

**Right-of-Way Stream Crossing Inventory  
Draft 2007 Report**

**Project WA20236**



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## Summary

In 2007, field staff surveyed a total of 113 culverts on County-maintained roads within the habitat of Endangered Species Act-listed Chinook salmon, Steelhead, and Bull trout. These surveys were conducted in support of Snohomish County Public Works Road Maintenance. Six of these culverts were surveyed for quality control (repeatability) purposes. During the extent of the survey, information was collected to help determine which culverts currently meet best management practices (BMP) for salmonid passage as established by the Washington Department of Fish and Wildlife level A protocol. The information collected in 2007, revealed that 59% or 67 out of 113 culverts failed to meet current BMPs, preventing or limiting salmonid access to upstream habitat.

## Purpose and Objectives

The purpose of the 2007 Right of Way Habitat Survey for Road/Stream Crossings (ROW) was to inventory habitat and culvert conditions adjacent to County-maintained roads. The surveys were conducted to support Snohomish County's effort to comply with the Regional Road Maintenance Program. This program was instituted in direct response to the Endangered Species Act-listing of Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead (*Oncorhynchus mykiss*) and Bull trout (*Salvelinus confluentus*). The initial objective of the survey was to inventory fifty culverts throughout unincorporated Snohomish County. Initial emphasis was placed on the following watershed areas as these were the remaining areas needing culvert surveys.

### Church Creek Watershed

Church Creek  
Freedom Creek  
Douglas Creek

### Tulalip Reservation

Tulalip Creek  
Mission Creek

### SF/NF Stilliguamish

Tributaries adjacent to  
Mtn. Loop Hwy and Hwy 530

### Unincorp. Marysville

Allen Creek  
Quilceda Creek  
Hayho Creek

### Sultan/Gold Bar/Index

Tributaries to Skykomish

## Methods

The project team collaborated with Road Maintenance staff and management to develop a data sheet, field survey protocols (Appendix A), a potential crossings map in ArcGIS, quality assurance and quality control. Potential stream crossings where culverts might be found were identified by overlaying roads and streams data in GIS. Each site was individually visited to determine if the culvert existed, whether the culvert could be surveyed and if the culvert currently met best available science for fish passage. All culverts surveyed followed the 2006 survey protocol developed by Snohomish County Surface Water Management (SWM) and fulfilled WDFW Level A protocol.

Three photographs were taken at each survey site that documented the upstream and downstream habitat. The third photograph was taken of the downstream end of the culvert. The culvert photograph documented the existing condition of the culvert and degree of perch, if the culvert was perched. In some instances it was not possible to obtain a photo of the end of the culvert due to accessibility. In these cases a culvert photo was obtained with as much information as possible. Photos documenting site visits are located on the server in the following folder:

X:\ESA\Habitat\ROW\StrmCrssPhotos\2007pics\PDF\_Prepped. The photos and field data are located in Appendix B.

## Results

Staff made 229 field visits to evaluate potential culverts at stream crossings, including 6 quality assurance surveys in 2007 (Table 1). These visits included instances where no culvert existed, the culvert was on a private road, the culvert was a bridge or a survey was previously completed. Of the total potential culvert crossings identified, 30 did not exist. The initial pool of potential crossings was identified through overlay of streams and county maintained roads. Due to scale factors, plus the small inaccuracies of road and stream locations, all potential crossings are not actual crossings. Where a culvert was not found, the stream either ran adjacent to the road or a bridge existed. Forty-one culverts were located on private roads or drives and could not be surveyed. Fifteen of the culverts were inaccessible due to steep ravines, dangerous traffic conditions, barbed or electric fencing, or barrier of some degree. Twenty-eight required road maintenance due to heavy infestation of blackberries (*Rubrus discolor*) or other non native vegetation. These culverts were not surveyed. Their maintenance needs were documented and road maintenance was routinely notified via e-mail.

