STREAM INVENTORY REPORT

Lindsay Creek

INTRODUCTION

A stream inventory was conducted from July 19, 2006 to September 12, 2006 on Lindsay Creek. The survey began approximately 2.3 miles upstream from the confluence with Mad River and extended upstream 6.8 miles.

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

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, 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

Lindsay Creek is a tributary to Mad River which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Lindsay Creek's legal description at the confluence with Mad River is T6N R1E S14. Its location is 40.9019 north latitude and 124.0320 west longitude, LLID number 1240308409021. Lindsay Creek is a third order stream and has approximately 28.7 miles of blue line stream according to the USGS Arcata North 7.5 minute quadrangle. Lindsay Creek drains a watershed of approximately 17.3 square miles. Elevations range from about 40 feet at the mouth of the creek to 1,700 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via Highway 101 to Highway 299 to the Glendale Exit. Drive east until you cross over Lindsay Creek.

METHODS

The habitat inventory conducted in Lindsay Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors 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.

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 Lindsay 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". Lindsay 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 Lindsay 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 Lindsay 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 Lindsay 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 Lindsay 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.

BIOLOGICAL INVENTORY

Biological sampling is used to determine fish species and their distribution in the stream. Detailed biological sampling (electrofishing and/or underwater observation) was not conducted on Lindsay Creek during the 2006 survey. Fish presence was observed from the stream banks during the 2006 habitat typing on Lindsay Creek. This sampling technique is discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 Lindsay 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 19, 2006 to September 12, 2006 was conducted by T. Fisher and E. Meiners (WSP) and M. Moorehouse (Lindsay Creek Watershed Coordinator). The total length of the stream surveyed was 35,671 feet with an additional 273 feet of side channel. The first 12,382 feet of Lindsay Creek was not surveyed. A section of Lindsay Creek from 17,738 feet to 21,042 feet was not surveyed. The data included in this report is for the 32,367 feet actually surveyed.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.7 cfs on August 10, 2006.

Lindsay Creek is a B5 channel type for 3,299 feet of the stream surveyed (Reach 1), an F4 channel type for 8,424 feet of the stream surveyed (Reach 2), a G4 channel type for 6,288 feet of the stream surveyed (Reach 3), an undetermined channel type for 3,304 feet of the stream surveyed (Reach 4), a G4 channel type for 2,298 feet of the stream surveyed (Reach 5), an F4 channel type for 2,692 feet of the stream surveyed (Reach 6), a B4 channel type for 3,529 feet of the stream surveyed (Reach 7), and an A4 channel type for 6,110 feet of the stream surveyed (Reach 8).

B5 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and sand-dominant substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates. B4 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate

gradients with low width /depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 62 degrees Fahrenheit. Air temperatures ranged from 48 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% flatwater units, 34% pool units, and 23% riffle units (Graph 1). Based on total length of Level II habitat types there was 49% flatwater units, 37% pool units, and 15% riffle units, (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 34% run units, 22% low gradient riffle units and 20% mid-channel pool units (Graph 3). Based on percent total length of surveyed stream, run units 33%, mid-channel pool units 23% and 16% glide units.

A total of 191 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. Fifty-one of the 189 non side-channel pools (27%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 190 pool tail-outs measured, 115 had a value of 1 (60.5%); 36 had a value of 2 (18.9%); 24 had a value of 3 (12.6%); 1 had a value of 4 (0.5%); 14 had a value of 5 (7.4%) (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 4, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 24 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 25, scour pools had a mean shelter rating of 21, and backwater pools had a mean shelter rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris was the dominant cover types in Lindsay Creek. Graph 7 describes the pool cover in Lindsay Creek. Large woody debris was 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 observed in 87% of pool tail-outs, sand was observed in 5% of pool tail-outs and small cobble was observed in 5% of pool tail-outs.

The mean percent canopy density for the surveyed length of Lindsay Creek was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 78% and 22%, respectively. Graph 9 describes the mean percent canopy in Lindsay Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 61% sand/silt/clay, 37% cobble/gravel, and 2% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 48% of the units surveyed. Additionally, 28% of the units surveyed had coniferous trees as the dominant vegetation type, and 12% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Salmonids were observed from the streambanks during the 2006 stream survey. Juvenile salmonids were observed on Lindsay Creek from the beginning of the survey to 48,060 feet upstream of the confluence with Mad River.

DISCUSSION

Lindsay Creek is a B5 channel type for the first 3,299 feet of stream surveyed, an F4 channel type for 8,424 feet, a G4 channel type for 6,288 feet, an undetermined channel type for 3,304 feet, a G4 channel type for 2,298 feet, an F4 channel type for 2,692 feet, a B4 channel type for 3,529 feet, and an A4 channel type for the remaining 6,110 feet of stream surveyed.

The suitability of the channel types on Lindsay Creek for fish habitat improvement structures is as follows: B5 channels are excellent for bank-placed boulders and good for low-stage weir, single and opposing wing-deflectors, channel constrictors and log cover. F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. G4 channels are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors and log cover. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days July 19, 2006 to September 12, 2006, ranged from 52 to 62 degrees Fahrenheit. Air temperatures ranged from 48 to 73 degrees Fahrenheit. To make any further 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 49% of the total length of this survey, riffles 15%, and pools 37%. The pools are relatively shallow, with 51 of the 189 pools (27%) pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth

order streams, a primary pool is defined to have a maximum residual depth of at least three feet, and occupy at least half the width of the low flow channel. Installing structure that will deepen pool habitat is recommended.

One hundred and forty-nine of the 188 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen 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.

One hundred and seventy-five of the 190 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 24. The shelter rating in the flatwater habitats was 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Lindsay Creek. Large woody debris 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 92%. Reach 1 had a canopy density of 76%, reach 2 had a canopy density of 90%, reach 3 had a canopy density of 90%, reach 5 had a canopy density of 90%, reach 6 had a canopy density of 93%, reach 7 had a canopy density of 94%, and reach 8 had a canopy density of 98%. In general, revegetation projects are considered when canopy density is less than 80%. The percentage of right and left bank covered with vegetation was 96% and 96%, respectively.

RECOMMENDATIONS

1) Lindsay Creek should be managed as an anadromous, natural production stream.

2) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.

4) 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 approximately 12,382 feet above confluence with Mad River. Reach 1 began with a B5 channel type. The survey crew observed young-of-the-year (YOY) salmonids.
3299	0030.00	Reach 2 began with a F4 channel type.
3726	0031.00	Squaw Creek (trib#01), entered from the left bank. It was not flowing. The temperature of Lindsay Creek downstream as well as upstream of the tributary was 62 degrees Fahrenheit. A visual observation was performed by the survey crew 400’ up the dry tributary. The slope was 8%.
4790	0045.00	A tributary (trib#02) entered from the right bank with an estimated flow of 0.01 cfs; contributing less than 1% to Lindsay Creek. The temperature downstream of tributary was 62 degrees Fahrenheit and upstream was 64 degrees Fahrenheit. The temperature of the tributary was 62 degrees Fahrenheit. It was accessible to fish but none were observed within the 100’ observed. The slope was less than 2%. The water was stagnant and canary reed and pampas grass choked the mouth.
5360	0054.00	Tributary (trib#03) entered from the left bank it is not flowing. Lindsay Creeks’ temperature downstream as well as upstream of the tributary was 62 degrees Fahrenheit. A small pool in the tributary also had a temperature of 62 degrees Fahrenheit. A 200’ observation of the tributary revealed a 3% slope. The dry channel had isolated pools as well as YOY salmonids.
5982	0057.00	Log debris accumulation (LDA#01) was caused by a slide on the right bank. Trees from the slope caused the accumulation. It was 10' high x 50' wide x 100' long with 10 pieces of large woody debris (LWD). Water flowed through visible gaps and there was no sediment retention.
6564	0068.00	Log debris accumulation (LDA#02) was caused by a slide on the right bank. It measured 20' high x 50' wide x 50' long, with 30 pieces of large woody debris (LWD). Water flowed through the accumulation but there were no visible gaps. There was almost no flow here with stagnant water.

