# STREAM INVENTORY REPORT

## Abalobadiah Creek

### INTRODUCTION

A stream inventory was conducted from July 16 to July 21, 2008 on Abalobadiah Creek. The survey began at the confluence with Pacific Ocean and extended upstream 2.3 miles. Stream inventories and reports were also completed for three tributaries to Abalobadiah Creek.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Abalobadiah Creek.

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

Abalobadiah Creek is a tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Abalobadiah Creek's legal description at the confluence with Pacific Ocean is T20N R17W S28. Its location is 39.5655 north latitude and 123.7661 west longitude, LLID number 1237660395655. Abalobadiah Creek is a second order stream and has approximately 3.0 miles of blue line stream according to the USGS Inglenook 7.5 minute quadrangle. Abalobadiah Creek drains a watershed of approximately 3.1 square miles. Elevations range from about 0 feet at the mouth of the creek to 800 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is primarily privately owned and is managed for residential use, timber production, and rangeland. Vehicle access exists via Highway 1 north of Forth Bragg.

### METHODS

The habitat inventory conducted in Abalobadiah Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians 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.

## 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 Abalobadiah Creek 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". Abalobadiah Creek 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 Abalobadiah Creek, 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.

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 Abalobadiah Creek, 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 Abalobadiah Creek, 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 Abalobadiah Creek, 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.

## 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 Abalobadiah Creek 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 AT THE END OF THE REPORT *

The habitat inventory of July 16 to July 21, 2008, was conducted by D. Wright and W. Holloway (PSMFC). The total length of the stream surveyed was 12,215 feet with an additional 22 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.1 cfs.

Abalobadiah Creek is a B4 channel type for 12,215 feet of the stream surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 61 degrees Fahrenheit. Air temperatures ranged from 59 to 69 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 48% pool units, 40% flatwater units, 10% riffle units, 1% culvert units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 69% flatwater units, 21% pool units, 6% riffle units, 3% dry units, and 1% culvert units (Graph 2).

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 30%; mid-channel pool units, 24%; and lateral scour pool - log enhanced units 11% (Graph 3). Based on percent total length, step run units made up 62%, mid-channel pool units 11%, and lateral scour pool - log enhanced units 5%.

A total of 101 pools were identified (Table 3). Main channel pools were the most frequently encountered at 60% (Graph 4), and comprised 62% 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. Nineteen of the 100 pools (19%) measured had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 100 pool tail-outs measured, 9 had a value of 1 (9%); 31 had a value of 2 (31%); 45 had a value of 3 (45%); 10 had a value of 4 (10%); 5 had a value of 5 (5%) (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 9, flatwater habitat types had a mean shelter rating of 68, and pool habitats had a mean shelter rating of 55 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 74. Backwater pools had a mean shelter rating of 72 and main channel pools had a mean shelter rating of 44 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Abalobadiah Creek. Graph 7 describes the pool cover in Abalobadiah Creek. Terrestrial vegetation is 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 90% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 6% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Abalobadiah Creek was 91%. Nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 72% and 28%, respectively. Graph 9 describes the mean percent canopy in Abalobadiah Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 69%. The mean percent left bank vegetated was 69%. The dominant elements composing the structure of the stream banks consisted of 61% sand/silt/clay, 38% cobble/gravel, and 1% boulder (Graph 10). Brush was the dominant vegetation type observed in 69% of the units surveyed. Additionally, 24% of the units surveyed had grass as the dominant vegetation type, and 5% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

## DISCUSSION

Abalobadiah Creek is a B4 channel type for 12,215 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days July 16 to July 21, 2008, ranged from 54 to 61 degrees Fahrenheit. Air temperatures ranged from 59 to 69 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.

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Flatwater habitat types comprised 69% of the total length of this survey, riffles 6%, and pools 21%. Nineteen of the 100 (19%) pools had a maximum residual depth greater than 2 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 channel width. Installing structures that will increase or deepen pool habitat is recommended.

Forty of the 100 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Five 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. Sediment sources in Abalobadiah Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Ninety-three of the 97 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 55. The shelter rating in the flatwater habitats was 68. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by terrestrial vegetation in Abalobadiah Creek. Terrestrial vegetation is 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 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 69% and 69%, 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) Abalobadiah Creek 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) Fish passage at the Highway 1 culvert located at 777 feet needs to be evaluated.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from terrestrial vegetation. Adding high quality complexity with woody cover in the pools is desirable.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

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 Pacific Ocean. |
| 28 | 0002.00 | Log debris accumulation (LDA #1) measured at 4.5' high x 24' wide x 54' long and consists of over 25 pieces of large woody debris (LWD). Water is flowing through the LDA and there were visible gaps. The LDA is retaining sediment that measured 2' high x 20' wide x 25' long and consists of sand and gravel. Fish were seen above the LDA. |
| 139 | 0005.00 | Concrete blocks have fallen into the stream. |
| 292 | 0008.00 | There is a lot of debris in creek. |
| 575 | 0013.00 | There is more debris in this unit which is thick and making the stream hard to walk through. |
| 595 | 0014.00 | There is substantial sediment buildup. |
| 777 | 0020.00 | Highway 1 culvert is in fairly bad condition with most of it filled in with sediment. On the downstream side of the culvert the distance between the streambed to the top of the culvert was 2' with a water depth of 1.4'. At the upstream side of the culvert, the distance between the streambed the top of the culvert is 3.5' with a water depth of 2.8'. A 2++ salmonid is observed. |

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| | | |
|---|---|---|
| 822 | 0021.00 | A culvert is the tail-out. A 2+ salmonid is observed. |
| 936 | 0024.00 | There are a couple debris accumulations retaining small amounts of sediment. There is a human-made dam that is not functioning. |
| 1081 | 0025.00 | There is a pipe leading into the stream. |
| 1221 | 0030.00 | Sediment buildup 15’ wide x 10’ long x 1.5’ high. A barbed wire fence is running across creek. |
| 1351 | 0032.00 | There are signs of cattle including footprints within the riparian area. |
| 1469 | 0033.00 | LDA #2 is 5.5’ high x 21’ wide x 8’ long and consists of 15 pieces of wood. Water flows through visible gaps. The retained sediment measures 2’ high x 17’ wide x 28’ long. The size range of the sediment is silt to gravel. |
| 1491 | 0034.00 | Cattle within riparian area, exposed sediment. |
| 1719 | 0038.00 | There are large amounts of exposed sediment along both banks. |
| 1787 | 0040.00 | A dirt road crosses the creek. |
| 2044 | 0046.00 | There are large amounts of fine sediment and signs of cattle. |
| 2101 | 0048.00 | A dirt road is on the right bank. |
| 2796 | 0058.00 | There is a left bank failure. |
| 2823 | 0060.00 | Dirt road continues along right bank. |
| 2935 | 0064.00 | Left bank failure with a large amount of sediment on the right bank. |
| 3019 | 0067.00 | Cattle in riparian area of stream. There is sediment built up along both banks. There is a left bank failure. |
| 3453 | 0070.00 | There is a right bank failure. |
| 3799 | 0074.00 | Road continues along right bank. |
| 4201 | 0080.00 | Culvert seems to be in good condition. The culvert is 4.5’ up from the stream. The water depth is 0.7’ and the culvert is slightly rusted out on the bottom. |
| 4708 | 0088.00 | There is a right bank failure. |

