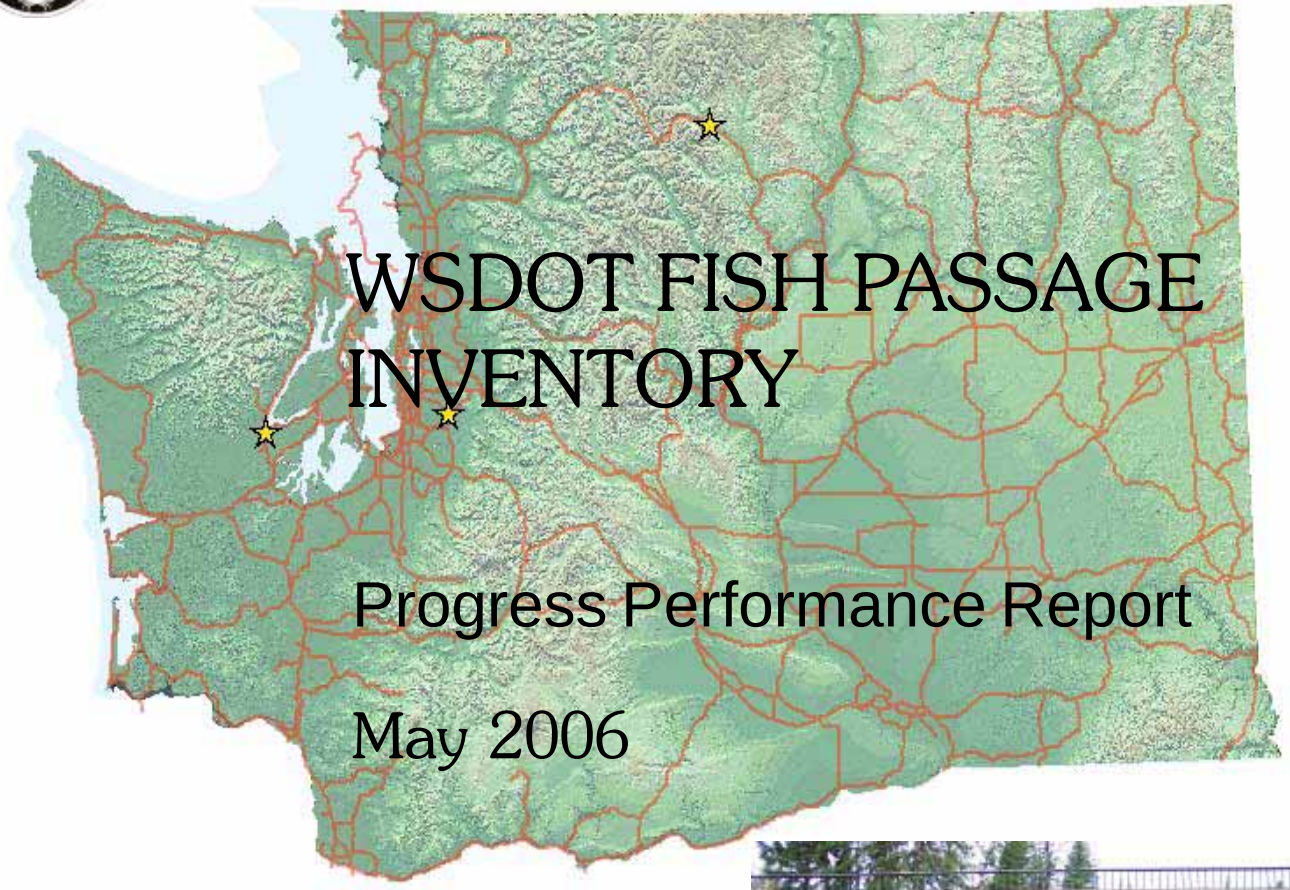
Washington State
Department of Fish and Wildlife

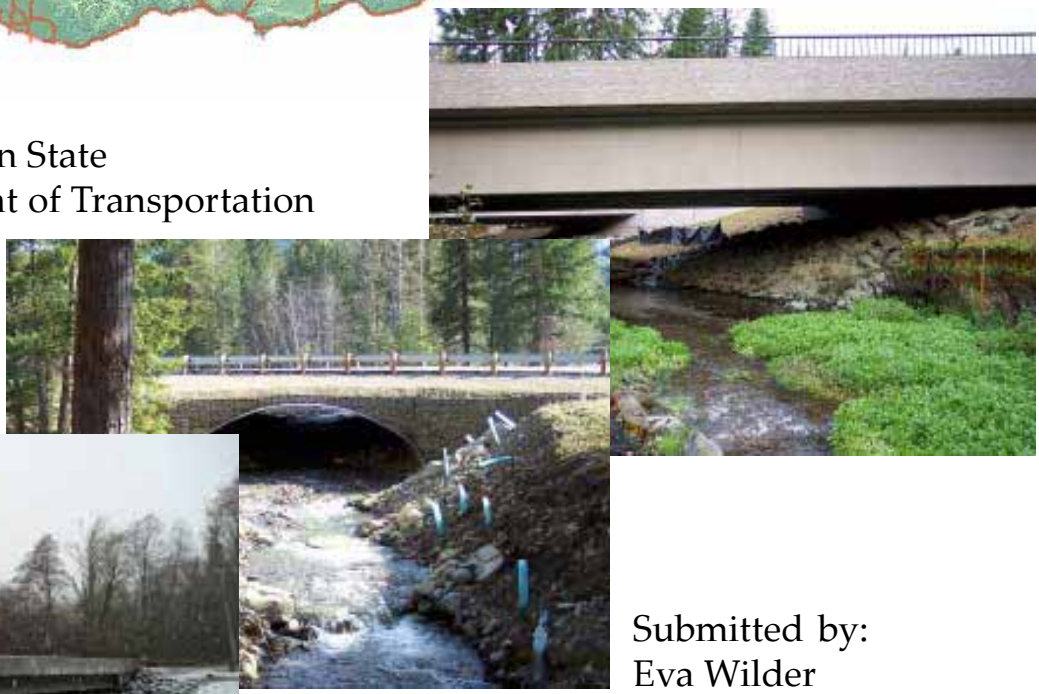


WSDOT FISH PASSAGE INVENTORY

Progress Performance Report

May 2006

Washington State
Department of Transportation



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Washington State Department of Fish and Wildlife

HABITAT PROGRAM
TECHNICAL APPLICATIONS DIVISION

Progress Performance Report
For
WSDOT Fish Passage Inventory

May 2006

Washington State Department of Transportation

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 the 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 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. WSDOT has spent over $39.7 million (including 05 - 07 budget) to inventory, conduct habitat studies, prioritize, and correct fish passage barriers in Washington streams. As a result of those combined efforts, access to over 1,752,387 square meters of salmonid habitat, or, over 662 linear kilometers (411 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 2005, 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 Game in 1994, the WSDOT culvert inventory was salmon-centric where a 7% stream gradient 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 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 process of all highway state 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* 2000).

To date, the expanded inventory has been completed on 6,090 kilometers (3,784 miles) of state routes, or 54% 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 6,090 kilometers (3,784 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 11,338 kilometers (7,045 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 calculate 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 density. It is important to keep in mind that those estimates will likely change in the future, as more of the eastern part of Washington is inventoried and will increase the accuracy of the estimates.

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 2005 Fish Passage and Diversion Screening Inventory Database	3,112	1,538	1,136	346	56	180
Extrapolated[3] data Total	3,754	2,007	1,518	427	62	

[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] One hundred and eighty WSDOT fish passage barriers have been reported as replaced or retrofitted for fish passage; however, 35 of those require additional work to meet current fish passage criteria (See Tables 3 and 5).
[3] Estimated statewide numbers based upon inventories conducted through March 2006.