7489	0083.00	Log debris accumulation (LDA#03) was measured to be 60' high x 20' wide x 30' long with approximately 50 pieces of large woody debris (LWD). Water flowed through and there were visible gaps. There was no sediment retention and fish were seen above.
9013	0101.00	Log debris accumulation (LDA#04) was caused by a slide on the left bank. It was measured to be 8' high x 40' wide x 20' long, with approximately 50 pieces of large woody debris (LWD). Water flowed through and there were no visible gaps. Sediment retention measured 10' wide x 10' long x 12' deep and ranged from silt to gravel. Fish were seen above.
9377	0105.00	There was a slide on the left bank that measured 30’ long x 20’ high.
9377	0105.00	Tributary (trib#04) entered from the left bank. The estimated flow and contribution to Lindsay Creek was less than 0.1 cfs and less than 1% respectively. The water temperature downstream, upstream and of the tributary was 58 degrees Fahrenheit. The tributary was accessible to fish, though none were observed in the first 10 feet. It was very entrenched and narrow.
9926	0113.00	Tributary (trib#05) entered from the right bank. The flow was estimated to be 1.0 cfs and it was contributing approximately 10% to Lindsay Creek flow. The temperature downstream of the tributary was 56 degrees Fahrenheit and upstream was 58 degrees Fahrenheit. The temperature of the tributary was 55 degrees Fahrenheit. An observation was made 100’ up the tributary. It revealed no fish, but the trib is accessible to fish with a 3% slope. The tributary was silty and choked with reeds and pampas.
11515	0133.00	Log debris accumulation (LDA#05) that measured 6' high x 30' wide x 5' long with approximately 23 pieces of large woody debris (LWD). Water flowed through it. There were visible gaps and it was retaining sediment ranging in size from silt and clay to gravel. Fish were seen above.
11723	0135.00	Tributary (trib#06) was not flowing. The temperature upstream as well as downstream of the tributary was 57 degrees Fahrenheit. The tributary was accessible to fish, but no fish were observed in its dry, small, narrow, 5% slope channel that was chocked with invasive grasses.
12041	0137.00	Log debris accumulation (LDA#06) measured 9' high x 35' wide x 80' long with approximately 50 pieces of large woody debris (LWD). Water was flowing through; there were visible gaps present and no sediment retention. Fish were seen above. A steel bridge measured 15' wide x 4.6' high x 50' long. An old Humboldt crossing failed on the left bank due to a slide.

13955	0162.00	Log debris accumulation (LDA#07) was creating a side channel. The accumulation measured 12' high x 60' wide x 35' long with 50+ pieces of large woody debris (LWD). Water flowed through it; there were visible gaps. There was sediment retention that measured 60' wide x 25' long x 15' deep. The sediment varied in size from silt/clay to gravel. Fish were seen above.
15869	0187.00	Log debris accumulation (LDA#08) was measured to be 6' high x 25' wide x 30' long with approximately 50 pieces of large woody debris (LWD). Water flowed through. There were visible gaps and no sediment retention. Fish were seen above.
16693	0192.00	Tributary #07 entered from the right bank. The estimated flow and contribution to Lindsay Creek was less than 0.1 cfs and 1% respectively. The temperature of Lindsay downstream as well as upstream of the tributary was 57 degrees Fahrenheit while the tributaries temperature was 55 degrees Fahrenheit. It was reported this tributary was not accessible to fish. No fish were observed in first 100 feet and its slope was 4%.
17105	0197.00	Tributary (trib#08) entered from the left bank. It was flowing but not at the confluence. Lindsay's temperature downstream as well as upstream of tributary #08 was 56 degrees Fahrenheit, while tributary #08's temperature was 57 degrees Fahrenheit. The tributary was accessible to fish; juvenile salmonids were observed. The slope was 4%.
17696	0207.00	This was the start of reach 4.
21014	0208.00	The survey resumes with the start of reach 5 a G4 channel type.
23224	0260.00	Tributary (trib#10) entered from the right bank. The estimated flow and contribution to Lindsay Creek were 1 cfs and 10% respectively. The temperature of Lindsay downstream of the tributary was 54 degrees Fahrenheit while upstream the temperature was 57 degrees Fahrenheit. The tributaries' temperature was 56 degrees Fahrenheit. The tributary appeared accessible to fish. The tributary's slope was ~1%.
23565	0267.00	Log debris accumulation (LDA#09) was caused by a redwood that was greater than 4' in diameter. The accumulation measured 8.5' high x 12.0' wide x 3.0' long with 9 pieces of large woody debris (LWD). Water flowed through visible gaps. There was no sediment retention and fish were seen above.

23620	0269.00	Log debris accumulation (LDA#10) measured 1.5' high x 12' wide x 3.0' long with 4 pieces of large woody debris (LWD). Water flowed through but there were no visible gaps. The sediment retained measured 3' wide x 12' long x 3' deep and ranged in size from silt to gravel. Fish were seen above the accumulation. Water goes subsurface.
23707	0271.00	Log debris accumulation (LDA#11) measured 5' high x 11' wide x 30' long with 30 pieces of small woody debris (SWD). Water flows through visible gaps. Sediment was being retained. It measured 5' wide x 3' long x 1' deep and its size ranged from silt to gravel. Fish were seen above.
23925	0277.00	Log debris accumulation (LDA#12) measured 7' high x 13' wide x 5' long with 12 pieces of large woody debris (LWD). Water flowed through even though there were no visible gaps. Sediment was not being retained. Fish were seen above.
24257	0283.00	Private road access, wood and steel bridge that measured 15' wide x 9' high x 50' long.
25529	0310.00	Log debris accumulation (LDA#13) measured 5.5' high x 22' wide x 37' long with 50 pieces large woody debris (LWD). Water flowed through it, and there were no visible gaps. Sediment retention measured 20' wide x 15' long x 6' deep ranging in size from silt to cobble. Fish were seen above.
25549	0311.00	There was an arch culvert at Fieldbrook Road was approximately 200' into this habitat unit. It measured 7' high x 20' wide x 77' long with no plunge height.
26004	0315.00	Start reach 7 a B4 channel type.
27466	0357.00	A steel bridge that measured 20' wide x 12' high x 50' long.
27534	0360.00	Log debris accumulation (LDA#14) measured 4.5' high x 15' wide x 30' long with 35 pieces large woody debris (LWD). Water flows through visible gaps and there is no sediment retention. Fish were seen above.
28406	0379.00	Tributary (trib#11) entered from the left bank. The estimated flow and contribution to Lindsay Creek were less than 0.1 cfs and 2% respectively. The temperature of Lindsay Creek downstream of the tributary was 55 degrees Fahrenheit and upstream was 56 degrees Fahrenheit. The temperature of the tributary was 57 degrees Fahrenheit. The tributary appeared inaccessible to fish; no fish were observed in first 100 feet of stream. The tributaries slope was 11%.

28914	0393.00	Tributary (trib#12) entered from the left bank. It was not flowing and had a temperature of 55 degrees Fahrenheit. The temperature of Lindsay Creek downstream as well as upstream of the tributary was 54 degrees Fahrenheit. It is accessible to fish, but no fish were seen in the first 75 feet. The slope was 1%.
29091	0399.00	Log debris accumulation (LDA#13) measured 4' high x 15' wide x 25' long with 15 pieces of large woody debris (LWD). Water flowed through visible gaps. There was no sediment retention and fish were seen above.
29498	0409.00	Tributary (trib#13) entered from the left bank. The estimated flow and contribution to Lindsay Creek were slightly less than 1 cfs and 10% respectively. The tributaries temperature was 51 degrees Fahrenheit. Lindsay Creeks' temperature downstream of the tributary was 52 degrees Fahrenheit while upstream it was 54 degrees Fahrenheit. The tributary appeared accessible to fish though no fish were observed in the first 100'. The slope was 5%.
29533	0410.00	Start of reach 8 an A4 channel type.
29578	0413.00	Log debris accumulation (LDA#14) was 5.5' high x 15' wide x 5' long with 15 pieces of large woody debris (LWD). Water flowed through it even though there weren't any visible gaps. The sediment retained measured 15' wide x 17' long x 6' deep. Fish were seen above the upstream.
29614	0415.00	A metal culvert that was 5.5' high x 6 wide x 37' long with a 6' diameter. There was no plunge. It did not have baffles or weirs. It was in fair condition though a little rusty.
30086	0422.00	A steel bridge at Crockett's Crossing measured 16' wide x 9.5' high x 40' long.
30197	0424.00	Tributary (trib#14) entered from the left bank. It was not flowing and the temperature of the tributary was not measurable. The temperature of Lindsay Creek downstream as well as upstream was 52 degrees Fahrenheit. It was accessible to fish, but no fish were seen in first 50 feet. The tributary's slope was 2%.
30351	0427.00	Tributary (trib#15) entered from the right bank. It was not flowing and thus no temperature was measured for the tributary. The temperature of Lindsay downstream as well as upstream was 54 degrees Fahrenheit. It appeared accessible to fish though no fish were seen in the first 20 feet. Its slope was 16%.