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|---|---|---|
| 4732 | 0089.00 | Signs of cattle in riparian area. |
| 5178 | 0095.00 | East Branch tributary enters here. |
| 5178 | 0095.00 | Dirt road crosses creek. |
| 5800 | 0100.00 | Cows within riparian area of creek. Salmonid observed. |
| 5800 | 0100.00 | LDA is 4.5’ high x 15’ wide x 8.5’ long and includes 12 pieces of LWD. Water is flowing through but there are no visible gaps. Retained sediment is 22’ wide x 17’ long x 1’ deep. Sediment size range is between sand and small cobble. |
| 5864 | 0102.00 | There is a right bank failure. |
| 6569 | 0118.00 | Salmonid YOY. |
| 6969 | 0122.00 | There is a left bank failure. |
| 7742 | 0134.00 | West Branch tributary enters here. |
| 8590 | 0152.00 | LDA includes 20 pieces of wood and is 5.5’ high x 13’ wide x 25’ long. Water is flowing through visible gaps. The retained sediment is 9’ wide x 22’ long x 3’ deep. Sediment size ranges from sand to gravel. |
| 8701 | 0154.00 | There is a left bank failure. |
| 8722 | 0155.00 | There is a right bank failure. |
| 9171 | 0168.00 | A road along the right bank is collapsing into the stream. |
| 9603 | 0177.00 | Sediment in stream is 12’ high x 20’ long x 2’ high. |
| 9785 | 0180.00 | Gulch One tributary enters here. |
| 10815 | 0192.00 | Dry right bank tributary. |
| 10867 | 0195.00 | The stream is narrowing and there is debris everywhere with fewer fish. |
| 11107 | 0201.00 | There are salmonid YOY in this unit. |
| 11250 | 0202.00 | There is a small LDA retaining small amount of sediment. |
| 11498 | 0205.00 | There is a landslide along the left bank. |
| 11638 | 0206.00 | There is a left bank landslide. |

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| | | |
|---|---|---|
| 11638 | 0206.00 | LDA is 5.5’ high x 15’ wide x 70’ long and includes more than 30 pieces of wood. Water is flowing through but there are no visible gaps. Sediment ranges in size from silt to large cobble. Sediment measured 15’ wide x 75’ long x 5’ deep. No fish were seen above this possible anadromous barrier. |
| 12215 | 0209.00 | End of survey. No fish have been observed since LDA #5 at habitat unit #206. There is a lot of sediment accumulation in the channel and frequent dry units. There is very little water and minimal habitat for salmonids at this point. |

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: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0 | CULVERT | 1.0 | 38 | 75 | 0.6 | | | | | | | | | |
| 3 | 0 | DRY | 1.4 | 129 | 386 | 3.2 | | | | | | | | | |
| 84 | 28 | FLATWATER | 40.0 | 100 | 8441 | 69.0 | 5.2 | 0.4 | 0.9 | 349 | 29318 | 149 | 12545 | | 68 |
| 101 | 101 | POOL | 48.1 | 26 | 2617 | 21.4 | 9.8 | 1.0 | 1.6 | 230 | 23262 | 293 | 29260 | 252 | 55 |
| 20 | 5 | RIFFLE | 9.5 | 36 | 718 | 5.9 | 4.3 | 0.2 | 0.3 | 64 | 1279 | 16 | 328 | | 9 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|---|---|---|---|---|
| 210 | 134 | 12237 | 53859 | 42133 |

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 5 | LGR | 9.0 | 28 | 531 | 4.3 | 4 | 0.2 | 0.4 | 64 | 1215 | 16 | 312 | | 9 | 88 |
| 1 | 0 | HGR | 0.5 | 187 | 187 | 1.5 | | | | | | | | | | 90 |
| 21 | 8 | RUN | 10.0 | 44 | 914 | 7.5 | 6 | 0.4 | 1.1 | 215 | 4523 | 108 | 2264 | | 53 | 95 |
| 63 | 20 | SRN | 30.0 | 119 | 7527 | 61.5 | 5 | 0.4 | 1.8 | 402 | 25356 | 166 | 10456 | | 74 | 91 |
| 51 | 51 | MCP | 24.3 | 27 | 1373 | 11.2 | 9 | 1.0 | 2.8 | 225 | 11500 | 267 | 13371 | 233 | 45 | 93 |
| 9 | 9 | CCP | 4.3 | 23 | 207 | 1.7 | 10 | 1.2 | 3.1 | 199 | 1791 | 295 | 2655 | 252 | 41 | 91 |
| 1 | 1 | STP | 0.5 | 55 | 55 | 0.4 | 6 | 1.0 | 1.2 | 330 | 330 | 396 | 396 | 330 | 15 | 30 |
| 1 | 1 | CRP | 0.5 | 23 | 23 | 0.2 | 12 | 0.7 | 1.1 | 276 | 276 | 276 | 276 | 193 | 20 | 99 |
| 24 | 24 | LSL | 11.4 | 26 | 619 | 5.1 | 11 | 1.0 | 3.1 | 247 | 5940 | 315 | 7567 | 266 | 84 | 90 |
| 4 | 4 | LSR | 1.9 | 32 | 126 | 1.0 | 8 | 1.3 | 2.9 | 199 | 798 | 327 | 1309 | 287 | 48 | 88 |
| 1 | 1 | LSBo | 0.5 | 36 | 36 | 0.3 | 14 | 1.5 | 1.9 | 504 | 504 | 857 | 857 | 756 | 60 | 75 |
| 1 | 1 | PLP | 0.5 | 24 | 24 | 0.2 | 14 | 1.9 | 2.7 | 336 | 336 | 739 | 739 | 638 | 15 | 92 |
| 1 | 1 | BPB | 0.5 | 29 | 29 | 0.2 | 8 | 1.4 | 1.9 | 220 | 220 | 331 | 331 | 309 | 10 | 90 |
| 1 | 1 | BPR | 0.5 | 20 | 20 | 0.2 | 9 | 1.0 | 1.9 | 180 | 180 | 216 | 216 | 180 | 40 | 95 |
| 7 | 7 | BPL | 3.3 | 15 | 105 | 0.9 | 13 | 1.0 | 2.15 | 198 | 1387 | 220 | 1543 | 185 | 86 | 96 |
| 3 | 0 | DRY | 1.4 | 129 | 386 | 3.2 | | | | | | | | | | 97 |
| 2 | 0 | CUL | 1.0 | 38 | 75 | 0.6 | | | | | | | | | | |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|---|---|---|---|---|
| 210 | 134 | 12237 | 54356 | 42291 |

**Table 3 - Summary of Pool Types**

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 61 | MAIN | 60 | 27 | 1635 | 62 | 9.2 | 1.0 | 223 | 13621 | 237 | 13990 | 44 |
| 31 | 31 | SCOUR | 31 | 27 | 828 | 32 | 10.5 | 1.1 | 253 | 7853 | 294 | 9129 | 74 |
| 9 | 9 | BACKWATER | 9 | 17 | 154 | 6 | 11.8 | 1.0 | 199 | 1788 | 198 | 1784 | 72 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|---|---|---|---|---|
| 101 | 101 | 2617 | 23262 | 24903 |

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | MCP | 50 | 2 | 4 | 41 | 82 | 7 | 14 | 0 | 0 | 0 | 0 |
| 9 | CCP | 9 | 0 | 0 | 7 | 78 | 1 | 11 | 1 | 11 | 0 | 0 |
| 1 | STP | 1 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | CRP | 1 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | LSL | 24 | 1 | 4 | 17 | 71 | 5 | 21 | 1 | 4 | 0 | 0 |
| 4 | LSR | 4 | 0 | 0 | 2 | 50 | 2 | 50 | 0 | 0 | 0 | 0 |
| 1 | LSBo | 1 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | PLP | 1 | 0 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 |
| 1 | BPB | 1 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | BPR | 1 | 0 | 0 | 1 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 4 | 4 | 77 | 77 | 17 | 17 | 2 | 2 | 0 | 0 |