Each of the following tables highlights the culvert identification number unique to the ROW project, the date of the site visit and/or survey, the closest address location and township and range (T/R) derived from the current parcels layer in GIS and other data specific to the individual table where information was collected which had direct or indirect influence on culvert function and fish passage.

**Table 1. Monthly culvert visits and surveys.**

Month	Update *	On Private Rd	Inaccessible**	Nonexistent	Road Maintenance	Total Sites Completed	Total Sites Visited
July	0	2	2	7	8	31	50
August	0	24	4	11	11	50	100
September	2	14	8	12	8	26	70
October	0	1	1	0	1	6	9
<b>Totals</b>	<b>2</b>	<b>41</b>	<b>15</b>	<b>30</b>	<b>28</b>	<b>113</b>	<b>229</b>

\*Update denotes any culvert with an existing but incomplete data set

\*\*Culvert located on private property or otherwise unable to investigate

Where culvert access for the survey was not possible due to heavy vegetation, the following information was documented, position location in GPS, brush cutting or other work needed and forwarded to the Road Maintenance Division (Table 2).

**Table 2: Road Maintenance Log, where T/R is Township and Range (Willamette Base and Meridian).**

culvert ID	date	Closest Address	Watershed Sub-Basin	Location T/R	Work Needed
310098	7/24/2007	27218 Woodland Rd	Church Creek	32/4	repair crack upstr
310078	7/24/2007	28319 Pioneer Hwy	Douglas Creek	32/4	brushcut access to culvert
310111	7/24/2007	6910 Pioneer Hwy	Church Creek	32/4	brushcut access to culvert
310302	7/24/2007	6918 100th St NE	Allen Creek	30/5	brushcut access to culvert
310051	7/31/2007	30025 44th Ave NW	Church Creek	32/4	brushcut access to culvert
310049	7/31/2007	30019 36th Ave NW	Church Creek	32/4	brushcut access to culvert

<b>culvert ID</b>	<b>date</b>	<b>Closest Address</b>	<b>Watershed Sub-Basin</b>	<b>Location T/R</b>	<b>Work Needed</b>
310058	7/31/2007	3025 300th ST NW	Church Creek	32/4	brushcut access to culvert
310029	8/7/2007	17917 SR 530 NE Arl	Frailey Mountain Drainages	32/6	brushcut access to culvert
310027	8/7/2007	17917 SR 530 NE Arl	Frailey Mountain Drainages	32/6	brushcut access to culvert
310097	8/7/2007	27802 139th Ave NE	Ebey Hill Drainages	32/6	brushcut access to culvert
310053	8/7/2007	30121 Hillis Rd	Frailey Mountain Drainages	32/6	brushcut access to culvert
310247	8/14/2007	5616 132nd St NE	Quilceda Creek	30/5	brushcut access to culvert
310281	8/15/2007	Waterworks Rd	Lake Agnes	29/4	brushcut access to culvert
310392	8/29/2007	16226 OK Mill RD	Pilchuck River	29/6	brushcut access to culvert
310673	9/11/2007	30928 Ben Howard RD	Lower Mainstem Skykomish	27/8	brushcut access to culvert
310751	9/12/2007	18117 203rd ST SE	Snoqualmie Mouth	27/6	brushcut access to culvert
310051	9/19/2007	29131 40th Ave NW	Church Creek	32/4	brushcut access to culvert
310055	9/19/2007	3630 300th ST NW	Church Creek	32/4	brushcut access to culvert
310811	9/19/2007	12003 Woods Creek Rd	Woods Creek	28/7	brushcut access to culvert
310616	9/19/2007	20808 Brown Rd	Woods Creek	28/7	brushcut access to culvert
310714	10/2/2007	18431 Fales Rd	Cathcart Drainages	27/6	brushcut access to culvert

According to the protocol (Appendix A), slope greater than 1% is a fish passage barrier having negative implications for fish access to spawning reaches upstream including back-sloped gradients. Their distribution is throughout rural Snohomish County. Length and vertical difference was measured at each culvert survey using an auto level on a tripod and a stadia rod. From these measurements the slope of the culvert was determined (Table 3).

