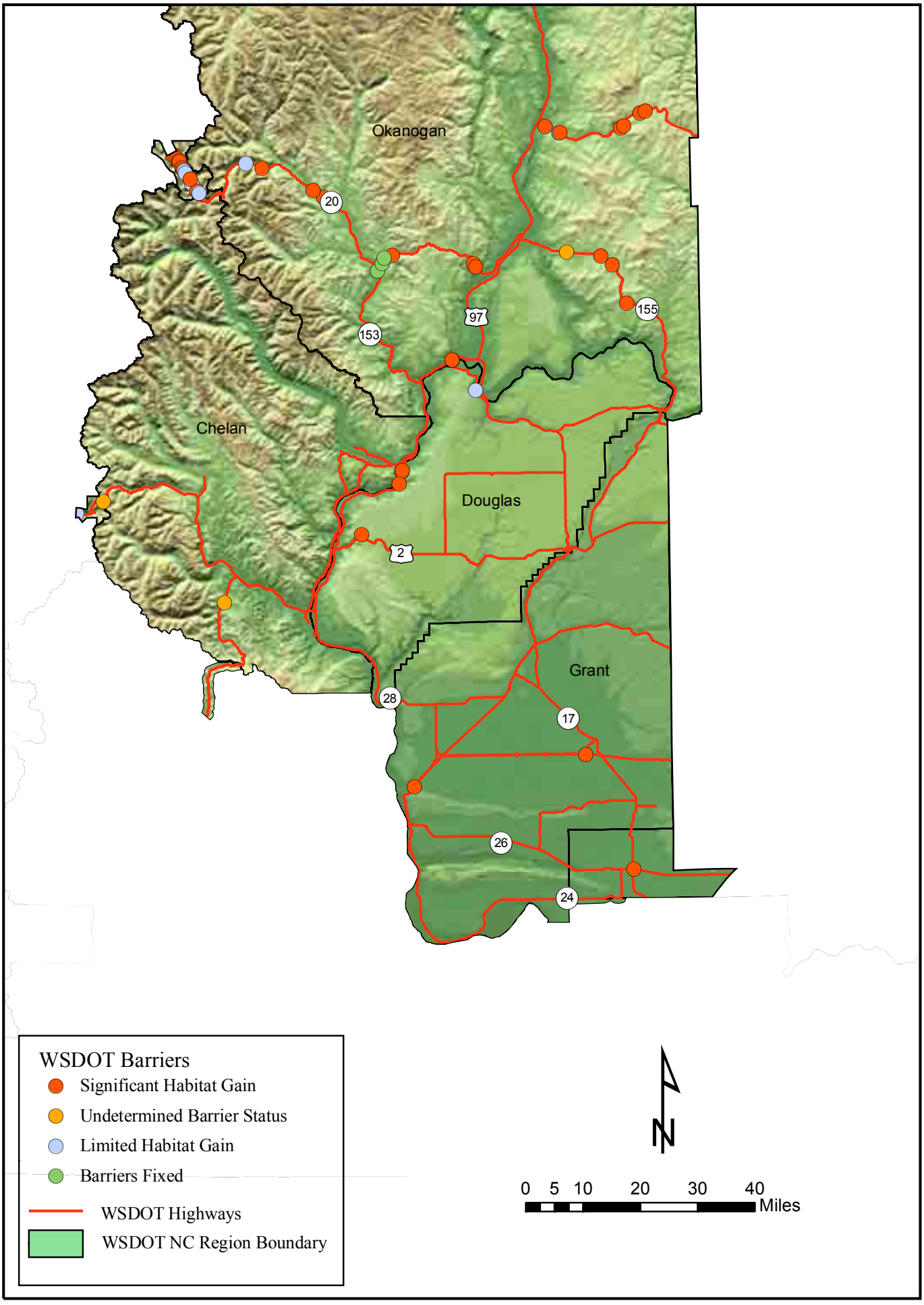

Figure 4. North Central Region Fish Passage Barriers, March 2007.

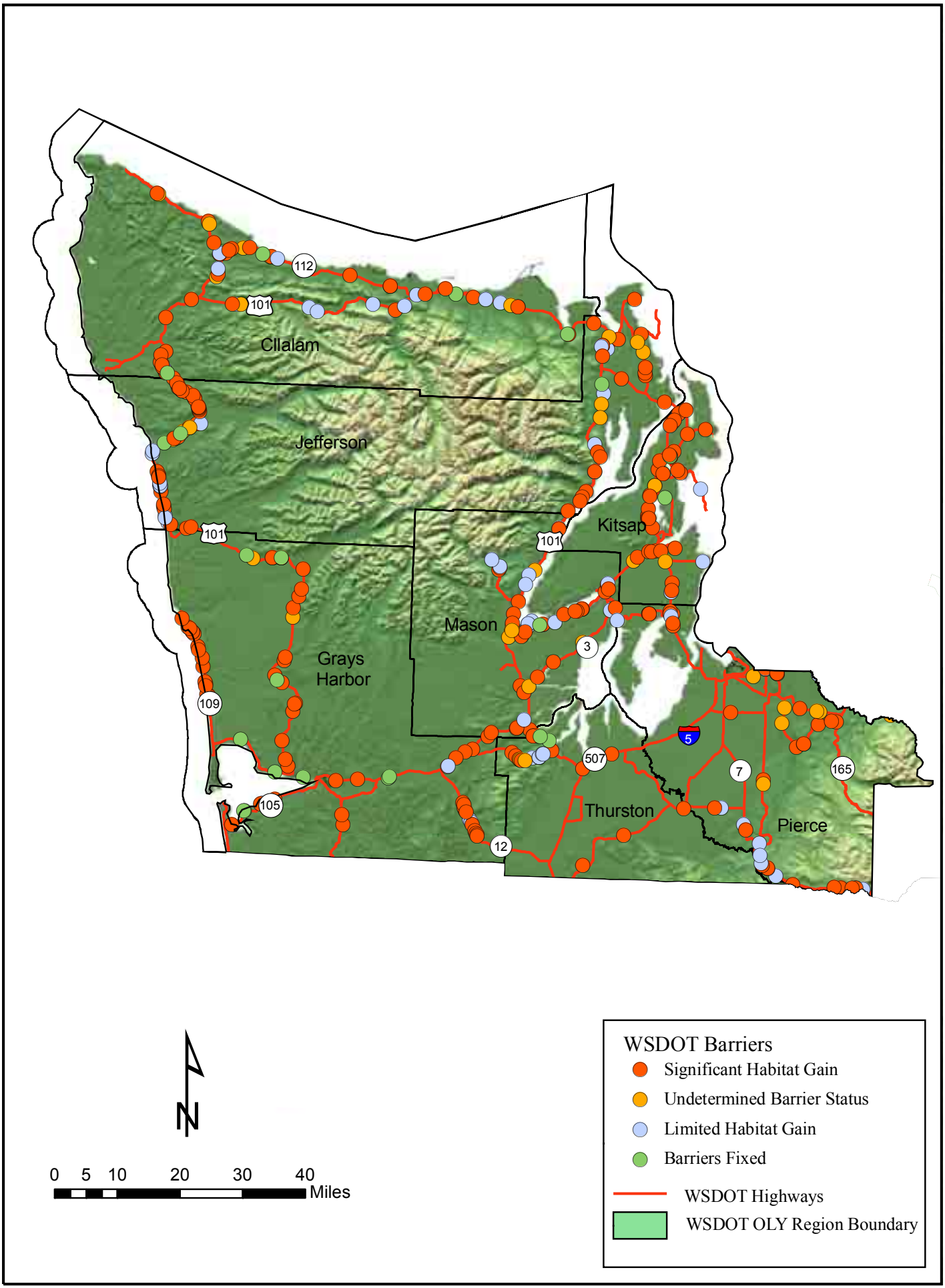

Figure 5. Olympic Region Fish Passage Barriers, March 2007.