Mean Maximum Residual Pool Depth (ft.): 1.6

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | BPL | 7 | 1 | 14 | 5 | 71 | 1 | 14 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 4 | 4 | 77 | 77 | 17 | 17 | 2 | 2 | 0 | 0 |

Mean Maximum Residual Pool Depth (ft.): 1.6

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008 Dry Units: 3

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 4 | LGR | 0 | 10 | 0 | 0 | 70 | 20 | 0 | 0 | 0 |
| 1 | 0 | HGR | | | | | | | | | |
| 20 | 4 | TOTAL RIFFLE | 0 | 10 | 0 | 0 | 70 | 20 | 0 | 0 | 0 |
| 21 | 8 | RUN | 4 | 16 | 3 | 0 | 78 | 0 | 0 | 0 | 0 |
| 63 | 19 | SRN | 4 | 18 | 10 | 0 | 65 | 0 | 0 | 3 | 0 |
| 84 | 27 | TOTAL FLAT | 4 | 18 | 8 | 0 | 69 | 0 | 0 | 2 | 0 |
| 51 | 51 | MCP | 13 | 16 | 7 | 0 | 62 | 3 | 0 | 0 | 0 |
| 9 | 8 | CCP | 43 | 9 | 11 | 0 | 38 | 0 | 0 | 0 | 0 |
| 1 | 1 | STP | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 1 | 1 | CRP | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 24 | 21 | LSL | 3 | 29 | 43 | 0 | 24 | 1 | 0 | 0 | 0 |
| 4 | 3 | LSR | 17 | 7 | 3 | 57 | 7 | 10 | 0 | 0 | 0 |
| 1 | 1 | LSBo | 30 | 10 | 0 | 0 | 30 | 0 | 0 | 30 | 0 |
| 1 | 1 | PLP | 0 | 10 | 60 | 0 | 30 | 0 | 0 | 0 | 0 |
| 1 | 1 | BPB | 70 | 0 | 0 | 0 | 20 | 0 | 0 | 10 | 0 |
| 1 | 1 | BPR | 20 | 30 | 0 | 0 | 10 | 40 | 0 | 0 | 0 |
| 7 | 7 | BPL | 9 | 43 | 33 | 0 | 16 | 0 | 0 | 0 | 0 |
| 101 | 96 | TOTAL POOL | 13 | 20 | 18 | 2 | 45 | 2 | 0 | 0 | 0 |
| 2 | 0 | CUL | | | | | | | | | |
| 210 | 127 | TOTAL | 11 | 19 | 15 | 1 | 51 | 2 | 0 | 1 | 0 |

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008 Dry Units: 3

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 19 | 5 | LGR | 0 | 0 | 80 | 0 | 0 | 20 | 0 |
| 1 | 0 | HGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 8 | RUN | 0 | 13 | 75 | 0 | 0 | 13 | 0 |
| 63 | 20 | SRN | 5 | 15 | 80 | 0 | 0 | 0 | 0 |
| 51 | 51 | MCP | 6 | 22 | 65 | 8 | 0 | 0 | 0 |
| 9 | 9 | CCP | 0 | 56 | 22 | 0 | 11 | 11 | 0 |
| 1 | 1 | STP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 1 | 1 | CRP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 24 | 24 | LSL | 13 | 4 | 79 | 4 | 0 | 0 | 0 |
| 4 | 4 | LSR | 0 | 25 | 75 | 0 | 0 | 0 | 0 |
| 1 | 1 | LSBo | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | PLP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 1 | 1 | BPB | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 1 | 1 | BPR | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 7 | 7 | BPL | 0 | 29 | 57 | 0 | 14 | 0 | 0 |

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Hardwood | Mean Percent Open Units | Mean Right Bank % Cover | Mean Left Bank % Cover |
|---|---|---|---|---|---|
| 91 | 28 | 72 | 0 | 69 | 69 |

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: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008 Survey Length (ft.): 12237 Main Channel (ft.): 12215 Side Channel (ft.): 22

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

## Summary of Fish Habitat Elements By Stream Reach

**STREAM REACH: 1**

Channel Type: B4
Reach Length (ft.): 12215
Riffle/Flatwater Mean Width (ft.): 5.1
BFW:
Range (ft.): 7 to 11
Mean (ft.): 8
Std. Dev.: 1
Base Flow (cfs.): 0.1
Water (F): 54 - 61 Air (F): 59 - 69
Dry Channel (ft): 386

Canopy Density (%): 91.3
Coniferous Component (%): 27.6
Hardwood Component (%): 72.4
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 68.6
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 15
LWD per 100 ft.:
Riffles: 1
Pools: 10
Flat: 2

Pools by Stream Length (%): 21.4
Pool Frequency (%): 48.1
Residual Pool Depth (%):
< 2 Feet Deep: 81
2 to 2.9 Feet Deep: 17
3 to 3.9 Feet Deep: 2
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 55

Pool Tail Substrate (%): Silt/Clay: 1 Sand: 3 Gravel: 90 Sm Cobble: 6 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 9.0 2. 31.0 3. 45.0 4. 10.0 5. 5.0

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

Stream Name: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

**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 | 1 | 0.4 |
| Boulder | 1 | 1 | 0.7 |
| Cobble / Gravel | 46 | 55 | 37.7 |
| Sand / Silt / Clay | 87 | 77 | 61.2 |

**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 | 38 | 27 | 24.3 |
| Brush | 88 | 98 | 69.4 |
| Hardwood Trees | 7 | 7 | 5.2 |
| Coniferous Trees | 1 | 2 | 1.1 |
| No Vegetation | 0 | 0 | 0.0 |

**Total Stream Cobble Embeddedness Values:** 3

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

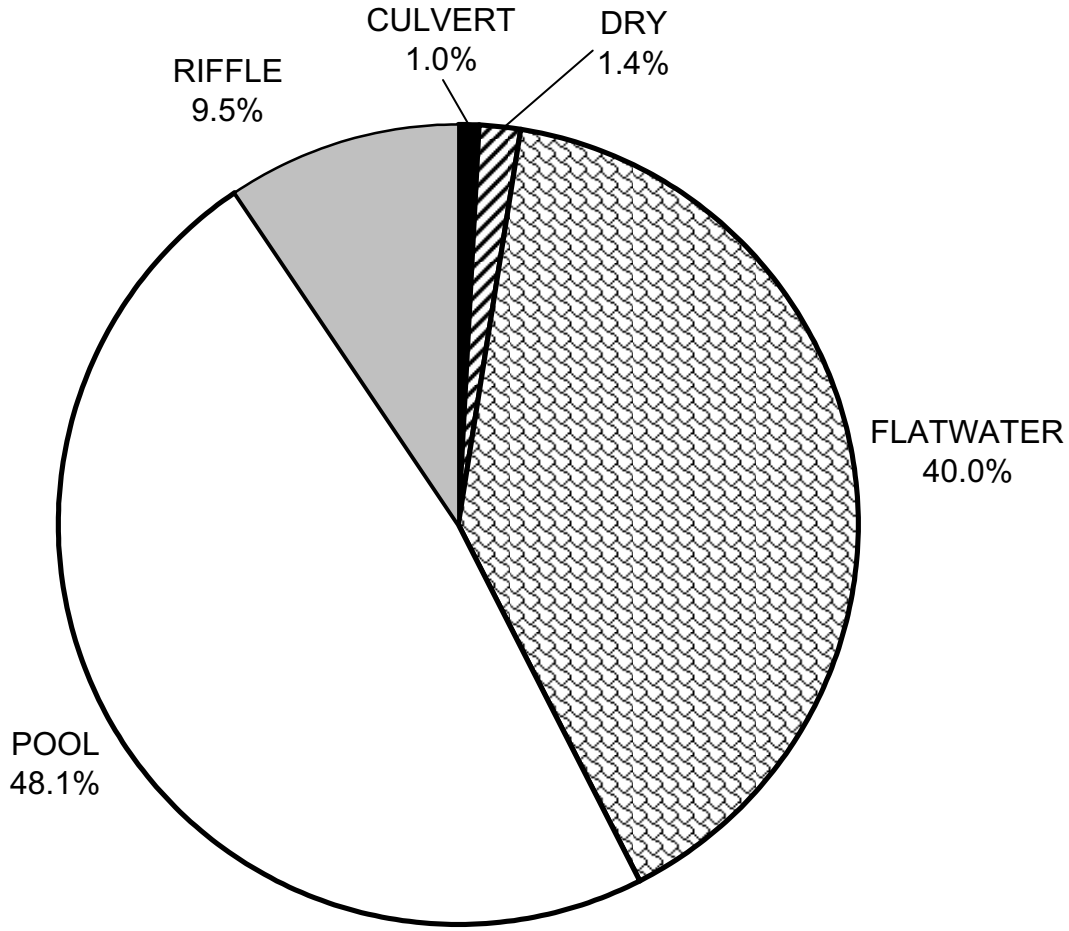
StreamName: Abalobadiah Creek LLID: 1237660395655 Drainage: Rockport