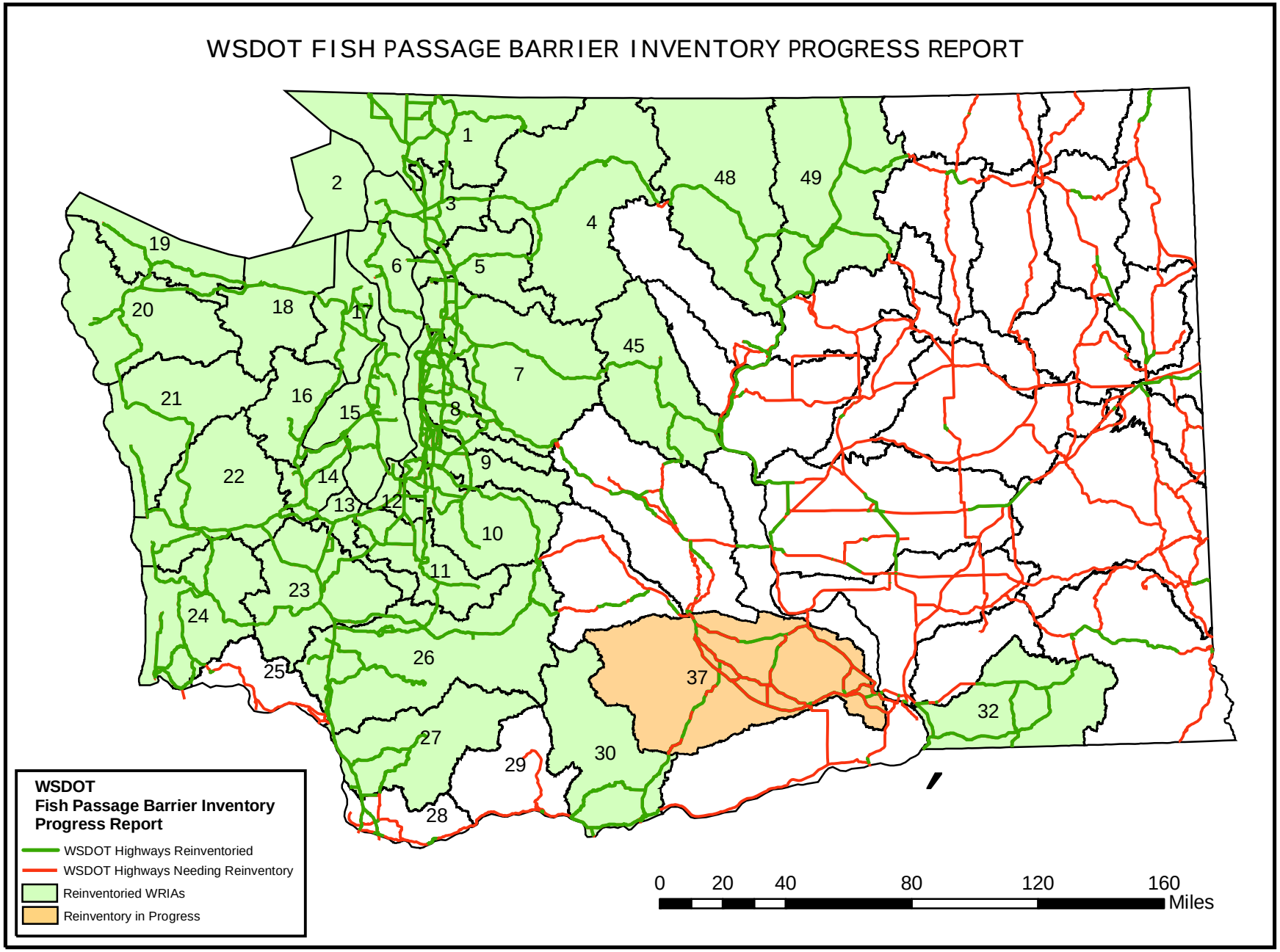

Figure 1. WRIAs inventoried during the Expanded Fish Passage Inventory since 1998.

Fish Passage Inventory Upgrades

During the ongoing WSDOT inventory, 5,853 crossings in natural drainages have been inspected; 3,112 have been identified as fish bearing. Approximately 49% (1,538) of the examined fish bearing crossings were identified as barriers (Table 1). Additionally, 344 crossings require further analysis to determine fish passage barrier status. Seventy-four percent of known barriers (1,136) have a significant habitat gain (at least 200 m) and will be prioritized for near-term correction, while 346 barriers with limited habitat gain (less than 200 m) will be considered for correction once the high priority barriers are corrected, or they be may be corrected during road maintenance or Safety and Mobility projects. Another 56 fish 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.

Regional Statistics

WSDOT has six geographic management regions: Northwest, North Central, Olympic, Southwest, South Central, and Eastern (See Figure 2). To date, the re-inventory process has been focused on the western part of the state; over 92% of the western part has been reinventoried using the updated barrier assessment protocols (See Figure 1 and Table 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 mega-projects. The UCO will be discussed further in subsequent reports.

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	979	511	349	137	25	84
North Central	50	195	95	73	17	5	9
Olympic	100	984	562	429	123	10	55
Southwest	62	671	301	232	60	9	21
South Central	11	152	27	21	3	3	4
Eastern	0	131	42	32	6	4	7
Total		3,112	1,538	1,136	346	56	180

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

[2] One hundred and eighty WSDOT fish passage barriers have been replaced or retrofitted, however, 35 of those require additional work to meet current fish passage criteria (See Tables 3 and 5).

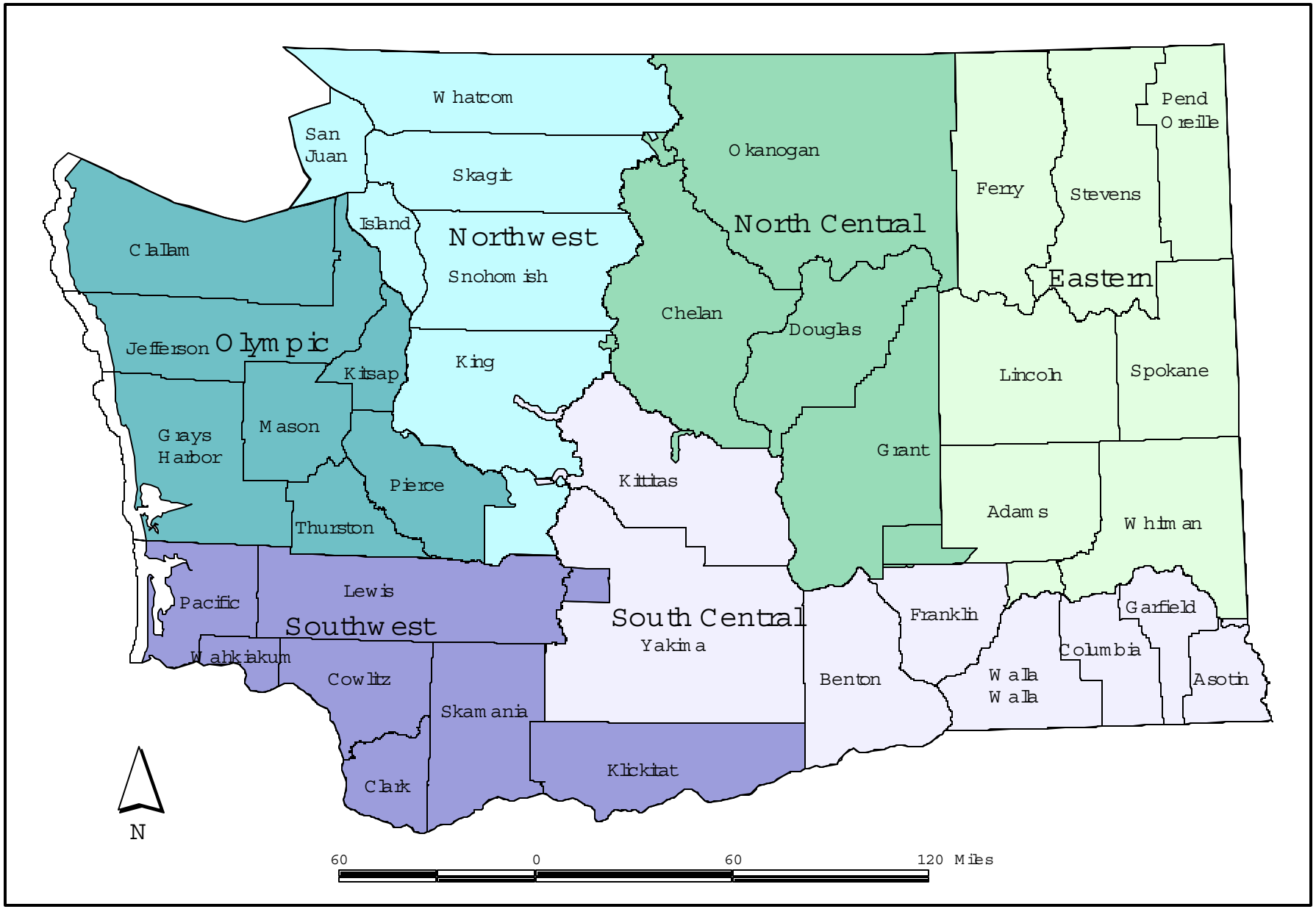

Figure 2.WSDOT Regions

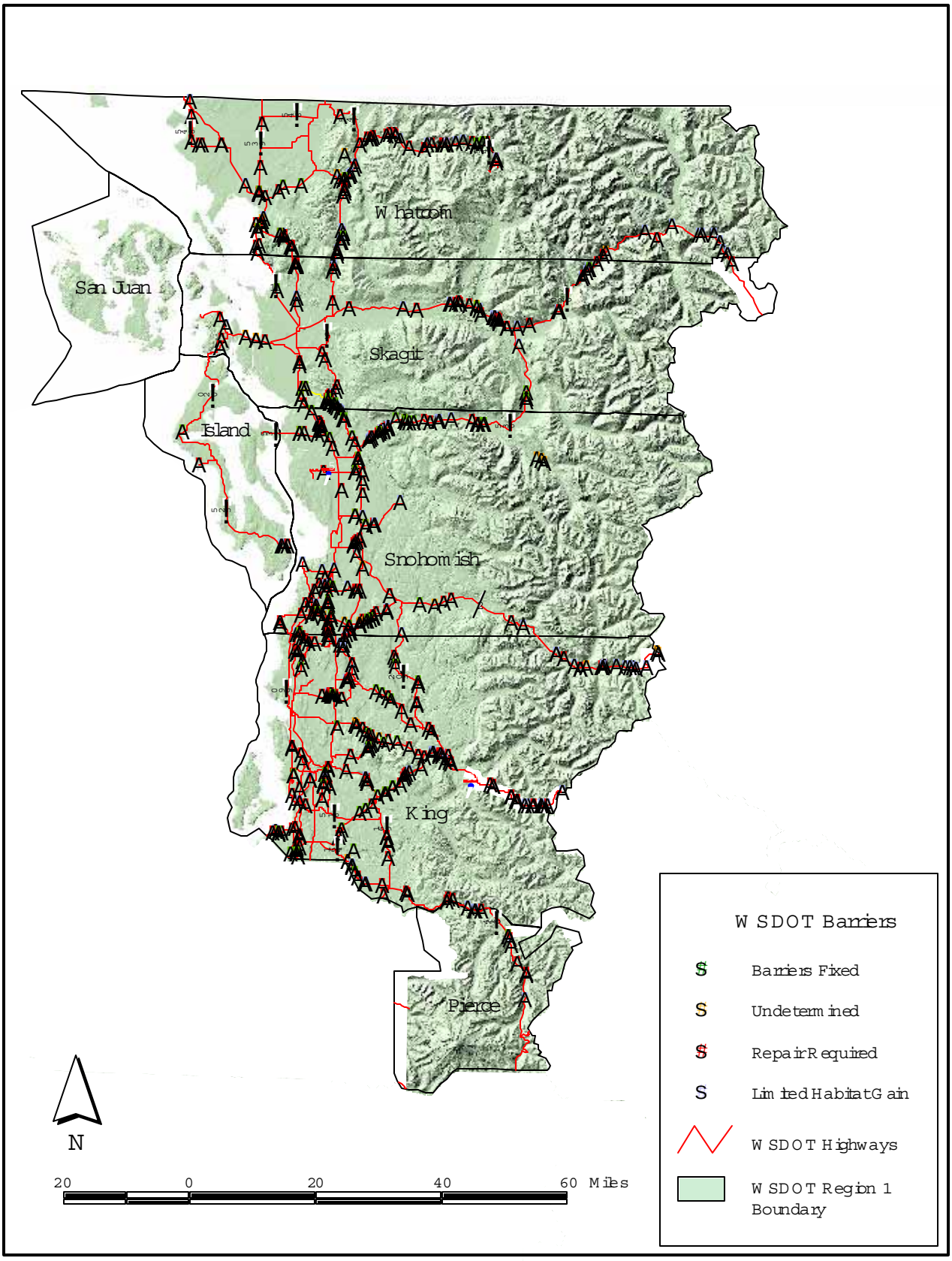

Figure 3. Northwest Region Fish Passage Barriers, March 2006.

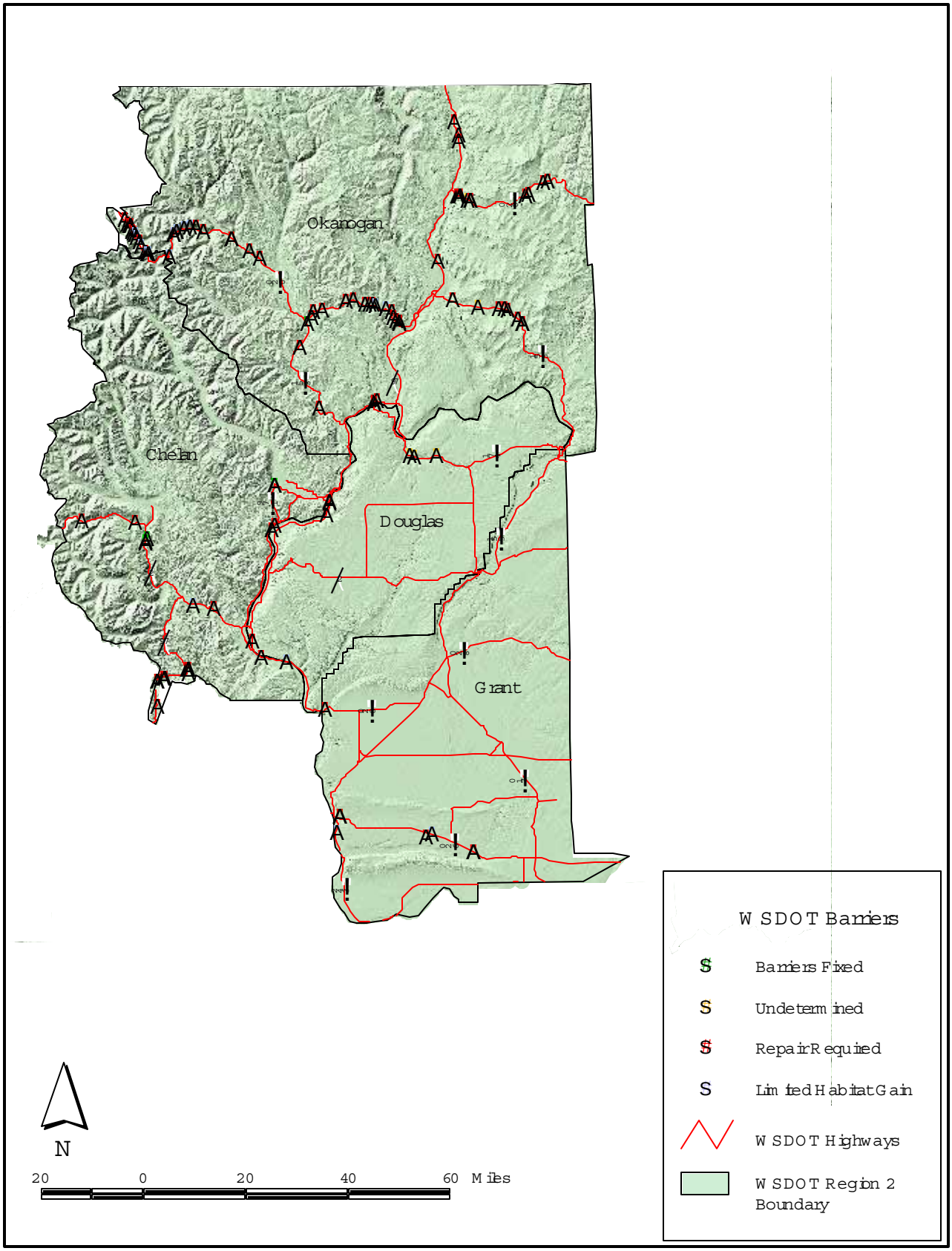

Figure 4. North Central Region Fish Passage Barriers, March 2006.

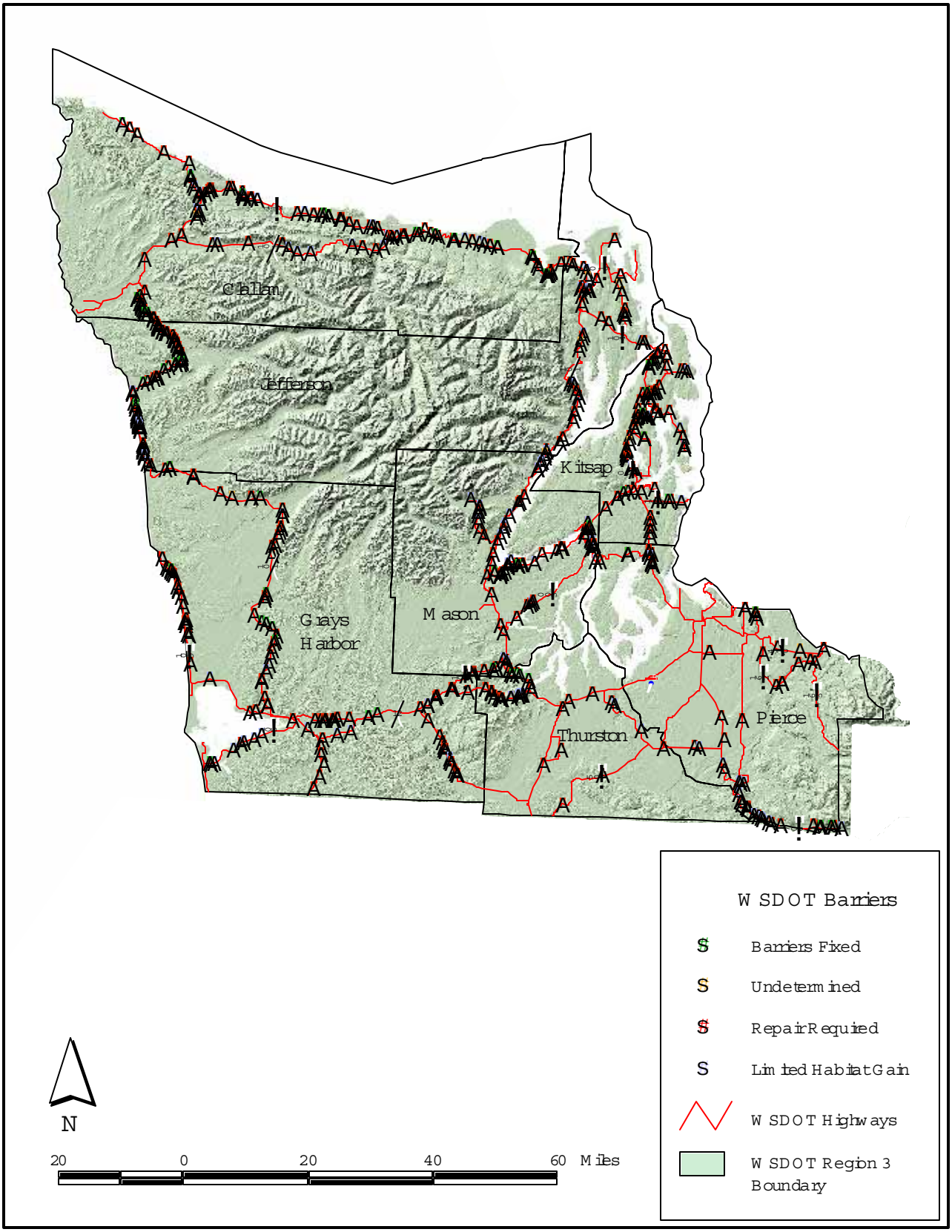

Figure 5. Olympic Region Fish Passage Barriers, March 2006.

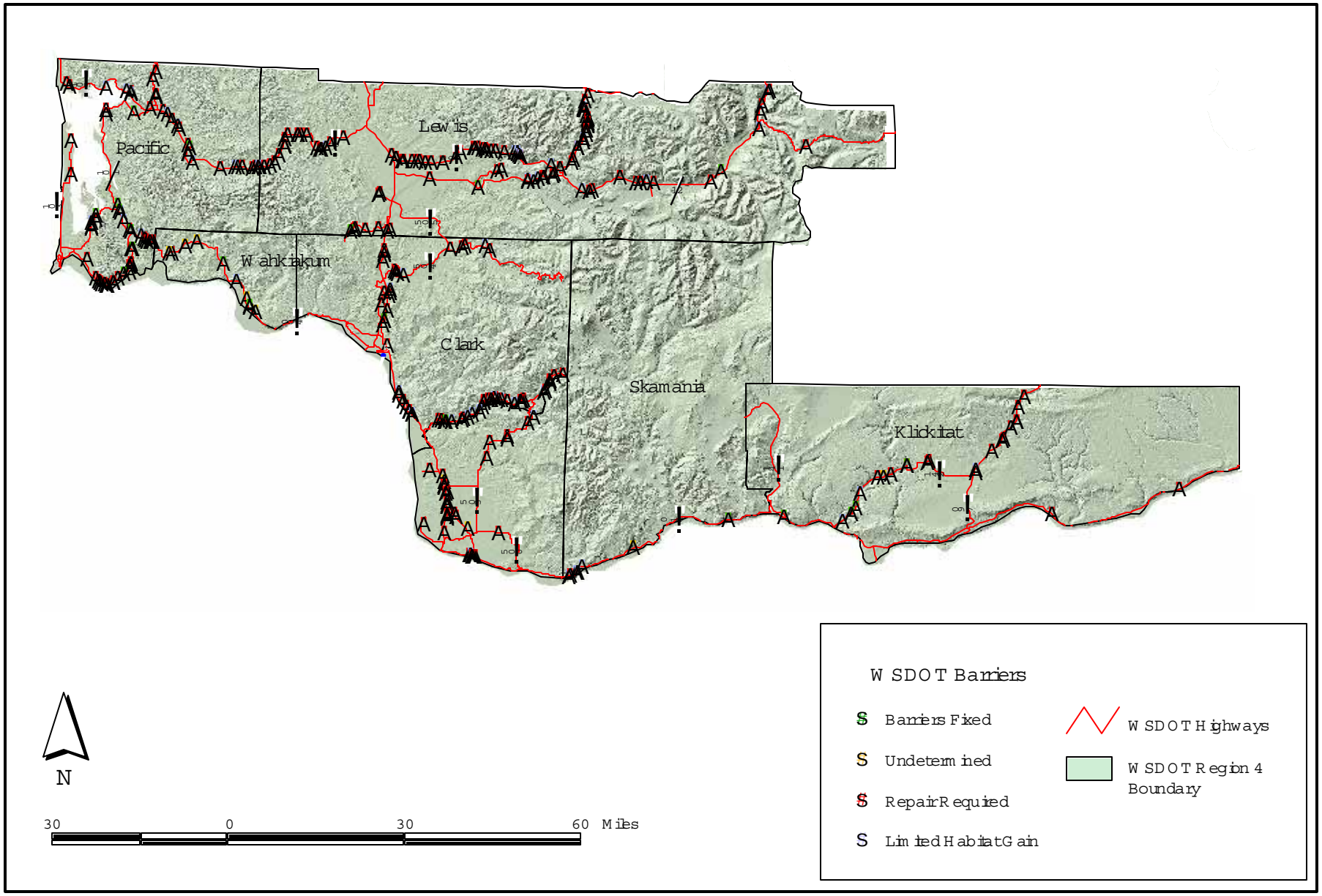

Figure 6. Southwest Region Fish Passage Barriers, March 2006.

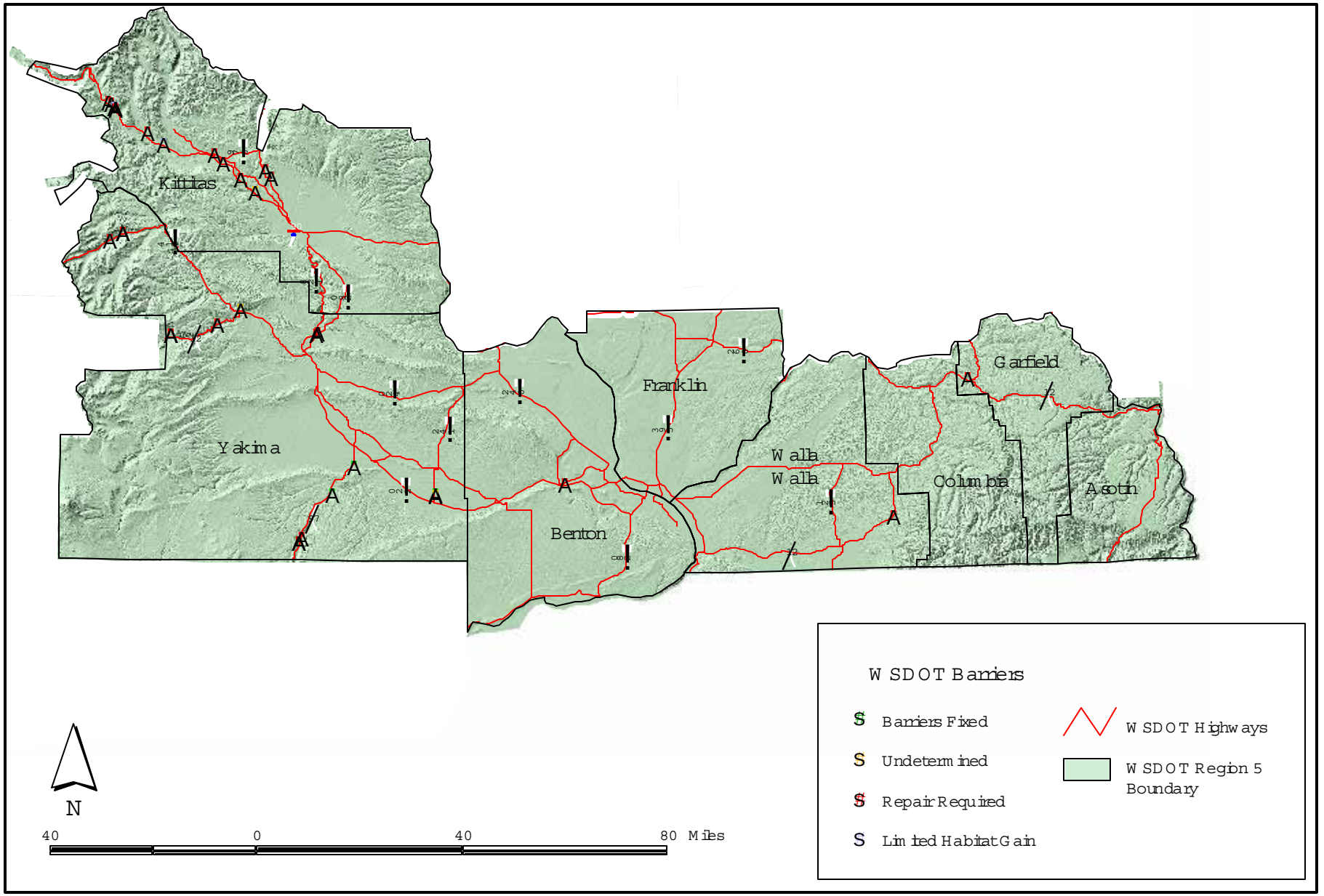

Figure 7. South Central Region Fish Passage Barriers, March 2006.

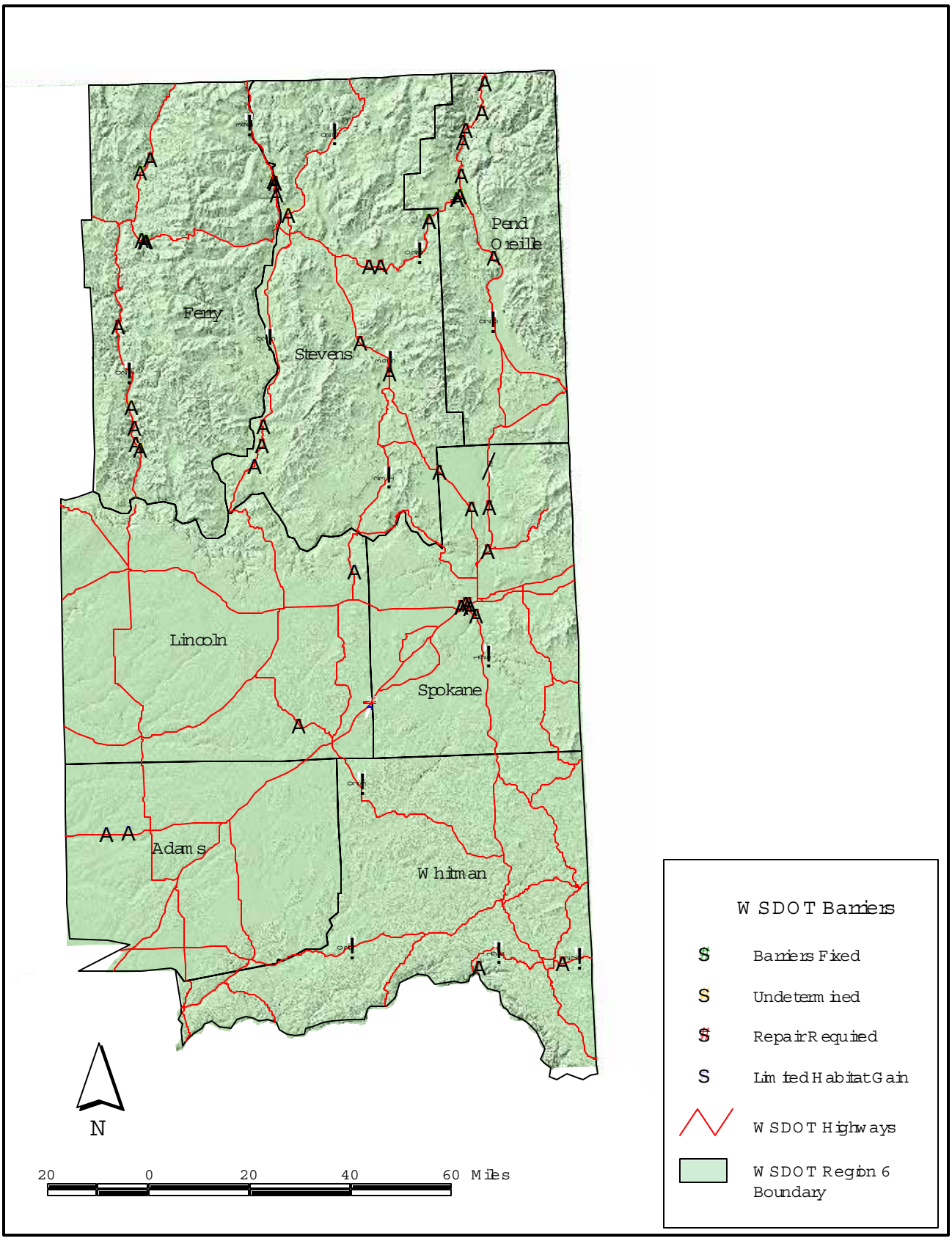

Figure 8. Eastern Region Fish Passage Barriers, March 2006.

WSDOT Fish Passage Barrier Correction Plan

WSDOT has been evaluating and correcting state highway fish passage barriers using the following approach: each biennium, the WSDOT submits a list of potential barrier corrections and the Legislature allocates funding for those projects. Second, as road projects are constructed, additional fish passage barriers are corrected whenever a Hydraulic Project Approval (HPA) is required. Combining fish passage restoration with road project construction decreases costs by eliminating duplication in equipment and personnel mobilization. And third, some fish passage barriers are corrected as a result of routine maintenance on failing culverts. Corrections achieved through maintenance are small scale repair projects and do not typically include anything as involved as full culvert replacement.

This approach to fish passage barrier correction does not assume habitat will immediately be used by target salmonids. Although in some cases salmon will start utilizing stream reaches previously blocked by barrier culverts almost immediately, many brood years may be required before newly opened habitat cycles up to full production. 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 11,338 kilometers (7,045 miles) of highways, while counties, for example, are responsible for an estimated 86,904 kilometers (54,000 miles) and cities for and additional 26,055 kilometers (16,190 miles) of roads (Washington State County Road Administration Board). The 1,136 WSDOT-owned fish barriers currently identified during the WSDOT Fish Passage Inventory as needing near-term correction are estimated to block more than 3,300* linear kilometers (2,050 miles) of potential salmonid habitat. To realize the full potential habitat gain, other non-WSDOT barriers will also need to be corrected.

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. 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: the degree of passability improvement, species-specific production potential of the gained habitat, amount of habitat gained, benefits or drawbacks 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 .

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* The amount of habitat blocked was based on a variety of methodologies: full physical surveys, Geographic Information System (GIS)-based threshold determination and GIS-based expanded threshold determination. For a full description of the methodologies used, refer to the WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual 2000) posted at: http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm)

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Six 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 three biennia. The Six Year Plan (included in Appendix IV) is the result of a process of project evaluation, scoping, development of conceptual designs, and budgeting. The Six 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

During monthly project scoping meetings, WDFW biologists present a summary of the key information collected in the inventory and habitat assessment effort for the highest priority fish barriers. 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, 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 be recommended to be placed on the Six Year Plan. In some instances, projects are placed on hold until further evaluation work is completed.

For every WSDOT fish barrier recommended for the Six Year Plan, WDFW environmental engineers conduct an engineering on-site field review with the WDFW scoping biologist and the appropriate WSDOT regional staff. They consider at least one conceptual design option for fish passage barrier correction and jointly generate an initial cost estimate for the project. Initial cost estimates are reported on the Six Year Plan and are intended to be used to request funding for further project development, engineering design, and construction. The initial cost estimates are for planning purposes only and do not include right-of-way acquisition, traffic control, safety design elements, paving, or striping, costs. Project costs shown on the Six Year Plan may increase or decrease during subsequent years due to consideration of different design options, increased cost of labor and materials, increased vehicle traffic, or any other unforeseen factors.

WSDOT fish passage barriers are placed on the Six Year Plan when both the biological and engineering scoping is completed by WDFW, and the appropriate WSDOT regional staff has concurred with the conceptual design option and the cost estimate.

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

WSDOT Fish Passage Barriers Corrected with Dedicated Funding

Since the expanded inventory in 1992 began, fish passage barriers have been corrected by WSDOT and WDFW's Technical Applications Division (formerly the Environmental Restoration Division), using dedicated funding, at 62 high priority sites (see Table 3). Fish passage barriers corrected in

2005 include bridge construction at Skobob Creek (Figures 9, 10, and 11), and culverts replacement at Little Boulder Creek (Figures 12, 13, and 14) and at Stevens Creek (Figures 15 and 16).

Fishways

In addition to culverts, WSDOT owns and maintains 152 fishways statewide. Regular inspections and maintenance are essential in the continued operation of fishways. Ninety 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 maintenance for fish passage, but are not fish passage barriers and do not require correction or repair are also regularly inspected. Currently, three fishways require maintenance for fish passage. Fishways that are barriers to fish passage and cannot be improved by continued operation and maintenance are taken off the inspection schedule until corrections are made. Fifty-six such fishways await barrier resolution (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. At present, six fishways need to be evaluated for durability and efficiency.

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	$183,000	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
								Total Estimated Expenditure:	$21,819,095		
									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	355,732	
										Estimated Area of Habitat Gain (m^2)	1,183,855

WSDOT Transportation Improvement Projects

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

Transportation project reviews take 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. Transportation projects reviewed include Mobility (I-1 subprogram) and Highway Safety (I-2 subprogram) of the Highway Improvement Program as well as Other Facilities projects (P-3 subprogram) of the Highway Preservation Program. All fish passage barriers inventoried during the Safety and Mobility reviews should be considered for correction, including barriers with limited habitat gain that are not considered for correction with Dedicated Funding (I-4 subprogram).

This report includes the results of transportation project reviews conducted by WDFW in 1998, 1999, 2000, 2001, 2003, and 2005. The next reviews will take place during the Spring of 2007.

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 (Table 4). For detailed accounts of barriers identified during the 2005 Highway Safety and Mobility project reviews in each region, refer to Appendix I (Appendix I includes a comprehensive list of barriers identified during the ongoing WSDOT fish passage barrier inventory beginning 1992 through March 2006, 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.

Table 4. Summary of Proposed WSDOT Highway Safety and Mobility Projects – Fish Passage Inventory Efforts.

WSDOT Region	Total Distance Surveyed[1] (mile)	Fish Crossings	Fish Barriers with Significant Habitat Gain[2]
Northwest	277.16	187	66
North Central	363.96	79	22
Olympic	217.14	147	45
Southwest	150.58	112	40
South Central	370.65	78	15
Eastern	156.19	36	19
Total	1,535.68	639	207

[1] On and off ramps were also evaluated, but are not included in the total distance surveyed.
[2] Represents fish passage barriers that are located within the proposed Safety and Mobility project vicinity.

Barrier Correction in the course of WSDOT Transportation Improvement and Road Construction Projects

Periodically, road culverts require maintenance, or fail completely and require replacement. Work within the ordinary high water mark of streams requires a Hydraulic Project Approval (HPA), which provides WDFW habitat biologists an opportunity to work with WSDOT engineers to correct fish passage deficiencies. In this process, WDFW's Technical Applications Division (TAPPS) may be contacted to provide detailed stream surveys, identify fish passage barriers, or to provide other pertinent information. To facilitate planning efforts, WDFW examines the milepost vicinities of upcoming safety and mobility projects and schedules an inventory of the project area if needed. Following the inventory, WDFW provides a list of fish passage barriers within the proposed safety and mobility projects to the appropriate WSDOT region.

It is important that WSDOT notify WDFW/ 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.

One hundred-eighteen fish passage barriers were reported corrected by WSDOT during safety and mobility projects since 1982 (see Table 5). Ten fish passage barriers were corrected in 2005 during road improvement projects. Three of the ten projects were completed during the ongoing SR 18 widening. Two Taylor Creek and SR 18 crossings (Figures 17, 18, 19 and Figures 20, 21, 22), as well as Downs Creek and the off ramp of SR 18 crossing (Figures 23, 24, and 25) were replaced with full-span bridges. WSDOT replaced a barrier culvert at an Unnamed Tributary to West Fork Hylebos Creek and SR 161 crossing (Figures 26, 27 and 28). The SR 522 widening project resulted in the replacement of two culverts at two Unnamed Tributaries to Evans Creek (Figures 29 through 34). Widening of SR 527 also resulted in the replacement of a barrier culvert at an Unnamed Tributary to Ruggs Lake (Figures 35 and 36). Several barrier culverts were replaced during the paving of SR 542 from spring 2004 to fall 2005. The replacement of one of the SR 542 crossing and an Unnamed Tributary to the North Fork Nooksack River was completed in 2005 (Figure 37, 38, and 39). WSDOT improved fish passage at the crossing of SR 706 and an Unnamed Tributary to Nisqually River (Figure 40 and 41).

Table 5. Fish Passage Projects Completed through WSDOT Transportation Projects and Other Funding Sources.

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		No
Olympic	990480	8.05	SR 112	49.50	Whiskey Cr	Strait Of Juan De Fuca	19.0020	1.50	TP		No
Northwest	05.0018 2.00		SR 532	6.14	Church Cr	Stillaguamish R	05.0018	2.00	OM		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	McGovern Cr	NF Stillaguamish R	05.0168		TP	1996	Yes
Northwest	991162		SR 530	31.20	Unnamed	Stillaguamish R	05.0168X		TP	1996	Yes

Table 5. Fish Passage Projects Completed through WSDOT Transportation Projects and Other Funding Sources.

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/No
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
Northwest	991153		SR 530	55.90	Unnamed	Skagit R	04.0707	0.21	TP	1996	Yes
Northwest	991059		SR 531	8.71	Unnamed	M F 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	20.02370		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

Table 5. Fish Passage Projects Completed through WSDOT Transportation Projects and Other Funding Sources.

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/No
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
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	DM 10		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

Table 5. Fish Passage Projects Completed through WSDOT Transportation Projects and Other Funding Sources.

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/No
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
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

Table 5. Fish Passage Projects Completed through WSDOT Transportation Projects and Other Funding Sources.

WSDOT Region	SiteID	PI	Road	Milepost	Stream	Tributary to	WRIA	RM	Funding	Year Fixed	Fish Passage Satisfactory Yes/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
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

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 Dedicated Funding 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.

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. If the reaches 500 upstream or downstream of the fish passage project are reaches where fish are not likely to be holding or spawning, the team relocates the survey accordingly.

WDFW evaluates dedicated funding projects to ensure they function properly. All projects completed by WDFW are evaluated for one year following construction. During this period, any design deficiencies are noted and corrected whenever possible. After building a project using dedicated I-4 funding, this one-year tune-up period allows for observation of conditions during high flow months when fish are migrating. An on-site review consists of physical assessment by the WDFW project team to confirm the new fish passage installation is durable and efficient. Project deficiencies are identified and corrected during this period beginning after project construction and ending on December 31 the year following.

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.

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 2004 and 2005. No spawning salmon were observed upstream of Stevens Creek, tributary to Lake Stevens, constructed in 2005.

Skobob Creek

Before Construction

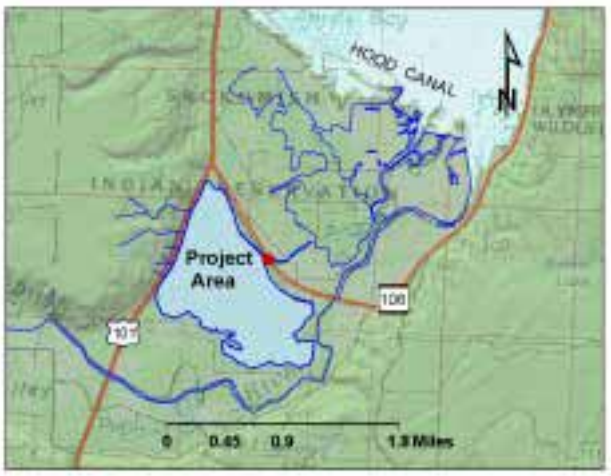

Figure 9. Skobob Creek - Project location: SR 106 at milepost 0.85.

Figure 10. A 1.83 m wide, concrete box culvert was identified as a barrier due to excessive water velocity evidenced by bank scouring downstream of the culvert.

After Construction

Figure 11. In 2005, WSDOT replaced the box culvert with a 37 m wide single span bridge through a Dedicated Funding (I-4) project. The new bridge provides an unlimited access to over 4.5 acres rearing habitat to coho and chinook salmon, steelhead, resident and searun cutthroat trout, as well as restores the channel and improves creek flow capacity under the highway during storm events. The construction cost of this $1.8 million bridge was a multi-agency effort involving the Hood Canal Salmon Enhancement Group, Skokomish Tribe, and WSDOT.

Little Boulder Creek

Before Construction

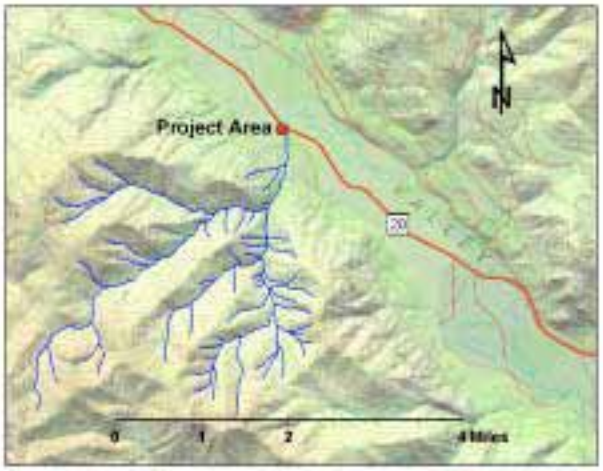

Figure 12. Little Boulder Creek - Project location: SR 20 at milepost 181.34, approximately three miles west of Mazama.

Figure 13. A 1.85 m high outfall drop on the downstream end of a 2.72 m wide structural steel plate culvert created a fish passage barrier to chinook salmon, steelhead, bull trout and resident cutthroat trout. The culvert was equipped with 13 baffles, which required frequent maintenance.

After Construction

Figure 14. In 2005, the steel culvert was replaced with an 8 m wide structural plate steel arch stream simulation culvert allowing unrestricted fish access to over 5,000 meters of upstream habitat. In addition to restoring fish passage for chinook salmon, steelhead, bull trout and resident trout, the Dedicated Funding (I-4), $545,000 project alleviated maintenance issues associated with clearing debris caught inside the baffled culvert and increased the culvert's capacity to accommodate 100 year flood flows.

Stevens Creek

Figure 15. Stevens Creek - Project location: SR 92 at milepost 0.47, just north of Lake Stevens.

After Construction

Figure 16. A single, 0.91 m concrete round culvert was replaced in 2005 by WSDOT through a Dedicated Funding (I-4) project with a 3.74 m wide concrete box culvert. A 2% slope and a 0.27 m outfall drop on the downstream end of the old culvert posed a challenge to fish passage. The $400,000 project restored access to over 2,000 meters of potential habitat for coho and kokanee salmon, steelhead, searun cut-throat, and resident trout. The new culvert is set at a slope of less than 1% and is countersunk with natural streambed material lining the bottom of the culvert. In addition to improving fish passage, the new culvert reduces the chances of flooding.

Taylor Creek

Before Construction

Figure 17. Taylor Creek - Project location: SR 18 at milepost 18.19.

Figure 18. A round, 1.52 m wide concrete culvert was undersized.

After Construction

Figure 19. A new bridge was constructed in 2005, during the SR 18 highway improvement project involving the construction of a 4 four-lane divided highway. WSDOT replaced seven culverts in Taylor Creek and its tributaries with full-span bridges between 2003 and 2005 at a cost of $9.72 million. The cost of this bridge was $2.14 million. Over 3,300 meters of potential habitat for coho salmon, steelhead and resident trout is now easily accessible. Another SR 18 culvert upstream of this crossing was replaced with a bridge in 2005 as well (See Figures 21 and 22).

Taylor Creek

Before Construction

Figure 20. Taylor Creek - Project location: SR 18 at milepost 18.45.

Figure 21. A round, 1.52 m concrete culvert was considered a barrier due to a 2.25% slope.

After Construction

Figure 19. A full-span bridge was constructed in 2005 during the SR 18 Safety and Mobility project. Coho salmon, steelhead and resident trout can fully utilize over 1,600 meters of habitat above the new bridge.

Downs Creek

Before Construction

Figure 23. Downs Creek - Project location: SR 18 at off ramp (the old frontage road).

Figure 24. The original 1.8 m round steel culvert was equipped with downstream rock controls. The rock controls were not effective in backwatering the culvert and the outfall drop gradually increased to 0.27 m obstructing fish passage.

After Construction

Figure 25. Fish passage at this crossing was addressed in 2005 during the SR 18 widening project. WSDOT replaced the old steel culvert with a full span bridge for a total cost of $291,600. The new bridge improved fish access to 7,400 meters of potential habitat upstream for coho salmon and resident cutthroat trout.

Unnamed Tributary to West Fork Hylebos Creek

Before Construction

Figure 26. Unnamed tributary to West Fork Hylebos Creek - Project location: SR 161 at milepost 35.1.

Figure 27. Two .46 m wide steel and concrete (left and right) pipes were considered barriers due to a slope of 1.8% and 2.1% respectively.

After Construction

Figure 28. Installed in 2005, the new, larger concrete, 3.7 m wide box culvert with natural streambed material throughout will provide unimpeded fish passage to over 3,000 meters of potential habitat for coho salmon, steelhead and resident trout. In addition to providing fish passage, the new culvert will be able to accommodate 100 year flows, and reduce erosion.

Unnamed Tributary to Evans Creek

Before Construction

Figure 29. Unnamed tributary to Evans Creek - Project location: SR 522 at milepost 18.44.

Figure 30. A 1.2 m wide, round corrugated steel culvert was a velocity barrier.

After Construction

Figure 31. A 4.10 m wide structural plate steel arch culvert was installed in 2005 replacing the undersized 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 2,700 meters of habitat for coho salmon, steelhead, resident, and searun cutthroat trout.

Unnamed Tributary to Evans Creek Tributary

Before Construction

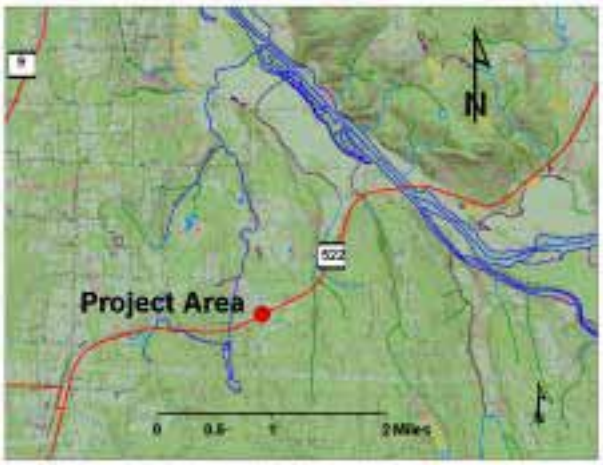

Figure 32. Unnamed tributary to Evans Creek Tributary - Project location: SR 522 at milepost 18.77.

Figure 33. A .61 m wide concrete culvert was a barrier to fish passage due to 2% slope.

After Construction

Figure 34. A 4.10 m wide corrugated steel culvert was installed in place of the old pipe in 2005 during a road widening project. Coho salmon, steelhead and resident trout will benefit from 370 meters of potential rearing habitat upstream of this crossing.

Unnamed Tributary to Ruggs Lake

Figure 35. Unnamed tributary to Ruggs Lake - Project location: SR 527 at milepost 9.33, just south of Everett.

After Construction

Figure 36. WSDOT replaced a 1.2 m wide, concrete box culvert with a 2.4 m wide, concrete box culvert, improving fish access to 37 acres of rearing habitat at the same time increasing creek flow capacity under the highway during extreme flows. The new culvert was a part of a 2005 Safety and Mobility project, where WSDOT widened the existing two-lane road to a four-lane one, replaced undersized culverts, and improved water quality through the construction of new detention ponds.

Unnamed Tributary to North Fork Nooksack River

Before Construction

Figure 37. Unnamed tributary to North Fork Nooksack River - Project location: SR 542 at milepost 45.51, east of Bellingham.

Figure 38. A .61 m wide round concrete culvert, was filled with sediments, impeding fish passage.

After Construction

Figure 39. As part of the 2004 and 2005 WSDOT highway improvement project, numerous undersized culverts were replaced with larger ones, improving fish passage and drainage during spring snow melt. This 2.45 m wide concrete box culvert benefits resident trout.

Unnamed Tributary to Nisqually River

Figure 40. Unnamed tributary to Nisqually River - Project location: SR 706 at milepost 8.02.

After Construction

Figure 41. Eight log controls were placed downstream of a squash, corrugated steel, 1.65 m wide culvert to backwater the culvert and improve access to 900 meters of habitat for resident trout.