CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE



STREAM INVENTORY REPORT

Duck Pond Gulch

INTRODUCTION

A stream inventory was conducted from June 14 to June 21, 2016, on Duck Pond Gulch. The survey began at the confluence with Albion River and extended upstream 1.6 miles.

The Duck Pond Gulch inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Duck Pond Gulch. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Duck Pond Gulch is a tributary to Albion River which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Duck Pond Gulch's legal description at the confluence with Albion River is T16N R17W S14. Its location is 39.2462° north latitude and 123.7151° west longitude, LLID number 1237140392463. Duck Pond Gulch is a first order stream and has approximately 1.6 miles of blue line stream according to the USGS Elk 7.5 minute quadrangle. Duck Pond Gulch drains a watershed of approximately 0.7 square miles. Elevations range from about 19 feet at the mouth of the creek to 622 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 1 to Little River Airport Road, south of Fort Bragg.

METHODS

The habitat inventory conducted in Duck Pond Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 1998). The Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and

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embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Duck Pond Gulch to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Water and air temperatures are measured and recorded at every tenth habitat unit using a handheld thermometer. Both temperatures are taken in degrees Fahrenheit and the time of the measurement is also recorded. Air temperatures are recorded within one foot of the water surface, while water temperatures are recorded (where possible) in flowing water within the habitat unit.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Duck Pond Gulch habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Duck Pond Gulch, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5

was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Duck Pond Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Duck Pond Gulch, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Duck Pond Gulch, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Duck Pond Gulch. In addition, underwater mask and snorkel observations were made at 10 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Duck Pond Gulch include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type

• Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED IN APPENDIX I *

The habitat inventory of June 14 to June 21, 2016, was conducted by Ryan Bernstein, Alejandra Camacho, and Nicole Bejar (WSP). The total length of the stream surveyed was 5,308 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.073 cfs on June 21, 2016.

Duck Pond Gulch is a G4 channel type for the entire 5,308 feet of the stream surveyed. G2 channels are entrenched "gully" step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51° to 55° Fahrenheit. Air temperatures ranged from 53° to 73° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 25% flatwater units, 23% riffle units, and 7% dry units (Graph 1). Based on total length of Level II habitat types there were 45% pool units, 27% flatwater units, 8% unsurveyed marsh units, 11% riffle units, and 8% dry units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 42%; run units, 23%; and low gradient riffle units, 23% (Graph 3). Based on percent total length, mid-channel pool units made up 43%, run units 21%, and low gradient riffle units 10%.

A total of 97 pools were identified (Table 3). Main channel pools were the most frequently encountered at 99% (Graph 4), and comprised 99% of the total length of all pools (Table 3). Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twelve of the 95 pools (13%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 96 pool tail-outs measured, 52 had a value of 1 (54.2%); 16 had a value of 2 (16.7%); 10 had a value of 3 (10.4%); 18 had a value of 5 (18.8%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 12, scour pools had a mean shelter rating of 60 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Duck Pond Gulch. Graph 7 describes the pool cover in Duck Pond Gulch. Undercut

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banks are the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 80% of pool tail-outs. A silt/clay substrate type was the next most frequently observed in 12% of pool tail-outs.

The mean percent canopy density for the surveyed length of Duck Pond Gulch was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 31% and 69%, respectively. Graph 9 describes the mean percent canopy in Duck Pond Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 98% sand/silt/clay and 2% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 57% of the units surveyed. Additionally, 26% of the units surveyed had deciduous trees as the dominant vegetation type, and 13% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at 10 sites for species composition and distribution in Duck Pond Gulch on September 14, 2016. The sites were sampled by Brian Starks and Chad Moura (CDFW).

The survey sites yielded 1 unknown fish species, 1 Rough-skinned newt, and 1 red-legged frog.

Date	Survey	Habitat	Habitat	Approx. Dist. from	Steell	nead Ti	rout	Coh Salm	io ion	Additional Aquatic Species
	Site #	Unit #	Туре	mouth (ft.)	YOY	1+	2+	YOY	1+	Observed
G4 Channe	l Type									
9/14/16	1	007	Run	152	0	0	0	0	0	
	2	009	Pool	602	0	0	0	0	0	
	3	012	Pool	620	0	0	0	0	0	
	4	014	Pool	667	0	0	0	0	0	1 unknown fish, 1 Rough-skinned newt
	5	016	Pool	749	0	0	0	0	0	
	6	017	Pool	764	0	0	0	0	0	
	7	019	Pool	796	0	0	0	0	0	1 red-legged frog
	8	026	Pool	880	0	0	0	0	0	
	9	027	Pool	894	0	0	0	0	0	
	10	028	Pool	909	0	0	0	0	0	

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DISCUSSION

Duck Pond Gulch is a G4 channel type for the entire 5,308 feet of the stream surveyed. The suitability of G4 channel types for fish habitat improvement structures is as follows: G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 14 to June 21, 2016, ranged from 51° to 55° Fahrenheit. Air temperatures ranged from 53° to 73° Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 27% of the total length of this survey, riffles 11%, and pools 45%. Twelve of the 95 (13%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channels width. Installing structures that will increase or deepen pool habitat is recommended.