Survey Dates: 7/16/2008 to 7/21/2008

Confluence Location: Quad: INGLENOOK Legal Description: T20NR17WS28 Latitude: 39:33:56.0N Longitude: 123:45:58.0W

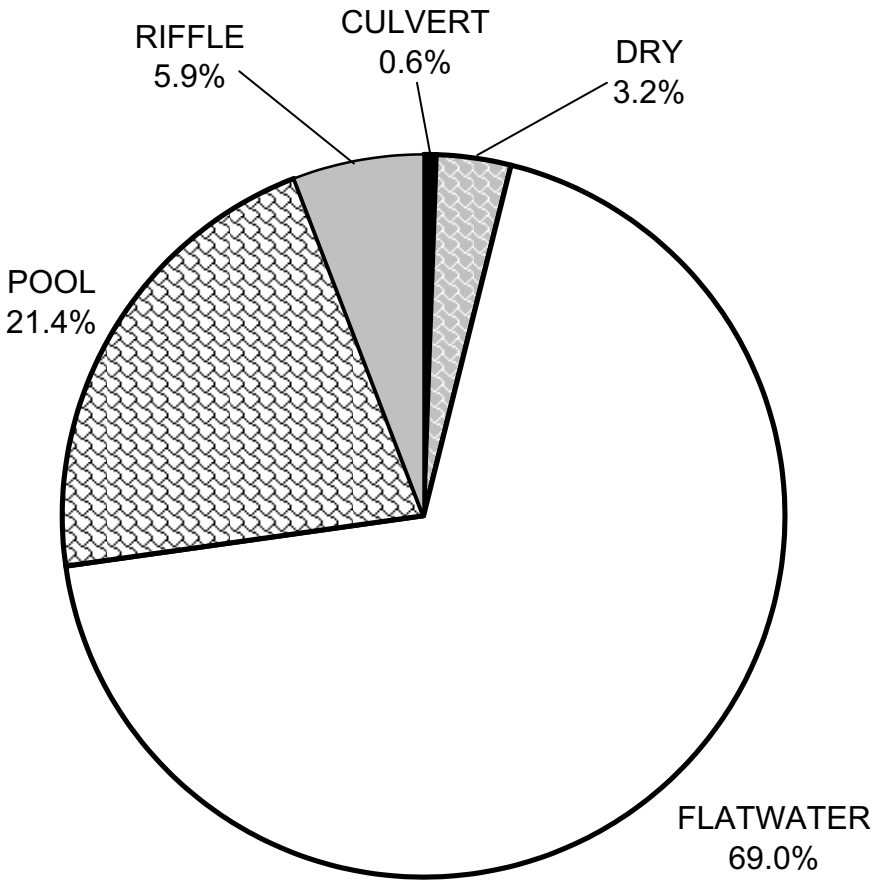
| | Riffles | Flatwater | Pools |
|---|---|---|---|
| UNDERCUT BANKS (%) | 0 | 4 | 13 |
| SMALL WOODY DEBRIS (%) | 10 | 18 | 20 |
| LARGE WOODY DEBRIS (%) | 0 | 8 | 18 |
| ROOT MASS (%) | 0 | 0 | 2 |
| TERRESTRIAL VEGETATION (%) | 70 | 69 | 45 |
| AQUATIC VEGETATION (%) | 20 | 0 | 2 |
| WHITEWATER (%) | 0 | 0 | 0 |
| BOULDERS (%) | 0 | 2 | 0 |
| BEDROCK LEDGES (%) | 0 | 0 | 0 |

