# STREAM INVENTORY REPORT

## Kangaroo Creek

### INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Kangaroo Creek. The survey began 1.4 above the confluence with the East Fork Scott River and extended upstream 1.4 miles.

The Kangaroo Creek 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 in Kangaroo Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

### WATERSHED OVERVIEW

Kangaroo Creek is a tributary to the East Fork Scott River, a tributary to the Scott River, a tributary to the Klamath River, which drains to the Pacific Ocean. It is located in Siskiyou County, California (Map 1). Kangaroo Creek's legal description at the confluence with the East Fork Scott River is T40N R7W S18. Its location is 41.3350 degrees north latitude and 122.7181 degrees west longitude. Kangaroo Creek is a second order stream and has approximately 4.5 miles of blue line stream according to the USGS Scott Mountain 7.5 minute quadrangle. Kangaroo Creek drains a watershed of approximately 6.4 square miles. Elevations range from about 3,500 feet at the mouth of the creek to about 5,800 feet in the headwater areas. Douglas fir, grass, oak, mixed hardwood, and mixed conifer forests dominate the watershed. The watershed is primarily privately owned and national forest land and is managed for timber production, rangeland, and recreation. Vehicle access exists via the Gazelle-Callahan Road to Forest Service Road 40N08.

### METHODS

The habitat inventory conducted in Kangaroo Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors, and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

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SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

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 Kangaroo Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (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 characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (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". Kangaroo Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean

wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Kangaroo 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 not suitable for spawning due to inappropriate substrate particle size, bedrock, 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 Kangaroo Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Kangaroo Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or 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 Kangaroo Creek the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from

the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100'.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

## BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Kangaroo Creek. In addition, eighteen sites were snorkel dived. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## 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 ten 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
- Mean Percent Vegetative Cover
- Fish Habitat Elements by Stream Reach
- Dominant Vegetation Type for Entire Stream
- Mean Percent Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Kangaroo 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 Low Gradient Riffles
- Mean 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 that took place between August 21 and September 4, 2002, was conducted by T. Behm and S. Maurer (DFG). The total length of stream surveyed was 5,951 feet.

A stream flow measurement of Kangaroo Creek on August 21, 2002 showed a stream flow of 0.12 cubic feet per second (cfs).

The following table summarizes bankfull widths and channel types in Kangaroo Creek:

| REACH | LENGTH | BANKFULL WIDTH | CHANNEL TYPE |
|---|---|---|---|
| 1 | 7,334 | Not surveyed | Not surveyed |
| 2 | 1,295 | 14.8 | F4 |
| 3 | 1,288 | 10.7 | G3 |
| 4 | 3,104 | 15.1 | B3 |
| 5 | 264 | 10 | A1 |

F4 channels are entrenched, meandering, riffle/pool channels with gravel dominant substrates. G3 channels are entrenched, "gully-like" step-pools with low width/depth ratio and moderate gradient. B3 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and cobble dominant substrates. A1 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils but very stable bedrock channels.

Water temperatures taken during the survey period ranged from 52 to 57 degrees Fahrenheit. Air temperatures ranged from 51 to 87 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 48% riffle units, 34% flatwater units, and 16% pool units (Graph 1). Based on total length of Level II habitat types there were 51% riffle units, 32% flatwater units, and 8% pool units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffle units, 24%; low gradient riffle units,18%; run units and step run units, both at 15% (Graph 3). Based on percent total length, high gradient riffle units made up 27%, step run units 21%, and low gradient riffle units 20%.

A total of 28 pools were identified (Table 3). Main pools were the most frequently encountered, at 46%, (Graph 4) and comprised 50% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Five of the 28 pools (18%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 28 pool tail-outs measured, 20 had a value of 1 (71%); five had a value of 2 (18%); and 3 had a value of 5 (11%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 20, flatwater habitat types had a mean shelter rating of 17, and pool habitats had a mean shelter rating of 34 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 49. Main channel pools had a mean shelter rating of 25 (Table 3).

Kangaroo Creek contained a total of 52 pieces of large woody debris (LWD). This is an average of 0.87 pieces of LWD per 100'. The following table summarizes large woody debris in Grouse Creek:

| Reach | Total Pieces | Average pieces LWD per 100' |
|---|---|---|
| 1 | Not surveyed | Not surveyed |
| 2 | 12 | 0.93 |
| 3 | 10 | 0.78 |
| 4 | 30 | 0.97 |
| 5 | 0 | 0.00 |

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Kangaroo Creek. Graph 7 describes the pool cover in Kangaroo Creek. Boulders are the dominant pool cover type followed by undercut banks and bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Large cobble was the dominant substrate observed in 32 % of pool tail-outs while gravel was the next most frequently observed substrate type, at 25%.

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The mean percent canopy density for the surveyed length of Kangaroo Creek was 92%. The mean percentages of deciduous and coniferous trees were 53% and 39%, respectively. Eight percent of the canopy was open. Graph 9 describes the mean percent canopy in Kangaroo Creek.

For the stream reaches surveyed, the mean percent right bank vegetated was 56%. The mean percent left bank vegetated was 52%. The dominant elements composing the structure of the stream banks consisted of 44% sand/silt/clay, 41% cobble/gravel, 13% boulders, and 3% bedrock (Graph 10). Brush was the dominant vegetation type observed in 34% of the units surveyed. Additionally, 22% of the units surveyed had brush as the dominant vegetation type, 22% had coniferous trees as the dominant vegetation type, and 22% had deciduous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Fifteen sites were snorkeled for species composition and distribution in Kangaroo Creek on September 9, 2002. Water temperatures taken during the dive period ranged from 51 to 53 degrees Fahrenheit. Air temperatures ranged from 54 to 75 degrees Fahrenheit. The sites were sampled by S. Maurer, and T. Behm (DFG).

The following table displays the information yielded from these sites:

| Date | Site # | Approx. Dist. from start (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | Steelhead | | | Coho | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | YOY | 1+ | 2+ | YOY | 1+ | 2+ |
| 9/09/02 | 1 | 131 | 5 | 3.3 | 2 | F4 | 4 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 2 | 211 | 9 | 6.5 | 2 | F4 | 30 | 4 | 1 | 0 | 0 | 0 |
| 9/09/02 | 3 | 815 | 31 | 1.2 | 2 | F4 | 195 | 1 | 0 | 0 | 0 | 0 |
| 9/09/02 | 4 | 1064 | 38 | 5.6 | 2 | F4 | 142 | 0 | 7 | 0 | 0 | 0 |
| 9/09/02 | 5 | 1781 | 61 | 1.2 | 3 | G3 | 57 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 6 | 1803 | 62 | 3.4 | 3 | G3 | 214 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 7 | 1823 | 63 | 5.6 | 3 | G3 | 84 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 8 | 2688 | 85 | 4.2 | 4 | B3 | 158 | 0 | 2 | 0 | 0 | 0 |
| 9/09/02 | 9 | 2866 | 90 | 3.3 | 4 | B3 | 103 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 10 | 3124 | 98 | 1.1 | 4 | B3 | 1 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 11 | 3144 | 99 | 3.3 | 4 | B3 | 0 | 1 | 1 | 0 | 0 | 0 |
| 9/09/02 | 12 | 6724 | 122 | 3.2 | 4 | B3 | 0 | 1 | 0 | 0 | 0 | 0 |
| 9/09/02 | 13 | 6753 | 123 | 1.2 | 4 | B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/09/02 | 14 | 6783 | 126 | 5.4 | 4 | B3 | 0 | 1 | 1 | 0 | 0 | 0 |
| 9/09/02 | 15 | 7954 | 168 | 4.1 | 5 | A1 | 0 | 1 | 3 | 0 | 0 | 0 |

DISCUSSION

Kangaroo Creek was not surveyed for the first 7,334 feet due to lack of landowner access. Kangaroo Creek is an F4 channel type for the next 1,295 feet, a G3 channel type for the next 1,288 feet, a B3 channel type for the next 1,979 feet, and an A1 channel type for the final 264 feet of the stream surveyed. The suitability of channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders; fair for plunge weirs, boulder clusters, single and opposing wing-deflectors, and log cover. G3 channels are good for bank-placed boulders; fair for plunge weirs, and log cover; poor for boulder clusters, and single-wing deflectors. B3 channels are excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing deflectors, and log cover. A1 channels are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days of August 21 to September 4, 2003 ranged from 52 to 57 degrees Fahrenheit. Air temperatures ranged from 51 to 87 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 34% of the total length of this survey, riffles 48%, and pools 16%. The pools are relatively shallow, with only five of the 28 (19%) pools having a maximum depth greater than two 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 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 debris accumulations (LDA's) in the stream.