31348	0453.00	A steel bridge on Burnt Stump Road measured 12' wide x 9' high x 25' long.
31510	0459.00	Tributary (trib#16) entered from the right bank. The estimated flow and contribution to Lindsay Creek was less than 1 cfs and 20% respectively. The temperature of the tributary was 50 degrees Fahrenheit. Lindsay Creeks' temperature downstream of the tributary was 54 degrees Fahrenheit while upstream was 50 degrees Fahrenheit. The tributary was accessible to fish, with a 6% slope. Fish were found in the first 200 feet of the tributary.
32368	0481.00	The stream flows subsurface here.
32610	0488.00	Concrete culvert in channel starts here.
32689	0491.00	Concrete culvert ends here.
33121	0505.00	Log debris accumulation (LDA#15) measured 4' high x 7' wide x 8'long and was made up of 10 pieces of large woody debris (LWD). Water flowed through it subsurface, though there were no visible gaps. There was no sediment retention and fish were seen above the LDA.
33499	0515.00	Log debris accumulation (LDA#16) measured 10' high x 9' wide x 6' long and contained 7 pieces of large woody debris (LWD). The stream flowed subsurface at the accumulation and there were no visible gaps. There was no sediment retention. Fish were seen above.
33524	0516.00	Log debris accumulation (LDA#17) measured 4' high x 8' wide x 8' long and contained 6 pieces of large woody debris (LWD). Water flows through, but there are no visible gaps. The sediment being retained measured 10' wide x 12' long x 4' deep and ranged in size from sand to small cobble. Fish were seen upstream.
33580	0519.00	Log debris accumulation (LDA#18) measured 3' high x 10' wide x 10' long and contained 12 pieces large woody debris (LWD). Water was flowed through visible gaps. The sediment being retained measured 11' wide x 10' long x 2.5' deep ranging from sand to gravel in size. Fish were seen above.
34012	0534.00	Log debris accumulation (LDA#19) measured 4.5' high x 14' wide x 15' long and contained 10 pieces of large woody debris (LWD). Water flowed through visible gaps. No sediment was being retained and fish were seen upstream.
34285	0543.00	The slope in this habitat unit was 12%.

34332	0545.00	Log debris accumulation (LDA#20) measured 4.5' high x 10' wide x 4' long and contained 15 pieces of large woody debris (LWD). Water flowed through visible gaps. Sediment retained measured 12' wide x 20' long x 5' deep and it ranged in size from sand to small cobble. Fish were seen upstream.
34605	0554.00	Log debris accumulation (LDA#21) measured 4' high x 7' wide x 45' long and contained 11 pieces of large woody debris (LWD). Water was flowing through it, though there were no visible gaps. The sediment being retained 15' wide x 45' long x 15' deep and ranged in size from sand to gravel. Fish were seen upstream.
34824	0563.00	In this habitat unit there was a log debris accumulation (LDA#22) leading up to a culvert. The accumulation measured 4.5' high x 8' wide x 25' long and contained 20 pieces of large woody debris (LWD). Water flowed through visible gaps. The sediment being retained measured 7' wide x 20' long x 4.5' deep and ranged in size from sand to boulder. Fish were seen upstream. The steel culvert measured a 4.6’ diameter and was 35’ long with a 5’ plunge at its outlet.
34951	0564.00	Log debris accumulation (LDA#23) measured 5' high x 11' wide x 17' long and contained 10 pieces of large woody debris (LWD). Water flowed visible gaps. The sediment retained measured 15' wide x 5' long x 5' deep and ranged in size from sand to large cobble. Fish were seen above.
35336	0565.00	There was a plunge with a height of 5.5’. Young-of-the-year salmonids as well as 1+ and 2+ salmonids have been observed throughout the entirety of the survey.
35381	0566.00	Log debris accumulation (LDA#24) measured 6' high x 12' wide x 10' long and contained 4 pieces of large woody debris (LWD). Water flowed through visible gaps. The sediment that was retained measured 12' wide x 10' long x 6' deep and ranged from sand to gravel. Fish were seen above despite the 6’ plunge.
35678	0567.00	End of survey. YOY salmonids were observed at the bottom of the plunge. This was possible the end of anadromy.

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	(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: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0

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
244	39	FLATWATER	42.8	65	15907	48.8	11.4	0.8	1.2	891	217480	878	214125		7
1	0	NO SURVEY	0.2	3304	3304										
1	0	NO SURVEY	0.2	34	34										
191	190	POOL	33.5	63	11950	36.6	16.5	1.7	2.5	1112	212476	2615	494182	1973	24
133	20	RIFFLE	23.3	36	4749	14.6	7.8	0.4	0.6	176	23463	77	10200		4

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
570	249	35944	453419	718508

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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 (%)
123	18	LGR	21.6	31	3759	11.6	8	0.4	1.8	186	22856	81	9982		2	96
8	1	HGR	1.4	117	938	2.9	5	0.3	0.5	94	748	28	224		0	99
2	1	CAS	0.4	26	52	0.2	4	0.5	0.6	90	180	45	90		45	95
47	12	GLD	8.2	109	5119	15.8	14	1.0	2.6	1500	70492	1872	87984		5	94
195	25	RUN	34.2	55	10721	33.1	10	0.7	1.6	652	127046	460	89674		7	94
2	2	SRN	0.4	34	67	0.2	8	0.6	1.2	238	475	132	264		15	100
114	114	MCP	20.0	64	7326	22.6	18	1.7	5.6	1202	137068	2860	326054	2178	25	88
1	1	STP	0.2	30	30	0.1	4			120	120				20	100
41	40	CRP	7.2	72	2965	9.2	15	1.5	4.2	1250	51250	2767	110613	2003	18	90
15	15	LSL	2.6	47	705	2.2	13	1.3	3.3	603	9046	1128	16914	820	31	94
7	7	LSR	1.2	55	383	1.2	17	1.8	4.2	958	6703	2404	16831	1909	19	95
1	1	LSBo	0.2	33	33	0.1	10	1.1	1.7	330	330	495	495	363	0	100
3	3	PLP	0.5	16	48	0.1	11	2.1	3.6	173	519	413	1240	327	30	99
9	9	DPL	1.6	51	460	1.4	16	2.1	7.7	842	7577	2461	22146	1951	30	82
1	0	NS	0.2	3304	3304											
1	0	MAR	0.2	34	34											

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
570	249	35944	434411	682512

Table 3 - Summary of Pool Types

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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
115	115	MAIN	60	64	7356	62	17.5	1.7	1193	137188	2178	248292	25
67	66	SCOUR	35	62	4134	35	14.8	1.5	1009	67608	1618	106738	21
9	9	BACKWATER	5	51	460	4	16.3	2.1	842	7577	1951	17555	30

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
191	190	11950	212373	372585

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

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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
114	MCP	60	0	0	36	32	43	38	27	24	8	7
40	CRP	21	0	0	19	48	12	30	8	20	1	3
15	LSL	8	0	0	9	60	5	33	1	7	0	0
7	LSR	4	0	0	0	0	6	86	0	0	1	14
1	LSBo	1	0	0	1	100	0	0	0	0	0	0
3	PLP	2	0	0	0	0	2	67	1	33	0	0
9	DPL	5	0	0	1	11	4	44	2	22	2	22

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
189	0	0	66	35	72	38	39	21	12	6

Mean Maximum Residual Pool Depth (ft.): 2.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006 Dry Units: 0

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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
123	17	LGR	8	20	60	0	12	0	0	0	0
8	1	HGR	0	0	0	0	0	0	0	0	0
2	1	CAS	0	0	0	0	10	0	0	90	0
133	19	TOTAL RIFFLE	5	13	40	0	12	0	0	30	0
47	12	GLD	30	35	17	12	7	0	0	0	0
195	25	RUN	12	38	21	10	14	0	0	5	0
2	2	SRN	10	30	50	0	10	0	0	0	0
244	39	TOTAL FLAT	17	37	21	10	12	0	0	3	0
114	114	MCP	16	29	38	3	10	1	0	2	0
1	1	STP	5	10	75	0	10	0	0	0	0
41	41	CRP	15	42	31	3	9	0	0	0	0
15	15	LSL	8	35	46	0	11	1	0	0	0
7	7	LSR	16	18	13	48	4	2	0	0	0
1	1	LSBo	0	0	0	0	0	0	0	0	0
3	3	PLP	12	0	75	0	5	5	2	0	0
9	9	DPL	17	39	33	3	8	1	0	0	0
191	191	TOTAL POOL	15	31	37	5	9	1	0	2	0
1	0	NS									
1	0	MAR									
570	249	TOTAL	15	32	35	5	10	1	0	2	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006 Dry Units: 0

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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
123	17	LGR	0	0	71	18	6	0	6
8	1	HGR	0	0	100	0	0	0	0
2	1	CAS	0	0	0	0	0	100	0
47	12	GLD	0	17	83	0	0	0	0
195	25	RUN	0	16	72	12	0	0	0
2	2	SRN	0	0	100	0	0	0	0
114	114	MCP	4	28	67	1	0	1	0
1	1	STP	0	0	100	0	0	0	0
41	41	CRP	2	15	80	2	0	0	0
15	15	LSL	0	27	67	0	0	0	7
7	7	LSR	0	14	86	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
3	3	PLP	0	67	33	0	0	0	0
9	9	DPL	11	22	67	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	22	78	0	96	96

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: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006 Survey Length (ft.): 35944 Main Channel (ft.): 35671 Side Channel (ft.): 273

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B5
Reach Length (ft.): 3299
Riffle/Flatwater Mean Width (ft.): 19.6
BFW:
Range (ft.): 17 to 25
Mean (ft.): 22
Std. Dev.: 4
Base Flow (cfs.): 1.7
Water (F): 58 - 59 Air (F): 59 - 72
Dry Channel (ft): 0

Canopy Density (%): 76.2
Coniferous Component (%): 8.3
Hardwood Component (%): 91.7
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 88.3
Dominant Shelter: Small Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 3
LWD per 100 ft.:
Riffles: 0
Pools: 1
Flat: 1

Pools by Stream Length (%): 11.4
Pool Frequency (%): 24.1
Residual Pool Depth (%):
< 2 Feet Deep: 14
2 to 2.9 Feet Deep: 14
3 to 3.9 Feet Deep: 43
>= 4 Feet Deep: 29
Mean Max Residual Pool Depth (ft.): 3.5
Mean Pool Shelter Rating: 1

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 86 Sm Cobble: 14 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 57.1 2. 28.6 3. 14.3 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: F4
Reach Length (ft.): 8424
Riffle/Flatwater Mean Width (ft.): 15.5
BFW:
Range (ft.): 17 to 48
Mean (ft.): 30
Std. Dev.: 11
Base Flow (cfs.): 1.7
Water (F): 56 - 62 Air (F): 55 - 73
Dry Channel (ft): 0

Canopy Density (%): 90.0
Coniferous Component (%): 26.9
Hardwood Component (%): 73.1
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 93.1
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 33
LWD per 100 ft.:
Riffles: 14
Pools: 12
Flat: 4

Pools by Stream Length (%): 54.5
Pool Frequency (%): 46.7
Residual Pool Depth (%):
< 2 Feet Deep: 33
2 to 2.9 Feet Deep: 37
3 to 3.9 Feet Deep: 20
>= 4 Feet Deep: 10
Mean Max Residual Pool Depth (ft.): 2.6
Mean Pool Shelter Rating: 27

Pool Tail Substrate (%): Silt/Clay: 6 Sand: 12 Gravel: 80 Sm Cobble: 2 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 59.2 2. 10.2 3. 8.2 4. 2.0 5. 20.4

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: G4
Reach Length (ft.): 6015
Riffle/Flatwater Mean Width (ft.): 14.8
BFW:
Range (ft.): 13 to 31
Mean (ft.): 26
Std. Dev.: 6
Base Flow (cfs.): 1.7
Water (F): 54 - 58 Air (F): 55 - 60
Dry Channel (ft): 0

Canopy Density (%): 89.4
Coniferous Component (%): 12.2
Hardwood Component (%): 87.8
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 97.7
Dominant Shelter: Small Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 32
LWD per 100 ft.:
Riffles: 0
Pools: 13
Flat: 4

Pools by Stream Length (%): 50.0
Pool Frequency (%): 50.7
Residual Pool Depth (%):
< 2 Feet Deep: 8
2 to 2.9 Feet Deep: 41
3 to 3.9 Feet Deep: 43
>= 4 Feet Deep: 8
Mean Max Residual Pool Depth (ft.): 2.9
Mean Pool Shelter Rating: 31

Pool Tail Substrate (%): Silt/Clay: 3 Sand: 0 Gravel: 82 Sm Cobble: 16 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 57.9 2. 28.9 3. 10.5 4. 0.0 5. 2.6

STREAM REACH: 4

Channel Type:
Reach Length (ft.): 3304
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs.):
Water (F): 0 - 0 Air (F): 0 - 0
Dry Channel (ft): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component (%):
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth (ft.):
Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: G4
Reach Length (ft.): 2298
Riffle/Flatwater Mean Width (ft.): 13.7
BFW:
Range (ft.): 12 to 19
Mean (ft.): 16
Std. Dev.: 3
Base Flow (cfs.): 1.3
Water (F): 54 - 57 Air (F): 55 - 61
Dry Channel (ft): 0

Canopy Density (%): 90.3
Coniferous Component (%): 24.8
Hardwood Component (%): 75.2
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 98.8
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 28
LWD per 100 ft.:
Riffles: 0
Pools: 8
Flat: 5

Pools by Stream Length (%): 61.3
Pool Frequency (%): 54.7
Residual Pool Depth (%):
< 2 Feet Deep: 38
2 to 2.9 Feet Deep: 41
3 to 3.9 Feet Deep: 21
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 2.2
Mean Pool Shelter Rating: 25

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 58.6 2. 13.8 3. 27.6 4. 0.0 5. 0.0

STREAM REACH: 6

Channel Type: F4
Reach Length (ft.): 2692
Riffle/Flatwater Mean Width (ft.): 7.1
BFW:
Range (ft.): 11 to 22
Mean (ft.): 14
Std. Dev.: 4
Base Flow (cfs.): 1.3
Water (F): 54 - 59 Air (F): 54 - 68
Dry Channel (ft): 0

Canopy Density (%): 93.1
Coniferous Component (%): 20.6
Hardwood Component (%): 79.4
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 92.6
Dominant Shelter: Small Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 21
LWD per 100 ft.:
Riffles: 0
Pools: 7
Flat: 1

Pools by Stream Length (%): 34.3
Pool Frequency (%): 42.6
Residual Pool Depth (%):
< 2 Feet Deep: 43
2 to 2.9 Feet Deep: 35
3 to 3.9 Feet Deep: 13
>= 4 Feet Deep: 9
Mean Max Residual Pool Depth (ft.): 2.4
Mean Pool Shelter Rating: 32

Pool Tail Substrate (%): Silt/Clay: 9 Sand: 9 Gravel: 83 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 65.2 2. 17.4 3. 4.3 4. 0.0 5. 13.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 7

Channel Type: B4
Reach Length (ft.): 3529
Riffle/Flatwater Mean Width (ft.): 6.8
BFW:
Range (ft.): 9 to 20
Mean (ft.): 13
Std. Dev.: 2
Base Flow (cfs.): 1.3
Water (F): 54 - 59 Air (F): 48 - 68
Dry Channel (ft): 0

Canopy Density (%): 94.3
Coniferous Component (%): 12.0
Hardwood Component (%): 88.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 98.8
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 20
LWD per 100 ft.:
Riffles: 1
Pools: 7
Flat: 2

Pools by Stream Length (%): 29.0
Pool Frequency (%): 27.4
Residual Pool Depth (%):
< 2 Feet Deep: 58
2 to 2.9 Feet Deep: 42
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 12

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 4 Gravel: 96 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 80.8 2. 15.4 3. 3.8 4. 0.0 5. 0.0

STREAM REACH: 8

Channel Type: A4
Reach Length (ft.): 6110
Riffle/Flatwater Mean Width (ft.): 6.2
BFW:
Range (ft.): 7 to 30
Mean (ft.): 12
Std. Dev.: 6
Base Flow (cfs.): 1.3
Water (F): 52 - 54 Air (F): 48 - 60
Dry Channel (ft): 0

Canopy Density (%): 97.8
Coniferous Component (%): 34.2
Hardwood Component (%): 65.8
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 98.0
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 21
LWD per 100 ft.:
Riffles: 5
Pools: 10
Flat: 6

Pools by Stream Length (%): 8.0
Pool Frequency (%): 12.0
Residual Pool Depth (%):
< 2 Feet Deep: 56
2 to 2.9 Feet Deep: 39
3 to 3.9 Feet Deep: 6
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 17

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 94 Sm Cobble: 6 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 38.9 2. 33.3 3. 27.8 4. 0.0 5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

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	5	5	2.0
Cobble / Gravel	97	87	36.9
Sand / Silt / Clay	147	157	61.0

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	32	29	12.2
Brush	26	30	11.2
Hardwood Trees	109	131	48.2
Coniferous Trees	82	59	28.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

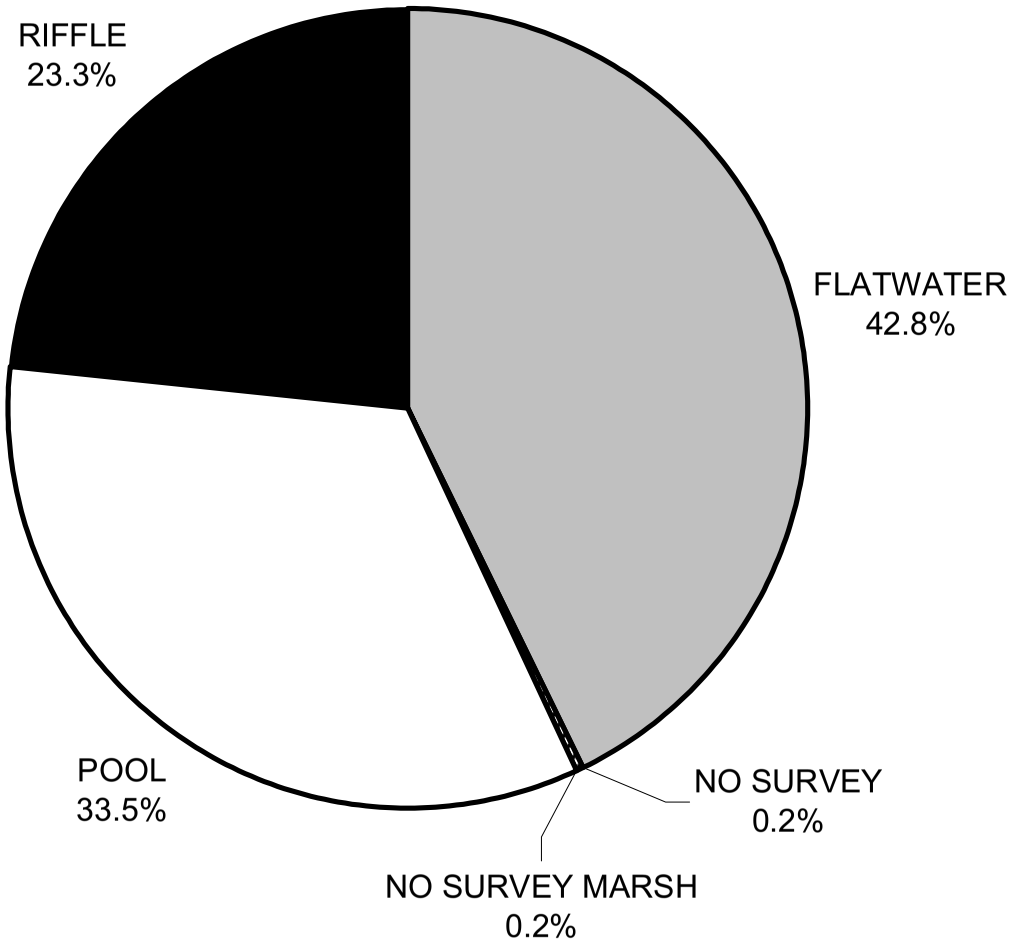
StreamName: Lindsay Creek LLID: 1240308409021 Drainage: Blue Lake