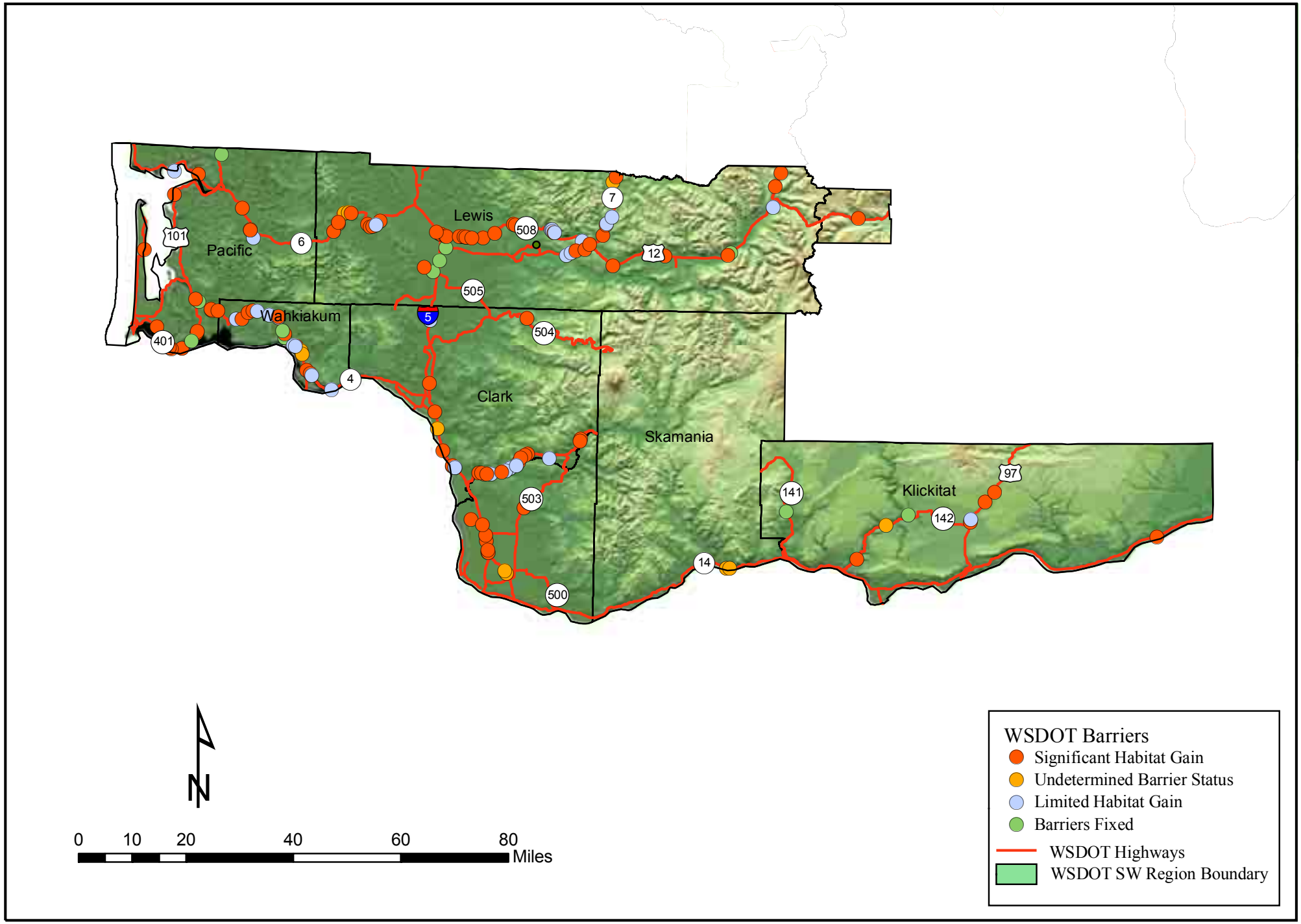

Figure 6. Southwest Region Fish Passage Barriers, March 2007.

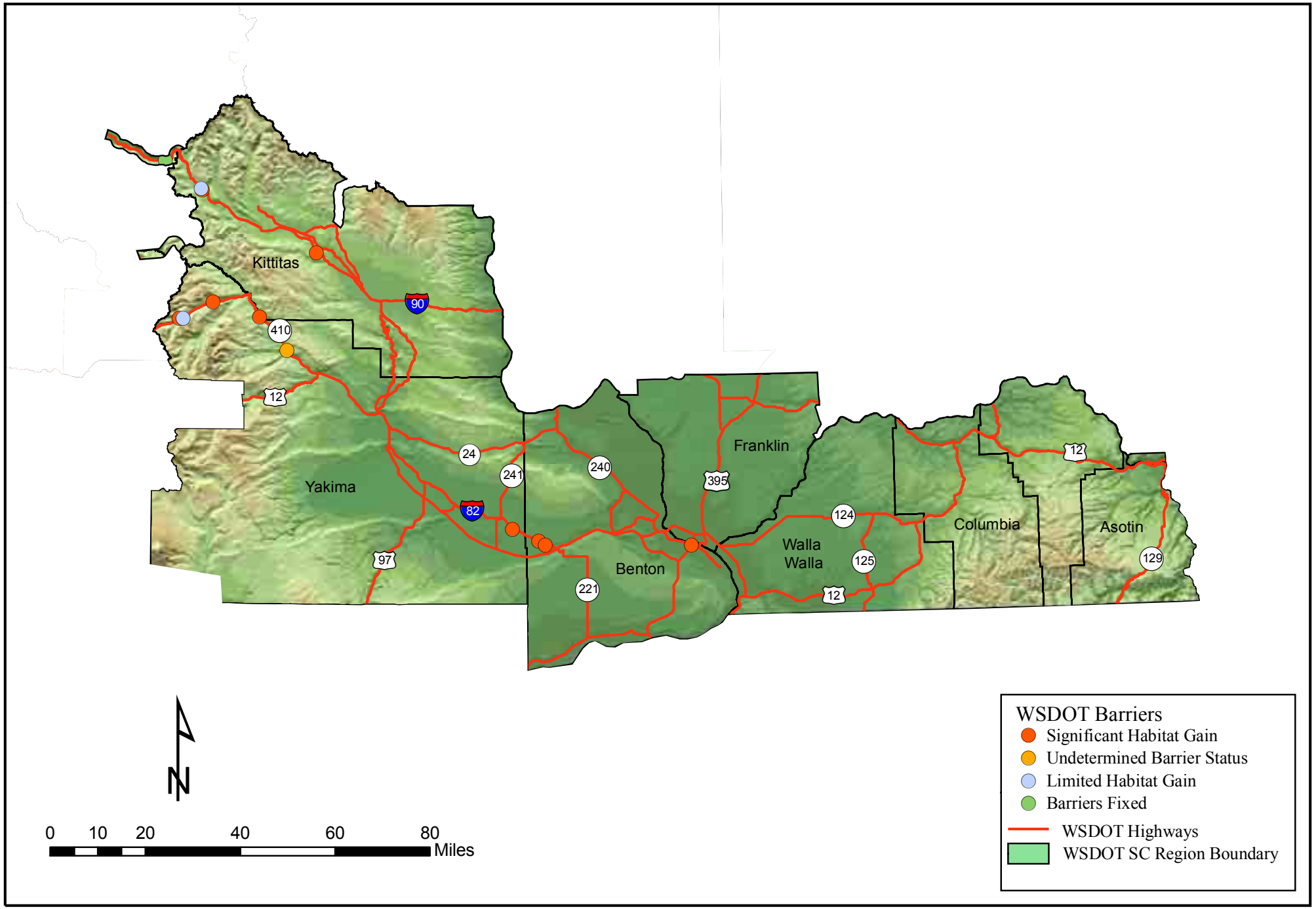

Figure 7. South Central Region Fish Passage Barriers, March 2007.