# ABALOBADIAH CREEK 2008
# HABITAT TYPES BY PERCENT OCCURRENCE



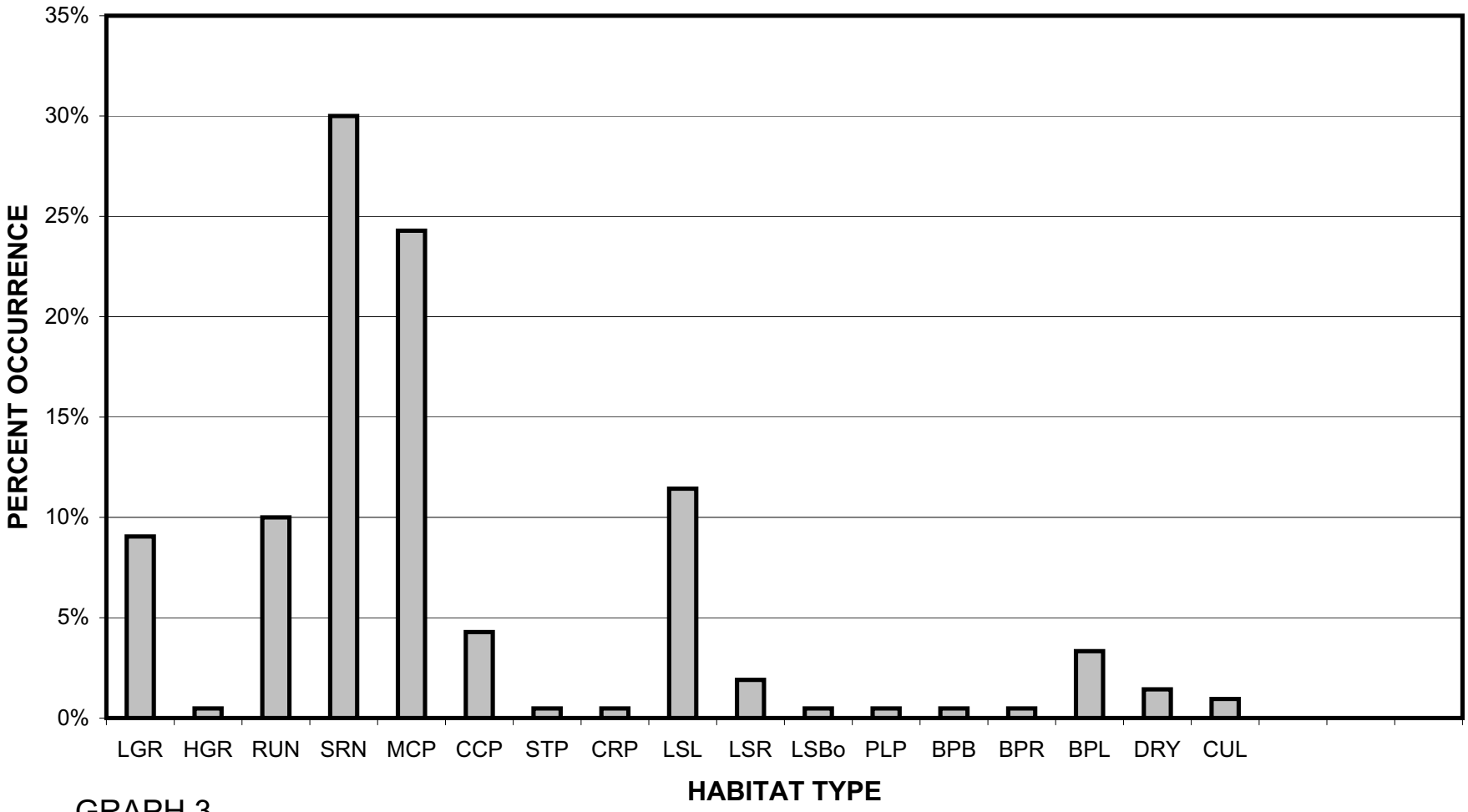

GRAPH 1

# ABALOBADIAH CREEK 2008
# HABITAT TYPES BY PERCENT TOTAL LENGTH



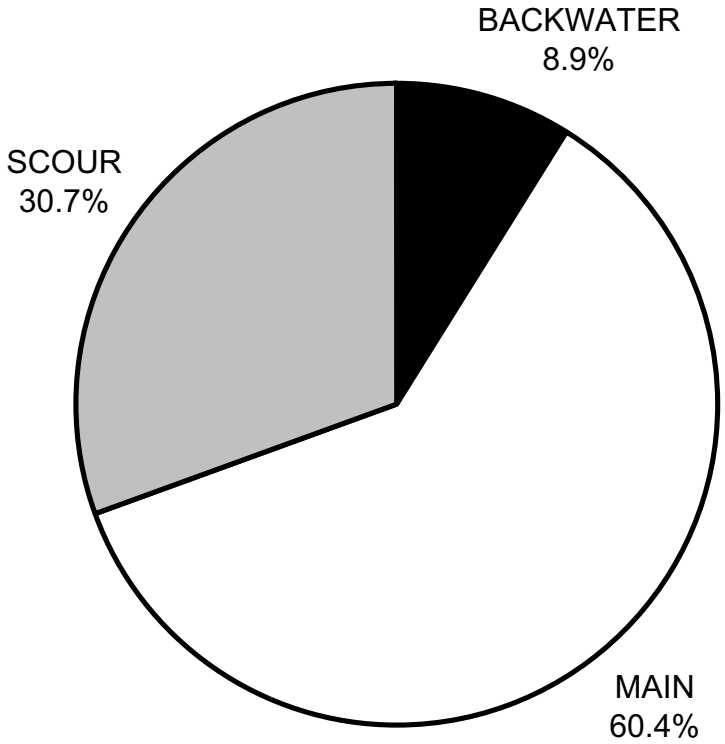

GRAPH 2

# ABALOBADIAH CREEK 2008
# HABITAT TYPES BY PERCENT OCCURRENCE



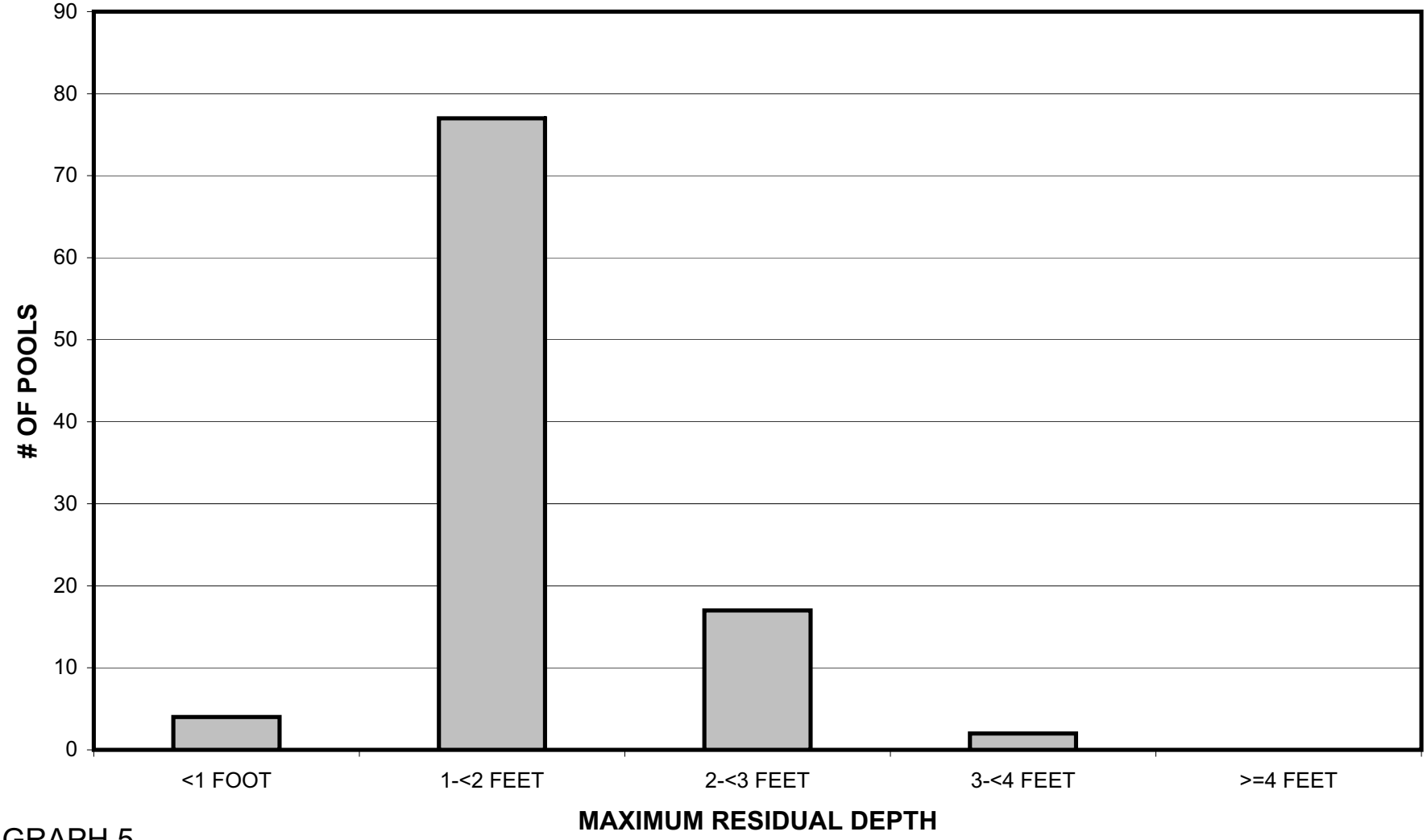