**Table 3: Slope Greater Than 1% (0.01).**

<b>Culvert ID</b>	<b>Creek</b>	<b>Watershed Sub-Basin</b>	<b>Location T/R</b>	<b>Date</b>	<b>Slope</b>
310002	trib to Fisher Cr	Skagit Flats South	32/4	07/31/07	-0.03
310005	Fisher Creek	Skagit Flats South	32/4	07/31/07	0.02
310009	trib to Everett Cr	Sauk River	32/10	08/28/07	0.03
310012	trib to Pilchuck Cr	Pilchuck Creek	32/4	08/22/07	0.01
310025	trib to Everett Cr	Sauk river	32/10	08/28/07	-0.01
310028	trib to Everett Cr	Sauk river	32/10	08/23/07	0.04
310032	trib to Deer Cr	Deer Creek	32/7	08/08/07	0.03
310033	trib to Church Cr	Church Creek	32/4	07/31/07	0.03

Table 3 cont'd					
Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date	Slope
310040	trib to Everett Cr	Sauk River	32/10	08/28/07	0.02
310048	trib to Pilchuck Cr	Pilchuck Creek	32/5	07/19/07	0.01
310054	trib to Church Cr	Church Creek	32/4	07/31/07	0.04
310055	trib to Church Cr	Church Creek	32/4	07/31/07	0.02
310056	trib to Pilchuck Cr	Pilchuck Creek	32/4	07/19/07	-0.04
310060	trib to NF Stilliguamish	Grandview Area	32/6	08/22/07	0.02
310065	ttrib to NF Stilliguamish	Grandview Area	32/7	08/08/07	0.04
310074	Moose Creek	Pilchuck Creek	32/9	07/19/07	0.02
310081	Freedom Creek	Church Creek	32/4	07/31/07	-0.02
310096	trib to NF Stilliguamish	Ebey Hill Drainages	32/6	08/07/07	0.01
310098	Church Cr	Church Creek	32/6	07/24/07	0.06
310102	trib to Jorgenson Slough	Church Creek	32/6	07/24/07	0.04
310118	trib to Sauk R	Sauk River	32/9	08/23/07	0.02
310130	trib to Jim Cr	Jim Creek	32/6	08/08/07	0.05
310160	SF Stillaguamish	Arlington Junction S.	31/6	08/28/07	0.03
310169	Murphy Creek	Sauk River	31/10	08/23/07	0.07
310169	Murphy Creek	Sauk River	31/10	08/23/07	0.07
310176	Goodman Creek	Sauk River	31/10	08/23/07	0.06
310220	trib to Tulalip Cr	Lake Goodwin	31/4	08/29/07	0.05
310234	WF Quilceda CR	Quilceda Creek	31/5	09/24/07	0.04
310250	Middle Fork Quiceda Creek	Quilceda Creek	32/5	07/18/07	0.02
310272	trib to SF Stilliguamish	Robe Valley Drainages	32/8	08/02/07	0.02
310275	Coho creek	Allen Creek	30/5	07/17/07	0.01
310279	trib to SF Stilliguamish	Robe Valley Drainages	30/8	08/02/07	0.03
310279	trib to SF Stilliguamish	Robe Valley Drainages	30/8	08/02/07	-0.04
310283	trib to SF Stilliguamish	Robe Valley Drainages	30/8	08/01/07	0.01
310288	Allen Creek	Allen Creek	30/5	07/16/07	0.02
310290	Allen Creek	Allen Creek	30/5	07/17/07	-0.01
310307	trib to Allen Cr	Allen Creek	30/5	07/16/07	0.02
310312	trib to Pilchuck R	Pilchuck River	30/7	08/01/07	0.01
310318	Hemple Creek	Gold Basin Drainages	30/8	08/02/07	0.03
310320	trib to SF Stilliguamish	Upper SF Stillaguamish	30/10	08/29/07	0.05
310323	trib to SF Stilliguamish	Upper SF Stillaguamish	30/9	08/29/07	0.02
310334	Eldred	Upper SF Stillaguamish	30/9	08/02/07	0.01
310358	Stevens Creek	Pilchuck River	29/5	08/29/07	0.02
310359	Stevens Creek	Pilchuck River	29/6	08/29/07	0.03
310395	trib to Dubuque Cr	Pilchuck River	29/6	08/29/07	0.03
310562	Bear Creek	Bear Creek	28/8	09/05/07	0.03
310570	Ames Creek	Lower Sultan River	28/8	09/11/07	0.05
310570	Ames Creek	Lower Sultan River	28/8	09/11/07	0.05
310597	Bear Creek	Bear Creek	28/8	09/05/07	0.02
310609	Ames Creek	Lower Sultan River	28/8	09/11/07	0.04
310618	trib to French Cr	French Creek	28/6	09/12/07	0.07
310640	trib to Snohomish R.	Cathcart Drainages	28/6	09/12/07	0.15
310666	trib to Skykomish R	Lower Mainstem Skykomish	27/8	09/11/07	0.02

Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date	Slope
310668	trib to Skykomish R	Upper Mainstem Skykomish	27/8	09/04/07	0.04
310672	trib to Skykomish R	Lower Mainstem Skykomish	27/7	09/11/07	0.02
310677	trib to NF Skykomish R	Lower NF Skykomish	27/10	09/05/07	0.09
310678	trib to Skykomish R	Lower Sultan River	28/8	09/11/07	0.02
310686	Mccoy Creek	Lower Mainstem Skykomish	27/8	09/04/07	0.02
310700	Austin Creek	Upper Mainstem Skykomish	27/9	09/05/07	0.18
310708	Canyon Creek	Lower NF Skykomish	27/10	09/05/07	0.03
310709	Elloitt Creek	Cathcart Drainages	27/6	10/02/07	0.05
310711	Riley Slough	Lower Mainstem Skykomish	27/7	09/12/07	0.01
310713	Evans Creek	Cathcart Drainages	27/6	10/02/07	0.03
310718	Canyon Creek	Lower NF Skykomish	27/10	09/05/07	0.06
310724	Evans Creek	Cathcart Drainages	27/6	10/03/07	0.01
310753	Peoples Creek	Snoqualmie Mouth	27/7	09/12/07	0.02
310762	trib to Snohomish R.	Bear Creek	27/6	10/17/07	0.03
310763	trib to Snohomish R.	Bear Creek	27/6	10/11/07	0.02
310765	trib to Snohomish R.	Bear Creek	27/6	10/11/07	0.01
310816	trib to May Cr	Upper Mainstem Skykomish	27/9	09/11/07	0.02
310817	Anderson Cr	Cathcart Drainages	27/6	09/18/07	-0.02

Six culverts were noted for having current beaver activity and control mechanisms in place. These mechanisms were installed by County employees and included the Clemson Beaver Pond Leveler, Flexible Leveler and Beaver Diversion Dam. The intent of the beaver control device is to prevent potential flooding caused by beaver damming and improve water flow through adjacent culverts (Table 4). This information was passed on to the appropriate Watershed Steward.

**Table 4: Culverts affected by beaver.**

Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date
310255	Quilceda Creek	Quilceda Creek	30/5	7/18/2007
310251	Middle fork Quiceda	Quilceda Creek	30/5	7/19/2007
310254	Quilceda Creek	Quilceda Creek	30/5	8/14/2007
310597	Bear Creek	Bear Creek	28/8	9/5/2007
310562	Bear Creek	Bear Creek	28/8	9/5/2007
310687	Evans Creek	Cathcart Drainage	27/6	9/12/2007

Freshwater mussels were noted where observed in the stream bed at culvert survey sites. These sites don't represent any particular significance of watershed characteristics. Their location was passed on to the appropriate Watershed Steward (Table 5).