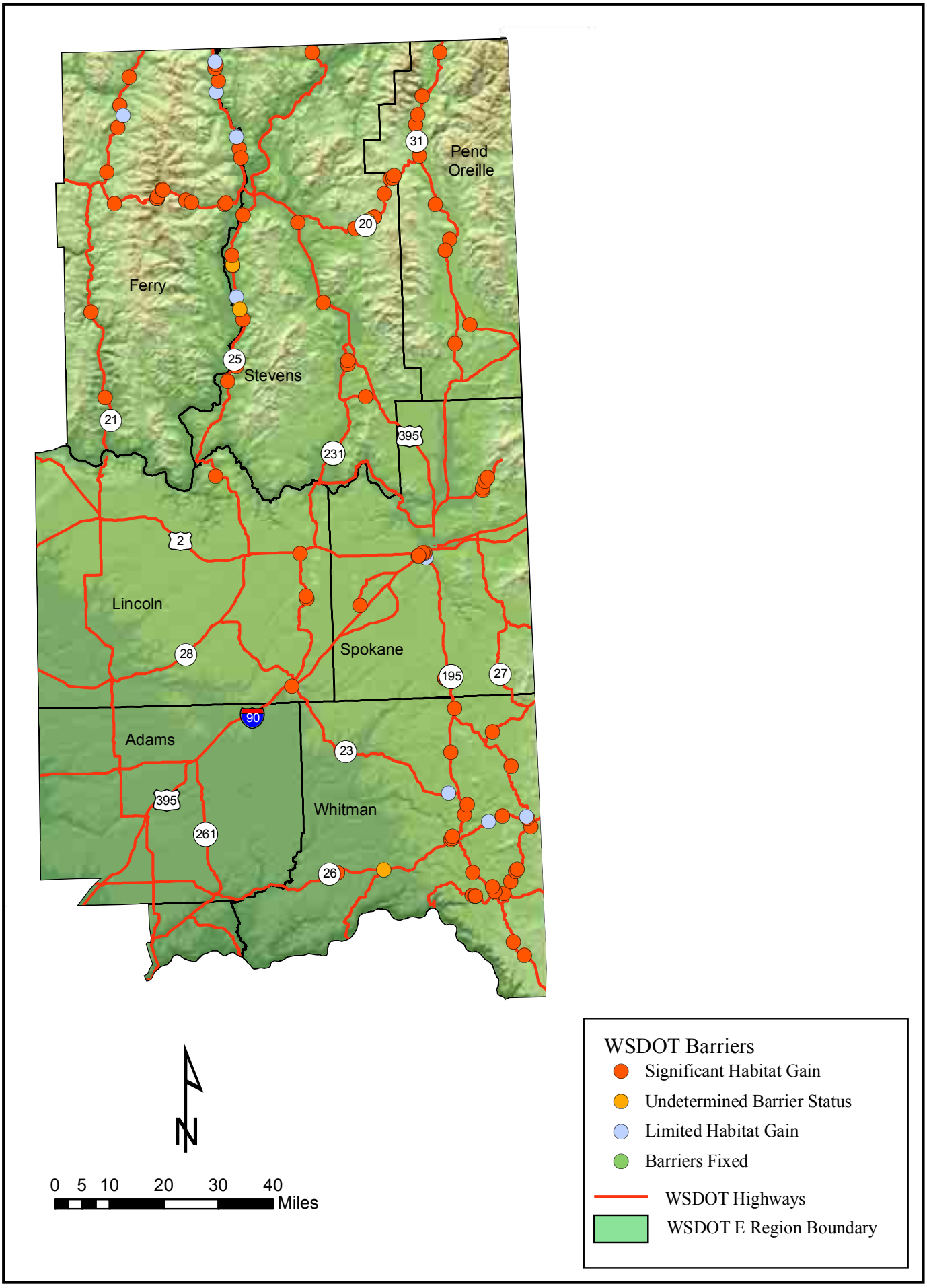

Figure 8. Eastern Region Fish Passage Barriers, March 2007.

WSDOT Fish Passage Barrier Correction Plan

WSDOT uses a three-pronged approach to correct fish passage barriers. First, each biennium ,the Legislature appropriates funds for stand-alone correction projects to address some of the highest priority barriers. These "dedicated correction" projects are part of the WSDOT Environmental Retrofit Program (I4). Second, when WSDOT plans a highway safety or mobility project, it reviews the project area for barrier correction opportunities. If it will require a Hydraulic Project Approval (HPA), all associated barriers will be corrected as part the highway construction project. If no HPA is required, WSDOT evaluates whether barriers within the project boundary can be corrected more efficiently as part of the highway project. Combining fish passage restoration with road project construction decreases costs by eliminating duplication in mobilization. And third, some fish passage barriers are corrected as a result of routine maintenance on failing culverts. Generally, however, corrections completed through maintenance are small-scale repair projects and do not typically include a full culvert replacement.

This approach to fish passage barrier correction does not assume habitat will immediately be used by targeted salmonids. Although in some cases salmon will start utilizing stream reaches previously blocked by barrier culverts almost immediately, many years may be required before newly opened habitat is fully utilized. Fish management decisions, such as supplementation or harvest adjustments, may be needed to jump-start the recolonization of newly accessible habitat. Additional factors, other than the loss of stream habitat caused by fish migration barriers, can affect fish production. Other problems threatening salmonid habitat include non-WSDOT fish passage barriers, stormwater, pollution, surface water diversions, hydropower, and general habitat degradation or loss.

Fish passage problems in Washington are shared among federal, state, tribal, county, city, and private owners. In Washington, WSDOT is responsible for an estimated 11,582 kilometers (7,197 miles) of highways, while counties, for example, are responsible for an estimated 86,904 kilometers (54,000 miles) and cities for an additional 26,055 kilometers (16,190 miles) of roads (Washington State County Road Administration Board). The 1,676 WSDOT-owned fish barriers currently identified during the WSDOT Fish Passage Inventory are estimated to block more than 3,825* linear kilometers (2,377 miles) of potential salmonid habitat. To realize the full potential habitat gain, other non-WSDOT barriers will also need to be corrected.

Stand-Alone Fish Passage Barrier Correction with Dedicated I-4 Funding

Each biennium, through legislative appropriation, dedicated funding within the WSDOT Environmental Retrofit Program (I-4) budget is set aside to provide for a sequential correction of high priority fish passage barriers identified during the WSDOT inventory. Stand-alone fish passage barrier correction projects are prioritized to provide the largest gains in habitat and the greatest production benefits for both anadromous and resident fish species. Among the many factors determining a project's priority are: amount of habitat gained, the degree of passability improvement, species-specific production potential of the gained habitat, benefits or drawbacks

* The amount of habitat blocked by barriers was obtained by measuring the habitat during full physical surveys and by estimating it using the Geographic Information System (GIS) software.

** Washington Department of Fish and Wildlife. 2003. SaSI 2002. Olympia, WA. Available at http://wdfw.wa.gov/fish/sasi/.

from increased mobility to species present, stock status of species present (WDFW Salmonid Stock Inventory, SaSI**), and cost of the project. All the factors are consolidated in a numeric Priority Index (PI) model and contained within the WDFW Fish Passage and Diversion Screening Inventory (FPDSI) Database providing an objective relative priority ranking for each project.

Ten Year Planning Document

At the request of WSDOT, WDFW prepares a prioritized list of fish passage projects to be constructed and evaluated over the next five biennia. The Ten Year Plan (included in Appendix IV) is the result of a process of project evaluation, scoping, development of conceptual designs, and budgeting. The Ten Year Plan is regularly updated as projects are identified, prioritized, scoped, and refined. Project scoping is a multi-phased process that is carried out by WDFW biologists, environmental engineers, and WSDOT headquarters and regional staff.

Fish Passage Project Scoping Process

The first step in the scoping process involves verification of inventory and assessment data and filling in any data gaps. Next, the WDFW biologists confirm completion of inventory work and the prioritization effort for each barrier culvert and verify that habitat conditions and species expected to benefit are correctly reflected in the PI for each barrier. In addition to the PI, other factors for fish passage project selection, such as additional human-made barriers in the watershed, project feasibility, likelihood for success, other restoration efforts in the watershed, and project costs are also considered. All scoping information is summarized and a map is generated to show the location of additional human-made barriers located downstream and upstream of the WSDOT barrier. Once biological scoping is complete, projects that successfully meet the verification process will have a WDFW scoping engineer assigned to develop conceptual designs for barrier correction. Some projects are placed on hold until further evaluation work is completed or progress is made to correct other fish passage barriers or other habitat deficiencies in the watershed. If the PI drops below the scoping threshold due to changes the biologist makes, the project is deferred until higher priority projects are completed.

Once the WDFW scoping engineer has identified all reasonable conceptual design options, a WSDOT pre-scoping meeting is held. Participants in this meeting are, at a minimum, the WDFW scoping biologist, scoping engineer and area habitat biologist (AHB). WSDOT participants include the regional scoping engineer and representatives of the Environmental Services Office, Regional Program Management, Regional Environmental Office, and Regional Project Development Office. The outcome of this meeting is a consensus decision on which conceptual design option will be pursued and a project cost estimated. A stakeholder concurrence form is generated that documents the outcome of the meeting. Once each participant present at the meeting reviews and concurs with the information on the concurrence form, pre-project scoping is complete and the project is eligible to be placed on the Ten Year Plan.

Appendix III includes all the sites that are currently being scoped by WDFW.

WSDOT Fish Passage Barriers Corrected with I-4 (Stand-Alone) Dedicated Funding

Since 1992, 69 fish passage barriers at high priority sites have been corrected by WSDOT and WDFW's Technical Applications Division using dedicated funding for stand-alone barrier corrections (see Table 3). Fish passage barriers corrected in 2006 include culvert replacements at Beaver and Frazer creeks on SR 20 (Figures 9, 10, 11, 12, 13, and 14), bridge construction at Bowman Creek on SR 142 (Figures 15, 16, and 17), fishway retrofit at Snyder Canyon Creek on SR 142 (Figures 18, 19, 20), culvert replacements on SR 112 at unnamed tributary to Pysht River and at Bear Creek (Figures 21, 22, 23, 24, 25, and 26), and culvert replacement at Mill Creek on US 2. (Figures 27, 28, and 29).

Fishways

In addition to culverts, WSDOT owns and maintains 153 fishways statewide. Regular inspections and maintenance are essential in the continued operation of fishways. Eighty-six fishways are currently considered durable and efficient, providing 100% fish passage, and as such have been placed on a regular inspection schedule. Fishways, which require routine maintenance for fish passage, but are not fish passage barriers are also regularly inspected. Fishways that are barriers to fish passage and cannot be improved by routine operation and maintenance are taken off the inspection schedule and placed on a barrier list. Sixty-three such fishways have been placed on the fish passage barrier list (see Appendix II). As new fishways are discovered through the inventory process, they need to be evaluated for fish passage and, if passable, placed on the inspection schedule.

Table 3. Dedicated Funding Projects Completed through WSDOT/WDFW Barrier Removal Program.

