

# **STREAM INVENTORY REPORT**

## **Little River (Mendocino County)**

### INTRODUCTION

A fisheries inventory was conducted during summer 1999 on Little River. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids; the objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. This report presents the inventory results and recommends options for potential habitat improvements for coho salmon and steelhead trout. The recommendations are based on target habitat values suitable for salmonids in California's north coast streams.

A September 1965 stream survey by the California Department of Fish and Game (DFG) (California Department of Fish and Game, 1965) described Little River as 2.6 miles of "excellent" spawning grounds and 3.9 miles of "good" nursery area for steelhead trout and coho salmon. Pools comprised about 10 percent of the stream. Fine sediments in the stream bottom were estimated at 5% sand in the lower 2 miles; above that reach, only sediments coarser than sand were apparent. The survey estimates were probably made by eye. The stream was "cleared of all debris" from the mouth to the end of the park road, apparently for park maintenance. Cover was provided by boulders and rubble. Juvenile coho were far more abundant than juvenile steelhead. Potential sedimentation problems from recent logging operations were noted. Clearance of 14 log jams and slash was recommended. In 1967 a 62 foot high earthen dam on a north side tributary failed, depositing sand and mud in 3.5 miles of downstream fish habitat, and killing an estimated 21,000 to 25,000 salmonids (California Department of Fish and Game, 1967).

Since 1986, annual spawner surveys, downstream migrant trapping, and electrofishing surveys have been conducted in Little River by DFG (Unpublished data). The data show that coho have become less abundant than steelhead, and that coho numbers have been declining since the early 1990's.

### WATERSHED OVERVIEW

Little River is tributary to the Pacific Ocean in Mendocino County, California (Map 1). Little River's mouth is located in T16N R17W S06 MDB&M, at 39°16'02" north latitude and 123°47'25" west longitude. Little River is a first order stream with about 5.4 miles of blue line stream on the USGS Mendocino and Mathison Peak 7.5 minute quadrangle maps. Little River drains a watershed of approximately 4.2 square miles. Elevations range from 0 feet at the mouth to 580 feet in the headwater areas. Coniferous forest is the main vegetation type. The watershed is owned mostly by the State of California (Van Damme State Park), with numerous smaller private holdings. Vehicle access exists via State Highway 1 and Little River Airport Road.

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### METHODS

The habitat inventory conducted in Little River follows the methods described in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The field inventory was conducted by a two-person team of AmeriCorps Watershed Stewards Project (WSP) members, who were trained in standardized habitat inventory methods by DFG.

### HABITAT INVENTORY COMPONENTS

A standardized habitat inventory protocol has been developed for California stream surveys; it is described in the *California Salmonid Stream Habitat Restoration Manual*. The protocol was followed in Little River. It has nine components:

#### 1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated.

#### 2. Channel Type:

Channel typing is conducted according to the methods 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.

#### 3. Temperatures:

Water and air temperatures are taken in degrees Fahrenheit at the middle of the habitat unit, within one foot of the water surface.

#### 4. Habitat Unit Type:

Habitat units are numbered sequentially and assigned a habitat type selected from a standard list of 24 habitat types (Appendix 1). Dewatered units are labeled "dry". The length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Habitat unit dimensions of mean length, mean width, mean depth, and maximum depth are measured. In pool units, maximum depth at the pool tail crest is also measured. Measurements are taken to the nearest 1/10 foot using hip chains, measuring tapes, or stadia rods.

#### 5. Embeddedness:

Embeddedness is defined as the percent of a cobble that is surrounded or buried by fine sediment. The values are 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 is assigned to

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substrates deemed unsuitable for spawning due to inappropriate substrate particle size (e.g. bedrock) or other considerations. On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail crest is not suitable for spawning. Embeddedness, estimated by eye, is taken in pool habitat units at the pool tail crest.

### **6. Shelter Rating:**

Instream shelter is composed of those elements within a stream channel that provide 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. The shelter rating is calculated 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. A standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) is assigned according to the complexity of the cover. Thus shelter rating can range from 0-300.

### **7. Substrate Composition:**

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. Dominant and sub-dominant substrate elements in the habitat unit are estimated by eye using a list of seven size classes. In addition, the dominant substrate composing the pool tail outs is recorded in pool habitat units.

### **8. Canopy:**

Canopy density relates to the amount of stream shaded from the sun. Stream canopy density in the habitat unit is estimated using a handheld spherical densiometer. In addition, the area of canopy is estimated by eye into percentages of coniferous and deciduous trees.

### **9. Bank substrate and Vegetation:**

Bank substrate elements range from bedrock to bare soil. Streambank substrates are often covered with grass, brush, or trees, influencing the ability of streambanks to withstand winter flows. The dominant substrate type and the dominant vegetation type of both the right and left banks of the habitat unit are estimated by eye and recorded. Additionally, the percent of each bank covered by vegetation is estimated by eye and recorded.

## **SAMPLING STRATEGY**

The sampling protocol calls for partial sampling of all habitat units within the survey reach and full sampling in approximately 10% of the habitat units. All habitat units are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat types encountered for the first time are fully sampled for all parameters on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for full

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sampling. Canopy density is recorded for every third unit, in addition to every fully-described unit, giving an approximate 30% sub-sample. Air temperature, water temperature, and time of day are recorded at every tenth habitat unit (once per field form page).

### BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. In Little River, fish presence was observed from the stream banks, and three sites were electrofished using a Smith-Root Model 12-B electrofisher. The sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

### DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, DFG. This program processes and summarizes the data, and produces the following tables:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of mean percent cover by habitat type
- Summary of dominant substrates by habitat type
- Summary of mean percent vegetative cover for entire stream
- Fish habitat inventory data summary
- Summary of streambank substrate and vegetation, and pool tail crest cobble embeddedness
- Mean percent of shelter cover types for entire stream

Graphics are produced from the tables. Graphics include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in the pool tail crests
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

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### HABITAT INVENTORY RESULTS

The habitat field inventory was conducted May 26-28, 1999 and June 1-2, 1999 by Adrienne Carr and Jennifer Jenkins (WSP/AmeriCorps). The total length of stream surveyed was 19,933 feet.

Streamflow was not measured during the survey.

Little River is a B4 channel type for the entire stream reach surveyed. B4 channels are moderately entrenched, of moderate gradient (2-4%), dominated by riffles, with mainly gravel substrate.

Water temperatures taken during the survey period ranged from 49 to 56 degrees Fahrenheit. Air temperatures ranged from 49 to 59 degrees Fahrenheit.

Based on frequency of occurrence of Level II habitat types, there were 11% riffle units, 50% flatwater units, and 38% pool units (Table 1, Graph 1). Based on total length of Level II habitat types, there were 4% riffle units, 71% flatwater units, and 22% pool units (Table 1, Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by occurrence were mid channel pools 35%, runs 31%, low gradient riffles 11%, glides 10%, and step-runs 9% (Graph 3). By length of stream, runs comprised 46%, mid channel pools 20%, glides 9%, and low gradient riffles 4%.

A total of 87 pools were identified (Table 3). Main channel pools were most frequently encountered at 92% (Graph 4) and comprised 91% of the total length of all pools. Of the 87 pools, 58 (67%) had a depth of two feet or greater (Table 4, Graph 5).

In a first order stream such as Little River, a primary pool is defined as a pool with a maximum depth of at least 2 feet. In Little River, primary pools totaled 3441 feet, or 17% of the total stream length surveyed.

Of the 87 pool tail crest embeddedness estimates, none had a value of 1 (0%), 22 had a value of 2 (25%), 42 had a value of 3 (48%), 11 had a value of 4 (13%), and 12 had a value of 5 (14%) (Graph 6).

Riffle habitat types had a mean shelter rating of 22, flatwater habitat types had a mean shelter rating of 23, and pool habitats had a mean shelter rating of 13 (Table 1). Mid channel pools, the dominant pool type, had a mean shelter rating of 10 (Table 2).

Cover in Little River was provided by a mix of undercut banks, small and large woody debris, root masses, terrestrial vegetation, and boulders (Table 5). Except for terrestrial vegetation, the same types also provided the main cover in pools (Graph 7).

Substrate in the main habitat types was dominated by gravel and sand (Table 6). Of the 5 low gradient riffles fully measured, all were dominated by gravel. Of the 5 runs fully measured, 4

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were dominated by gravel and 1 by sand. Of the 5 step runs fully measured, 3 were dominated by gravel and 2 by small cobble. Of the 12 mid channel pools fully measured, 8 were dominated by gravel, 3 by sand, and 1 by small cobble. The dominant pool tail crest substrate was gravel in 85% of the samples, followed by sand and bedrock (6% each) (Graph 8).