Survey Dates: 7/19/2006 to 9/12/2006

Confluence Location: Quad: ARCATA NORTH Legal Description: T06NR01ES14 Latitude: 40:54:08.0N Longitude: 124:01:51.0W

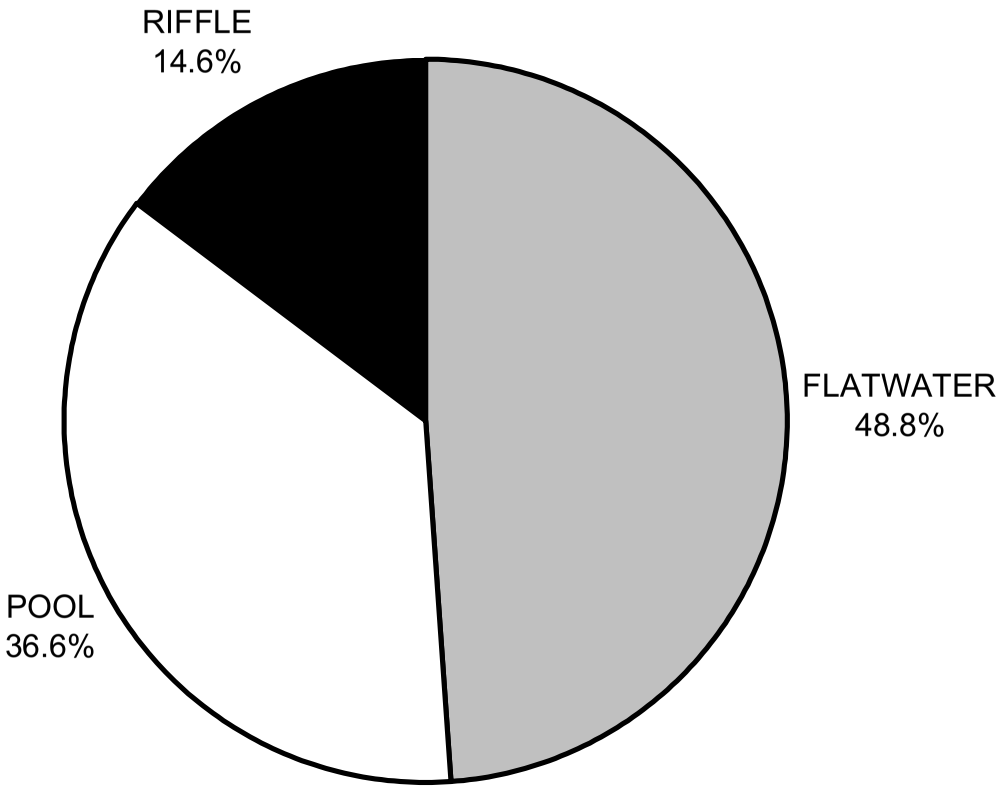
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	5	17	15
SMALL WOODY DEBRIS (%)	13	37	31
LARGE WOODY DEBRIS (%)	40	21	37
ROOT MASS (%)	0	10	5
TERRESTRIAL VEGETATION (%)	12	12	9
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	0
BOULDERS (%)	30	3	2
BEDROCK LEDGES (%)	0	0	0

LINDSAY CREEK 2006
HABITAT TYPES BY PERCENT OCCURRENCE



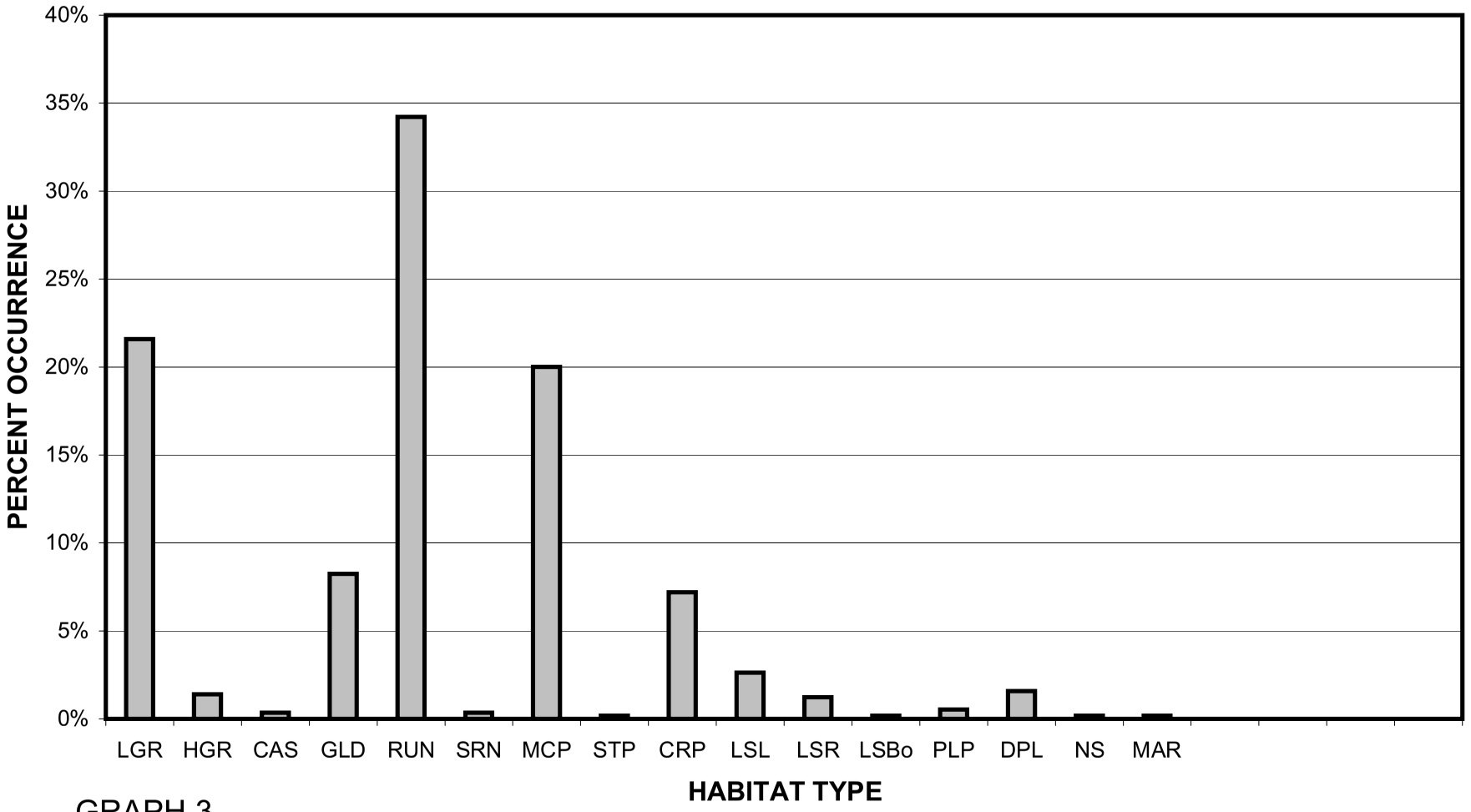
GRAPH 1

LINDSAY CREEK 2006
HABITAT TYPES BY PERCENT TOTAL LENGTH



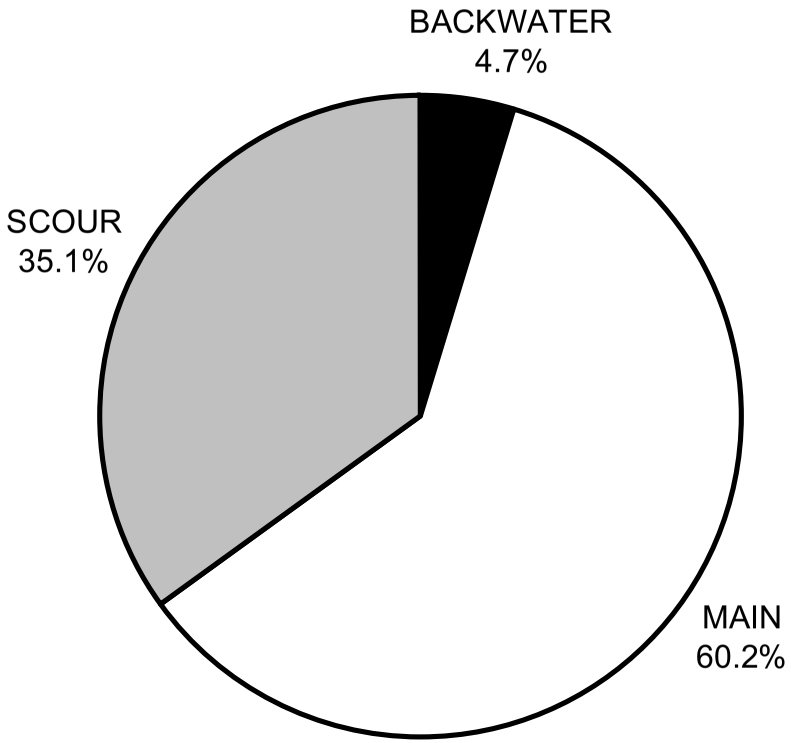
GRAPH 2

LINDSAY CREEK 2006
HABITAT TYPES BY PERCENT OCCURRENCE



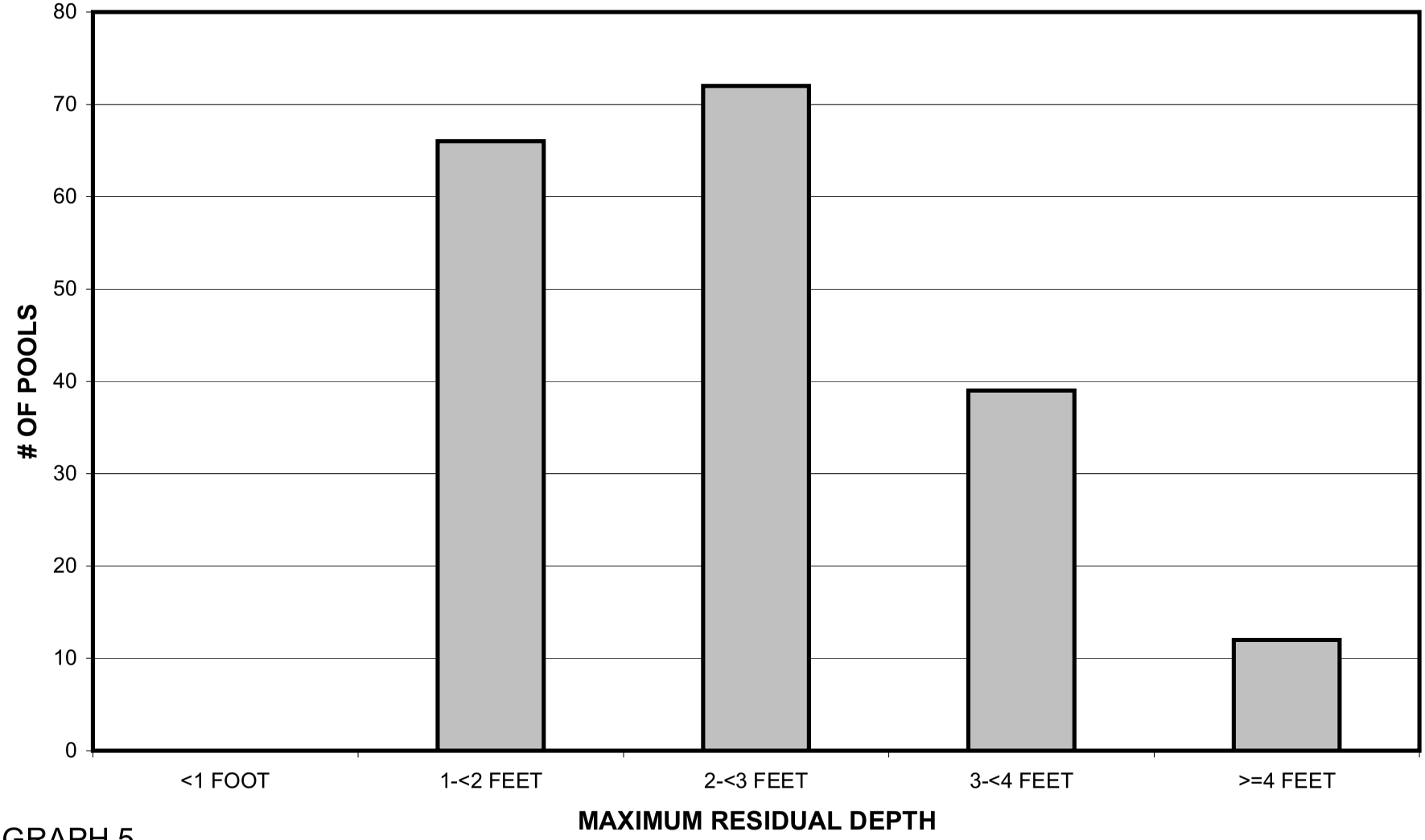
GRAPH 3

LINDSAY CREEK 2006
POOL TYPES BY PERCENT OCCURRENCE



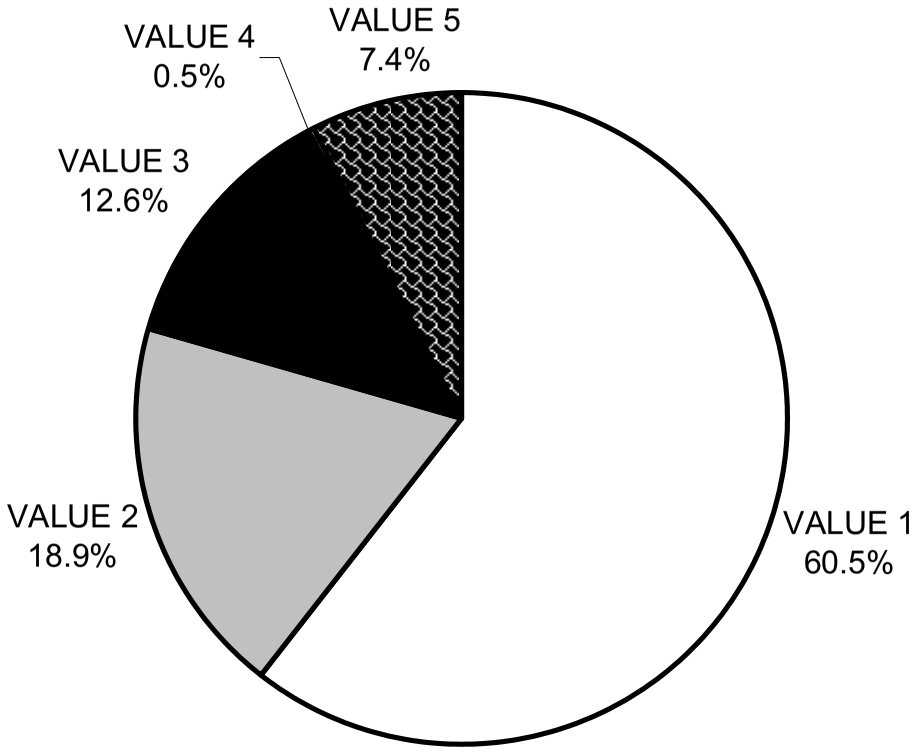
GRAPH 4

LINDSAY CREEK 2006
MAXIMUM DEPTH IN POOLS



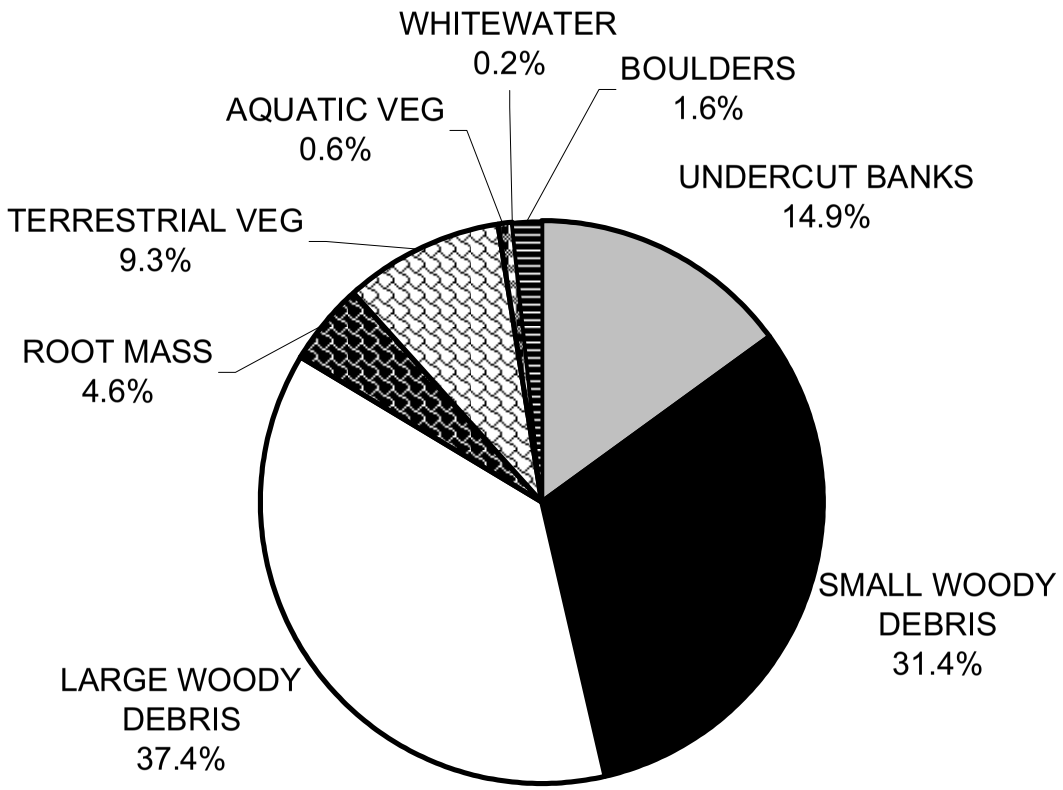
GRAPH 5

LINDSAY CREEK 2006
PERCENT EMBEDDEDNESS