**Table 5: Observed freshwater mussel presence.**

Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date
310340	Mission Cr	Misson Creek	30/4	8/14/2007
310321	Tulalip Cr	Tulalip Creek	30/4	8/15/2007
310597	Bear Cr	Bear Creek	28/8	9/5/2007
310632	Wagleys Cr	Lower Mainstem Skykomish	28/8	9/5/2007
310687	Evans Cr	Cathcart Drainages	27/6	9/12/2007

Fish are an important indicator of environmental quality and as such were noted where observed at culvert survey sites. Juveniles were present throughout but no identification was made (Table 6).

**Table 6. Observed fish presence.**

Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date
310120	trib to Pilchuck Cr	Pilchuck Creek	32/4	7/12/2007
310239	trib to WF Quilceda	Quilceda Creek	32/5	7/17/2007
310256	Middle Fork Quilceda	Quilceda Creek	30/5	7/18/2007
310253	Heyho	Quilceda Creek	30/5	7/18/2007
310250	Middle Fork Quilceda	Quilceda Creek	30/5	7/18/2007
310073	trib to Pilchuck Cr	Pilchuck Creek	32/5	7/19/2007
310100	Church	Church Creek	32/4	7/24/2007
310081	Freedom	Church Creek	32/4	7/31/2007
310312	trib to Pilchuck R	Pilchuck River	30/7	8/1/2007
310283	trib to SF Stilliguamish R	Robe Valley Drainages	30/8	8/1/2007
310096	trib to NF Stilliguamish R	Ebey Hill Drainages	32/6	8/7/2007
310130	trib to Jim Cr	Jim Creek	32/6	8/8/2007
310123	trib to Jim Cr	Jim Creek	32/7	8/8/2007
310032	trib to NF Stilliguamish R	Deer Creek	32/7	8/8/2007
310124	trib to Jim Cr	Jim Creek	32/7	8/8/2007
310254	Quilceda	Quilceda Creek	30/5	8/14/2007
310255	Middle Fork Quilceda	Quilceda Creek	30/5	7/18/2007
310135	Kackman Creek	Harvey-Armstrong Creek	32/5	8/22/2007
310169	Murphy Creek	Sauk River	31/10	8/23/2007
310814	trib to Sauk R	Sauk River	32/9	8/28/2007
310030	trib to Everett Cr	Sauk River	32/10	8/28/2007
310685	trib to Barr Cr	Lower Mainstem Skykomish	27/7	9/4/2007
310668	trib to Skykomish R	Upper Mainstem Skykomish	27/8	9/4/2007
310815	Wallace River	Wallace River	28/9	9/5/2007
310597	Bear creek	Bear Creek	28/8	9/5/2007
310632	Wagleys creek	Lower Mainstem Skykomish	28/8	9/5/2007
310609	Ames Creek	Lower Sultan River	28/8	9/11/2007
310570	Ames Creek	Lower Sultan River	28/8	9/11/2007
310753	Peoples Creek	Snoqualmie Mouth	27/7	9/12/2007
310687	Evans Creek	Cathcart Drainages	27/6	9/12/2007

Level A protocol states that an outfall greater than 0.7 feet is a fish barrier. Culverts where this was observed were perched due to scouring during high flow or the culvert was installed above the substrate. documented (Table 7).

