

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

Project WA20236



Project Staff:

Project Lead:

Michael Purser, Senior Habitat Specialist, SWM

Shannon Britton, Engineering Technician IV Temp, SWM

Thomas Coburn, Engineering Technician IV Temp, SWM

Deborah Haynes, Senior GIS Analyst, SWM

**For
Snohomish County Public Works-Road Maintenance Division
Roy Scaff, L. Ted Parker**

1/17/08

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 |
| Totals | 2 | 41 | 15 | 30 | 28 | 113 | 229 |

*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 |

| culvert ID | date | Closest Address | Watershed Sub-Basin | Location T/R | Work Needed |
|-------------------|-------------|------------------------|----------------------------|---------------------|----------------------------|
| 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).

| Culvert ID | Creek | Watershed Sub-Basin | Location T/R | Date | Slope |
|-------------------|---------------------|----------------------------|---------------------|-------------|--------------|
| 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).