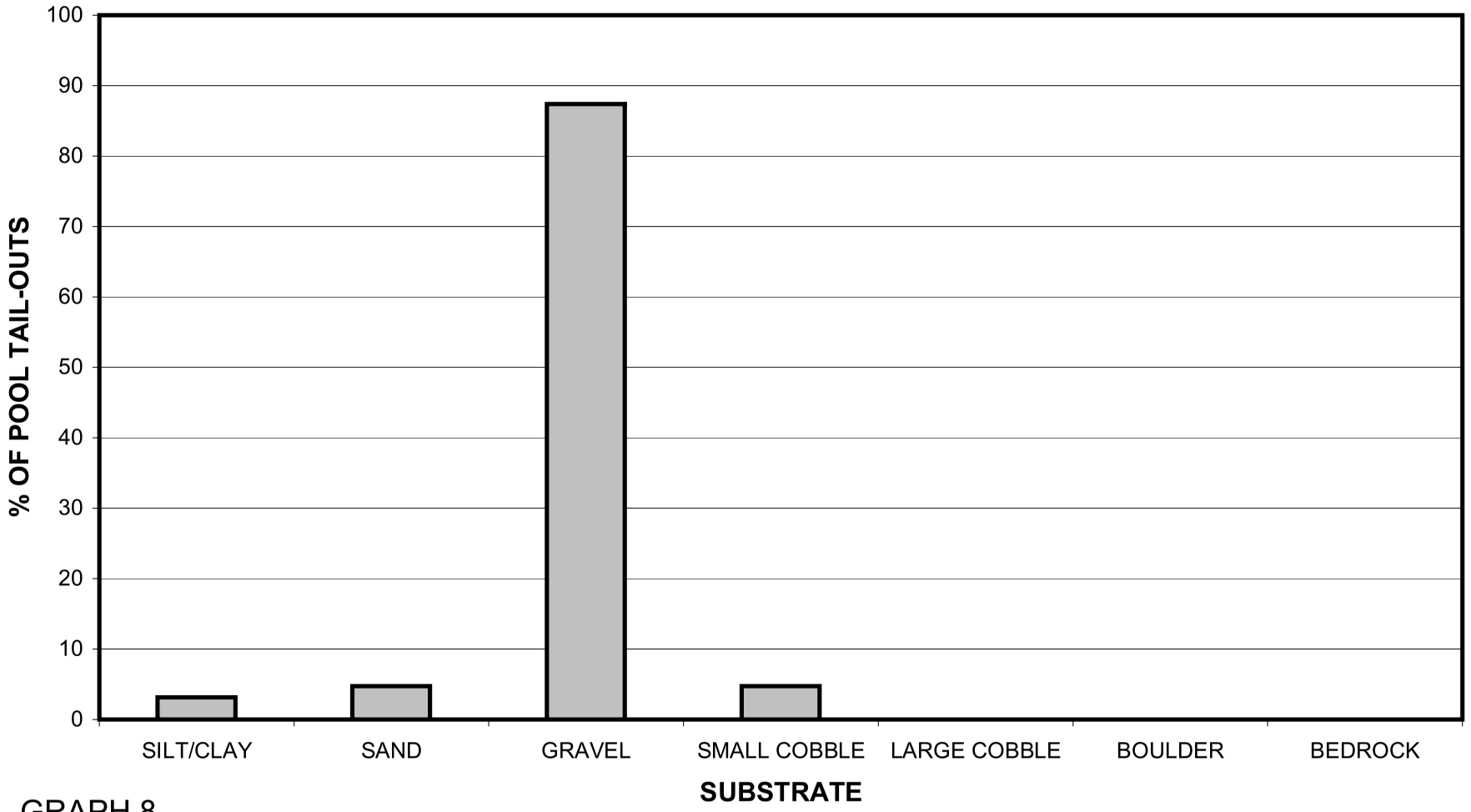
GRAPH 6

LINDSAY CREEK 2006
MEAN PERCENT COVER TYPES IN POOLS



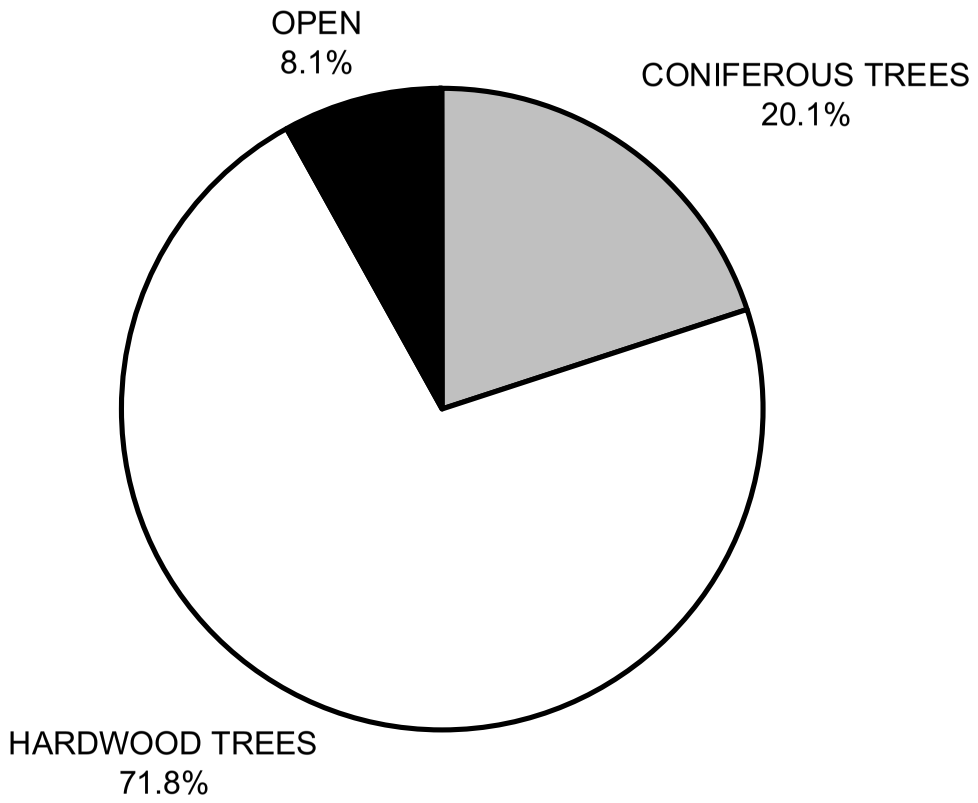
GRAPH 7

LINDSAY CREEK 2006
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



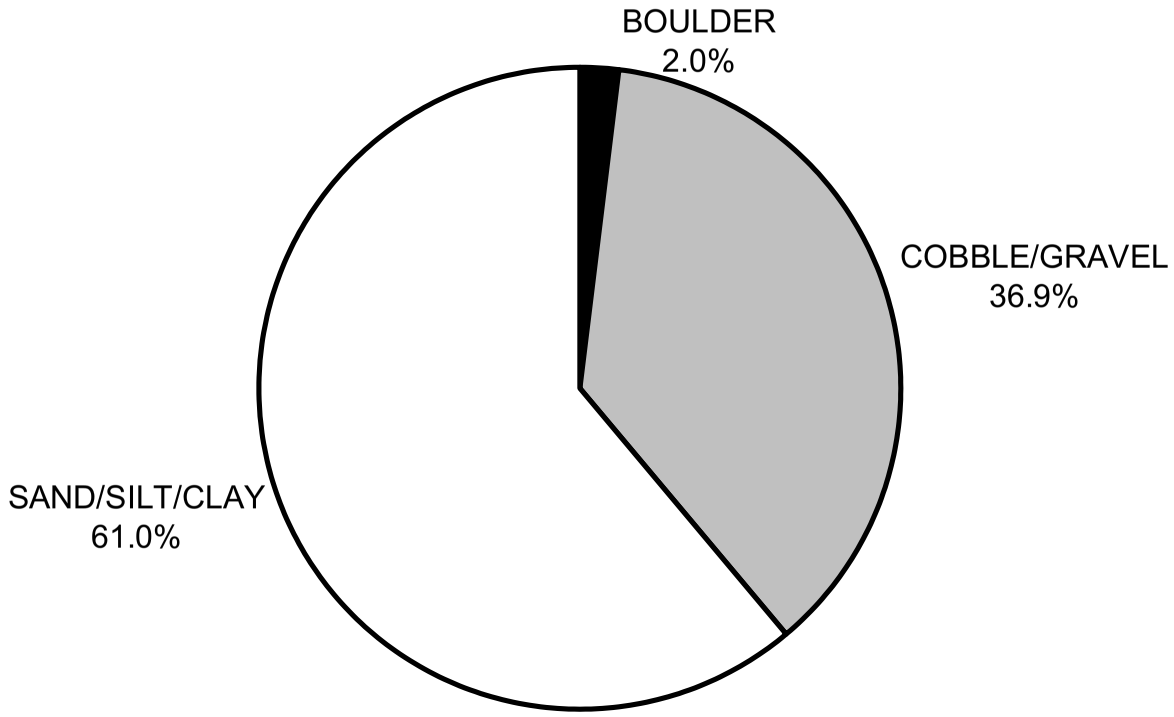
GRAPH 8

LINDSAY CREEK 2006
MEAN PERCENT CANOPY



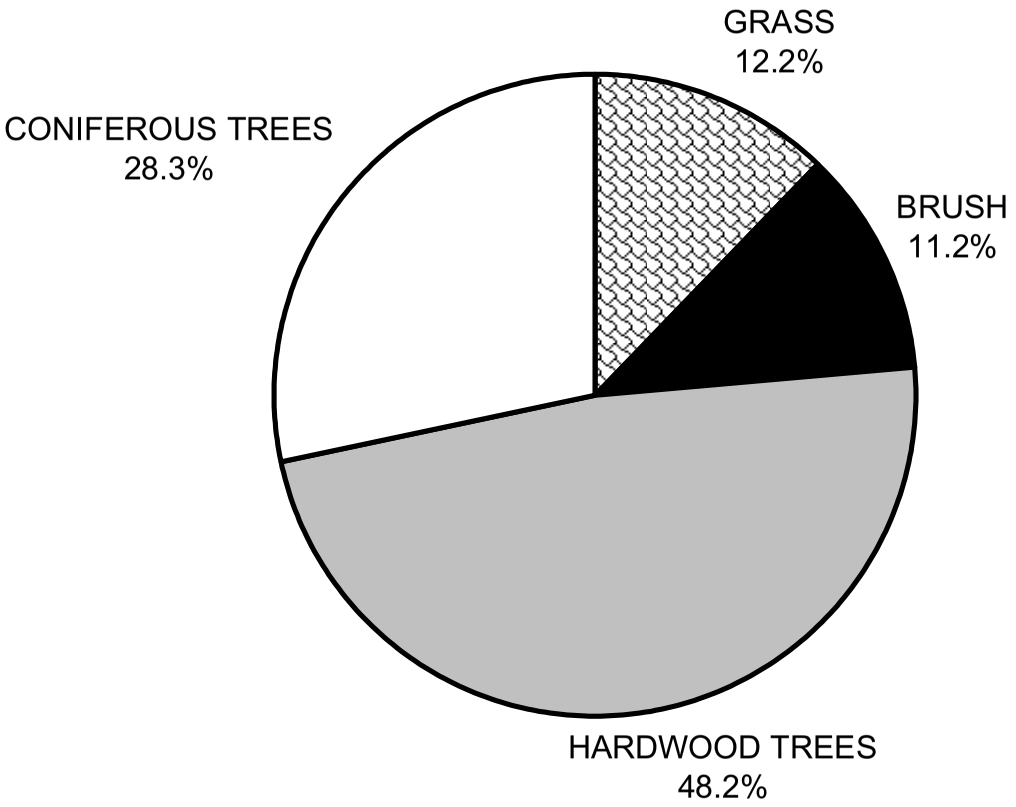
GRAPH 9

LINDSAY CREEK 2006
DOMINANT BANK COMPOSITION IN SURVEY REACH

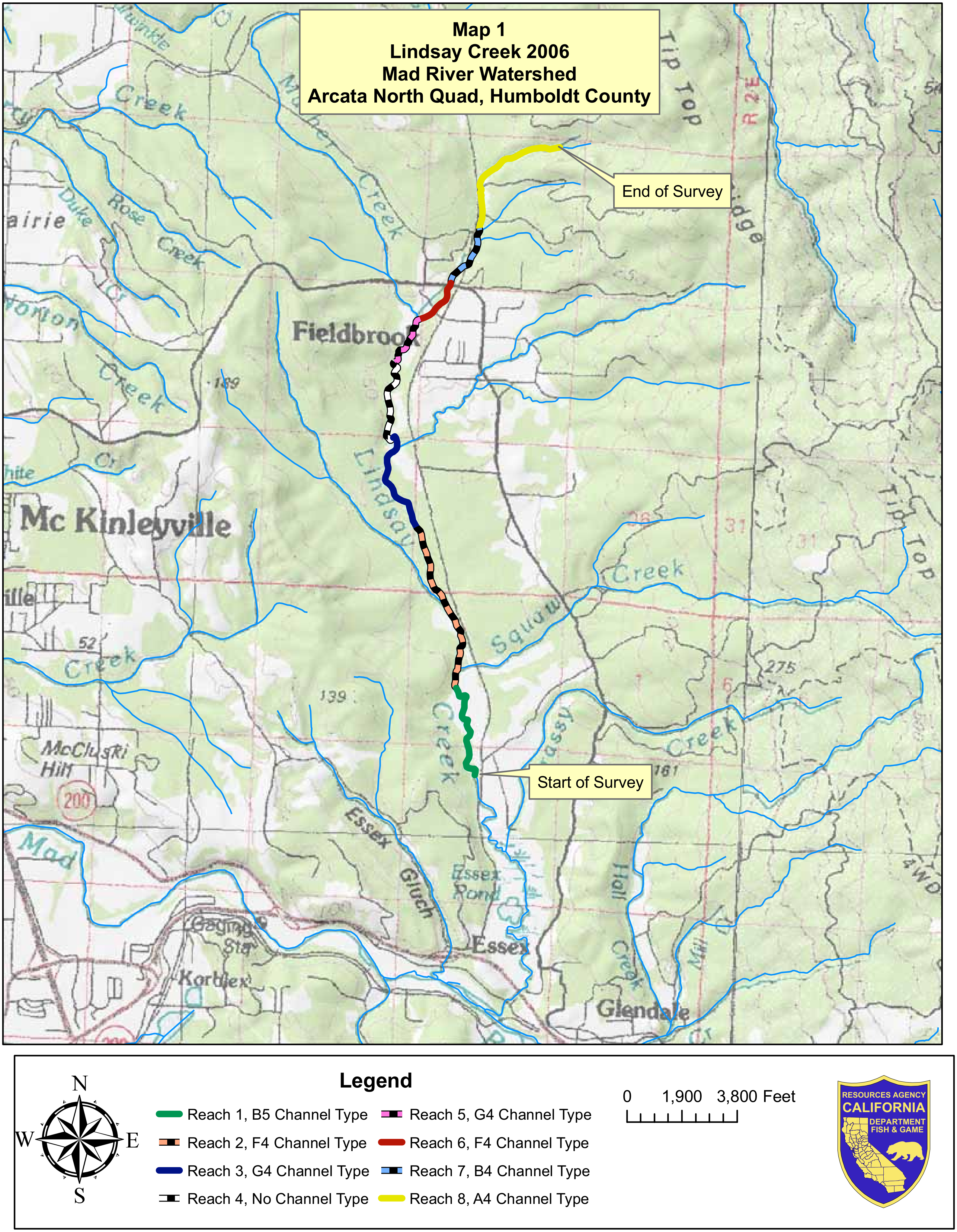


GRAPH 10

LINDSAY CREEK 2006
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11


Map 1
Lindsay Creek 2006
Mad River Watershed
Arcata North Quad, Humboldt County
End of Survey
Start of Survey
Fieldbrook
Mc Kinleyville
Lindsay Creek
Squaw Creek
Rose Creek
Duke
Norton Creek
McCluski Hill
Essex Gulch
Essex Pond
Essex
Korblex
Glendale
Mad
Tip Top Ridge
Grassy Creek
Hall Creek
Mill
R 2 E
200
Legend
Reach 1, B5 Channel Type
Reach 2, F4 Channel Type
Reach 3, G4 Channel Type
Reach 4, No Channel Type
Reach 5, G4 Channel Type
Reach 6, F4 Channel Type
Reach 7, B4 Channel Type
Reach 8, A4 Channel Type
0 1,900 3,800 Feet
N
S
W
E
RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME