

# **STREAM INVENTORY REPORT**

## **Donnelly Gulch**

### **INTRODUCTION**

A stream inventory was conducted on July 3, 2007 on Donnelly Gulch. The survey began at the confluence with Big Salmon Creek and extended upstream 0.4 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Donnelly Gulch.

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**

Donnelly Gulch is a tributary to Big Salmon Creek, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Donnelly Gulch's legal description at the confluence with Big Salmon Creek is T16N R16W S32. Its location is 39.2034 north latitude and 123.6652 west longitude, LLID number 1236640392033. Donnelly Gulch is a first order stream and has approximately 0.88 miles of blue line stream according to the USGS Elk 7.5 minute quadrangle. Donnelly Gulch drains a watershed of approximately 0.79 square miles. Elevations range from about 220 feet at the mouth of the creek to 900 feet in the headwater areas. Redwood conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via Albion Ridge Road.

### **METHODS**

The habitat inventory conducted in Donnelly Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries (PSMFC) Fisheries Technicians and Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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 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.

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### 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 Donnelly 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:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

#### 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". Donnelly 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 Donnelly Gulch, embeddedness was ocularly 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 unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

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### 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 Donnelly 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 Donnelly 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 Donnelly 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.

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### **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.

## **DATA ANALYSIS**

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. 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 Donnelly 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

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### HABITAT INVENTORY RESULTS

\* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT \*

The habitat inventory of July 3, 2007, was conducted by C. Navarro (WSP) and M. Reneski (PSMFC). The total length of the stream surveyed was 1,984 feet.

Stream flow was not measured on Donnelly Gulch.

Donnelly Gulch is a G4 channel type for 1,369 feet of the stream surveyed (Reach 1), and an A3 channel type for 615 feet of the stream surveyed (Reach 2). G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 58 degrees Fahrenheit. Air temperatures ranged from 59 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 30% flatwater units, 20% riffle units, and 6% dry units, (Graph 1). Based on total length of Level II habitat types there were 46% flatwater units, 32% pool units, 19% riffle units, and 2% dry units, (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 22%; low gradient riffle units, 20%; and mid-channel pool units, 20% (Graph 3). Based on percent total length, step run units made up 37%, low gradient riffle units 19%, and mid-channel pool units 16%.

A total of 22 pools were identified (Table 3). Main channel pools were the most frequently encountered at 50% (Graph 4), and comprised 66% 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. Two of the 22 pools (9%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 22 pool tail-outs measured, 7 had a value of 1 (31.8%); 7 had a value of 2 (31.8%); 3 had a value of 3 (13.6%); 3 had a value of 4 (13.6%); 2 had a value of 5 (9.1%) (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 unsuited 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 13, and pool habitats had a mean

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shelter rating of 31 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 58. Scour pools had a mean shelter rating of 43. Main channel pools had a mean shelter rating of 16 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Donnelly Gulch. Graph 7 describes the pool cover in Donnelly Gulch. Undercut banks are the dominant pool cover type followed by small 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 64% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Donnelly Gulch was 93%. Seven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 29% and 71%, respectively. Graph 9 describes the mean percent canopy in Donnelly Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 85%. The mean percent left bank vegetated was 86%. The dominant elements composing the structure of the stream banks consisted of 100% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 69% of the units surveyed. Additionally, 16% of the units surveyed had brush as the dominant vegetation type, and 10% had grass as the dominant vegetation type (Graph 11).

## **DISCUSSION**

Donnelly Gulch is a G4 channel type for the first 1,369 feet of stream surveyed and an A3 channel type for the remaining 615 feet. The suitability of G4 and A3 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. A3 channel types are generally not suitable for fish habitat improvement structures due to the high gradient.

The water temperatures recorded on the survey day of July 3, 2007, ranged from 54 to 58 degrees Fahrenheit. Air temperatures ranged from 59 to 66 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 46% of the total length of this survey, riffles 19%, and pools 32%. 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 channel width. Installing large wood structures that will increase or deepen pool habitat is recommended.

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Fourteen of the 22 pool tail-outs measured had embeddedness ratings of 1 or 2. Six of the pool tail-outs had embeddedness ratings of 3 or 4. Two 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.

Twenty of the 22 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 was 31. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Donnelly Gulch. Undercut banks are the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 93%. Reach 1 had a canopy density of 93.4%, Reach 2 had a canopy density of 93.1%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 85% and 86%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## **RECOMMENDATIONS**

- 1) Donnelly Gulch should be managed as an anadromous, natural production stream.
- 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.
- 3) 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.

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### 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 confluence with Big Salmon Creek.
	0018.00	Tributary #01 enters on the right bank. The (estimated) flow is less than 0.1 cfs. The water temperature downstream of the tributary is 56 degrees Fahrenheit, the water temperature of the tributary is 55 degrees Fahrenheit, and the water temperature upstream of the confluence is 56 degrees Fahrenheit. The slope of the tributary is 6% and fish are not observed in the 200 feet explored. The tributary is dry for about 50'.
1369	0031.00	The channel type changes from G4 to A3.
1379	0032.00	A coho salmon young-of-the-year (YOY) was positively identified.
1587	0037.00	Log debris accumulation (LDA) #01 contains 2 pieces of large woody debris (LWD) and measures 2.7' high x 15' wide x 6.5' long. Water flows through visible gaps. Retained sediment ranges from gravel to cobble and measures 6' wide x 4.5' long x 1.5' deep. Fish are present above the LDA.
1600	0038.00	This is the last observation of salmonids in the within the survey reach. Steelhead YOY and a coho YOY were observed to this point in the survey.
1860	0046.00	LDA #02 contains two pieces of LWD and measures 4' high x 11' wide x 3' long. Water flows through, though there are no visible gaps. Retained sediment ranges from fines to gravel and measures 7' wide x 10' long x 2' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
1915	0048.00	LDA #03 contains one piece of LWD and measures 3.5' high x 7.5' wide x 4' long. Water flows through though there are no visible gaps. Retained sediment ranges from sand to gravel and measures 8' wide x 4' long x 1.6' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
1984	0050.00	End of survey.