GRAPH 3

# ABALOBADIAH CREEK 2008
# POOL TYPES BY PERCENT OCCURRENCE



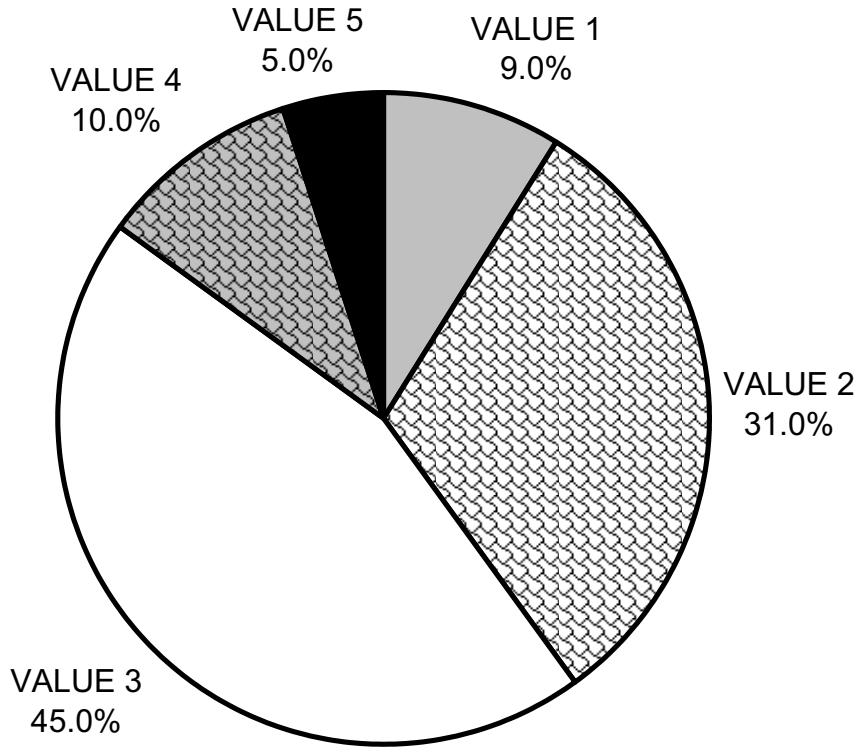

GRAPH 4

# ABALOBADIAH CREEK 2008
# MAXIMUM DEPTH IN POOLS



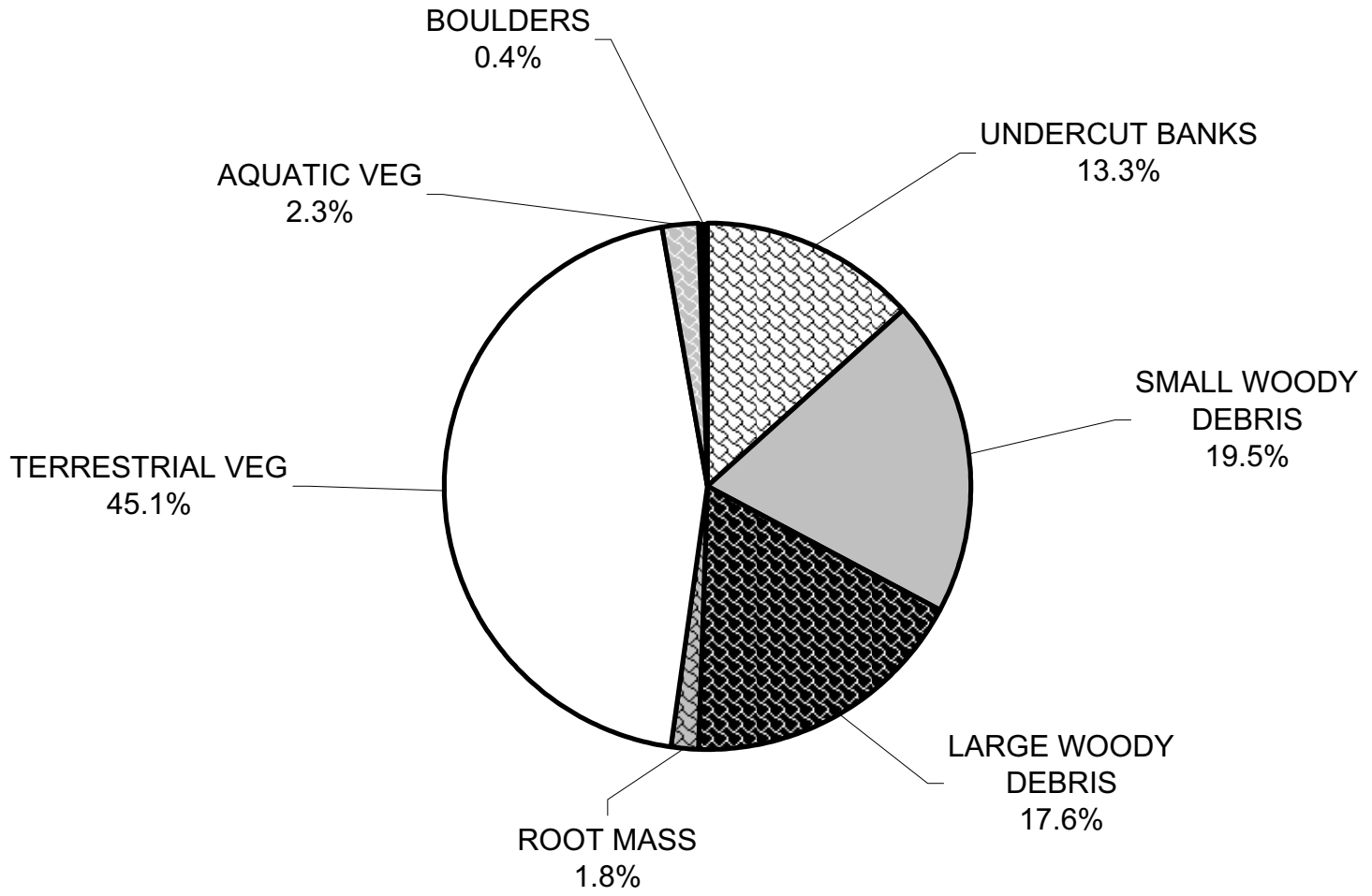

GRAPH 5

# ABALOBADIAH CREEK 2008
# PERCENT EMBEDDEDNESS



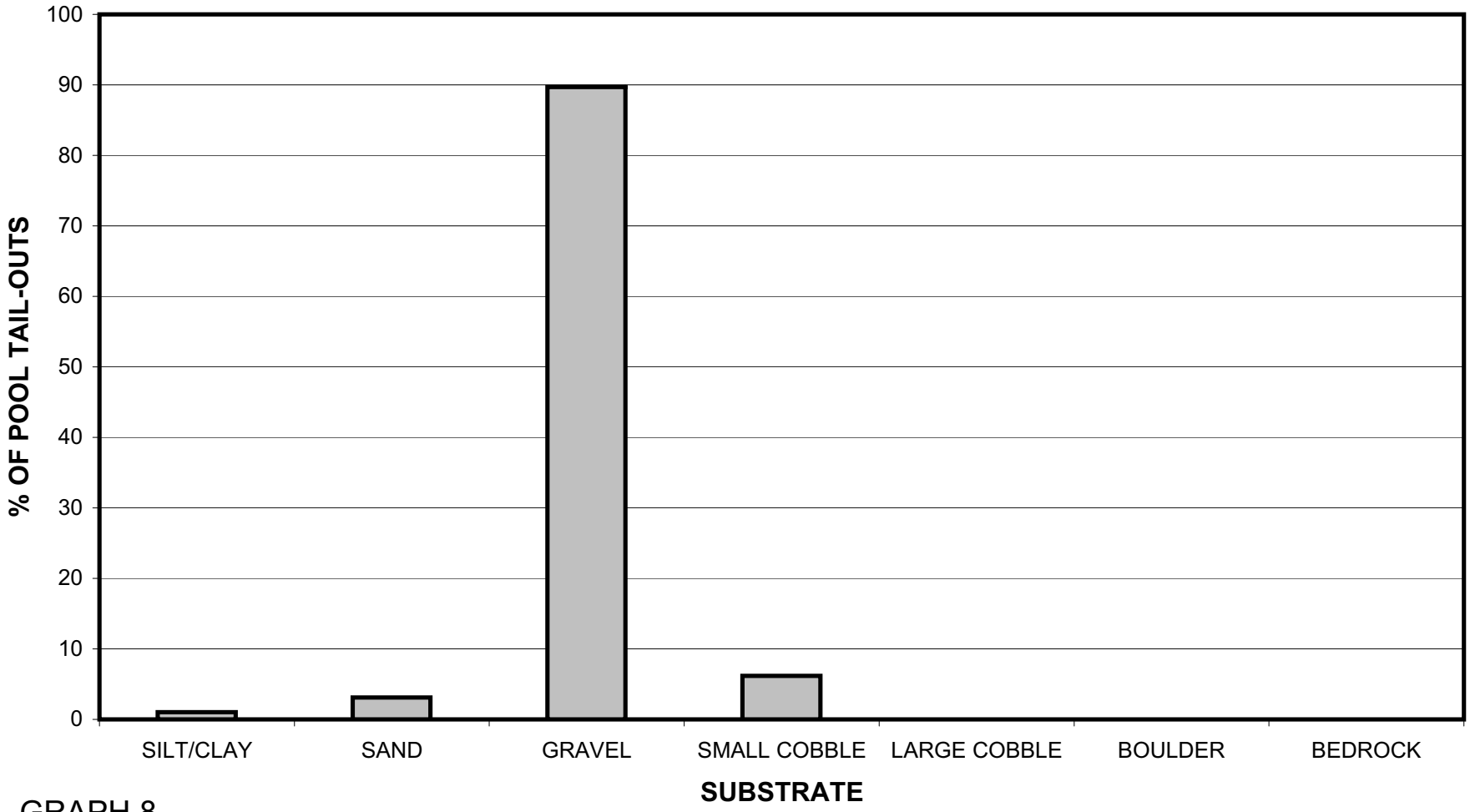

GRAPH 6