Mean percent canopy for the stream reach surveyed was 75%, with conifers the main component (Table 7, Graph 9).

Sand/silt/clay dominated the streambank substrate in 67% of the fully sampled units. Other values were cobble/gravel 19%, boulder 7%, and bedrock 7% (Graph 10). In the fully sampled units, right streambanks had an average of 93% vegetative cover, and left streambanks had an average of 90% vegetative cover (Table 7). Streambank vegetation was mainly deciduous trees, brush, and coniferous trees (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Coho salmon and steelhead are known to exist in Little River from ongoing studies conducted by DFG. To help define the upstream extent of habitat use by coho salmon, three sites relatively high in the basin were electrofished on July 7, 1999. The sites were sampled by Douglas Albin (DFG), and Adrienne Carr and Jennifer Jenkins (WSP).

The first site sampled was unit 226, a run habitat unit just upstream of a bedrock sheet that is a possible barrier to upstream migration. The unit yielded one steelhead.

The second site was unit 189, a mid channel pool habitat unit. The site yielded 3 steelhead.

The third site was habitat unit 137, a mid-channel pool habitat unit. The site yielded 2 steelhead.

## **DISCUSSION**

Little River is channel type B4. The suitability of B4 channels for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing deflectors, and log cover. Channel morphology may be affected by the road running along the surveyed reach. The road constricts the active channel and extent of meander, probably affecting gradient, sinuosity, and riffle-pool ratio.

Water temperatures recorded on the survey days were within the suitable ranges for rearing of coho salmon and steelhead. Given Little River's location in the coastal fog belt and the canopy density found, it is doubtful that stream temperatures are unsuitable for coho or steelhead. Continuous monitoring of temperature throughout the warm season would be needed to verify temperature suitability.

Flatwater habitat types comprised 71% of the total length of the survey, riffles 4%, and pools 22%. Primary pools composed 17% of the length surveyed. DFG data indicate that the better

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coastal coho streams have as much as 40% of their total habitat length in primary pools, and pool enhancement should be considered when primary pools comprise less than that percentage.

The prevalence of gravel as the dominant pool tail crest substrate is considered generally suitable for salmonid spawning. However most embeddedness ratings were 2 or 3, indicating lower spawning substrate quality due to presence of fine sediments. None of the pool tail crests sampled had the highest quality rating of 1. Fine sediments need to be controlled at the source.

The shelter ratings for riffle, flatwater, and pool habitats are lower than desirable for salmonids. The pool shelter rating of 13 is much lower than the desirable pool rating of 100. The low level of cover that now exists is provided by a mix of boulders, undercut banks, root wads, and large and small instream wood. Greatly increased log and root wad cover in the pool and flatwater habitats is needed for both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, shelter from winter's high water velocities, and divides territorial units to reduce density related competition.

The frequency of sand as a dominant substrate in pools further indicates the need to control sources of fine sediment. Some apparent sources were recent failures in the riparian road.

The mean percent canopy density of 75% is slightly lower than 80%, the general level below which canopy revegetation projects are considered.

The streambank vegetation coverage values of 90% and 93% are high enough to place a generally low priority on streambank revegetation efforts.

Coho salmon were not found in any of the habitat units sampled, suggesting that in 1999, coho did not successfully rear in significant numbers upstream of habitat unit 137.

## RECOMMENDATIONS

- 1) Little River should be managed as an anadromous, natural production stream.
- 2) Active and potential sediment delivery from roads and other sources in the watershed should be identified, mapped, and quantified. They should be treated according to their potential for sediment yield to the stream and its tributaries. The assessment of the riparian road should consider effects on channel morphology and consequent habitat quality as well as potential sediment delivery; treatment options should include narrowing, relocation, and removal.
- 3) Greatly increase instream wood to improve cover, and to promote scour to increase depths of existing pools and help form new pools.

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### COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. Distances are in feet from the beginning of the survey reach.

Position (ft):	Comment:
0'	Begin survey at mouth of Little River at Pacific Ocean. Not surveyed because estuary. Will begin habitat units once outside tidal influence.
92'	Estuary pool begins.
363'	Highway 1 bridge: 9.4' high x 40' wide x 34' long.
480'	At begin of unit, large woody debris (LWD) holding gravel: ½ cubic yard total.
568'	Right bank tributary enters. Flow is less than 0.1 cfs.
910'	LWD accumulation. 2' diameter alder creating pool.
984'	Pool formed by downed alder. Still living. Trunk and rootwad in creek. 1.5' undercut bank.
1,002'	Three downed logs (one has cable in it) form pool. Two foot diameter culvert on the left bank.
1,359'	Bank stabilization structure on left bank.
1,714'	Trail running along left bank.
1,871'	Footbridge: 5' long x 40' wide x 2.7' high.
2,272'	Van Damme Road on left bank.
2,402'	Campsites along the left bank.
2,504'	Campsites along left bank.
2,584'	Campsites along left bank. Channel type taken between units 0027 and 0028.
2,790'	Road crossing at beginning of unit. 8.2' high x 40' wide x 13' long.
2,906'	2.5' undercut bank.
3,129'	Every 30 feet has rip rap with digger logs.



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- 3,309' Bedrock was concrete. Another double culvert bridge 13' wide x 8.3' high x 32' long, flow only through one culvert of the bridge.
- 3,423' Right bank tributary enters.
- 3,518' CDFG downstream migrant trap at end of unit. 2' undercut bank. Channel pinched with boulders to narrow channel and guide fish into trap.
- 3,544' Road and campsites along left bank.
- 3,687' Road crossing. Rip-rap under bridge. 5.3' high 40' wide x 16' long. Bedrock outcrop on left bank.
- 3,726' Young-of-the-year (YOY) salmonids observed.
- 3,780' Pool formed by root wad and bedrock.
- 4,057' Campsites on right bank.
- 4,198' Fern Canyon trail on right bank.
- 4,310' Fern Canyon trail on right bank. Right bank slide on other side of trail. Large debris accumulation (LDA) at end of unit. Water runs through on right side, mostly blocked in middle and on left side of channel. LDA measures 8.5' high x 45' wide x 15' long.
- 4,350' Fern Canyon trail on right bank. Base of right bank slide approx 100 cubic yards. Toe in creek. Slide contributed four large woody debris (LWD) pieces to stream. No longer "bleeding" sediment, but with any amount of precipitation will begin to. Closes off fern Can trail.
- 4,518' Fern Canyon Trail on right bank. YOY observed. Lots of sand (2' deep) rip rap along right bank for entire unit.
- 4,588' Fern Canyon Trail on right bank. Two tributaries enter on the right bank through culverts. Rip rap along much of the right bank. Through most of the unit the two cited tributaries are less than 0.1 cfs. Measured channel type.
- 5,344' Fern Canyon Trail on right bank.
- 5,557' Fern Canyon Trail on right bank. LDA at end of unit mostly out of channel on left bank. 6' high x 10' long x 25' wide.
- 5,595' Fern Canyon Trail on right bank.
- 5,638' Fern Canyon Trail on right bank.

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- 5,690' Fern Canyon Trail on right bank.
- 5,802' Fern Canyon Trail on right bank. YOY in pool. Down douglas fir upstream creating pool. 1' sediment.
- 5,831' Fern Canyon Trail on right bank. LDA measures 9' high x 30' wide x 25' long. Water flows under holding silt upstream. Upstream pool totally filled with silt.
- 6,040' Fern Canyon Trail on right bank.
- 6,077' Fern Canyon Trail on right bank.
- 6,151' Fern Canyon Trail on right bank.
- 6,276' Fern Canyon Trail on right bank.
- 6,366' Fern Canyon. Trail on right bank.
- 6,385' Fern Canyon Trail on right bank.
- 6,435' Fern Canyon Trail on right bank.
- 6,457' Fern Canyon Trail on right bank. Concrete culvert section approximately three feet long creating small debris accumulation.
- 6,651' Fern Canyon Trail on right bank. Small debris accumulation is separating two pools.
- 6,693' Fern Canyon Trail on right bank.
- 6,722' Fern Canyon Trail on right bank.
- 6,834' Fern Canyon Trail on right bank.
- 6,866' Fern Canyon Trail on right bank until unit 0079.
- 7,116' Tributary enters on the right bank through two foot diameter culvert. Flow is less than 0.1 cfs. Rip-rap on right bank. Left bank debris torrent. Four trees recruited into stream banks. Debris torrent measures 100' high x 25' wide x 5' long. Fern Canyon Trail washed out.
- 7,239' LDA measures 39' long x 5' high x 20' wide.
- 7,302' YOY in unit.
- 7,485' YOY in pool. Two pieces of LWD and one rootwad forming pool. Rip-rap on left bank and right bank.