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### **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.

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### LEVEL III and LEVEL IV HABITAT TYPES

#### RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

#### CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

#### FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

#### MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

#### SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

#### BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

#### ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

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
3	0	DRY	6.0	15	45	2.3									
15	6	FLATWATER	30.0	61	917	46.2	7.0	0.4	0.7	343	5143	155	2327		13
22	22	POOL	44.0	29	637	32.1	7.2	0.8	1.4	184	4044	172	3787	139	31
10	3	RIFFLE	20.0	38	385	19.4	6.5	0.2	0.5	70	696	16	162		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
50	31				1984					9883			6276		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

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 (%)
10	3	LGR	20.0	38	385	19.4	6	0.2	1	70	696	16	162		0	95
4	2	RUN	8.0	47	187	9.4	8	0.4	0.9	329	1315	152	606		3	96
11	4	SRN	22.0	66	730	36.8	7	0.4	1.1	350	3849	157	1726		18	94
10	10	MCP	20.0	32	322	16.2	8	0.8	1.8	221	2210	207	2074	173	15	94
1	1	STP	2.0	96	96	4.8	4	0.4	1.6	384	384	230	230	154	25	98
5	5	LSL	10.0	21	105	5.3	6	0.8	2	130	650	130	651	101	54	90
3	3	LSBk	6.0	18	55	2.8	8	0.9	2.2	124	372	125	375	100	23	91
3	3	BPL	6.0	20	59	3.0	8	0.9	1.8	143	429	152	457	121	58	93
3	0	DRY	6.0	15	45	2.3										91

Total Units  
50

Total Units Fully Measured  
31

Total Length (ft.)  
1984

Total Area (sq.ft.)  
9904

Total Volume (cu.ft.)  
6281

Table 3 - Summary of Pool Types

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

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
11	11	MAIN	50	38	418	66	7.2	0.8	236	2594	171	1882	16
8	8	SCOUR	36	20	160	25	7.1	0.8	128	1022	101	807	43
3	3	BACKWATER	14	20	59	9	7.8	0.9	143	429	121	362	58
Total Units	Total Units Fully Measured				Total Length (ft.)				Total Area (sq.ft.)			Total Volume (cu.ft.)	
22	22				637				4044			3050	

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

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
10	MCP	45	1	10	9	90	0	0	0	0	0	0
1	STP	5	0	0	1	100	0	0	0	0	0	0
5	LSL	23	0	0	4	80	1	20	0	0	0	0
3	LSBk	14	0	0	2	67	1	33	0	0	0	0
3	BPL	14	0	0	3	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
22	1	5	19	86	2	9	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Dry Units: 3

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

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
10	3	LGR	0	0	0	0	0	0	0	0	0
10	3	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
4	2	RUN	0	100	0	0	0	0	0	0	0
11	4	SRN	0	55	45	0	0	0	0	0	0
15	6	TOTAL FLAT	0	70	30	0	0	0	0	0	0
10	10	MCP	64	22	12	0	2	0	0	0	0
1	1	STP	60	10	10	0	0	0	0	0	20
5	5	LSL	20	32	48	0	0	0	0	0	0
3	3	LSBk	45	10	20	0	5	0	0	0	20
3	3	BPL	27	60	13	0	0	0	0	0	0
22	22	TOTAL POOL	45	28	22	0	1	0	0	0	3
50	31	TOTAL	40	34	23	0	1	0	0	0	3

**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Dry Units: 3

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

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
10	10	LGR	0	0	80	20	0	0	0
4	4	RUN	0	50	50	0	0	0	0
11	11	SRN	0	9	73	18	0	0	0
10	10	MCP	10	20	60	10	0	0	0
1	1	STP	0	0	0	0	0	0	100
5	5	LSL	0	20	80	0	0	0	0
3	3	LSBk	0	0	0	0	0	0	100
3	3	BPL	67	0	33	0	0	0	0



**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
93	71	29	0	85	86

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: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Survey Length (ft.): 1984

Main Channel (ft.): 1984

Side Channel (ft.): 0

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G4

Reach Length (ft.): 1369

Riffle/Flatwater Mean Width (ft.): 6.6

BFW:

Range (ft.): 9 to 12

Mean (ft.): 10

Std. Dev.: 1

Base Flow (cfs.): 0.0

Water (F): 54 - 56

Air (F): 59 - 63

Dry Channel (ft): 0

Canopy Density (%): 93.4

Coniferous Component (%): 73.8

Hardwood Component (%): 26.3

Dominant Bank Vegetation: Hardwood Trees

Vegetative Cover (%): 89.3

Dominant Shelter: Small Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 10

LWD per 100 ft.:

Riffles: 0

Pools: 3

Flat: 0

Pools by Stream Length (%): 26.0

Pool Frequency (%): 43.3

Residual Pool Depth (%):

< 2 Feet Deep: 92

2 to 2.9 Feet Deep: 8

3 to 3.9 Feet Deep: 0

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 1.4

Mean Pool Shelter Rating: 25

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 0

Gravel: 77

Sm Cobble: 23

Lg Cobble: 0

Boulder: 0

Bedrock: 0

Embeddedness Values (%): 1. 46.2

2. 30.8

3. 15.4

4. 7.7

5. 0.0

STREAM REACH: 2

Channel Type: A3

Reach Length (ft.): 615

Riffle/Flatwater Mean Width (ft.): 7.8

BFW:

Range (ft.): 8 to 9

Mean (ft.): 8

Std. Dev.: 1

Base Flow (cfs.): 0.0

Water (F): 58 - 58

Air (F): 64 - 66

Dry Channel (ft): 45

Canopy Density (%): 93.1

Coniferous Component (%): 66.3

Hardwood Component (%): 33.8

Dominant Bank Vegetation: Hardwood Trees

Vegetative Cover (%): 79.5

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 30

LWD per 100 ft.:

Riffles: 0

Pools: 5

Flat: 7

Pools by Stream Length (%): 45.7

Pool Frequency (%): 45.0

Residual Pool Depth (%):

< 2 Feet Deep: 89

2 to 2.9 Feet Deep: 11

3 to 3.9 Feet Deep: 0

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 1.5

Mean Pool Shelter Rating: 41

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 0

Gravel: 44

Sm Cobble: 33

Lg Cobble: 0

Boulder: 0

Bedrock: 22

Embeddedness Values (%): 1. 11.1

2. 33.3

3. 11.1

4. 22.2

5. 22.2

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

Latitude: 39:12:12.0N

Longitude: 123:39:50.0W

**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	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	35	35	100.0

**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	2	5	10.0
Brush	5	6	15.7
Hardwood Trees	27	21	68.6
Coniferous Trees	1	3	5.7
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Donnelly Gulch

LLID: 1236640392033

Drainage: Albion River

Survey Dates: 7/3/2007 to 7/3/2007

Confluence Location: Quad: ELK

Legal Description: T16NR16WS32

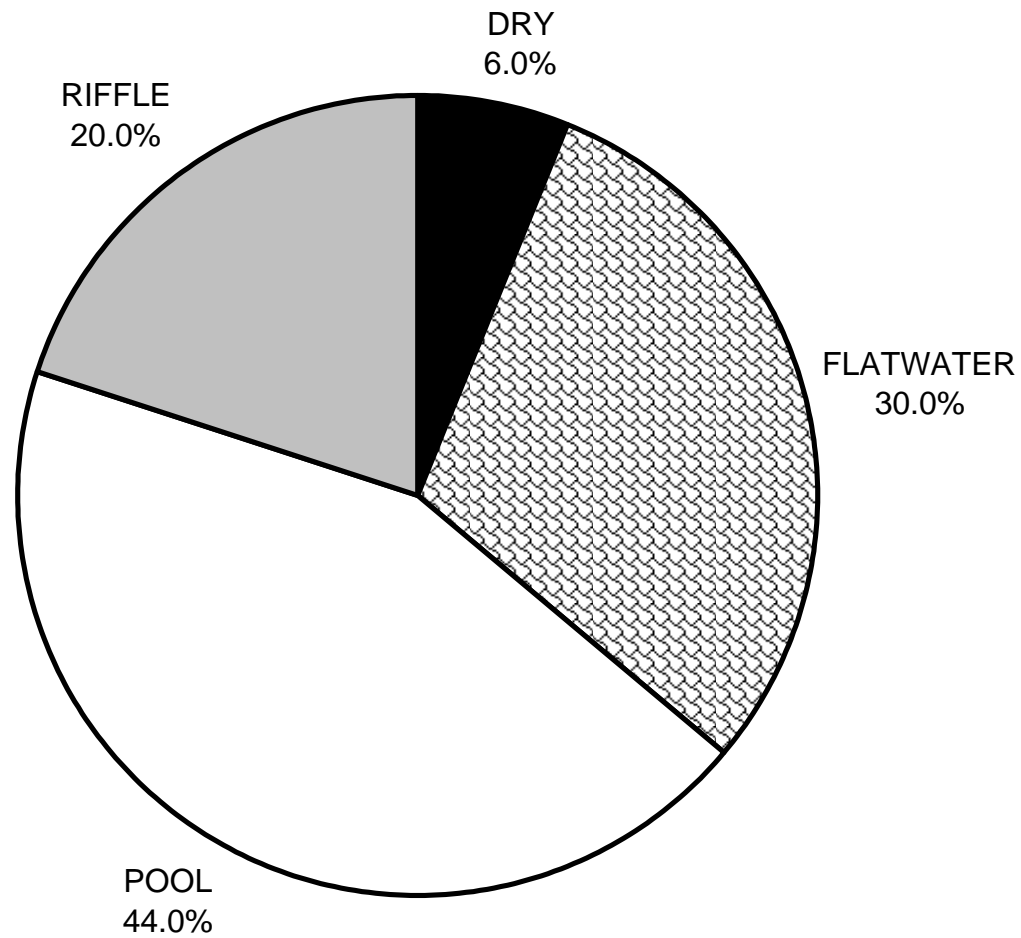
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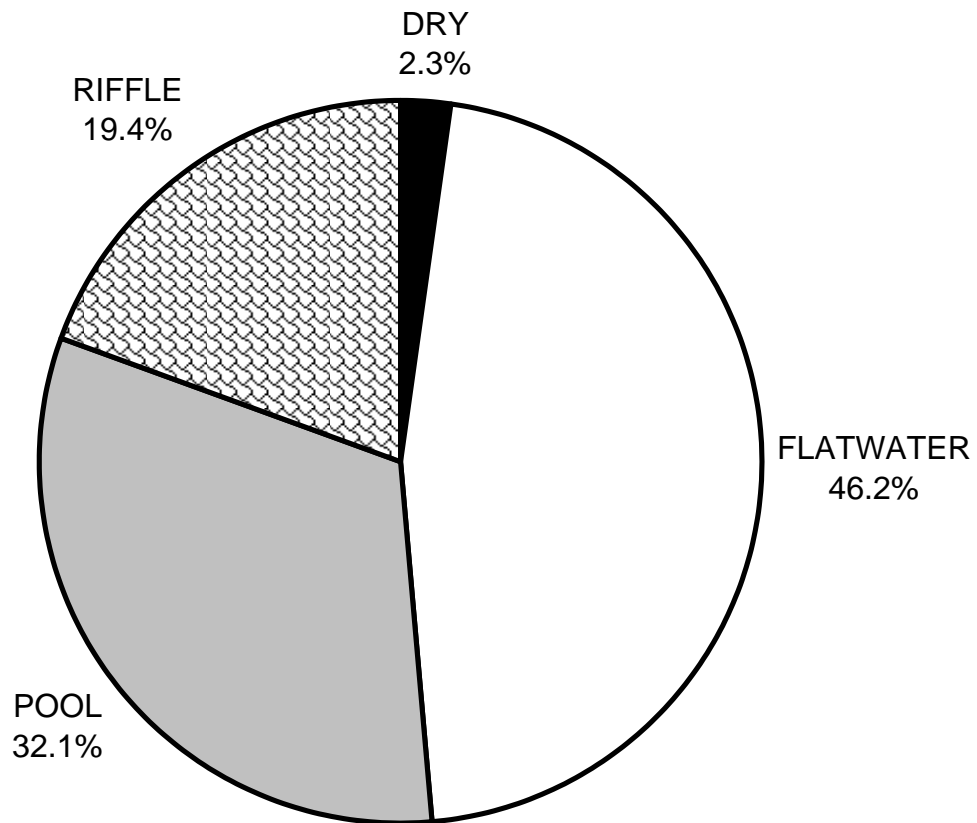
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
<hr/>			
UNDERCUT BANKS (%)	0	0	45
SMALL WOODY DEBRIS (%)	0	70	28
LARGE WOODY DEBRIS (%)	0	30	22
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	0	0	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	3

**DONNELLY GULCH 2007**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

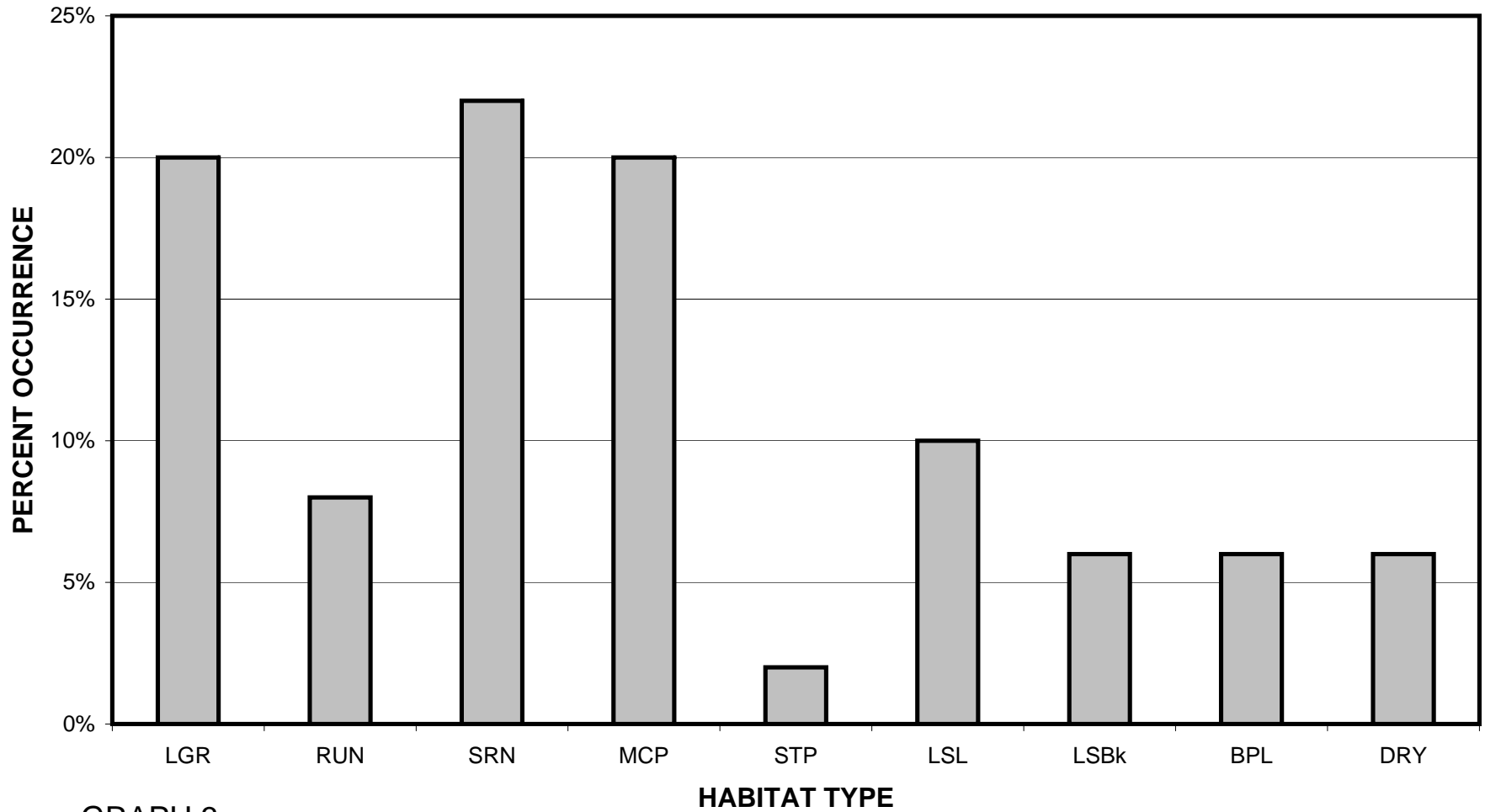
**DONNELLY GULCH 2007**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

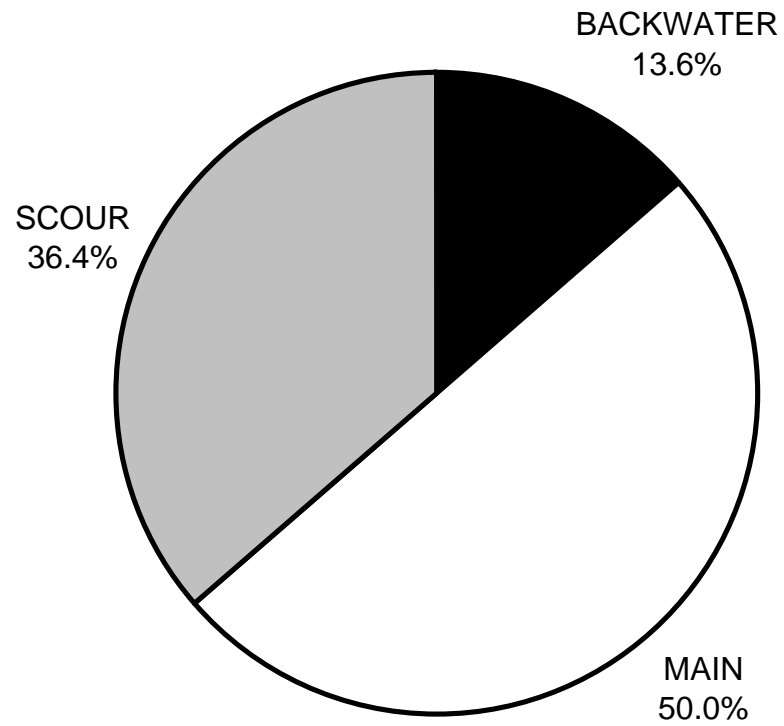
# DONNELLY GULCH 2007

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

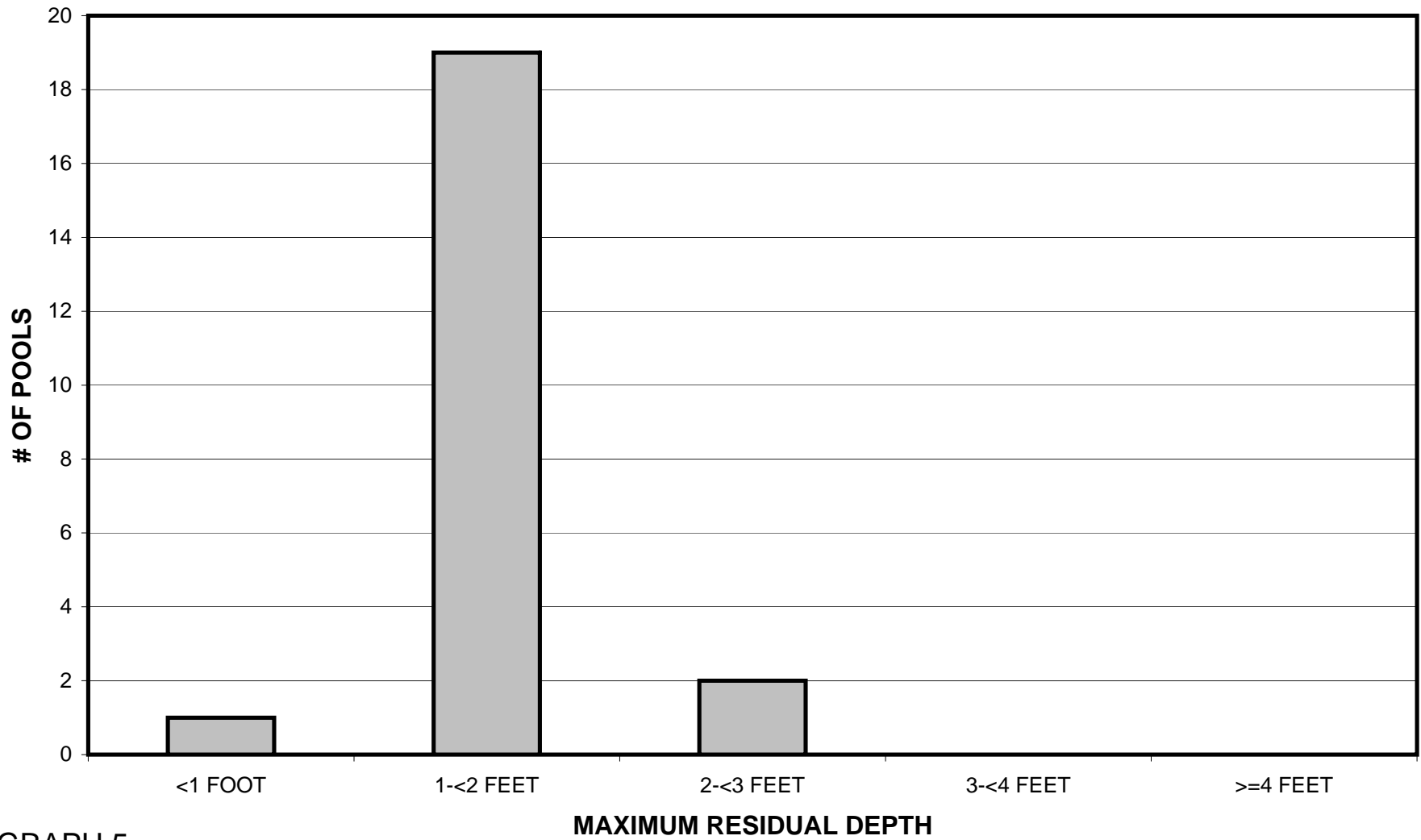
**DONNELLY GULCH 2007**  
**POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

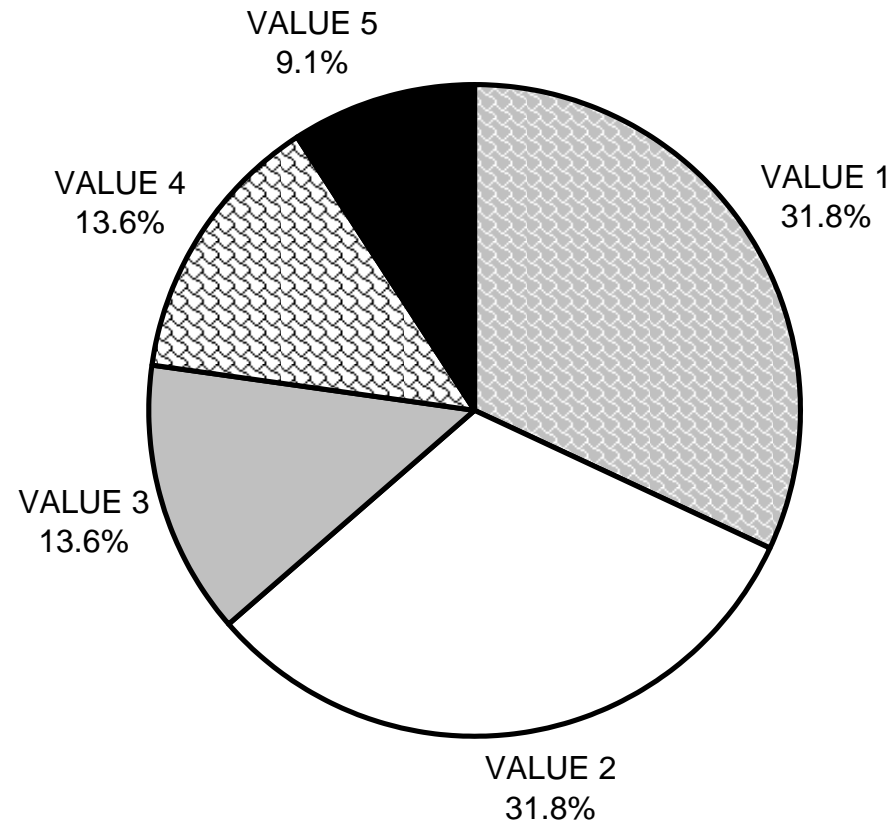


# DONNELLY GULCH 2007 MAXIMUM DEPTH IN POOLS



GRAPH 5

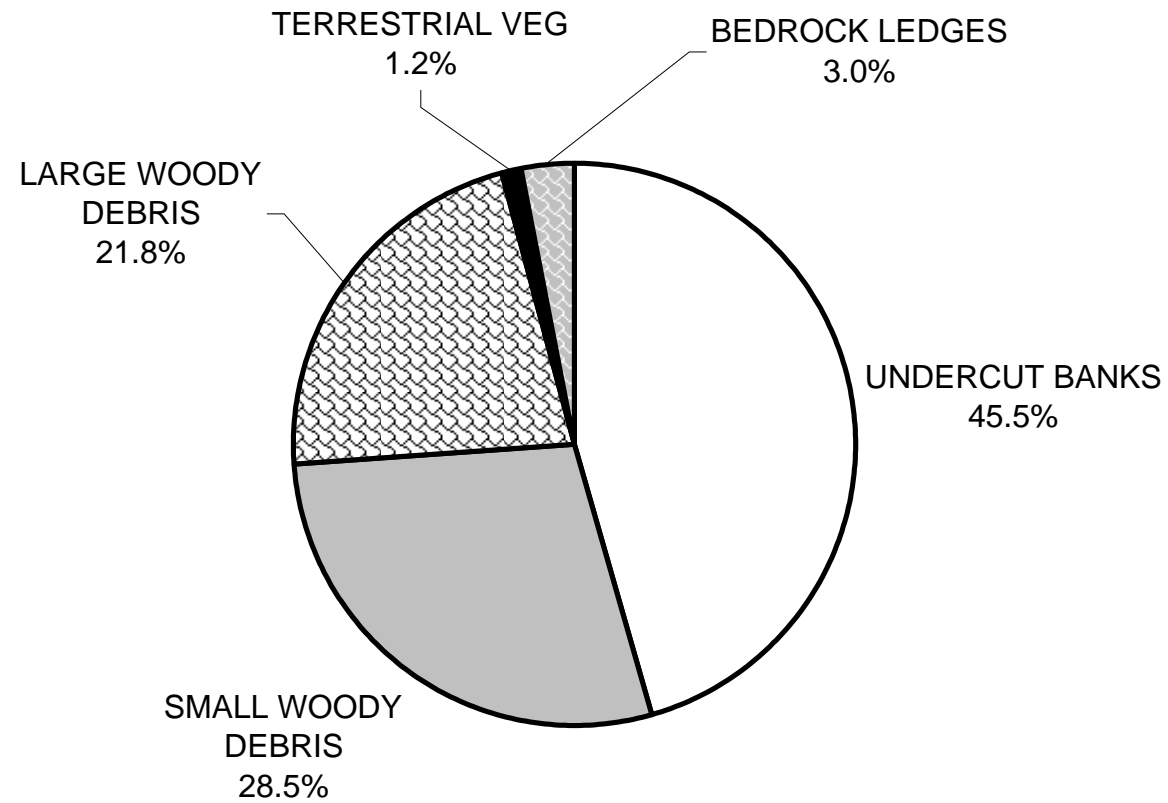
# DONNELLY GULCH 2007 PERCENT EMBEDDEDNESS



GRAPH 6

# DONNELLY GULCH 2007

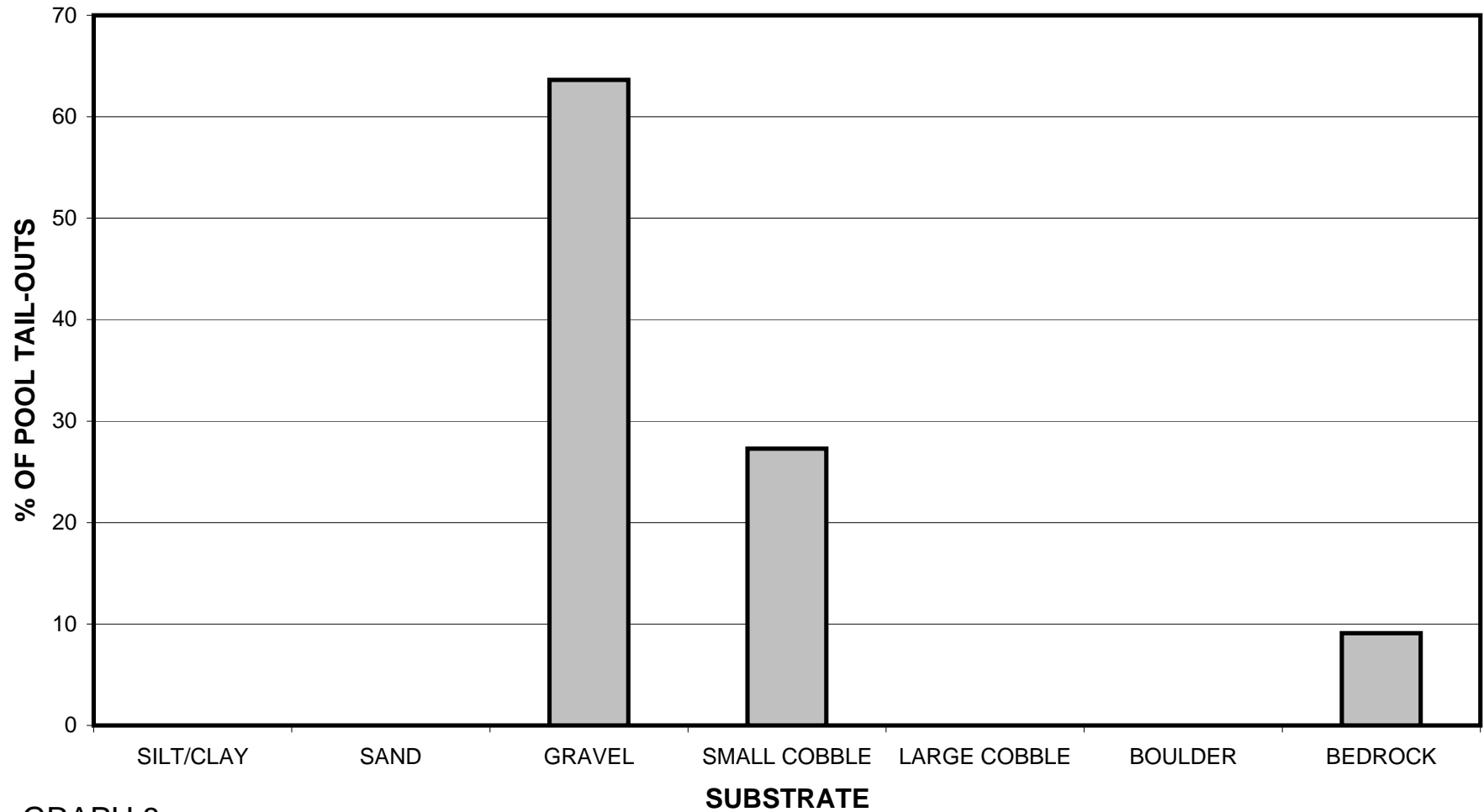
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

