STREAM INVENTORY REPORT

PENNINGTON CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Pennington Creek. The survey began at the confluence with Chorro Creek and extended up the main channel for 4.7 continuous miles. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Pennington Creek.

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

WATERSHED OVERVIEW

Pennington Creek is a tributary to Chorro Creek, tributary to Morro Bay Estuary and tributary to the Pacific Ocean. Pennington Creek is located in San Luis Obispo County, California (Map 1). Pennington Creek's legal description at the confluence with Chorro Creek is T30S R11E (no section number). Its location at the mouth is 35°19′31″ north latitude and 120°45′0″ west longitude. Pennington Creek is a second order stream and has approximately 5.2 miles of blue line stream according to the USGS San Luis Obispo, Morro Bay South, and Atascadero 7.5 minute quadrangles. Pennington Creek drains a watershed of approximately 3.2 square miles. Elevations range from 140 feet at the mouth of the creek to 1600 feet in the headwater areas. Valley grassland, coastal scrub and oak savanna dominate the watershed, with mixed conifer forest and oak woodlands dominating the upper elevations. The watershed is entirely publicly owned . Public ownership includes the National Guard (Camp San Luis Obispo), the County of San Luis Obispo, Cuesta College, California Polytechnic State University, and Los Padres National Forest. The majority of the watershed is managed for livestock grazing, military operations, paved and unpaved roads, urban development (lower portion of the watershed), and timber harvest (higher portion of the watershed). Vehicle access exists via Tehama Avenue located off of Cuesta College Road, which is located off of Education Drive and Highway 1 North. Foot access is available from the California Men's Colony Wastewater Treatment Plant located near the mouth of Pennington Creek.

METHODS

The habitat inventory conducted in Pennington Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). California Conservation Corps (CCC) Members and a volunteer from the Morro Bay National Estuary Program (MBNEP) conducted the inventory and were trained in standardized habitat inventory methods by the California Department of Fish and Game (CDFG). This inventory was conducted by a three to four-person team. Quality Assurance was provided by CDFG trained members of the CCC, the Coastal San Luis Resource Conservation District (CSLRCD), MBNEP, and consultation with CDFG habitat inventory specialists.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). 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, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further 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 Pennington Creek to record measurements and observations. There are nine components to the inventory form.

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. Flow information was provided by MBNEP staff.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 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 dimensions were

measured using a clinometer, hand level, 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 (1988). 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". Pennington 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. Channel dimensions were measured using tape measures, and stadia rods. All units were measured for mean length. Additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Pennington 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 particle size, having a bedrock tail-out, or other considerations.

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 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 Pennington 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.

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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 Pennington Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every tenth unit in addition to every fully-described unit, giving an approximate 10% sub-sample. However, canopy readings in Pennington Creek were taken in 43% of the total number of units in the survey. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous 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 Pennington 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 was estimated and recorded.

GPS Data Collection:

In addition to the nine components of the habitat inventory, a variety of other stream characteristics were located using a Global Positioning System (GPS). Locations included: the creek thalweg, bank erosion sites, pool tail crests, fish species seen in pools, log jams, culverts, drain pipes, invasive plants, barriers to steelhead passage, and landmarks such as bridges, trails, and fences. A more detailed list of attributes to each layer is attached to the end of this report. A Trimble ® Pathfinder Pro-XR GPS unit was used to record locations. Latitude and longitude measurements recorded with this unit are accurate to within one meter. The Quality Assurance Project Plan for the Morro Bay Watershed GPS Survey provides a detailed description of device settings and other information related to the GPS data collection methods (Close, 2001).

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DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Corel. Graphics developed for Pennington Creek 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 outs
- Percent canopy
- Bank composition by composition type
- 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 18, 23, 24, 26, 30, 31, August 1, 2, and 6, 2001, was conducted by a team of three to four members including Adam Howell (CCC), Stacey Smith (CCC), Paul Corsi (CCC), Charlie Johnck (CCC), Bobby Jo Close (CCC), Julie Thomas (Volunteer), and Ann Huber (CSLRCD). The total length of the stream surveyed was 24,994 feet with an additional 1,318 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Gurley Model flowmeter at 0.293 cfs on July 24, 1995.

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Pennington Creek is a F6 channel type for the first 1,701 feet of stream, a F4 for 20,077 feet, a B2 for 1,879 feet, and an A2 channel type for the final 1,338 feet of stream surveyed. F6 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and silt/clay-dominant substrates. F4 channels are morphologically similar to F6 channel types, but have gravel-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel types with infrequently spaced pools, stable banks and boulder-dominant substrates. A2 channels are steep, narrow, cascading, step-pool channels with high energy/debris transport associated with depositional soils and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 68 degrees Fahrenheit. Air temperatures ranged from 63 to 79 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% riffle units, 26% flatwater units, and 32% pool units (Graph 1). Based on total length of Level II habitat types there were 42% riffles, 29% flatwaters, and 27% pools (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 34%; runs, 20%; and mid-channel pools, 18% (Graph 3). Based on percent total length, low gradient riffle units made up 35%, run units 20%, and mid-channel pools units 16%.

A total of 248 pools were identified (Table 3). Main-channel pools were most frequently encountered, at 60%, and comprised 65% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seventy-six of the 248 pools (31%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 248 pool tail-outs measured, forty-four had a value of 1 (18%); ninety had a value of 2 (36%); sixty-two had a value of 3 (25%); twenty-seven had a value of 4 (11%) and twenty-five had a value of 5 (10%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In Pennington Creek, three of the twenty-five pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. The other tail-outs were unsuitable for spawning due to the tail-outs being comprised of large cobble, boulder, bedrock or wood.

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 23, flatwater habitat types had a mean shelter rating of 20, and pool habitats had a mean shelter rating of 5 (Table 1). Of the pool types, the backwater pools had the highest mean shelter

rating at 11. Scour pools had a mean shelter rating of 5. Main-channel pools had a mean shelter rating of 4 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Pennington Creek. Graph 7 describes the pool cover in Pennington Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 172 of the 248 pool tail-outs measured (69%). Small cobble was the next most frequently observed dominant substrate type and occurred in 40% of the pool tail outs (Graph 8).

The mean percent canopy density for the surveyed length of Pennington Creek was 82%. The mean percentages of deciduous and coniferous trees were 41% and 59%, respectively. Graph 9 describes the canopy in Pennington Creek.

For the stream length surveyed, the mean percent right bank vegetated was 26%. The mean percent left bank vegetated was 29%. The dominant elements composing the structure of the stream banks consisted of 5% bedrock, 14% boulder, 6% cobble/gravel, and 75% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 48% of the units surveyed. Additionally, 21% of the units surveyed had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11). Areas of eroded banks along Pennington Creek were mapped using a global positioning device and are shown on Map 1.

Numerous sightings of Sacramento pike minnows in pools below the Highway 1 culvert suggest a predatory impact on the juvenile steelhead population in this section of Pennington Creek. Only two sightings of the Sacramento pike minnow were recorded upstream of the Highway 1 culvert. Numerous crayfish sightings were also observed downstream of Highway 1. Many one year and two year steelhead were sighted near the upstream side of Highway 1. Steelhead did not appear to be as abundant downstream of the Highway 1 crossing.

A potential barrier to anadromous fish passage was found 10,469 feet upstream of the mouth, near the Rancho El Chorro School in Reach 2. This site is a log jam approximately 37 feet wide, 5 feet high, and 11.5 feet long and is retaining gravel. Meredith Hardy, a CCC fisheries habitat assistant, observed the site during the survey and agreed that the log jam is likely a barrier to steelhead passage (personal communication).

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DISCUSSION

Pennington Creek is a F6 channel type for the first 1,701 feet of stream, a F4 for the next 20,077 feet, then a B2 for 1,879 feet, and an A2 for the final 1,338 feet of surveyed length. The suitability of F6, F4, B2, A2 channel types for fish habitat improvement structures is as follows: F6 is good for bank-placed boulders; fair for plunge weirs, boulder clusters, single and opposing wing deflectors and log cover. F4 channel types are good for structures similar to F6 channels, although they are not suitable for boulder clusters and are also good for channel constrictor structures. B2 channel types are excellent for plunge weirs, single and opposing wing-deflectors and log cover. A2 channel types are generally not suitable for fish improvement structures because they are high energy channels and have poor gravel retention capabilities.

The water temperatures recorded on the survey days July 18, 23, 24, 26, 30, 31, and August 1, 2, 6, 2001, ranged from 50 to 68 degrees Fahrenheit. Air temperatures ranged from 63 to 79 degrees Fahrenheit. This is a fair to warm water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and biological sampling would need to be conducted. However, water temperatures in Pennington Creek are monitored by the Regional Water Resources Control Board. Maximum temperatures from 1995 to 1999, respectively, were as follows: 76°F, 70°F, 75°F, 64°F, and 70°F (Regina Wilson, personal communication). These temperatures are in the warm temperature range for salmonids. Planting native riparian species where canopy is lacking or minimal is recommended to lower maximum temperatures in Pennington Creek.

Flatwater habitat types comprised 29% of the total length of this survey, riffles 42%, and pools 27%. The pools are relatively shallow, with only 76 of the 248 (31%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for in the B2 channel type in locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log and small woody debris accumulations in the stream. Many of the woody debris accumulations in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any woody debris accumulation modification.

A log jam located 10,469 feet upstream of the mouth is a potential barrier to anadromous fish passage and is retaining gravel. Appropriate measures should be taken to improve fish passage at this site.