Project Description	WRIA	Tributary To	PI	WSDOT Region	Highway	MP	Agency	Year	Cost (I-4 Funds)	Habitat Survey Length (m)	Habitat Gain (m^2)
Tumwater Cr Fishway	18.0256	Port Angeles Harbor		Olympic	US 101	246.40	WDFW	1991	$18,356	1,440	6,158
Fisher Cr Fishway	03.0181	Carpenter Cr		Northwest	I-5	219.20	WDFW	1992	$20,000	1,430	28,376
Evans Cr Fishway	08.0106	Bear Cr		Northwest	SR 202	11.96	WSDOT	1992	$319,044	4,480	4,922
Parish Cr Fishway	15.0220	Gorst Cr		Olympic	SR 3	33.70	WDFW	1992	$14,834	1,600	7,594
Green Cr Fishway Upgrade	24.0341	Willapa R		Southwest	SR 6	8.90	WSDOT	1992	$8,000		10,134
Chuckanut Cr Fishway	01.0626	Chuckanut Bay	38.28	Northwest	SR 11	18.00	WDFW	1993	$68,788	2,680	22,565
Unnamed Tributary Culvert Replacement	07.0864	Skykomish R	19.23	Northwest	US 2	18.00	WSDOT	1993	$60,000	1,726	7,669
Squalicum Cr Fishway	01.0552	Bellingham Bay	38.09	Northwest	SR 542	3.50	WSDOT	1994	$68,000	4,745	16,567
Bagley Cr Fishway	18.0183	Strait Of Juan De Fuca	48.12	Olympic	US 101	253.85	WDFW	1994	$42,306	10,450	33,970
S Nemah R Fishway	24.0503	Willapa Bay	34.34	Southwest	US 101	29.80	WDFW	1994	$34,986	4,362	17,857
Johnson Cr Fishway	17.0301	Port Williams	28.17	Olympic	US 101	266.50	WDFW	1995	$121,945	1,754	7,208
Pussywillow Cr Culvert Replacement	10.0048	White R	15.48	Northwest	SR 164	8.30	WSDOT	1996	$100,000	5,738	5,092
Grader Cr Fishway	20.0237	Bogachiel R	24.48	Olympic	US 101	189.40	WDFW	1996	$183,000	4,484	25,894
Huelsdonk Cr Fishway	20.0437 D	Hoh R	24.69	Olympic	US 101	171.70	WDFW	1996	$18,594	1,292	12,709
Harlow Cr Fishway*	21.0134	Queets R	25.68	Olympic	US 101	146.85	WDFW	1996	$96,000	5,525	33,156
Rasmussen Cr Bridge	19.0230	Strait of Juan de Fuca	15.42	Olympic	SR 112	4.00	WDFW	1996	$603,000	1,325	6,023
Ashley Cr Weirs*	08.0083	Little Bear Cr	14.24	Northwest	SR 9	1.18	WDFW	1997	$24,264	1,800	4,210
Unnamed Tributary Fishway and Culvert Replacement	22.0052	Fairchild Cr	19.46	Olympic	US 101	104.90	WDFW	1997	$207,206	5,462	16,164
Kinnman Cr Culvert Retrofit	15.0368	Hood Canal	28.95	Olympic	SR 3	57.10	WSDOT	1997	$365,902	3,623	9,745
Fairchild Cr Fishway and Culvert Removal	22.0051	Humptulips R	20.30	Olympic	US 101	105.60	WDFW	1997	$193,258	4,238	19,214
Church Cr Baffles and Fishway	05.0021	Church Cr	33.70	Northwest	I-5 (Old 99)	216.70	WDFW	1998	$17,101	1,600	43,557
Big Cedar Cr Baffles	20.0576	Pacific Ocean	19.73	Olympic	US 101	162.15	WDFW	1998	$122,998	2,351	11,036

* Fishway is currently a partial or a total barrier to fish passage. For more information refer to Appendix II.

Table 3. (cont.)

Project Description	WRIA	Tributary To	PI	WSDOT Region	Highway	MP	Agency	Year	Cost (I-4 Funds)	Habitat Survey Length (m)	Habitat Gain (m^2)
Steamboat Cr Fishway and Culvert Replacement	20.0574	Pacific Ocean	27.53	Olympic	US 101	162.60	WSDOT	1998	$23,000	7,434	51,530
Unnamed Tributary Culvert Replacement	22.0059	SB Big Cr	20.62	Olympic	US 101	101.10	WDFW	1998	$249,305	3,811	9,960
McDonald Cr Fishway	14.0023	Skookum Cr	23.21	Olympic	SR 108	8.90	WDFW	1998	$260,997	1,274	2,301
Jewett Cr Culvert Replacement	29.0342	Columbia R	10.20	Southwest	SR 14	66.00	WSDOT	1998	$413,000	210	807
First Cr Bridge	47.0096	Lake Chelan		North Central	SR 971	8.90	WSDOT	1999	$265,000	200	4,200
First Cr Bridge	47.0096	Lake Chelan		North Central	SR 971	9.10	WSDOT	1999	$265,000	200	4.000
Tibbetts Cr Fishway	08.0169	Lake Sammamish	23.16	Northwest	SR 900	19.50	WDFW	1999	$147,000	671	2,077
Schoolyard Cr Fishway and Culvert Replacement	05.0145	Stillaguamish R	21.32	Northwest	SR 530	25.90	WDFW	1999	$350,000	1,280	3,477
Unnamed Tributary Fishway*	21.0715	Pacific Ocean	15.49	Olympic	SR 109	36.40	WSDOT	1999	$189,566	842	1,783
Birnie Cr Fishway	25.0281	Columbia R	30.28	Southwest	SR 4	35.60	WDFW	1999	$67,570	3,924	35,766
Beaver Cr Culvert Replacement	48.0307	Methow R	37.85	North Central	SR 153	29.28	WSDOT	2000	$554,000	96,354	165,674
Unnamed Tributary Baffles and Grade Controls	05.0065	Pilchuck Cr	42.03	Northwest	I-5	211.50	WDFW	2000	$116,577	9,246	21,938
Valley Cr Baffles and Roughened Channel	18.0249	Port Angeles Harbor	33.07	Olympic	US 101	246.90	WDFW	2000	$92,000	2,021	11,883
Unnamed Tributary Culvert Replacement	26.0429B	Stillwater Cr	16.62	Southwest	SR 506	2.33	WSDOT	2000	$99,000	1,502	4,672
Kenyon Cr Fishway	27.0320	NF Lewis R	24.07	Southwest	SR 503	49.03	WDFW	2001	$224,000	1,456	15,170
Birnie Cr Fishway	25.0281	Columbia R	28.98	Southwest	SR 409	3.85	WDFW	2001	$322,000	3,924	35,766
Johnson Cr Bridge	24.0581	Naselle R	28.74	Southwest	SR 4	4.50	WSDOT	2001	$269,000	3,854	5,037
O'Brien Cr Bridge	52.0394A	O'Brien Cr	3.50	Eastern	SR 20	310.06	WSDOT	2001	$906,000	1,4747	4,863
			4.31	Eastern	SR 20	309.96	WSDOT	2001		1,689	4,588
			6.29	Eastern	SR 20	309.31	WSDOT	2001		1,3410	49,935

* Fishway is currently a partial or a total barrier to fish passage. For more information refer to Appendix II.

Table 3. (cont.)

Project Description	WRIA	Tributary To	PI	WSDOT Region	Highway	MP	Agency	Year	Cost (I-4 Funds)	Habitat Survey Length (m)	Habitat Gain (m^2)
Skinney Cr Culvert Removal	45.0701	Chiwaukum C	13.50	North Central	US 2	87.10	WSDOT	2001	$1,441,000	3,061	5,782
	45.0701	Chiwaukum C	14.01	North Central	US 2	87.67	WSDOT	2001		3,543	6,693
	45.0701	Chiwaukum C	19.96	North Central	US 2	88.03	WSDOT	2001			18,500
Sweetwater Cr Culvert Removal	15.0504	Hood Canal	10.53	Olympic	SR 3	25.31	WSDOT	2001	$261,000	1,673	2,340
Cement Cr Fishway	24.0598	Nasselle R	36.55	Southwest	SR 401	8.80	WDFW	2002	$200,000	6,464	15,957
WF Hylebos Cr Fishway	10.0014	Hylebos Cr	37.46	Northwest	SR 99	6.86	WDFW	2002	$164,000	3,364	19,503
Unnamed Tributary Fishway	03.0199	Bulson Cr	28.02	Northwest	SR 534	1.2	WDFW	2002	$686,000	7,932	36,405
Coal Cr Log Controls Replacement	08.0268	Lake Washington	34.58	Northwest	I-405	10.20	WSDOT	2002	$128,000	8,240	35,330
Fink Cr Culvert Replacement	05.0257	NF Stillaguamish R	23.98	Northwest	SR 530	44.00	WSDOT	2002	$312,000	7,329	33,726
Moose Cr Culvert Replacement	05.0257A	NF Stillaguamish R	23.88	Northwest	SR 530	44.27	WSDOT	2002		6,681	31,076
Silver Cr Stream Simulation Culvert	26.0540	Mayfield Lk	33.83	Southwest	US 12	81.22	WSDOT	2003	$527,000	6,788	42,143
Unnamed Tributary Fishway	22.0057	Big Cr	17.07	Olympic	US 101	103.65	WDFW	1997	$96,175	3,434	11,009
Unnamed Tributary Fishway Tune up								2003	$33,000	3,434	5,573
Fletcher Cr Fishway	20.0426	Hoh R	20.61	Olympic	US 101	167.42	WDFW	2003	$30,000	2,189	13,076
Ennis Cr Fishway	18.0234	Straits of Juan de Fuca	31.33	Olympic	US 101	250.00	WDFW	2004	$58,000	8,950	33,437
Jim Cr	19.0110	Straits of Juan de Fuca	28.50	Olympic	SR 112	32.02	WSDOT	2004	$870,000	14,100	33,799
Tibbetts Cr	08.0169	Lk Sammamish	25.93	Northwest	I-90	15.48	WSDOT	2004	$5,300,000	9,424	9,012
Jimmycomelately	17.0285	Sequim Bay	31.09	Olympic	US 101	270.98	WSDOT	2004	$1,282,482	10,401	21,725
Little Boulder Cr	48.1400	Methow R	15.67	North Central	SR 20	181.34	WSDOT	2005	$545,000	5,054	5,893

Table 3. (cont.)

Project Description	WRIA	Tributary To	PI	WSDOT Region	Highway	MP	Agency	Year	Cost (I-4 Funds)	Habitat Survey Length (m)	Habitat Gain (m^2)
Stevens Cr	07.0147	Lake Stevens	22.00	Northwest	SR 92	0.47	WSDOT	2005	$400,000	2,083	3,125
Skobob Cr	16.0004	Skokomish R	19.96	Olympic	SR 106	0.85	WSDOT	2005	$1,800,000	1,434	18,500
Beaver Cr	48.0307	Methow R	43.61	North Central	SR 20	205.84	WSDOT	2006	$832,000	92,943	105,061
Frazer Cr	48.0309	Beaver Cr	19.05	North Central	SR 20	206.85	WSDOT	2006		12,291	11,267
Bowman Cr	30.0068	L Klickitat R	32.35	Southwest	SR 142	20.20	WSDOT	2006	$1,495,495	36,671	33,523
Snyder Canyon Cr	30.0018	Klickitat R	23.19	Southwest	SR 142	13.40	WSDOT	2006		6,267	15,216
Unnamed tributary	19.0113K	Pysht R	25.36	Olympic	SR 112	24.91	WSDOT	2006	$700,000	1,603	3,574
Bear Cr	19.0014	Salt Cr	17.21	Olympic	SR 112	54.35	WSDOT	2006	$1,000,000	3,729	6,694
Mill Cr	45.0956	Nason Cr	19.09	North Central	US 2	70.21	WSDOT	2006	$1,177,634	11,553	29,203
								Total Estimated Expenditure:	**$26,859,818**	**520,789**	**1,388,393**
									Estimated Linear Habitat Gain (m): Based on habitat survey length only. Actual amount of habitat gain may be greater, due to different habitat survey methods and criteria used.		
											Estimated Area of Habitat Gain (m^2):

WSDOT Transportation Improvement Projects (Barriers fixed as part of highway safety and mobility projects)

Integration of fish passage repairs with road project construction is a cost-effective way to accelerate barrier correction and reduce mobilization costs. WDFW and WSDOT integrate fish passage barrier correction into planned WSDOT transportation improvement projects whenever possible.

Inventory of upcoming transportation safety and mobility projects takes place at least one year prior to the anticipated construction dates to accommodate WSDOT transportation project long-range budgeting and planning requirements. Every odd year, WDFW requests and receives a list of proposed transportation projects from each of the six WSDOT regions. WDFW examines the milepost vicinities of upcoming transportation projects and and schedules an inventory of the project area if needed. Following the inventory, WDFW provides a list of identified fish passage barriers within the proposed transportation project to the appropriate WSDOT region. All fish passage barriers identified within the upcoming transportation project should be considered for correction, including barriers with limited habitat gain that are not considered for correction with dedicated funding (I-4 subprogram).

It is important that WSDOT notify WDFW's Technical Applications Division (TAPPS) whenever a WSDOT fish passage barrier is scheduled for correction, or has been corrected during road construction or routine maintenance. WDFW/ TAPPS will schedule an inspection of all WSDOT fish barrier corrections and update the fish passage database to accurately reflect the status of corrected WSDOT fish passage barriers and include them in the annual progress report.

WDFW conducted inventories of prospective transportation projects in 1998, 1999, 2000, 2001, 2003, and 2005. WDFW anticipates concluding the inventory of all the WSDOT owned highways by the end of 2007 eliminating the need to carry on the transportation project reviews in the spring of 2007. Additional, ad hoc transportation reviews may be performed if needed in the future.

During the summer and fall of 1998, 1999, 2000, 2001, 2003, and 2005 WDFW inventoried a total of 2,463 highway kilometers (1,536 miles) within Highway Safety and Mobility projects statewide and evaluated 639 fish-bearing crossings, assessing 207 as fish passage barriers requiring repair. Detailed accounts of barriers identified during the 2005 Highway Safety and Mobility project reviews in each region are included in Appendix I (Appendix I includes a comprehensive list of barriers identified during the ongoing WSDOT fish passage barrier inventory from1992 through March 2007, as well as barriers identified during transportation reviews).

Additional data can be obtained by contacting WDFW Fish and Wildlife Biologist, Eva Wilder; e-mail: wildeelw@dfw.wa.gov; phone: (360) 902-2411.

Barriers Corrected in the course of WSDOT Transportation Projects

One hundred thirty six fish passage barriers were corrected by WSDOT during transportation projects and during culvert replacements due to culvert failure since 1982. Thirteen fish passage barriers were corrected in 2006 during road improvement projects. Several culverts were replaced on SR 9: Ashley Creek (also known as Cutthroat Creek, Figures 30, 31, and 32), Bone and Easterbrook creeks (Figures 33, 34, 35, 36, 37, and 38). Four culverts on South Fork Dogfish Creek were replaced during an ongoing SR 305 widening project (Figures 39 through 50). Three Mile Creek culvert on SR 31 was replaced as a result of a road improvement project in 2006 (Figures 51, 52, and 53). A full span bridge construction initiated in 2005 at Downs Creek on SR 18 culminated in culvert removal, channel daylightening and realignment in 2006 (Figures 54, 55, and 56). A failing culvert was replaced at an unnamed tributary to Crocket Lake on SR 20 (Figures 57, 58, and 59). I-405 widening project resulted in a culvert replacement and a fishway construction at Forbes Creek (Figures 60, 61, and 62). An undersized culvert was removed and channel realigned at an unnamed tributary to Little Bear Creek on SR 9 (See Figures 63, 64, and 65). A continuing widening of SR 522 resulted in another barrier culvert correction in 2006 (See Table 4).

Table 4. (cont.)

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/ No
Northwest	995411	9.24	I-5	246.75	Chuckanut Cr	Puget Sound	1.0626		TP	1948	No
Olympic	990480	8.05	SR 112	49.50	Whiskey Cr	Strait Of Juan De Fuca	19.0020	1.50	TP	1955	No
Northwest	05.0018 2.00		SR 532	6.14	Church Cr	Stillaguamish R	05.0018	2.00	OM	1961	Yes
Olympic	15.0051 0.20		SR 302	11.42	Little Minter Cr	Minter Cr	15.0051	0.20	OM	1982	No
Olympic	14.0010 0.10		US 101	356.80	Countyline Cr	Schneider Cr	14.0010	0.10	OM	1985	Yes
Olympic	14.0009A 0.06		US 101	357.90	Holiday Valley Cr	Schneider Cr	14.0009A	0.06	OTH	1986	Yes
Northwest	08.0049 3.00		I-5 NB off ramp	177.67	McAleer Cr	Lk Washington	8.0049	3.00	TP	1988	Yes
Olympic	18.0021 5.40		US 101	260.95	Matriotti Cr	Dungeness R	18.0021	5.40	TP	1989	No
Northwest	996965		I-90	20.42	Unnamed	EF Issaquah Cr	8.0186	0.00	TP	1990	Yes
Northwest	997679		SR 509	25.69	Miller Cr	Puget Sound	09.0371		TP		No
Olympic	991227		SR 706	9.81	Unnamed	Nisqually R	11.0222		TP		Unk
Olympic	22.0351 0.10		US 12	12.48	Camp Cr	Metcalf Sl	22.0351	0.10	OTH	1993	Yes
Northwest	08.0077 0.20		SR 527	6.57	Penny Cr	North Cr	08.0077	0.20	OTH	1994	Yes
Souh Central	990189	6.13	US 97	37.14	Highbridge Springs	Satus Cr	37		TP	1994	No
Northwest	990272	73.54	SR 104	29.65	McAleer Cr	Lk Washington	08.0049	3.10	TP	1995	Yes
Northwest	08.0070A 0.01		SR 527	4.00	Sulphur Springs Cr	North Cr	08.0070A	0.01	TP	1995	Yes
Northwest	08.0075 0.70		SR 527	4.46	Silver Cr. #2	North Cr	08.0075	0.7	TP	1995	Yes
Northwest	08.0070B 0.30		SR 527	6.32	Nickel Cr	North Cr	08.0070B	0.3	TP	1995	Yes
Northwest	990644		SR 530	31.01	Unnamed	NF Stillaguamish R	05		TP	1995	No
Northwest	991168		SR 530	31.90	Unnamed	Stillaguamish R	05		TP	1995	Yes
Olympic	996952		SR 160	3.80	Curley Cr	Sinclair Inlet	15		TP	1995	Yes
Northwest	991519	16.25	SR 18	19.59	Unnamed	Carey Cr	08.0218A	0.35	TP	1996	Yes
Northwest	990064		SR 18	19.76	Carey Cr	Issaquah Cr	08.0218		TP	1996	Yes
Soutwest	30.0068 0.40	32.35	SR 142	20.20	Bowman Cr	L Klickitat R	30.0068	0.40	TP	1996	No
Northwest	990271		SR 530	29.60	Mc Govern Cr	NF Stillaquamish R	05.0168		TP	1996	Yes
Northwest	991162		SR 530	31.20	Unnamed	Stillaguamish R	05.0168X		TP	1996	Yes
Northwest	991164		SR 530	32.51	Unnamed	Stillaguamish R	05		TP	1996	No
Northwest	991154		SR 530	55.10	Unnamed	Sauk R	04.1062		TP	1996	Yes

Table 4. (cont.)