# ABALOBADIAH CREEK 2008
# MEAN PERCENT COVER TYPES IN POOLS



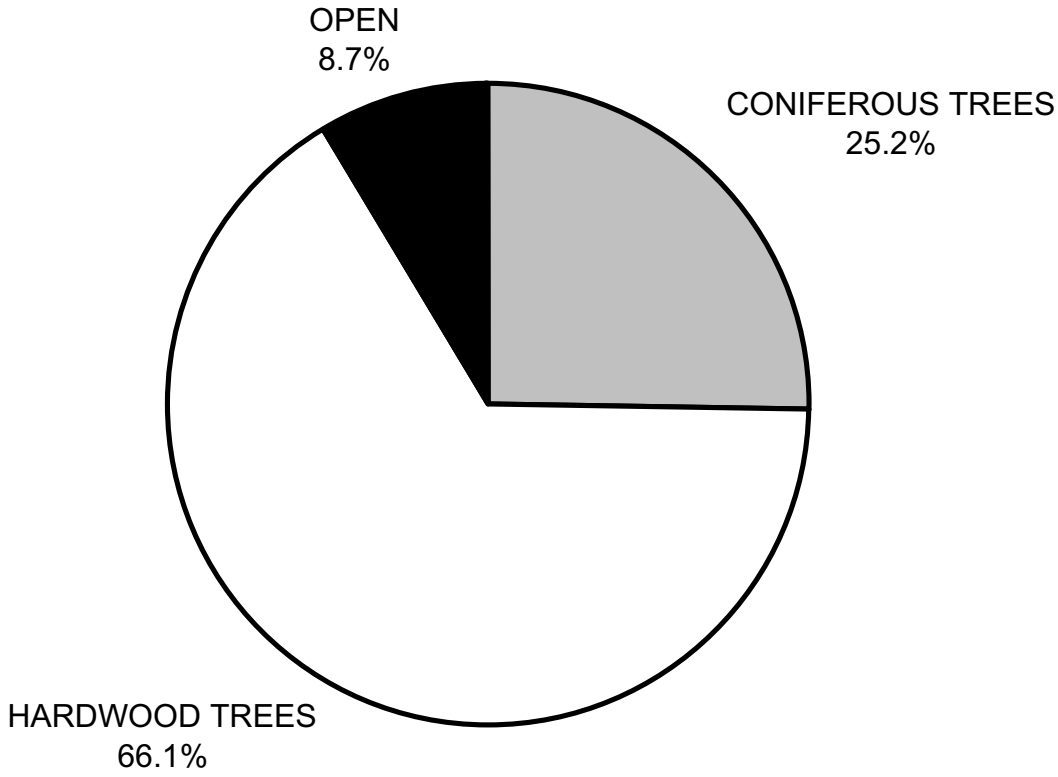

GRAPH 7

# ABALOBADIAH CREEK 2008
# SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



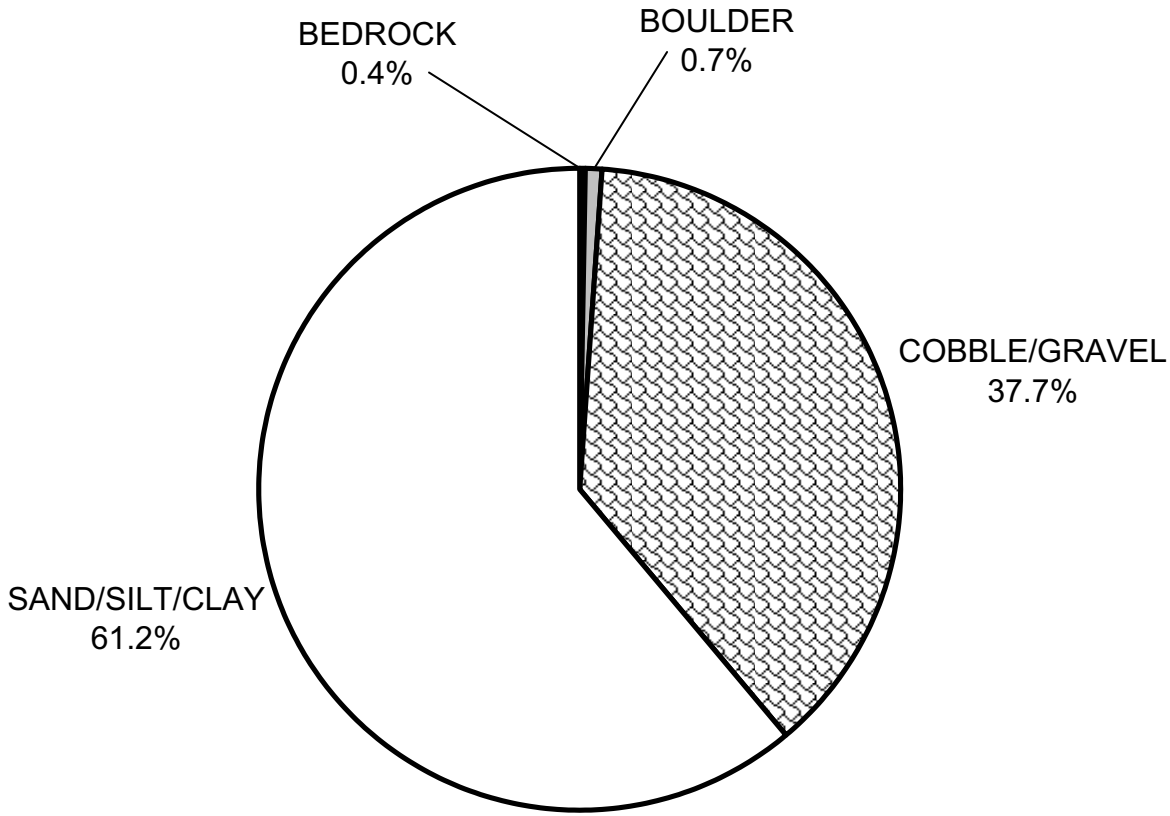

GRAPH 8

# ABALOBADIAH CREEK 2008
# MEAN PERCENT CANOPY



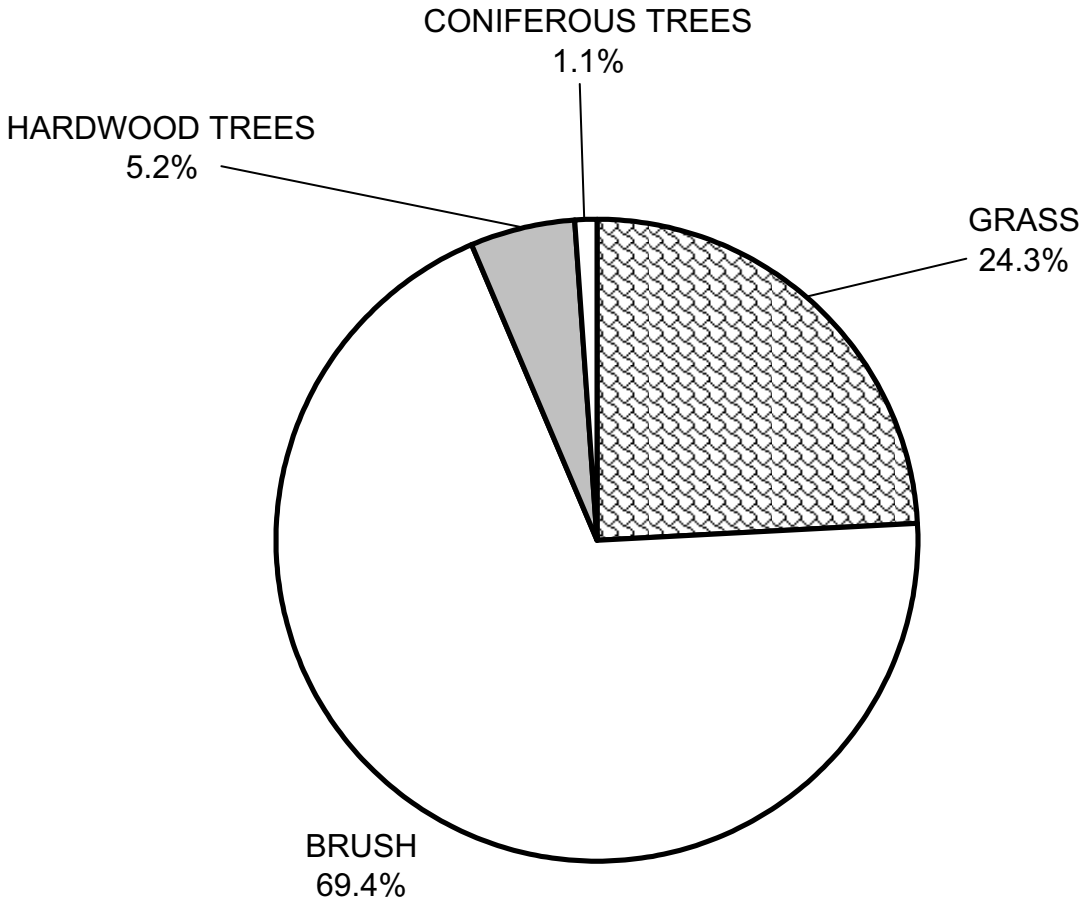

GRAPH 9