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Forty-four of the 248 pool tail-outs measured had an embeddedness rating of 1. Ninety of the pool tail-outs had embeddedness rating of 2, and 89 pool tail-outs had ratings of 3 or 4. Twenty-five of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. Three of the twenty-five were unsuitable for spawning due to the dominant substrate being silt/sand/clay or gravel. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Pennington Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken. Reach 1 has tremendously high degree of fine sediment, which is the predominant substrate in the channel; although the pool tail-outs in reach 1 do not appear to have have higher embeddedness values on average than the other reaches. An effort to map sediment sources is currently underway by the Morro Bay National Estuary Program..

The mean shelter rating for pools was very low with a rating of 5. The shelter rating in the flatwater habitats was slightly better at 23. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, root wads contribute a small amount to cover as well. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

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

The mean percent canopy density for the stream was 82%. This is a relatively moderate percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 26% and 29%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended. Eroded banks along Pennington Creek are also likely contributing sediment to spawning gravels. Map 1, which shows locations of eroded banks and their maximum height classes, can help prioritize stream bank stabilization projects in the future.

Frequent sightings of the Sacramento pike minnow in Reach 1 suggest a predatory impact on the juvenile steelhead population in this section of Pennington Creek. A biological survey of fisheries species abundance and distribution would provide more complete data to assess the predatory threat to steelhead in the creek, and to help determine the potential likelihood that the Highway 1 culvert is functioning as a barrier to Sacramento pike minnows. If possible, direct removal of Sacramento pike minnow in Reach 1 are recommended in conjunction with habitat improvement practices which favor steelhead habitat conditions. Habitat improvement projects

would include planting riparian species along the banks where canopy is lacking in Reach 1 to reduce water temperatures, and adding log cover structures where feasible to provide more shelter for steelhead.

RECOMMENDATIONS

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

2) Fish passage should be monitored and improved where possible. A log jam in Reach 2 may be acting as a fish barrier, and should be a high priority for fish passage improvement measures.Fish passage should be monitored and improved where possible.

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

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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

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

7) The water temperature data suggest that maximum temperatures are near the upper acceptable range for juvenile salmonids. Revegetation with native riparian plants along the banks is recommended in areas with suboptimal canopy or where water temperatures are highest in the creek from July through September.

8) Numerous log and small woody debris accumulations are present in Pennington Creek which are retaining gravel. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

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COMMENTS AND LANDMARKS

*COMMENTS LOCATED AT THE END OF THE REPORT.

REFERENCES

Close, Bobby Jo. 2001. Quality Assurance Project Plan: Habitat Typing GPS Data Collection. California Conservation Corps, San Luis Obispo, California.

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, California.

PERSONAL COMMUNICATIONS

Meredith Hardy, California Conservation Corps. Personal communication through survey participation and by phone. July and October 2001.

Regina Wilson, Morro Bay National Estuary Program. Personal communication via email, October 2001.

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
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
BACKWATER POOLS		
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

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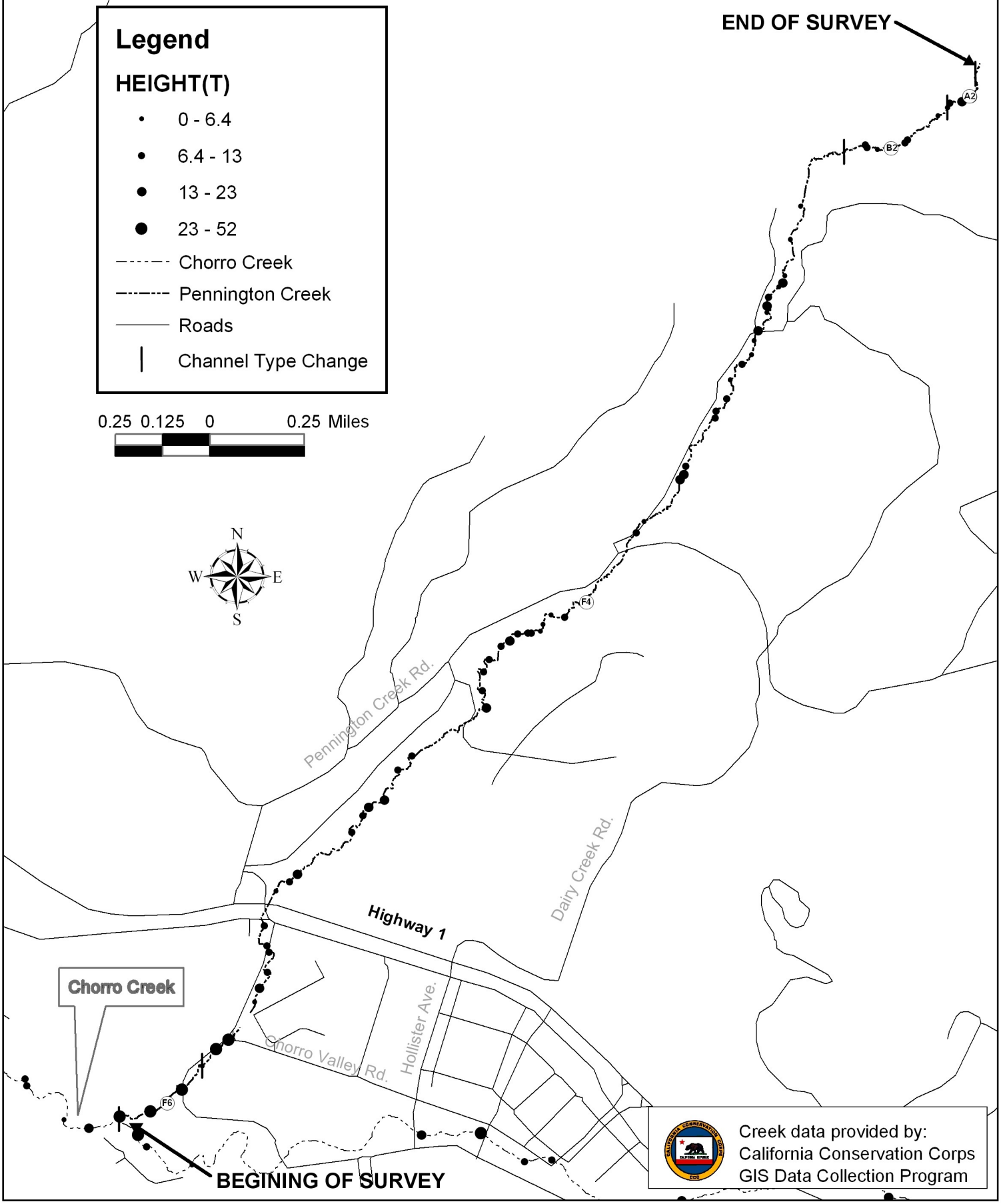
Channel Types &
Stream Bank Erosion Sites



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.

0'	Begin survey at confluence of Pennington and Chorro; Reach 1, F6; Waste water treatment plant outfall into Chorro approximately 15-20' downstream of confluence.
50'	Erosion both banks; 28'H. X 634.2'L.
164'	Algae cover next 479' of stream; Sacramento pike minnow (squawfish) young of year (yoy).
396'	Left bank barbed wire fence.
562'	Landslide of gravel and soil; 30'H. x 31.3'L.
659'	Squawfish.
729'	Channel type location.
751'	Left bank spring; Approximately .01cfs; Squawfish in pool; No fish in tributary.
848'	Squawfish.
908'	End of erosion left and right banks.
1057'	Log jam; Gravel retention; Water flows; Not a barrier; 26.7'L. X 8'W. X 15'H.
1118'	Squawfish; Erosion left bank begins; 30'H. x 121.1'L.
1174'	Speckled dace >100 observed for the next 1819'; Erosion left bank ends; End of Reach 1.
1239'	Pipeline cross channel at top of ledges.
1357'	Barbed wire fence.
1449'	Squawfish.
1647'	Left bank erosion begins; 7.95H. X 11.5'L.
1705'	Channel type location; Reach 2; Erosion right bank; 4'H. X 63.3'L.

1918'	Erosion left bank begins; 25'H. X 145'L.
2033'	End erosion.
2150'	Left bank erosion begins; 20'H. X 99'L.; Right bank erosion begins; 52'H. 63'L.
2738'	Access via Cuesta College Math Department building.
2783'	Fish ladder; Erosion.
2848'	Right bank erosion; 272'L.
3001'	Right bank erosion; Telephone poles laying across bank full width.
3312'	Steelhead trout.
3390'	Start right bank erosion; 13'H. X 341.2'L.; Algae approximately 75% of stream.
3424'	Nylon fence across creek.
3650'	Old footbridge; Debris in creek.
3698'	End right bank erosion.
3781'	Erosion starts right bank; 12'H. X 470.3'L.
3795'	Erosion starts left bank; 10'H. X 172'L.
3940'	Erosion ends left bank.
4105'	Concrete slab in creek.
4179'	Pipe across creek.
4191'	Start left bank erosion; End right bank erosion; Cattle crossing.
4251'	End left bank erosion; 12'H. X 76'L.
4267'	Floating fence.
4444'	Riprap on right bank; 8'H. X 17'L.
4472'	Riprap on left bank; 9'H. X 15'L. ; Steelhead yoy.
4487'	Steelhead yoy.