Twenty-five of the 28 pool tail-outs measured had embeddedness ratings of 1 or 2. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Kangaroo Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eleven of the 27 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean shelter rating for pools was 34. The shelter rating in the flatwater habitats was 17. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock ledges and whitewater contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

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The mean percent canopy density for the stream was 92%. Reach 1 was not surveyed while Reach 2 had a canopy density of 87%. Reaches 3, 4, and 5 had canopy densities of 89%, 95%, and 88%, respectively. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 56% and 52%, 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.

## RECOMMENDATIONS

1. Kangaroo Creek should be managed as an anadromous, natural production stream. Based on available information, favorable water temperatures, gradient and flow regimes exist in the stream to support various life history stages of salmonids.

2. Spawning and rearing distribution within Kangaroo Creek for the various species of salmonids utilizing the stream should be determined.

3. Barriers within the stream blocking or impeding fish movement should be identified and treated according to their potential to increase useable habitat.

4. Active and potential sediment sources related to streambank erosion, the road system, mining activities and landslides should be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

5. Irrigation diversions should be screened to prevent entrainment of juvenile salmonids into ditches.

6. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

7. Increase woody cover in pools and flatwater habitat units.

8. If there are areas where the stream is impacted from cattle trampling the riparian zone, alternatives to minimize or prevent continued degradation should be explored with the landowner and developed if possible.

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COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

| Position (ft): | Comments: |
|---|---|
| 0' | Start of survey 1.4 miles above confluence with East Fork Scott River at USFS property line. The channel type is an F4. |
| 83’ | Pileated woodpecker pair observed. |
| 131’ | Dive site #1. |
| 211’ | Dive site #2. |
| 815’ | Dive site #3. |
| 865’ | Dammed pools. |
| 1064’ | Dive site #4. |
| 1235’ | Low water crossing. Barbed wire on each side. |
| 1295’ | The channel changes from an F4 to a G3. |
| 1720’ | Ditch relief culvert on the left bank. Forest road 40N08 adjacent. |
| 1781’ | Dive site #5. |
| 1,803’ | Dive site #6. |
| 1,823’ | Dive site #7. |
| 1,922’ | Road 40N08 culvert crossing. 2.8 foot high plunge from 72-inch diameter corrugated metal pipe (CMP). |
| 1,941’ | Road 40N08 culvert crossing: 72-inch diameter CMP. |
| 2,062’ | Irrigation diversion intake dam and plastic across stream and lining pool bottom. |
| 2,583’ | The channel changes from a G3 to a B3. |
| 2,688’ | Dive site #8. |
| 2,866’ | Dive site #9. |

3,124’ Dive site #10.

3,144’ Dive site #11.

4,583’ Dry channel. Right bank tributary with water temperature of 51 degrees Fahrenheit.

6,724’ Dive site #12.

6,753’ Dive site #13.

6,771’ Right bank tributary. Old ditch may still carry water.

6,783’ Dive site #14. Small right bank seep with water temperature of 51 degrees Fahrenheit.

7,214’ Left bank tributary with water temperature of 53 degrees Fahrenheit.

7,844’ The channel changes from a B3 to an A1.

7,954 Dive site #15.

8,108’ End of Survey at USFS property line.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

**Kangaroo Creek**

LEVEL III and LEVEL IV HABITAT TYPES

| | | | |
|---|---|---|---|
| RIFFLE | | | |
| Low Gradient Riffle | (LGR) | [1.1] | { 1} |
| High Gradient Riffle | (HGR) | [1.2] | { 2} |
| | | | |
| CASCADE | | | |
| Cascade | (CAS) | [2.1] | { 3} |
| Bedrock Sheet | (BRS) | [2.2] | {24} |
| | | | |
| FLAT WATER | | | |
| Pocket Water | (POW) | [3.1] | {21} |
| Glide | (GLD) | [3.2] | {14} |
| Run | (RUN) | [3.3] | {15} |
| Step Run | (SRN) | [3.4] | {16} |
| Edgewater | (EDW) | [3.5] | {18} |
| | | | |
| MAIN CHANNEL POOLS | | | |
| Trench Pool | (TRP) | [4.1] | { 8 } |
| Mid-Channel Pool | (MCP) | [4.2] | {17} |
| Channel Confluence Pool | (CCP) | [4.3] | {19} |
| Step Pool | (STP) | [4.4] | {23} |
| | | | |
| SCOUR POOLS | | | |
| Corner Pool | (CRP) | [5.1] | {22} |
| Lateral Scour Pool - Log Enhanced | (LSL) | [5.2] | {10} |
| Lateral Scour Pool - Root Wad Enhanced | (LSR) | [5.3] | {11} |
| Lateral Scour Pool - Bedrock Formed | (LSBk) | [5.4] | {12} |
| Lateral Scour Pool - Boulder Formed | (LSBo) | [5.5] | {20} |
| Plunge Pool | (PLP) | [5.6] | { 9 } |
| | | | |
| BACKWATER POOLS | | | |
| Secondary Channel Pool | (SCP) | [6.1] | { 4 } |
| Backwater Pool - Boulder Formed | (BPB) | [6.2] | { 5 } |
| Backwater Pool - Root Wad Formed | (BPR) | [6.3] | { 6 } |
| Backwater Pool - Log Formed | (BPL) | [6.4] | { 7 } |
| Dammed Pool | (DPL) | [6.5] | {13} |
| | | | |
| ADDITIONAL UNIT DESIGNATIONS | | | |
| Dry | (DRY) | [7.0] | |
| Culvert | (CUL) | [8.0] | |
| Not Surveyed | (NS) | [9.0] | |
| Not Surveyed due to a marsh | (MAR) | [9.1] | |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

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

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 18 | RIFFLE | 48 | 37 | 3033 | 51 | 5.3 | 0.3 | 186 | 15212 | 48 | 3943 | 0 | 20 |
| 58 | 15 | FLATWATER | 34 | 33 | 1907 | 32 | 5.8 | 0.4 | 175 | 10133 | 91 | 5285 | 0 | 17 |
| 28 | 28 | POOL | 16 | 16 | 454 | 8 | 7.9 | 0.7 | 113 | 3155 | 86 | 2416 | 66 | 34 |
| 1 | 0 | DRY | 1 | 510 | 510 | 9 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | CULVERT | 1 | 47 | 47 | 1 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |

| TOTAL UNITS | TOTAL UNITS | TOTAL LENGTH (ft.) | TOTAL AREA (sq. ft.) | TOTAL VOL. (cu. ft.) |
|---|---|---|---|---|
| 170 | 61 | 5951 | 28500 | 11644 |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 6 | LGR | 18 | 39 | 1205 | 8 | 7 | 0.2 | 1.6 | 291 | 9029 | 63 | 1948 | 0 | 16 | 95 |
| 42 | 7 | HGR | 24 | 38 | 1602 | 10 | 5 | 0.3 | 1.1 | 164 | 6908 | 49 | 2050 | 0 | 26 | 92 |
| 1 | 1 | CAS | 1 | 24 | 24 | 0 | 7 | 0.3 | 0.5 | 115 | 115 | 35 | 35 | 0 | 25 | 88 |
| 8 | 4 | BRS | 5 | 25 | 202 | 1 | 3 | 0.3 | 0.6 | 81 | 650 | 28 | 224 | 0 | 15 | 91 |
| 6 | 4 | GLD | 3 | 20 | 120 | 1 | 5 | 0.5 | 1.3 | 105 | 628 | 44 | 262 | 0 | 34 | 87 |
| 26 | 5 | RUN | 15 | 20 | 513 | 3 | 7 | 0.4 | 1.2 | 104 | 2702 | 38 | 980 | 0 | 10 | 92 |
| 26 | 6 | SRN | 15 | 49 | 1274 | 8 | 5 | 0.5 | 5.2 | 280 | 7289 | 167 | 4348 | 0 | 13 | 95 |
| 2 | 2 | TRP | 1 | 24 | 48 | 0 | 7 | 1.0 | 3.0 | 156 | 312 | 163 | 326 | 123 | 18 | 88 |
| 10 | 10 | MCP | 6 | 16 | 157 | 1 | 8 | 0.7 | 1.8 | 113 | 1130 | 76 | 755 | 54 | 24 | 88 |
| 1 | 1 | STP | 1 | 21 | 21 | 0 | 8 | 0.6 | 1.3 | 131 | 131 | 78 | 78 | 65 | 50 | 94 |
| 2 | 2 | LSBk | 1 | 13 | 26 | 0 | 5 | 0.9 | 1.5 | 62 | 123 | 53 | 106 | 47 | 18 | 97 |
| 10 | 10 | PLP | 6 | 14 | 141 | 1 | 9 | 0.8 | 3.1 | 115 | 1147 | 96 | 958 | 68 | 56 | 90 |
| 3 | 3 | DPL | 2 | 20 | 61 | 0 | 6 | 0.6 | 1.2 | 104 | 312 | 64 | 193 | 70 | 10 | 97 |
| 1 | 0 | DRY | 1 | 510 | 510 | 3 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | CUL | 1 | 47 | 47 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| TOTAL UNITS | TOTAL UNITS | LENGTH (ft.) | AREA (sq.ft) | TOTAL VOL. (cu.ft) |
|---|---|---|---|---|
| 170 | 61 | 5951 | 30477 | 12264 |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 13 | MAIN | 46 | 17 | 226 | 50 | 7.6 | 0.7 | 121 | 1573 | 89 | 1159 | 66 | 25 |
| 12 | 12 | SCOUR | 43 | 14 | 167 | 37 | 8.7 | 0.8 | 106 | 1270 | 89 | 1064 | 65 | 49 |
| 3 | 3 | BACKWATER | 11 | 20 | 61 | 13 | 5.9 | 0.6 | 104 | 312 | 64 | 193 | 70 | 10 |

| TOTAL UNITS | TOTAL UNITS | TOTAL LENGTH (ft.) | TOTAL AREA (sq.ft.) | TOTAL VOL. (cu.ft.) |
|---|---|---|---|---|
| 28 | 28 | 454 | 3155 | 2416 |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

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

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 | 7 | 0 | 0 | 1 | 50 | 0 | 0 | 1 | 50 | 0 | 0 |
| 10 | MCP | 36 | 0 | 0 | 10 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | STP | 4 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | LSBk | 7 | 0 | 0 | 2 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | PLP | 36 | 0 | 0 | 6 | 60 | 2 | 20 | 2 | 20 | 0 | 0 |
| 3 | DPL | 11 | 0 | 0 | 3 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL UNITS 28 | | | 0 | | 23 | | 2 | | 3 | | 0 | |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 6 | LGR | 0 | 9 | 0 | 0 | 3 | 0 | 19 | 68 | 0 |
| 42 | 7 | HGR | 0 | 4 | 1 | 0 | 3 | 0 | 29 | 63 | 0 |
| 1 | 1 | CAS | 0 | 15 | 0 | 0 | 0 | 0 | 40 | 25 | 20 |
| 8 | 4 | BRS | 8 | 3 | 0 | 0 | 0 | 0 | 40 | 5 | 45 |
| 6 | 4 | GLD | 0 | 9 | 5 | 15 | 1 | 0 | 4 | 66 | 0 |
| 26 | 5 | RUN | 2 | 5 | 0 | 0 | 6 | 0 | 7 | 80 | 0 |
| 26 | 6 | SRN | 0 | 3 | 0 | 0 | 4 | 0 | 10 | 83 | 0 |
| 2 | 2 | TRP | 13 | 5 | 0 | 0 | 0 | 0 | 15 | 28 | 40 |
| 10 | 10 | MCP | 25 | 8 | 4 | 2 | 3 | 0 | 2 | 46 | 11 |
| 1 | 1 | STP | 0 | 10 | 0 | 0 | 10 | 0 | 20 | 60 | 0 |
| 2 | 2 | LSBk | 10 | 10 | 0 | 0 | 0 | 0 | 10 | 43 | 28 |
| 10 | 10 | PLP | 19 | 14 | 5 | 3 | 3 | 0 | 12 | 35 | 11 |
| 3 | 3 | DPL | 2 | 22 | 0 | 0 | 0 | 0 | 7 | 70 | 0 |
| 1 | 0 | DRY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | CUL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Kangaroo Creek

Drainage: EAST FORK SCOTT RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/21/02 to 09/04/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS18 LATITUDE:41°20'5" LONGITUDE:122°43'9"

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 31 | 6 | LGR | 0 | 0 | 17 | 33 | 17 | 33 | 0 |
| 42 | 7 | HGR | 0 | 0 | 0 | 0 | 29 | 57 | 14 |
| 1 | 1 | CAS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 8 | 4 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 6 | 4 | GLD | 0 | 25 | 25 | 0 | 25 | 0 | 25 |
| 26 | 5 | RUN | 0 | 20 | 20 | 20 | 20 | 20 | 0 |
| 26 | 6 | SRN | 0 | 0 | 17 | 50 | 0 | 33 | 0 |
| 2 | 2 | TRP | 0 | 0 | 0 | 50 | 0 | 0 | 50 |
| 10 | 10 | MCP | 0 | 10 | 20 | 10 | 20 | 0 | 40 |
| 1 | 1 | STP | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 2 | 2 | LSBk | 0 | 0 | 50 | 0 | 0 | 0 | 50 |
| 10 | 10 | PLP | 0 | 30 | 20 | 0 | 10 | 20 | 20 |
| 3 | 3 | DPL | 0 | 33 | 33 | 0 | 33 | 0 | 0 |
| 1 | 0 | DRY | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | CUL | 0 | 0 | 0 | 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 |
|---|---|---|---|---|---|
| 92 | 42 | 58 | 1 | 55.7 | 51.9 |

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.

39%

42 x .92 = ~~38.6~~ 39% coniferous 39%

58 x .92 = ~~53.4~~ 53% deciduous 53%

100 - 92 = 8% open canopy

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Kangaroo Creek
SAMPLE DATES: 08/21/02 to 09/04/02
STREAM LENGTH: 15442 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Scott Mtn — Latitude: 41°20'5"
Legal Description: T40NR07WS18 — Longitude: 122°43'9"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

| | |
|---|---|
| Channel Type: N/A | Canopy Density: **********% |
| Channel Length: 0 ft. (7,334 ft.) | Coniferous Component: **********% |
| Riffle/flatwater Mean Width: ********* | Deciduous Component: **********% |
| Total Pool Mean Depth: **** ft. | Pools by Stream Length: **********% |
| Base Flow: 0.0 cfs | Pools >=3 ft.deep: **********% |
| Water: - °F Air: - °F | Mean Pool Shelter Rtn: ********** |
| Dom. Bank Veg.: Brush | Dom. Shelter: Undercut Banks |
| Vegetative Cover: **********% | Occurrence of LOD: **********% |
| Dom. Bank Substrate: Silt/Clay/Sand | Dry Channel: 0 ft. |

Embeddness Value: 1. **********% 2.**********% 3. **********% 4. **********% 5. **********%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 7334 ft.

STREAM REACH 2

| | |
|---|---|
| Channel Type: F4 | Canopy Density: 87% |
| Channel Length: 1295 ft. | Coniferous Component: 32% |
| Riffle/flatwater Mean Width: 6 ft. | Deciduous Component: 68% |
| Total Pool Mean Depth: 0.6 ft. | Pools by Stream Length: 10% |
| Base Flow: 0.1 cfs | Pools >=3 ft.deep: 13% |
| Water: 56 - 57 °F Air: 51 -64 °F | Mean Pool Shelter Rtn: 36 |
| Dom. Bank Veg.: Brush | Dom. Shelter: Boulders |
| Vegetative Cover: 60% | Occurrence of LOD: 3% |
| Dom. Bank Substrate: Silt/Clay/Sand | Dry Channel: 0 ft. |

Embeddness Value: 1. 63% 2.38% 3. 0% 4. 0% 5. 0%

STREAM REACH 3

| | |
|---|---|
| Channel Type: G3 | Canopy Density: 89% |
| Channel Length: 1288 ft. | Coniferous Component: 20% |
| Riffle/flatwater Mean Width: 6 ft. | Deciduous Component: 80% |
| Total Pool Mean Depth: 0.7 ft. | Pools by Stream Length: 12% |
| Base Flow: 0.1 cfs | Pools >=3 ft.deep: 11% |
| Water: 54 - 57 °F Air: 58 -73 °F | Mean Pool Shelter Rtn: 48 |
| Dom. Bank Veg.: Brush | Dom. Shelter: Boulders |
| Vegetative Cover: 66% | Occurrence of LOD: 1% |
| Dom. Bank Substrate: Silt/Clay/Sand | Dry Channel: 0 ft. |

Embeddness Value: 1. 78% 2.11% 3. 0% 4. 0% 5. 11%

STREAM REACH 4

| | |
|---|---|
| Channel Type: B3 | Canopy Density: 95% |
| Channel Length: 3104 ft. | Coniferous Component: 46% |

Riffle/flatwater Mean Width: 6 ft.
Total Pool Mean Depth: 0.9 ft.
Base Flow: 0.1 cfs
Water: 52 - N/A°F Air: 72 -87 °F
Dom. Bank Veg.: Brush
Vegetative Cover: 56%
Dom. Bank Substrate: Silt/Clay/Sand

Deciduous Component: 54%
Pools by Stream Length: 4%
Pools >=3 ft.deep: 0%
Mean Pool Shelter Rtn: 23
Dom. Shelter: Boulders
Occurrence of LOD: 1%
Dry Channel: 510 ft.

Embeddness Value: 1. 78% 2.11% 3. 0% 4. 0% 5. 11%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 2157 ft.

STREAM REACH 5

Channel Type: A1
Channel Length: 264 ft.
Riffle/flatwater Mean Width: 4 ft.
Total Pool Mean Depth: 1.1 ft.
Base Flow: 0.1 cfs
Water: 54 - 55 °F Air: 74 -75 °F
Dom. Bank Veg.: Brush
Vegetative Cover: 8%
Dom. Bank Substrate: Silt/Clay/Sand

Canopy Density: 88%
Coniferous Component: 85%
Deciduous Component: 15%
Pools by Stream Length: 15%
Pools >=3 ft.deep: 50%
Mean Pool Shelter Rtn: 8
Dom. Shelter: Bedrock Ledges
Occurrence of LOD: 0%
Dry Channel: 0 ft.

Embeddness Value: 1. 50% 2.0% 3. 0% 4. 0% 5. 50%

BFW

Reach 1 - unsurveyed
Reach 2 - 14.8
Reach 3 - 10.7
Reach 4 - 15.1
Reach 5 - 10.0

LWD

Reach 1 - unsurveyed
Reach 2 - .93 pieces per 100 ft. (12 total)
Reach 3 - .78 " " " " (10 total)
Reach 4 - .97 " " " " (30)
Reach 5 - 0 (0)

Mean Percentage of Dominant Substrate

| Dominant Class of Substrate | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|---|---|---|---|
| Bedrock | 1 | 2 | 2.6 |
| Boulder | 9 | 6 | 12.9 |
| Cobble/Gravel | 22 | 25 | 40.5 |
| Silt/clay | 26 | 25 | 44.0 |

Mean Percentage of Dominant Vegetation

| Dominant Class of Vegetation | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|---|---|---|---|
| Grass | 11 | 15 | 22.4 |
| Brush | 24 | 15 | 33.6 |
| Decid. Trees | 14 | 11 | 21.6 |
| Conif. Trees | 9 | 17 | 22.4 |
| No Vegetation | 0 | 0 | 0 |

Total stream average embeddedness value for pool 1.6

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

Stream: Kangaroo Creek Drainage: EAST FORK SCOTT RIVER

Survey Date: 08/21/02 to 09/04/02

| | RIFFLES | FLATWATER | POOLS |
|---|---|---|---|
| UNDERCUT BANKS | 8.5 | 0.7 | 17.1 |
| SMALL WOODY DEBRIS | 8.4 | 5 | 11.6 |
| LARGE WOODY DEBRIS | 1.8 | 1.3 | 2.9 |
| ROOTS | 1.7 | 4 | 1.6 |
| TERRESTRIAL VEG | 2.7 | 4 | 2.3 |
| AQUATIC VEG | 0 | 0 | 0 |
| WHITEWATER | 14.0 | 7.3 | 8.2 |
| BOULDERS | 53.8 | 77.7 | 43.6 |
| BEDROCK LEDGES | 9.1 | 0 | 12.7 |

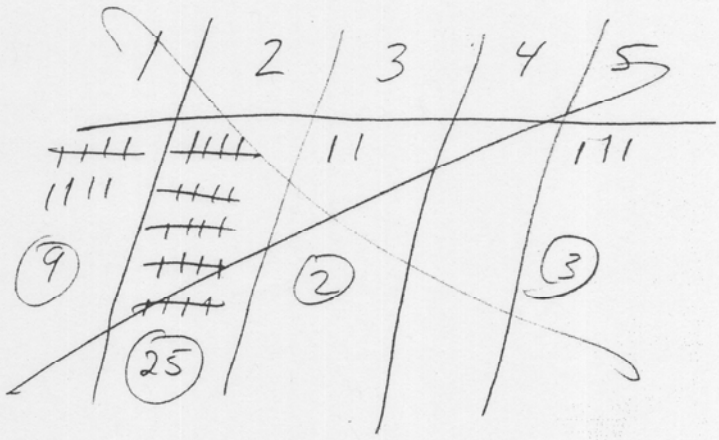
Kangaroo Creek - 2002

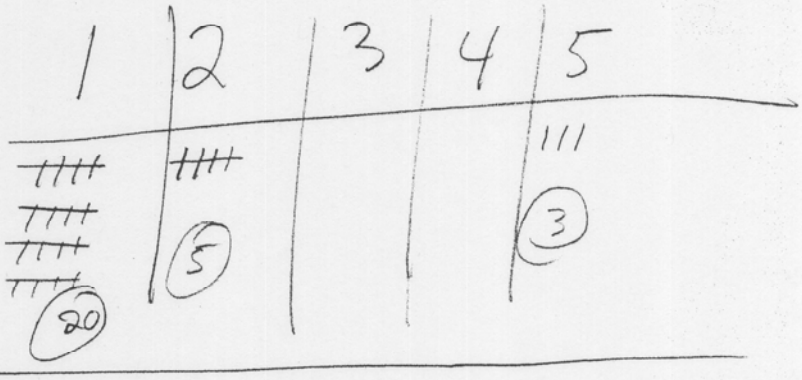
## Embeddedness % Results

# of 1's : 20 =
# of 2's : 5 =
# of 3's : ~~0~~
# of 4's : ~~0~~
# of 5's : 3 =

T = 28

Graph 6



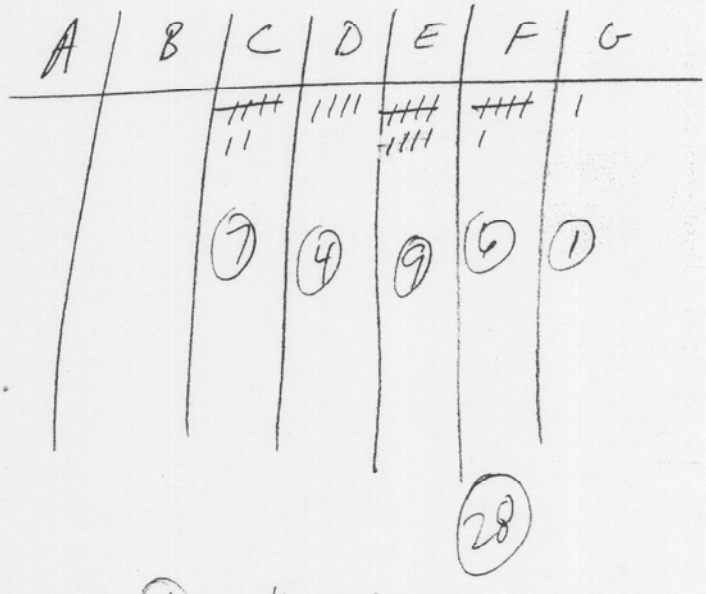

## Pool Tail Substrate Calculations

4 = ~~0~~ = 0%
3 = ~~0~~ = 0%
= 7 = 25%
= 4 = 14%
= 9 = 32%
= 6 = 21%
5 = 1 = 4%

T = 28

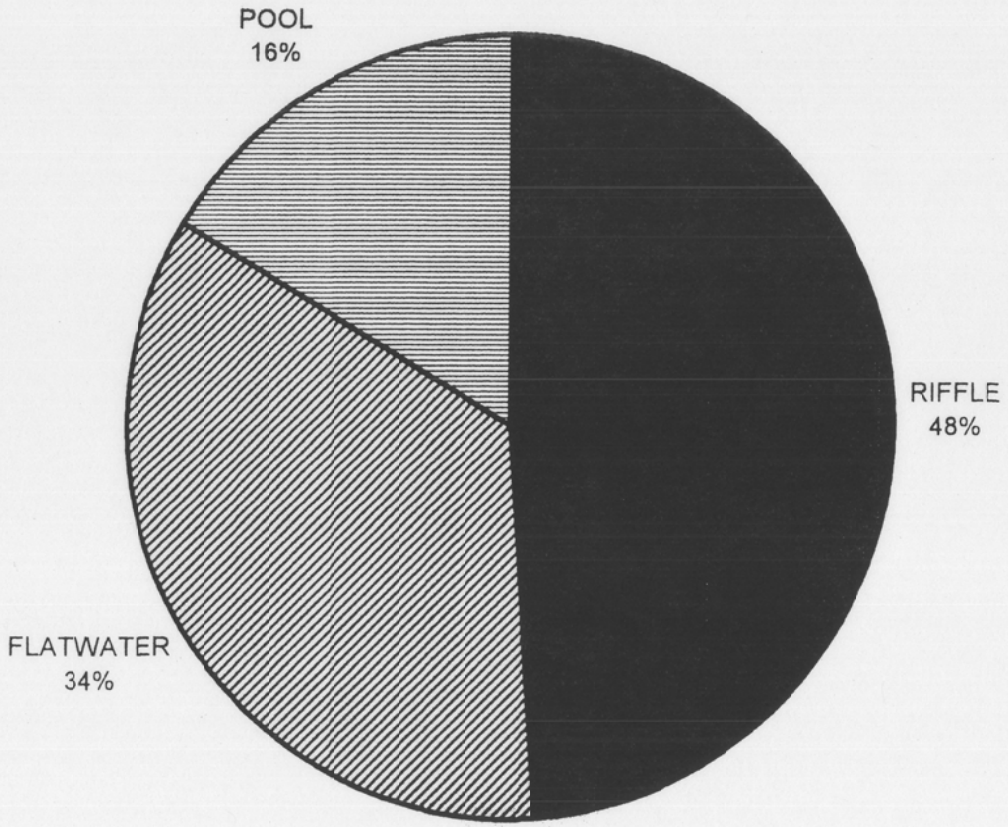
1 unknown = 4%

Graph 8



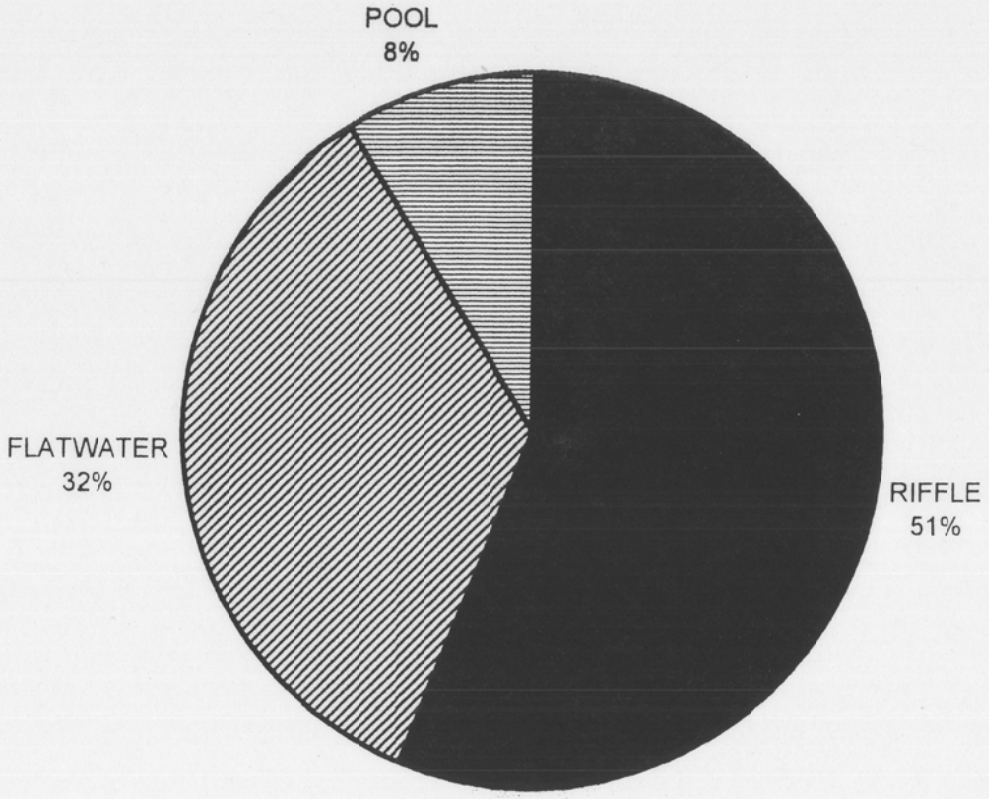

1 unknown

# KANGAROO CREEK 2002
# HABITAT TYPES BY PERCENT OCCURENCE




GRAPH 1

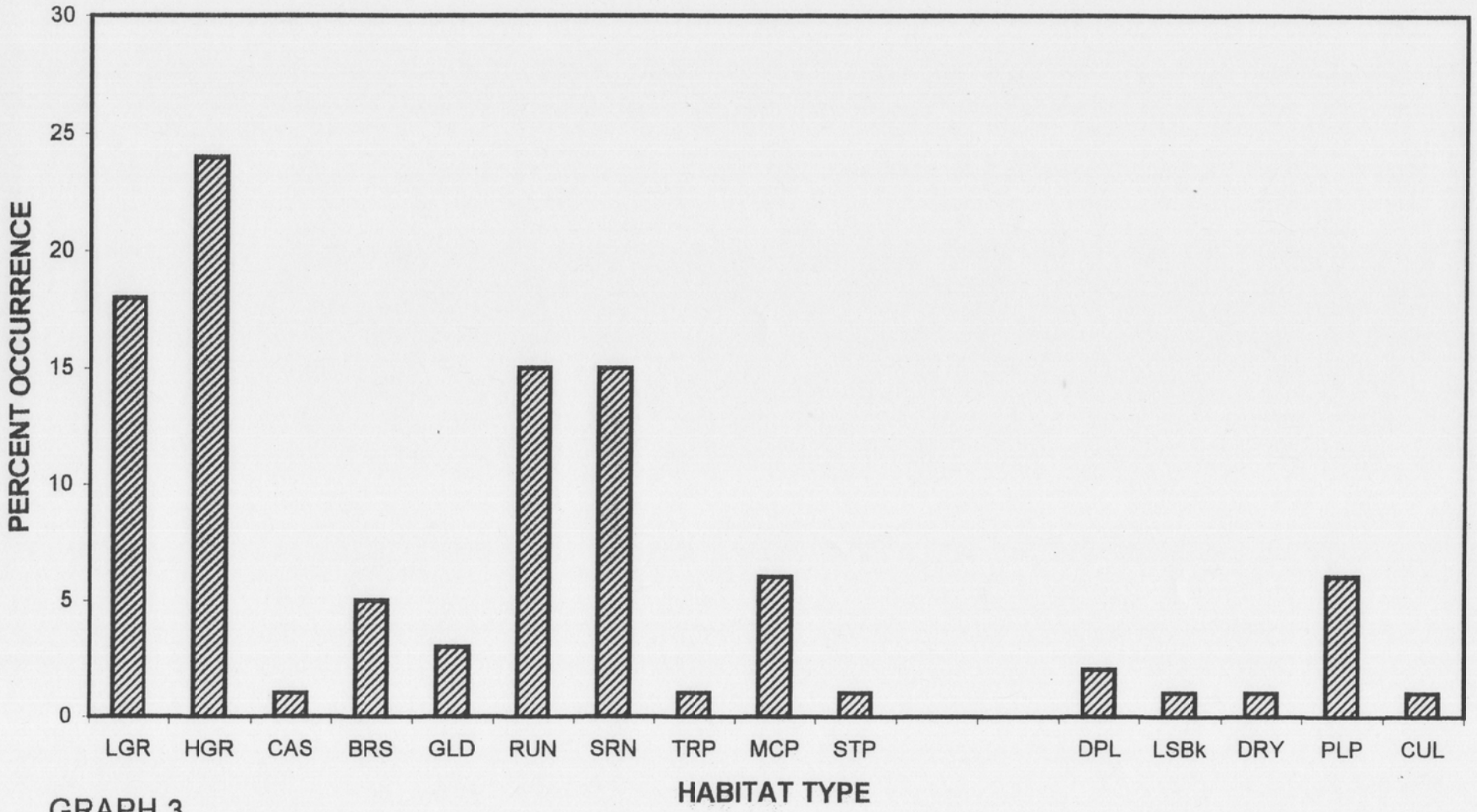
# KANGAROO CREEK 2002
## HABITAT TYPES BY PERCENT TOTAL LENGTH




GRAPH 2

# KANGAROO CREEK 2002

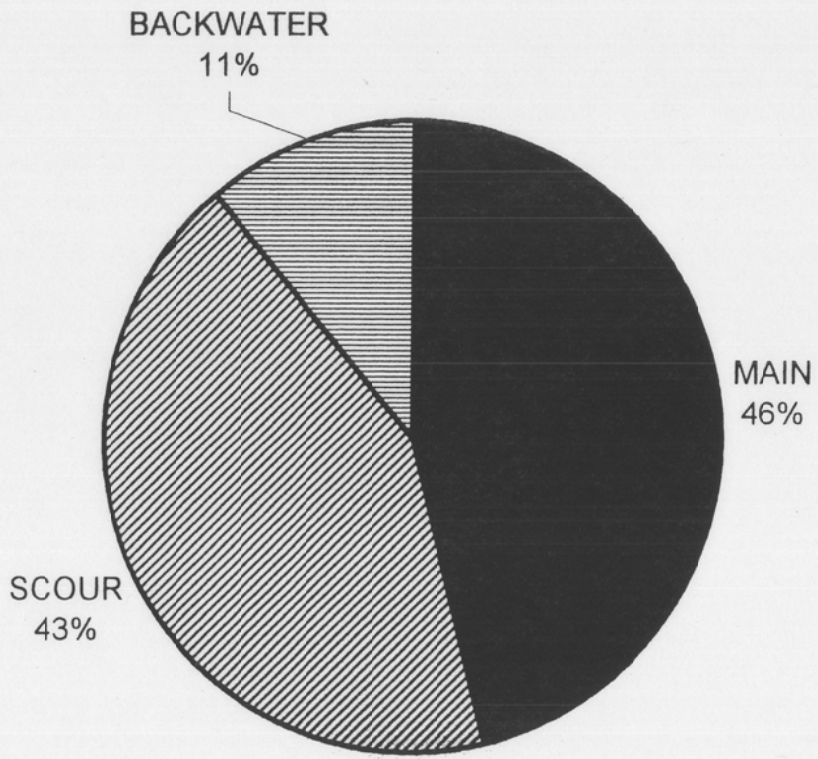
## HABITAT TYPES BY PERCENT OCCURRENCE




GRAPH 3

# KANGAROO CREEK 2002

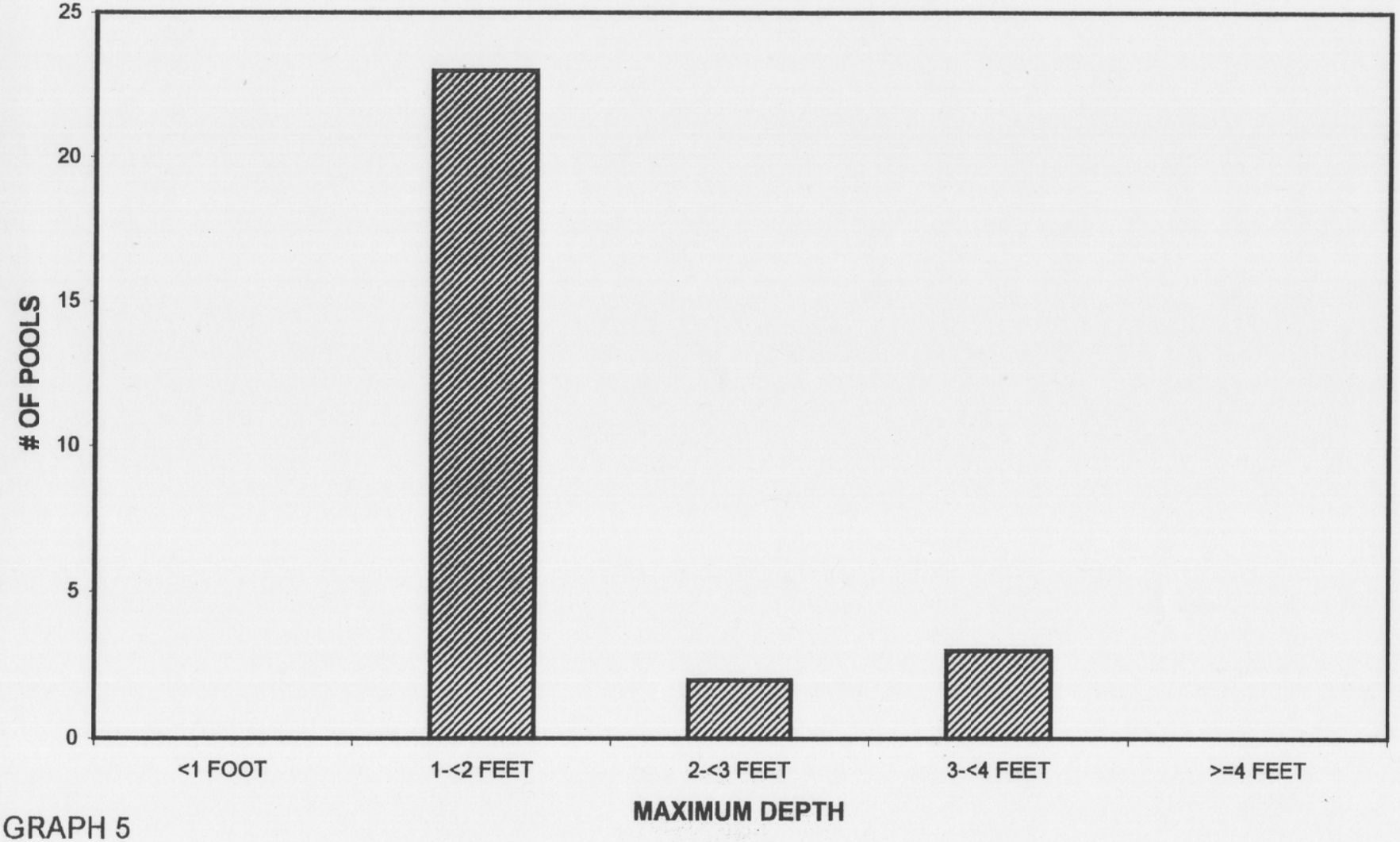
## POOL HABITAT TYPES BY PERCENT OCCURRENCE




GRAPH 4

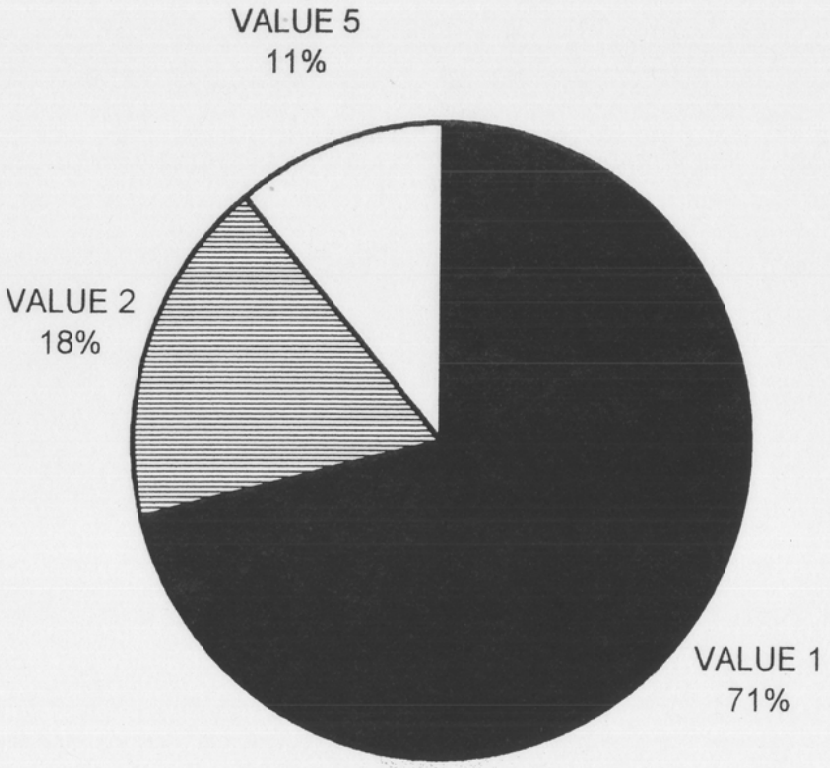
# KANGAROO CREEK 2002

## MAXIMUM DEPTH IN POOLS



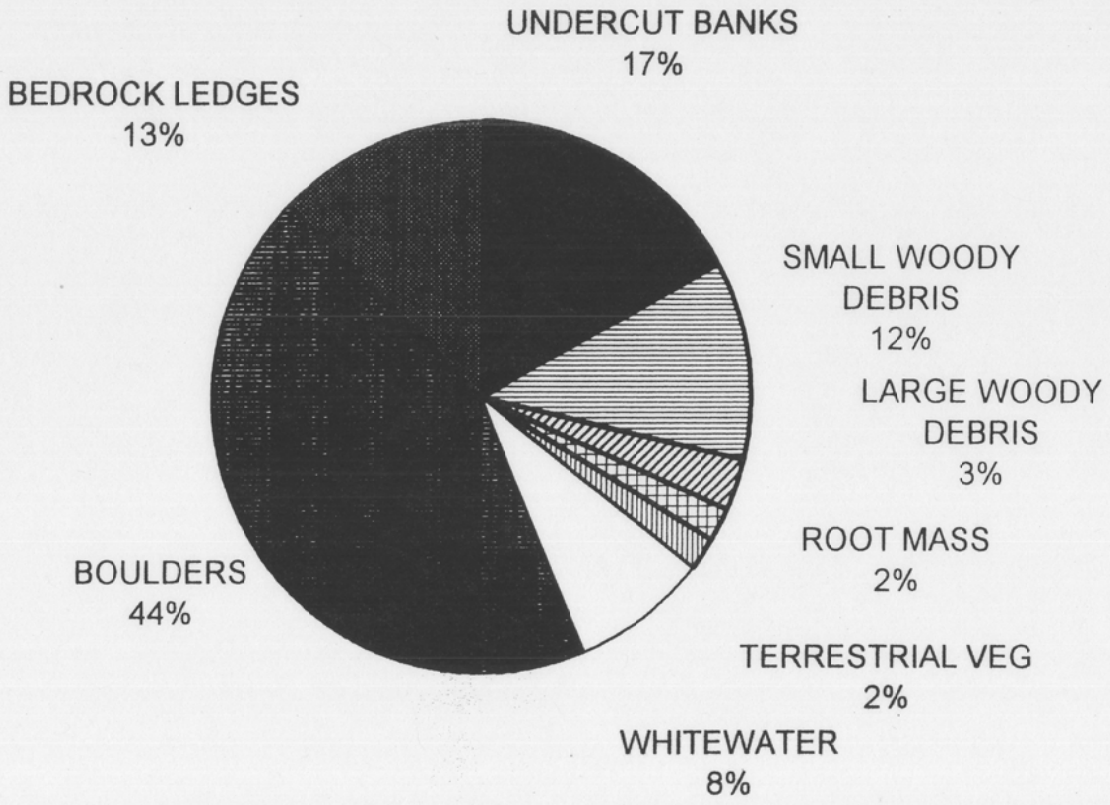

GRAPH 5

# KANGAROO CREEK 2002
## PERCENT EMBEDDEDNESS




GRAPH 6