# ABALOBADIAH CREEK 2008
# DOMINANT BANK COMPOSITION IN SURVEY REACH

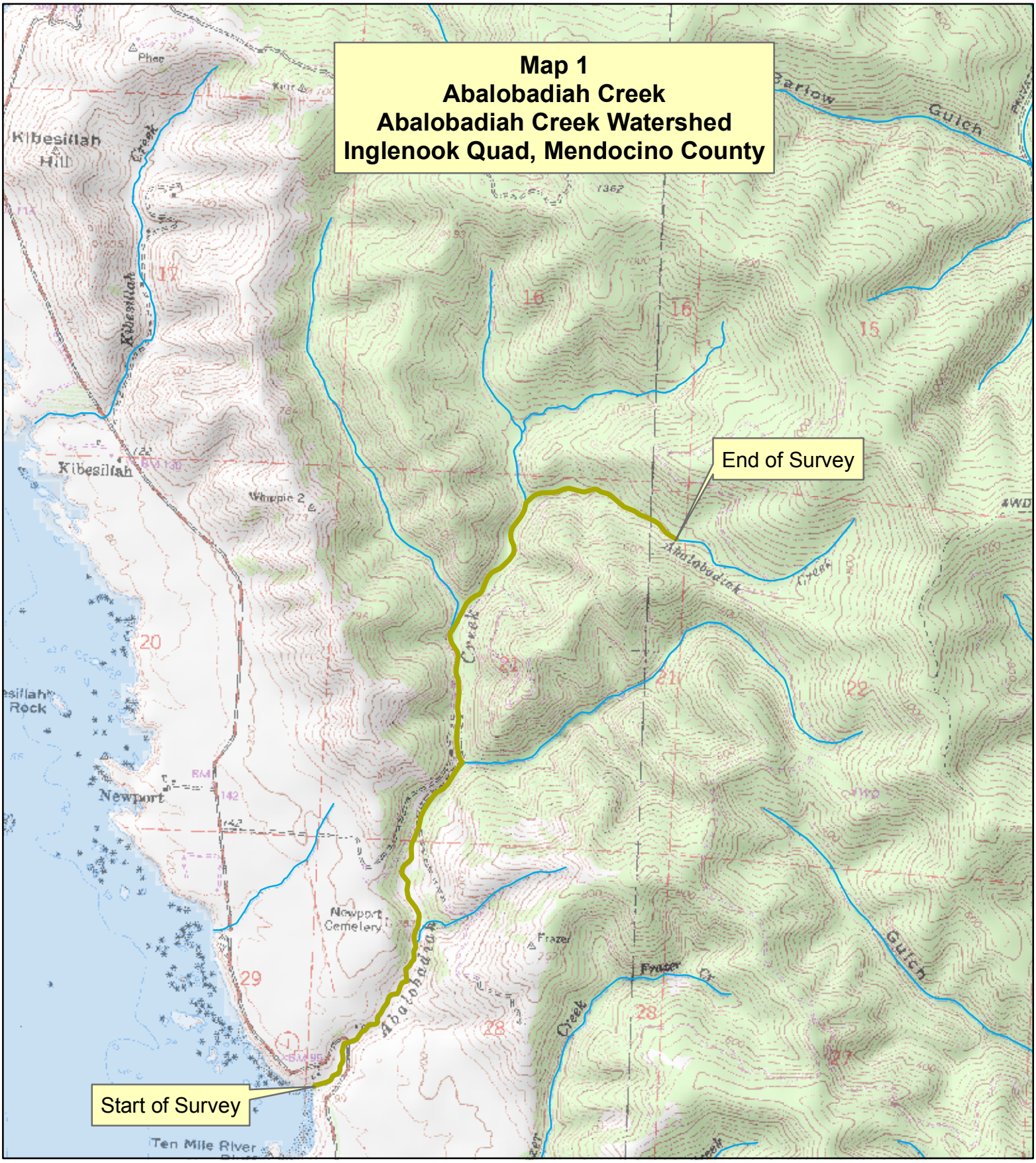



GRAPH 10

# ABALOBADIAH CREEK 2008
# DOMINANT BANK VEGETATION IN SURVEY REACH




GRAPH 11




N
W E
S

## Legend

2008 Surveyed Length

0 1,250 2,500 Feet

End survey point is approximate.

RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME