Fishery Data Series No. 20-12

Fish Passage Assessment and Prioritization of Culverts in Gustavus, Haines, Juneau, Skagway, and Sitka, 2011–2012

by

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and

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May 2020

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 20-12

FISH PASSAGE ASSESSMENT AND PRIORITIZATION OF CULVERTS IN GUSTAVUS, HAINES, JUNEAU, SKAGWAY, AND SITKA, 2011–2012

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ABSTRACT

In 2011 and 2012, Alaska Department of Fish and Game (ADF&G) assessed and inventoried 345 fish passage sites across 54 miles of road in the Southeast Alaska communities of Gustavus, Haines, Juneau, Sitka, and Skagway. Of those sites, the project rated 142 sites as Green, or crossing assumed to be adequate for juvenile fish passage; 102 sites were rated Red, or crossing assumed to be inadequate for juvenile fish passage; 85 sites were rated Gray, or crossing may be inadequate for fish passage; and 16 sites were rated Black, or unable to be rated for various reasons. Of the 102 sites rated Red, 32 sites were found to be potential adult fish passage barriers having an outfall >1 foot, and 34 sites were found to have a gradient over 4%. Fifteen of the Red sites were potential adult fish passage barriers with respect to both outfall and gradient.

Key words: Fish passage, culvert, aquatic organism passage, assessment, prioritization, Alaska, Sitka, Juneau, Gustavus, Haines, Skagway

INTRODUCTION

Culverted road crossings often delay, impede, or block fish movement into and out of stream systems resulting in habitat fragmentation with the potential to affect fish populations. Culvert assessments throughout the Pacific Northwest (Botkin et al. 1995; Kahler and Quinn 1998; Mirati 1999) and Southeast and Southcentral Alaska (Flanders and Cariello 2000; O'Doherty 2014; O'Doherty and Eisenman *In prep*) demonstrated that many existing culverts obstruct fish movements to some degree.

Culverts may be barriers to fish immediately upon installation or develop into barriers over time due to alterations in stream flow and channel morphology up and downstream, or poor maintenance and debris jams. Types of barriers include over-steepened reaches, excessive water velocities, impassable jumps at the entry into the culvert, physical blockage due to damaged pipes or debris, inadequate water depth, and subsurface flow at damaged structures. Free and efficient movement through culverts is necessary for anadromous and resident fishes of all age classes and life stages to allow unobstructed access to important habitats (Kahler and Quinn 1998). Adult fish, including salmon, lamprey, flounder, eulachon, and other anadromous and resident species, must access spawning areas. Juvenile salmon such as Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch)*, and sockeye salmon (*O. nerka*) spend up to two years in fresh water as juveniles, moving to exploit diverse habitats for feeding and overwintering. Fish passage barriers affect resident species such as Arctic grayling (*Thymallus arcticus*), which use specific streams for spawning, juvenile rearing, summer feeding, and over-wintering. Culverts are most likely to have a negative effect on the movements of fish with limited swimming and leaping abilities, such as juvenile salmonids, and species such as coho salmon, that rely on small streams for spawning and rearing habitat.

GOALS

Goals of this project were to inventory and assess culverts on state and locally managed roads in the northern Southeast communities of Juneau, Gustavus, Haines, Sitka, and Skagway (Figures 1–5), and develop priorities for replacing culverts to restore access to the most productive and fragmented streams. The data collected during this project are available on the Fish Resource Monitor located at: http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=culv.

OBJECTIVES

The objectives of this project were to:

1. Locate, inventory, and assess for fish passage at stream crossings (culverts) associated with roads, trails, and driveways within the communities and road systems of Juneau, Gustavus, Haines, Sitka, and Skagway.
2. Determine if crossing structures impede the movements of resident fish, anadromous fish, or both.
3. Prioritize fish passage barriers with respect to replacement or removal for maximum ecological benefit.
4. Add all inventoried culvert crossing sites to Alaska Department of Fish and Game (ADF&G) Fish Passage Improvement Database and make information publicly available with mapped information on fish presence through the Department's online interactive Fish Resource Monitor located at: http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=culv.

METHODS

STUDY AREA

The study area consisted of 5 communities and their respective road systems in northern Southeast Alaska. Roads in Juneau and Gustavus were assessed in 2011; and roads in Sitka, Skagway, Haines, and the remainder of Juneau were assessed in 2012 (Table 1, Figures 1–5).

Table 1.–Number of crossings and road miles in each road system assessed in this project.

City	Total miles of road assessed	No. of crossings assessed
Gustavus	71	25
Haines	90	111
Juneau	224	122
Sitka	56	44
Skagway	33	43
Total	474	345

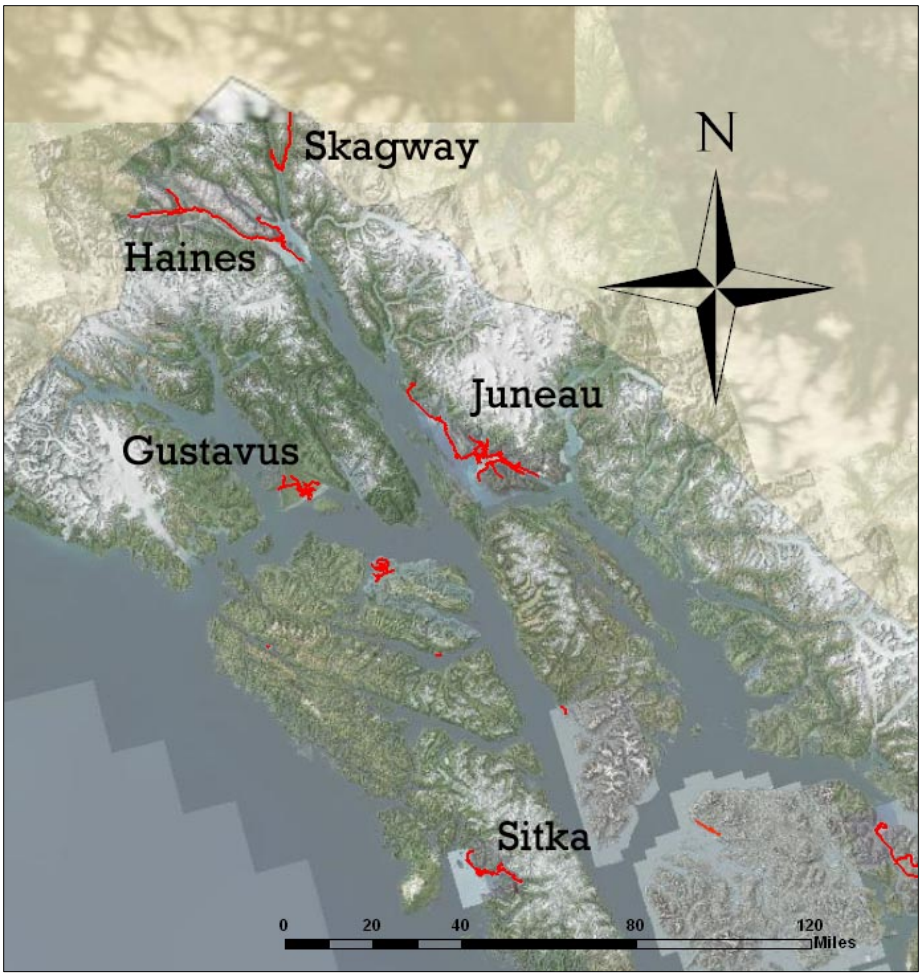

Figure 1.–Overview map of project area showing surveyed roads.

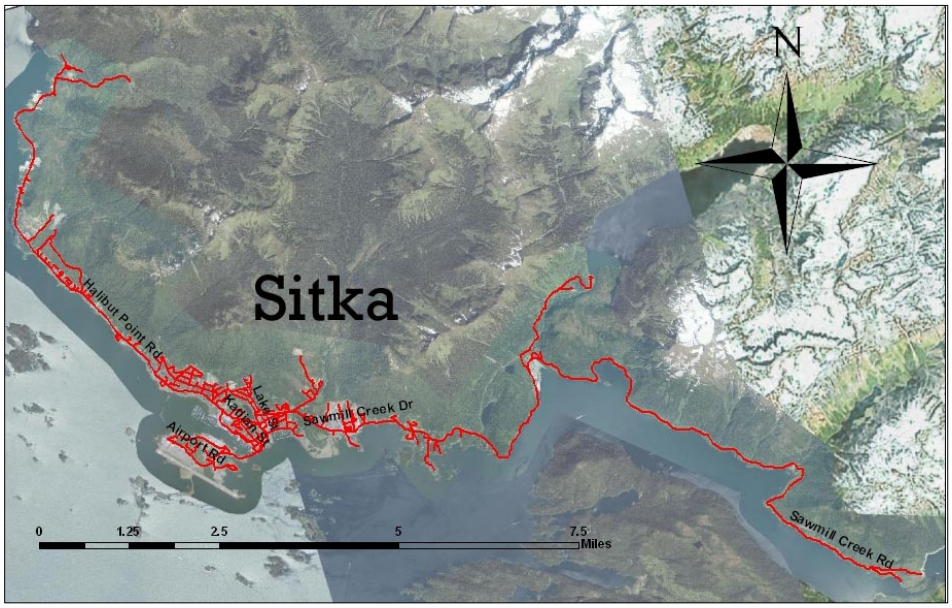

Figure 2.–Sitka area road system.

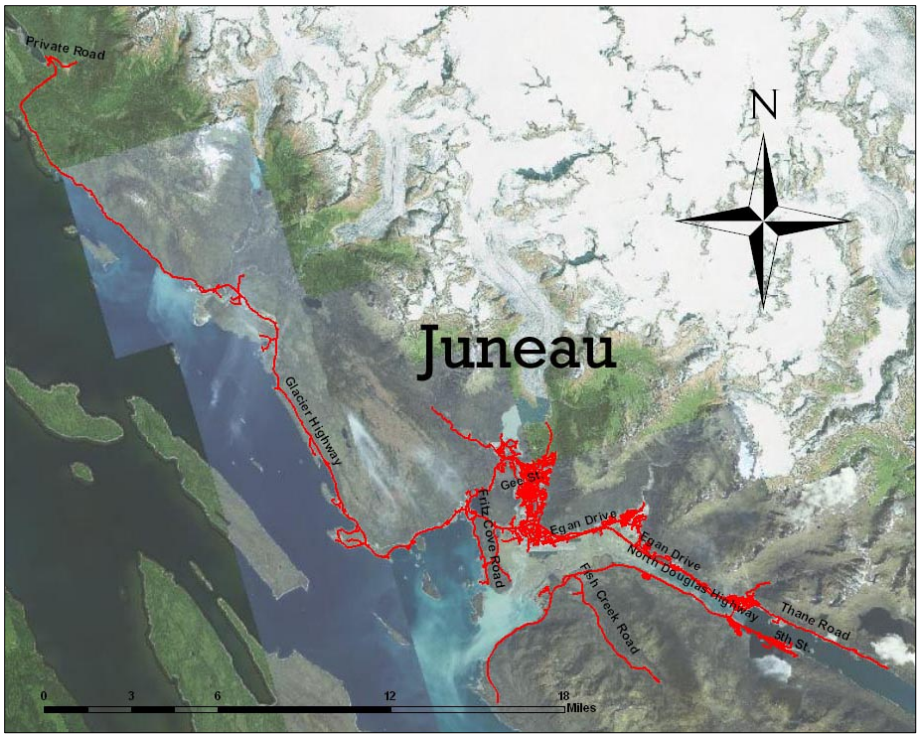

Figure 3.–Juneau area road system.

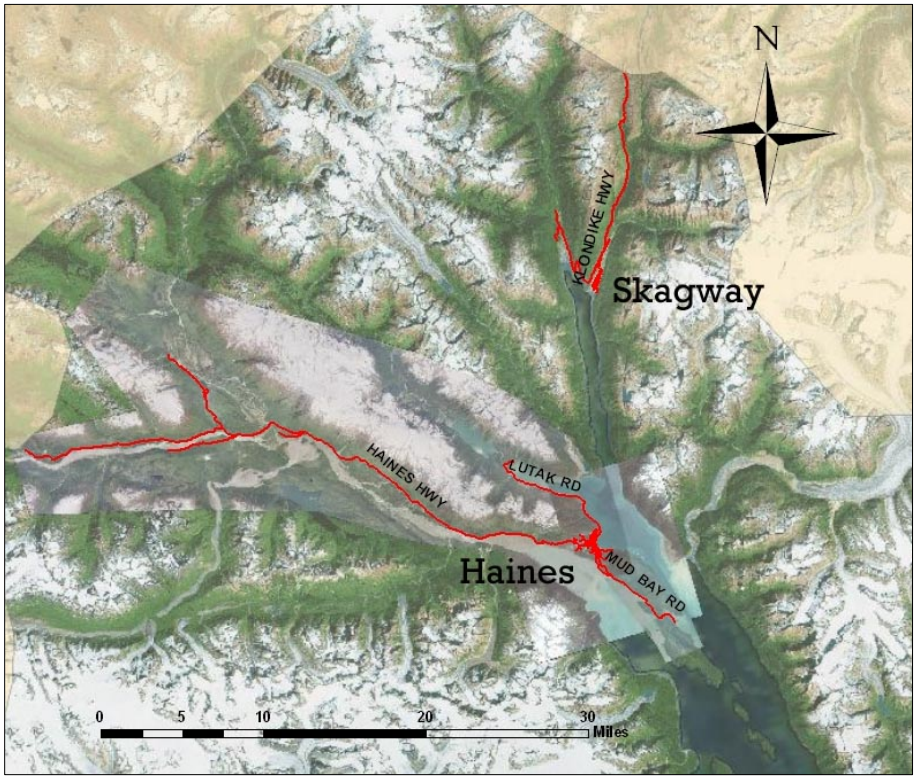

Figure 4.–Haines and Skagway area road systems.

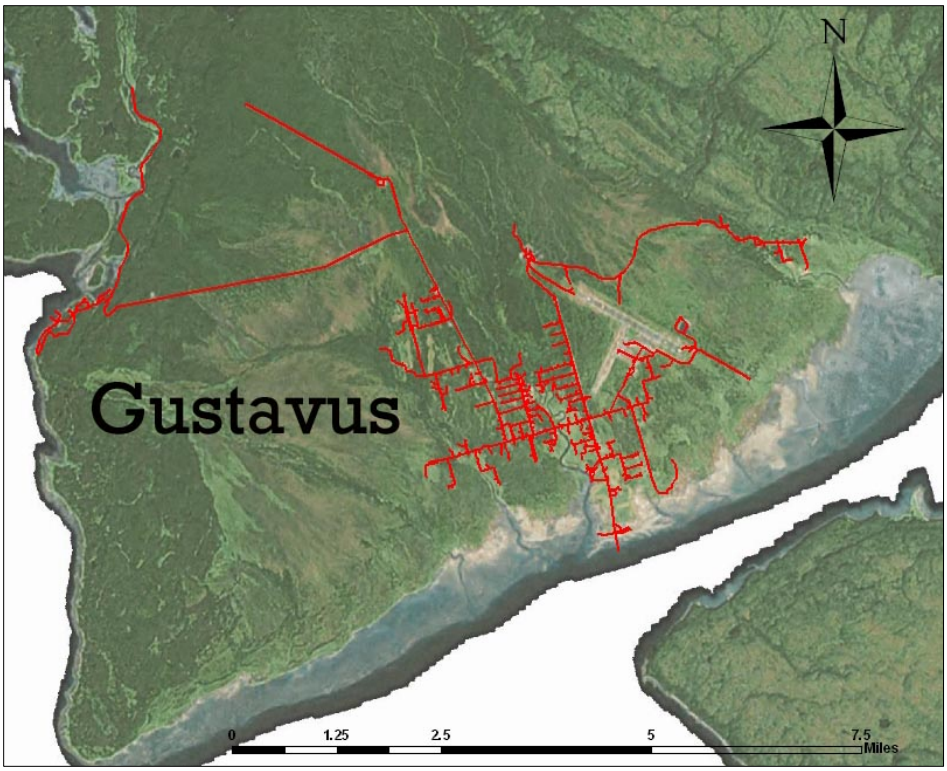

Figure 5.–Gustavus area road system.

FISH PASSAGE RATING OVERVIEW

To rate sites for effects on the passage of juvenile and weak-swimming fish, ADF&G follows a standardized method that was developed through coordination with other state and federal agencies specifically for use in Alaska. Culverts (crossings) are categorized by type and size, three Critical Values are calculated (gradient, outfall height, and constriction ratio), and results are compared to a decision matrix called the Level 1 Assessment Matrix (Figure 6). After categorization, the crossings are rated as Red, Green, or Gray with respect to their potential to pass juvenile and other weak swimming fish; or a Black rating is given if the crossing cannot be rated (Clarkin et al. 2005; Gordon et al. 2004; Karle 2005). In addition, potential barriers to adult salmon and strong swimming fish can be identified using the survey data. Culvert ratings are described in more detail below:

- Green: assumed to be adequate for juvenile fish passage
- Gray: may be inadequate for juvenile fish passage
- Red: assumed to be inadequate for juvenile fish passage
- Black: unable to be rated because of lack of information or safety concerns, or culvert has been replaced and not reassessed

The Level 1 Assessment Matrix (Figure 6) uses the best available information to predict the ability of a young of the year juvenile coho (55 mm) to pass through a variety of culvert types. A 55 mm coho was chosen as the model fish because they are believed to be the weakest swimming juvenile salmonid fish, and therefore, culverts that are passable by 55 mm coho should be passable by other juvenile salmonids (Clarkin et al. 2005; Behlke et al. 1991).

	Structure Type	Green	Grey	Red
1	Bottomless pipe arch, embedded pipe arch, corrugated metal pipe, box culvert or other embedded structure that functions in a similar fashion.	Installed at channel gradient (+/–1% slope), AND constriction ratio greater than or equal to 0.75 OR fully backwatered	Structure not installed at channel gradient (+/–1%), OR constriction ratio of 0.5 to 0.75	Constriction ratio less than 0.5
2	Culverts (all span widths) with 2 X 6-inch corrugations or greater, not embedded.	Culvert gradient less than 1.0%, AND outfall height = 0, AND constriction ratio greater than 0.75 OR fully backwatered	Culvert gradient 1.0 to 2.0%, OR less than or equal to 4-inch outfall height, OR constriction ratio of 0.5 to 0.75	Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR constriction ratio less than 0.5
3	Pipe arch or circular corrugated metal pipe (span width greater than 4 feet), less than 2 X 6-inch corrugations, not embedded	Culvert gradient less than 0.5%, AND outfall height = 0, AND constriction ratio greater than 0.75 OR fully backwatered	Culvert gradient 0.5 to 2.0%, OR less than or equal to 4-inch outfall height, OR constriction ratio of 0.5 to 0.75	Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR constriction ratio less than 0.5
4	Pipe arch or circular corrugated metal pipe (span width less than or equal to 4 feet), less than 2 X 6-inch corrugations, not embedded	Culvert gradient less than 0.5%, AND outfall height = 0, AND constriction ratio greater than 0.75 OR fully backwatered	Culvert gradient 0.5 to 1.0%, OR less than or equal to 4-inch outfall height, OR constriction ratio of 0.5 to 0.75	Culvert gradient greater than 1.0%, OR outfall hgt. greater than 4 inches, OR constriction ratio less than 0.5.
5	Non-embedded box culverts, culverts with non-standard configurations or materials, culverts with baffles or downstream weirs or step pools, fish ladders, bridges with aprons.	Fully backwatered as described below	All others	Outfall height at downstream end of structure greater than 4 inches.
6	Multiple Structure Installations (MSI)	Individual culverts all classified as Green as above	Individual culverts all classified as Gray or as some mix of Green, Gray or Red as above.	Individual culverts all classified as Red as above.

Figure 6.–ADF&G Level 1 Assessment Matrix.

Notes: These criteria are not design standards, but rather indicate whether the structure is likely to provide fish passage for juvenile salmonids based on a one-time evaluation.

Ordinary high water (OHW) is the mean stream width measured either upstream or downstream of the culvert beyond the hydraulic influence of the culvert.

An embedded culvert must have 100% bed load coverage. Circular and box culverts must be embedded at least 20% of their height. A pipe arch must be embedded so that the mean bed load depth is greater than or equal to the vertical distance from the bottom of the pipe to the point of maximum horizontal dimension of the culvert (haunch height) or is 1 foot deep, whichever is greater.

A culvert is considered backwatered if one of the following conditions is met: 1) elevation of the tailwater control exceeds the elevation of the invert at both the outlet and inlet of the culvert and the invert of any aprons or other inlet or outlet structures; or 2) the culvert is located in a pond, slough, or other area with slow-moving or still water, the tailwater and headwater surfaces are equivalent, and water surface is continuous throughout the entire structure and at least 0.1 feet in depth at the shallowest point. Culvert gradient, span to OHW ratio, and outfall height criteria are not considered in the assessment of fish passage in backwatered culverts. A culvert is not backwatered if a hydraulic jump occurs within the barrel.

Outfall height is the difference between the water surface elevation at the outlet and in the outlet pool (or the equivalent tailwater surface).

If a structure was damaged or there were other factors affecting fish passage, those factors were considered during rating and noted in the site comments. For example, if a culvert was damaged and judged impassable, it would have been given a Red rating and a note made in the comments section.

SITE SELECTION AND NAMING

Prior to beginning fieldwork all known and potential road-stream crossing locations were identified and mapped using ArcGIS. The National Hydrography Dataset (NHD) was overlaid on the most current road layer available and all places where the two intersect were marked as potential crossing locations. Additional information was gathered from earlier surveys, partner organizations, road managers and previous fisheries surveys and added to ArcGIS to create a comprehensive map of known and suspected crossing locations. These locations were downloaded to a handheld Garmin GPS unit used to locate sites in the field. The survey crew also visually located and recorded additional stream crossings on public roads as well as unmapped roads (such as driveways and bike trails).

Once in the field, only sites known or reasonably expected to be fish-bearing were included in the assessment project. Sites that were assumed to be non-fish bearing include ephemeral drainages that do not contain a defined channel; disconnected ponds; extremely steep channels; and crossings located above known natural barriers such as waterfalls, drainage swales, drainage ditches, cross drainage culverts, or other artificial water features. Crossings that are located above man-made barriers were treated as if the man-made barriers did not exist.

All surveys received a Survey ID at the time data is collected. This Survey ID is composed of the project ID, the year, the survey ID (assigned by field staff) and follows the previously used alphanumeric conventions for project name and location (e.g., SEA12-GLH01, where SEA12 refers to the project and year, Southeast Alaska 2012, and GLH01 refers to the road the survey was conducted on and survey number on that road, Glacier Highway survey 01) (Eisenman and O'Doherty 2014). After fieldwork was completed each new survey was assigned to a Site, which is a permanent location with a unique ID number and a fixed location. Each site may have multiple surveys (Figure 7) which allows us to track change at the site over time. In the remainder of this report we will discuss the most current data for each site and will use the Site ID only.

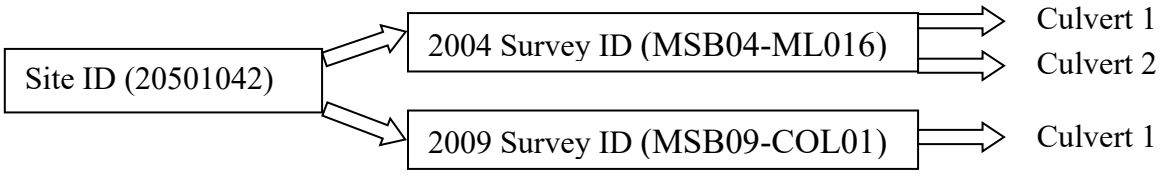

Figure 7.–Example of Site ID and Survey ID nomenclature for a site with more than one survey.

Assessment Protocol

A standard assessment protocol was used to collect data on crossings throughout the project. A summary of the assessment protocol is presented here; a detailed description can be found in the Culvert Inventory and Assessment Manual for Fish Passage in the State of Alaska: A Guide to the Procedures and Techniques used to Inventory and Assess Stream Crossings 2009-2014 (Eisenman

and O'Doherty 2014). All data was recorded on project data forms (Appendix A) and in survey notebooks, and later entered into the project database.

Crossing and Assessment Information

Information was collected on the location of each crossing (coordinates) as well as the date and time of survey and the identities of the crew.

Description of the Crossing Structure

Information was collected on culvert length, dimensions, shape, and the type of material used for construction. The type of inlet and outlet (projecting, mitered, or flared) was noted as was the presence of a headwall, wingwalls, or an apron. Where a crossing structure consisted of multiple culverts, each individual culvert was numbered according to its position sequentially from left to right as the observer faces downstream. Tidal influence and potential tidal influence are noted during the assessment. Tidally influenced sites are rated Gray. Assessments also note if baffles are present inside the culvert. Baffled culverts are rated Gray unless they have a greater than 4-inch drop between the baffles or at the outfall, in which case they are rated Red (Figure 6).

Each culvert outfall was categorized as either set at stream grade (AG), a free-fall into the outlet pool (F), a free-fall onto riprap (FR), a cascade over riprap (C), a fish passage structure (PS), smooth flow over an apron (SF), an overflow pipe (OP), or a hydraulic jump (HJ) at the time of survey. If an inlet or outlet apron existed, the construction material was noted, and the length measured as described above.

Culverts that contained substrate were inspected to determine whether they were considered embedded by measuring the depth of the substrate at the inlet and outlet to the nearest 0.1 ft. For a culvert to be considered embedded, both inverts must be lower than the streambed elevation; the barrel must contain streambed material throughout its length; circular culverts must be buried at least 20 percent of their diameter; pipe-arch culverts must be embedded so that the mean depth of the substrate within the pipe is equal to or greater than the vertical distance from the bottom of the culvert to the point of maximum horizontal dimension or 20 percent of the height, whichever is greater. Where substrate depth is greater than approximately 0.5 feet deep, substrate depth was estimated by driving a steel rod of known length into the material and subtracting the height of the rod projecting above the substrate from the total length.

The condition of each culvert was ranked 1 through 5 and defined below.

1. Defective: Culvert is in dire need of prompt repair or replacement; flaws threaten to disrupt or are hindering traffic.
2. Poor: Culvert needs repair and shows potential for further deterioration.
3. Fair: Culvert is operational but may need maintenance to restore function to its full potential (i.e., when distinct rust lines, abraded bottom, or both are present, adverse conditions could lead to major problems).
4. Good: Culvert shows minor deficiencies, beginning of rust line formation may be visible, but with continued maintenance the culvert should be trouble free.
5. Excellent: Culvert shows no signs of problems or rust and could allow flow at full capacity without disrupting fish passage.

Longitudinal Profile

A longitudinal profile is a survey of the stream down the length of the thalweg; in this case, the longitudinal profile encompassed the reach of the stream containing the culvert(s). The purpose was to collect relative elevations of the stream, water surface, and culvert structure in order to calculate water depth at outlet, outfall height, pipe gradient, and if a site was backwatered. Occasionally when a longitudinal profile could not be carried out the water depth at outlet and outfall heights were measured using hand-held tape measures and documented in the survey notes. A culvert was considered backwatered if one of the following conditions was met: 1) elevation of the tailwater control exceeded the elevation of the invert at both the outlet and inlet of the culvert and the invert of any aprons, or other inlet or outlet structures; or 2) the culvert is located in a pond, slough, or other area with slow moving or still water and the tailwater and headwaters surface are equivalent and water surface is continuous throughout the entire structure and at least 0.1 ft in depth at the shallowest point. Culvert gradient, constriction ratio, and outfall height criteria were not considered in the assessment of fish passage in backwatered culverts. A culvert is considered not backwatered if a hydraulic jump occurs within the barrel.

Stream Measurements

The average width of the stream at ordinary high water (OHW) above the culvert was measured along three straight runs or heads of riffles at locations upstream of any obvious influence of the crossing structure. All channel widths were measured perpendicular to stream flow and to the nearest 0.10 ft using a fiberglass tape. If the upstream channel was a lake, wide slough, or braided channel, channel widths of the downstream channel is recorded instead. If both up and downstream water bodies were ponds, lakes, or sloughs, average width was not recorded.

The alignment of the inlet with the upstream channel was determined to the nearest 1 degree using a sighting compass. The approach angle was calculated by subtracting the back azimuth of the line looking downstream through the culvert, from the azimuth of the channel looking upstream from the culvert inlet.

The dominant and subdominant substrate type at the inlet and outlet and in the up and downstream channels outside of the culvert influence were determined visually and recorded.

In 2011, it became standard protocol to collect the gradient of the stream. This is measured as the change in elevation of the water surface over a curvilinear distance of at least 10 times the OHW width. The stream gradient is calculated outside the influence of the culvert.

Site Observation Codes

Site observation codes refer to criteria that affect fish passage at a site and are used to clarify the reasons a site was placed into the Gray or Red categories as well as to note problems that are not part of the Red–Gray–Green classification system, but potentially affect fish passage or the prioritization of the culvert for replacement or repair. These include poor alignment, significant sedimentation, beaver activity, deliberate blockage by means of a screen or grill, debris blockage, or various types of structural damage. The complete list of codes and definitions can be found in *Culvert Inventory and Assessment Manual for Fish Passage in the State of Alaska: A Guide to the Procedures and Techniques used to Inventory and Assess Stream Crossings 2009-2014* (Eisenman and O'Doherty 2014).

Site Sketch

The site sketch includes the culvert and road, direction of flow, location of fish traps, and any significant features observed at the site.

Photographs

A series of photographs were taken at each site with a digital camera. The order of photographs and a description of each are recorded in the survey notebook. At minimum, photographs included the following:

- A site marker with the Site ID, road, and date written on a dry erase board at the site.
- A view of the road surface at the crossing site.
- A view from the culvert looking downstream at the tail crest and beyond.
- A view from below the tail crest looking upstream showing the culvert outlet type, condition, and road embankment. This photograph should show channel roughness (substrate, debris, vegetation, etc.) and culvert outlet height above the tailwater.
- A view from an upstream location (looking downstream) showing the culvert inlet type, condition, and road embankment. This photograph should show channel roughness (substrate, debris, vegetation etc.) and culvert inlet conditions.
- A view from the culvert looking upstream.
- A photograph, when possible, of typical stream substrate and other channel roughness elements upstream of the culvert's influence.
- Additional photographs of conditions, if any, that may be negatively affecting fish passage (e.g., damage, debris, undesirable bed load deposition).

Fish Trapping

Traps were set at site to establish fish presence. Traps were baited with cured salmon roe and set near the bank far enough up and downstream of the culvert to minimize disturbance from surveying activities on trapping. Traps soaked approximately 1–2 hours at most sites, although on a few occasions the traps soaked for 8–10 hours. Any captured fish were identified to species and measured then released in pools at or adjacent to capture site.

Fish observed at the site, but not trapped or handled, were also noted as visual observations.

All fish capture information was submitted as additional or backup information to the Anadromous Waters Catalog (AWC).

CALCULATING THE CRITICAL VALUES

Gradient

Culvert gradient was calculated as the difference in elevations between inlet invert and outlet invert, divided by the length of the culvert and multiplied by 100. In the case of an embedded culvert, or a culvert with sediment at inlet, outlet, or at both, the top of culvert elevations were used instead of invert elevations:

$$\frac{(\text{inlet elevation} - \text{outlet elevation})}{\text{culvert length}} * 100 = \text{pipe gradient.}$$

During the project, any structures found to contain sections that were considerably steeper than the average gradient were calculated separately. These sections are referred to as "maximum gradients" and are used to rate the culvert. Maximum gradients may also be calculated for aprons where they were significantly steeper than the culvert itself and may impede fish passage. If a maximum gradient was used it was noted in the comments for that site.

Outfall height

Outfall height (OH) was calculated from longitudinal survey elevation data and is the distance from the water surface at outlet (OWS) to the outlet pool surface or tailwater surface (TWS):

$$OH = OWS - TWS.$$

The outfall height for a free-fall into pool outfall type is the outlet water surface elevation subtracted from the outlet pool surface elevation (Figure 8).

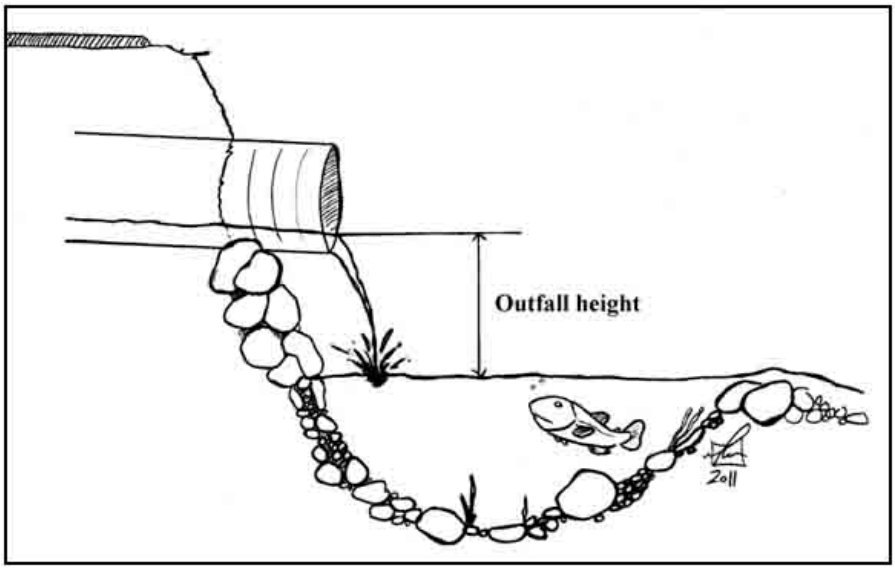

Figure 8.–Illustration showing where outfall height is measured on a free-fall into pool outfall type.

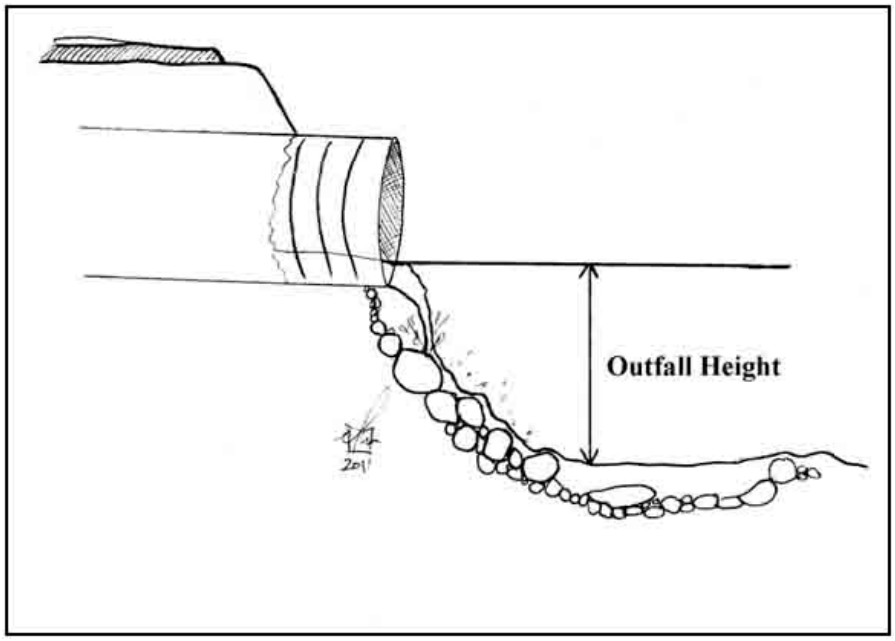

Figure 9.–Illustration showing the outfall height measurement for a free-fall onto riprap and cascade over riprap.

Where the outfall falls onto riprap, cascades over riprap, or consists of a fish passage structure, the outfall height was measured from the water surface at the outlet invert to the water surface at the end of cascade or fish passage structure (Figure 9; Eisenman and O'Doherty 2014).

Constriction Ratio

The constriction ratio (CR) for one culvert is calculated as the culvert width (CW) divided by the average channel width at OHW. Culvert width is the widest point at the inlet invert.

$$(CW/OHW):1$$

For more than one circular culvert, use this formula.

$$CR = \sqrt{(r_1{}^2 + r_2{}^2 + r_{x,\ldots}{}^2)} * 2 \,/\, \mathrm{OHW}$$

Where r is the radius of the culverts.

Constriction ratio is not calculated in the field for sites that have more than one pipe arch or a battery of multiple types of culverts.

DATA MANAGEMENT AND QUALITY CONTROL

Data was collected on paper data sheets and entered into the Fish Passage Inventory Database throughout the field season. At the end of the field season, all data was printed out and compared to the original field sheets manually by two project staff to catch data entry errors. Then a series of automated data checks was used to identify any outlying values or inconsistent entries, such as sites with a high outfall that were not rated as Red. Locations of sites were checked individually using GIS, and photographs and comments were reviewed for accuracy at each site by two project personnel. Where sites locations were inconsistent with the mapped locations of creeks and roads, it was found that the mapped locations of creeks and roads were typically in error and therefore,

sites were not moved to existing GIS features. Instead locations were accurately represented on the mapper and the latitude and longitudes in the database were those collected at the site at the time of survey.

A final review of all ratings was independently done by a Habitat Biologist I and III before each season's data was released as draft, and an additional review took place at the end of the project.

PRIORITIZATION

The goal of prioritization was to identify the barriers where replacement or removal has the greatest potential to benefit fish populations. Fish passage prioritizations often attempt to consider factors such as potential cost and road ownership when prioritizing culverts (Taylor et al. 2003; WDFW 2009; CRWP 2011). For our prioritization, we chose to look solely at the potential ecological benefit using upstream habitat extent, species usage, and severity of barrier. Further prioritization using species of interest, road ownership or estimated cost can be overlaid on this prioritization and used to make final selections of projects for replacement.

The prioritization assigns each site a score based on the following:

1. The amount of stream habitat available upstream up to the next barrier, the end of the stream or a gradient of approximately 10%, as determined from maps or other available data (60%).
2. Lakes and ponds are given a lake acres rating based on sized. Waterbodies over 150 acres are given a rating of 3, between 75 and 150 acres are given a 2, and any pond of lake smaller than 75 acres is given a rating of 1 (20%).
3. The number of anadromous species documented to occur in the stream the crossing is located on (15%).
4. The number of resident species documented to occur in the stream the crossing is located on (5%).
5. The barrier multiplier (R) as described above is a multiplier applied to the weighting.

The prioritization score (PS) was calculated as follows:

$$PS = R[(\text{upstream miles} * 0.6) + (\text{lake acres} * 0.2) + (\text{number of anadromous species} * 0.15) + (\text{number of resident species} * 0.05)].$$

The higher the score, the more potential impact the culvert has on fisheries resources and the more it should be prioritized for replacement.

Stream Habitat: The number of miles of habitat upstream of each culvert were measured or estimated using ArcGIS and topographical maps, the National Hydrography Database (NHD), the Anadromous Waters Catalog (AWC), aerial photography, or all of these, for all sites where data was available using the most accurate information for each stream. Cataloged anadromous stream miles and total stream miles, including potential habitat above documented anadromy, were measured or estimated separately. Stream miles were included upstream until another barrier was encountered, or the extent of known fish use was reached, or if a 10–12% gradient was sustained over a 100 ft reach. Where extent of upstream habitat could not be determined, sites were assigned an arbitrary upstream minimum value of 0.01 miles of potential stream habitat. Due to the number of unmapped streams and the various methods used to calculate the upstream miles, these figures should be treated as low quality estimates and used for comparison purposes only. Habitat quality

was not addressed due to limited availability of information. All stream miles were assumed capable of being used as habitat by fish that can access them.

Lakes and Ponds: The size of all lakes and ponds was estimated using the same methods for stream miles. Each site was assigned a ranking based on the amount of potential lake habitat.

Anadromous Species: The number of anadromous species using the stream was based on AWC data and nominations, and our own trapping efforts. It is likely there are many additional streams that are not cataloged in the AWC but do contain salmonids or resident fish.

Resident Species: The number of resident fish species was based on the Alaska Freshwater Fish dataset, our own fish trapping efforts, and by information posted by U.S. Forest Service on Forest Service Stream Crossing placards at certain sites. It is likely there are many additional streams that are not cataloged in the AWC but do contain salmonids or resident fish.

The Barrier Multiplier: Additionally, culverts were also given a barrier multiplier (R). Red culverts were given a multiplier of 1, Gray culverts a multiplier of 0.5, and Green culverts received a multiplier of 0 so that their prioritization score would also be 0. Culverts found with an outfall greater than 1 ft were given a multiplier of 1.5 (Red rating + Outfall greater than 1 ft) to reflect their potential to restrict adult fish movement as well as juvenile fish movement (NMFWS 2001). Culverts with a low condition rating, 1 or 2, were also given an additional 0.5 to its barrier multiplier to reflect the impact of damaged structures and deferred maintenance on fish movement.

For this prioritization, upstream habitat was given a weight of 0.60 in the prioritization formula, lake acres rating was given a weight of 0.20, anadromous fish were given a weight of 0.15, and resident fish a weight of 0.05. These weightings are based on the best professional judgement of the authors and were chosen for use statewide based on a larger data set. They are intended to give a general prioritization that can be refined by the user for more local use, or in the event a prioritization is desired that focuses on one species or one road owner.

RESULTS

PROJECT FISH PASSAGE RATINGS

Over the course of this two-year project, 357 assessments were conducted on 345 unique sites. In 2011, some sites in Juneau were unable to be fully assessed due to high water and were revisited in 2012 when water levels were lower. In Haines, one culvert was replaced while the crew was in town and that site was also revisited, but the crew was unable to properly evaluate the site because the work was not finished. Since field work was completed, an additional 3 culverts have been replaced in Haines, 3 in Gustavus, and 1 in Skagway.

In 2011, 115 sites were assessed: 25 in Gustavus, and 90 in the Juneau area. In 2012, 242 sites were assessed: 111 in Haines, 44 in Sitka, 43 in Skagway, and 32 in Juneau. Out of the 345 sites, 95% were rated Red, Gray, or Green using the Level 1 Assessment Matrix; the rest were rated as Black, indicating that we were unable to assign a fish passage rating. The Black rating was typically assigned due to safety concerns at site, but may also be due to extensive damage, inundation, or time constrains (Table 2). Of the sites surveyed, 297 were known fish bearing streams (Table 3). For this project, a stream was considered fish bearing if it was cataloged in AWC, if fish had been documented by AFFI, if fish were trapped or observed during culvert assessments, or if fish have been documented by the U.S. Forest Service and marked with a Forest Service Stream Crossing placard (Figure 10).

Of the 345 sites assessed, 32 (9.3%) were considered likely adult fish passage barriers due to an outfall over 1 foot. Thirty-four sites (9.9%) were considered a potential adult fish passage barrier due to a gradient exceeding 4% throughout an unembedded pipe, and 15 sites (4.3%) had both an outfall height greater than 1ft and a sustained gradient over 4% (NMFS 2001; Table 4).

Figure 10.–U.S. Forest Service Stream Crossing placard showing fish presence.

Table 2.–Number of crossings in Gustavus, Haines, Juneau, Sitka, and Skagway rated Red, Gray, Green, or Black including known fish-bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat during the site visit.

Rating	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of total sites
Red	6	24.0	42	37.8	34	27.9	11	25.0	9	20.9	102	29.6
Gray	3	12.0	30	27.0	24	19.7	17	38.6	11	25.6	85	24.6
Green	16	64.0	38	34.2	59	48.4	13	29.5	16	37.2	142	41.2
Black	0	0.0	1	0.9	5	4.1	3	6.8	7	16.3	16	4.6
Total	25	100.0	111	100.0	122	100.0	44	100.0	43	100.0	345	100.0

Table 3.–Number of crossing in Gustavus, Haines, Juneau, Sitka, and Skagway rated Red, Gray, Green, or Black on known fish-bearing streams.

Rating	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of total sites
Red	5	25.0	36	37.1	26	23.6	7	23.3	8	20.0	82	27.6
Gray	3	15.0	26	26.8	23	20.9	12	40.0	11	27.5	75	25.3
Green	12	60.0	34	35.1	56	50.9	9	30.0	14	35.0	125	42.1
Black	0	0.0	1	1.0	5	4.5	2	6.7	7	17.5	15	5.1
Total	20	100.0	97	100.0	110	100.0	30	100.0	40	100.0	297	100.0

Table 4.–Sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway with culverts found to have potential adult fish passage barriers.

Barrier	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of total sites
Outfall >1ft.	1	4.0	14	12.6	8	6.6	8	18.2	1	2.3	32	9.3
Gradient >4%	0	0.0	12	10.8	12	9.8	9	20.5	1	2.3	34	9.9
Both	0	0.0	5	4.5	5	4.1	5	11.4	0	0.0	15	4.3

Gustavus Fish Passage Ratings

In Gustavus, 5 sites (25%) on known fish bearing streams were rated Red where the crossing was assumed to be adequate for juvenile fish passage, 3 sites (15%) were rated Gray where the crossing may be inadequate for juvenile fish passage, and 12 sites (60%) were rated Green where the crossing was assumed to be inadequate for juvenile fish passage (Table 3, Figure 11). The project found one culvert site (4%) with an outfall greater than 1 foot (Table 4).

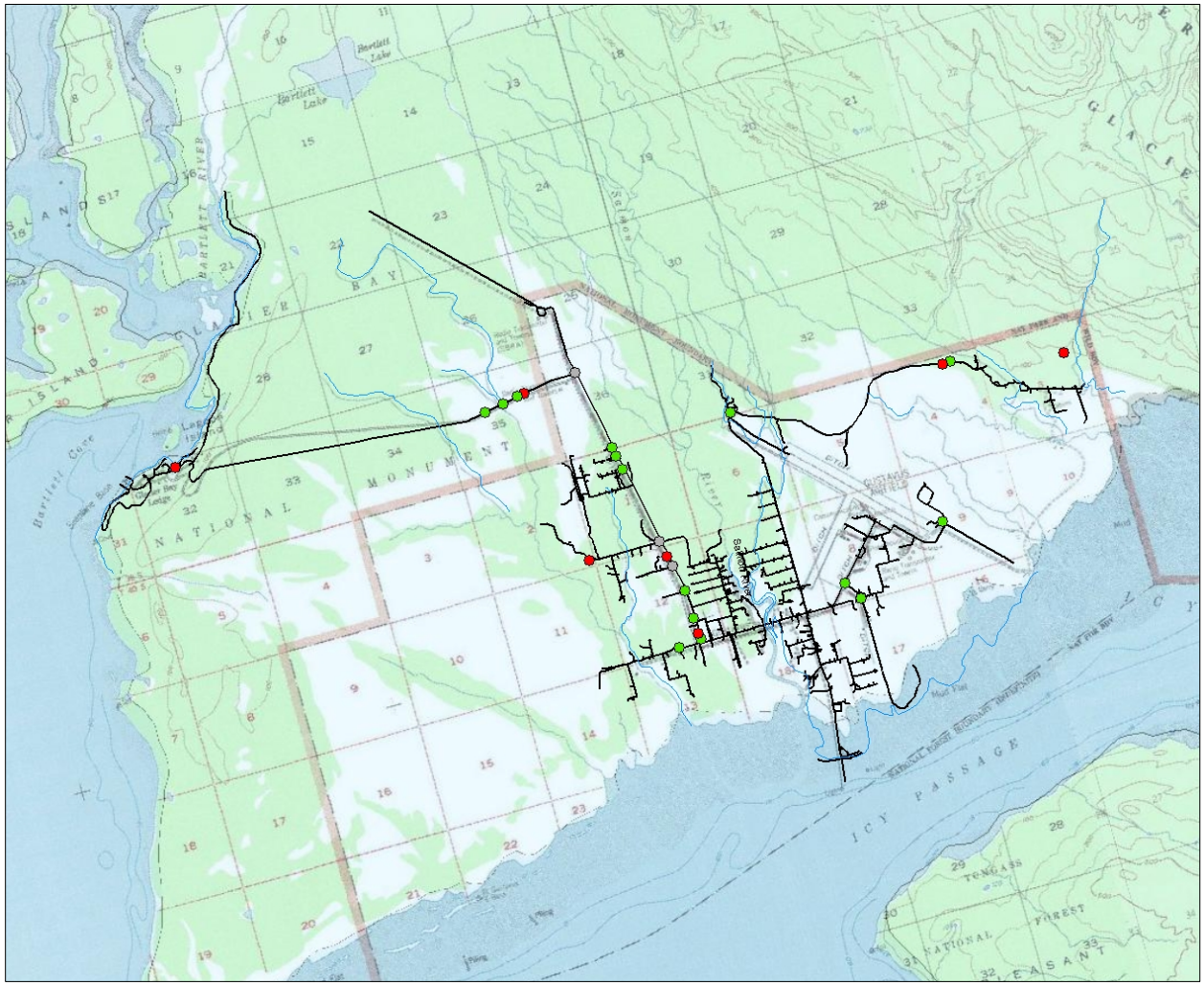

Figure 11.–Map showing surveyed culvert locations in Gustavus and their site ratings.

Haines Fish Passage Ratings

In 2012, ADF&G's fish passage assessment crew visited Haines and assessed 111 sites (Figures 13–15). Due to time constraints, the assessment crew was unable to complete longitudinal surveys on the last 10 sites visited in the area. These sites had already been assessed by the Takshanuk Watershed Council (TWC), and data was used from that report to help assess those sites along with baseline data, measurements, and photographs that were taken at each site. Outfall heights and steep gradients were noted and considered when rating the sites for this assessment (TWC 2011).

On streams known to be fish bearing in Haines, the project rated 36 sites (37.1%) Red, 26 sites (26.8%) Gray, 34 sites (35.1%) Green, and 1 site (1%) Black. The project found 14 culvert sites (12.6%) with an outfall over 1 foot, 12 culvert sites (10.8%) with gradients over 4%, with 5 of those sites (4.5%) having both potential adult barriers to fish passage (Tables 3 and 4, Figures 12–14)

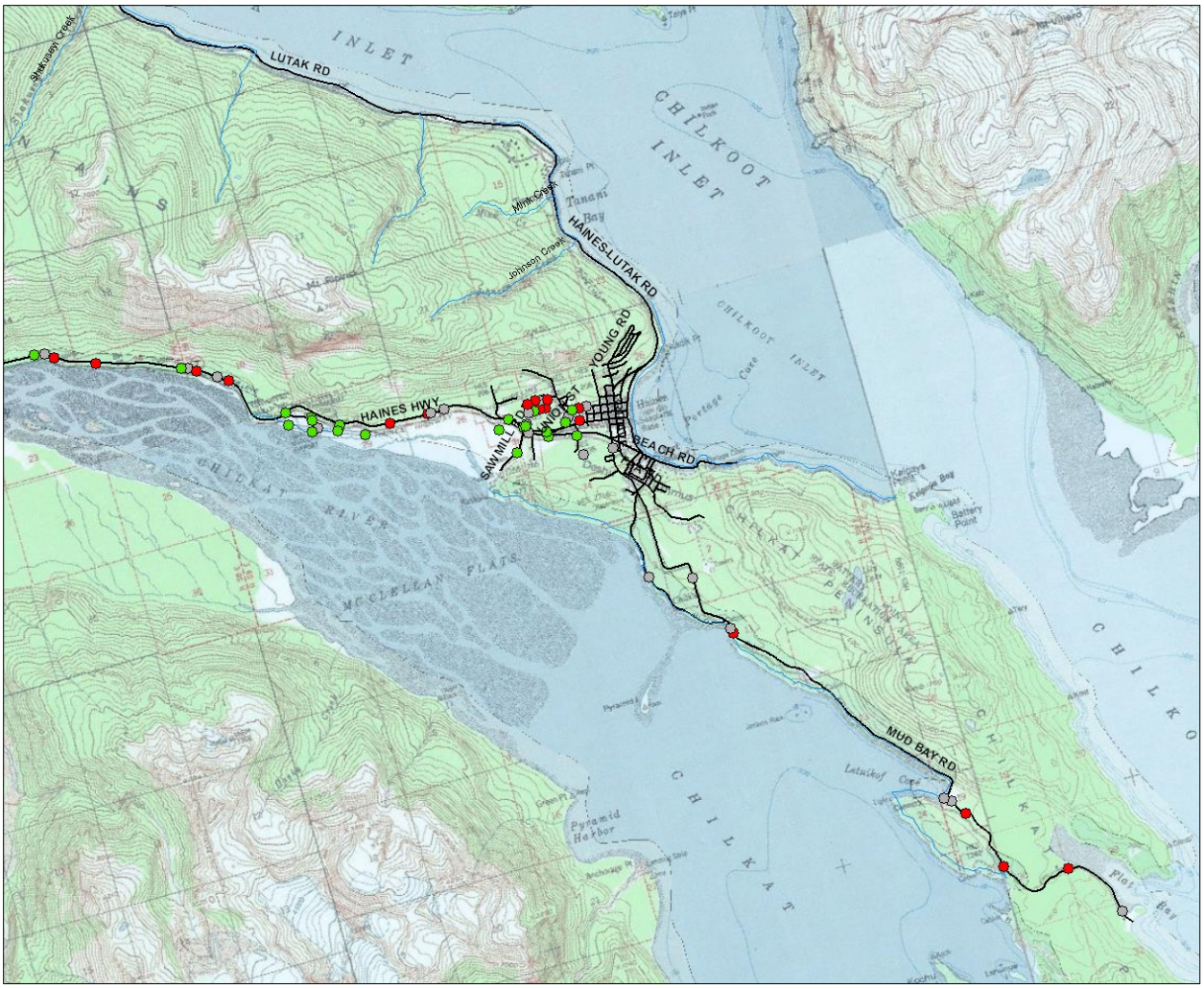

Figure 12.–Map showing assessed site locations and site ratings in Haines and the Chilkat Peninsula.

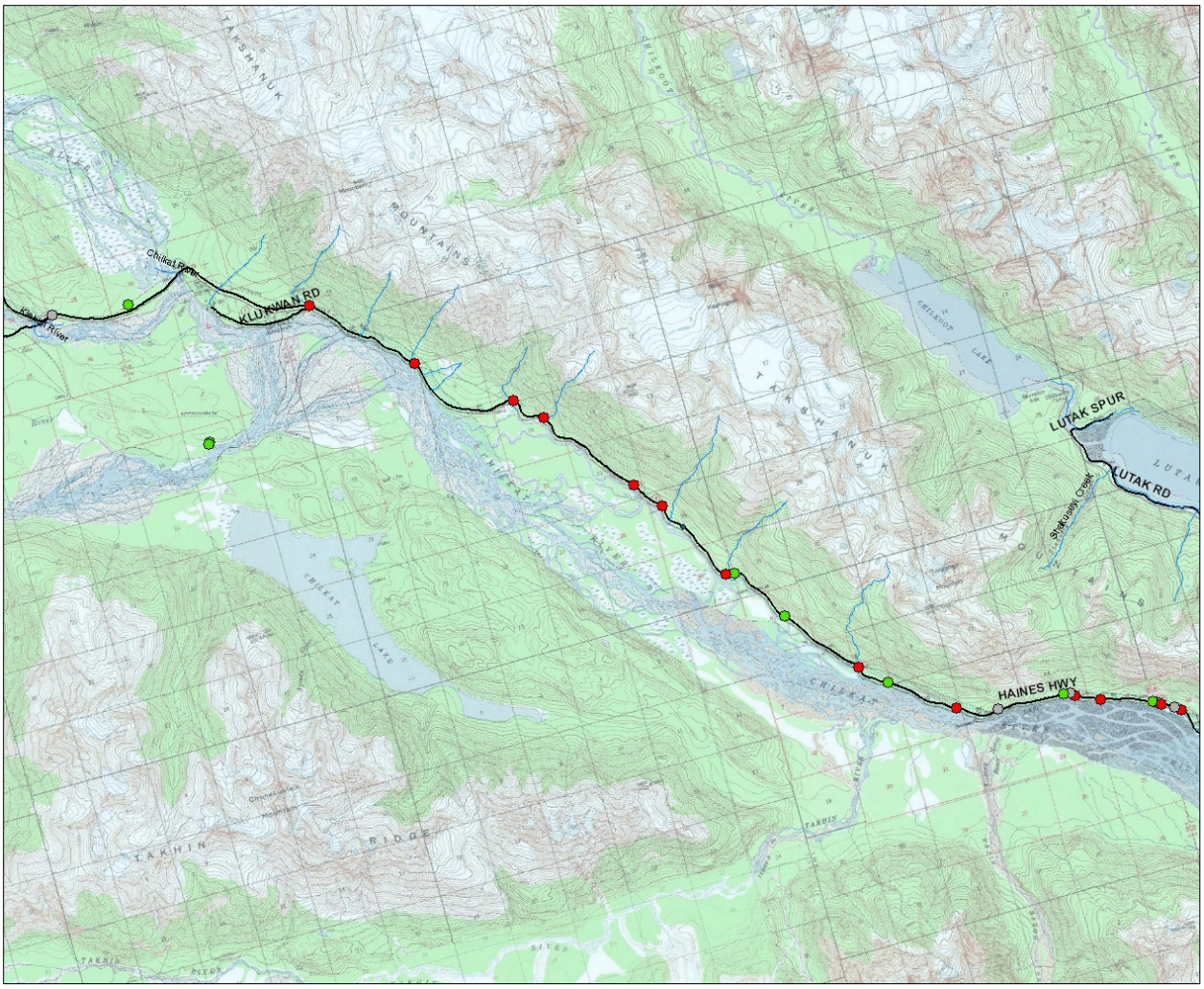

Figure 13.–Map showing assessed sites and site ratings along the Haines Highway from approximately milepost 7 to milepost 28.

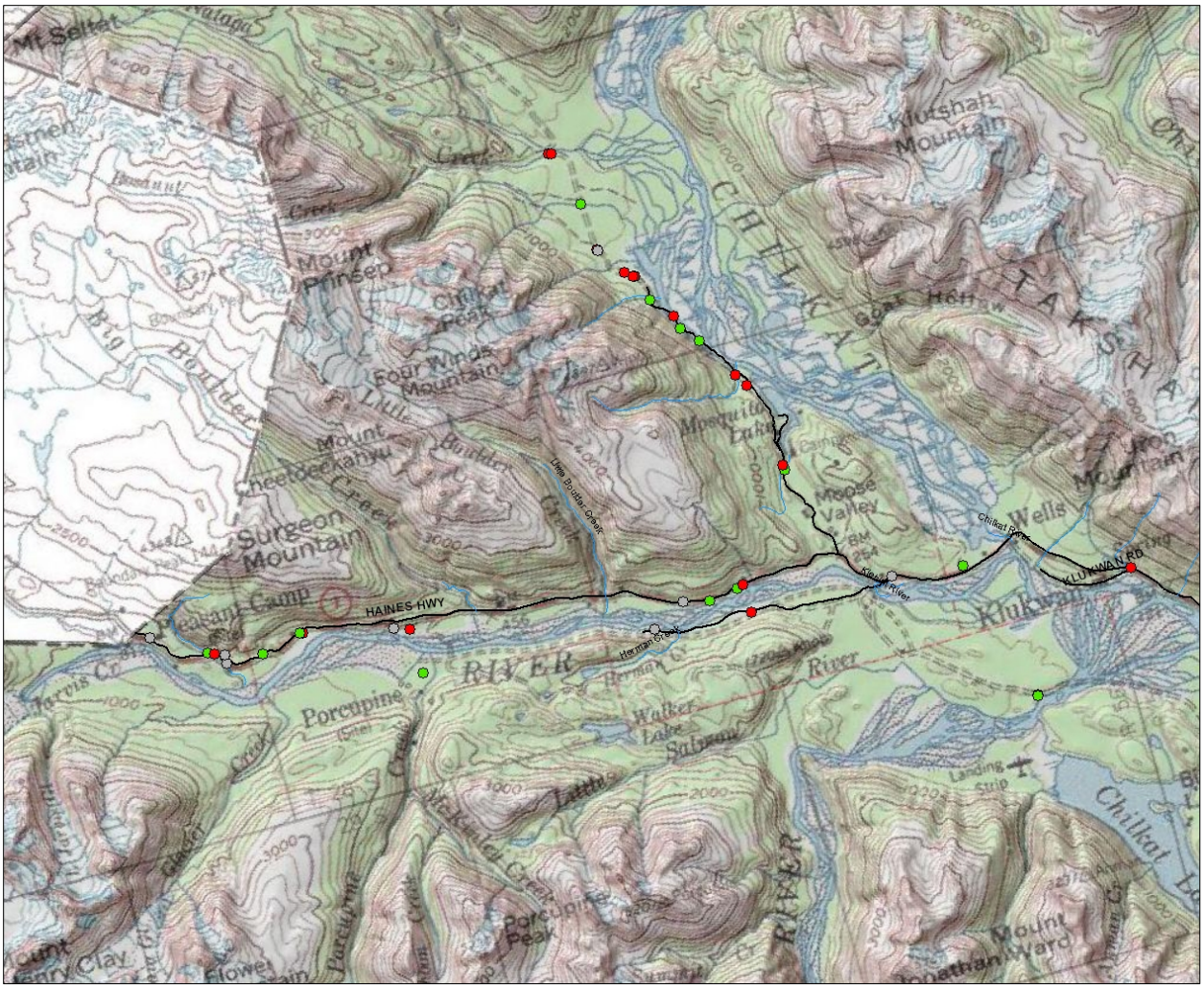

Figure 14.–Map showing assessed site locations and site ratings along the upper Haines highway from Klukwan to the border and sites along the Mosquito Lake and Kelsall Roads.

Juneau Fish Passage Ratings

In Juneau, 26 sites (23.6%) on known fish bearing waters were rated Red, 23 sites (20.9%) Gray, 56 sites (50.9%) Green, and 5 sites (4.5%) rated Black (Table 3, Figure 15). The project found 8 culvert sites (6.6%) in Juneau with an outfall over 1 foot, 12 culvert sites (9.8%) with a gradient over 4%, and 5 of those sites (4.1%) having both potential barriers (Table 4).

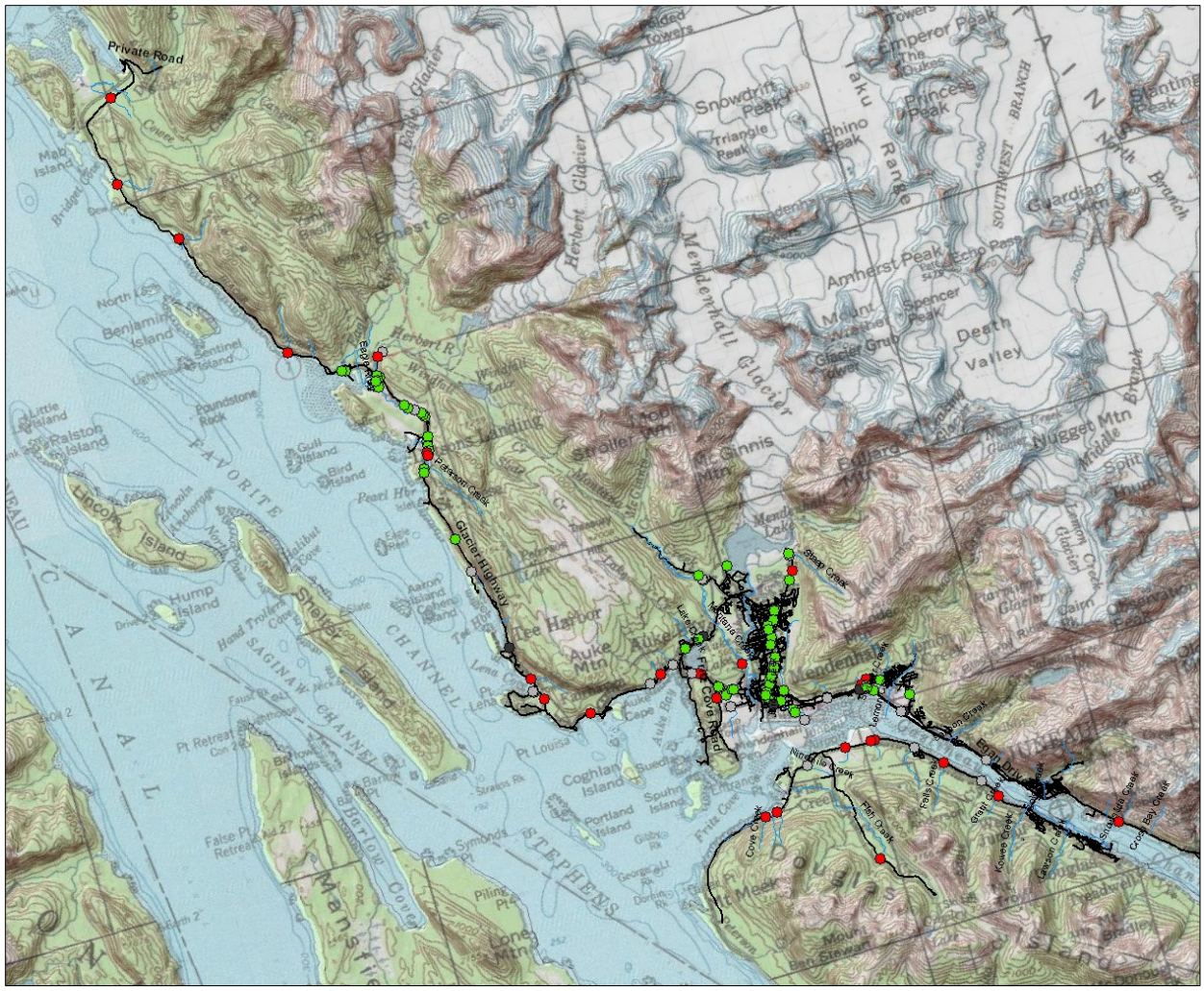

Figure 15.–Map of Juneau showing locations of surveyed culverts and their site ratings.

Sitka Fish Passage Ratings

In the Sitka area, on streams known to be fish bearing, 7 sites (23.3%) were rated Red, 12 sites (40%) were rated Gray, and 9 sites (30%) were rated Green. Additionally, assessment crews documented 3 dams in the area, and 2 of those sites (6.7%) are on known fish bearing streams and all are rated Black (Table 3, Figure 16). The project documented 8 culvert sites (18.2%) with an outfall over 1 foot, 9 culvert sites (20.5%) with a gradient that exceeded 4%, and 5 of those sites (11.4%) had both potential barriers to adult fish passage (Table 4).

Figure 16.–Map showing surveyed culvert locations and site rating in the Sitka area.

Skagway Fish Passage Ratings

Of the 43 sites assessed in the Skagway area, 31 were on Pullen Creek. Pullen Creek has three branches that run through downtown Skagway and the White Pass and Yukon Route rail yard. Pullen Creek also gets a significant amount of flow from a hydroelectric plant. All three branches eventually combine near Pullen Pond, an artificial pond used for rearing Chinook salmon and then empties into Taiya Inlet via a fish ladder next to a cruise ship dock. According to the Pullen Creek Action Plan (TIWC 2006), Pullen Creek has been heavily manipulated and rechanneled and runs through dozens of private properties as it meanders through town (Figure 18). Over much of its length Pullen Creek is only about 2 to 3 feet wide with a gravel and sand substrate (TIWC 2006).

In the Skagway area on streams known to be fish bearing 8 sites (20%) were rated as Red, 11 sites (27.5%) were rated Gray, 14 sites (35.0%) were rated Green and 7 sites (17.5%) were not able to be rated due to their location on private property and were rated Black (Table 3, Figures 17 and 18). The project documented one site (2.3%) with an outfall over 1 foot and one culvert (2.3%) with a gradient exceeding 4% (Table 4).

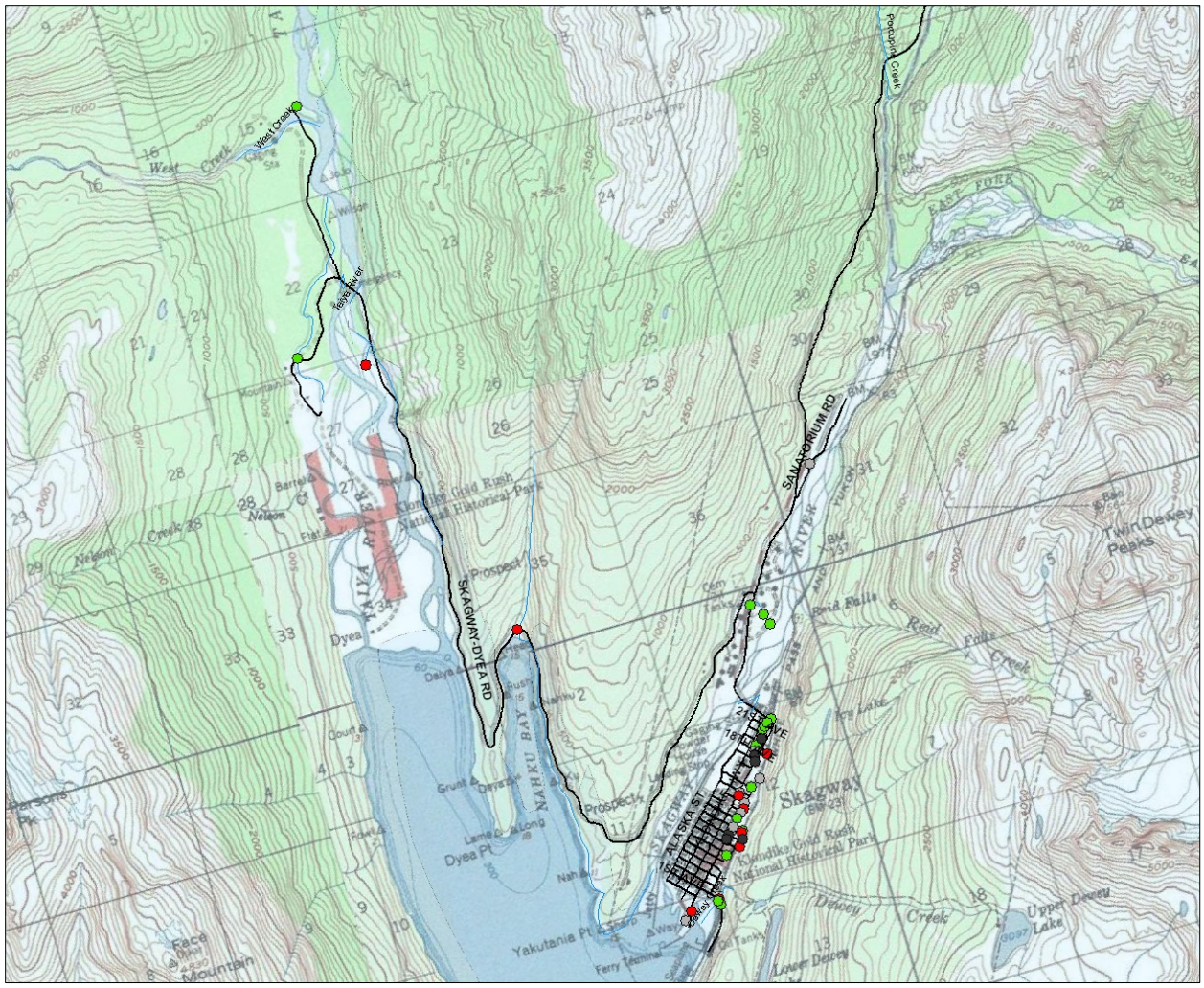

Figure 17.–Assessed site locations and site ratings in the Skagway area.

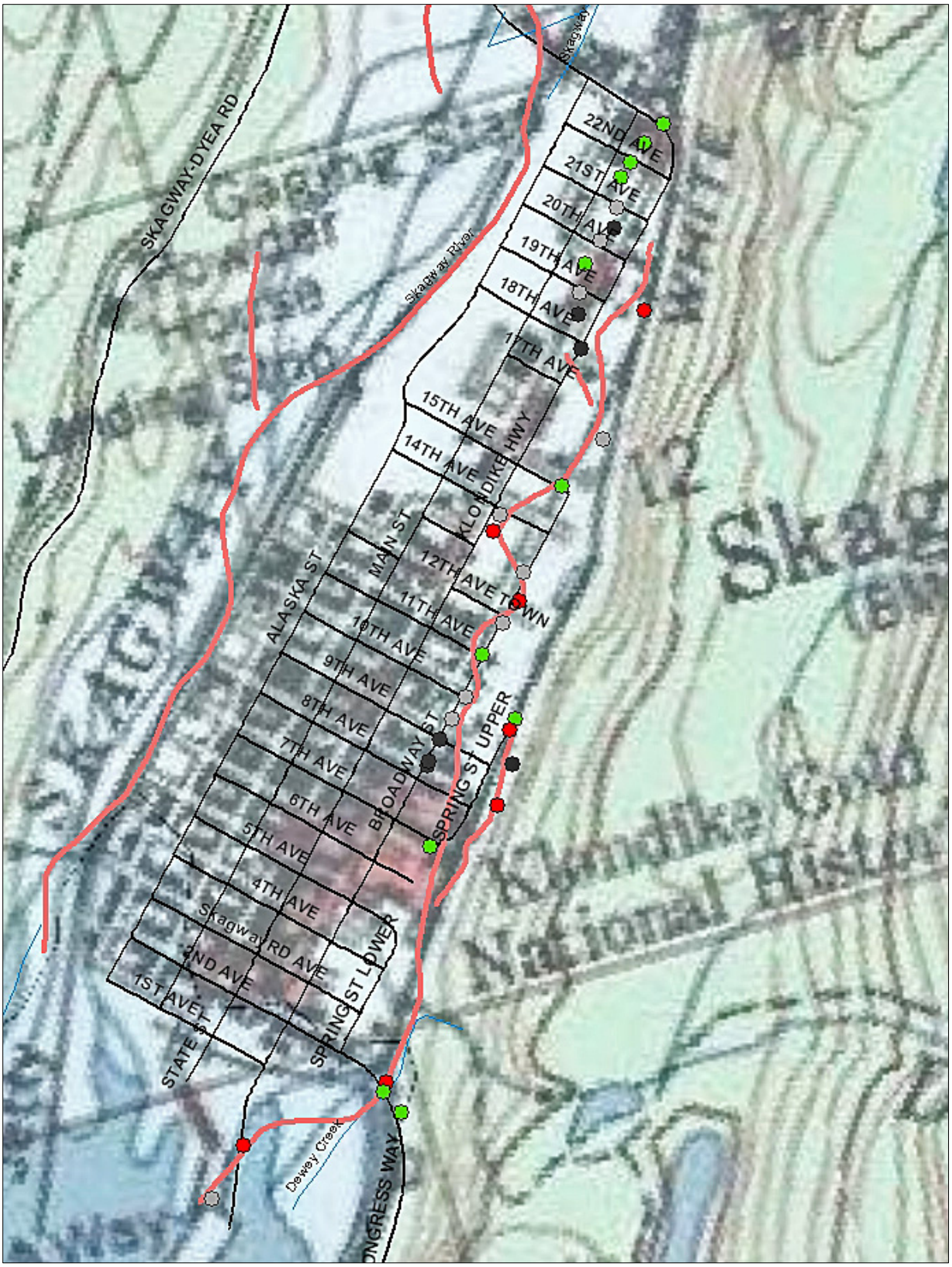

Figure 18.–Assessed sites and site ratings for culverts in downtown Skagway on the Pullen Creek complex.

FACTORS AFFECTING FISH PASSAGE

Most sites were rated based on the decision matrix which uses three major criteria or Critical Values: culvert gradient, outfall height and constriction ratio (Figure 6). Outfall heights and gradients were measured at most sites. However, constriction ratio was only measured at sites where it was possible to determine a standard ordinary high-water width, meaning culverts connecting two sloughs or ponds or an artificial channel to a lake are not represented in the data. Also, crews were not able to collect all measurements or evaluation criteria at every site or culvert due to safety, access, or culvert inundation. Other factors that may affect passage are recorded as site codes and are listed below (Table 5). It should also be noted that some data are culvert specific, meaning the measurement or metric collected was for an individual culvert if more than one culvert was present at the site, and some data are site-specific pertaining to the site as a whole.

Gustavus

In Gustavus, the most common factors affecting fish passage were constriction, indicating a narrowing of the stream through the culvert and a consequent increase in velocities, and the presence of an outfall (perch) (Table 5).

Haines

In Haines, the most common factors affecting fish passage were steep culvert gradients, constriction, and outfall. Additionally, 42 sites (37.8%) were observed to have major mechanical or structural issues, and 51 sites (45.9%) were given poor, 1 or 2, condition ratings (Table 5).

Juneau

In Juneau, the most common factors affecting fish passage were steep culvert gradients, outfall, and constriction. Additionally, 8 sites (6.6%) were observed to have major mechanical or structural issues, 27 sites (22.2%) were given a poor condition rating, and 13 sites (10.7%) had tidal influence (Table 5).

Sitka

In Sitka, the most common factors affecting fish passage were steep gradients, Red outfalls, and constriction. Nineteen sites (43.2%) were given a poor condition rating, and 8 sites (18.2%) were noted with major mechanical or structural issues (Table 5).

Skagway

In Skagway, the most common factors affecting fish passage were steep culvert gradients and constriction. Skagway also had 11 sites (25.6%) given a poor condition rating, and 5 sites (11.6%) where major mechanical and structural issues were observed (Table 5).

Table 5.–Factors Affecting Fish Passage for sites assessed in Gustavus, Haines, Juneau, Skagway, and Sitka (Critical Values are underlined).

Factors Affecting Fish Passage	Gustavus	% of Sites	Haines	% of Sites	Juneau	% of Sites	Sitka	% of Sites	Skagway	% of Sites	Total	% of Sites
Beaver activity	0	0.0	1	0.9	6	4.9	0	0.0	0	0.0	7	2.0
Compound slope	0	0.0	7	6.3	3	2.5	5	11.4	0	0.0	15	4.3
Condition rating = 2	3	12.0	40	36.0	19	15.6	12	27.3	9	20.9	83	24.1
Condition rating = 1	2	8.0	11	9.9	8	6.6	7	15.9	2	4.7	30	8.7
Culvert sagging in middle	0	0.0	13	11.7	1	0.8	2	4.5	1	2.3	17	4.9
Debris flow	0	0.0	2	1.8	5	4.1	0	0.0	1	2.3	8	2.3
Gray constriction ratio	7	28.0	16	14.4	22	18.0	7	15.9	0	0.0	52	15.1
Gray outfall	2	8.0	1	0.9	4	3.3	2	4.5	0	0.0	7	2.0
Gray slope	6	24.0	21	18.9	19	15.6	13	29.5	13	30.2	72	20.9
Hydraulic capacity inadequate	2	8.0	9	8.1	8	6.6	2	4.5	1	2.3	22	6.4
Ice damage	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Inlet perch	0	0.0	14	12.6	5	4.1	2	4.5	2	4.7	23	6.7
Mechanical/ joints parting/ structural defect	3	12.0	42	37.8	8	6.6	8	18.2	5	11.6	66	19.1
Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Poor alignment	2	8.0	26	23.4	7	5.7	6	13.6	5	11.6	46	13.3
Red constriction ratio	5	20.0	8	7.2	15	12.3	3	6.8	6	14.0	37	10.7
Red outfall	3	12.0	18	16.2	19	15.6	10	22.7	2	4.7	52	15.1
Red slope	1	4.0	33	29.7	33	27.0	11	25.0	8	18.6	86	24.9
Road erosion	2	8.0	2	1.8	0	0.0	0	0.0	0	0.0	4	1.2
Sediment accumulation	0	0.0	3	2.7	3	2.5	0	0.0	0	0.0	6	1.7
Shallow fill	0	0.0	0	0.0	0	0.0	1	2.3	1	2.3	2	0.6
Step pools	0	0.0	0	0.0	1	0.8	2	4.5	0	0.0	3	0.9
Tidal	0	0.0	3	2.7	13	10.7	6	13.6	1	2.3	23	6.7
Woody debris	0	0.0	3	2.7	5	4.1	1	2.3	1	2.3	10	2.9

CRITICAL VALUES

The Fish Passage Assessment Program uses three major criteria or Critical Values for rating culverts for fish passage: constriction, outfall, and gradient.

Constriction ratio (CR) is the ratio between the width of the stream, measured at ordinary high water, and the opening of the culvert(s). The lower the number the more constricted a stream is at a crossing and the more likely that it poses as a velocity barrier to juvenile fish passage. Any site having a constriction ratio lower than 0.50, meaning the culvert is 50% less than the width of the stream, is rated Red. Culverts with a CR between 0.50 and 0.75 are rated Gray, and any ratio above 0.75 are rated Green.

Outfall height (perch) is measured as the difference between the water surface elevation at the culvert outlet pool and the water surface elevation at the culvert outlet (Figures 8 and 9). Outfall heights are determined from elevations taken from the longitudinal profile. Culverts with an outfall up to 4 inches (0.33 ft) are rated Gray, and over 4 inches are rated Red by the decision matrix. Outfall heights over 1 foot are considered to be a potential barrier to adult salmonids (NOAA 2001).

Culvert gradient (slope) is measured as the difference in elevation between the inlet and outlet divided by the culvert length. Most culverts were rated using elevations at the invert, unless substrate is present, and then the top of culvert elevations were used. The culvert's fish passage rating for gradient is determined by the structure type, which is determined from the culvert's width and corrugation measurements (Figure 6). This project considers a culvert with a gradient over 4% a potential adult fish passage barrier.

If a site was found to meet the criteria for being backwatered, Critical Values are not considered when rating the site. However, collected constriction ratio and gradient data is presented in Tables 6 and 8, but is not reflected as a factor affecting fish passage in Table 5.

Gustavus

Of the 22 sites assessed for constriction in Gustavus, 5 sites (22.7%) were rated Red, and 7 sites (31.8%) were rated Gray (Table 6). In Gustavus, 25 culverts (80.6%) did not have an outfall, 4 culverts (12.9%) had an outfall greater than 4 inches and were rated Red, and 2 culverts (6.5%) had an outfall under 4 inches and were rated Gray. The most common type of Red outfall was free-fall into pool (Tables 7 and 8). Culvert gradients in Gustavus were not typically an impediment to fish passage with 86% of culvert gradients under 1%, and no culverts were found with a gradient over 2%. Only one culvert (3.3%) assessed was found to have a Red gradient, and 6 culverts (20%) were rated Gray (Table 9).

Haines

Most sites in Haines consisted of small creeks or culverts connecting two ephemeral areas. Of the 45 sites assessed for constriction, 8 sites (17.8%) were rated Red, and 15 sites (33.3%) were rated Gray (Table 6). In Haines, 105 sites (81.4%) were found to have no outfall, 22 culverts (17%) had an outfall over 4 inches, and 2 culverts (1.6%) had an outfall under 4 inches. The most common Red outfall types were free-fall into pool and free-fall onto riprap (Tables 7 and 8). Culvert gradients in the Haines area tended to be mild with 50 culverts (43.9%) having a gradient under 1% (Table 9).

Juneau

Of the 69 sites assessed for constriction in Juneau, 16 sites (23.2%) were rated Red, and 21 sites (30.4%) were rated Gray (Table 6). In Juneau, 111 culverts (78.7%) were found to have no outfall, 25 culverts (17.8%) had an outfall greater than 4 inches and were rated Red, and 5 culverts (3.5%) had an outfall under 4 inches and were rated Gray. The primary Red outfall types were free-fall into pool and cascade over riprap (Tables 7 and 8). Most culverts in the Juneau area, 81 (60.9%), had less than a 1% slope (Table 9).

Sitka

Of the 19 sites assessed for constriction in Sitka, 4 sites (20.3%) were rated Red, and 7 sites (36.8%) were rated Gray (Table 6). In the Sitka area, 31 culverts (67.4%) did not have an outfall, 11 culverts (23.9%) had an outfall over 4 inches and were rated Red, and 4 culverts (8.7%) had an outfall under 4 inches and were rated Gray. The dominant Red outfall type was free-fall into pool and cascade over riprap (Tables 7 and 8). In Sitka, 21 culverts (48.8%) had a gradient less than 1%. Red gradients were widely variable with the 5 culverts (11.6%) exceeding 10% (Table 9).

Skagway

Of the 9 sites assessed for constriction in the Skagway, 5 sites (55.6%) were rated Red (Table 6). In the Skagway area, 40 culverts (93%) did not have an outfall, 3 culverts (7%) had an outfall greater than 4 inches and were rated Red, and no culverts were found with a Gray outfall. Outfall types were split in Skagway with each recorded outfall type being observed at only one site each (Table 7 and 8). Gradients for culverts in the Skagway area were mild with 26 (63.4%) of culverts being under 1% gradient (Table 9).

Table 6.–Constriction Ratio for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway where constriction ratios could be calculated.

Constriction Ratio	Gustavus	% of Sites	Haines	% of Sites	Juneau	% of Sites	Sitka	% of Sites	Skagway	% of Sites	Total	Total % of Sites	Fish passage rating
0–0.25	0	0.0	0	0.0	2	2.9	0	0.0	0	0.0	2	1.2	Red
0.25–0.5	5	22.7	8	17.8	14	20.3	4	21.1	5	55.6	36	22.0	Red
0.5–0.75	7	31.8	15	33.3	21	30.4	7	36.8	0	0.0	50	30.5	Gray
0.75–1	3	13.6	12	26.7	12	17.4	5	26.3	2	22.2	34	20.7	Green
1–1.25	3	13.6	3	6.7	6	8.7	1	5.3	0	0.0	13	7.9	Green
1.25–1.5	3	13.6	3	6.7	3	4.3	2	10.5	0	0.0	11	6.7	Green
1.5–1.75	1	4.5	1	2.2	5	7.2	0	0.0	0	0.0	7	4.3	Green
1.75–2	0	0.0	0	0.0	2	2.9	0	0.0	1	11.1	3	1.8	Green
2–2.25	0	0.0	2	4.4	1	1.4	0	0.0	1	11.1	4	2.4	Green
2.25–2.5	0	0.0	1	2.2	1	1.4	0	0.0	0	0.0	2	1.2	Green
2.5–2.75	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	Green
2.75–3	0	0.0	0	0.0	1	1.4	0	0.0	0	0.0	1	0.6	Green
3–3.25	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	Green
3.25–3.5	0	0.0	0	0.0	1	1.4	0	0.0	0	0.0	1	0.6	Green
Total	22	100.0	45	100.0	69	100.0	19	100.0	9	100.0	164	100.0	

Table 7.–Culvert outfall heights (inches) for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway where outfall heights were measured.

Outfall height (in)	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	Total %	Fish passage rating
At Grade	25	80.6	105	81.4	111	78.7	31	67.4	40	93.0	312	80.0	Green
>0–4	2	6.5	2	1.6	5	3.5	4	8.7	0	0.0	13	3.3	Gray
4–12	3	9.7	6	4.7	15	10.6	3	6.5	2	4.7	29	7.4	Red
12–24	1	3.2	8	6.2	3	2.1	1	2.2	1	2.3	14	3.6	Red
24–36	0	0.0	3	2.3	3	2.1	2	4.3	0	0.0	8	2.1	Red
36–48	0	0.0	1	0.8	1	0.7	4	8.7	0	0.0	6	1.5	Red
48–60	0	0.0	3	2.3	2	1.4	1	2.2	0	0.0	6	1.5	Red
60–72	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3	Red
>72	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.3	Red
Total	31	100.0	129	100.0	141	100.0	46	100.0	43	100.0	390	100.0	

Table 8.–Outfall types for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Outfall Type	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
At stream grade	25	80.6	104	78.8	111	77.6	31	66.0	40	88.9	310	78.1
Cascade over riprap	0	0.0	3	2.3	5	3.5	3	6.4	0	0.0	11	2.8
Fish passage structure	0	0.0	0	0.0	1	0.7	0	0.0	1	2.2	2	0.5
Free-fall into pool	4	12.9	19	14.4	19	13.3	11	23.4	1	2.2	54	13.6
Free-fall onto riprap	0	0.0	5	3.8	4	2.8	2	4.3	1	2.2	12	3.0
Hydraulic jump	2	6.5	0	0.0	3	2.1	0	0.0	1	2.2	6	1.5
Overflow pipe	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
Smooth flow over apron	0	0.0	0	0.0	0	0.0	0	0.0	1	2.2	1	0.3
Total	31	100.0	132	100.0	143	100.0	47	100.0	45	100.0	397	100.0

Table 9.–Overall culvert gradients for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway where culvert gradients could be calculated.

Culvert Gradient	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
-5 – 4.5	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
-4.5 – 4	0	0.0	0	0.0	0	0.0	1	2.3	0	0.0	1	0.3
-4 – 3.5	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	1	0.3
-3.5 – 3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
-3 – 2.5	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
-2.5 – 2	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
-2 – 1.5	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
-1.5 – 1	2	6.7	3	2.6	1	0.8	0	0.0	1	2.4	7	1.9
-1 – 0.5	2	6.7	3	2.6	4	3.0	0	0.0	0	0.0	9	2.5
-0.5 – 0	5	16.7	5	4.4	13	9.8	4	9.3	2	4.9	29	8.0
0 – 0.5	7	23.3	20	17.5	29	21.8	9	20.9	10	24.4	75	20.8
0.5 – 1	6	20.0	19	16.7	33	24.8	7	16.3	13	31.7	78	21.6
1 – 1.5	2	6.7	11	9.6	9	6.8	5	11.6	4	9.8	31	8.6
1.5 – 2	2	6.7	14	12.3	12	9.0	2	4.7	4	9.8	34	9.4
2 – 2.5	0	0.0	5	4.4	5	3.8	1	2.3	0	0.0	11	3.0
2.5 – 3	0	0.0	4	3.5	9	6.8	1	2.3	1	2.4	15	4.2
3 – 3.5	0	0.0	11	9.6	1	0.8	1	2.3	0	0.0	13	3.6
3.5 – 4	0	0.0	4	3.5	4	3.0	0	0.0	5	12.2	13	3.6
4 – 4.5	0	0.0	2	1.8	0	0.0	1	2.3	0	0.0	3	0.8
4.5 – 5	0	0.0	2	1.8	0	0.0	1	2.3	0	0.0	3	0.8
5 – 5.5	0	0.0	2	1.8	3	2.3	1	2.3	1	2.4	7	1.9
5.5 – 6	0	0.0	0	0.0	1	0.8	1	2.3	0	0.0	2	0.6
6 – 6.5	0	0.0	1	0.9	2	1.5	1	2.3	0	0.0	4	1.1
6.5 – 7	0	0.0	2	1.8	2	1.5	1	2.3	0	0.0	5	1.4
7 – 7.5	0	0.0	1	0.9	0	0.0	0	0.0	0	0.0	1	0.3
7.5 – 8	0	0.0	3	2.6	0	0.0	1	2.3	0	0.0	4	1.1
8 – 8.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
8.5 – 9	0	0.0	1	0.9	1	0.8	0	0.0	0	0.0	2	0.6
9 – 9.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
9.5 – 10	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
>10	0	0.0	1	0.9	3	2.3	5	11.6	0	0.0	9	2.5
Total	30	100.0	114	100.0	133	100.0	43	100.0	41	100.0	361	100.0

CULVERT TYPES AND DIMENSIONS

Gustavus

Most crossings in Gustavus were single, circular culverts between 2 and 6 feet in width and between 30 and 40 feet in length (Tables 10–13). Six culverts (19.4%) were found to be embedded and 14 sites (56%) were found to be backwatered (Tables 14–17). No sites in the Gustavus area were found to have tidal influence or baffles.

Haines

Most crossings in Haines were single, circular culverts between 2 and 8 feet in width, and between 30 and 60 feet in length (Tables 10–13). In the Haines area, 18 culverts (13.4%) were found to be embedded with an additional 6 culverts (4.5%) possibly being embedded. Twenty-nine sites (26.1%) were backwatered, 3 sites (2.7%) were found to have some tidal influence, and 4 culverts (3.0%) were found to have baffles (Tables 14–17).

Juneau

Most crossings in Juneau were single, circular culverts between 2 and 8 feet in width, and between 40 and 100 feet in length (Tables 10–13). In the Juneau area, 28 culverts (20%) were found to be embedded, with an additional 8 culverts (5.7%) possibly being embedded; 43 sites (35.2%) were found to be backwatered, with an additional 4 sites (3.3%) possibly being backwatered; 13 sites (10.7%) were found to have tidal influence, with an additional 7 sites (5.7%) potentially having tidal influence; and 2 culverts (1.4%) were found to have baffles (Tables 14–17).

Sitka

Most crossings in Sitka were single, circular culverts between 2 and 6 feet wide, and between 20 to 70 feet in length (Tables 10–13). Not shown in the data were two large culverts draining Swan Lake and the lower extent of Petersen Creek. Both sites had large, long culverts of varying material that ran under multiple streets before emptying out in Sitka Sound. The Petersen Creek outlet is approximately 500 feet long and composed of 6 separate culverts of varying materials. The Swan Lake outlet culvert is approximately three-quarters of a mile long and runs from the lake outlet to the exit point below the public library. There were also 3 dams inventoried (Table 13).

In the Sitka area, 8 culverts (17%) were found to be embedded; 10 sites (22.7%) were found to be backwatered; 6 sites (13.6%) were found to have tidal influence, with one additional site (2.3%) that may have tidal influence; and one culvert (2.1%) was found to have baffles (Tables 14–17).

Skagway

Most crossings in Skagway are single, circular culverts between 2–4 ft wide and 30–40 ft long (Tables 10–13). In the Skagway area, 6 culverts (13.6%) were found to be embedded, with an additional 5 culverts (11.4%) that may be embedded. Ten sites (23.3%) were found to be backwatered; and one site (2.3%) was found to have tidal influence, with an additional site (2.3%) that possibly has tidal influence. There were no culverts with baffles found in the Skagway area (Tables 14–17).

Table 10.–Culvert lengths for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Culvert length (ft)	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
10–20	0	0.0	0	0.0	0	0.0	0	0.0	4	9.5	4	1.0
20–30	6	19.4	1	0.8	1	0.7	6	13.6	6	14.3	20	5.2
30–40	11	35.5	24	18.5	7	5.2	14	31.8	11	26.2	67	17.5
40–50	7	22.6	28	21.5	15	11.1	4	9.1	1	2.4	55	14.4
50–60	2	6.5	22	16.9	14	10.4	2	4.5	5	11.9	45	11.8
60–70	1	3.2	18	13.8	17	12.6	5	11.4	5	11.9	46	12.0
70–80	2	6.5	6	4.6	14	10.4	3	6.8	5	11.9	30	7.9
80–90	1	3.2	10	7.7	15	11.1	4	9.1	1	2.4	31	8.1
90–100	1	3.2	5	3.8	14	10.4	1	2.3	1	2.4	22	5.8
100–110	0	0.0	5	3.8	6	4.4	2	4.5	0	0.0	13	3.4
110–120	0	0.0	0	0.0	3	2.2	1	2.3	0	0.0	4	1.0
120–130	0	0.0	4	3.1	3	2.2	1	2.3	0	0.0	8	2.1
130–140	0	0.0	0	0.0	4	3.0	0	0.0	0	0.0	4	1.0
140–150	0	0.0	0	0.0	5	3.7	0	0.0	1	2.4	6	1.6
150–160	0	0.0	2	1.5	5	3.7	0	0.0	0	0.0	7	1.8
160–170	0	0.0	0	0.0	4	3.0	1	2.3	1	2.4	6	1.6
170–180	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.3
180–190	0	0.0	0	0.0	2	1.5	0	0.0	1	2.4	3	0.8
190–200	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
200–210	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
210–220	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
220–230	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.3
230–240	0	0.0	0	0.0	2	1.5	0	0.0	0	0.0	2	0.5
240–250	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
250–260	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.3
260–270	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
270–280	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
280–290	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
290–300	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
>300	0	0.0	1	0.8	1	0.7	0	0.0	0	0.0	2	0.5
Total	31	100.0	130	100.0	135	100.0	44	100.0	42	100.0	382	100.0

Table 11.–Culvert inlet widths for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Culvert inlet widths (ft)	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
0–2	1	3.2	15	11.5	4	2.9	0	0.0	8	18.2	28	7.1
2–4	14	45.2	60	45.8	34	24.5	19	40.4	22	50.0	149	38.0
4–6	12	38.7	35	26.7	36	25.9	17	36.2	10	22.7	110	28.1
6–8	2	6.5	13	9.9	26	18.7	6	12.8	0	0.0	47	12.0
8–10	2	6.5	4	3.1	16	11.5	2	4.3	3	6.8	27	6.9
10–12	0	0.0	0	0.0	10	7.2	2	4.3	1	2.3	13	3.3
12–14	0	0.0	2	1.5	8	5.8	1	2.1	0	0.0	11	2.8
14–16	0	0.0	1	0.8	2	1.4	0	0.0	0	0.0	3	0.8
16–18	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.3
18–20	0	0.0	0	0.0	2	1.4	0	0.0	0	0.0	2	0.5
20–22	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.3
Total	31	100.0	131	100.0	139	100.0	47	100.0	44	100.0	392	100.0

Table 12.–Culvert types for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Culvert type	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
Box culvert	0	0.0	3	2.2	4	2.7	1	2.1	0	0.0	8	2.0
Circular pipe	29	90.6	121	90.3	96	65.8	33	70.2	27	60.0	306	75.7
Flat bottom oval pipe	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.2
Open-bottom arch	1	3.1	0	0.0	8	5.5	3	6.4	1	2.2	13	3.2
Other	0	0.0	0	0.0	2	1.4	1	2.1	0	0.0	3	0.7
Oval	0	0.0	4	3.0	7	4.8	6	12.8	12	26.7	29	7.2
Pipe-arch	2	6.3	6	4.5	28	19.2	3	6.4	5	11.1	44	10.9
Total	32	100.0	134	100.0	146	100.0	47	100.0	45	100.0	404	100.0

Table 13.–Number of culverts per site for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Number of culverts at site	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of all culverts
1	19	76.0	92	82.9	100	82.0	36	81.8	38	88.4	285	82.6
2	5	20.0	14	12.6	20	16.4	4	9.1	3	7.0	46	13.3
3	0	0.0	4	3.6	1	0.8	1	2.3	0	0.0	6	1.7
4	1	4.0	1	0.9	1	0.8	0	0.0	1	2.3	4	1.2
Other structure	0	0.0	0	0.0	0	0.0	3	6.8	1	2.3	4	1.2
Total	25	100.0	111	100.0	122	100.0	44	100.0	43	100.0	345	100.0

Table 14.–Embedded and nonembedded culverts at sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Embedded?	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
Maybe	0	0.0	6	4.5	8	5.7	0	0.0	5	11.4	19	4.8
No	25	80.6	109	81.3	104	74.3	39	83.0	33	75.0	310	78.3
Unknown	0	0.0	1	0.7	0	0.0	0	0.0	0	0.0	1	0.3
Yes	6	19.4	18	13.4	28	20.0	8	17.0	6	13.6	66	16.7
Total	31	100.0	134	100.0	140	100.0	47	100.0	44	100.0	396	100.0

Table 15.–Backwatered sites for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Backwatered?	Gustavus	% of sites	Haines	% of Sites	Juneau	% of Sites	Sitka	% of Sites	Skagway	% of Sites	Total	% of all culverts
Maybe	0	0.0	1	0.9	4	3.3	0	0.0	0	0.0	5	1.4
No	10	40.0	77	69.4	72	59.0	31	70.5	28	65.1	218	63.2
Unknown	1	4.0	4	3.6	3	2.5	3	6.8	5	11.6	16	4.6
Yes	14	56.0	29	26.1	43	35.2	10	22.7	10	23.3	106	30.7
Total	25	100.0	111	100.0	122	100.0	44	100.0	43	100.0	345	100.0

Table 16.–Sites with tidal influence for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Tidal influence?	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of all culverts
Maybe	0	0.0	0	0.0	7	5.7	1	2.3	1	2.3	9	2.6
No	25	100.0	108	97.3	102	83.6	37	84.1	41	95.3	313	90.7
Yes	0	0.0	3	2.7	13	10.7	6	13.6	1	2.3	23	6.7
Total	25	100.0	111	100.0	122	100.0	44	100.0	43	100.0	345	100.0

Table 17.–Culverts with baffles for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Baffles?	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
Maybe	0	0.0	1	0.7	0	0.0	0	0.0	0	0.0	1	0.3
No	31	100.0	129	96.3	136	98.6	46	97.9	45	100.0	387	98.0
Yes	0	0.0	4	3.0	2	1.4	1	2.1	0	0.0	7	1.8
Total	31	100.0	134	100.0	138	100.0	47	100.0	45	100.0	395	100.0

STREAM CHARACTERISTICS

Some data collected during surveys are flow dependent, meaning that measurements and observations are based on current conditions. Water depth at outlet and stream stage are recorded at time of survey.

Gustavus

In the Gustavus area, 26 culverts (83.9%) had a water depth at outlet less than 1 foot and most sites were at medium stream stage. Of the 22 streams that had stream widths collected, 17 streams (77.3%) were between 2 and 8 feet wide (Tables 18–20).

Haines

In the Haines area, 90 culverts (71.4%) had a water depth at outlet less than 1 foot and most sites were at medium stream stage. Of the 45 sites that had stream widths collected, 25 streams (55.6%) were between 2 and 6 feet wide (Tables 18–20).

Juneau

In the Juneau area, 92 culverts (69.1%) had a water depth at outlet of less than 1 foot and most were at medium stream stage. Of the 71 sites where stream widths were collected, 42 streams (59.1%) were between 2 and 10 feet wide (Tables 18–20).

Sitka

In the Sitka area, 38 culverts (86.4%) had less than 1 foot of water depth at outlet and most were at medium stream stage. Of the 19 sites where stream widths were collected, 12 streams (63.2%) were between 4 and 10 feet in width (Tables 18–20).

Skagway

In the Skagway area, 33 culverts (80.5%) had a water depth at outlet less than 1 foot and most sites were at medium stream stage, but the crew encountered considerable precipitation during assessments and 15 sites (34.9%) had a high-water stage during visit. Stream widths varied greatly at sites where stream widths were taken, but of the 9 sites where stream widths were collected, 5 streams (55.6%) were between 4 and 10 feet in width. Please note that almost no stream widths were taken on Pullen Creek due to heavy stream channel manipulation and accessibility (Tables 18–20).

Table 18.–Water depths at outlet for culverts assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Water Depth at Outlet (ft)	Gustavus	% of culverts	Haines	% of culverts	Juneau	% of culverts	Sitka	% of culverts	Skagway	% of culverts	Total	% of all culverts
0–0.25	6	19.4	32	25.4	42	31.6	18	40.9	2	4.9	100	26.7
0.25–0.5	8	25.8	27	21.4	18	13.5	10	22.7	8	19.5	71	18.9
0.5–0.75	10	32.3	20	15.9	20	15.0	5	11.4	16	39.0	71	18.9
0.75–1	2	6.5	11	8.7	12	9.0	5	11.4	7	17.1	37	9.9
1–1.25	1	3.2	10	7.9	9	6.8	0	0.0	2	4.9	22	5.9
1.25–1.5	3	9.7	7	5.6	5	3.8	1	2.3	2	4.9	18	4.8
1.5–1.75	0	0.0	3	2.4	4	3.0	2	4.5	2	4.9	11	2.9
1.75–2	0	0.0	7	5.6	6	4.5	1	2.3	1	2.4	15	4.0
2–2.25	1	3.2	1	0.8	3	2.3	2	4.5	1	2.4	8	2.1
2.25–2.5	0	0.0	1	0.8	3	2.3	0	0.0	0	0.0	4	1.1
2.5–2.75	0	0.0	3	2.4	3	2.3	0	0.0	0	0.0	6	1.6
2.75–3	0	0.0	0	0.0	4	3.0	0	0.0	0	0.0	4	1.1
>3	0	0.0	4	3.2	4	3.0	0	0.0	0	0.0	8	2.1
Total	31	100.0	126	100.0	133	100.0	44	100.0	41	100.0	375	100.0

Table 19.–Stream stage at time of survey for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Stream Stage	Gustavus	%	Haines	%	Juneau	%	Sitka	%	Skagway	%	Total	Total %
Dry	0	0.0	2	1.8	4	3.3	1	2.3	0	0.0	7	2.0
Dry, defined channel	0	0.0	0	0.0	3	2.5	0	0.0	0	0.0	3	0.9
High	0	0.0	17	15.3	16	13.1	5	11.4	15	34.9	53	15.4
Low	1	4.0	4	3.6	6	4.9	2	4.5	0	0.0	13	3.8
Medium	23	92.0	87	78.4	89	73.0	33	75.0	24	55.8	256	74.2
Not recorded or not applicable	1	4.0	1	0.9	4	3.3	3	6.8	4	9.3	13	3.8
Total	25	100.0	111	100.0	122	100.0	44	100.0	43	100.0	345	100.0

Table 20.–Average stream widths at ordinary high water (OHW) for sites assessed in Gustavus, Haines, Juneau, Sitka, and Skagway.

Average stream width at OHW (ft)	Gustavus	% of sites	Haines	% of sites	Juneau	% of sites	Sitka	% of sites	Skagway	% of sites	Total	% of total sites
0–2	0	0.0	0	0.0	1	1.4	0	0.0	0	0.0	1	0.6
2–4	4	18.2	12	26.7	9	12.7	0	0.0	0	0.0	25	15.1
4–6	4	18.2	13	28.9	9	12.7	6	31.6	2	22.2	34	20.5
6–8	9	40.9	5	11.1	12	16.9	3	15.8	2	22.2	31	18.7
8–10	2	9.1	4	8.9	12	16.9	3	15.8	1	11.1	22	13.3
10–12	1	4.5	4	8.9	7	9.9	2	10.5	1	11.1	15	9.0
12–14	2	9.1	1	2.2	7	9.9	3	15.8	0	0.0	13	7.8
14–16	0	0.0	1	2.2	2	2.8	2	10.5	0	0.0	5	3.0
16–18	0	0.0	2	4.4	5	7.0	0	0.0	1	11.1	8	4.8
18–20	0	0.0	1	2.2	2	2.8	0	0.0	0	0.0	3	1.8
20–22	0	0.0	0	0.0	2	2.8	0	0.0	1	11.1	3	1.8
22–24	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
24–26	0	0.0	0	0.0	1	1.4	0	0.0	0	0.0	1	0.6
26–28	0	0.0	1	2.2	2	2.8	0	0.0	0	0.0	3	1.8
28–30	0	0.0	1	2.2	0	0.0	0	0.0	1	11.1	2	1.2
Total	22	100.0	45	100.0	71	100.0	19	100.0	9	100.0	166	100.0

PRIORITIZATION

The goal of prioritization was to identify the barriers where replacement or removal has the greatest potential to benefit fish populations, but this is intended as a "first cut" effort at prioritization and is not definitive. The highest prioritization scores reflect those culverts with the most diversity of fish species and the greatest potential to block fish movement, and these culverts should be considered first for replacement (Tables 21–30). Green and Black culverts all score zero and are not assigned a prioritization score.

Prioritization scores are grouped by road network to facilitate site selection. In this report, prioritization is further subdivided into groups of known fish-bearing waters (Tables 21, 23, 25, 27, and 29) and water bodies not known to be fish-bearing but judged to have suitable habitat during the site visit (Tables 22, 24, 26, 28, and 30). This is to allow immediate identification of sites where replacement can benefit fish when cross-referencing Tables 21, 23, 25, 27, and 29, as well as to show how those sites compare with additional crossings on streams where we have less data.

To use the prioritization, first identify the geographic area of interest and locate the highest-scoring culverts in that area. Scores are calculated in the same way for each area, so it is possible to compare sites across tables as well as within a table; however, be aware that fish diversity is an important component of the prioritization score when comparing water bodies with known fish presence to those with suspected fish presence. Using the scores in the tables below, additional information in the appendices, and the ADF&G Fish Resource Monitor (an interactive mapper with full survey data and numerous photographs of each site as well as information on fish species and life stages from both the AWC and AFFI datasets), it is possible to target a small subset of barriers for replacement based on various criteria such as species of interest, stream size, watershed, and road ownership. Although the data and results presented here and on the Fish Resource Monitor can be used to help determine the site to target for prioritization, we recommend, at a minimum, a site visit should be conducted to ensure the culvert remains in the same condition and to identify any non-ecological factors that may impact replacement.

On most road networks in northern Southeast Alaska, we observed a relatively small number of culverts with high prioritization scores, and we recommend those are the first structures considered for replacement when funds are available (Figures 19–31). Where there are many culverts with similar scores, replacement of many structures may be required to see a large improvement in fish passage throughout the watershed or region, and it is recommended that a comprehensive plan for improvement is developed locally to consider issues such as barriers per watershed, road ownership, scheduled road maintenance, seasonal traffic loads, and cost. An example of this includes the results for Pullen Creek in Skagway (Tables 29 and 30; Figures 30 and 31).

The Haines road network contained the largest number of culverts as well as the highest-scoring and therefore the highest-priority culverts in the region. Although it is difficult to directly compare benefits between watersheds, it is suggested that the Haines area be regarded as potentially the most impacted by barriers to fish passage in the northern Southeast Alaska region at this time.

Factors such as habitat quality, presence of invasive species, road maintenance, and species of concern are not included in this prioritization but should be considered before any project is undertaken. In addition, due to the number of unmapped streams and the various methods used to calculate the upstream miles or lake size habitat extent, figures presented herein should be treated as low-quality estimates and used for comparison purposes only or replaced if more accurate information is available. ADF&G hopes to update this prioritization in the future if and when better stream mapping becomes available.

Gustavus Prioritization

Table 21.–Prioritization table of Red and Gray rated sites in the Gustavus Area known to be fish bearing.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species.
10302255	Mountain View Rd.	Good River	1.452	1.92	1.92	0	2	0
10302241	Wilson Road	Rink Creek	0.738	0.73	0	0	2	0
10302256	Tong Road	Good River	0.678	1.76	1.76	0	2	0
10302262	Tong Road	Good River trib.	0.534	0.64	0.64	0	1	0
10302244	Wilson Road	Unnamed	0.306	0.01	0	0	2	0
10302261	Mountain View Rd.	Good River	0.153	0.01	0	0	2	0

Table 22.–Prioritization table of all Red and Gray rated sites for the Gustavus area including known fish bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat during the site visit.

Site ID	Road Name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species.
10302255	Mountain View Rd	Good River	1.452	1.92	1.92	0	2	0
10302241	Wilson Road	Rink Creek	0.738	0.73	0.73	0	2	0
10302256	Tong Road	Good River	0.678	1.76	1.76	0	2	0
10302262	Tong Road	Good River trib.	0.534	0.64	0	0	1	0
10302244	Wilson Road	Unnamed	0.306	0.01	0	0	2	0
10302261	Mountain View Rd	Good River	0.153	0.01	0	0	2	0
10302267	Glacier National Park Dr	Bartlett Cove tributary	0.009	0.01	0	0	0	0
10302263	Mountain View Road	Good River drainage	0.006	0.01	0	0	0	0

Figure 19.–Site #10302255 in Gustavus showing an undersized culvert with a constriction ratio of 0.40 on a private driveway off Mountain View Road.

Figure 20.–Site #10302241 in Gustavus showing the Red outfall heights of both culvert outlets. This site also had a Gray constriction ratio of 0.56.

Haines Prioritization

Table 23.–Prioritization of Red and Gray rated culverts for the Haines area on known fish bearing streams.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302838	Porcupine Road	Herman Creek	2.840	3.40	2.73	15	4	0
10302864	Haines Highway	37 Mile Creek	2.397	6.49	6.49	0	6	0
10302828	Mosquito Lake Road	Tributary to Mosquito Lake	1.548	1.22	1.22	0	2	0
10302829	Kelsall Road	Tributary to Chilkat River	1.296	0.94	0.94	0	2	0
10302852	Haines Highway	Sawmill Creek	1.257	3.44	3.44	0	3	0
10302878	Border Patrol Subdivision	39 Mile Creek	1.029	2.68	2.37	0	3	0
10302913	Haines Highway	10 Mile Creek	0.900	0.50	0.28	0	4	0
10302822	Haines Highway	Unnamed tributary to Chilkat River	0.846	0.66	0.01	0	3	0
10302868	Haines Highway	17 Mile Creek	0.828	0.17	0.17	0	3	0
10302856	Kelsall Road	Unnamed tributary to Kelsall River	0.684	0.26	0	0	2	0
10302881	Haines Highway	Unnamed tributary to Chilkat River	0.684	0.01	0	0	3	0
10302909	DOT Yard	Tributary to Sawmill	0.678	0.38	0.38	0	3	0
10302890	Haines Highway	Unnamed tributary to Chilkat River	0.540	0.15	0.15	0	3	0
10302869	Haines Highway	Horse Farm Creek	0.498	0.33	0.30	0	2	0
10302906	Mud Bay Road	Flat Bay Creek	0.498	0.08	0.33	0	3	0
10302839	Haines Highway	Tributary to Chilkat River	0.474	0.04	0.04	0	3	0
10302867	Union Street	Tributary to Sawmill Creek	0.468	0.03	0.03	0	3	0
10302915	Haines Highway	8.5 Mile Creek	0.459	0.01	0	0	2	0
10302886	Haines Highway	Tributary to Klehini River	0.456	0.01	0	0	3	0
10302855	Kelsall Road	Unnamed tributary to Kelsall River	0.438	0.23	0	0	2	0
10302914	Mud Bay Road	Onemile Creek	0.438	0.46	0.46	0	4	0
10302926	Haines Highway	Tributary to the Chilkat River	0.438	0.23	0.23	0	2	0
10302912	Small Tracts Road	Onemile Creek	0.435	0.45	0.45	0	4	0
10302923	Haines Highway	Unnamed tributary to Chilkat River	0.378	0.38	0	0	1	0
10302877	Haines Highway	37 Mile Creek	0.351	0.42	0.42	0	3	0
10302823	Haines Highway	Unnamed tributary to Chilkat River	0.330	0.05	0.05	0	2	0
10302853	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0
10302898	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0

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Table 23.–Page 2 of 3.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302910	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0
10302859	Kelsall Road	Unnamed tributary to Chilkat River	0.312	0.01	0	0	1	0
10302833	Haines Airport Taxiway	Unnamed tributary to Chilkat River	0.309	0.53	0.53	0	2	0
10302863	Haines Highway	Unknown tributary to 37 Mile Creek	0.306	0.01	0	0	2	0
10302931	Haines Highway	Unnamed tributary to Chilkat River	0.306	0.01	0	0	2	0
10302894	Haines Highway	Unnamed tributary to Chilkat River	0.285	0.20	0.20	0	3	0
10302841	Haines Highway	Tributary to Chilkat River	0.246	0.16	0.16	0	1	0
10302854	Kelsall Road	Unnamed tributary to Mosquito Lake	0.234	0.01	0.12	0	1	0
10302891	Haines Highway	Tributary to Klehini River	0.234	0.01	0	0	1	0
10302908	Mud Bay Road	Unnamed tributary to Car's Cove	0.234	0.01	0	0	1	0
10302857	Haines Highway	Tributary to Chilkat River	0.228	0.01	0	0	3	0
10302860	Driveway off Haines Hwy	Tributary to Chilkat River	0.228	0.01	0	0	3	0
10302866	Haines Highway	Unnamed tributary to Chilkat River	0.228	0.01	0	0	3	0
10302925	Haines Highway	26 Mile Creek	0.228	0.01	0	0	3	0
10302844	Union Street	Sawmill Creek tributary	0.219	0.23	0.23	0	2	0
10302896	Comstock Road	Tributary to Sawmill Creek	0.21	0.10	0	0	1	0
10302846	Unnamed road	Tributary to Sawmill Creek	0.204	0.09	0.09	0	1	0
10302904	Mud Bay Road	Letnikof Creek	0.198	0.16	0.16	0	2	0
10302911	Mud Bay Road	Tributary to Car's Cove	0.189	0.13	0.13	0	2	0
10302875	Haines Highway	Tributary to 39 Mile Creek	0.186	0.06	0.06	0	1	0
10302826	Porcupine Road	Cave Creek	0.174	0.33	0.33	0	1	0
10302840	Haines Highway	40 Mile Creek	0.159	0.28	0.28	0	1	0
10302871	Haines Highway	6 Mile Creek	0.156	0.01	0	0	1	0
10302873	Haines Highway	Unnamed tributary to Chilkat River	0.156	0.01	0	0	1	0
10302899	Mud Bay Road	Jurgeleit Creek	0.156	0.01	0.07	0	1	0
10302858	Allen Road	Tributary to Sawmill Creek	0.121	0.07	0.09	0	1	1
10302874	Haines Highway	Unnamed tributary to Chilkat River	0.102	0.09	0.08	0	1	0
10302851	Unnamed Road	Unnamed tributary to Sawmill Creek	0.099	0.08	0.07	0	1	0
10302900	Chilkoot Loop	Sawmill Creek	0.096	0.07	0	0	1	0

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Table 23.–Page 3 of 3.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302879	Haines Highway	Unnamed tributary to Chilkat River	0.078	0.01	0	0	1	0
10302905	Ed Shirley and Mud Bay Rd	Tributary to Sawmill Creek	0.078	0.01	0	0	1	0
10302927	Driveway on New Sawmill Rd	Tributary to Sawmill Creek	0.078	0.01	0	0	1	0

Table 24.–Prioritization of all Red and Gray rated culverts for the Haines area including known fish bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302838	Porcupine Road	Herman Creek	2.840	3.40	2.73	15	4	0
10302864	Haines Highway	37 Mile Creek	2.397	6.49	6.49	0	6	0
10302828	Mosquito Lake Road	Tributary to Mosquito Lake	1.548	1.22	1.22	0	2	0
10302829	Kelsall Road	Tributary to Chilkat River	1.296	0.94	0.94	0	2	0
10302852	Haines Highway	Sawmill Creek	1.257	3.44	3.44	0	3	0
10302878	Border Patrol Subdivision	39 Mile Creek	1.029	2.68	2.37	0	3	0
10302913	Haines Highway	10 Mile Creek	0.900	0.50	0.28	0	4	0
10302822	Haines Highway	Unnamed tributary to Chilkat River	0.846	0.66	0.01	0	3	0
10302868	Haines Highway	17 Mile Creek	0.828	0.17	0.17	0	3	0
10302856	Kelsall Road	Unnamed tributary to Kelsall River	0.684	0.26	0	0	2	0
10302881	Haines Highway	Unnamed tributary to Chilkat River	0.684	0.01	0	0	3	0
10302909	DOT Yard	Tributary to Sawmill	0.678	0.38	0.38	0	3	0
10302890	Haines Highway	Unnamed tributary to Chilkat River	0.540	0.15	0.15	0	3	0
10302869	Haines Highway	Horse Farm Creek	0.498	0.33	0.30	0	2	0
10302906	Mud Bay Road	Flat Bay Creek	0.498	0.08	0.33	0	3	0
10302839	Haines Highway	Tributary to Chilkat River	0.474	0.04	0.04	0	3	0
10302867	Union Street	Tributary to Sawmill Creek	0.468	0.03	0.03	0	3	0
10302915	Haines Highway	8.5 Mile Creek	0.459	0.01	0	0	2	0
10302886	Haines Highway	Tributary to Klehini River	0.456	0.01	0	0	3	0
10302855	Kelsall Road	Unnamed Tributary to Kelsall River	0.438	0.23	0	0	2	0
10302914	Mud Bay Road	Onemile Creek	0.438	0.46	0.46	0	4	0
10302926	Haines Highway	Tributary to the Chilkat River	0.438	0.23	0.23	0	2	0
10302912	Small Tracts Road	Onemile Creek	0.435	0.45	0.45	0	4	0
10302923	Haines Highway	Unnamed tributary to Chilkat River	0.378	0.38	0	0	1	0
10302877	Haines Highway	37 Mile Creek	0.351	0.42	0.42	0	3	0
10302823	Haines Highway	Unnamed tributary to Chilkat River	0.330	0.05	0.05	0	2	0
10302853	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0
10302898	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0
10302910	Comstock Road	Tributary to Sawmill Creek	0.315	0.10	0	0	1	0
10302859	Kelsall Road	Unnamed tributary to Chilkat River	0.312	0.01	0	0	1	0

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Table 24.–Page 2 of 3.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302833	Haines Airport Taxiway	Unnamed tributary to Chilkat River	0.309	0.53	0.53	0	2	0
10302863	Haines Highway	Unknown tributary to 37 Mile Creek	0.306	0.01	0	0	2	0
10302931	Haines Highway	Unnamed tributary to Chilkat River	0.306	0.01	0	0	2	0
10302894	Haines Highway	Unnamed tributary to Chilkat River	0.285	0.20	0.20	0	3	0
10302841	Haines Highway	Tributary to Chilkat River	0.246	0.16	0.16	0	1	0
10302854	Kelsall Road	Unnamed tributary to Mosquito Lake	0.234	0.12	0.12	0	1	0
10302891	Haines Highway	Tributary to Klehini River	0.234	0.01	0	0	1	0
10302908	Mud Bay Road	Unnamed tributary to Car's Cove	0.234	0.01	0	0	1	0
10302857	Haines Highway	Tributary to Chilkat River	0.228	0.01	0	0	3	0
10302860	Driveway off Haines Hwy	Tributary to Chilkat River	0.228	0.01	0	0	3	0
10302866	Haines Highway	Unnamed tributary to Chilkat River	0.228	0.01	0	0	3	0
10302925	Haines Highway	26 Mile Creek	0.228	0.01	0	0	3	0
10302844	Union Street	Sawmill Creek Tributary	0.219	0.23	0.23	0	2	0
10302896	Comstock Road	Tributary to Sawmill Creek	0.210	0.10	0	0	1	0
10302846	Unnamed road	Tributary to Sawmill Creek	0.204	0.09	0.09	0	1	0
10302904	Mud Bay Road	Letnikof Creek	0.198	0.16	0.16	0	2	0
10302911	Mud Bay Road	Tributary to Car's Cove	0.189	0.13	0.13	0	2	0
10302875	Haines Highway	Tributary to 39 Mile Creek	0.186	0.06	0.06	0	1	0
10302826	Porcupine Road	Cave Creek	0.174	0.33	0.33	0	1	0
10302840	Haines Highway	40 Mile Creek	0.159	0.28	0.28	0	1	0
10302871	Haines Highway	6 Mile Creek	0.156	0.01	0	0	1	0
10302873	Haines Highway	Unnamed tributary to Chilkat River	0.156	0.01	0	0	1	0
10302899	Mud Bay Road	Jurgeleit Creek	0.156	0.01	0	0	1	0
10302858	Allen Road	Tributary to Sawmill Creek	0.121	0.07	0.07	0	1	1
10302874	Haines Highway	Unnamed tributary to Chilkat River	0.102	0.09	0.09	0	1	0
10302851	Unnamed Road	Unnamed tributary to Sawmill Creek	0.099	0.08	0.08	0	1	0
10302900	Chilkoot Loop	Sawmill Creek	0.096	0.07	0.07	0	1	0
10302879	Haines Highway	Unnamed tributary to Chilkat River	0.078	0.01	0	0	1	0
10302905	Ed Shirley and Mud Bay Rd	Tributary to Sawmill Creek	0.078	0.01	0	0	1	0
10302927	Driveway on New Sawmill Rd	Tributary to Sawmill Creek	0.078	0.01	0	0	1	0

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Table 24.–Page 3 of 3.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302901	Mud Bay Road	Unnamed tributary to Letnikof Cove	0.009	0.01	0	0	0	0
10302920	Kelsall Road	Unnamed tributary to Chilkat River	0.009	0.01	0	0	0	0
10302865	Haines Highway	Unnamed tributary to Klehini River	0.006	0.01	0	0	0	0
10302918	Kelsall Road	Tributary to Chilkat River	0.006	0.01	0	0	0	0
10302919	Kelsall Road	Unnamed tributary to Chilkat River	0.006	0.01	0	0	0	0
10302922	Kelsall Road	Unnamed tributary to Chilkat River	0.006	0.01	0	0	0	0
10302880	Haines Highway	37.5 Mile Pond outlet	0.003	0.01	0	0	0	0
10302892	Mud Bay Road	Kip's Creek	0.003	0.01	0	0	0	0
10302924	Kelsall Road	Unnamed tributary to Chilkat River	0.003	0.01	0	0	0	0

Figure 21.–Site #10302838 on the Porcupine Road north of Haines. The crossing has a Red constriction ratio of 0.40.

Figure 22.–Site #103022829 culverts on Kelsall Road north of Haines. All culverts perched over 5 feet, with Red gradients and Red constriction. Below this site, the stream is cataloged for coho rearing and pink spawning.

Figure 23.–Site #10302913 undersized culverts on Ten Mile Creek off the Haines Highway.

Juneau Prioritization

Table 25.–Prioritization table for Red and Gray rated culverts in the Juneau area on known fish bearing streams.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302974	Airport	Jordan Creek	1.621	4.15	4.15	0	5	0
10303024	Crazy Horse Road	Casa del Sol Creek	1.278	1.38	1.38	0	3	0
10302215	Glacier Highway	Lena Cove tributary	1.236	1.06	0.15	0	4	0
10302240	Glacier Highway	Bridget Cove tributary	1.154	1.09	0.69	7.57	2	0
10302212	Glacier Highway	Waydelich Creek	1.125	0.75	0	0	2	0
10302158	North Douglas Highway	Neilson Creek	1.080	1.30	0.10	0	2	0
10302170	North Douglas Highway	Johnson Creek	1.038	0.73	0.73	0	4	0
10302165	North Douglas Highway	Hendrickson Creek	0.960	0.60	0.60	0	4	0
10302156	North Douglas Highway	Falls Creek	0.873	0.72	0.34	0	1	0
10302238	Glacier Highway	Bessie Creek	0.864	0.69	0.03	0	3	0
10302998	Glacier Highway	Auke Nu	0.840	2.55	0.21	0	1	0
10302210	Glacier Highway	Auke Creek	0.753	0.01	0	175.44	6	0
10303025	Egan Drive	Vanderbilt Creek	0.660	1.20	1.20	0	4	0
10302154	North Douglas Highway	Grant Creek	0.657	0.48	0	0	1	0
10302239	Glacier Highway	Cowee Creek tributary	0.600	0.75	0	0	1	0
10302155	North Douglas Highway	Eagle Creek	0.552	1.09	0.28	0	3	0
10302207	Back Loop Road	MB Creek	0.534	0.39	0	0	2	0
10302214	Glacier Highway	Picnic Creek	0.522	0.12	0.12	0	3	0
10302216	Lena Point Road	Picnic Creek	0.519	0.48	0.48	0	5	0
10302208	University Drive	Auke Lake tributary	0.456	0.01	0.03	0	3	0
10302178	North Douglas Highway	Ninemile Creek	0.435	0.70	0.53	0	3	0
10302234	Glacier Highway	Eagle River tributary	0.426	0.67	0.13	0	3	0
10302168	Fish Creek Road	Fish Creek	0.398	0.57	0	0	0	1
10302217	Picnic Beach Road	Picnic Creek	0.390	0.05	0.05	0	5	0
10302237	Glacier Highway	Favorite Channel tributary	0.384	0.01	0	0	1	2
10302167	Glacier Spur Road	Steep Creek	0.336	0.62	0.29	0	2	0
10302211	Glacier Highway	Bay Creek	0.321	0.57	0.18	0	2	0
10302162	Lupine Drive	West Creek -DOT	0.312	0.27	0	0	1	0

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Table 25.–Page 2 of 2.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302976	Engineer's Cutoff Road	Peterson Hill Creek	0.306	0.01	0.02	0	2	0
10302205	Glacier Highway	Auke Lake tributary	0.306	0.01	0	0	2	0
10302227	Herbert River Road	Herbert River tributary	0.303	0.01	0	0	4	0
10302988	Cohen Drive	Tee Creek	0.270	0.15	0.05	0	3	0
10302161	Schinder Drive	East Creek	0.234	0.14	0.06	0	1	0
10302202	Emmanuel Baptist Church	Casa Del Sol tributary	0.234	0.01	0	0	1	0
10302981	Glacier Highway	Tributary to Peterson Creek	0.234	0.01	0	0	1	0
10302171	Glacier Spur Road	Mendenhall River tributary	0.234	0.01	0	0	1	0
10302182	Nancy Street	Duck Creek East Fork	0.222	0.12	0.12	0	1	0
10302163	Egan Drive	West Creek	0.178	0.01	0	0	2	1
10302153	Thane Road	Snowslide Creek	0.162	0.02	0	0	1	0
10302168	Fish Creek Road	Fish Creek	0.156	0.01	0	0	1	0
10302982	Glacier Highway	Tributary with Peterson Creek	0.156	0.01	0	0	1	0
10302166	North Douglas Highway	Hendrickson Creek tributary	0.156	0.01	0	0	1	0
10302200	Glacier Highway	Casa Del Sol tributary	0.156	0.01	0	0	1	0
10302201	Engineers Cutoff Road	Casa Del Sol tributary	0.153	0.01	0	0	2	0
10302157	Vanderbilt Road	Vanderbilt Creek	0.153	0.01	0.17	0	2	0
10303041	Glacier Highway	East Creek	0.126	0.17	0.17	0	1	0
10302224	Glacier Highway	Strawberry Creek side channel	0.126	0.17	0	0	1	0
10303042	Glacier Highway	Unnamed Creek	0.103	0.01	0.04	0	1	1
10303044	Egan Drive	Unnamed Creek	0.087	0.04	0	0	1	0
10302181	Cinema Drive	Duck Creek	0.078	0.01	0	0	1	0
10302194	Montana Creek Road	Montana Creek side channel	0.078	0.01	0	0	1	0
10302213	Glacier Highway	Auke Bay tributary	0.056	0.01	0	0	0	1

Table 26.–Prioritization table for all Red and Gray rated culverts in the Juneau area including known fish bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat during the site visit.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302974	Airport	Jordan Creek	1.621	4.15	4.15	0	5	0
10303024	Crazy Horse Road	Casa del Sol Creek	1.278	1.38	1.38	0	3	0
10302215	Glacier Highway	Lena Cove tributary	1.236	1.06	0.15	0	4	0
10302240	Glacier Highway	Bridget Cove tributary	1.154	1.09	0.69	7.57	2	0
10302212	Glacier Highway	Waydelich Creek	1.125	0.75	0	0	2	0
10302158	North Douglas Highway	Neilson Creek	1.080	1.30	0.10	0	2	0
10302170	North Douglas Highway	Johnson Creek	1.038	0.73	0.73	0	4	0
10302165	North Douglas Highway	Hendrickson Creek	0.960	0.60	0.60	0	4	0
10302156	North Douglas Highway	Falls Creek	0.873	0.72	0.34	0	1	0
10302238	Glacier Highway	Bessie Creek	0.864	0.69	0.03	0	3	0
10302998	Glacier Highway	Auke Nu	0.840	2.55	0.21	0	1	0
10302210	Glacier Highway	Auke Creek	0.753	0.01	0	175.44	6	0
10303025	Egan Drive	Vanderbilt Creek	0.660	1.20	1.20	0	4	0
10302154	North Douglas Highway	Grant Creek	0.657	0.48	0	0	1	0
10302239	Glacier Highway	Cowee Creek tributary	0.600	0.75	0	0	1	0
10302155	North Douglas Highway	Eagle Creek	0.552	1.09	0.28	0	3	0
10302207	Back Loop Road	MB Creek	0.534	0.39	0	0	2	0
10302214	Glacier Highway	Picnic Creek	0.522	0.12	0.12	0	3	0
10302216	Lena Point Road	Picnic Creek	0.519	0.48	0.48	0	5	0
10302208	University Drive	Auke Lake tributary	0.456	0.03	0.03	0	3	0
10302178	North Douglas Highway	Ninemile Creek	0.435	0.70	0.53	0	3	0
10302234	Glacier Highway	Eagle River tributary	0.426	0.67	0.13	0	3	0
10302168	Fish Creek Road	Fish Creek	0.398	0.57	0	0	0	1
10302217	Picnic Beach Road	Picnic Creek	0.390	0.05	0.05	0	5	0
10302237	Glacier Highway	Favorite Channel tributary	0.384	0.01	0	0	1	2
10302167	Glacier Spur Road	Steep Creek	0.336	0.62	0.29	0	2	0
10302211	Glacier Highway	Bay Creek	0.321	0.57	0.18	0	2	0
10302162	Lupine Drive	West Creek -DOT	0.312	0.27	0	0	1	0
10302976	Engineer's Cutoff Road	Peterson Hill Creek	0.312	0.02	0.02	0	2	0
10302205	Glacier Highway	Auke Lake tributary	0.306	0.01	0	0	2	0

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Table 26.–Page 2 of 2.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302227	Herbert River Road	Herbert River tributary	0.303	0.01	0	0	4	0
10302988	Cohen Drive	Tee Creek	0.270	0.15	0.05	0	3	0
10302161	Schinder Drive	East Creek	0.234	0.14	0.06	0	1	0
10302202	Emmanuel Baptist Church	Casa Del Sol tributary	0.234	0.01	0	0	1	0
10302981	Glacier Highway	Tributary to Peterson Creek	0.234	0.01	0	0	1	0
10302171	Glacier Spur Road	Mendenhall River tributary	0.234	0.01	0	0	1	0
10302182	Nancy Street	Duck Creek East Fork	0.222	0.12	0.12	0	1	0
10302163	Egan Drive	West Creek	0.178	0.01	0	0	2	1
10302153	Thane Road	Snowslide Creek	0.162	0.02	0	0	1	0
10302982	Glacier Highway	Tributary with Peterson Creek	0.156	0.01	0	0	1	0
10302166	North Douglas Highway	Hendrickson Creek tributary	0.156	0.01	0	0	1	0
10302200	Glacier Highway	Casa Del Sol tributary	0.156	0.01	0	0	1	0
10302201	Engineers Cutoff Road	Casa Del Sol tributary	0.153	0.01	0	0	2	0
10302157	Vanderbilt Road	Vanderbilt Creek	0.153	0.01	0	0	2	0
10303041	Glacier Highway	East Creek	0.126	0.17	0.17	0	1	0
10302224	Glacier Highway	Strawberry Creek side channel	0.126	0.17	0.17	0	1	0
10303042	Glacier Highway	Unnamed Creek	0.103	0.01	0	0	1	1
10303044	Egan Drive	Unnamed Creek	0.087	0.04	0.04	0	1	0
10302181	Cinema Drive	Duck Creek	0.078	0.01	0	0	1	0
10302194	Montana Creek Road	Montana Creek side channel	0.078	0.01	0	0	1	0
10302213	Glacier Highway	Auke Bay tributary	0.056	0.01	0	0	0	1
10302197	North Douglas Highway	Cove Creek	0.042	0.07	0	0	0	0
10302192	North Douglas Highway	Unnamed	0.009	0.01	0	0	0	0
10303007	Mendenhall Riverside Trail	Tributary to Mendenhall River	0.009	0.01	0	0	0	0
10302206	Glacier Highway	Auke Lake tributary	0.006	0.01	0	0	0	0
10303008	Mendenhall Riverside Trail	Tributary to Mendenhall River	0.006	0.01	0	0	0	0
10302228	Herbert River Road	Herbert River tributary	0.006	0.01	0	0	0	0
10303019	Egan Drive	Unnamed trib. to Gastineau Channel	0.003	0.01	0	0	0	0

Figure 24.–Site #10302170 culvert on Johnson Creek on the North Douglas Highway. Culvert is Red for gradient and constriction and has a Gray outfall height. Stream is cataloged for coho and pink salmon, Dolly Varden, and cutthroat trout.

Figure 25.–Site #10302165 culvert on Hendrickson Creek on the North Douglas Highway. Culvert is a gradient barrier and has a Gray constriction ration and outfall height. Creek is cataloged for coho and pink salmon, Dolly Varden, and cutthroat trout.

Figure 26.–Site #10302212 on Waydelich Creek off the Glacier Highway in Juneau. Site has a Red outfall, 2.63 ft, and a Red gradient, 2.63%, as well as, a Gray constriction ratio. Stream is cataloged for pink and chum salmon below crossing.

Sitka Prioritization

Table 27.–Prioritization table for Red and Gray rated culverts in the Sitka area on known fish bearing streams.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302984	Sawmill Creek Road	Unnamed Creek	1.212	0.26	0.15	0	3	0
10303013	Estuary Loop	Tributary to Starrigavan Creek	0.930	1.30	0.41	0	1	0
10302986	Sawmill Creek Road	Unnamed Creek	0.927	0.28	0.04	0	3	0
10302994	Sawmill Creek Road	Unnamed Creek	0.837	0.18	0.05	0	3	0
10303020	Wachusetts Street	Peterson Creek	0.774	0.54	0.54	0	3	0
10303040	Blueberry Lane	Unnamed Stream	0.765	0.10	0.10	0	3	0
10303014	Peterson Drive	Peterson Creek	0.756	0.09	0.09	0	3	0
10303021	Halibut Point Road	Peterson Creek	0.588	0.23	0.23	0	3	0
10302989	Sawmill Creek Road	Unnamed Stream	0.474	0.58	0.29	0	4	0
10303036	Sawmill Creek Road	Thimbleberry Creek	0.288	0.21	0.10	0	3	0
10303032	Harbor Mountain Road	unnamed Creek	0.267	0.39	0.39	0	2	0
10303039	Sawmill Creek Road	Unnamed creek	0.264	0.13	0.13	0	3	0
10302991	Sawmill Creek Road	Unnamed Creek	0.240	0.15	0.15	0	1	0
10302993	Nelson Logging Road	Tributary to Starrigavan Creek	0.180	0.05	0.05	0	1	0
10303027	Halibut Point Rd.	Unnamed Creek	0.156	0.02	0.02	0	2	0
10302996	Mosquito Cove Trail	Unnamed Creek	0.120	0.15	0.15	0	1	0
10302997	Halibut Point Road	Unnamed Creek	0.078	0.01	0	0	1	0
10303022	Lake Street	Swan Lake Outlet	0.078	0.01	0	0	1	0
10303009	Bayside Loop	Unnamed Stream	0.078	0.01	0	0	1	0

Table 28.–Prioritization table for all Red and Gray rated culverts in the Sitka area including known fish bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat during the site visit.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302984	Sawmill Creek Road	Unnamed Creek	1.212	0.26	0.15	0	3	0
10303013	Estuary Loop	Tributary to Starrigavan Creek	0.930	1.30	0.41	0	1	0
10302986	Sawmill Creek Road	Unnamed Creek	0.927	0.28	0.04	0	3	0
10302994	Sawmill Creek Road	Unnamed Creek	0.837	0.18	0.05	0	3	0
10303020	Wachusetts Street	Peterson Creek	0.774	0.54	0.54	0	3	0
10303040	Blueberry Lane	Unnamed Stream	0.765	0.10	0.10	0	3	0
10303014	Peterson Drive	Peterson Creek	0.756	0.09	0.09	0	3	0
10303021	Halibut Point Road	Peterson Creek	0.588	0.23	0.23	0	3	0
10302989	Sawmill Creek Road	Unnamed Stream	0.474	0.58	0.29	0	4	0
10303036	Sawmill Creek Road	Thimbleberry Creek	0.288	0.21	0.10	0	3	0
10303032	Harbor Mountain Road	unnamed Creek	0.267	0.39	0.39	0	2	0
10303039	Sawmill Creek Road	Unnamed creek	0.264	0.13	0.13	0	3	0
10302991	Sawmill Creek Road	Unnamed Creek	0.240	0.15	0.15	0	1	0
10302993	Nelson Logging Road	Tributary to Starrigavan Creek	0.180	0.05	0.05	0	1	0
10303027	Halibut Point Rd.	Unnamed Creek	0.156	0.02	0.02	0	2	0
10303035	Unnamed BLH hydro	Sawmill Creek	0.120	0.10	0	0	0	0
10302996	Mosquito Cove Trail	Unnamed Creek	0.120	0.15	0.15	0	1	0
10302997	Halibut Point Road	Unnamed Creek	0.078	0.01	0	0	1	0
10303022	Lake Street	Swan Lake Outlet	0.078	0.01	0	0	1	0
10303009	Bayside Loop	Unnamed Stream	0.078	0.01	0	0	1	0
10302990	Sawmill Creek Road	Unnamed Stream	0.009	0.01	0	0	0	0
10302985	Sawmill Creek Road	Unnamed Creek	0.009	0.01	0	0	0	0
10303034	Lake Street	Arrowhead Creek	0.006	0.01	0	0	0	0
10303029	Estuary Loop Road	Unnamed Creek	0.003	0.01	0	0	0	0
10302935	Estuary Loop Road	Tributary to Starrigaven Creek	0.003	0.01	0	0	0	0
10302995	Bayside Loop	Unnamed Stream	0.003	0.01	0	0	0	0
10303028	Nelson Logging Road	Tributary to Starrigavan Creek	0.003	0.01	0	0	0	0
10303023	Sheldon Jackson Campus	Side channel to Indian River	0.003	0.01	0	0	0	0

Figure 27.–Site #10302984 on Sawmill Creek Road in Sitka showing a Red outfall.

Figure 28.–Site #1030286 on Sawmill Creek Road in Sitka showing a Red outfall.

Figure 29.–Site #10303040 on Blueberry Road in Sitka, showing a Red outfall over riprap.

Skagway Prioritization

Table 29.–Prioritization table for Red and Gray rated culverts in the Skagway area on known fish bearing streams.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302951	Broadway	Pullen Creek	1.071	0.19	0.19	0	4	0
10302969	Yukon and White Pass RR	Pullen Creek	0.972	0.08	0.08	0	4	0
10302949	White Pass Yukon Route RR	Pullen Creek	0.858	0.43	0.43	0	4	0
10302962	12.5 Avenue	Pullen Creek	0.648	0.08	0.08	0	4	0
10302943	Klondike Goldrush Campground R	Tributary to Taiya River	0.624	0.54	0.54	0	2	0
10302938	9.5 Ave	Pullen Creek	0.618	0.03	0.03	0	4	0
10302968	13.5 Avenue	Pullen Creek	0.612	0.02	0.02	0	4	0
10302940	White Pass and Yukon Route RR	Pullen Creek	0.612	0.01	0.01	0	2	0
10302934	Yukon Route and White Pass RR	Pullen Creek	0.57	0.45	0.45	0	2	0
10302971	16.5 Avenue	Pullen Creek	0.381	0.27	0.27	0	4	0
10302937	14th Avenue	Pullen Creek	0.345	0.15	0.15	0	4	0
10302967	10th Avenue	Pullen Creek	0.333	0.11	0.11	0	4	0
10302952	21st Ave	Pullen Creek	0.333	0.11	0.11	0	4	0
10302947	Unnamed Rd near Harbor	Pullen Creek	0.321	0.07	0.07	0	4	0
10302959	19th Avenue	Pullen Creek	0.321	0.07	0.07	0	4	0
10302961	Broadway Street	Pullen Creek	0.318	0.06	0	0	4	0
10302963	Broadway and 12th Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10303006	8.5 Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10302941	9th Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10303003	18.5 Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10302958	20.5 Ave	Pullen Creek	0.306	0.02	0.02	0	4	0
10303005	8th Avenue	Pullen Creek	0.303	0.01	0.01	0	4	0
10302956	20th Avenue	Pullen Creek	0.231	0.02	0	0	3	0
10302945	Liarsville Road	Lillihaven Creek	0.228	0.26	0.26	0	2	0
10303004	State Street	Pullen Creek	0.162	0.04	0.04	0	2	0

Table 30.–Prioritization table for all Red and Gray rated culverts in the Skagway area including known fish bearing streams and waterbodies not known to be fish-bearing but judged to have suitable habitat during the site visit.

Site ID	Road name	Stream name	Prioritization Score	Stream miles above culvert	AWC miles above culvert	Lake acres above culvert	Anadromous fish species	Resident fish species
10302951	Broadway	Pullen Creek	1.071	0.19	0.19	0	4	0
10302969	Yukon and White Pass RR	Pullen Creek	0.972	0.08	0.08	0	4	0
10302949	White Pass Yukon Route RR	Pullen Creek	0.858	0.43	0.43	0	4	0
10302962	12.5 Avenue	Pullen Creek	0.648	0.08	0.08	0	4	0
10302943	Klondike Goldrush Campground R	Tributary to Taiya River	0.624	0.54	0.54	0	2	0
10302938	9.5 Ave	Pullen Creek	0.618	0.03	0.03	0	4	0
10302968	13.5 Avenue	Pullen Creek	0.612	0.02	0.02	0	4	0
10302940	White Pass and Yukon Route RR	Pullen Creek	0.612	0.01	0.01	0	2	0
10302934	Yukon Route and White Pass RR	Pullen Creek	0.570	0.45	0.45	0	2	0
10302944	Skagway-Dyea Road	Matthews Creek	0.552	0.92	0	0		
10302971	16.5 Avenue	Pullen Creek	0.381	0.27	0.27	0	4	0
10302937	14th Avenue	Pullen Creek	0.345	0.15	0.15	0	4	0
10302967	10th Avenue	Pullen Creek	0.333	0.11	0.11	0	4	0
10302952	21st Ave	Pullen Creek	0.333	0.11	0.11	0	4	0
10302947	Unnamed Rd near Harbor	Pullen Creek	0.321	0.07	0.07	0	4	0
10302959	19th Avenue	Pullen Creek	0.321	0.07	0.07	0	4	0
10302961	Broadway Street	Pullen Creek	0.318	0.06	0	0	4	0
10302963	Broadway and 12th Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10303006	8.5 Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10302941	9th Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10303003	18.5 Avenue	Pullen Creek	0.309	0.03	0.03	0	4	0
10302958	20.5 Ave	Pullen Creek	0.306	0.02	0.02	0	4	0
10303005	8th Avenue	Pullen Creek	0.303	0.01	0.01	0	4	0
10302956	20th Avenue	Pullen Creek	0.231	0.02	0	0	3	0
10302945	Liarsville Road	Lillihaven Creek	0.228	0.26	0.26	0	2	0
10303004	State Street	Pullen Creek	0.162	0.04	0.04	0	2	0

Figure 30.–Site #10302949 with an undersized culvert on Pullen Creek crossing the White Pass and Yukon Route railroad in Skagway.

Figure 31.–Site #1030251 with an undersized culvert on Pullen Creek running under Broadway Street.

FISH DATA

In 2011 and 2012, assessment crews trapped 23 sites not present in the Anadromous Waters Catalog (AWC). Minnow traps were used and crews captured fish at 13 sites and recorded visual observations at 119 additional sites. Seventeen nominations supporting additions and back-up information were submitted to the Anadromous Waters Catalog (Appendix C1).

DISCUSSION

The results indicate that fish passage for juvenile salmonids and other weak swimming fish is widely impacted by culverts throughout Southeast Alaska's small and medium size streams. The project found that most culverts on most road systems were either rated as a definite barrier (Red) or as a potential or partial barrier (Gray). Because road systems in Southeast Alaska tend to follow shorelines due to a topography that is dominated by large, steep mountains, this often means that the majority of habitat for those streams lies upstream of any road crossings. However, it also means that the majority of streams in Southeast Alaska are only crossed once along their course, and that replacing one barrier would allow access to all potential upstream habitat.

These small and medium sized creeks are important to juvenile salmonids that will utilize nonnatal streams for rearing for up to two years (Kahler and Quinn 1998). Additionally, many of the small streams in Southeast Alaska have resident populations of Dolly Varden char and cutthroat trout, and it has been observed that these fish utilize the entire length of usable habitat in their streams when flows allow. Providing a road crossing that maintains favorable flow conditions is critical for maintaining habitat connectivity (Bryant et al. 2009).

The majority of the sites were rated only for juvenile salmonid and weak swimming fish passage using the decision matrix, but the data collected during the surveys allowed some additional refinement and classification, such as the identification of culverts that are likely adult barriers due to perched outlets or are at imminent risk of failure due to damage. This information is available for all sites online at the Fish Resource Monitor[1]. Information includes culvert dimensions and measurements, longitudinal profile, and stream channel dimensions as outlined in the *Culvert Inventory and Assessment Manual for Fish Passage in the State of Alaska* (Eisenman and O'Doherty 2014).

The Level 1 Assessment Matrix assessment method employed for this project is useful in classifying culverts into categories based on the measurements taken during surveys, especially Green culverts, or those of low concern. However, it should be noted that the Level 1 Assessment Matrix was designed as a quick assessment tool that focused on juvenile salmonids over a large geographic area. Prior to selection of restoration sites, the restoration practitioner should review the available information and consider factors such as species and life stage of interest, channel type, and flow conditions at the site.

Similarly, the prioritization protocol is intended to be a guide for identifying and selecting sites with above or below average potential ecological significance and impacts to salmonid passage. It is not meant to be a prescriptive order of replacement. There is an abundance of sites within Southeast Alaska that have no available habitat or fish information, lack comprehensive information, or are not in the Anadromous Waters Catalog, and are therefore, underscored in the prioritization tables. Finally, conditions at any site are subject to change without notice to the Fish

[1] Fish Resource Monitor can be found at http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=culv.

Passage Improvement Program. Ground truthing conditions at sites is recommended early on in any kind of replacement selection process.

There are some improvements and refinements that would make future Level 1 assessment projects more useful and these include:

- The development of separate Critical Values for different types of streams such as the steep colluvial streams found on many roads systems in Southeast Alaska and streams where the culvert is tidally influenced. These Critical Values should be based on stream gradient, sediment type, and species utilization.
- Additional information on the swimming ability of species such as Dolly Varden, cutthroat trout, adult salmon, and other juvenile salmon to improve the decision matrix or allow development of multiple matrixes.
- Testing the existing and newly developed criteria in the field.
- Investigating the effects of additional factors such as the length of culvert and culvert size, and incorporating that information into assessments.

RECOMMENDATIONS

RESTORATION RECOMMENDATIONS

We recommend that fish passage replacement projects:

1. are considered as part of all road upgrades and incorporated wherever possible;
2. are prioritized based on predicted ecological benefit as much as possible, with the understanding that they are often carried out in an opportunistic manner and not in the order of prioritization;
3. are concentrated within watersheds for maximum benefit, which may mean replacing one or more lower priority culverts concurrently with the replacement of a high priority culvert to improve fish passage throughout the watershed;
4. consider replacing all culverts when multiple barrier culverts exist on a stream to open as much upstream habitat as possible, concentrating on the culverts lower in the watershed first; and
5. are not concentrated in the best-studied and best-known watersheds to the detriment of potentially more productive watersheds elsewhere in Southeast Alaska.

We also recommend that the existing prioritization is recalculated when additional habitat or fisheries data is available.

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APPENDIX A: FIELD FORMS

Appendix A1.–Field Data Form (front).

Survey ID		**Date**	
Site ID		**Time**	
Road Name		**Book #**	
Milepost		**Crew**	
Watershed		**Lat.**	
Stream Name		**Long.**	

Site Classification (Red/Gray/Green) _____

(Complete all applicable sections of this form before leaving survey site!)

Failure Codes	**1**	**2**	**3**	**4**	**5**	**6**
from table						

Resurvey? (Y/N)	
Backwatered? (Y/N)	

Old Survey ID (if known)_____

Step Pools ❑ Baffles ❑ Tidal ❑

Culvert Description: pipes numbered left to right facing downstream

	Units	1	2	3	4	5
Culvert Type (CIR, PA, etc.)						
Culvert Material (CSP, SSP, etc.)						
Structure Type (from matrix)	1 to 5					
Inlet Type (PRO, HDW, ect)						
Inlet Apron Length	ft					
Inlet Width	ft					
Inlet Height	ft					
Substrate Depth Inlet	ft					
Rust Line Height Inlet	ft					
Sedimentation at Inlet?	Y/N					
Outlet Type (PRO, HDW, ect.)						
Outlet Apron Length	ft					
Outlet Width	ft					
Outlet Height	ft					
Outfall Type (AG, F, C, etc.)						
Substrate Depth Outlet	ft					
Corrugation Depth	in					
Corrugation Width	in					
Culvert Length	ft					
Embedded?	Y/N					
Embedded Depth	ft					
Condition Rating (5=best)	1 to 5					
Outfall Height	ft					
Pipe Gradient	%					
Water Depth at Outlet	ft					
Max Gradient	%					
Length of Max Gradient	ft					
Stream Gradient	%					
Backwatered?	Y/N					
Individual Culvert Rating (Red, Gray, Green)						

Habitat Elements	**Upstream**	**Downstream**	**Inlet**	**Outlet**
Dominant substrate				
Subdominant substrate				

Stream Measurements

	Dist.	**OHW**
Upstream width		
Upstream width		
Upstream width		
Upstream width		
Downstream width		
Downstream width		
Downstream width		

Avg u/s width	
Avg d/s width	
Constriction Ratio	

Stream Stage (High, Med, or Low)	

Stream Approach Angle	

Fish data:	Sheet #		Line #s	
Trap	Loc/Dist	Time In	Time out	Soak Time
A				
B				

Notes: (Fish observations, damage, oddities, ect)

Appendix A2.–Field Data Form (back).

	Structure Type	Green *Conditions may be adequate to pass juvenile fish*	Gray *Conditions unlikely to pass juvenile fish, additional analysis required*	Red *Conditions assumed inadequate to pass juvenile fish, additional analysis required*
1	Bottomless pipe arch, embedded pipe arch, CMP, box culvert or other embedded structure that functions in a similar fashion to an embedded pipe arch.	Installed at channel gradient (+/- 1% gradient), AND culvert span to OHW width ratio greater than or equal to 0.75 OR fully backwatered	Structure not installed at channel gradient (+/- 1%), OR culvert span to OHW width ratio of 0.5 to 0.75	Culvert span to OHW width ratio less than 0.5
2	Culverts (all span widths) with 2 X 6 inch corrugations or greater, not embedded.	Culvert gradient less than 1.0%, AND outfall hgt.= 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered	Culvert gradient 1.0 to 2.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75	Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR span to OHW width ratio less than 0.5
3	Pipe arch or circular CMP (span width greater than 4 feet), less than 2 X 6 inch corrugations, not embedded	Culvert gradient less than 0.5%, AND outfall hgt. = 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered	Culvert gradient 0.5 to 2.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75	Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR culvert span to OHW width ratio less than 0.5
4	Pipe arch or circular CMP (span width less than or equal to 4 feet), less than 2 X 6 inch corrugations, not embedded	Culvert gradient less than 0.5%, AND outfall hgt.= 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered	Culvert gradient 0.5 to 1.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75	Culvert gradient greater than 1.0%, OR outfall hgt. greater than 4 inches, OR span to OHW width ratio less than 0.5.
5	Non-embedded box culverts, culverts with non-standard configurations or materials, culverts with baffles or downstream weirs or step pools, fish ladders, bridges with aprons.	Fully backwatered as described below.	All others	Outfall height at downstream end of structure greater than 4 inches.
6	Multiple Structure Installations	Individual culverts all classified as Green as above	Individual culverts all classified as Gray or as some mix of Green, Gray or Red as above.	Individual culverts all classified as Red as above.

1. These criteria are not design standards, but rather indicate whether the structure is likely to provide fish passage for juvenile salmonids based on a one-time evaluation.
2. Ordinary high water (OHW) is the mean stream width measured either upstream or downstream of the culvert beyond the hydraulic influence of the culvert. .
3. An embedded culvert must have 100% bedload coverage. Circular and box culverts must be embedded at least 20% of their height. A pipe-arch must be embedded so that the mean bedload depth is greater than or equal to the vertical distance from the bottom of the pipe to the point of maximum horizontal dimension of the culvert (haunch height) or is 1 foot deep, whichever is greater.
4. A culvert is considered backwatered if one of the following conditions is met: 1) elevation of the tailwater control exceeds the elevation of the invert at both the outlet and inlet of the culvert and the of any aprons or other inlet or outlet structures 2) the culvert is located in a pond, slough or other area with slow moving or still water and the tailwater and headwaters surface are equivalent and water surface is continuous throughout the entire structure and at least 0.1 feet in depth at the shallowest point. Culvert gradient, span to OHW ratio, and outfall height criteria are not considered in the assessment of fish passage in backwatered culverts. A culvert is not backwatered if a hydraulic jump occurs within the barrel.
5. Outfall height is the difference between the water surface elevation at the outlet and in the outlet pool (or the equivalent tailwater surface).

Site Observations

OHG	Outfall height gray
OHR	Outfall height red
GRDG	Culvert gradient gray
GRDR	Culvert gradient red
CRG	Constriction ratio gray
CRR	Constriction ratio red
AL	Culvert is poorly aligned
BV	Beaver Activity
CG	Compound gradient in pipe
CS	Cut-slope sliding into culvert
DF	Debris Flow
EC	Hydraulic flows exceeded capacity
IAS	Inlet apron too steep
IB	Improper bedding
IC	Damage associated with ice problems
IP	Inlet perch
MP	Mechanical damage or joints parting
MT	Material inadequate for designed use
OAS	Outlet apron too steep
OT	Other - vibrations, cavitation, etc.
RD	Road bank erosion
RF	Road Fill (pushed off road by grader)
SD	Sediment accumulation
SF	Shallow fill above culvert
SG	Culvert sagging in middle
SS	Subsidence
ST	Structural Problem
TS	Culvert is too short
WD	Woody Debris
NO	None of this type

Inlet/Outlet Type

PRO	Projecting
MIT	Mitered
HDW	Headwall
FLA	Flared
APR	Apron
WIN	Wing Wall

Culvert Material

SSP	Structural steel plate (bolted)
SAP	Structural aluminum plate (bolted)
CSP	Corrugated steel
CAP	Corrugated aluminum
WOD	Wood
RCP	Reinforced concrete
CPP	Corrugated plastic
NCP	Non-corrugated metal
UNK	Unknown/Other

Culvert Type

CIR	Circular pipe
OVL	Oval
AO	Open-bottom arch
BOX	Box culvert
PA	Pipe-arch
BR	Bridge
OT	Other
RM	Removed structure
FBO	Flat-bottom Oval

Substrate Types

Code	Descriptio	Size Guidelines
MD	Silt/ Clay	0.08mm to less than 2mm
SA	Sand	2mm to less than 5mm
GRV	Gravel	5mm to less than 80mm
CBL	Cobble	80mm to less than 250mm
BO	Boulder	250mm to less than 1 meter
BD	Bedrock	1 meter or greater
OR	Organics	n/a
NO	None	n/a

Outfall Type

AG	At Stream Grade
F	Free Fall In To Pool
C	Cascade Over Rip-Rap
SF	Smooth Flow Over Apron
OP	Overflow Pipe
HJ	Hydraulic Jump
FR	Free Fall on To Rip Rap
PS	Fish Passage Structue

Appendix A3.–Photo site field data form.

Fish Passage Survey Photo Site Only Form

(Remember to fill out a section in the Survey Notebook for this site as well)

Survey ID:	_____	Date:	_____
Site ID:	_____	Time:	_____
Road Name:	_____	Book #	_____
Milepost	_____	Crew:	_____
Watershed	_____	Latitude	_____
Stream Name	_____	Longitude:	_____

Photo Log

Comments: (Include why this is a photo site only: bridge, safty concern, ect.)

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____

ALASKA DEPARTMENT OF FISH AND GAME

*All Site ID's for Photo Sites should begin with the prefix PS to denote a photosite.
(Example:PSARD01)
**This Form should only be filled out if you were unable to take any physical measurements at the site or if you are documenting a site as a bridge replacement.

Appendix A4.–Fish sampling form.

Fish Passage Culvert Assessment Sheet ____ of ____

Fish Sampling Form

Date _____ **Project** _____

	Site ID	Trap #	Distance from culvert	U/S or D/S	Species	Size category	Number	Comments
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

APPENDIX B: COMPLETE SITE LIST ARRANGED BY TOWN AND ROAD

Appendix B1.–Gustavus site list by road name.

Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302260	8/14/2011	Driveway off Mountain View Rd	Good River	58.441028	-135.764039	Green	3	Constriction ratio gray, Culvert gradient gray
10302267	8/14/2011	Glacier National Park Drive	Bartlett Cove tributary	58.454417	-135.873978	Red	3	Outfall height red, Culvert is poorly aligned
10302247	8/6/2011	Glen's Ditch Road	Glen's Ditch	58.41245	-135.71274	Green	3	Culvert is too short
10302246	8/6/2011	Glen's Ditch Road	Glen's Ditch	58.412664	-135.71271	Green	3	Culvert gradient gray, Culvert is too short
10302257	8/8/2011	Good River Road	Good River	58.41273	-135.76134	Green	1	Constriction ratio gray, Culvert gradient gray, Improper bedding, Road bank erosion, Structural Problem, Culvert is too short
10302245	8/6/2011	Gustavus Airport Access Road	Glen's Ditch	58.41943	-135.68712	Green	3	None of this type
10302248	8/6/2011	Gustavus Road	Glen's Ditch tributary	58.41502	-135.71565	Green	4	Culvert is too short
10302250	8/8/2011	Lukes Drive	Good River	58.41309	-135.75533	Green	2	Culvert is too short, Structural Problem, Road bank erosion
10302255	8/11/2011	Mountain View Road	Good River	58.42498	-135.75792	Red	3	Constriction ratio red, Culvert is too short, Hydraulic flows exceeded capacity
10302251	8/10/2011	Mountain View Road	Good River	58.4139	-135.75546	Red	3	Outfall height red
10302261	8/15/2011	Mountain View Road	Good River	58.452083	-135.768003	Gray	–	No survey performed
10302263	8/14/2011	Mountain View Road	Good River drainage	58.451292	-135.782156	Red	3	Constriction ratio red
10302252	8/10/2011	Mountain View Road	Good River	58.41608	-135.75558	Green	3	None of this type
10302253	8/10/2011	Mountain View Road	Good River	58.41994	-135.75589	Green	3	Constriction ratio gray
10302266	8/14/2011	Mountain View Road	Good River drainage	58.450261	-135.793058	Green	3	None of this type

-continued-

Appendix B1.–Page 2 of 2.

Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302265	8/14/2011	Mountain View Road	Good River drainage	58.450692	-135.788097	Green	3	None of this type
10302264	8/14/2011	Mountain View Road	Good River drainage	58.451075	-135.783881	Green	3	Culvert is poorly aligned
10302259	8/14/2011	Owen Drive	Good River	58.439817	-135.763539	Green	3	Constriction ratio red
10302254	8/11/2011	Spruce Lane	Good River	58.42347	-135.75714	Green	5	Site replaced with bridge Sept. 2014
10302256	8/13/2011	Tong Road	Good River	58.42723	-135.75864	Gray	3	Constriction ratio gray
10302262	8/4/2011	Tong Road	Good River tributary	58.42736	-135.77742	Red	3	Outfall height red, Constriction ratio gray
10302258	8/14/2011	Veneta Street	Good River	58.437881	-135.762892	Green	3	Culvert gradient gray, Constriction ratio red
10302241	8/13/2011	Wilson Road	Rink Creek	58.43685	-135.64516	Red	4	Outfall height red, Constriction ratio gray
10302244	8/9/2011	Wilson Road	Unnamed	58.43981	-135.67612	Red	3	Culvert gradient red, Constriction ratio red
10302249	8/13/2011	Wilson Road	Airport Ditch	58.44124	-135.73212	Green	2	Culvert gradient gray, Mechanical damage or joints parting
10302242	8/13/2011	Wilson Road, Berry Creek Drive	Rink Creek Tributary	58.43782	-135.6674	Green	5	Site Replaced in 2012 with fish pass culvert
10302243	8/9/2011	Wilson Road, drive adjacent	Unnamed	58.43984	-135.67397	Green	4	Constriction ratio gray

Note: En dash denotes no information.

Appendix B2.–Haines site list by road name.

Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302858	8/21/2012	Allen Road	Tributary to Sawmill Creek	59.23709	-135.45789	Gray	2	Culvert gradient gray, Mechanical damage or joints parting, Structural Problem
10302897	8/22/2012	AML Driveway--Off Union Street	Tributary to Sawmill Creek	59.23787	-135.45645	Green	1	Mechanical damage or joints parting, Structural Problem, Culvert is poorly aligned
10302878	8/4/2012	Border Patrol Subdivision	39 Mile Creek	59.43686	-136.32079	Gray	3	Constriction ratio gray
10302900	8/8/2012	Chilkoot Loop	Sawmill Creek	59.23137	-135.45668	Gray	4	Culvert gradient gray, Culvert is poorly aligned
10302884	8/22/2012	Comstock Road	Tributary to Sawmill Creek	59.24037	-135.46422	Gray	4	Site replaced
10302853	8/8/2012	Comstock Road	Tributary to Sawmill Creek	59.2404	-135.46312	Red	2	Outfall height red, Culvert gradient red, Mechanical damage or joints parting, Compound gradient in pipe
10302898	8/8/2012	Comstock Road	Tributary to Sawmill Creek	59.24055	-135.46564	Red	2	Culvert gradient red, Outfall height red, Mechanical damage or joints parting, Structural Problem
10302910	8/8/2012	Comstock Road	Tributary to Sawmill Creek	59.24028	-135.46774	Red	1	Culvert gradient red, Outfall height red, Culvert sagging in middle, Mechanical damage or joints parting
10302896	8/8/2012	Comstock Road	Tributary to Sawmill Creek	59.24026	-135.46223	Red	2	Constriction ratio red
10302909	8/22/2012	DOT Yard	Tributary to Sawmill	59.23616	-135.4552	Red	3	Constriction ratio red, Mechanical damage or joints parting, Culvert sagging in middle
10302860	8/21/2012	Driveway off Haines Highway	Tributary to Chilkat River	59.24287	-135.49422	Gray	3	Constriction ratio gray

-continued-

Appendix B2.–Page 2 of 10.

Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302927	8/19/2012	Driveway on New Sawmill Road	Tributary to Sawmill Creek	59.23762	-135.46968	Gray	2	–
10302928	8/19/2012	Driveway on New Sawmill Road	Tributary to Sawmill Creek	59.23741	-135.47	Green	3	–
10302905	8/22/2012	Ed Shirley and Mud Bay Road	Tributary to Sawmill Creek	59.23111	-135.44861	Gray	3	Culvert is too short, Mechanical damage or joints parting
10302903	8/8/2012	Fair Drive	Sawmill Creek	59.23421	-135.45714	Green	3	Hydraulic flows exceeded capacity
10302824	8/18/2012	Farm Road	Unnamed Tributary to Tsirku River	59.37566	-135.93922	Green	4	Culvert gradient gray
10302843	8/8/2012	Farm Road	Unnamed Tributary to Tsirku River	59.37534	-135.93965	Green	4	Culvert gradient gray
10302832	8/16/2012	Haines Airport Access Road	Unknown Tributary to Chilkat River	59.24474	-135.51927	Green	3	Culvert sagging in middle
10302835	8/16/2012	Haines Airport Access Road	Unnamed Tributary to Chilkat River	59.24648	-135.52629	Green	2	Mechanical damage or joints parting
10302888	8/16/2012	Haines Airport Ramp B	Unnamed Tributary to Chilkat River	59.2467	-135.53307	Green	1	–
10302837	8/16/2012	Haines Airport Ramp C	Unnamed Tributary to Chilkat River	59.24492	-135.52728	Green	3	Inlet perch
10302834	8/16/2012	Haines Airport Ramp D	Unnamed Tributary to Chilkat River	59.24412	-135.5202	Green	3	Inlet perch, Culvert sagging in middle
10302836	8/16/2012	Haines Airport Ramp E	Unnamed Tributary to Chilkat River	59.24258	-135.51337	Green	3	Mechanical damage or joints parting, Inlet perch

-continued-

Appendix B2.–Page 3 of 10.

Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302833	8/16/2012	Haines Airport Taxiway	Unnamed Tributary to Chilkat River	59.24524	-135.52544	Gray	2	–
10302913	8/15/2012	Haines Highway	10 Mile Creek	59.28496	-135.68188	Red	3	Culvert gradient gray, Constriction ratio red, Hydraulic flows exceeded capacity
10302868	8/15/2012	Haines Highway	17 Mile Creek	59.36025	-135.78931	Red	2	Culvert gradient gray, Outfall height red, Mechanical damage or joints parting, Structural Problem
10302864	8/5/2012	Haines Highway	37 Mile Creek	59.43433	-136.23651	Gray	4	Constriction ratio gray
10302822	8/19/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.314	-135.72865	Red	2	Culvert gradient red, Constriction ratio red, Culvert is poorly aligned
10302926	8/19/2012	Haines Highway	Tributary to the Chilkat River	59.39989	-135.87825	Red	3	Culvert gradient red, Culvert is poorly aligned
10302890	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.25509	-135.54546	Red	2	Culvert gradient red, Constriction ratio gray, Mechanical damage or joints parting
10302839	8/21/2012	Haines Highway	Tributary to Chilkat River	59.24284	-135.49496	Red	3	Culvert gradient red, Culvert is poorly aligned
10302931	8/19/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.33325	-135.74791	Red	3	Culvert gradient red, Culvert is poorly aligned
10302869	8/15/2012	Haines Highway	Horse Farm Creek	59.36593	-135.80023	Red	2	Hydraulic flows exceeded capacity, Culvert gradient red, Constriction ratio red
10302863	8/5/2012	Haines Highway	Unknown Tributary to 37 Mile Creek	59.43932	-136.28072	Red	4	Culvert gradient red, Constriction ratio gray, Culvert sagging in middle
10302823	8/19/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.3396	-135.75763	Red	3	Culvert gradient red, Culvert is poorly aligned

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302915	8/15/2012	Haines Highway	8.5 Mile Creek	59.26975	-135.64398	Red	2	Culvert gradient red, Outfall height red, Hydraulic flows exceeded capacity
10302891	8/6/2012	Haines Highway	Tributary to Klehini River	59.42179	-136.06485	Red	3	Inlet perch, Culvert is poorly aligned, Culvert gradient gray, Outfall height red
10302852	8/9/2012	Haines Highway	Sawmill Creek	59.23644	-135.46964	Gray	3	Culvert gradient gray, Mechanical damage or joints parting
10302877	8/4/2012	Haines Highway	37 Mile Creek	59.43883	-136.32037	Gray	4	Culvert gradient gray, Culvert is poorly aligned
10302894	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.25607	-135.5482	Gray	2	Structural Problem, Culvert is poorly aligned
10302886	8/6/2012	Haines Highway	Tributary to Klehini River	59.42152	-136.09554	Gray	3	Culvert gradient gray, Constriction ratio gray
10302925	8/19/2012	Haines Highway	26 Mile Creek	59.41379	-135.99294	Gray	3	Culvert gradient gray
10302866	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.25832	-135.55556	Gray	2	Culvert gradient gray, Mechanical damage or joints parting
10302857	8/21/2012	Haines Highway	Tributary to Chilkat River	59.24293	-135.49028	Gray	3	Culvert gradient gray, Culvert is poorly aligned, Debris Flow
10302923	8/19/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.38041	-135.8391	Red	2	Culvert gradient red, Hydraulic flows exceeded capacity, Structural Problem, Culvert is poorly aligned
10302841	8/21/2012	Haines Highway	Tributary to Chilkat River	59.24311	-135.50584	Red	2	Culvert gradient red
10302840	8/3/2012	Haines Highway	40 Mile Creek	59.44801	-136.3539	Gray	4	Culvert is poorly aligned
10302875	8/4/2012	Haines Highway	Tributary to 39 Mile Creek	59.44004	-136.32515	Red	3	Culvert gradient red, Culvert is poorly aligned

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302871	8/20/2012	Haines Highway	6 Mile Creek	59.2625	-135.57962	Red	2	Culvert gradient red, Outfall height gray, Inlet perch, Mechanical damage or joints parting
10302874	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.26581	-135.59236	Gray	3	Constriction ratio gray, Mechanical damage or joints parting
10302879	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.26674	-135.62581	Gray	2	Beaver Activity, Structural Problem
10302865	8/5/2012	Haines Highway	Unnamed Tributary to Klehini River	59.43313	-136.22891	Red	4	Culvert gradient red, Sediment accumulation
10302873	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.26491	-135.59027	Red	1	Culvert gradient red, Mechanical damage or joints parting
10302881	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.25763	-135.55345	Red	2	Culvert gradient red, Mechanical damage or joints parting
10302880	8/4/2012	Haines Highway	37.5 Mile Pond outlet	59.43909	-136.32033	Gray	2	–
10302861	8/3/2012	Haines Highway	39 Mile Creek	59.44064	-136.32841	Green	4	–
10302882	8/4/2012	Haines Highway	37 Mile Creek	59.43932	-136.28209	Green	4	–
10302862	8/5/2012	Haines Highway	37 1/2 Mile Creek	59.43676	-136.30247	Green	4	Culvert sagging in middle
10302887	8/6/2012	Haines Highway	Klehini River side channel	59.42014	-136.08269	Green	3	–
10302889	8/6/2012	Haines Highway	Tributary to Klehini River	59.42119	-136.06828	Green	3	Culvert sagging in middle
10302850	8/9/2012	Haines Highway	Sawmill Creek	59.23521	-135.4647	Green	3	Compound gradient in pipe, Mechanical damage or joints parting

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302821	8/19/2012	Haines Highway	Thirteen Mile Creek	59.31376	-135.72446	Green	2	Culvert gradient red, Constriction ratio gray, Culvert is poorly aligned
10302885	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.30099	-135.70799	Green	3	–
10302883	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.27979	-135.67085	Green	3	Culvert is poorly aligned
10302876	8/20/2012	Haines Highway	Seven Mile Creek	59.26601	-135.59525	Green	2	Culvert gradient red, Constriction ratio gray, Hydraulic flows exceeded capacity, Mechanical damage or joints parting
10302870	8/20/2012	Haines Highway	Unnamed Tributary to Chilkat River	59.25864	-135.55717	Green	1	Mechanical damage or joints parting
10302872	8/21/2012	Haines Highway	Tributary to Chilkat River	59.24856	-135.5327	Green	4	Culvert is poorly aligned
10302845	8/21/2012	Haines Highway	Tributary to Chilkat River	59.23902	-135.47403	Green	3	–
10302930	8/19/2012	Haines Highway	14 Mile Creek	59.32722	-135.74129	Black		–
10302829	8/18/2012	Kelsall Road	Tributary to Chilkat River	59.47258	-136.04103	Red	2	Culvert gradient red, Outfall height red, Constriction ratio red, Mechanical damage or joints parting, Inlet perch, Sediment accumulation
10302856	8/7/2012	Kelsall Road	Unnamed Tributary to Kelsall River	59.53791	-136.0997	Red	3	Culvert gradient red, Outfall height red
10302854	8/7/2012	Kelsall Road	Unnamed Tributary to Mosquito Lake	59.46937	-136.03682	Red	3	Outfall height red, Culvert gradient red, Inlet perch, Compound gradient in pipe, Culvert sagging in middle

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302855	6/7/2012	Kelsall Road	Unnamed Tributary to Kelsall River	59.5381	-136.10092	Red	3	Culvert gradient red, Inlet perch, Mechanical damage or joints parting
10302859	8/7/2012	Kelsall Road	Unnamed Tributary to Chilkat River	59.49085	-136.06276	Red	2	Outfall height red, Culvert gradient red, Culvert is poorly aligned, Mechanical damage or joints parting
10302918	8/17/2012	Kelsall Road	Tributary to Chilkat River	59.51196	-136.0905	Red	2	Hydraulic flows exceeded capacity, Culvert gradient red, Culvert is poorly aligned
10302920	8/17/2012	Kelsall Road	Unnamed Tributary to Chilkat River	59.50322	-136.07655	Red	2	Constriction ratio red, Culvert gradient gray, Outfall height red, Road bank erosion
10302922	8/17/2012	Kelsall Road	Unnamed Tributary to Chilkat River	59.50468	-136.08014	Red	3	Culvert gradient gray, Outfall height red, Hydraulic flows exceeded capacity, Culvert is poorly aligned, Inlet perch
10302919	8/17/2012	Kelsall Road	Unnamed Tributary to Chilkat River	59.50313	-136.07585	Red	3	Culvert gradient red
10302924	8/17/2012	Kelsall Road	Unnamed Tributary to Chilkat River	59.51153	-136.08998	Gray	2	Culvert gradient gray, Structural Problem, Culvert is poorly aligned, Mechanical damage or joints parting
10302893	8/6/2012	Kelsall Road	Tributary to Chilkat River	59.49641	-136.0717	Gray	1	Culvert gradient red
10302921	8/17/2012	Kelsall Road	Tributary to Chilkat River	59.52393	-136.09207	Green	2	Constriction ratio gray, Hydraulic flows exceeded capacity
10302917	8/17/2012	Kelsall Road	Tributary to Chilkat River	59.4875	-136.06091	Green	2	Culvert gradient gray
10302916	8/17/2012	Kelsall Road	Tributary to Chilkat River	59.48328	-136.0536	Green	2	–

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302828	8/18/2012	Mosquito Lake Road	Tributary to Mosquito Lake	59.44779	-136.0302	Red	3	Outfall height red, Culvert gradient red, Constriction ratio gray, Inlet perch, Compound gradient in pipe, Culvert is too short
10302906	8/22/2012	Mud Bay Road	Flat Bay Creek	59.15659	-135.35968	Red	3	Outfall height red, Woody Debris, Culvert sagging in middle, Mechanical damage or joints parting
10302914	8/22/2012	Mud Bay Road	Onemile Creek	59.21225	-135.44873	Gray	4	–
10302908	8/22/2012	Mud Bay Road	Unnamed Tributary to Car's Cove	59.20143	-135.43068	Red	1	Outfall height red, Mechanical damage or joints parting, Inlet perch, Culvert sagging in middle, Culvert is poorly aligned
10302907	8/22/2012	Mud Bay Road	Lenikof Creek	59.17089	-135.38731	Gray	1	Site Replaced
10302904	8/22/2012	Mud Bay Road	Letnikof Creek	59.1702	-135.38547	Gray	4	–
10302911	8/22/2012	Mud Bay Road	Tributary to Car's Cove	59.20212	-135.43091	Gray	4	Culvert sagging in middle, Mechanical damage or joints parting
10302901	8/22/2012	Mud Bay Road	Unnamed Tributary to Letnikof Cove	59.16798	-135.38274	Red	1	Outfall height red, Compound gradient in pipe
10302899	8/22/2012	Mud Bay Road	Jurgeleit Creek	59.15934	-135.37677	Red	3	Outfall height red, Compound gradient in pipe
10302892	8/22/2012	Mud Bay Road	Kip's Creek	59.14869	-135.34872	Gray	3	Mechanical damage or joints parting, Culvert is poorly aligned
10302831	8/16/2012	New Sawmill Road	Tributary to Sawmill Creek	59.23734	-135.4705	Green	3	–
10302838	8/18/2012	Porcupine Road	Herman Creek	59.41462	-136.06438	Red	3	Constriction ratio red, Culvert gradient gray, Woody Debris, Mechanical damage or joints parting

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302826	8/18/2012	Porcupine Road	Cave Creek	59.41693	-136.11258	Gray	3	Constriction ratio gray, Inlet perch, Road bank erosion, Culvert sagging in middle
10302825	8/18/2012	Porcupine Road	Unnamed Tributary to Klehini River	59.42159	-136.22862	Green	4	–
10302830	8/16/2012	Road from Highway to Airport	Unnamed Tributary to Chilkat River	59.24694	-135.52647	Green	3	Culvert is poorly aligned
10302842	8/16/2012	Sawmill Road	Sawmill Creek	59.23423	-135.47423	Green	1	Mechanical damage or joints parting, Culvert gradient gray
10302912	8/22/2012	Small Tracts Road	Onemile Creek	59.21045	-135.43735	Gray	4	Inlet perch
10302902	8/8/2012	Spruce Grove Drive	Sawmill Creek	59.2359	-135.46484	Green	4	Inlet perch, Culvert gradient gray
10302867	8/21/2012	Union Street	Tributary to Sawmill Creek	59.23783	-135.45439	Red	3	Culvert gradient red, Constriction ratio gray, Debris Flow, Woody Debris
10302844	8/21/2012	Union Street	Sawmill Creek Tributary	59.23777	-135.45232	Gray	4	Culvert is poorly aligned
10302895	8/22/2012	Union Street	Tributary to Sawmill Creek	59.23641	-135.45917	Green	3	Culvert sagging in middle, Mechanical damage or joints parting
10302846	8/9/2012	Unnamed road	Tributary to Sawmill Creek	59.23917	-135.46341	Red	3	Culvert gradient red, Constriction ratio gray
10302848	8/9/2012	Unnamed road	Unnamed Tributary to Sawmill Creek	59.23915	-135.46494	Gray	3	Culvert replaced
10302851	8/9/2012	Unnamed Road	Unnamed Tributary to Sawmill Creek	59.23916	-135.46819	Gray	2	Culvert gradient gray, Constriction ratio gray, Mechanical damage or joints parting
10302827	8/18/2012	Unnamed Road	Tributary to Mosquito Lake	59.44646	-136.0298	Green	3	Mechanical damage or joints parting

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Site ID	Date of Survey	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302849	8/9/2012	Unnamed Road	Unnamed Tributary to Sawmill Creek	59.23915	-135.46654	Green	3	Sediment accumulation
10302847	8/21/2012	Unnamed road	Tributary to Chilkat River	59.23795	-135.47732	Green	3	–
10302929	8/19/2012	Unnamed road off Haines Hwy	Tributary to Chilkat River	59.41149	-135.95798	Green	4	–

Note: En dash denotes no information.

Appendix B3.–Juneau site list by road name.

Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302974	6/20/2012	Airport	Jordan Creek	58.35323	-134.5692	Gray	3	Compound gradient in pipe
10302973	6/20/2012	Airport	Jordan Creek	58.35709	-134.57405	Green	3	None of this type
10302176	8/26/2011	Aspen Avenue	Duck Creek	58.39116	-134.575265	Green	5	None of this type
10302207	7/14/2011	Back Loop Road	MB Creek	58.3922	-134.63556	Red	2	Culvert gradient red, Road Fill (pushed off road by grader)
10302204	7/14/2011	Back Loop Road	Hanna Creek	58.39407	-134.62193	Black	1	Beaver Activity
10302209	7/13/2011	Back Loop Road	Auke Lake tributary	58.39183	-134.63634	Green	2	Road Fill (pushed off road by grader), Culvert is poorly aligned
10302185	8/25/2011	Berners Avenue	Duck Creek	58.36345	-134.58751	Green	4	Constriction ratio red
10303049	7/25/2012	Casa del Sol	Tributary to Casa del Sol	58.37176	-134.6122	Green	3	None of this type
10303046	7/24/2012	Cessna Drive	Duck Creek	58.36231	-134.5876	Black	3	–
10302218	7/12/2011	Chilkat Road	Tee Harbor tributary	58.41106	-134.75774	Black	–	–
10303051	7/25/2012	Church of the Nazarene Drive	Duck Creek East Fork	58.3788	-134.57661	Green	3	None of this type
10302181	8/26/2011	Cinema Drive	Duck Creek	58.37685	-134.577544	Gray	3	Constriction ratio gray
10302988	6/23/2012	Cohen Drive	Tee Creek	58.44215	-134.76831	Gray	2	Culvert gradient red, Culvert is poorly aligned
10303024	6/24/2012	Crazy Horse Road	Casa del Sol Creek	58.36602	-134.61705	Gray	1	Hydraulic flows exceeded capacity, Mechanical damage or joints parting
10302188	7/24/2012	Del Rae Road	Duck Creek	58.36714	-134.58945	Green	4	None of this type
10302186	8/25/2011	Driveway adjacent to Glacier H	Duck Creek	58.36432	-134.588583	Green	4	Constriction ratio red, Hydraulic flows exceeded capacity
10302233	6/25/2011	Driveway to gravel pit	Herbert River tributary	58.52068	-134.79507	Green	3	Constriction ratio gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302179	8/26/2011	Duck Creek Loop	Duck Creek	58.38403	-134.577077	Green	3	Constriction ratio red
10302177	8/26/2011	Duran Street	Duck Creek	58.3895	-134.575325	Green	3	Constriction ratio red
10302235	6/23/2011	Eagle River Camp Road	Eagle River tributary	58.5274	-134.81425	Green	4	None of this type
10303025	6/24/2012	Egan Drive	Vanderbilt Creek	58.3458	-134.50079	Gray	3	Tidal
10303044	7/23/2012	Egan Drive	Unnamed Creek	58.35853	-134.54889	Gray	2	None of this type
10303019	6/25/2012	Egan Drive	Unnamed Tributary to Gastineau Channel	58.31929	-134.45282	Gray	3	Tidal
10302163	7/19/2011	Egan Drive	West Creek	58.35802	-134.52301	Gray	4	Compound gradient in pipe
10302164	7/19/2011	Egan Drive	DOT Creek	58.3581	-134.52515	Black	–	–
10302160	6/22/2011	Egan Drive	Switzer Creek	58.35649	-134.51527	Green	4	None of this type
10302184	7/24/2012	Egan Drive	Duck Creek	58.36965	-134.5864	Green	2	Culvert sagging in middle, Road Fill (pushed off road by grader)
10303048	7/25/2012	Egan Drive	East Creek	58.35806	-134.51927	Green	4	None of this type
10302180	6/21/2012	Egan Drive	Jordan Creek	58.36593	-134.57743	Green	3	Culvert gradient gray, Culvert is poorly aligned
10302202	7/20/2011	Emmanuel Baptist Church	Casa Del Sol tributary	58.37468	-134.62169	Red	4	Outfall height red, Culvert gradient red
10302203	7/20/2011	Emmanuel Baptist Church	Casa Del Sol tributary	58.37449	-134.62177	Green	4	None of this type
10302201	7/29/2011	Engineers Cutoff Road	Casa Del Sol tributary	58.37402	-134.62155	Gray	2	Constriction ratio gray, Culvert gradient gray
10302976	6/21/2012	Engineer's Cutoff Road	Peterson Hill Creek	58.37078	-134.62506	Red	2	Culvert gradient red, Outfall height red, Constriction ratio gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302168	6/7/2011	Fish Creek Road	Fish Creek	58.29556	-134.54587	Red	5	Culvert gradient red, Constriction ratio gray
10302215	7/12/2011	Glacier Highway	Lena Cove tributary	58.39739	-134.74889	Red	2	Culvert gradient red, Constriction ratio gray, Woody Debris
10302212	7/14/2011	Glacier Highway	Waydelich Creek	58.38528	-134.65869	Red	3	Outfall height red, Constriction ratio gray, Culvert gradient red
10302238	7/8/2011	Glacier Highway	Bessie Creek	58.59278	-134.90228	Red	3	Culvert gradient red, Outfall height red, Constriction ratio red
10302210	7/12/2011	Glacier Highway	Auke Creek	58.38221	-134.63745	Gray	3	None of this type
10302214	7/29/2011	Glacier Highway	Picnic Creek	58.38876	-134.74419	Red	2	Constriction ratio gray, Culvert gradient red
10302240	6/21/2011	Glacier Highway	Bridget Cove tributary	58.61877	-134.93423	Red	3	Culvert gradient red, Outfall height red, Culvert is poorly aligned
10302234	6/23/2011	Glacier Highway	Eagle River tributary	58.52794	-134.81419	Gray	5	Culvert gradient gray
10302239	6/20/2011	Glacier Highway	Cowee Creek tributary	58.65012	-134.92123	Red	1	Woody Debris, Beaver Activity
10302211	7/14/2011	Glacier Highway	Bay Creek	58.38741	-134.64822	Gray	2	Constriction ratio gray, Mechanical damage or joints parting
10302981	6/23/2012	Glacier Highway	Tributary to Peterson Creek	58.48953	-134.77443	Red	1	Beaver Activity
10302982	6/23/2012	Glacier Highway	Tributary with Peterson Creek	58.48854	-134.77492	Red	2	Culvert gradient red, Beaver Activity, Outfall height red
10302237	7/5/2011	Glacier Highway	Favorite Channel tributary	58.54035	-134.85071	Red	3	Outfall height red, Inlet perch
10302213	7/11/2011	Glacier Highway	Auke Bay tributary	58.37858	-134.71495	Red	3	Culvert gradient red, Outfall height red, Constriction ratio gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302998	6/24/2012	Glacier Highway	Auke Nu	58.38272	-134.66789	Gray	3	Woody Debris
10303041	7/23/2012	Glacier Highway	East Creek	58.35883	-134.51985	Gray	4	Culvert gradient gray
10302224	7/25/2011	Glacier Highway	Strawberry Creek side channel	58.52625	-134.77419	Gray	4	Culvert gradient gray, Inlet perch, Road Fill (pushed off road by grader)
10302205	7/25/2012	Glacier Highway	Auke Lake tributary	58.38073	-134.63074	Red	3	Culvert gradient red, Outfall height red, Culvert is poorly aligned
10302206	7/25/2012	Glacier Highway	Auke Lake tributary	58.38131	-134.63245	Red	3	Culvert gradient red, Outfall height red
10302200	7/20/2011	Glacier Highway	Casa Del Sol tributary	58.37418	-134.62111	Red	3	Culvert gradient red
10303042	7/23/2012	Glacier Highway	Unnamed Creek	58.35905	-134.54869	Gray	3	Culvert gradient gray
10302975	6/21/2012	Glacier Highway	Jordan Creek	58.36262	-134.58142	Green	3	None of this type
10302933	6/22/2012	Glacier Highway	Tributary to Peterson Creek	58.49536	-134.77103	Green	3	None of this type
10302236	6/21/2011	Glacier Highway	Eagle River tributary	58.52784	-134.81674	Green	5	None of this type
10302977	6/22/2012	Glacier Highway	Tributary to Peterson Creek	58.4936	-134.77243	Green	4	Mechanical damage or joints parting
10302159	6/22/2011	Glacier Highway	Switzer Creek	58.35938	-134.50888	Green	3	None of this type
10302979	6/22/2012	Glacier Highway	Tributary to Peterson Creek	58.49202	-134.77281	Green	4	None of this type
10302980	6/22/2012	Glacier Highway	Tributary to Peterson Creek	58.49014	-134.77321	Green	4	Road Fill (pushed off road by grader), Sediment accumulation
10302230	6/25/2011	Glacier Highway	Herbert River tributary	58.52257	-134.7934	Green	3	Constriction ratio red
10302229	6/25/2011	Glacier Highway	Herbert River tributary	58.52148	-134.79213	Green	3	Beaver Activity, Culvert is poorly aligned

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302226	7/1/2011	Glacier Highway	Strawberry Creek tributary	58.50908	-134.7804	Green	4	Road Fill (pushed off road by grader)
10302983	6/23/2012	Glacier Highway	Tributary to Peterson Creek	58.48409	-134.77977	Green	3	None of this type
10302987	6/23/2012	Glacier Highway	Tributary to Peterson Creek	58.48281	-134.78096	Green	3	None of this type
10302223	7/13/2011	Glacier Highway	Shrine Creek	58.45557	-134.77261	Green	4	None of this type
10303043	7/23/2012	Glacier Highway	Tributary to Casa del Sol Creek	58.37196	-134.61334	Green	3	None of this type
10302196	7/23/2012	Glacier Highway	Casa Del Sol tributary	58.37209	-134.61533	Green	3	None of this type
10302225	7/25/2011	Glacier Highway	Strawberry Creek	58.50771	-134.7784	Green	5	None of this type
10302222	8/1/2011	Glacier Highway	Strawberry Creek	58.50453	-134.77022	Green	4	None of this type
10302220	8/1/2011	Glacier Highway	Strawberry Creek tributary	58.50261	-134.76881	Green	4	Culvert gradient red, Hydraulic flows exceeded capacity
10302189	8/25/2011	Glacier Highway	Duck Creek	58.36505	-134.589703	Green	4	None of this type
10302190	8/25/2011	Glacier Highway	Duck Creek	58.36646	-134.590716	Green	3	Hydraulic flows exceeded capacity
10302978	6/22/2012	Glacier Highway	Tributary to Peterson Creek	58.49536	-134.77103	Green	3	None of this type
10302221	8/1/2011	Glacier Highway	Strawberry Creek tributary	58.50359	-134.76936	Green	4	Hydraulic flows exceeded capacity
10302219	8/1/2011	Glacier Highway	Strawberry Creek tributary	58.50323	-134.76871	Green	3	None of this type
10302167	6/9/2011	Glacier Spur Road	Steep Creek	58.4139	-134.54553	Gray	3	Outfall height red, Culvert gradient gray, Debris Flow

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302171	6/10/2011	Glacier Spur Road	Mendenhall River tributary	58.40808	-134.54712	Red	1	Culvert gradient red, Constriction ratio red, Beaver Activity, Debris Flow, Mechanical damage or joints parting
10302169	6/9/2011	Glacier Spur Road	Steep Creek tributary	58.41444	-134.54607	Green	3	Debris Flow
10302172	6/10/2011	Glacier Spur Road	Mendenhall River tributary	58.40497	-134.55069	Green	3	Culvert gradient gray, Constriction ratio gray, Debris Flow
10302228	7/6/2011	Herbert River Road	Herbert River tributary	58.52921	-134.78926	Red	4	Constriction ratio red, Hydraulic flows exceeded capacity, Woody Debris, Culvert gradient gray, Inlet perch
10302227	7/6/2011	Herbert River Road	Herbert River tributary	58.53052	-134.78473	Gray	3	Culvert gradient red
10302231	6/23/2011	Herbert River Road	Herbert River tributary	58.52069	-134.7939	Green	3	None of this type
10302232	6/23/2011	Herbert River Road	Herbert River tributary	58.51826	-134.79492	Green	4	Culvert gradient gray, Constriction ratio gray
10302216	7/29/2011	Lena Point Road	Picnic Creek	58.39219	-134.74974	Gray	3	Constriction ratio gray
10302162	7/7/2011	Lupine Drive	West Creek - DOT	58.35961	-134.52292	Red	2	Culvert gradient red, Structural Problem
10302175	7/24/2012	McGinnus Drive	Duck Creek	58.38652	-134.575052	Green	4	None of this type
10302174	8/26/2011	Mendenhall Boulevard	Duck Creek	58.39236	-134.570376	Green	3	None of this type
10302187	8/25/2011	Mendenhall Loop Road	Duck Creek	58.36477	-134.589279	Green	4	Culvert gradient gray
10303047	7/24/2012	Mendenhall Loop Road	Duck Creek	58.37529	-134.57936	Green	2	Hydraulic flows exceeded capacity
10303045	7/24/2012	Mendenhall Loop Road	Duck Creek	58.37247	-134.58301	Green	2	Road Fill (pushed off road by grader), Culvert gradient gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10303050	7/25/2012	Mendenhall Loop Road	Lake 2 Creek	58.39363	-134.62566	Green	3	None of this type
10302183	7/24/2012	Mendenhall Mall Drive	Duck Creek	58.37145	-134.58503	Green	3	Mechanical damage or joints parting
10303007	6/25/2012	Mendenhall Riverside Trail	Tributary to Mendenhall River	58.38026	-134.60086	Red	3	Culvert gradient red, Outfall height red
10303008	6/25/2012	Mendenhall Riverside Trail	Tributary to Mendenhall River	58.38027	-134.60048	Red	3	Outfall height red, Culvert gradient red
10302194	6/24/2011	Montana Creek Road	Montana Creek side channel	58.4148	-134.61061	Gray	4	Culvert gradient gray
10302195	6/24/2011	Montana Creek Road	Montana Creek side channel	58.4164	-134.61279	Green	3	Culvert gradient gray, Constriction ratio red
10302193	6/24/2011	Montana Creek Road	Montana Creek side channel	58.41445	-134.61026	Green	3	Culvert gradient gray, Constriction ratio gray
10302182	8/25/2011	Nancy Street	Duck Creek East Fork	58.37526	-134.578444	Red	3	Culvert gradient red, Constriction ratio red
10302170	6/17/2011	North Douglas Highway	Johnson Creek	58.33908	-134.5466	Red	4	Constriction ratio red, Culvert gradient red, Outfall height gray
10302165	6/18/2011	North Douglas Highway	Hendrickson Creek	58.33865	-134.52521	Red	3	Culvert gradient red, Constriction ratio gray, Outfall height gray
10302156	6/18/2011	North Douglas Highway	Falls Creek	58.32307	-134.48219	Red	3	Outfall height red, Constriction ratio red, Culvert gradient red, Debris Flow
10302154	6/19/2011	North Douglas Highway	Grant Creek	58.30491	-134.45178	Red	3	Culvert gradient red, Constriction ratio red, Outfall height red, Compound gradient in pipe, Woody Debris, Mechanical damage or joints parting
10302192	6/8/2011	North Douglas Highway	Unnamed	58.32326	-134.607189	Red	3	Culvert gradient red, Outfall height red, Constriction ratio gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302178	6/17/2011	North Douglas Highway	Ninemile Creek	58.33672	-134.5764	Gray	2	Hydraulic flows exceeded capacity, Mechanical damage or joints parting
10302155	6/18/2011	North Douglas Highway	Eagle Creek	58.31249	-134.46019	Gray	2	Culvert gradient red, Outfall height gray, Constriction ratio red
10302158	6/18/2011	North Douglas Highway	Neilson Creek	58.3317	-134.49957	Gray	3	Culvert gradient gray, Constriction ratio gray, Outfall height red
10302197	6/8/2011	North Douglas Highway	Cove Creek	58.32273	-134.61598	Red	3	Culvert gradient red
10302166	7/23/2012	North Douglas Highway	Hendrickson Creek tributary	58.33878	-134.52774	Red	2	Culvert gradient red, Outfall height gray
10302217	7/12/2011	Picnic Beach Road	Picnic Creek	58.39279	-134.75055	Gray	3	Constriction ratio gray
10302161	7/7/2011	Schinder Drive	East Creek	58.36118	-134.5186	Red	3	Culvert gradient red, Constriction ratio gray, Inlet perch
10302199	6/19/2011	Sherwood Drive	Casa Del Sol tributary	58.37079	-134.61806	Green	3	Culvert gradient gray, Constriction ratio gray, Sediment accumulation
10302198	6/19/2011	Sherwood Drive	Casa Del Sol tributary	58.37132	-134.61694	Green	3	Sediment accumulation
10302191	6/24/2011	Skater Cabin Road	Mendenhall Lake tributary	58.41699	-134.59096	Green	3	Culvert gradient gray, Constriction ratio gray
10302173	8/26/2011	Taku Boulevard	Duck Creek	58.3956	-134.567346	Green	3	Constriction ratio red, Culvert gradient gray
10302153	6/19/2012	Thane Road	Snowslide Creek	58.28292	-134.37453	Red	3	Culvert gradient red, Outfall height red, Cut-slope slumping or sliding into culvert (single event), Inlet perch
10302208	7/13/2011	University Drive	Auke Lake tributary	58.39211	-134.63623	Red	2	Culvert gradient red, Road Fill (pushed off road by grader)
10303026	6/24/2012	Vanderbilt Hill Road	Vanderbilt Creek	58.35114	-134.49155	Green	3	Culvert is poorly aligned
10302157	7/19/2011	Vanderbilt Road	Vanderbilt Creek	58.34561	-134.49933	Black	1	Dam
10302972	6/20/2012	Yandunkin Drive	Jordan Creek	58.35833	-134.57486	Green	3	None of this type

Note: En dash denotes no information.

Appendix B4.–Sitka site list by road name.

Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10303018	7/20/2012	Baranof Road	Wrinkleneck Creek	57.05575	-135.331	Green	3	Hydraulic flows exceeded capacity
10303009	7/5/2012	Bayside Loop	Unnamed Stream	57.13524	-135.368	Gray	3	Culvert gradient gray
10302995	7/6/2012	Bayside Loop	Unnamed Stream	57.13428	-135.367	Gray	3	Constriction ratio gray, Culvert gradient gray
10302992	7/6/2012	Bayside Loop	Unnamed Creek	57.13398	-135.367	Green	3	Culvert gradient gray, Constriction ratio gray
10303040	7/21/2012	Blueberry Lane	Unnamed Stream	57.03939	-135.264	Red	3	Constriction ratio gray, Culvert gradient red, Outfall height red, Compound gradient in pipe
10303000	7/7/2012	Dam	Indian River	57.05387	-135.315	Black	–	Dam
10303013	6/28/2012	Estuary Loop	Tributary to Starrigavan Creek	57.12933	-135.361	Red	3	Culvert gradient red, Compound gradient in pipe
10303029	6/27/2012	Estuary Loop Road	Unnamed Creek	57.13062	-135.361	Gray	3	Culvert gradient gray, Culvert is poorly aligned
10302935	6/28/2012	Estuary Loop Road	Tributary to Starrigaven Creek	57.13075	-135.36	Gray	3	Culvert gradient gray
10303001	7/8/2012	Flood Control Dam	Tributary to Peterson Creek	57.06358	-135.344	Black	–	Dam
10303027	7/12/2012	Halibut Point Rd.	Unnamed Creek	57.08864	-135.385	Gray	3	Outfall height red, Outfall height gray, Mechanical damage or joints parting, Woody Debris, Inlet perch, Culvert gradient red
10303021	7/8/2012	Halibut Point Road	Peterson Creek	57.06031	-135.348	Gray	1	None of this type
10302997	7/6/2012	Halibut Point Road	Unnamed Creek	57.12868	-135.374	Gray	1	Culvert gradient gray
10303032	7/12/2012	Harbor Mountain Road	unnamed Creek	57.08868	-135.384	Gray	3	Culvert gradient gray
10303012	7/18/2012	Harbor Mountain Road	Unnamed Creek	57.09166	-135.383	Green	4	None of this type

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10303010	7/7/2012	Indian River Road	Tributary to Indian River	57.05479	-135.316	Green	3	Culvert gradient gray, Mechanical damage or joints parting, Culvert sagging in middle
10303037	7/19/2012	Indian River Road	Tributary to Indian River	57.05558	-135.312	Green	3	Cut-slope slumping or sliding into culvert (single event)
10303022	7/20/2012	Lake Street	Swan Lake Outlet	57.05355	-135.335	Gray	2	None of this type
10303034	7/21/2012	Lake Street	Arrowhead Creek	57.05845	-135.336	Red	2	Outfall height red
10303016	7/20/2012	Lake Street	Wrinkleneck Creek	57.05526	-135.335	Green	3	None of this type, Tidal
10303030	7/19/2012	Levee next to Peter Simpson Rd	Tributary to Indian River	57.05611	-135.312	Green	3	None of this type
10303015	7/20/2012	Monastery Road	Arrowhead Creek	57.05861	-135.335	Green	3	None of this type
10303017	7/20/2012	Monastery Street	Wrinkleneck Creek	57.05563	-135.333	Green	1	Culvert gradient gray, Culvert is poorly aligned
10302996	7/6/2012	Mosquito Cove Trail	Unnamed Creek	57.13562	-135.368	Gray	3	Constriction ratio gray
10302993	7/6/2012	Nelson Logging Road	Tributary to Starrigavan Creek	57.12601	-135.345	Gray	1	Constriction ratio gray, Culvert gradient gray, Structural Problem, Mechanical damage or joints parting, Shallow fill; inadequate road fill volume above culvert
10303028	7/12/2012	Nelson Logging Road	Tributary to Starrigavan Creek	57.12725	-135.357	Gray	4	Outfall height gray
10303033	7/12/2012	Nelson Logging Road	Tributary to Starrigavan Creek	57.12755	-135.357	Green	3	None of this type
10303038	7/19/2012	Peter Simpson Road	Tributary to Indian River	57.05577	-135.312	Green	3	None of this type
10303014	7/8/2012	Peterson Drive	Peterson Creek	57.06147	-135.344	Red	1	Constriction ratio red, Culvert gradient gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302984	7/9/2012	Sawmill Creek Road	Unnamed Creek	57.01041	-135.155	Red	1	Constriction ratio red, Outfall height red, Culvert gradient red, Mechanical damage or joints parting, Inlet perch, Culvert is poorly aligned
10302986	7/9/2012	Sawmill Creek Road	Unnamed Creek	57.02461	-135.176	Red	2	Outfall height red, Culvert gradient red, Compound gradient in pipe, Mechanical damage or joints parting
10302994	7/9/2012	Sawmill Creek Road	Unnamed Creek	57.01856	-135.164	Red	2	Culvert gradient red, Outfall height red, Mechanical damage or joints parting, Compound gradient in pipe
10302989	7/10/2012	Sawmill Creek Road	Unnamed Stream	57.04384	-135.2	Gray	3	Culvert gradient gray, Culvert is poorly aligned
10303036	7/21/2012	Sawmill Creek Road	Thimbleberry Creek	57.03864	-135.257	Gray	4	Compound gradient in pipe
10303039	7/21/2012	Sawmill Creek Road	Unnamed creek	57.0407	-135.263	Gray	4	Culvert gradient red, Constriction ratio gray
10302990	7/10/2012	Sawmill Creek Road	Unnamed Stream	57.02774	-135.18	Red	2	Culvert gradient red, Culvert is poorly aligned
10302991	7/10/2012	Sawmill Creek Road	Unnamed Creek	57.04644	-135.207	Gray	2	Constriction ratio gray, Outfall height red
10302985	7/9/2012	Sawmill Creek Road	Unnamed Creek	57.01101	-135.154	Red	3	Outfall height red, Culvert gradient red
10303031	7/7/2012	Sawmill Creek Road	Side Channel to Indian River	57.05331	-135.32	Green	3	None of this type
10303023	7/7/2012	Sheldon Jackson Campus	Side channel to Indian River	57.05141	-135.321	Gray	2	Culvert gradient gray, Hydraulic flows exceeded capacity, Culvert sagging in middle

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10303011	7/7/2012	Sheldon Jackson Campus	side channel to Indian River	57.05156	-135.321	Green	4	None of this type
10302999	7/7/2012	Sheldon Jackson Campus	Side channel to Indian River	57.05167	-135.322	Black	–	Water intake dam
10303035	7/21/2012	Unnamed BLH hydro	Sawmill Creek	57.0516	-135.231	Red	1	Culvert gradient red, Culvert is poorly aligned, Outfall height red
10303020	7/8/2012	Wachusetts Street	Peterson Creek	57.06257	-135.344	Red	2	Culvert gradient red, Outfall height red, Constriction ratio red, Structural Problem

Note: En dash denotes no information.

Appendix B5.–Skagway site list by road name.

Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302967	6/10/2012	10th Avenue	Pullen Creek	59.4581	-135.30983	Gray	4	Culvert gradient gray
10302962	6/10/2012	12.5 Avenue	Pullen Creek	59.45938	-135.30725	Red	2	Culvert gradient red, Culvert is poorly aligned
10302968	6/11/2012	13.5 Avenue	Pullen Creek	59.46062	-135.30746	Red	2	Culvert gradient red, Culvert sagging in middle
10302937	6/11/2012	14th Avenue	Pullen Creek	59.46084	-135.3071	Gray	2	Culvert gradient gray
10302970	6/11/2012	15th Avenue	Pullen Creek	59.46102	-135.30489	Green	3	Culvert gradient gray, Culvert is poorly aligned
10302971	6/11/2012	16.5 Avenue	Pullen Creek	59.46157	-135.30316	Gray	3	Culvert gradient gray
10303003	6/9/2012	18.5 Avenue	Pullen Creek	59.46366	-135.30283	Black	–	–
10302957	6/9/2012	19.5 Ave	Pullen Creek	59.46442	-135.30215	Green	3	–
10302959	6/9/2012	19th Avenue	Pullen Creek	59.46399	-135.30257	Gray	3	Culvert gradient gray
10302958	6/9/2012	20.5 Ave	Pullen Creek	59.46487	-135.3009	Black	2	Culvert is poorly aligned, Road Fill (pushed off road by grader)
10302956	6/8/2012	20th Avenue	Pullen Creek	59.46473	-135.30145	Gray	4	Culvert gradient red
10302955	6/8/2012	21.5 Ave	Pullen Creek	59.46608	-135.29918	Green	3	Culvert gradient red
10302953	6/8/2012	21.5 Ave	Pullen Creek	59.46563	-135.30022	Green	3	Culvert gradient gray
10302952	6/8/2012	21st Ave	Pullen Creek	59.46517	-135.30063	Gray	3	Culvert gradient gray, Inlet perch
10302954	6/8/2012	22nd Avenue	Pullen Creek	59.46584	-135.2998	Green	3	Culvert gradient gray
10302960	6/9/2012	7th Avenue	Pullen Creek	59.4559	-135.31229	Green	2	–
10303006	6/9/2012	8.5 Avenue	Pullen Creek	59.45726	-135.31155	Black	–	–
10303005	6/9/2012	8th Avenue	Pullen Creek	59.45719	-135.31166	Black	–	–
10302938	6/9/2012	9.5 Ave	Pullen Creek	59.45781	-135.31044	Gray	1	–
10302941	6/9/2012	9th Avenue	Pullen Creek	59.45755	-135.311	Black	3	–
10302951	6/7/2012	Broadway	Pullen Creek	59.45201	-135.32088	Red	1	Constriction ratio red, Culvert gradient gray, Mechanical damage or joints parting, Inlet perch
10302966	6/10/2012	Broadway	Pullen Creek	59.4587	-135.3089	Green	3	–
10302963	6/10/2012	Broadway and 12th Avenue	Pullen Creek	59.4591	-135.30798	Gray	4	Culvert gradient gray

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302961	6/10/2012	Broadway Street	Pullen Creek	59.45982	-135.3069	Gray	3	Culvert gradient gray
10302950	6/7/2012	Congress Way	Pullen Creek	59.45222	-135.31596	Green	3	–
10302943	6/6/2012	Klondike Goldrush Campground R	Tributary to Taiya River	59.50593	-135.34907	Red	3	Constriction ratio red, Culvert gradient red
10302932	6/6/2012	Klondike Highway	Dairy Creek	59.47636	-135.2964	Green	4	–
10302945	6/7/2012	Liarsville Road	Lillihaven Creek	59.48681	-135.27948	Gray	4	–
10302942	6/6/2012	Old Dyea Road	Nelson Slough	59.50814	-135.36003	Green	4	–
10302936	6/11/2012	Old Railroad Grade	Tributary to Pullen Creek	59.45753	-135.30847	Green	3	Culvert gradient gray
10302965	6/10/2012	Private Road	Dairy Creek	59.47522	-135.2946	Green	3	Culvert gradient gray, Constriction ratio red
10302964	6/10/2012	Private Road	Dairy Creek	59.4743	-135.29393	Green	5	–
10302944	6/6/2012	Skagway-Dyea Road	Matthews Creek	59.47997	-135.33636	Red	3	Culvert gradient red, Outfall height red, Constriction ratio red, Debris Flow
10302939	6/5/2012	Skagway-Dyea Road	Tributary to West Creek	59.52942	-135.3481	Green	2	Constriction ratio red, Mechanical damage or joints parting, Woody Debris, Shallow fill; inadequate road fill volume above culvert
10303004	6/9/2012	State Street	Pullen Creek	59.46309	-135.30305	Black	–	–
10302946	6/7/2012	State Street	Pullen Creek	59.4663	-135.29842	Green	2	Culvert is too short, Road Fill (pushed off road by grader)
10302947	6/7/2012	Unnamed Rd near Harbor	Pullen Creek	59.45132	-135.32234	Gray	3	–
10302940	6/8/2012	White Pass and Yukon Route RR	Pullen Creek	59.45739	-135.30873	Red	1	Culvert gradient red, Outfall height red
10302949	6/7/2012	White Pass Yukon Route RR	Pullen Creek	59.45236	-135.3158	Red	3	Mechanical damage or joints parting, Constriction ratio red
10302948	6/7/2012	White Pass Yukon Route RR	Dewey Creek	59.45181	-135.31563	Green	2	Culvert is too short, Mechanical damage or joints parting
10303002	6/8/2012	White Pass Yukon Route RR	Pullen Creek	59.45682	-135.30896	Black	–	Dam

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Site ID	Survey Date	Road Name	Stream Name	Latitude	Longitude	Site Rating	Condition Rating	Site Observations
10302969	6/11/2012	Yukon and White Pass RR	Pullen Creek	59.46341	-135.3007	Red	1	Hydraulic flows exceeded capacity, Structural Problem, Culvert is poorly aligned
10302934	6/8/2012	Yukon Route and White Pass RR	Pullen Creek	59.45625	-135.309815	Red	3	Culvert gradient red, Culvert is poorly aligned

Note: En dash denotes no information.

APPENDIX C: FISH COLLECTION EFFORT AND OBSERVATIONS

Appendix C1.–Fish collection effort, observations, and AWC nominations for the communities of Gustavus, Haines, Juneau, Sitka, and Skagway.

Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302213	Auke Bay tributary	Glacier Highway	58.37858	-134.71495	Yes	Yes	Dolly Varden	No	–
10302207	MB Creek	Back Loop Road	58.3922	-134.63556	Yes	No	–	No	Unidentified fish observed
10302199	Casa Del Sol tributary	Sherwood Drive	58.37079	-134.61806	No	No	–	No	Juvenile salmonids observed
10302202	Casa Del Sol tributary	Emmanuel Baptist Church	58.37468	-134.62169	No	No	–	No	Juvenile salmonids observed
10302203	Casa Del Sol tributary	Emmanuel Baptist Church	58.37449	-134.62177	No	No	–	No	Juvenile salmonids observed
10302201	Casa Del Sol tributary	Engineers Cutoff Road	58.37402	-134.62155	No	No	–	No	Juvenile salmonids observed
10302160	Switzer Creek	Egan Drive	58.35649	-134.51527	No	No	–	No	Juvenile salmonids observed
10302163	West Creek	Egan Drive	58.35802	-134.52301	No	No	–	No	Juvenile salmonids observed
10302168	Fish Creek	Fish Creek Road	58.29556	-134.54587	Yes	No	–	No	Juvenile salmonids observed
10302245	Glen's Ditch	Gustavus Airport Access Road	58.41943	-135.68712	No	No	–	No	Juvenile salmonids observed
10302247	Glen's Ditch	Glen's Ditch Road	58.41245	-135.71274	No	No	–	No	Juvenile salmonids observed
10302246	Glen's Ditch	Glen's Ditch Road	58.412664	-135.71271	No	No	–	No	Juvenile salmonids observed
10302239	Cowee Creek tributary	Glacier Highway	58.65012	-134.92123	Yes	Yes	Coho	Yes	–
10302240	Bridget Cove tributary	Glacier Highway	58.61877	-134.93423	No	No	–	No	Juvenile salmonids observed
10302229	Herbert River tributary	Glacier Highway	58.52148	-134.79213	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302237	Favorite Channel tributary	Glacier Highway	58.54035	-134.85071	Yes	Yes	Coho, Dolly Varden, Sculpin	Yes	–
10302215	Lena Cove tributary	Glacier Highway	58.39739	-134.74889	No	No	–	No	Dolly Varden observed
10302210	Auke Creek	Glacier Highway	58.38221	-134.63745	No	No	–	No	Juvenile salmonids observed
10302223	Shrine Creek	Glacier Highway	58.45557	-134.77261	No	No	–	No	Juvenile salmonids observed
10302211	Bay Creek	Glacier Highway	58.38741	-134.64822	No	No	–	No	Juvenile salmonids observed
10302212	Waydelich Creek	Glacier Highway	58.38528	-134.65869	No	No	–	No	Juvenile salmonids observed
10302200	Casa Del Sol tributary	Glacier Highway	58.37418	-134.62111	No	No	–	No	Juvenile salmonids observed
10302224	Strawberry Creek side channel	Glacier Highway	58.50625	-134.77419	No	No	–	No	Juvenile salmonids observed
10302214	Picnic Creek	Glacier Highway	58.38876	-134.74419	No	No	–	No	Juvenile salmonids observed
10302220	Strawberry Creek tributary	Glacier Highway	58.50261	-134.76881	No	No	–	No	Juvenile salmonids observed
10302186	Duck Creek	Driveway adjacent to Glacier H	58.364322	-134.588583	No	No	–	No	Carcasses
10302187	Duck Creek	Mendenhall Loop Road	58.36477	-134.589279	No	No	–	No	Carcasses
10302189	Duck Creek	Glacier Highway	58.365047	-134.589703	No	No	–	No	Carcasses
10302190	Duck Creek	Glacier Highway	58.366456	-134.590716	No	No	–	No	Unidentified adults

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302257	Good River	Good River Road	58.41273	-135.76134	No	No	–	No	Unidentified fish observed
10302248	Glen's Ditch tributary	Gustavus Road	58.41502	-135.71565	No	No	–	No	Juvenile salmonids observed
10302231	Herbert River tributary	Herbert River Road	58.52069	-134.7939	No	No	–	No	Juvenile salmonids observed
10302227	Herbert River tributary	Herbert River Road	58.53052	-134.78473	Yes	Yes	Dolly Varden, Coho, Stickleback	Yes	–
10302193	Montana Creek side channel	Montana Creek Road	58.41445	-134.61026	No	No	–	No	Juvenile salmonids observed
10302169	Steep Creek tributary	Glacier Spur Road	58.41444	-134.54607	No	No	–	No	Juvenile salmonids observed
10302171	Mendenhall River tributary	Glacier Spur Road	58.40808	-134.54712	No	No	–	No	Juvenile salmonids observed
10302250	Good River	Lukes Drive	58.41309	-135.75533	No	No	–	No	Juvenile salmonids observed
10302253	Good River	Mountain View Road	58.41994	-135.75589	No	No	–	No	Juvenile salmonids observed
10302266	Good River drainage	Mountain View Road	58.450261	-135.793058	No	No	–	No	Juvenile salmonids observed
10302192	Unnamed	North Douglas Highway	58.323236	-134.607189	Yes	No	–	No	–
10302158	Neilson Creek	North Douglas Highway	58.3317	-134.49957	No	No	–	No	Juvenile salmonids observed
10302165	Hendrickson Creek	North Douglas Highway	58.33865	-134.52521	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302156	Falls Creek	North Douglas Highway	58.32307	-134.48219	No	No	–	No	Juvenile salmonids observed
10302217	Picnic Creek	Picnic Beach Road	58.39279	-134.75055	No	No	–	No	Juvenile salmonids observed
10302164	DOT Creek	Egan Drive	58.3581	-134.52515	No	No	–	No	Juvenile salmonids observed
10302218	Tee Harbor tributary	Chilkat Road	58.41106	-134.75774	No	No	–	No	Adults observed
10302157	Vanderbilt Creek	Vanderbilt Road	58.34561	-134.49933	No	No	–	No	Juvenile salmonids observed
10302191	Mendenhall Lake tributary	Skater Cabin Road	58.41699	-134.59096	No	No	–	No	Juvenile salmonids observed
10302198	Casa Del Sol tributary	Sherwood Drive	58.37132	-134.61694	No	No	–	No	Juvenile salmonids observed
10302161	East Creek	Schinder Drive	58.36118	-134.5186	Yes	Yes	Dolly Varden	Yes	–
10302162	West Creek -DOT	Lupine Drive	58.35961	-134.52292	Yes	Yes	Dolly Varden	Yes	–
10302262	Good River tributary	Tong Road	58.42736	-135.77742	No	No	–	No	Juvenile salmonids observed
10302244	Unnamed	Wilson Road	58.43981	-135.67612	No	No	–	No	Sticklebacks observed
10302243	Unnamed	Wilson Road, drive adjacent	58.43984	-135.67397	No	No	–	No	Juvenile salmonids observed
10302241	Rink Creek	Wilson Road	58.43685	-135.64516	No	No	–	No	Juvenile salmonids observed
10302249	Airport Ditch	Wilson Road	58.44124	-135.73212	No	No	–	No	Juvenile salmonids observed
10302858	Sawmill Creek tributary	Allen Road	59.23709	-135.45789	No	No	–	No	Cutthroat Trout observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302897	Sawmill Creek tributary	AML Driveway-off Union St	59.23787	-135.45645	No	No	–	No	Unidentified Fish observed
10302973	Jordan Creek	Airport	58.35709	-134.57405	No	No	–	No	Juvenile salmonids observed
10303018	Wrinkleneck Creek	Baranof Road	57.05575	-135.33113	No	No	–	No	Juvenile salmonids observed
10302878	39 Mile Creek	Border Patrol Subdivision	59.43686	-136.32079	No	No	–	No	Juvenile salmonids observed
10303024	Casa del Sol Creek	Crazy Horse Road	58.36602	-134.61705	No	No	–	No	Juvenile salmonids observed
10302909	Sawmill Creek tributary	DOT Yard	59.23616	-135.4552	No	No	–	No	Juvenile salmonids observed
10302976	Peterson Hill Creek	Engineer's Cutoff Road	58.37078	-134.62506	No	No	–	No	Juvenile salmonids observed
10303044	Unnamed	Egan Drive	58.35853	-134.54889	No	No	–	No	Juvenile salmonids observed
10303048	East Creek	Egan Drive	58.35806	-134.51927	No	No	–	Yes	Adult chum salmon observed
10303013	Starrigavin Creek tributary	Estuary Loop	57.12933	-135.36133	No	No	–	No	Juvenile salmonids observed
10302824	Tsirku River tributary	Farm Road	59.37566	-135.93922	No	No	–	No	Juvenile salmonids observed
10302975	Jordan Creek	Glacier Highway	58.36262	-134.58142	No	No	–	No	Juvenile salmonids observed
10302933	Peterson Creek tributary	Glacier Highway	58.49536	-134.77103	No	No	–	No	Juvenile salmonids observed
10302977	Peterson Creek tributary	Glacier Highway	58.4936	-134.77243	No	No	–	No	Juvenile salmonids observed
10302979	Peterson Creek tributary	Glacier Highway	58.49202	-134.77281	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302980	Peterson Creek tributary	Glacier Highway	58.49014	-134.77321	No	No	–	No	Juvenile salmonids observed
10302981	Peterson Creek tributary	Glacier Highway	58.48953	-134.77443	No	No	–	No	Juvenile salmonids observed
10302987	Peterson Creek tributary	Glacier Highway	58.48281	-134.78096	No	No	–	No	Juvenile salmonids observed
10303042	Unnamed	Glacier Highway	58.35905	-134.54869	No	No	–	No	Juvenile salmonids observed
10303041	East Creek	Glacier Highway	58.35883	-134.51985	No	No	–	No	Juvenile salmonids observed
10303049	Casa del Sol Creek tributary	Casa del Sol	58.37176	-134.6122	No	No	–	No	Unidentified Fish observed
10302978	Peterson Creek tributary	Glacier Highway	58.49536	-134.77103	No	No	–	No	Juvenile salmonids observed
10302837	Chilkat River tributary	Haines Airport Ramp C	59.24492	-135.52728	No	No	–	No	Juvenile salmonids observed
10302833	Chilkat River tributary	Haines Airport Taxiway	59.24524	-135.52544	No	No	–	No	Juvenile salmonids observed
10302836	Chilkat River tributary	Haines Airport Ramp E	59.24258	-135.51337	No	No	–	No	Juvenile salmonids observed
10302840	40 Mile Creek	Haines Highway	59.44801	-136.3539	No	No	–	No	Unidentified Fish observed
10302864	37 Mile Creek	Haines Highway	59.43433	-136.23651	No	No	–	No	Juvenile salmonids observed
10302865	Klehini River tributary	Haines Highway	59.43313	-136.22891	No	No	–	No	Juvenile salmonids observed
10302915	8.5 Mile Creek	Haines Highway	59.26975	-135.64398	No	No	–	Yes	Adult pinks salmon observed
10302913	10 Mile Creek	Haines Highway	59.28496	-135.68188	No	No	–	Yes	Adult pinks salmon observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302869	Horse Farm Creek	Haines Highway	59.36593	-135.80023	No	No	–	Yes	Adult pinks salmon observed
10302868	17 Mile Creek	Haines Highway	59.36025	-135.78931	No	No	–	Yes	Adult pinks salmon observed
10302925	26 Mile Creek	Haines Highway	59.41379	-135.99294	Yes	Yes	Coho	Yes	–
10302923	Chilkat River tributary	Haines Highway	59.38041	-135.8391	Yes	Yes	Coho	Yes	–
10302823	Chilkat River tributary	Haines Highway	59.3396	-135.75763	No	No	–	No	Juvenile salmonids observed
10302931	Chilkat River tributary	Haines Highway	59.33325	-135.74791	No	No	–	No	Juvenile salmonids observed
10302822	Chilkat River tributary	Haines Highway	59.314	-135.72865	No	No	–	No	Adult pinks salmon observed
10302821	Thirteen Mile Creek	Haines Highway	59.31376	-135.72446	No	No	–	Yes	Juvenile salmonids observed
10302885	Chilkat River tributary	Haines Highway	59.30099	-135.70799	No	No	–	No	Juvenile salmonids observed
10302883	Chilkat River tributary	Haines Highway	59.27979	-135.67085	No	No	–	No	Juvenile salmonids observed
10302879	Chilkat River tributary	Haines Highway	59.26674	-135.62581	No	No	–	No	Juvenile salmonids observed
10302876	Seven Mile Creek	Haines Highway	59.26601	-135.59525	Yes	Yes	Coho	Yes	–
10302874	Chilkat River tributary	Haines Highway	59.26581	-135.59236	No	No	–	No	Juvenile salmonids observed
10302873	Chilkat River tributary	Haines Highway	59.26491	-135.59027	No	No	–	No	Juvenile salmonids observed
10302871	6 Mile Creek	Haines Highway	59.2625	-135.57962	No	No	–	No	Juvenile salmonids observed
10302881	Chilkat River tributary	Haines Highway	59.25763	-135.55345	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302890	Chilkat River tributary	Haines Highway	59.25509	-135.54546	No	No	–	No	Juvenile salmonids observed
10302841	Chilkat River tributary	Haines Highway	59.24311	-135.50584	No	No	–	No	Juvenile salmonids observed
10302839	Chilkat River tributary	Haines Highway	59.24284	-135.49496	No	No	–	No	Juvenile salmonids observed
10302860	Chilkat River tributary	Driveway off Haines Highway	59.24287	-135.49422	No	No	–	No	Juvenile salmonids observed
10302857	Chilkat River tributary	Haines Highway	59.24293	-135.49028	No	No	–	No	Juvenile salmonids observed
10302845	Chilkat River tributary	Haines Highway	59.23902	-135.47403	No	No	–	No	Juvenile salmonids observed
10303012	Unnamed	Harbor Mountain Road	57.09166	-135.38316	No	No	–	No	Dolly Varden observed
10302180	Jordan Creek	Egan Drive	58.36593	-134.57743	No	No	–	No	Juvenile salmonids observed
10302855	Kelsall River tributary	Kelsall Road	59.5381	-136.10092	Yes	Yes	Cutthroat Trout	No	–
10302856	Kelsall River tributary	Kelsall Road	59.53791	-136.0997	Yes	Yes	Dolly Varden	Yes	–
10302859	Chilkat River tributary	Kelsall Road	59.49085	-136.06276	Yes	Yes	Coho	Yes	–
10302921	Chilkat River tributary	Kelsall Road	59.52393	-136.09207	Yes	No	–	no	–
10302918	Chilkat River tributary	Kelsall Road	59.51196	-136.0905	Yes	No	–	no	–
10302920	Chilkat River tributary	Kelsall Road	59.50322	-136.07655	Yes	No	–	no	–
10302917	Chilkat River tributary	Kelsall Road	59.4875	-136.06091	No	No	–	No	Juvenile salmonids observed
10303034	Arrowhead Creek	Lake Street	57.05845	-135.33604	No	No	–	No	Cutthroat trout observed
10303050	Lake 2 Creek	Mendenhall Loop Road	58.39363	-134.62566	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302827	Mosquito Lake tributary	Unnamed Road	59.44646	-136.0298	Yes	No	–	No	–
10303017	Wrinkleneck Creek	Monastery Street	57.05563	-135.33345	No	No	–	No	Juvenile salmonids observed
10302166	Hendrickson Creek tributary	North Douglas Highway	58.33878	-134.52774	No	No	–	no	Juvenile salmonids observed
10302993	Starrigavin Creek tributary	Nelson Logging Road	57.12601	-135.34547	No	No	–	no	Juvenile salmonids observed
10303028	Starrigavin Creek tributary	Nelson Logging Road	57.12725	-135.35689	Yes	No	–	no	–
10303033	Starrigavin Creek tributary	Nelson Logging Road	57.12755	-135.35657	Yes	No	–	no	–
10302831	Sawmill Creek tributary	New Sawmill Road	59.23734	-135.4705	No	No	–	no	Juvenile salmonids observed
10302928	Sawmill Creek tributary	Driveway on New Sawmill Road	59.23741	-135.47	No	No	–	no	Juvenile salmonids observed
10302927	Sawmill Creek tributary	Driveway on New Sawmill Road	59.23762	-135.46968	No	No	–	no	Juvenile salmonids observed
10302942	Nelson Slough	Old Dyea Road	59.50814	-135.36003	Yes	No	–	no	–
10302826	Cave Creek	Porcupine Road	59.41693	-136.11258	Yes	Yes	Coho	Yes	–
10302930	14 Mile Creek	Haines Highway	59.32722	-135.74129	No	No	–	No	Juvenile salmonids observed
10303000	Indian River		57.05387	-135.31487	No	No	–	No	Juvenile salmonids observed
10303001	Peterson Creek tributary	Flood Control Dam	57.06358	-135.34421	No	No	–	No	Juvenile salmonids observed
10302842	Sawmill Creek	Sawmill Road	59.23423	-135.47423	No	No	–	No	Juvenile salmonids observed

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Site ID	Stream Name	Road Name	Latitude	Longitude	Site Trapped?	Fish Caught?	Species Caught	Nominated to AWC	Fish Observed?
10302912	Onemile Creek	Small Tracts Road	59.21045	-135.43735	No	No	–	No	Juvenile salmonids observed
10302849	Sawmill Creek tributary	Unnamed Road	59.23915	-135.46654	No	No	–	No	Juvenile salmonids observed
10302848	Sawmill Creek tributary	Unnamed road	59.23915	-135.46494	No	No	–	No	Juvenile salmonids observed
10302929	Chilkat River tributary	Unnamed road off Haines Hwy	59.41149	-135.95798	No	No	–	No	Juvenile salmonids observed
10302847	Chilkat River tributary	Unnamed road	59.23795	-135.47732	No	No	–	No	Juvenile salmonids observed
10302844	Sawmill Creek tributary	Union Street	59.23777	-135.45232	No	No	–	No	Juvenile salmonids observed
10302867	Sawmill Creek tributary	Union Street	59.23783	-135.45439	No	No	–	No	Juvenile salmonids observed
10302895	Sawmill Creek tributary	Union Street	59.23641	-135.45917	No	No	–	No	Juvenile salmonids observed
10303025	Vanderbilt Creek	Egan Drive	58.3458	-134.50079	No	No	–	No	Juvenile salmonids observed
10303026	Vanderbilt Creek	Vanderbilt Hill Road	58.35114	-134.49155	No	No	–	No	Juvenile salmonids observed
10302972	Jordan Creek	Yandunkin Drive	58.35833	-134.57486	No	No	–	No	Juvenile salmonids observed

Note: En dash denotes no information.