4507'	Culvert under Highway 1; Wooden baffles; Plunge 6' deep; 200'L. X 12'W. X 10'H.
4812'	Start erosion left bank; 5'H. X 130'L.
4852'	Culvert/tributary; 58'L. X 12.3'W. X 10'H.; End erosion left bank.
5029'	Erosion begins left bank; 10'H. X 182.6'L.; Drainpipe 6' above creek; 6' diameter; Plastic.
5190'	Left bank erosion ends.
5213'	Erosion on right bank begins; 14'H. X 172.8'L.
5366'	End right bank erosion.
5487'	Start left bank erosion; 12'H. X 150.9'L.
5627'	End left bank erosion.
5744'	Partial log jam; 3 pieces LWD; 10'L. X 20'W X 4'H.; No gravel retention; Water flows; No fish barrier.
6204'	Erosion begins left bank; 10'H. X 254'L.
6425'	Erosion ends left bank.
6842'	Erosion begins left bank; 11'H. 172.5'L.
6965'	Erosion ends left bank; Squawfish.
7089'	Start erosion left bank; 16'H. X 98.3'L.
7129'	End erosion left bank.
7162'	Channel change begins.
7344'	Erosion begins left bank; 18'H.
7405'	Water pipe.
7818'	Trail.
7901'	Right bank erosion begins; 10'H. X 121.4'L.

7985'	End right bank erosion.
8192'	Speckled dace.
8313'	Left bank erosion begins; 7'H. X 105.5'L.
8370'	Left bank erosion ends.
8444'	Squawfish.
8645'	Partial debris jam; No gravel retention; Water flows; No fish barrier; 10'L. X 6'W. X 3'H.
8882'	Steelhead yearling and yoy spotted periodically for next 10,884'.
8937'	Speckled dace.
9053'	Ranch El Chorro Outdoor School property; Right bank concrete steps run into creek.
9267'	Footbridge; 305'L. X 32'W. X 6.3'H.; Exposed pipe across creek; 6" diameter.
9320'	Crayfish.
9572'	Crayfish.
9636'	Start left bank erosion; Possible channel change.
9683'	End left bank erosion.
9703'	Volunteer dam made of small boulders.
9749'	Crayfish.
9795'	Plank to path; Tributary left bank.
9867'	Crayfish.
10026'	Start erosion right bank; 12'H.
10146'	Paved bridge; 10.2'H. X 19.3'L. X 71'W.
10357'	Right bank tributary not suitable for spawning; Slope approximately 15%.

10469'	Log jam; 36.6'W. X 5'H. X 11.5'L.; Fish barrier; Retaining gravel; Water goes subsurface; Dry side channel; Erosion begins left bank; 11'H.
10525'	Erosion ends.
10735'	Erosion begins left bank; 12'H.
10895'	Possible channel type unit.
11042'	Erosion begins right bank; 13'H.
11255'	Erosion ends right bank.
11246'	Erosion begins left bank; 15'H.
11284'	Steps on right bank; Access path.
11348'	Possible channel change; Erosion ends.
11419'	Trail right bank; Water pipe; Erosion begins left bank; 11'H.
11620'	Erosion begins left bank; 10'H.
11661'	Erosion ends left bank.
11680'	Erosion begins right bank; 8'H.
11708'	Erosion ends right bank.
11780'	Partial debris jam; Not a fish barrier; Not retaining gravel; Water flows; 3'H. X 8'W. X 3'L.
11827'	Erosion left bank begins; 4'H.
11882'	Trail and footbridge across creek.
11919'	Erosion begins right bank; 3.5'H.
12057'	Left bank erosion ends.
12176'	Partial log jam; 4'L. X 20'W. X 8'H.
12197'	Erosion left bank begins; 5'H.; Access footbridge.
12250'	Erosion left bank ends.

12279'	Channel type location, F4.
12393'	Erosion begins left bank and ends at the end of the unit; 12'H.
12598'	Erosion begins left bank.
12636'	Partial debris jam; 21.5'L. X 20'W. X 3'H.
12658'	Fish ladder; Three steps.
12681'	Footbridge.
13018'	Erosion by barbed wire fence; Bridge; 20.3'L X 59.4'W. X 7.4'H.
13421'	Cow access.
13544'	Erosion ends.
13757'	Concrete formed plunge.
13827'	Fence across creek.
14009'	Partial log jam; Retaining gravel; 5.3'L. X 12'W. X 3.7'H.; Cow access.
14158'	Erosion begins right bank; 9'H. X 102.8'L.
14246'	Erosion ends right bank.
14262'	End of fence left bank.
14309'	Old bridge foundation.
14419'	Erosion begins both banks; 6'H. X 405.8'L.; Pipe crosses creek.
14788'	Erosion ends right and left banks.
14989'	Fence in creek.
15240'	Erosion begins right bank; 20'H. X 111'L.
15321'	Right bank erosion ends.
15350'	Left bank erosion begins; 23'H. X 601.3'L.

15669'	Channel type location, F4.
15815'	Log jam; Water flows; Not a fish barrier; Gravel retention; 18'W. X 5'H. X 5'L.
15836'	Debris jam; Water flows; Not a fish barrier; Gravel retention; 9'W. X 5'L. X 3'H.
15951'	Erosion ends right and left banks.
15596'	Tributary right bank; Dry; No fish; Approximately 30 degree slope.
16413'	Side channel starts; Start erosion left bank; 8'H.
16442'	Log jam; Water flows; Gravel retention; Not a fish barrier; 6'L. X 14'W. X 4'H.
16514'	Erosion begins right bank; 11'H.
16548'	Log jam; Water flows; Not a fish barrier; Retains gravel; 4.5'L. X 10'W. X 1.5'H.
16620'	Side channel begins.
16620'	Partial debris jam; 18'W. X 4'H. X 16'L; Water flows; Not a fish barrier.
16703'	Start left bank erosion; 11'H. X 20'L.
16804'	Pipe or water line.
16924'	Partial log jam; Retaining gravel; Water flows; Not a fish barrier; 6'L. X 13'W. X 3'H.
17011'	Partial log jam; Not a fish barrier; Retains no gravel; Water flows; 8'W. X 3'L. X 3'H.
17038'	Right bank erosion begins; 5'H. X 40.2'L.
17093'	Partial log jam; No gravel retention; Water flows; Not a fish barrier; 7'L. X 12'W. X 2'H.
17278'	Floating fence.
17407'	Erosion begins; 8.3'H. X 29'L.; Road crosses creek.
17541'	Floating barbed wire fence.
17593'	Erosion begins; 4'H. X 50'L.

17658'	Partial log jam; No gravel retention; Water flows; Not a fish barrier; 12'W. X 3'L. X 3.5'H.
17775'	Water pennies.
17825'	Erosion begins; 3'H. X 27'L.
17993'	Erosion begins right bank; 15'H. X 12.9'L.
18453'	Erosion begins left bank; 4'H. X 125.7'L.
18638'	Erosion begins right bank; 23'H. X 180'L.
18845'	Erosion begins right bank; 12'H. X 69.3'L.
18964'	Barbed wire fence left bank.
19048'	Erosion begins left bank; 15'H. X 123.2'L.
19173'	Erosion begins left bank; 6'H. X 104.3'L.
19292'	Erosion begins left bank; 5.4'H. X 275.9'L.
19497'	Channel type location, F4.
19518'	Potential erosion area on right bank; Bare undercut bank.
19625'	Barbed wire fence left bank.
19877'	Long exposed pipe in center of creek.
19916'	Erosion begins right bank; 5'H. X 137.8'L.
20055'	Barbed wire fence and electric fence crosses creek.
20135'	Cow access; Road left bank.
20166'	Road crosses creek.
20249'	Road crosses creek.
20331'	Barbed wire fence crosses creek.
20531'	Cow access; Right bank erosion begins; 447'L.

20576'	Fence crosses creek.
20665'	Barbed wire fence; Cow access.
20696	Undercut bank over 1'.
20897'	Road right bank.
21174'	Rock retaining wall; Wet tributary; Right bank; Surveyed 150'; Saw steelhead.
21494'	Partial log jam; No gravel retention; Water flows; Not a fish barrier; 4.6'H. X 23.7'W. X 46.7'L.
21628'	Half inch plastic pipe in creek.
21762'	End Reach 2.
22178'	Right bank erosion begins; 8'H. X 34.6'L.
22213'	Left bank erosion begins; 9.8'H. X 53.9'L.
22338'	Left bank erosion begins;60.8'L.
22665'	Left bank tributary; Walked 200'; “Skunk Hollow” sign.
22809'	Left bank erosion begins; 7.4'H. X 168.9'L.
22820'	Right bank erosion; 6.4'H. X 513.2'L.
23242'	Dry tributary left bank.
23259'	Channel type location, B2.
23457'	Erosion left bank begins; 6'H. X 50.5'L.
23532'	End Reach 3.
23571'	Old culvert 20'L. X 2.5'D; Washed out 4x4 road crosses creek; Dry tributary on right bank.
23637'	Start and end right bank erosion; 5.5'H. X 20'L.
23645'	Start left bank erosion; 4.5'H. X 106.9'L.
23718'	Right bank erosion begins and ends; 10'H. X 42.8'L.

23913'	Erosion left bank begins and ends; 15'H. X 35.7'L.
24070'	Erosion right bank begins and ends; 25'H. X 5'L.
24116'	Left bank tributary.
24607'	Debris jam; Possible barrier; 12'H. X 40'L. X 30'H.; Several trees fallen into creek.
24710'	Channel type location A2.
24756'	Potential fish barrier.
24792'	End of Survey due to end of anadromy. Fish barrier is a cascade of large boulders more than 200 feet long, with an average slope of 45-60%. No steelhead found upstream.

PENNINGTON

Drainage: CHORRO

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

Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES

LATITUDE:35°19'31" LONGITUDE:120°45'0"

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 VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
315	46	RIFFLE	41	35	11083	42	7.5	0.3	256	80513	67	21136	0	23
198	34	FLATWATER	26	39	7702	29	8.2	0.5	415	82119	126	24946	0	20
248	248	POOL	32	29	7119	27	8.2	1.1	258	63927	312	77492	241	5
3	0	DRY	0	40	119	0	0.0	0.0	0	0	0	0	0	0
2	1	CULVERT	0	145	289	1	2.0	0.1	376	752	38	75	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
766	329	26312	227310	123649

PENNINGTON Drainage: CHORRO

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES LATITUDE:35°19'31" LONGITUDE:120°45'0"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
259	35	LGR	34	35	9146	35	8	0.3	1.1	262	67975	75	19534	0	24	80
53	8	HGR	7	32	1686	6	5	0.3	0.9	93	4904	29	1557	0	24	84
3	3	CAS	0	84	251	1	14	0.3	1.3	610	1831	71	212	0	13	97
16	5	GLD	2	66	1053	4	6	0.6	1.6	345	5518	274	4376	0	19	82
154	22	RUN	20	35	5370	20	6	0.5	1.2	211	32500	105	16240	0	19	84
27	6	SRN	4	47	1260	5	18	0.4	1.2	1280	34569	98	2659	0	27	87
1	1	EDW	0	19	19	0	5	0.1	0.2	52	52	5	5	0	5	97
2	2	TRP	0	40	80	0	5	1.6	2.8	190	380	282	564	224	0	0
141	141	MCP	18	29	4122	16	8	1.2	5.4	248	35005	309	43533	239	4	82
1	1	CCP	0	21	21	0	7	0.9	1.6	137	137	123	123	96	0	0
6	6	STP	1	63	375	1	6	1.6	5.8	376	2254	720	4317	622	23	88
7	7	CRP	1	32	225	1	9	0.9	2.6	292	2042	293	2049	216	1	70
8	8	LSL	1	27	215	1	8	0.7	2.5	211	1689	158	1264	101	4	65
35	35	LSR	5	34	1183	4	11	0.9	3.4	433	15170	466	16303	358	3	79
14	14	LSBk	2	28	398	2	6	0.9	2.0	173	2423	142	1992	88	5	55
6	6	LSBo	1	19	111	0	7	0.7	1.5	140	839	90	539	56	5	98
17	17	PLP	2	15	253	1	11	1.3	5.8	179	3043	341	5793	265	10	89
2	2	BPB	0	8	15	0	5	0.9	1.3	34	69	31	62	27	25	78
2	2	BPR	0	14	28	0	7	0.9	2.3	109	218	119	239	89	25	50
5	5	BPL	1	12	61	0	6	0.8	1.5	74	368	63	315	47	4	100
2	2	DPL	0	17	33	0	9	1.3	2.7	146	291	200	400	146	3	78
3	0	DRY	0	40	119	0	0	0.0	0.0	0	0	0	0	0	0	100
2	1	CUL	0	145	289	1	2	0.1	0.3	376	752	38	75	0	0	100

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
766	329	26312	212028	122150

PENNINGTON

Drainage: CHORRO

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES

LATITUDE:35°19'31" LONGITUDE:120°45'0"

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 EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
150	150	MAIN	60	31	4598	65	7.7	1.2	252	37776	324	48537	253	4
87	87	SCOUR	35	27	2385	33	9.3	1.0	290	25206	321	27940	241	5
11	11	BACKWATER	4	12	136	2	6.5	0.9	86	945	92	1016	69	11

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
248	248	7119	63927	77492

PENNINGTON

Drainage: CHORRO

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES

LATITUDE:35°19'31" LONGITUDE:120°45'0"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
2	TRP	1	0	0	0	0	2	100	0	0	0	0
141	MCP	57	8	6	88	62	35	25	9	6	1	1
1	CCP	0	0	0	1	100	0	0	0	0	0	0
6	STP	2	0	0	2	33	2	33	0	0	2	33
7	CRP	3	0	0	5	71	2	29	0	0	0	0
8	LSL	3	0	0	7	88	1	13	0	0	0	0
35	LSR	14	0	0	26	74	8	23	1	3	0	0
14	LSBk	6	0	0	13	93	1	7	0	0	0	0
6	LSBo	2	0	0	6	100	0	0	0	0	0	0
17	PLP	7	1	6	6	35	6	35	3	18	1	6
2	BPB	1	0	0	2	100	0	0	0	0	0	0
2	BPR	1	0	0	1	50	1	50	0	0	0	0
5	BPL	2	0	0	5	100	0	0	0	0	0	0
2	DPL	1	0	0	1	50	1	50	0	0	0	0

TOTAL UNITS
248

PENNINGTON

Drainage: CHORRO

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES LATITUDE:35°19'31" LONGITUDE:120°45'0"

UNITS MEASURED	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
259	35	LGR	5	10	0	6	7	5	2	64	0
53	7	HGR	1	2	0	0	9	0	23	61	4
3	2	CAS	0	0	0	0	5	5	35	55	0
16	5	GLD	0	22	0	26	2	20	1	29	0
154	22	RUN	16	7	0	5	21	0	1	49	1
27	5	SRN	5	4	0	19	13	0	26	33	0
1	1	EDW	0	0	0	0	0	0	0	100	0
2	0	TRP	0	0	0	0	0	0	0	0	0
141	17	MCP	21	2	4	19	24	0	4	23	3
1	0	CCP	0	0	0	0	0	0	0	0	0
6	3	STP	0	0	0	32	0	0	15	27	27
7	1	CRP	30	35	0	30	0	0	0	5	0
8	1	LSL	0	5	50	30	15	0	0	0	0
35	4	LSR	3	26	0	51	14	5	0	1	0
14	3	LSBk	42	0	0	2	10	0	0	37	10
6	2	LSBo	0	15	15	20	0	0	13	38	0
17	5	PLP	10	1	0	0	0	6	38	45	0
2	2	BPB	23	0	0	3	8	0	15	53	0
2	2	BPR	8	3	0	40	8	0	0	43	0
5	1	BPL	0	0	15	60	25	0	0	0	0
2	1	DPL	0	0	0	0	0	0	0	100	0
3	0	DRY	0	0	0	0	0	0	0	0	0
2	0	CUL	0	0	0	0	0	0	0	0	0

PENNINGTON

Drainage: CHORRO

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/18/01 to 08/06/01

Confluence Location: QUAD: SLO,MB,S.A LEGAL DESCRIPTION: T30SR11ES LATITUDE:35°19'31" LONGITUDE:120°45'0"

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
259	35	LGR	0	6	74	14	0	6	0
53	8	HGR	0	0	13	38	0	50	0
3	3	CAS	0	0	0	0	0	67	33
16	5	GLD	20	60	0	0	0	20	0
154	22	RUN	14	5	73	5	5	0	0
27	5	SRN	0	0	60	0	0	40	0
1	1	EDW	0	0	100	0	0	0	0
2	0	TRP	0	0	0	0	0	0	0
141	17	MCP	29	24	47	0	0	0	0
1	0	CCP	0	0	0	0	0	0	0
6	3	STP	0	67	33	0	0	0	0
7	1	CRP	0	100	0	0	0	0	0
8	1	LSL	100	0	0	0	0	0	0
35	4	LSR	50	50	0	0	0	0	0
14	3	LSBk	33	33	33	0	0	0	0
6	2	LSBo	0	0	50	0	0	50	0
17	5	PLP	0	40	20	0	0	0	40
2	2	BPB	50	0	50	0	0	0	0
2	2	BPR	50	0	0	0	0	50	0
5	1	BPL	0	100	0	0	0	0	0
2	1	DPL	100	0	0	0	0	0	0
3	0	DRY	0	0	0	0	0	0	0
2	1	CUL	0	0	100	0	0	0	0

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 % Cover	Mean Left Bank % Cover
82	41	59	1	26.4	28.6

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: PENNINGTON
SAMPLE DATES: 07/18/01 to 08/06/01
STREAM LENGTH: 24994 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: SLO,MB,S.A — Latitude: 35°19'31"
Legal Description: T30SR11ES — Longitude: 120°45'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F6	Canopy Density: 60%
Channel Length: 1701 ft.	Coniferous Component: 6%
Riffle/flatwater Mean Width: 7 ft.	Deciduous Component: 94%
Total Pool Mean Depth: 1.4 ft.	Pools by Stream Length: 42%
Base Flow: 0.3 cfs	Pools >=3 ft.deep: 13%
Water: 061- 064°F Air: 063-075°F	Mean Pool Shelter Rtn: 26
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 63%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 25% 2.31% 3. 31% 4. 0% 5. 13%

STREAM REACH 2

Channel Type: F4	Canopy Density: 84%
Channel Length: 20077 ft.	Coniferous Component: 29%
Riffle/flatwater Mean Width: 9 ft.	Deciduous Component: 71%
Total Pool Mean Depth: 1.1 ft.	Pools by Stream Length: 29%
Base Flow: 0.3 cfs	Pools >=3 ft.deep: 7%
Water: 050- 068°F Air: 063-075°F	Mean Pool Shelter Rtn: 28
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 78%	Occurrence of LOD: 2%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 36 ft.

Embeddness Value: 1. 20% 2.38% 3. 25% 4. 12% 5. 6%

STREAM REACH 3

Channel Type: B2	Canopy Density: 91%
Channel Length: 1879 ft.	Coniferous Component: 81%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 19%
Total Pool Mean Depth: 1.0 ft.	Pools by Stream Length: 9%
Base Flow: 0.3 cfs	Pools >=3 ft.deep: 0%
Water: 057- 063°F Air: 063-073°F	Mean Pool Shelter Rtn: 22
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 73%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 6% 2.31% 3. 25% 4. 19% 5. 19%

STREAM REACH 4

Channel Type: A2	Canopy Density: 83%
Channel Length: 1338 ft.	Coniferous Component: 94%
Riffle/flatwater Mean Width: 9 ft.	Deciduous Component: 6%
Total Pool Mean Depth: 1.0 ft.	Pools by Stream Length: 16%
Base Flow: 0.3 cfs	Pools >=3 ft.deep: 11%
Water: 059- 066°F Air: 063-079°F	Mean Pool Shelter Rtn: 27
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders

Vegetative Cover: 71%
Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand
Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2.33% 3. 28% 4. 0% 5. 39%

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	8	5	5.33
Boulder	15	18	13.52
Cobble/Gravel	10	5	6.15
Silt/clay	89	94	75

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	14	10	9.84
Brush	28	19	19.26
Decid. Trees	52	66	48.36
Conif. Trees	24	27	20.90
No Vegetation	4	0	1.64

Total stream average embeddedness value for pool 2.55

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

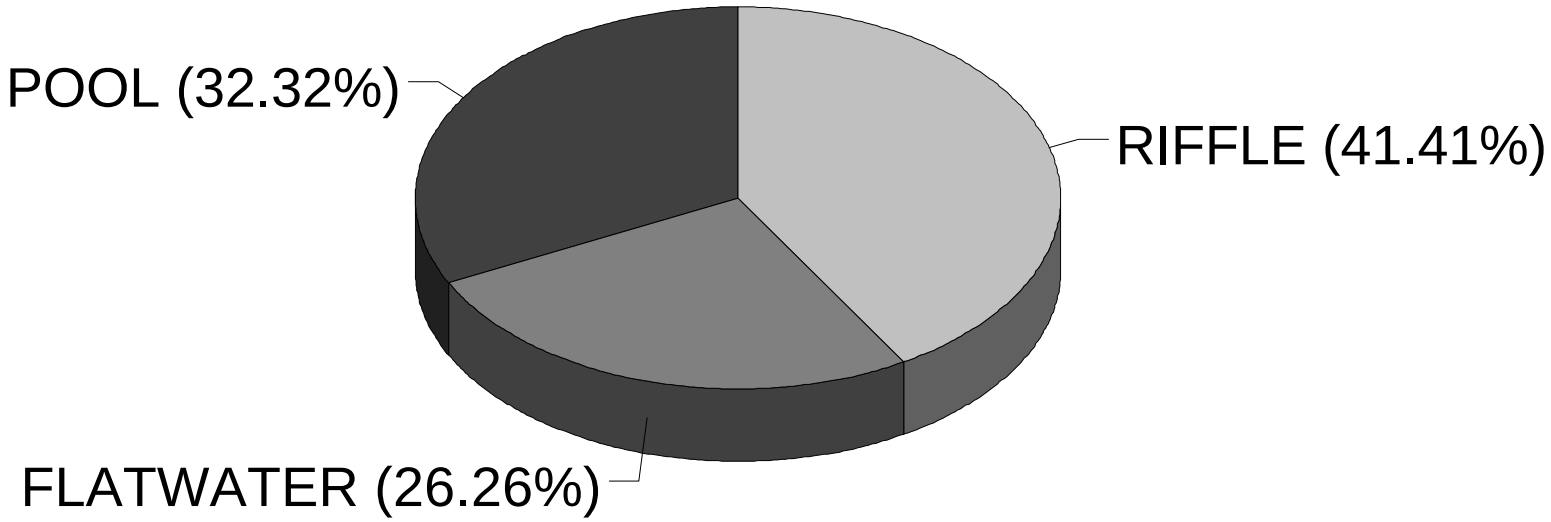
Stream: PENNINGTON Drainage:

Survey Date: 07/18/01 to 08/06/01

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	9.9	11.5	15
SMALL WOODY DEBRIS	7.9	8.5	5.2
LARGE WOODY DEBRIS	1.3	0	3.6
ROOTS	11.8	10.2	20.3
TERRESTRIAL VEG	11.7	16.1	12.9
AQUATIC VEG	2.9	3.0	1.2
WHITEWATER	7.1	4.8	8.5
BOULDERS	45.6	45	29.5
BEDROCK LEDGES	1.8	0.9	3.7

PENNINGTON CREEK

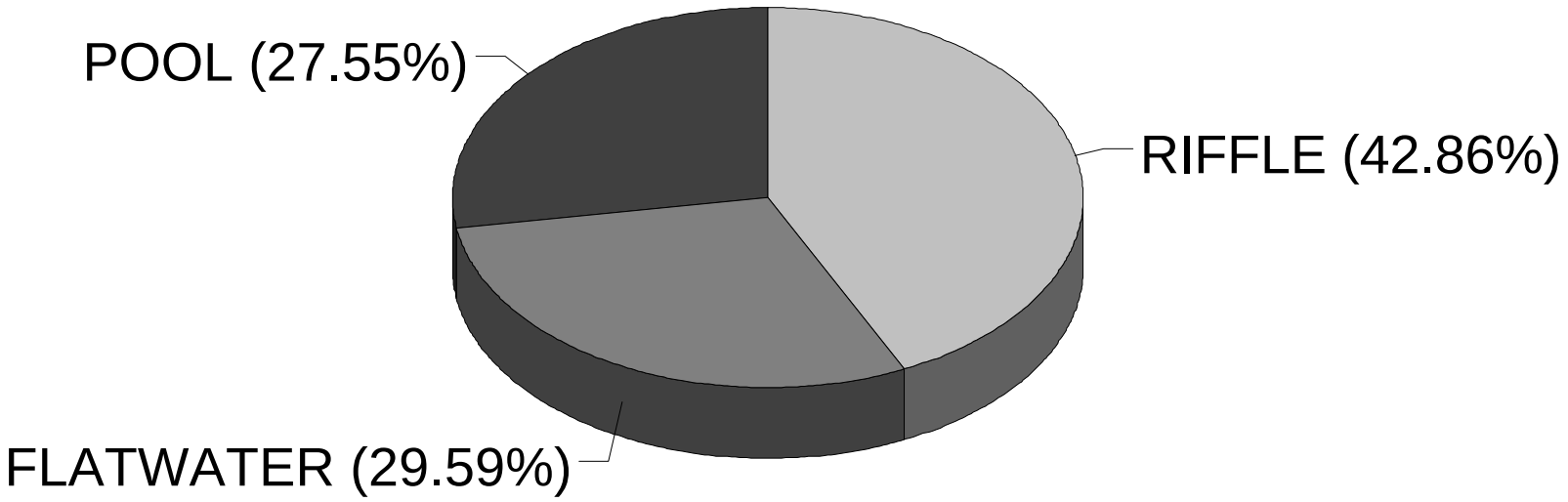
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

PENNINGTON CREEK

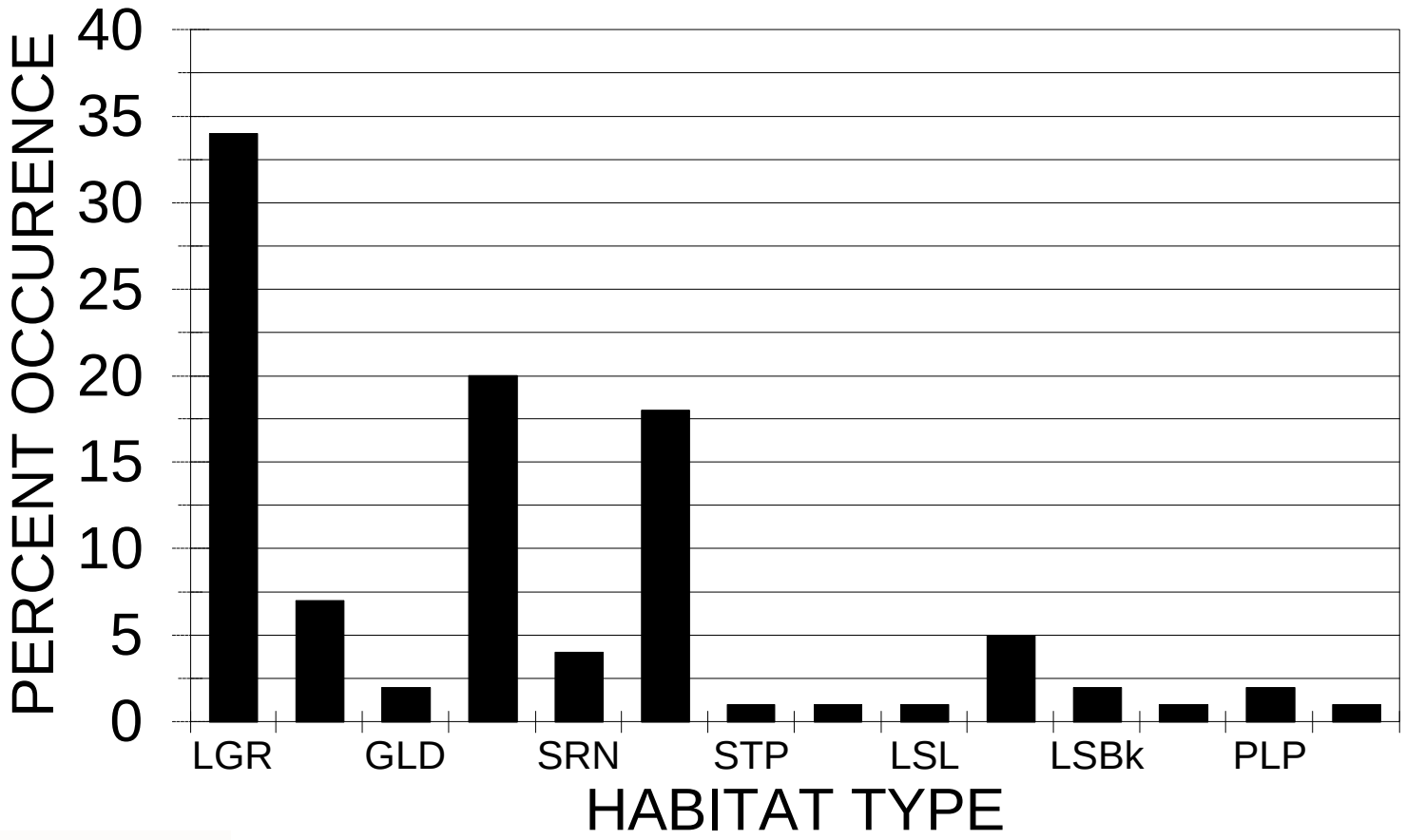
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

PENNINGTON CREEK

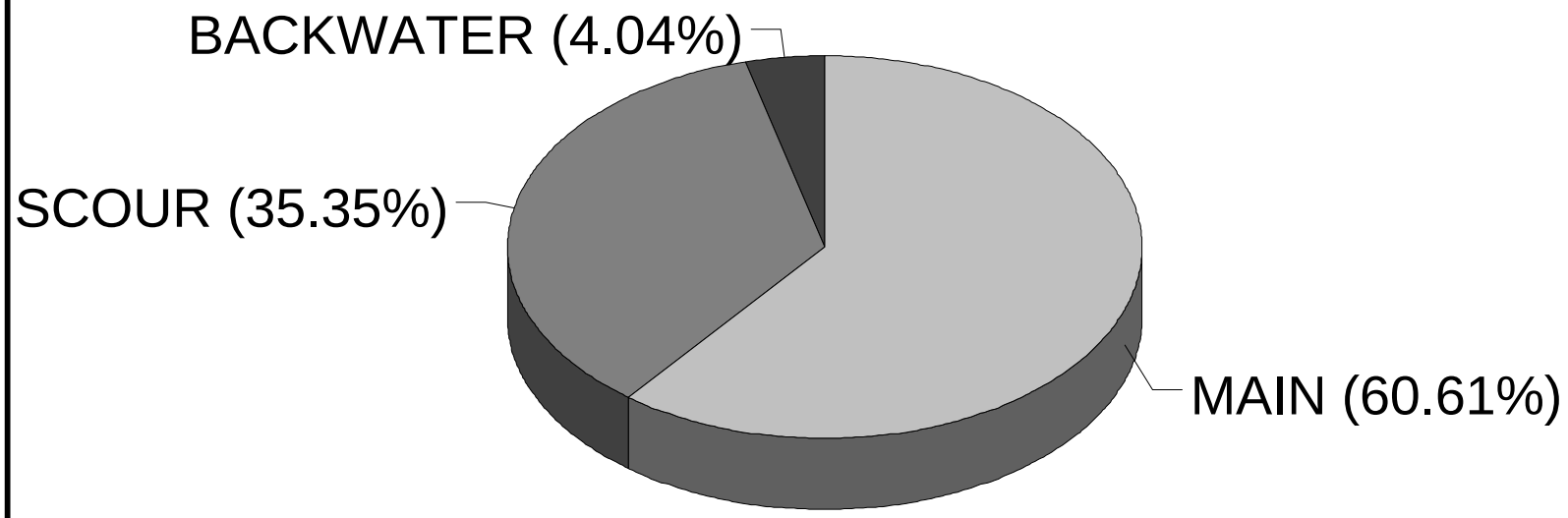
HABITAT TYPE BY PERCENT OCCURENCE



GRAPH 3

PENNINGTON CREEK

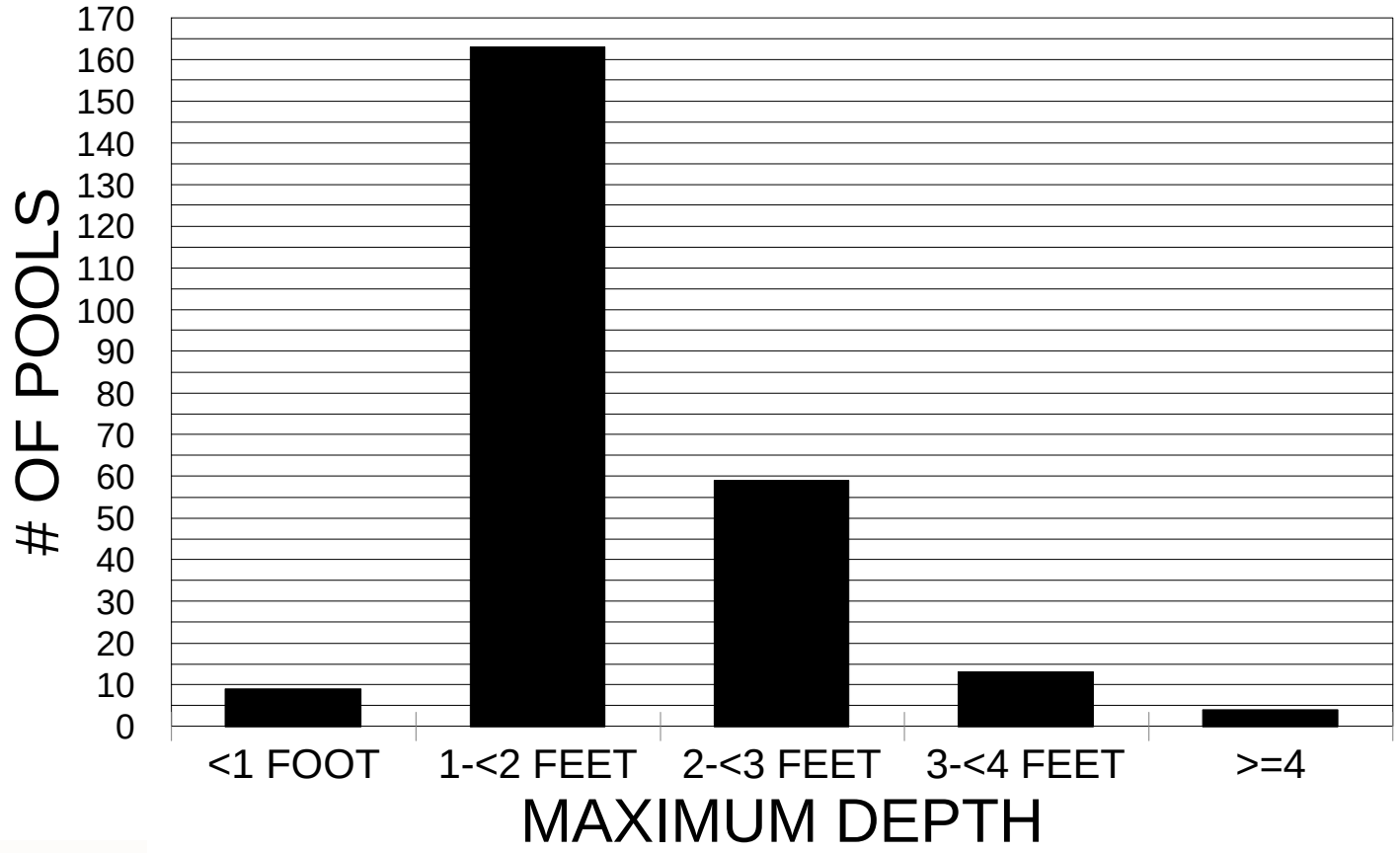
POOL HABITAT BY PERCENT OCCURENCE



GRAPH 4

PENNINGTON CREEK

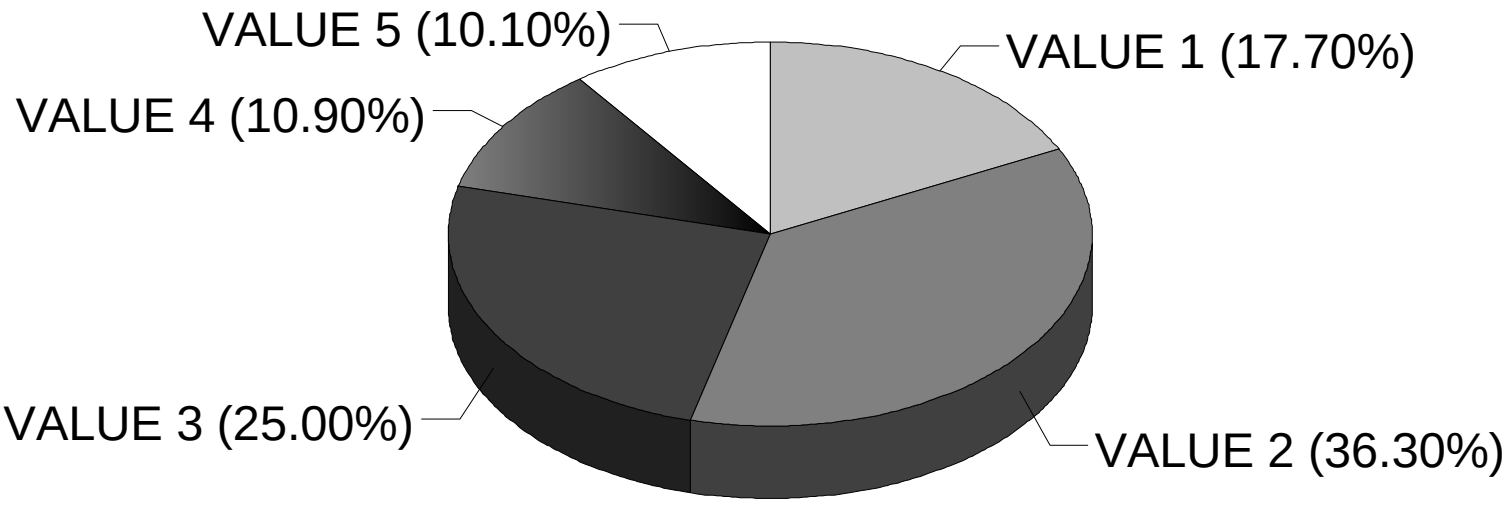
MAXIMUM POOL DEPTHS



GRAPH 5

PENNINGITON CREEK

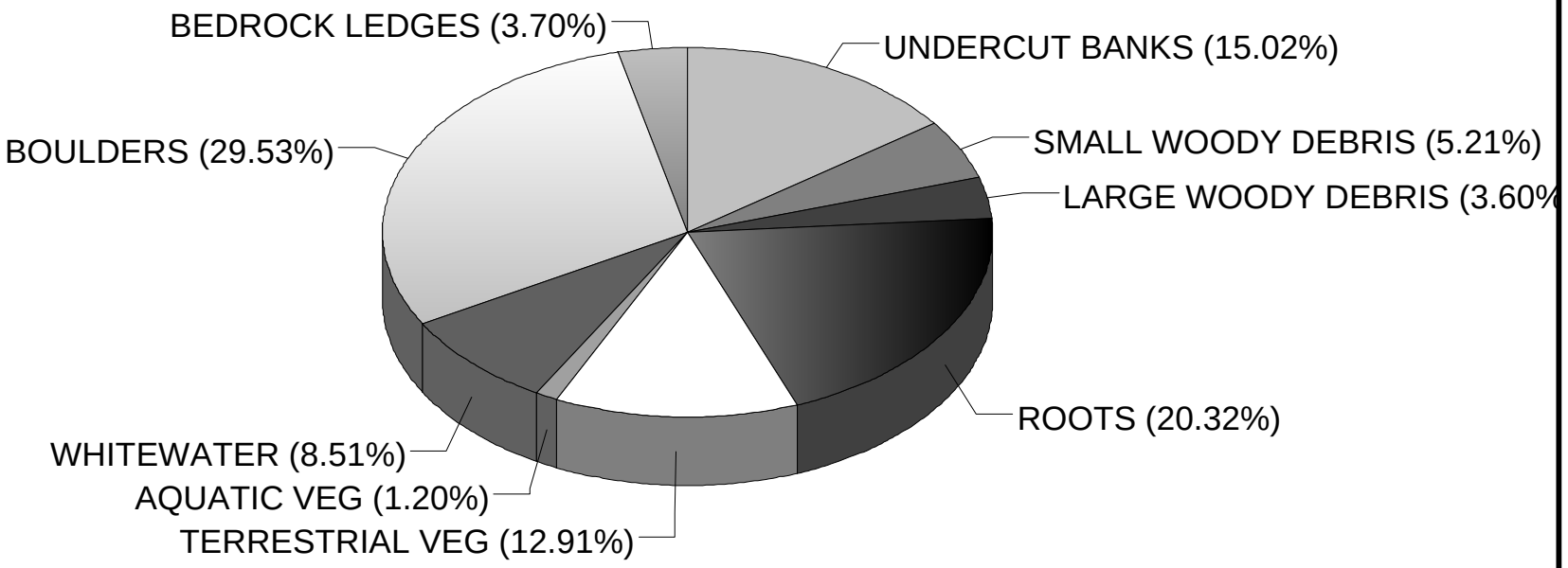
PERCENT EMBEDDEDNESS



GRAPH 6

PENNINGTON CREEK

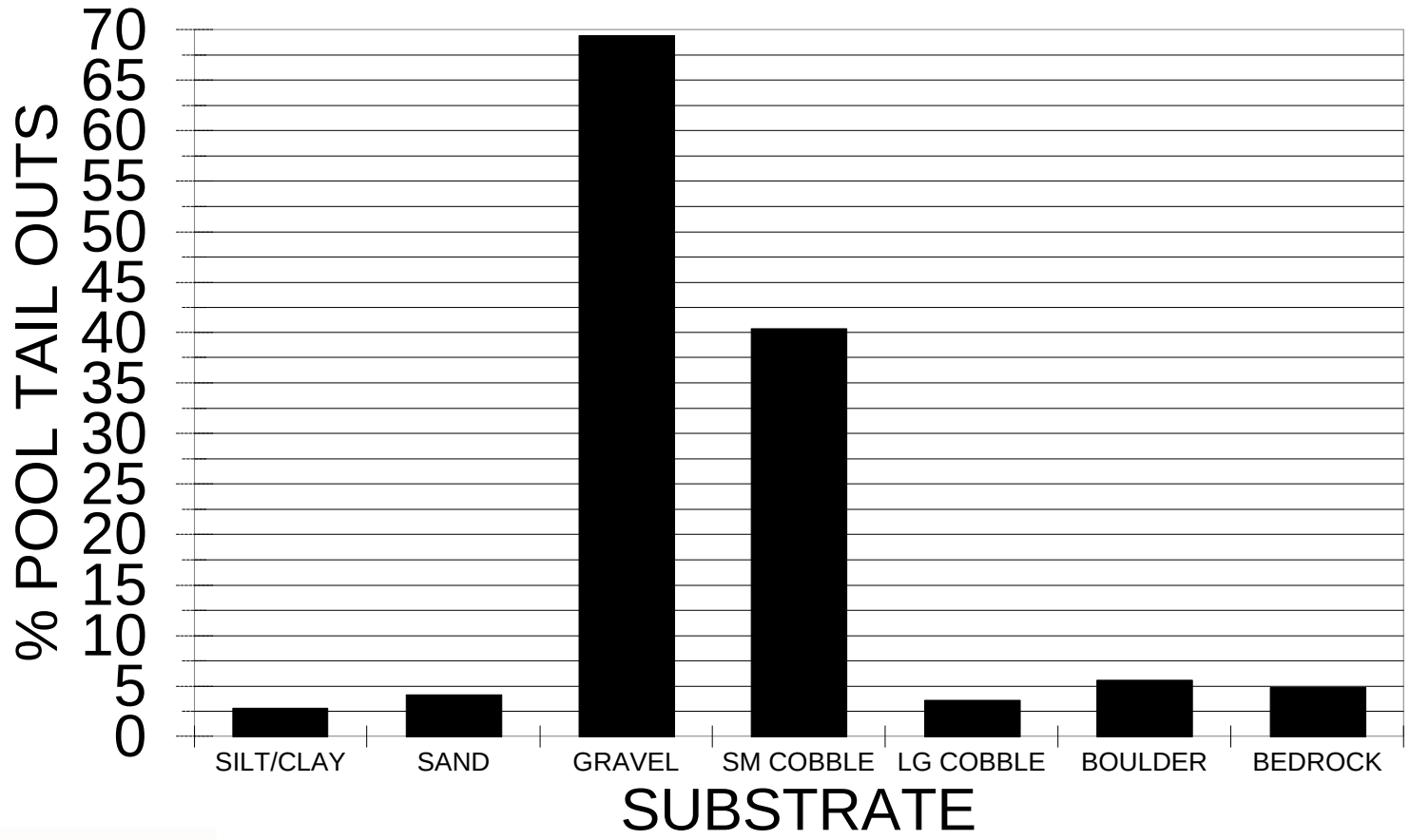
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

PENNINGTON CREEK

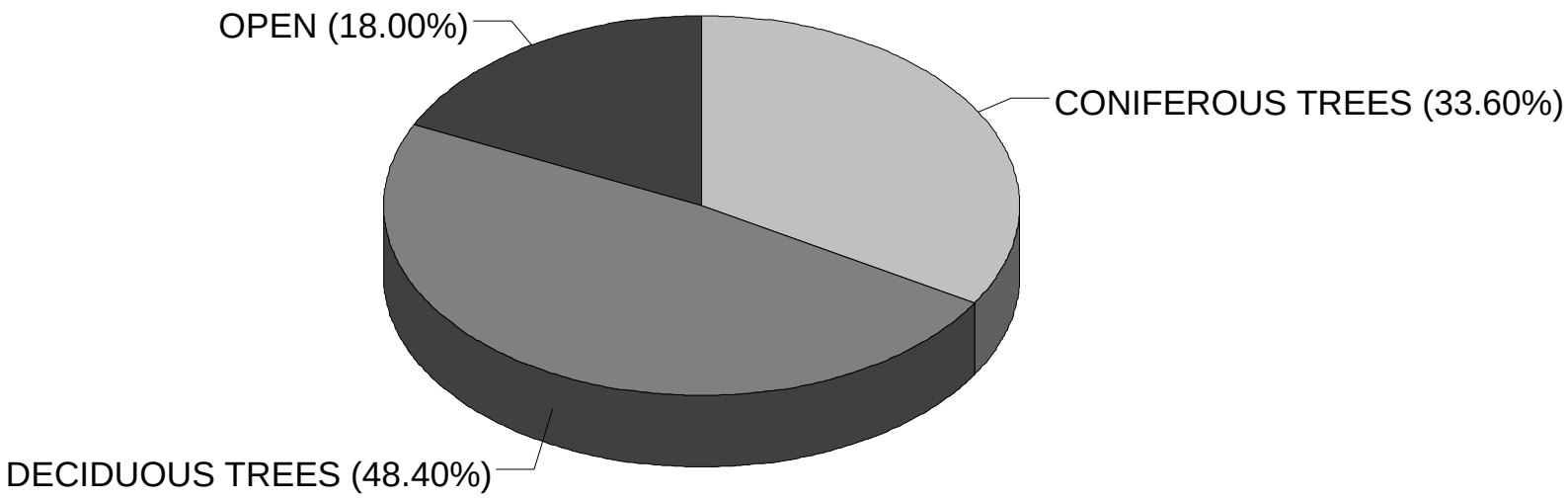
SUBSTRATE COMPOSITION IN POOL-TAIL OUT



GRAPH 8

PENNINGTON CREEK

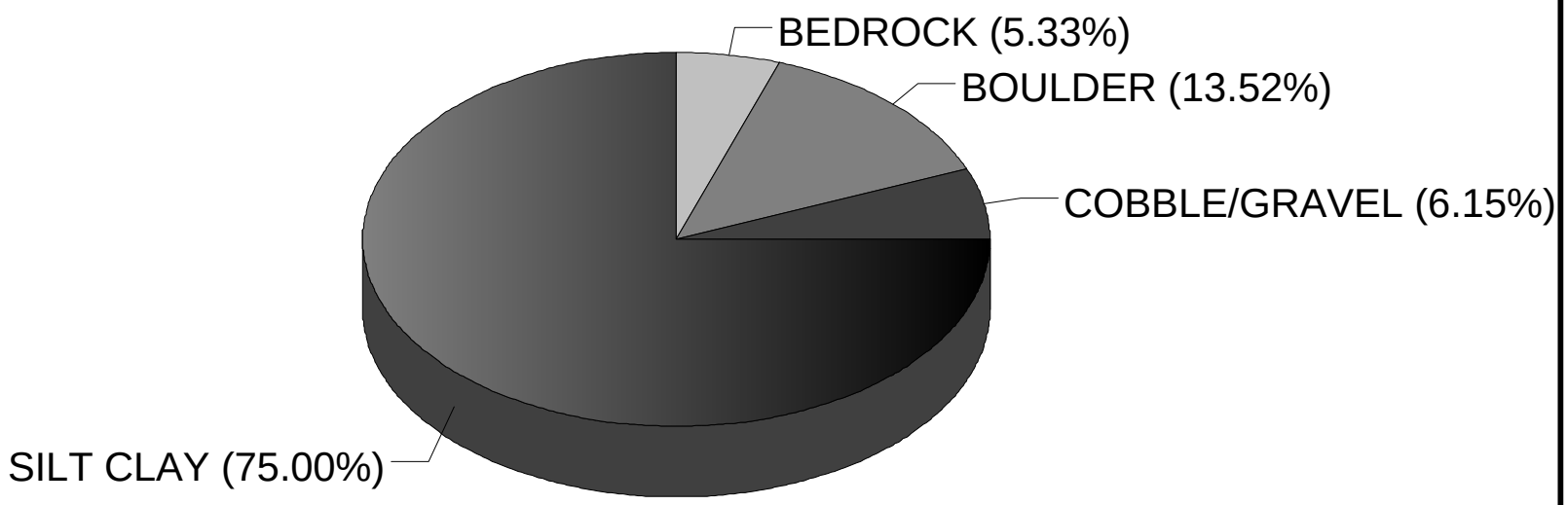
PERCENT CANOPY



GRAPH 9

PENNINGTON CREEK

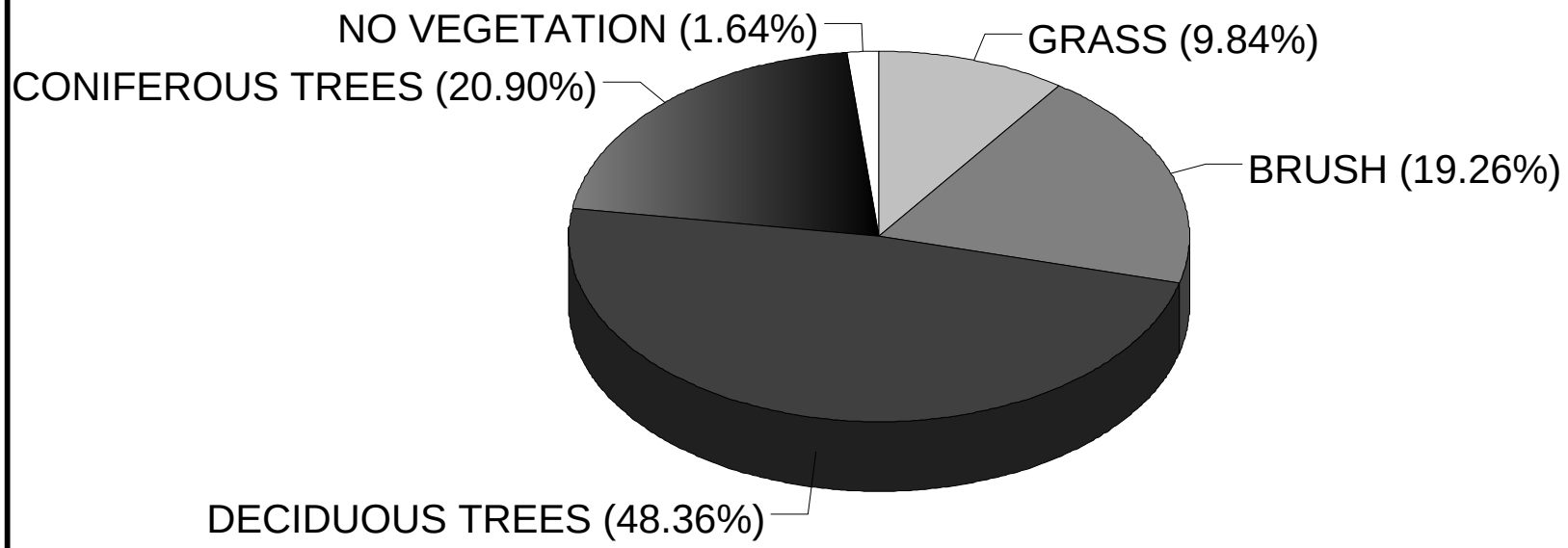
DONIMANT BANK COMPOSITION IN



GRAPH 10

PENNINGTON CREEK

DOMINANT BANK VEGETATION



GRAPH 11

Habitat Typing GPS Data Collection

Definitions

Point locations: Five stationary positions (recordings of latitude, longitude, and elevation) are averaged together to create one point.

Line locations: Continues positions taken while the operator walks along the feature.

GIS Layers

thalwag (line): The line connecting the lowest or deepest points along a streambed.

pool tail crest (point) This feature will include the habitat unit, habitat unit length (ft), fish type, present, date, and any additional comments that need to be made about the site.

log jam (point) This feature will include the log jam type (log, debris, or both), if there is gravel retention, the length of the log jam in feet, width, the culverts height, the habitat unit, date, and comment.

culvert (point) This feature will include the material the culvert is made out of, if it has baffles, if it has a fish barrier, the plunge height in feet, length, width, the culvert's height, the habitat unit, date and comments.

drainpipe (point) This feature will include the material the drainpipe is made out of including metal, concrete, or plastic, the height from bank full stage1 to the bottom of the drainpipe, the diameter, habitat unit, date, and comment.

bridge (point) This feature will include the name of the bridge, length, width, habitat unit, date and comment. A height was also measured, generally from the water at thalwag2 to the bottom of bridge.

barrier (point) This feature will include the type of barrier, length, width, and height measurements, the habitat unit, date and comment.

bank erosion (point) This feature will include the length, height from bank full stage to top of erosion, the habitat unit, slope (ranging from 0-30 degrees, 31-60 degrees, and 61-90 degrees), which bank(s) the erosion is located on in respect to looking downstream, comment, and date.

access (line) This feature will include the type of access (trail or road), surface of the access(dirt, paved, or gravel), width, date, and comment.

creek (line) This feature will include the name, date, and comment.

fence across creek (point) This feature will include the type of fence (for example, barbed wire, metal, etc. condition of fence (good, repair, remove), habitat unit, comment, and date.

tributary (point) This feature will include the habitat unit, comment, and date.

invasive plant (point) This feature will include the species (castor bean, arundo, pampas grass, cape ivy, other), comment, and date.