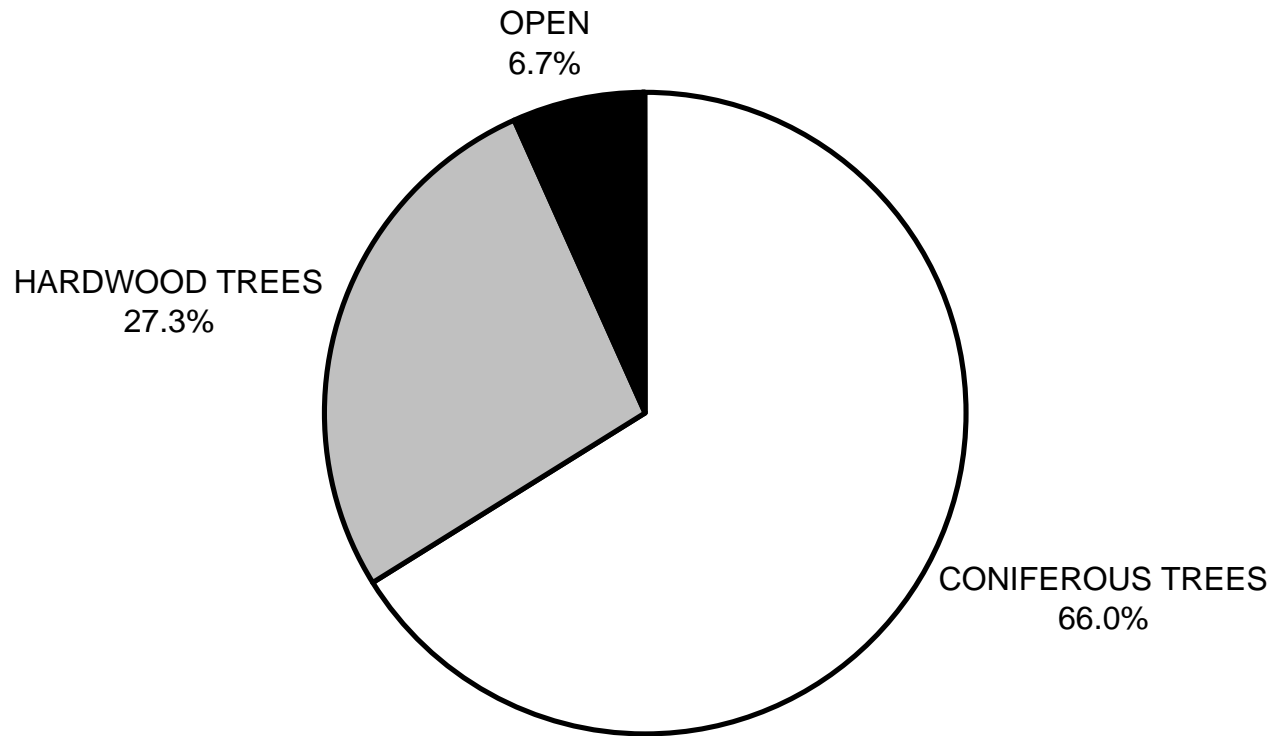
# DONNELLY GULCH 2007

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



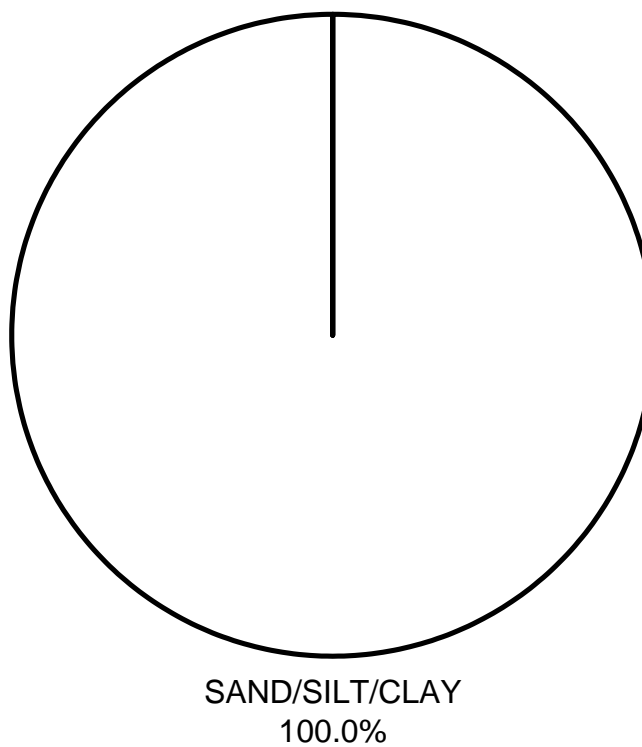
GRAPH 8

**DONNELLY GULCH 2007  
MEAN PERCENT CANOPY**



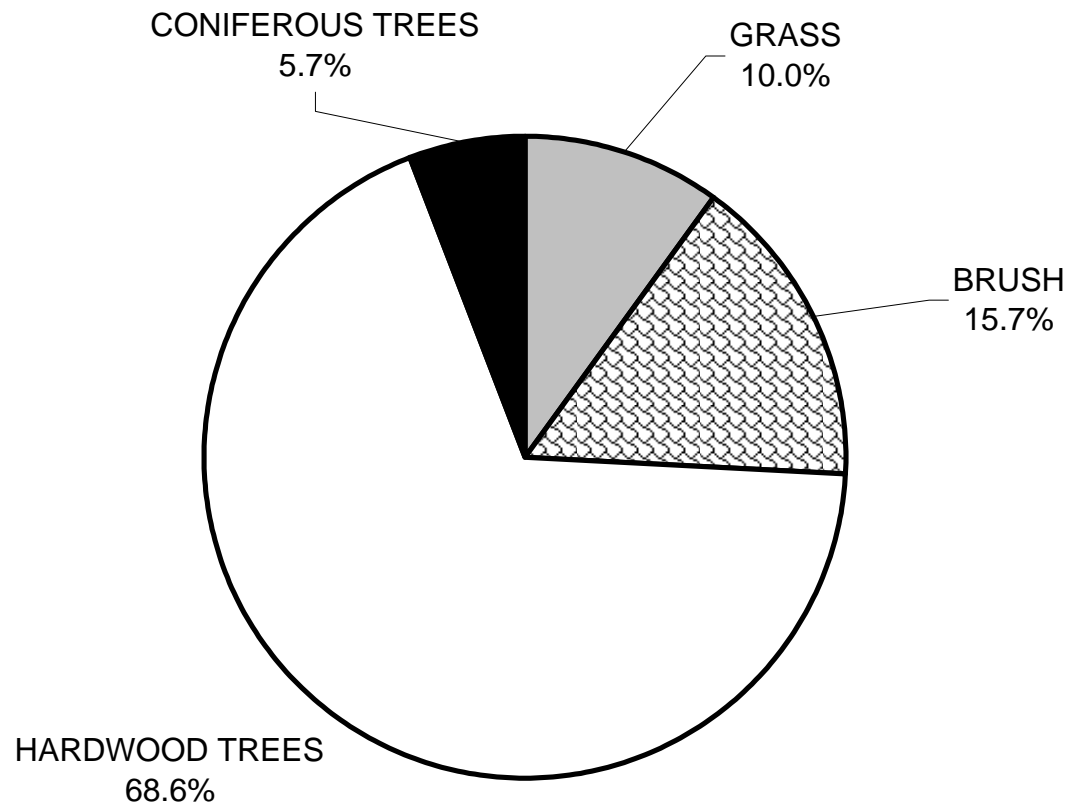
GRAPH 9

**DONNELLY GULCH 2007**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**DONNELLY GULCH 2007**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

**Map 1**  
**Donnelly Gulch**  
**Big Salmon Creek Watershed**  
**Elk Quad, Mendocino County**

Start of Survey

End of Survey

**Legend**

- Reach 1, G4 Channel Type
- Reach 2, A3 Channel Type

0 1,000 2,000 Feet

Reach lengths are approximate.