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/ No
Northwest	991153		SR 530	55.90	Unnamed	Skagit R	04.0707	0.21	TP	1996	Yes
Northwest	991059		SR 531	8.71	Unnamed	MF Quilceda Cr	07.0060		OTH	1996	No
Northwest	990390	22.76	SR 18	8.90	Soosette Cr	Soos Cr	09.0073	1.20	TP	1997	Yes
Eastern	990350		SR 20	388.13	Renshaw Cr	Pend Oreille R	62.0310		TP	1997	No
Eastern	990351		SR 20	389.50	Renshaw Cr	Pend Oreille R	62.0310		TP	1997	No
Olympic	990164		US 101	186.30	Fuhrman Cr	Bogachiel R	20.0237E		TP	1997	Yes
Olympic	990156		US 101	186.40	Frakker Cr	Bogachiel R	20.0237O		TP	1997	Yes
Olympic	990716		US 101	186.45	Unnamed	Frakker Cr	20.0237X		TP	1997	Yes
Olympic	991512		US 101	186.70	Forgotten Marsh	Fuhrman Cr	20.0237N		TP	1997	Yes
Olympic	22.0349 0.70		US 12	12.36	Unnamed	Unnamed	22.0349	0.70	OTH	1997	Yes
Southwest	992462		US 101	28.92	Roaring Cr Sl	Naselle R	24.0563		TP	1997	Yes
Northwest	991155		SR 530	54.60	Unnamed	Sauk R	04.1064	0.30	TP	1997	Yes
Soutwest	990119		SR 14	55.80	Dog Cr	Columbia R	29.0130	0.00	TP	1998	Unk
Soutwest	990116	7.55	SR 142	5.20	Dillacort Cr	Klickitat R	30.0009	0.00	TP	1998	Yes
Northwest	07.0383A 0.50		SR 202	13.80	Dry Cr	Patterson Cr	07.0383A	0.50	TP	1998	Yes
Northwest	101S-23		SR 203	7.83	Unnamed	Harris Cr	07.0285	0.53	TP	1998	Yes
Olympic	991852		SR 303	6.9	Barker Cr	Dyes Inlet	15.0255	1.67	TP	1998	Yes
Olympic	990121		SR 305	12.80	Dogfish Cr	Liberty Bay	15.0285		TP	1998	Yes
Olympic	990249	17.72	US 101	174.00	Lost Cr	Hoh R	20.0440		TP	1998	Yes
Olympic	991644		US 101	175.15	Unnamed	Old Joe Sl	20.0440B	0.20	OM	1998	No
Northwest	994239		SR 520 ROW	6.27	Yarrow Cr	Lk Washington	08.0252	0.92	TP	1998	Yes
Olympic	991532		US 12	13.80	Unnamed	Chehalis R	22.0354		TP	1998	Yes
Southwest	992272	12.05	I-5	42.40	Unnamed	Cowlitz R	26.0129	0.11	TP	1999	Yes
Southwest	991698	21.45	US 101	24.13	Unnamed	Willapa Bay	24.0673		OTH	1999	Yes
Southwest	990948		US 12	127.44	Dry Cr	Cowlitz R	26.1119		TP	1999	Yes
Olympic	991690		US 101	119.90	Unnamed	Stevens Cr	22		TP	1999	No
Olympic	990370		SR 101	359.6	Schneider Cr	Totten Inlet	14.0009		TP	1999	Yes
Northwest	990294		SR 528	2.47	Munson Cr	Allen Cr	07.0073	2.20	OTH	2000	No

Table 4. (cont.)

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/ No
Northwest	01.0228 4.80		SR 542	6.55	Anderson Cr	Nooksack R	01.0228	4.80	OTH	2000	Yes
Olympic	991295		SR 105	31.10	Unnamed	South Bay	22		OM	2000	Yes
Eastern	992006	5.96	SR 21	172.17	Lambert Cr	Curlew Cr	60.0327		OM	2001	Yes
Olympic	991729	7.50	SR 112	19.60	Unnamed	Clallam R	19		TP	2001	Yes
Olympic	991545	10.43	SR 112	19.90	Unnamed	Clallam R	19.0129A	0.00	TP	2001	Yes
Olympic	990144		SR 112	48.49	Field Cr	Strait of Juan de Fuca	19.0026	2.10	TP	2001	No
Olympic	15.0051 0.10		SR 302	11.32	Little Minter Cr	Minter Cr	15.0051	0.10	OM	2001	No
Southwest	991397		SR 4	25.91	Unnamed	Skamokawa R	25		TP	2001	Yes
Southwest	992271		SR 142	3.65	Knight Cr	Klickitat R	30.0008	0.01	TP	2001	Yes
Eastern	990881		SR 20	380.1	Unnamed	Lk Thomas	59		TP	2000	No
North Central	990202		US 97	158.32	Iron Cr	Swauk R	39.1209		TP	2000	No
Northwest	995977		SR 20	25.77	Unnamed	Penn Cove	06.0003	0.01	TP	2000	Unk
Northwest	991708		SR 20	90.13	Unnamed	Skagit R	04		TP	2000	Yes
Northwest	DM10		SR 20	114.94	Damnation Cr	Skagit R	04.1844		TP	2000	Yes
Northwest	105 R042117a		SR 164	8.20	Unnamed	White R	10.0048	0.60	TP	2000	Yes
Northwest	105 R071916a		SR 410	48.31	Boundary Cr	White R	10.0250	0.70	TP	2000	No
South Central	990436		US 97	57.20	Toppenish Cr	Yakima R	37.1178		TP	2000	Yes
Northwest	990344		SR 9	28.38	Portage Cr	Stillaguamish R	05.0036		TP	2002	Yes
Northwest	991166		SR 9	32.20	Unnamed	Stillaguamish R	05.0129A		TP	2002	Yes
Northwest	LP23		SR 9	35.46	Unnamed	Unnamed	05.0080B	0.07	TP	2002	Yes
Northwest	LP27		SR 9	35.52	Unnamed	Unnamed	05.0080C	0.06	TP	2002	Yes
Northwest	LP28		SR 9	35.70	Unnamed	Unnamed	05	0.09	TP	2002	Yes
Northwest	990625		SR 9	38.57	Unnamed	Unnamed	05.0080H		TP	2002	Yes
Northwest	LP32		SR 9	38.69	Unnamed	Unnamed	05	0.22	TP	2002	No
Northwest	NC180		SR 9	39.69	Unnamed	Lk McMurray	03	0.10	TP	2002	No
Northwest	NC170		SR 9	39.87	Unnamed	Lk McMurray	03		TP	2002	No
Northwest	995389		SR 9	69.88	Unnamed	Samish R	03		TP	2002	No
Northwest	08.0110 0.10		SR 202	11.10	Rutherford Cr	Evans Cr	08.0110	0.10	TP	2002	Yes

Table 4. (cont.)

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/ No
Northwest	993115	11.21	I-405	29.67	Martha Cr	Swamp Cr	08	0.17	TP	2002	Yes
Northwest	990262	13.29	SR 522	2.00	Maple Leaf Cr	Thorton Cr	08.0033	0.80	TP	2002	Yes
Olympic	15.0280 1.00		SR 308	1.15	Big Scandia Cr	Liberty Bay	15.0280	1.00	TP	2002	No
South Central	990440		SR 241	9.20	Unnamed	Sulphur Cr Wstwy	37		TP	2002	Yes
South Central	990409	5.41	SR 410	82.80	Miner Cr	American R	38.1027		TP	2002	No
Northwest	991199		SR 167	23.65	NF Springbrook Cr	Springbrook Cr	09.0020		OTH	2003	Yes
Northwest	990208		SR 18	12.70	Jenkins Cr	Soos Cr	09.0087		TP	2003	Yes
Northwest	990209		SR 18	13.80	Jenkins Cr	Soos Cr	09.0087		TP	2003	Yes
Northwest	08.0183 1.00		I-90	17	EF Issaquah Cr	Issaquah Cr	08.0183	1	TP	2003	Yes
Olympic	990910	20.16	SR 106	6.95	Dalby Cr	Hood Canal	14	0.04	OTH	2003	Yes
Northwest	101S-27		SR 203	12.76	Deer Cr	Snoqualmie R	07		OTH	2003	Yes
Northwest	991189		SR 527	7.38	Unnamed	North Cr	08		TP	2003	Yes
Soutwest	991415		SR 401	3.22	Unnamed	Columbia R	24		TP	2003	Yes
Northwest	990136		SR 112	6.84	Edison Sl	Samish Bay	3.0001		TP	2004	Yes
Northwest	105 S012018a		SR 509	10.71	Lacota Cr	Puget Sound	10.0386		TP	2004	Yes
Northwest	990434		SR 542	15.32	Jim Cr	Nooksack R	01		TP	2004	Yes
Northwest	995578		SR 542	44.14	Unnamed	NF Nooksack R	01		TP	2004	Yes
Northwest	995580		SR 542	44.34	Unnamed	NF Nooksack R	01		TP	2004	Yes
Olympic	115 MC176		SR 106	7.06	Alderbrook Cr	Hood Canal	14		OTH	2004	Yes
Olympic	105 R050320a		SR 167	0.16	Jovita Cr	Milwaukee Canal	10.0034		TP	2004	No
Southwest	992311	15.68	US 101	53.56	Old Mill Pond	Willapa R	24		OTH	2004	Yes
Northwest	08.0320 1.20		SR 18 Off Ramp	16.94	Downs Cr	Cedar R	08.0320	1.20	TP	2005	Yes
Northwest	991576	20.5	SR 18	18.19	Taylor Cr	Downs Cr	08.0326	2.98	TP	2005	Yes
Northwest	990426	25.48	SR 18	18.43	Taylor Cr	Downs Cr	8.0326		TP	2005	Yes
Northwest	991620		SR 161	35.1	Unnamed	EF Hylebos Cr	10.0016		TP	2005	Yes
Northwest	991486		SR 167	25.65	Unnamed	Springbrook Cr	9.0006		TP	2005	No
Northwest	992374	21.20	SR 522	18.44	Unnamed	Evans Cr	07.0211	2.43	TP	2005	Yes
Northwest	990016	6.42	SR 522	18.77	Unnamed	Evans Cr	07	1.20	TP	2005	Yes

Table 4. (cont.)

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/ No
Northwest	993087		SR 527	9.33	Unnamed	Ruggs Lk	08		TP	2005	Yes
Northwest	990015	33.8	SR 539	0.3	Spring Cr	Baker Cr	01.0556	0	TP	2005	No
Northwest	995582		SR 542	45.51	Unnamed	NF Nooksack R	01		TP	2005	Yes
Olympic	991275		US 101	130.6	Unnamed	Ten O Clock Cr	21		TP	2005	Yes
Olympic	991636		SR 706	8.02	Unnamed	Nisqually R	11.0008A	0	TP	2005	Yes
Northwest	370219		SR 9	96.6	Bone Cr	Sumas R	01.0685		TP	2006	Yes
Northwest	370220		SR 9	96.1	Easterbrook Cr	Bone Cr	01.0686		TP	2006	Yes
Northwest	08.0320 1.30		SR 18	16.94	Downs Cr	Cedar R	08.0320		TP	2006	No
Northwest	990376		I-405	19.12	Forbes Cr	Juanita Bay	08.0242		TP	2006	No
Northwest	995979		SR 20	14.65	Unnamed	Crocket Lk	06.0053		TP	2006	Yes
Northwest	995980		SR 9	0.97	Unnamed	Little Bear Cr	08		TP	2006	Yes
Northwest	992631	13.4	SR 522	17.87	Unnamed	Evans Cr	07.0211		TP	2006	Yes
Northwest	990316	14.2	SR 9	1.16	Ashley Cr	Little Bear Cr	08.0083		TP	2006	Yes
North Central	991762	15.7	SR 26	1.79	Sand Hollow Cr	Columbia R	41.2151		OM	2006	No
Olympic	991853		SR 305	12.1	SF Dogfish Cr	Dogfish Cr	15		TP	2006	Yes
Olympic	991854		SR 305	12.29	SF Dogfish Cr	Dogfish Cr	15		TP	2006	Yes
Olympic	15.0285 H 0.50		SR 305 ROW	12.34	SF Dogfish Cr	Dogfish Cr	15.0285 H		TP	2006	Yes
Olympic	990998	15.7	SR 305	11.62	SF Dogfish Cr	Dogfish Cr	15		TP	2006	Yes
Eastern	991471		SR 31	18.22	Three Mile Cr	Pend Oreille R	62.0051		TP	2006	Yes

Funding Codes:
OM - operational maintenance
TP - transportation project
OTH - other

Fish Passage Compliance Codes:
Yes - meets fish passage requirements
No - project does not meet current fish passage requirements
Unkn - fish passage barrier status undetermined

Evaluation of Stand-Alone I-4 Retrofit Projects, Before and After Barrier Removal

The goal of the evaluation program is to accomplish the following:

- Determine fish utilization upstream and downstream of sites prior to and one year after project construction,
- Evaluate new fish passage projects for design, durability, and efficiency for one year following construction, and
- Provide long-term effectiveness monitoring of selected sites to evaluate various design options and the changes in fish utilization over an extended period of time.

WDFW evaluates I-4 stand alone fish passage barrier correction projects to ensure their proper functioning. All projects completed by WSDOT are evaluated for one year following construction. During this period, any design deficiencies are noted and corrected whenever possible.

Adult spawner surveys are a direct way to determine target species presence or absence above and below a newly completed fish passage installation, or to evaluate a pre-project barrier. Three such surveys are conducted per year for each project. The surveys are conducted 500 meters below and above the project, or to the confluence with a larger body of water downstream, or to a natural barrier upstream. The survey may be relocated according to where fish are likely to spawn if there is no spawning habitat within 500 m upstream or downstream of the fish passage project.

If resources allow, adult surveys may be conducted in subsequent years if salmonids are not detected upstream of the fish passage project in the first year after construction.

On a select number of sites, representing various design options, adult spawner surveys and fish passage facility assessments will occur over an extended period. This will provide insight into the long-term adult utilization changes and the durability and efficiency of various design options. WDFW will start long-term monitoring of stream utilization by adult salmon on selected streams in the fall of 2007.

Appendix V shows the results of spawner surveys conducted for dedicated funding projects that will be built in the near future and for projects built in 2005 and 2006. The 2006 adult spawner surveys were incomplete due to extreme weather during the spawning season (low flows due to drought immediately followed by floods).

A pair of spawning coho salmon and 6 redds were observed upstream of the 2006 Snyder Canyon Creek fish passage project. One redd, but no spawning salmon were observed upstream of Bowman Creek bridge, constructed in 2006. Four chinook redds were observed upstream of the culvert at Mill Creek on US 2, also constructed in 2006.

Beaver Creek

Before Construction

Figure 9. Beaver Creek - Project location: SR 20 at milepost 205.84, southeast of Twisp.

Figure 10. A double culvert crossing consisting of 1.83 m wide, concrete box culvert and a 1.22 m round corrugated aluminum culvert was identified as fish passage barrier due to excessive water velocity.

After Construction

Figure 11. The Beaver Creek culverts were replaced in 2006 with a 7.93 m wide concrete arch culvert through I-4 project. The new culvert provides better access to almost 93 km of habitat to coho and chinook salmon, and steelhead, resident cutthroat, and bull trout.

Frazer Creek

Before Construction

Figure 12. Frazer Creek - Project location: SR 20 at milepost 206.85, south-east of Twisp.

Figure 13. Two round steel culverts 0.91 m in diameter were determined to be fish passage barriers due to a slope and outfall drop.

After Construction

Figure 14. In 2006, the two steel culverts were replaced with a 4.57 m wide concrete arch stream simulation culvert. The I-4 project included another barrier culvert replacement at Beaver Creek (see Figures 9-11). This project improved fish access to 12,290 meters of habitat upstream for chinook and coho salmon, and steelhead, bull, and resident cutthroat trout.

Bowman Creek

Figure 15. Bowman Creek - Project location: SR 142 at milepost 20.20, west of Goldendale.

Figure 16. A 3 m wide concrete box culvert was a barrier due to excessive water velocity.

After Construction

Figure 17. In 2006, the box culvert was replaced with a full-span, 18 m wide bridge, providing 36,671 m of upstream habitat available for coho salmon, and steelhead, bull, and resident cutthroat trout.

Snyder Canyon Creek

Before Construction

Figure 18. Snyder Canyon Creek - Project location: SR 142 at milepost 13.40, west of Goldendale.

Figure 19. A 3 m wide concrete box culvert was a partial barrier to fish passage due to an 0.51 m water surface drop.

After Construction

Figure 20. In 2006, WSDOT removed the apron at the mouth of the culvert and re-poured it at a lower elevation. Two weirs were mounted on the new apron to trap bedload, while gravel and rubble was added to floor to add roughness. Wing walls were reworked to provide additional support. The project was funded through the I-4 program. Coho salmon, steelhead trout and resident cutthroat trout will benefit from improved access to over 6,200 m of habitat upstream.

Unnamed to Pysht

Before Construction

Figure 21. Unnamed tributary to Pysht River - Project location: SR 112 at milepost 24.91, west of Port Angeles, near Cllalam Bay.

Figure 22. Two round, 0.91 m concrete culverts were considered barriers due to a 3% slope and 0.24 m outfall drop.

After Construction

Figure 23. A 4.6 m wide concrete box culvert with natural streambed material throughout the culvert was installed in place of the double pipes improving fish access to over 3,000 m of habitat for coho salmon and resident cutthroat trout.

Bear Creek

Before Construction

Figure 24. Bear Creek - Project location: SR 112 at milepost 54.35, west of Port Angeles, close to the town of Joyce.

Figure 25. A concrete box culvert, 1.83 m wide was a velocity barrier to fish passage.

After Construction

Figure 26. This I-4 funded project replaced the barrier culvert with a bottomless concrete arch with natural streambed material throughout the culvert. The new culvert improves passage to coho salmon, and steelhead, searun cutthroat and resident cutthroat trout to 3,700 m of upstream habitat.

Mill Creek

Before Construction

Figure 27. Mill Creek - Project location: US 2 at milepost 70.21, near Stevens Pass.

Figure 28. A round corrugated steel pipe was assessed as a total fish barrier due to a 0.49 m outfall drop.

After Construction

Figure 29. The 2006 project replaced the undersized culvert with a bottomless structural plate arch with natural streambed material placed throughout the culvert. The new crossing restores access to over 11,500 m of habitat to chinook salmon, and steelhead, resident cutthroat, and bull trout.

Ashley Creek(Cutthroat Creek)

Before Construction

Figure 30. Ashley Creek- Project location: SR 9 at milepost 1.16, north of Woodinville.

Figure 31. A round, 0.60 m wide concrete culvert was a velocity barrier. The culvert was equipped with 3 downstream controls to temporarily backwater the culvert and provide fish passage.

After Construction

Figure 32. A 4.6 m wide structural plate steel squash culvert with a natural streambed material throughout the culvert was installed in place of the undersized concrete culvert improving fish access to over 1,800 m of habitat for for coho salmon, and steelhead, searun cutthroat, and resident trout.

Bone Creek

Before Construction

Figure 33. Bone Creek - Project location: SR 9 at milepost 96.6, just south of Sumas.

Figure 34. Two round, 1.22 m concrete culverts were undersized creating a velocity barrier.

After Construction

Figure 35. A 4.6 m wide concrete box culvert with a natural streambed material throughout was installed in place of the double pipes during a 2006 SR 9 road realignment project improving fish access to over 3,000 m of upstream habitat for coho salmon and resident trout.

Easterbrook Creek

Before Construction

Figure 36. Easterbrook Creek- Project location: SR 9 at milepost 96.1, just south of Sumas.

Figure 37. The original 0.76 m round steel culvert was a barrier to fish passage due to insufficient depth through the culvert.

After Construction

Figure 38. Fish passage at this crossing was addressed in 2006 during the SR 9 realignment project. WSDOT replaced the small steel culvert with a 4.6 m wide concrete box, improving resident cutthroat trout's access to 700 meters of potential habitat upstream while improving drainage.

SF Dogfish Creek

Before Construction

Figure 39. SF Dogfish Creek - Project location: SR 305 at milepost 12.10, near the town of Poulsbo.

Figure 40. A 0.91 m wide concrete culvert was considered a barrier due to a slope of 1.3%.

After Construction

Figure 41. Eight fish passage barriers are slated for replacement during a SR 305 widening project. Four fish passage barriers on South Fork Dogfish Creek have been replaced to date with 100 % passable culverts. Installed in 2006, this new, steel pipe is 2.8 m wide and it has natural streambed material placed throughout. This will provide unimpeded fish passage to over 400 m of potential habitat for coho and chum salmon, and steelhead, searun cutthroat, and resident cutthroat trout.

SF Dogfish Creek

Before Construction

Figure 42. SF Dogfish Creek - Project location: SR 305 at milepost 12.29, near the town of Poulsbo.

Figure 43. A 0.91 m wide, round concrete culvert was a velocity barrier.

After Construction

Figure 44. A 2.85 m wide structural plate steel culvert was installed in 2006 replacing the undersized concrete culvert. The new culvert is set at a slope of less than 1% and has natural streambed material throughout, providing unobstructed fish passage to over 1,000 m of habitat for coho and chum salmon, and steelhead, resident cutthroat, and searun cutthroat trout.

SF Dogfish Creek

Before Construction

Figure 45. SF Dogfish Creek - Project location: SR 305 at milepost 11.62, near the town of Poulsbo.

Figure 46. A 0.61 m wide, round concrete culvert was evaluated as a barrier due to a 3.8% slope.

After Construction

Figure 47. A 3.51 m wide concrete box culvert was installed in 2006 replacing the undersized concrete pipe. The new culvert is set at a 0% slope and has natural streambed material throughout, improving fish passage to over 1,544 m of habitat. Fish species that will benefit from the new culvert include coho salmon, and steelhead, resident cutthroat, and searun cutthroat trout.

SF Dogfish Creek

Before Construction

Figure 48. SF Dogfish Creek Tributary - Project location: SR 305 at milepost 12.34, near the town of Poulsbo.

Figure 49. A 0.91 m wide concrete culvert was a barrier to fish passage due to 1.9% slope.

After Construction

Figure 50. The new, 2.6 m wide corrugated steel culvert was installed in place of the old concrete pipe in 2006 during a road-widening project. Coho and chum salmon, and steelhead and resident cutthroat trout will benefit from almost 600 m of potential habitat upstream of this crossing.

Three Mile Creek

Before Construction

Figure 51. Three Mile Creek - Project location: SR 31 at milepost 18.22, near the town of Metaline.

Figure 52. A 0.46 m wide concrete culvert equipped with an overflow 0.61 m wide steel pipe was a barrier to fish passage due to 1.9% slope.

After Construction

Figure 53. WSDOT replaced the barrier culvert with a 2.4 m wide, corrugated steel culvert, restoring the habitat connection between 8,000 m of potential habitat upstream and the Pend Oreille River downstream for resident cutthroat trout The new culvert was a part of a 2006 Safety and Mobility project where WSDOT widened the existing two-lane road to a four-lane road.

Downs Creek

Before Construction

Figure 54. Downs Creek - Project location: SR 18 at milepost 16.94, near 244th Ave SE.

Figure 55. A 1.2 m wide concrete box was equipped with concrete baffles to reduce water velocity inside the culvert.

After Construction

Figure 56. As part of the SR 18 widening project, WSDOT replaced a baffled culvert with a bridge. The old culvert was blocked off and the flow rerouted to a new channel equipped with log controls and large woody debris. The bridge improves access to over 3,300 m of potential habitat for sockeye and coho salmon and resident cutthroat trout.

Unnamed to Crocket Lake

Before Construction

Figure 57. Unnamed tributary to Crocket Lake - Project location: SR 20 at milepost 14.65, near Keystone.

Figure 58. A 0.76 m wide corrugated steel round culvert was undersized.

After Construction

Figure 59. In 2006, WSDOT replaced the culvert with a 1.22 m wide plastic pipe that is passable to fish. Over 500 m of habitat for chum and coho salmon, searun cutthroat and resident cutthroat trout exists upstream of the new culvert.

Forbes Creek

Before Construction

Figure 60. Forbes Creek- Project location: I-405 at milepost 19.12, near the town of Juanita.

Figure 61. A 1.1 m wide corrugated steel round culvert was a barrier due to an excessive outfall drop.

After Construction

Figure 62. In 2006, WSDOT replaced the old pipe with a 1.7 m wide concrete pipe. Over 1,200 m of habitat for coho salmon, and searun cutthroat and resident cutthroat trout exists upstream of the new culvert. The new culvert was installed at a slope of less than 1% and in such a way as to gain an additional 250 feet of stream habitat downstream of the culvert. The photo on the bottom right shows a newly created channel equipped with concrete controls and large woody debris.

Unnamed to Little Bear Creek

Before Construction

Figure 63. Unnamed tributary to Little Bear Creek- Project location: SR 9 at milepost 0.97, north of Woodinville.

Figure 64. A 0.76 m wide corrugated steel round culvert was too small for the stream.

After Construction

Figure 65. During a 2006 widening project this crossing was eliminated. Fish access to and from Little Bear Creek is available through a 100% passable culvert a little further south on SR 9 - at a milepost 0.88. Along with culvert abandonment, habitat enhancement work was done on this creek, such as addition of woody debris, re-vegetation of stream banks, and realignment of the old streambed to simulate a natural meandering channel.