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- 7,554' Foot bridge at beginning of unit. 1.5' high x 7.5' long x 16' wide. Trail crosses to the left bank.
- 7,833' Right composition is wood. Three redwood rootwads on right bank provide good cover. Fern Canyon Trail on left bank.
- 7,962' Foot bridge measures 65' long x 1.5' high x 16' wide. Fern Canyon Trail now on right bank until unit 0087.
- 8,124' 1.5' diameter redwood and douglas fir digger log and boulders creating pool. 2.5' jump over redwood.
- 8,233' Long shallow pool. Tributary enters on the left bank.
- 8,311' Three digger logs on left bank. Rip-rap on right bank.
- 8,421' Foot bridge at beginning of unit measures 1.7' high x 6.5' long x 20' wide. Fern Canyon Trail on left bank until unit 0098.
- 8,540' Two separate small debris accumulations approx. 20' apart, forming two steps.
- 8,595' Old redwood rootwad forming pool.
- 8,628' Log weir at end of unit.
- 8,644' Rootwad on right bank forming pool.
- 8,928' Old growth rootwad on right bank at end of unit.
- 8,989' Boulder in middle of pool.
- 9,364' Concrete platform and riprap on right bank and left bank.
- 9,393' Footbridge measures 6.5' long x 20' wide x 2.1' high. Fern Canyon Trail now on right bank. Rip rap continues 20 feet into unit. After rip-rap sand bag bank. Stabilization on left bank next 30'.
- 9,419' Fern Canyon Trail on right bank until unit 0107. Two standing redwoods and two rootwads on left bank.
- 9,546' Two downed douglas firs through middle of unit forming pool.
- 9,998' 10 foot x 8 foot metal sheet and two 1.5 foot pieces of cover. Rip rap on left bank and right bank.

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- 10,029' Footbridge measures 7' long x 30' wide x 1.9' high. Trail is now on left bank until unit 0113. Rip-rap and sand bags continue 20 feet.
- 10,173' YOY observed. 1+ observed.
- 10,381' Left bank erosion approximately two cubic yards. 1.5 cubic yards on site.
- 10,399' LDA measures 10' long x 8' high x 40' wide.
- 10,609' Concrete platform and rip-rap on left bank and right bank.
- 10,653' Footbridge at beginning of unit measures 2.7' high x 63' long x 20" wide. Trail on right bank until unit 0120. Sand bags on left bank and right bank.
- 10,687' Hollowed out rootwad.
- 10,711' Bedrock bottom in unit for 30'. LDA measures 10' high x 20' wide x 10' long. Right bank trail/road failure for 20 feet.
- 11,139' LDA at end of unit measures 7' high x 50' wide x 15' long. Water flows through LDA over unit holding back 2.5' sediment.
- 11,167' Formed by rootwad, but more than 60% of channel width.
- 11,226' More concrete rip-rap on left bank.
- 11,251' Footbridge measures 6.5' long x 0.8' high x 20' wide. Fern Canyon Trail on left bank until unit 0133. Rip-rap and sand bags continue next 30 feet. This pool is full of sediment. Large (greater than 4' diameter) root wad, hollow and providing good cover on right bank.
- 11,434' LDA at end of unit measures 3' high x 6' long x 25' wide. Water flows under. LDA is holding 1.5' sediment.
- 11,500' Back water and log scour creating this pool. Very sandy bottom.
- 11,619' LDA begins (not a complete jam). It measures 15' long x 4.5' high x 15' wide. Several of the logs are floating. Possibly blown out this winter.
- 11,704' Right bank tributary enters.
- 11,788' Right bank wetted channel not flowing, but not side channel. Large gravel bar in middle.
- 11,832' Road crossing at end of unit. Concrete and boulder raised above channel separating two pools.

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- 11,899' Small foot platform. This is a road crossing. Concrete and rock structure. Fern Canyon Trail on right bank until unit 0195.
- 12,754' LDA measures 5' high x 30' wide x 14' long.
- 12,790' Left bank tributary enters. Lots of bedrock in the unit.
- 13,315' LDA measures 3' high x 8' wide x 25' long. Downstream rootwad and left bank rootwad catching debris.
- 13,460' Left rootwad providing good cover.
- 13,535' Trail on right bank until habitat unit # 0195. Right bank log creating some scour.
- 13,690' Right bank tributary.
- 13,874' Right bank tributary enters.
- 13,890' Substrate changes. Many YOY observed.
- 14,101' Slide on left bank, 200' uphill. 50+ downed trees, not all reaching creek. Campsites on right bank. LDA begins, continues through 10' of next unit. Contains trees from left bank slide.
- 14,242' LDA begins, lots of SWD mixed with LWD, water runs thru LDA. Left bank slide contributing sediment. LDA measures 70' long x 100' wide.
- 14,963' Left bank rootwad under cut four feet.
- 15,220' Left bank tributary.
- 15,397' LDA measures 50' wide x 5' high x 13' long. Smaller debris caught near surface of water. Largest tree jam 5' above channel. Water flows under.
- 15,690' Trail and road continues on right bank. Sand covered substrate in unit.
- 16,237' LDA measures 20' long x 4' high x 30' wide. LDA backing up 3' sediment directly behind LDA. Water flow around on left bank side, but other wise there is just a trickle coming from underneath. Even further upstream the creek is narrow, flat, and there are lots of gravel deposits. Left bank tributary enters. The tributary is narrow and full of gravel deposits as well.
- 16,342' YOY in pool.
- 16,407' Trail/road. Crossing. Trail on right bank splits into two trails, one on left bank.

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- 16,449' Two right bank rootwads providing excellent cover, but pool totally filled with sand.
- 16,769' Right bank tributary enters.
- 17,499' LDA measures 25' wide x 10' long x 4' high. 1.5' sediment (mostly sand) backed up on left bank side. Water flows freely under and around LDA.
- 17,809' LDA measures 5' high x 18' wide x 10' long. Pool formed by LDA at end of unit.
- 17,965' Left bank draw.
- 17,994' Road/trail continues on right bank .
- 18,189' Trail leaves the creek for rest of site.
- 18,415' Small debris accumulation helping form pool.
- 18,707' One foot high plunge formed by douglas fir log spanning channel.
- 18,785' Very silty pool.
- 19,233' Tributary enters on right bank.
- 19,505' 1+ steelhead in pool with 2' undercut bank.
- 19,896' Left bank bedrock sheet. Tributary enters on the left bank; it is not accessible to fish. 8' jump with no pool below. 6' high x 30' long bedrock sheet.
- 19,918' End of survey due to possible end of anadromy. Bedrock sheet does not have sufficient jump pool to accommodate spawning salmonids. Even in winter flows the pool below does not rise enough to support the jump. The sheet is at a gradual slope so it is quite a distance to jump.
- 19,980' Footbridge measures 3.6' high x 4.2' long x 30' wide. Tributary enters on the right bank; its flow is less than 0.1 cfs. A second footbridge crosses measuring 2.7' high x 4.1' long x 50' wide.
- 20,380' Left bank seep.
- General There is a road/trail that follows along this creek for its entire length. Often it is at flood prone level. In many places it is failing. At nearly all road/trail crossings there are remnants of old CCC construction. What remains is rip-rap and concrete sand bags for 20' on either side of a crossing. 10' x 10' iron plates in the creek.

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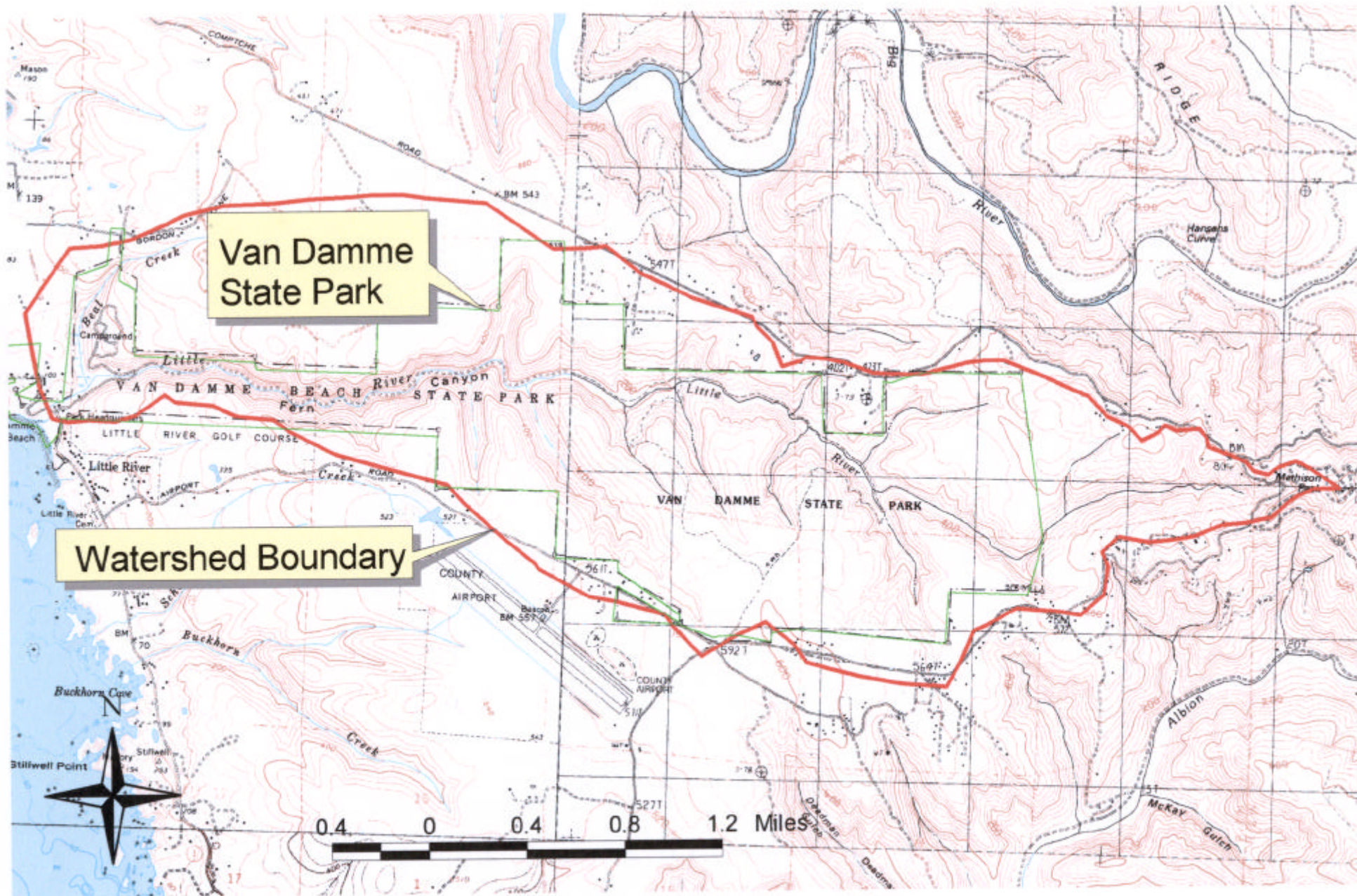
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### LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
<b>RIFFLE</b>		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
<b>CASCADE</b>		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
<b>FLATWATER</b>		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
<b>MAIN CHANNEL POOLS</b>		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
<b>SCOUR POOLS</b>		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
<b>BACKWATER POOLS</b>		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5





Map 1

LITTLE RIVER

Drainage: PACIFIC OCEAN

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 05/26/99 to 06/02/99

Confluence Location: QUAD: MENDOCINO LEGAL DESCRIPTION: T16NR17WS6 LATITUDE:39°16'2" LONGITUDE:123°47'25"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN ESTIMATED VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
26	6	RIFFLE	11	33	861	4	14.7	0.4	398	10358	148	3847	0	22
115	11	FLATWATER	50	126	14467	71	20.7	0.7	2253	259051	1854	213192	0	23
87	87	POOL	38	53	4573	22	15.7	1.2	879	76483	1195	103935	647	13
1	1	CULVERT	0	32	32	0	13.0	0.2	416	416	83	83	0	0
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)				TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)			
229	105				19933				346308		321057			

LITTLE RIVER

Drainage: PACIFIC OCEAN

Table 2 SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 05/26/99 to 06/02/99

Confluence Location: QUAD: MENDOCINO LEGAL DESCRIPTION: T16NR17WS6 LATITUDE:39°16'2" LONGITUDE:123°47'25"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MEAN MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL EST. POOL	MEAN SHELTER VOL RATING	MEAN CANOPY
#			%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
25	5	LGR	11	33	831	4	13	0.5	1.4	353	8817	165	4125	0	24	79
1	1	BRS	0	30	30	0	22	0.1	0.6	627	627	63	63	0	10	80
23	1	GLD	10	83	1913	9	44	1.1	1.9	2508	57684	2759	63452	0	80	73
72	5	RUN	31	131	9410	46	19	0.5	1.1	948	68275	542	39046	0	11	75
20	5	SRN	9	157	3144	15	18	0.7	2.4	3506	70118	2984	59688	0	24	69
80	80	MCP	35	52	4171	20	16	1.2	4.2	877	70124	1193	95455	645	10	77
3	3	LSL	1	51	152	1	17	1.1	2.3	934	2801	1028	3083	602	33	61
1	1	LSR	0	73	73	0	13	1.2	2.4	949	949	1139	1139	759	20	90
2	2	LSB <sub>o</sub>	1	76	152	1	14	1.4	2.4	1154	2309	1994	3988	966	85	74
1	1	PLP	0	25	25	0	12	0.9	1.8	300	300	270	270	150	30	85
1	1	CUL	0	32	32	0	13	0.2	0.4	416	416	83	83	0	0	66
<b>TOTAL UNITS</b>	<b>TOTAL UNITS</b>				<b>LENGTH (ft.)</b>					<b>AREA (sq. ft)</b>			<b>TOTAL VOL. (cu. ft)</b>			
229	105				19933					282419			270392			

LITTLE RIVER

Drainage: PACIFIC OCEAN

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 05/26/99 to 06/02/99

Confluence Location: QUAD: MENDOCINO LEGAL DESCRIPTION: T16NR17WS6 LATITUDE:39°16'2" LONGITUDE:123°47'25"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
80	80	MAIN	92	52	4171	91	15.8	1.2	877	70124	1193	95455	645	10
7	7	SCOUR	8	57	402	9	14.9	1.2	908	6359	1211	8480	664	46
<b>TOTAL</b>	<b>TOTAL</b>				<b>TOTAL LENGTH</b>				<b>TOTAL AREA</b>			<b>TOTAL VOL.</b>		
UNITS	UNITS				(ft.)				(sq.ft.)			(cu.ft.)		
87	87				4573				76483			103935		

LITTLE RIVER

Drainage: PACIFIC OCEAN

Table 4 SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 05/26/99 to 06/02/99

Confluence Location: QUAD: MENDOCINO LEGAL DESCRIPTION: T16NR17WS6 LATITUDE:39°16'2" LONGITUDE:123°47'25"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT		1-<2 FT.		1-<2 FOOT		2-<3 FT.		2-<3 FOOT		3-<4 FT.		3-<4 FOOT		>=4 FEET		>=4 FEET	
			MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE
80	MCP	92	0	0	27	34	40	50	12	15	1	1								
3	LSL	3	0	0	1	33	2	67	0	0	0	0								
1	LSR	1	0	0	0	0	1	100	0	0	0	0								
2	LSB <sub>o</sub>	2	0	0	0	0	2	100	0	0	0	0								
1	PLP	1	0	0	1	100	0	0	0	0	0	0								

TOTAL

UNITS

87



LITTLE RIVER

Drainage: PACIFIC OCEAN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 05/26/99 to 06/02/99

Confluence Location: QUAD: MENDOCINO LEGAL DESCRIPTION: T16NR17WS6 LATITUDE:39°16'2" LONGITUDE:123°47'25"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
25	5	LGR	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	100
23	1	GLD	0	100	0	0	0	0	0
72	5	RUN	0	20	80	0	0	0	0
20	5	SRN	0	0	60	40	0	0	0
80	12	MCP	0	25	67	8	0	0	0
3	1	LSL	0	100	0	0	0	0	0
1	1	LSR	0	0	100	0	0	0	0
2	2	LSBo	0	0	100	0	0	0	0
1	1	PLP	0	0	0	0	0	0	100
1	1	CUL	0	0	0	0	0	0	100

**TABLE 7****Summary of Mean Percent Vegetative Cover for Entire Stream**

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Deciduous	Mean Percent Open Units	Mean Right Bank Percent Cover	Mean Left Bank Percent Cover
75	62	38	0	93	90

Note: Mean percent conifer and deciduous 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: LITTLE RIVER

SAMPLE DATES: 05/26/99 to 06/02/99

STREAM LENGTH: 20413 ft.

LOCATION OF STREAM MOUTH:

USGS Quad Map: MENDOCINO

Legal Description: T16NR17WS6

Latitude: 39°16'2"

Longitude: 123°47'25"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B4

Channel Length: 19933 ft.

Riffle/flatwater Mean Width: 19 ft.

Total Pool Mean Depth: 1.2 ft.

Base Flow: 0.0 cfs

Water: 049- 056°F Air: 049-059°F

Dom. Bank Veg.: Deciduous Trees

Vegetative Cover: 89%

Dom. Bank Substrate: Silt/Clay/Sand

Canopy Density: 75%

Coniferous Component: 62%

Deciduous Component: 38%

Pools by Stream Length: 23%

Pools >=3 ft.deep: 15%

Mean Pool Shelter Rtn: 64

Dom. Shelter: Boulders

Occurrence of LOD: 18%

Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 2.25% 3. 48% 4. 13% 5. 14%

Length of stream section not surveyed within survey reach  
and not included in above totals or calculations: 480 ft.

**TABLE 9**

## Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	2	3	7.35
Boulder	2	3	7.35
Cobble/Gravel	10	3	19.12
Silt/clay	20	26	67.65

## Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	2	3	7.35
Brush	14	8	32.35
Decid. Trees	11	12	33.82
Conif. Trees	7	11	26.47
No Vegetation	1	1	2.94

Total stream average embeddedness value for pool tails:

3.15

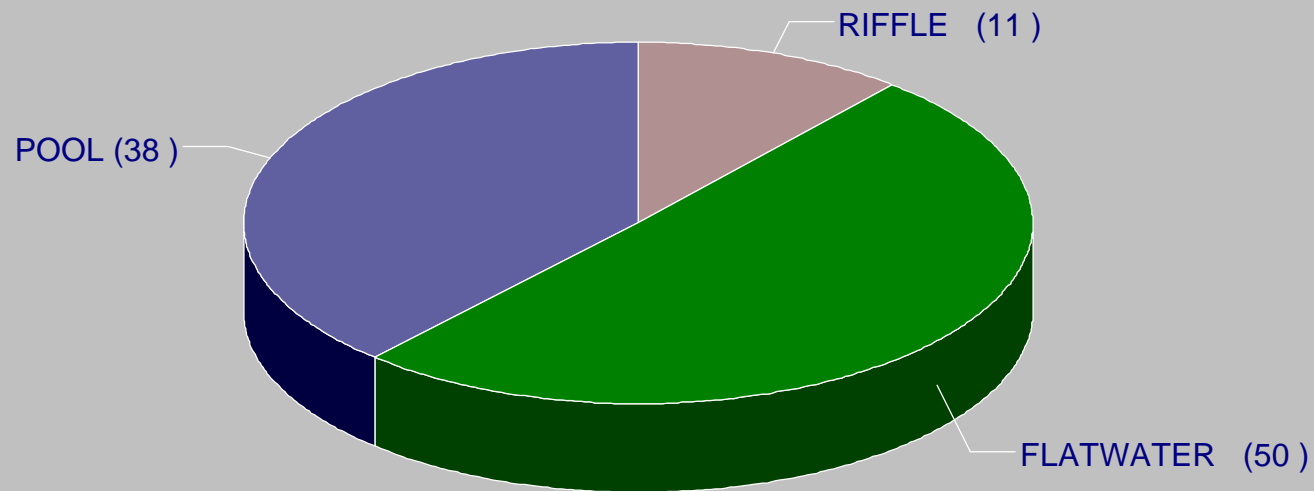
TABLE 10. MEAN PERCENT OF SHELTER COVER TYPES FOR ENTIRE STREAM

Stream: LITTLE RIVER                      Drainage: PACIFIC OCEAN

Survey Date: 05/26/99 to 06/02/99

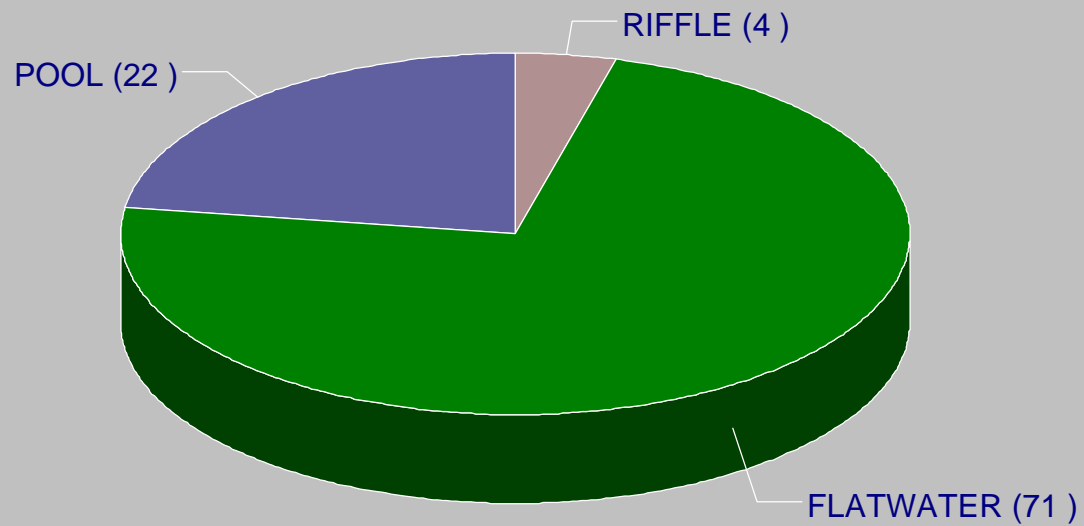
	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	10	7.73	12.94
SMALL WOODY DEBRIS	14.29	25	11.47
LARGE WOODY DEBRIS	17.71	12.73	18.24
ROOTS	11.71	5.45	20.59
TERRESTRIAL VEG	10.71	17.73	2.35
AQUATIC VEG	0.43	0.91	0
WHITewater	5.29	5.91	0.59
BOULDERS	19.43	24.09	19.12
BEDROCK LEDGES	7.57	0.45	14.71

# HABITAT TYPES BY PERCENT OCCURRENCE



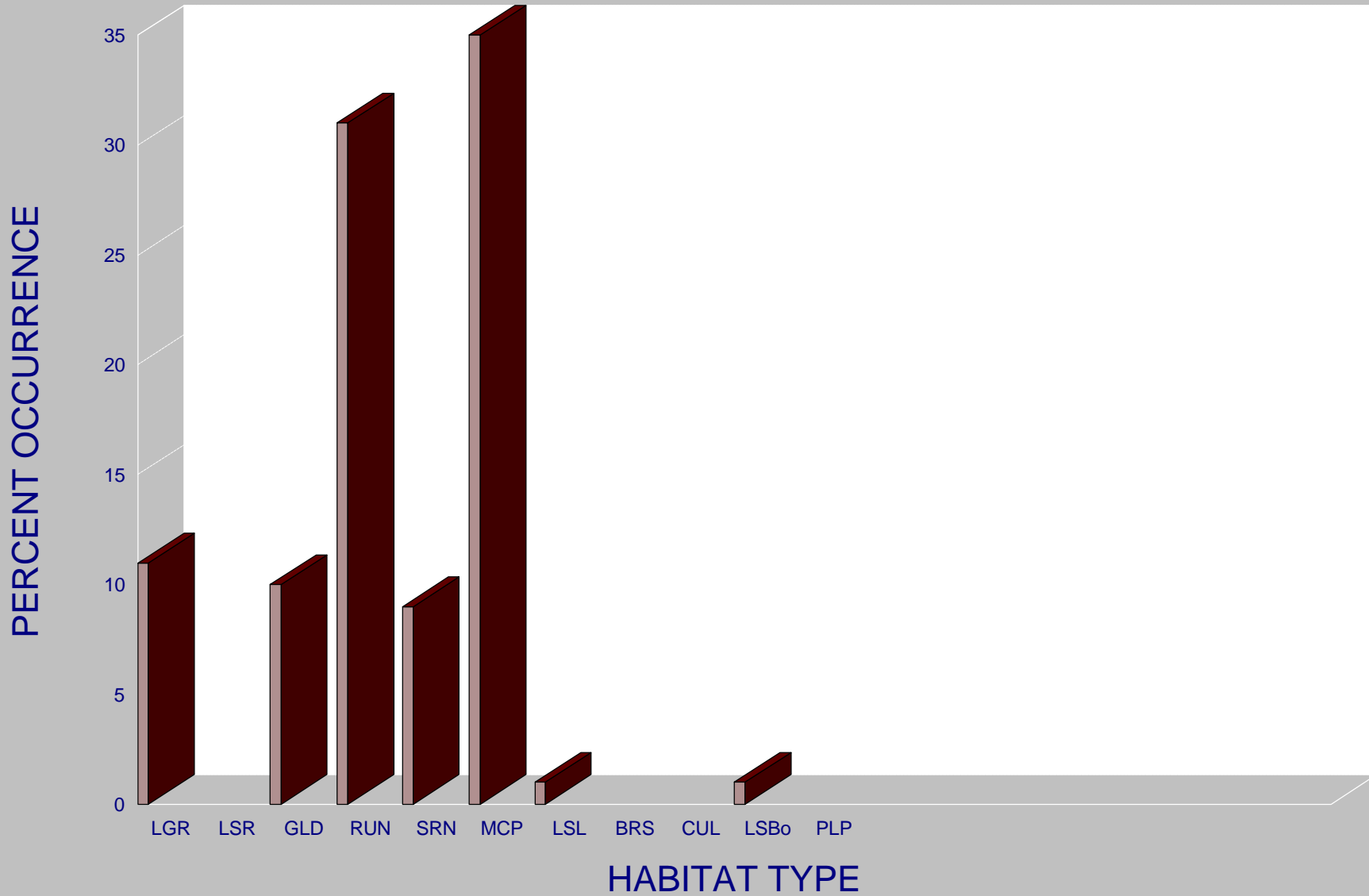
GRAPH 1

# HABITAT TYPES BY PERCENT TOTAL LENGTH



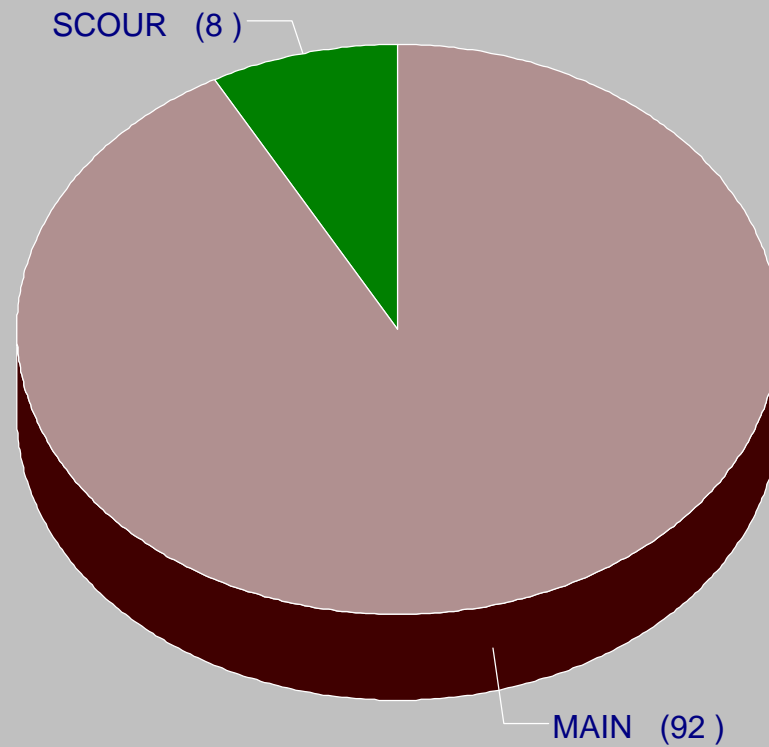
GRAPH 2

# HABITAT TYPES BY PERCENT OCCURRENCE



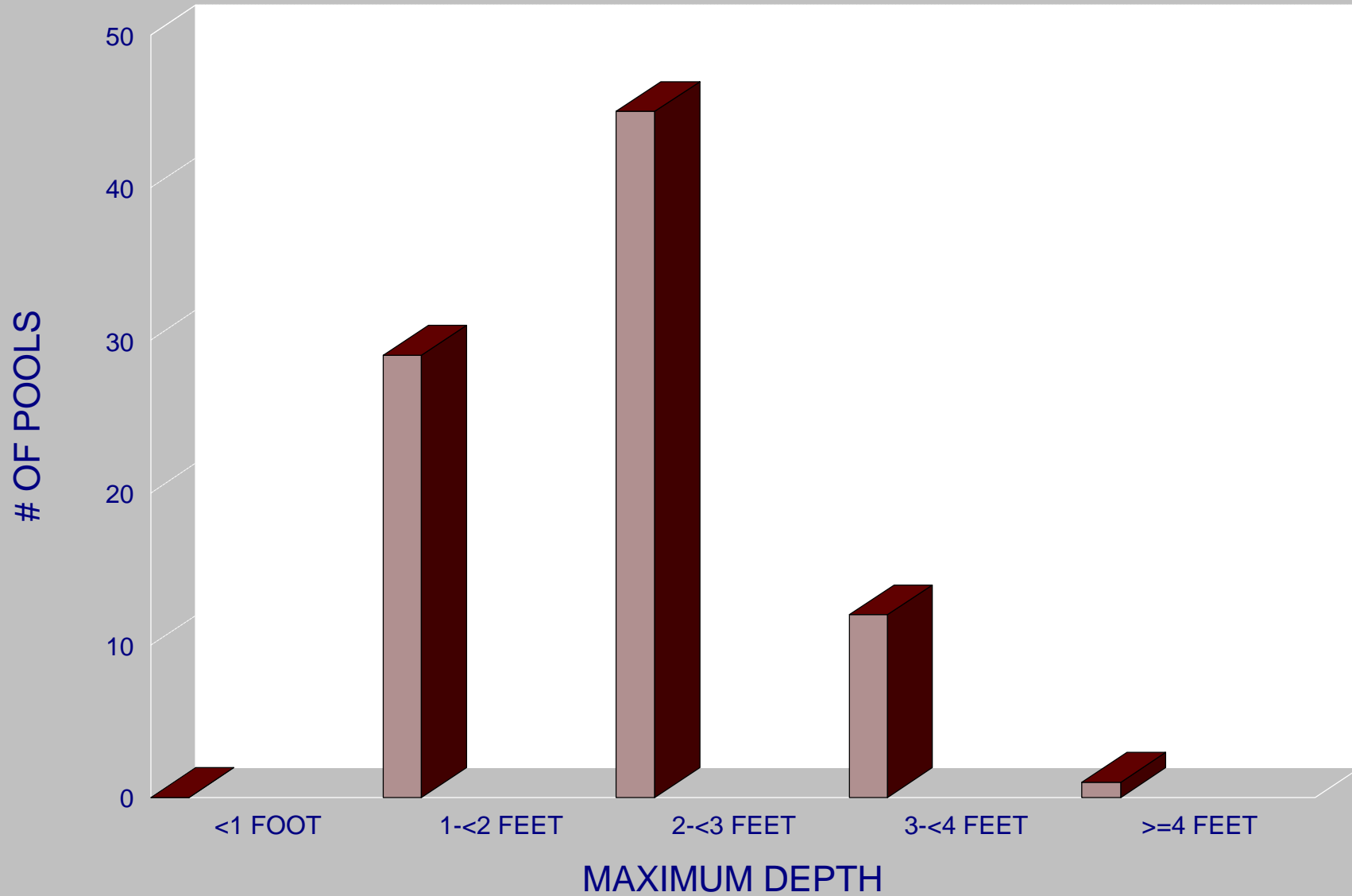
GRAPH 3

# POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

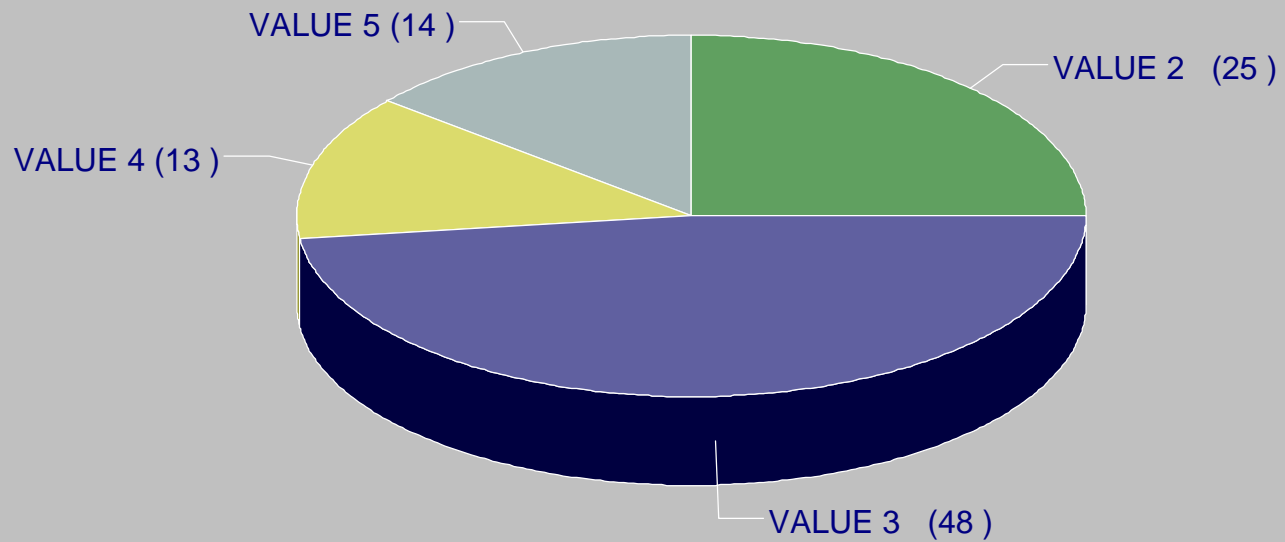
# MAXIMUM POOL DEPTHS



GRAPH 5

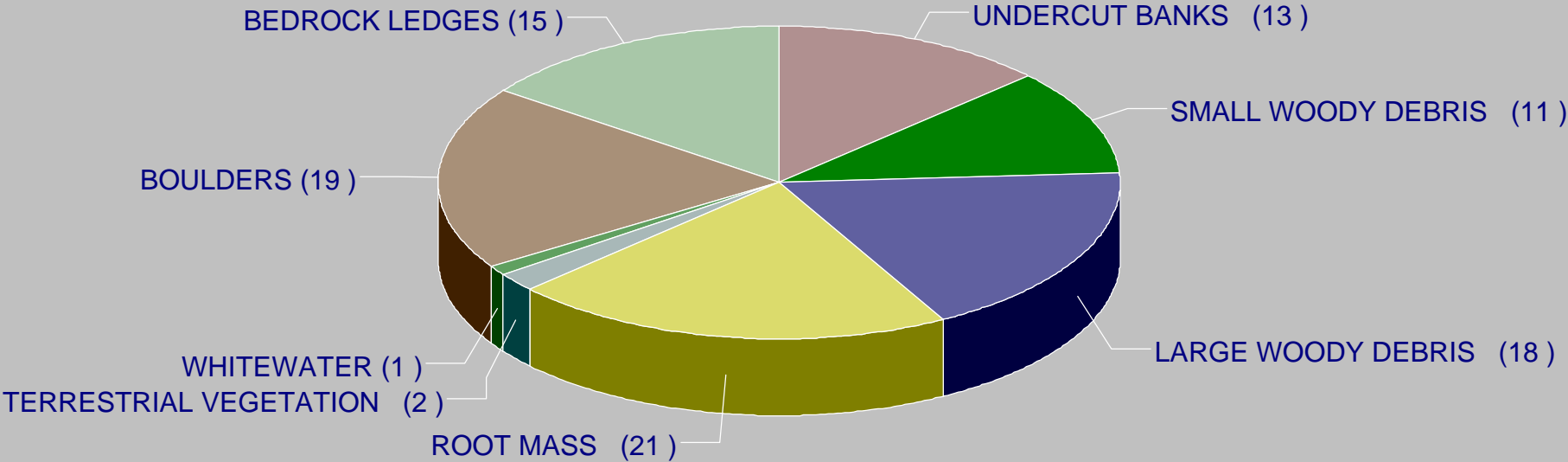


# PERCENT EMBEDDEDNESS



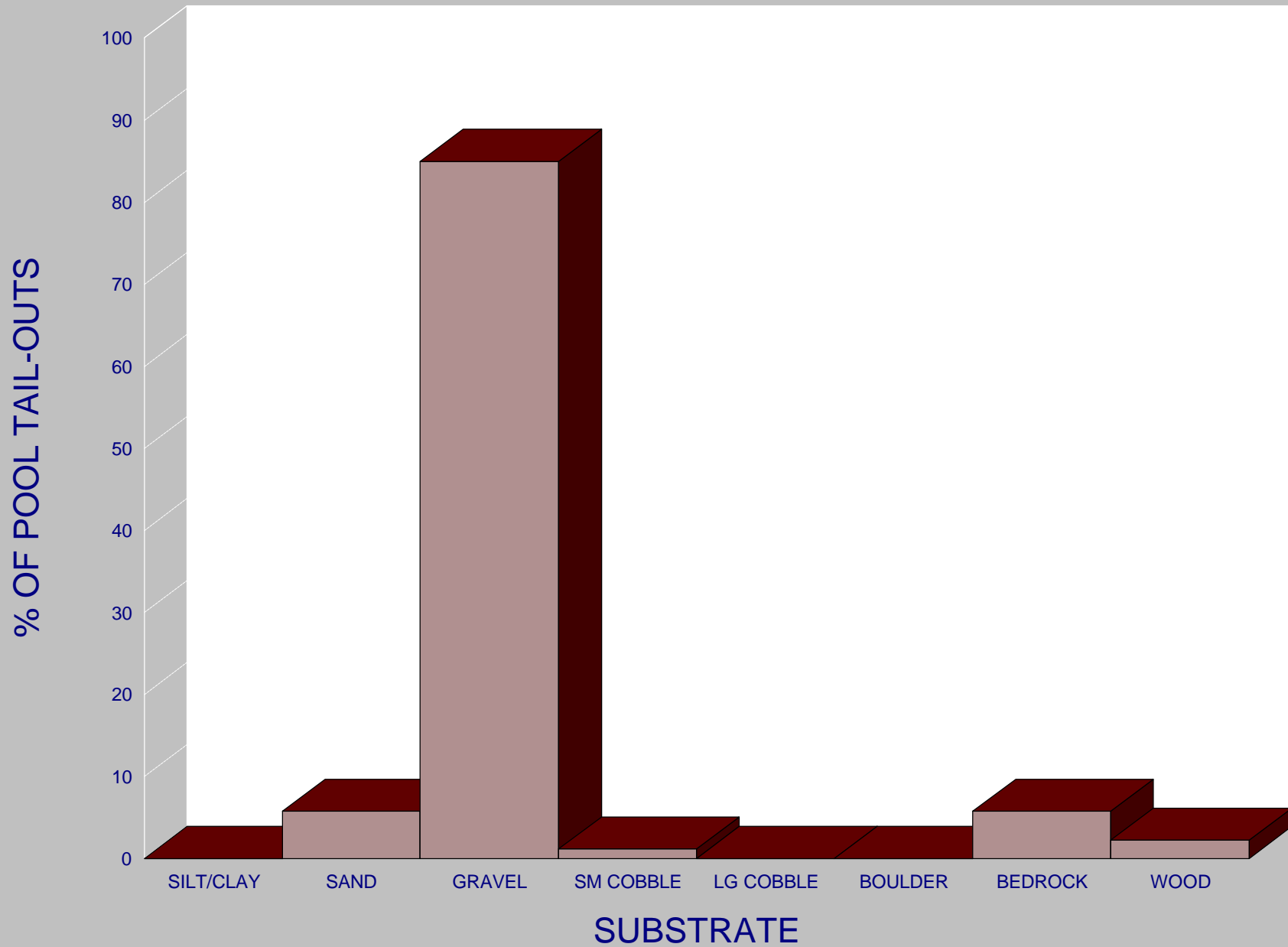
GRAPH 6

# MEAN PERCENT COVER TYPES IN POOLS



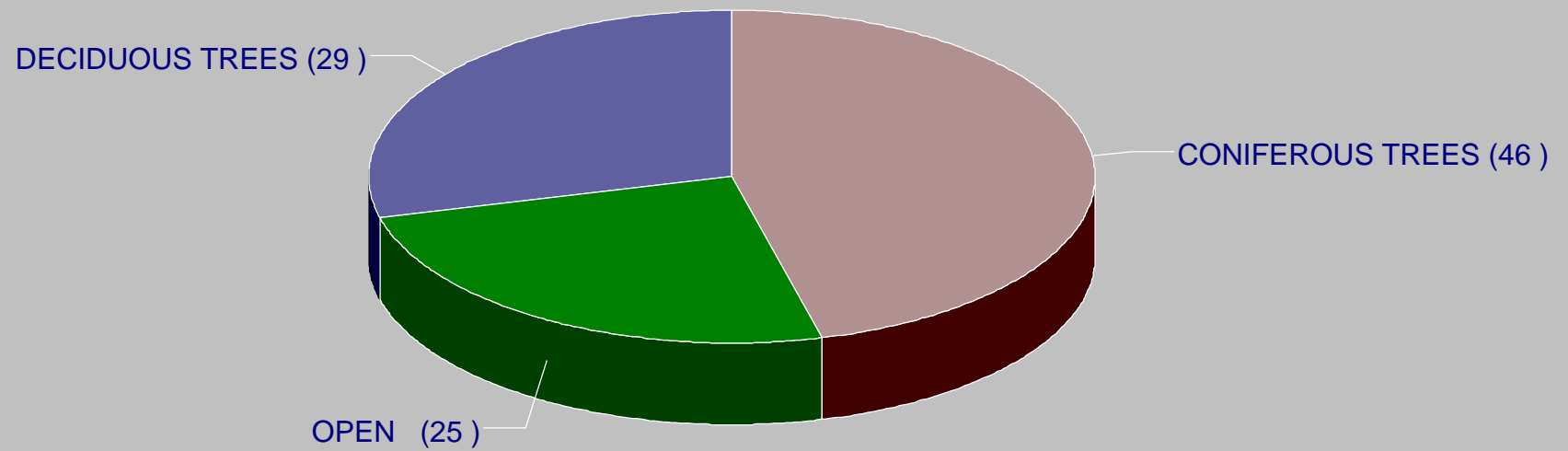
GRAPH 7

# SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



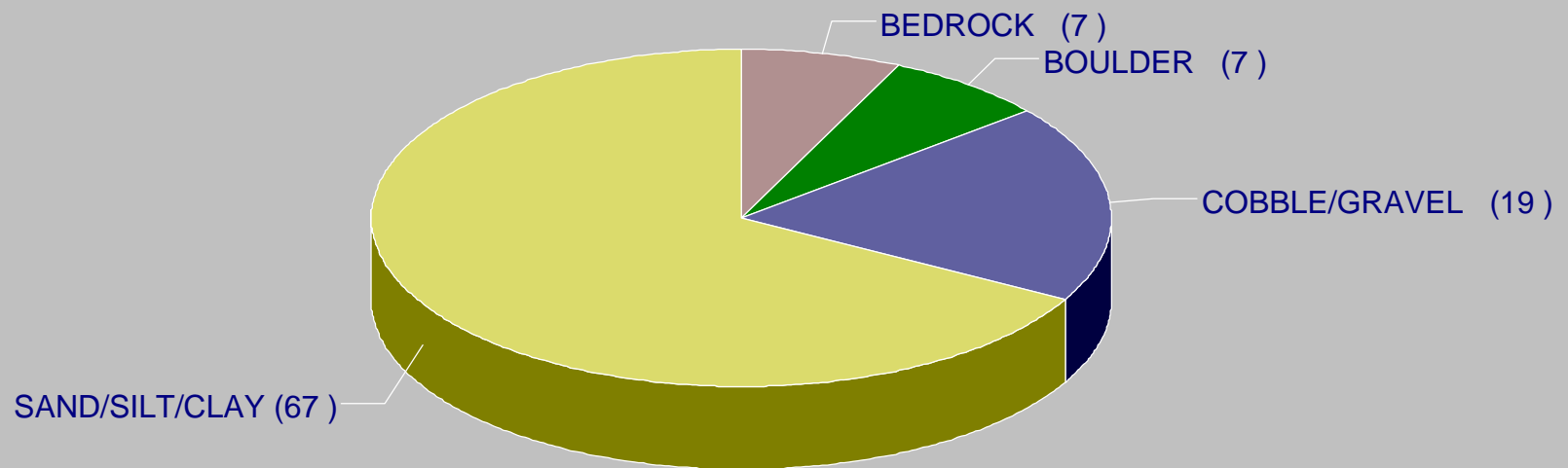
GRAPH 8

# PERCENT CANOPY



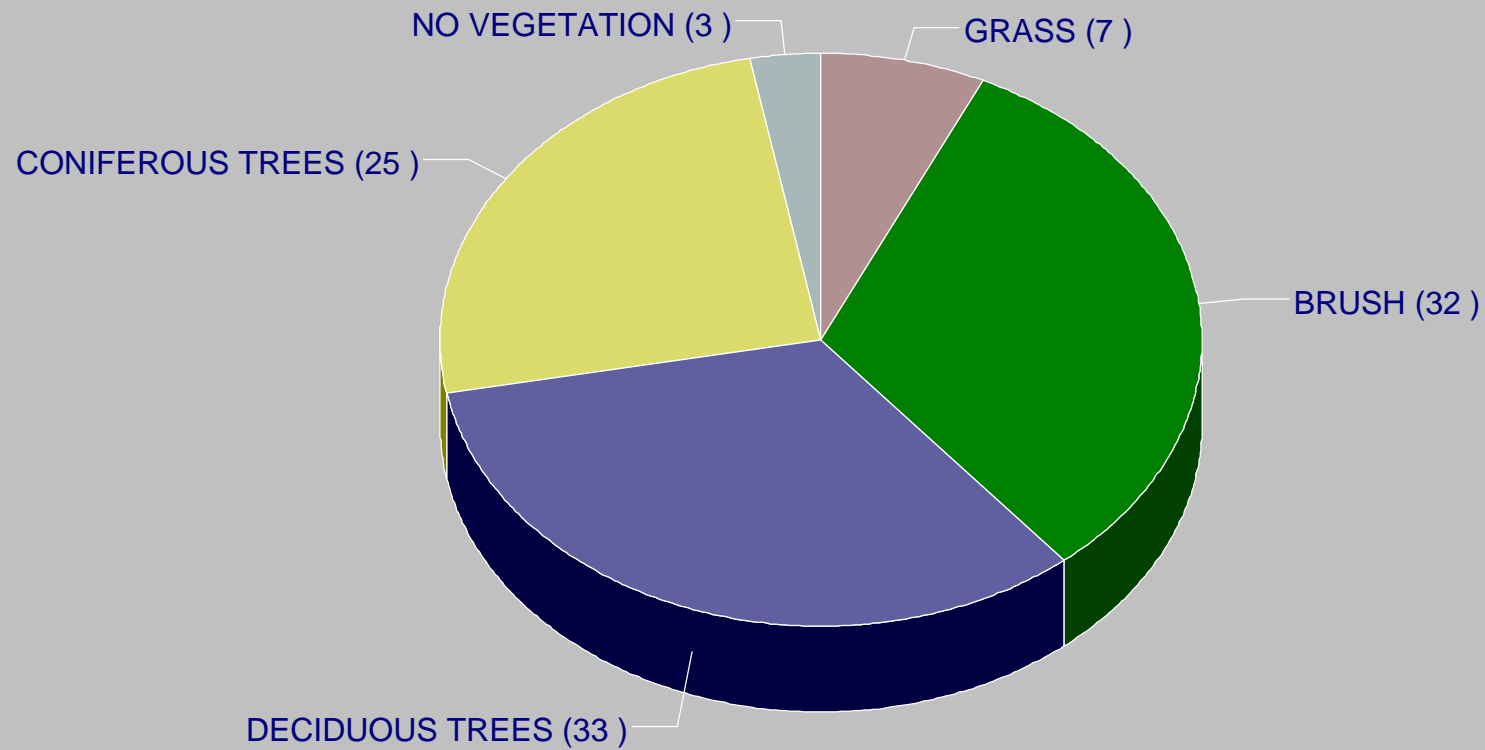
GRAPH 9

# PERCENT BANK COMPOSITION



GRAPH 10

# PERCENT BANK VEGETATION



GRAPH 11