**Table 7: Outfall > 0.7 feet**

Culvert ID	Creek	Watershed Sub-Basin	Location T/R	Date
310005	Fisher Creek	Cathcart Drainages	32/4	07/31/07
310032	trib to Deer Cr	Deer Creek	32/4	08/08/07
310073	trib to Pilchuck Cr	Pilchuck Creek	32/5	07/19/07
310102	trib to Jorgenson Slough	Stillaguamish Floodplain	32/4	07/24/07
310176	Goodman Creek	Sauk River	31/10	08/23/07
310234	WF Quilceda CR	Quilceda Creek	31/5	09/24/07
310272	trib to SF Stilliguamish R	Robe Valley Drainages	30/8	08/02/07
310312	trib to Pilchuck R	Pilchuck River	30/7	08/01/07
310321	Tulalip Creek	Tulalip Creek	30/4	08/15/07
310570	Ames Creek	Lower Sultan River	28/8	09/11/07
310597	Bear Creek	Bear Creek	28/8	09/05/07
310618	trib to French Cr	French Creek	28/6	09/12/07
310640	trib to Snohomish R.	Cathcart Drainages	28/6	09/12/07
310677	trib to NF Skykomish R	Lower NF Skykomish	27/10	09/05/07
310678	trib to Snohomish R.	Lower Sultan River	28/8	09/11/07
310708	trib to NF Skykomish R	Lower NF Skykomish	27/10	09/05/07
310709	Eloitt Creek	Cathcart Drainages	27/6	10/02/07
310711	Riley Slough	Lower Mainstem Skykomish	27/7	09/12/07
310713	Evans Creek	Cathcart Drainages	27/6	10/02/07
310718	Canyon Creek	Lower NF Skykomish	27/10	09/05/07
310724	Evans Creek	Cathcart Drainages	27/6	10/03/07
310753	Peoples Creek	Snoqualmie Mouth	27/7	09/12/07
310753	Peoples Creek	Snoqualmie Mouth	27/7	09/12/07
310762	trib to Snohomish R.	Bear Creek	27/6	10/17/07
310763	trib to Snohomish R.	Bear Creek	27/6	10/11/07
310765	trib to Snohomish R.	Bear Creek	27/6	10/11/07
310817	Anderson Cr	Cathcart Drainages	27/6	09/18/07

Map locations are shown in Appendix C. (Figures 1 – 10)

### Habitat Condition

Stream habitat conditions range from grassy ditches to forested areas. Fish were present in 30 of the 113 culvert waterways surveyed on county maintained right-of-ways. Fresh water mussels were observed in 5 of 113 culverts surveyed. The mussels were not identified to species. Of all the culverts visited 22 of the 229 culverts required road maintenance or brush cutting due to the excessive invasive vegetation preventing access. Vegetation found included blackberries (*Rubrus discolor*), Japanese knotweed (*Polygonum sachalinense*), Nightshade (*Solanum dulcamera*) and Reed canary grass (*Phalaris arundinacea*). Trash was noted at several sites including a small gasoline engine buried in the stream bed. The engine was found at culvert 310039, which is located northeast of Arlington on North Cedarvale loop road. This information was passed on to the Water Quality Group. Sixty of the culverts surveyed

contained large woody debris (LWD) within the stream bed and six of the culverts had active beaver (*Caster canadensis*) activity.

### **Culvert condition**

WDFW level A protocol establishes a baseline to judge existing culvert conditions for fish passage. Known barriers to fish passage include outfall drops greater than 0.7 feet and culvert slopes greater than 1%. Culvert condition was determined using measurement criteria established by SWM and WDFW. Of the 113 culverts surveyed 21 were back-sloped, 65 had slopes greater than 1%, and 27 had outfalls greater than 0.7 feet. Twenty five of the 113 displayed both fish barrier mechanisms (slopes greater than 1% and outfalls greater than 0.7 feet). One culvert was found completely submerged and was not surveyed due to water depth greater than 5 feet. Bank erosion was noted at some of the sites with several culverts having silted-in conditions due to sediment deposits.

### **Conclusion**

The 2007 ROW survey revealed 59% of 113 county-maintained culverts surveyed currently do not meet BMP's for salmonid passage. Over half of the culverts surveyed (58%) had slopes exceeding a 1% slope. In addition 24% of the culverts surveyed had outfalls exceeding 0.7 feet. Salmonid presence was noted in 27% of the surveyed culverts, however, it is assumed all streams surveyed were fish bearing streams (listed as Type 3 or less streams by WDFW).