Sixty-eight of the 96 pool tail-outs measured had embeddedness ratings of 1 or 2. Ten of the pool tail-outs had embeddedness ratings of 3 or 4. Eighteen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Seventy-nine of the 95 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 12. The shelter rating in the flatwater habitats is 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Duck Pond Gulch. Undercut banks are the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 98%. The percentage of right and left bank covered with vegetation was 100% and 100%, respectively.

RECOMMENDATIONS

Duck Pond Gulch should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this

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stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in Duck Pond Gulch. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

- 1) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from undercut banks. Adding high quality complexity with woody cover in the pools is desirable.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft.):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with Albion River.
152	0007.00	Un-surveyable marsh approximately 440' long.
1577	0063.05	Water flows subsurface.
1577	0064.00	Substrate is all clay.
1755	0070.00	There is subsurface water feeding into the main channel and side channel.
1829	0074.00	Stream no longer entrenched.
1957	0082.00	There is a 1' plunge.
2242	0091.00	There are wooden planks from an old bridge in the stream.
3016	0118.00	Channel is very entrenched, 2' wide.
3096	0121.00	This marks the start of a marshy area, it stretches until Habitat Unit (HU) #126.
3232	0128.00	This section of the stream has a very low gradient with occasional deeper pool sections.

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3362	0129.00	Log debris accumulation (LDA) #3 contains 3 pieces of large woody debris (LWD) and measures 6.5' high x 12'wide x 4' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment is gravel sized and above the LDA. measures 9' wide x 7' long x 6' deep. Fish were not observed.
3661	0144.00	There was a 2' plunge into a pool. 5' of erosion present.
3779	0151.00	Dry unit surrounding LDA. LDA #2 contains 3 pieces of LWD and measures 6' high x 9' wide x 7' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment is gravel sized and measures 6' wide x 7' long x 2' deep. Fish were not observed above the LDA.
3798	0152.00	There is a 3' plunge into a 1.5' deep pool.
4354.3	0179.00	LDA #3 contains 4 pieces of LWD and measures 4.5' high x 7' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment is gravel sized and measures 6' wide x 12' long x 1.5' deep. Fish not observed above the LDA.
5138.3	0217.00	End of survey due to dry creek bed.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE Low Gradient Riffle High Gradient Riffle	(LGR) (HGR)	[1.1] [1.2]	$\{1\}$ $\{2\}$
CASCADE Cascade Bedrock Sheet	(CAS) (BRS)	[2.1] [2.2]	{ 3} {24}
FLATWATER Pocket Water Glide Run Step Run Edgewater	(POW) (GLD) (RUN) (SRN) (EDW)	[3.1] [3.2] [3.3] [3.4] [3.5]	{21} {14} {15} {16} {18}
MAIN CHANNEL POOLS Trench Pool Mid-Channel Pool Channel Confluence Pool Step Pool	(TRP) (MCP) (CCP) (STP)	[4.1] [4.2] [4.3] [4.4]	{ 8 } {17} {19} {23}
SCOUR POOLS Corner Pool Lateral Scour Pool - Log Enhanced Lateral Scour Pool - Root Wad Enhanced Lateral Scour Pool - Bedrock Formed Lateral Scour Pool - Boulder Formed Plunge Pool	(CRP) (LSL) (LSR) (LSBk) (LSBo) (PLP)	[5.1] [5.2] [5.3] [5.4] [5.5] [5.6]	<pre>{22} {10} {11} {11} {12} {20} {9}</pre>
BACKWATER POOLS Secondary Channel Pool Backwater Pool - Boulder Formed Backwater Pool - Root Wad Formed Backwater Pool - Log Formed Dammed Pool	(SCP) (BPB) (BPR) (BPL) (DPL)	[6.1] [6.2] [6.3] [6.4] [6.5]	{ 4 } { 5 } { 6 } { 7 } { 13 }
ADDITIONAL UNIT DESIGNATIONS Dry Culvert Not Surveyed Not Surveyed due to a marsh	(DRY) (CUL) (NS) (MAR)	[7.0] [8.0] [9.0] [9.1]	



Coordinate System: NOD 1920 California Teal a Johana Data Sources: CDF W, USGS, California Teal a Johana Data Sources: CDF W, USGS, California Teal a Johana *River Mile indicates distance from confluence with Albion River

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APPENDIX I

TABLES AND GRAPHS

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Duck Pond Gulch

Survey Dates: 6/14/2016 to 6/21/2016

Confluence Location: Quad: ELK Legal Description: T16NR17WS13 Latitude: 39:14:47.0N Longitude: 123:42:50.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
15	1	DRY	6.8	28	418	7.9	3.5	0.0		53	788				0
56	8	FLATWATER	25.2	26	1449	27.3	4.6	0.5	0.9	204	11449	147	8233		5
1	0	NOSURVEY	0.5	39	39	0.7									
1	0	NOSURVEY_	0.5	440	440	8.3									
97	95	POOL	43.7	25	2389.3	45.0	5.1	0.6	1.4	131	12744	106	10250	88	12
52	5	RIFFLE	23.4	11	573	10.8	3.2	0.1	0.2	36	1873	3	167		0
Total Units	Total U Fully Me	Jnits asured		To	tal Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)	9	

LLID: 1237140392463

222 109

(ft.) 5308.3 (sq.ft.) 26853

18650

Drainage: Albion River

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Duck Pond Gulch

Survey Dates: 6/14/2016 to 6/21/2016

Confluence Location: Quad: ELK

Legal Description: T16NR17WS13 Latitude: 39:14:47.0N Longitude: 123:42:50.0W

LLID: 1237140392463

Drainage: Albion River

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
51	5	LGR	23.0	10	518	9.8	3	0.1	0.3	36	1837	3	164		0	99
1	0	HGR	0.5	55	55	1.0										
50	5	RUN	22.5	23	1127	21.2	5	0.5	1.7	218	10906	198	9878		6	98
6	3	SRN	2.7	54	322	6.1	4	0.3	1	182	1090	63	377		0	100
94	93	MCP	42.3	24	2286	43.1	5	0.6	3.8	128	12072	100	9402	83	12	98
2	1	STP	0.9	38	77	1.5	8	0.4	1.2	225	450	113	225	90	5	100
1	1	PLP	0.5	26	26	0.5	12	1.8	3.6	312	312	624	624	562	60	100
15	1	DRY	6.8	28	418	7.9	4	0.0		53	788				0	100
1	0	NS	0.5	39	39	0.7										
1	0	MAR	0.5	440	440	8.3										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)	
222	109	5308.3	27455	20670	

Table 3 - Summary of Pool Types

Stream Name: Duck Pond Gulch								LLID: 123714	0392463	Drainage:	Albion Rive	er	
Survey D	ates: 6/14/20	016 to 6/21/201	6										
Confluen	ce Location:	Quad: ELK		Legal D	Description:	T16NR17WS13 I		Latitude: 39:14:47.0N		Longitude:	123:42:50.0W		
Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
96	94	MAIN	99	25	2363	99	5.0	0.6	129	12428	83	7919	12
1	1	SCOUR	1	26	26	1	12.0	1.8	312	312	562	562	60

Total	Total Units	Total Length	Total Area	Total Volume	
Units	Fully Measured	(ft.)	(sq.ft.)	(cu.ft.)	
97	95	2389.3	12740	8481	

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Duck Pond Gulch

LLID: 1237140392463 Drainage: Albion River

>= 4 Feet

Percent

Occurrence

Survey Dates: 6/14/2016 to 6/21/2016

Confluence Location: Quad: ELK Legal Description: T16NR17WS13 Latitude: 39:14:47.0N Longitude: 123:42:50.0W Habitat Habitat Habitat < 1 Foot < 1 Foot 1 < 2 Feet 1 < 2 Feet 2 < 3 Feet 2 < 3 Feet 3 < 4 Feet 3 < 4 Feet >= 4 Feet Units Type Occurrence Maximum Percent Maximum Percent Maximum Percent Maximum Percent Maximum (%) Residual Occurrence Residual Occurrence Residual Occurrence Residual Occurrence Residual

		Depth			Depth		Depth		Depth		Depth	
93	MCP	98	14	15	68	73	9	10	2	2	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
1	PLP	1	0	0	0	0	0	0	1	100	0	0

Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Units	< 1 Foot	< 1 Foot	1< 2 Foot	1< 2 Foot	2< 3 Foot	2< 3 Foot	3< 4 Foot	3< 4 Foot	>= 4 Foot	>= 4 Foot
	Max Resid.	% Occurrence								
	Depth		Depth		Depth		Depth		Depth	
95	14	15	69	73	9	9	3	3	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Duck Pond Gulch

LLID: 1237140392463

Drainage: Albion River

Survey Dates: 6/14/2016 to 6/21/2016

Dry Units: 15

Confluence	e Location:	Quad: ELK	Legal Descri	ption: T16NR	17WS13		Latitude: 39:14:4	47.0N	Longitude:	123:42:50.0W	
Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
51	11	LGR	0	0	0	0	0	0	0	0	0
52	11	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
50	13	RUN	12	22	22	0	44	0	0	0	0
6	3	SRN	0	0	0	0	0	0	0	0	0
56	16	TOTAL FLAT	17	17	16	0	50	0	0	0	0
94	92	МСР	44	23	30	2	1	0	0	0	0
2	1	STP	0	100	0	0	0	0	0	0	0
1	1	PLP	50	0	20	0	0	0	30	0	0
97	94	TOTAL POOL	43	25	29	1	2	0	0	0	0
1	0	NS									
1	0	MAR									
222	124	TOTAL	42	24	30	2	2	0	0	0	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Duck Pond Gulch LLID: 1237140392463						Drainage:	Albion River		
Survey Dates: 6/14/2016 to 6/21/2016 Dry Units: 15									
Confluence Location: Quad: ELK		Legal Des	Legal Description: T16NR17WS13 Latitude: 39:14:47.0N				123:42:50.0W		
Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
51	5	LGR	0	0	100	0	0	0	0
1	0	HGR	0	0	0	0	0	0	0
50	6	RUN	83	0	17	0	0	0	0
6	3	SRN	67	0	33	0	0	0	0
94	93	MCP	61	0	38	0	0	0	1
2	1	STP	100	0	0	0	0	0	0
1	1	PLP	100	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name	: Duck Pond Gu	llch				LLID: 1237140392463	Drainage:	Albion River
Survey Dates:	6/14/2016 to 6	/21/2016						
Confluence Lo	ocation: Quad:	ELK	Legal	Description:	T16NR17WS13	Latitude: 39:14:47.0N	Longitude:	123:42:50.0W
Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	: Mean Left Bank % Cover			
98	69	31	0	100	100			

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Duck Pond Gulch		LLID: 1237140392463	Drainage: Albion River
Survey Dates: 6/14/2016 to 6/21/2016	Survey Length (ft.): 5308.3	Main Channel (ft.): 5148.3	Side Channel (ft.): 160
Confluence Location: Quad: ELK	Legal Description: T16NR17W	/S13 Latitude: 39:14:47.0N	Longitude: 123:42:50.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1		
Channel Type: G4	Canopy Density (%): 98.0	Pools by Stream Length (%): 45.0
Reach Length (ft.): 5148.3	Coniferous Component (%): 69.3	Pool Frequency (%): 43.7
Riffle/Flatwater Mean Width (ft.): 4.1	Hardwood Component (%): 30.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 87
Range (ft.): 4 to 12	Vegetative Cover (%): 100.0	2 to 2.9 Feet Deep: 9
Mean (ft.): 8	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 3
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 14	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 51 - 55 Air (F): 53 - 73	LWD per 100 ft.:	Mean Pool Shelter Rating: 12
Dry Channel (ft): 418	Riffles: 1	
	Pools: 5	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 12 San Embeddedness Values (%): 1. 54.2 2.	d: 4 Gravel: 80 Sm Cobble: 3 Lg Cobble: 1 16.7 3. 10.4 4. 0.0 5. 18.8	Boulder: 0 Bedrock: 0
1		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Duck Pond Gulch			LLID: 1237140392463	Drainage:	Albion River
Survey Dates: 6/14/2016 to 6/21/2016					
Confluence Location: Quad: ELK	Legal Description:	T16NR17WS13	Latitude: 39:14:47.0N	Longitude:	123:42:50.0W

2

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	1	0	0.5
Boulder	0	0	0.0
Cobble / Gravel	3	1	1.8
Sand / Silt / Clay	107	110	97.7

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	5	5	4.5
Brush	17	11	12.6
Hardwood Trees	31	27	26.1
Coniferous Trees	58	68	56.8
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

Quad: ELK

Stream Name: Duck Pond Gulch

LLID: 1237140392463

Drainage: Albion River

Survey Dates: 6/14/2016 to 6/21/2016

Confluence Location:	
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Legal Description: T16NR17WS13

Latitude: 39:14:47.0N

Longitude: 123:42:50.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	17	43
SMALL WOODY DEBRIS (%)	0	17	25
LARGE WOODY DEBRIS (%)	0	16	30
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	0	50	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

DUCK POND GULCH 2016 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

DUCK POND GULCH 2016 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

DUCK POND GULCH 2016 HABITAT TYPES BY PERCENT OCCURRENCE



DUCK POND GULCH 2016 POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

DUCK POND GULCH 2016 MAXIMUM DEPTH IN POOLS



GRAPH 5

DUCK POND GULCH 2016 PERCENT EMBEDDEDNESS





DUCK POND GULCH 2016 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

DUCK POND GULCH 2016 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



DUCK POND GULCH 2016 MEAN PERCENT CANOPY





DUCK POND GULCH 2016 DOMINANT BANK COMPOSITION IN SURVEY REACH



DUCK POND GULCH 2016 DOMINANT BANK VEGETATION IN SURVEY REACH