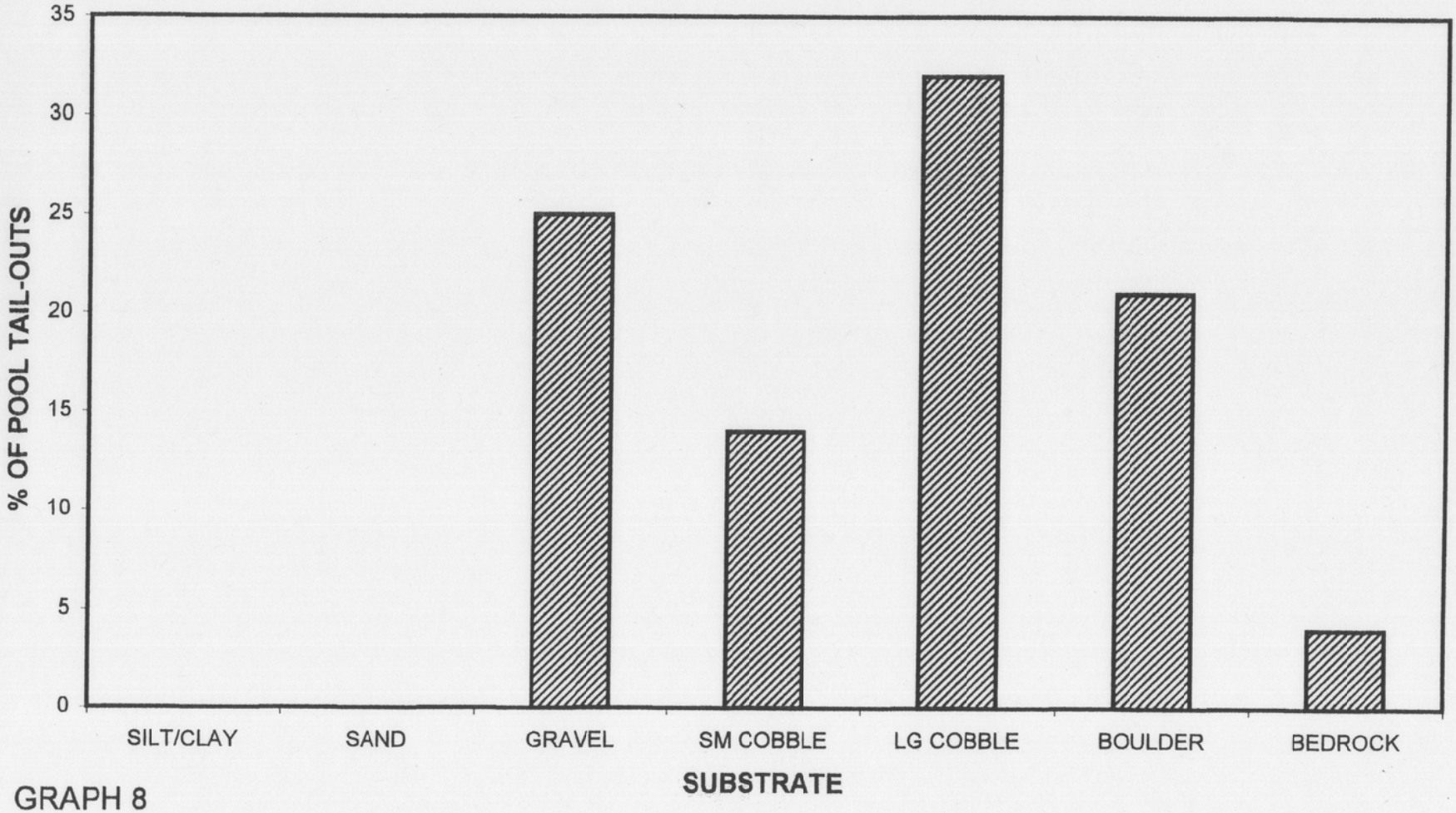
# KANGAROO CREEK 2002
## MEAN PERCENT COVER TYPES IN POOLS




GRAPH 7

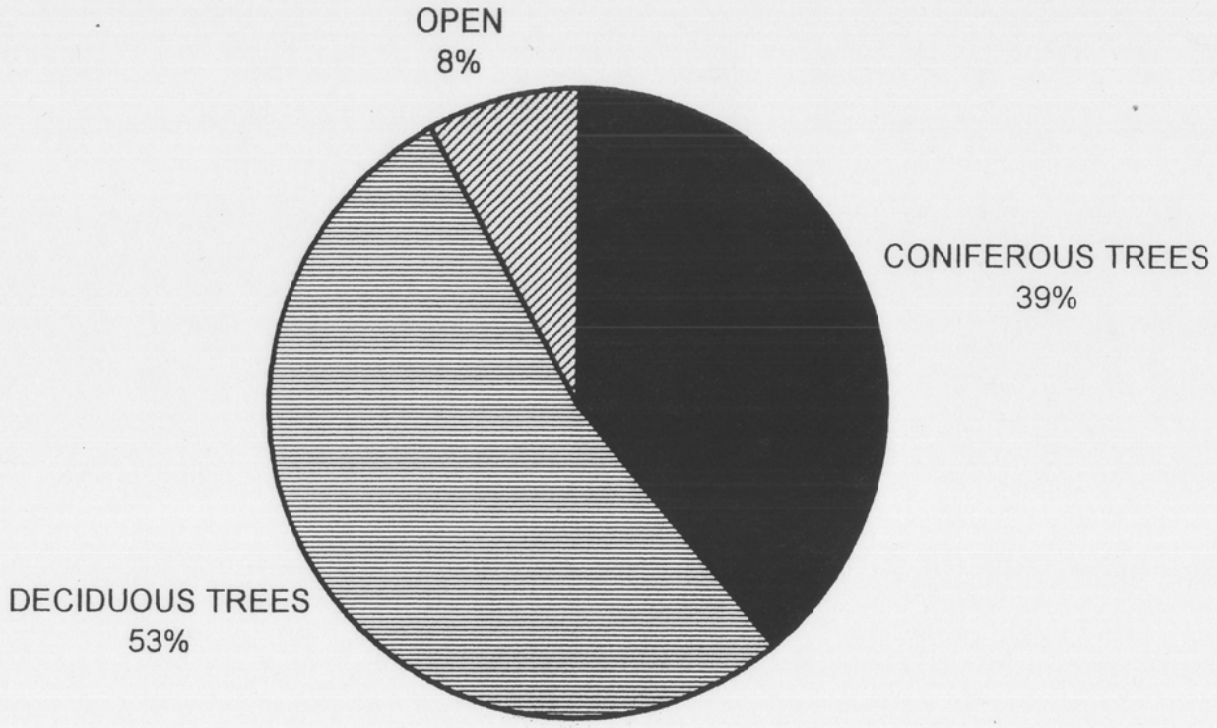
# KANGAROO CREEK 2002

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS




GRAPH 8

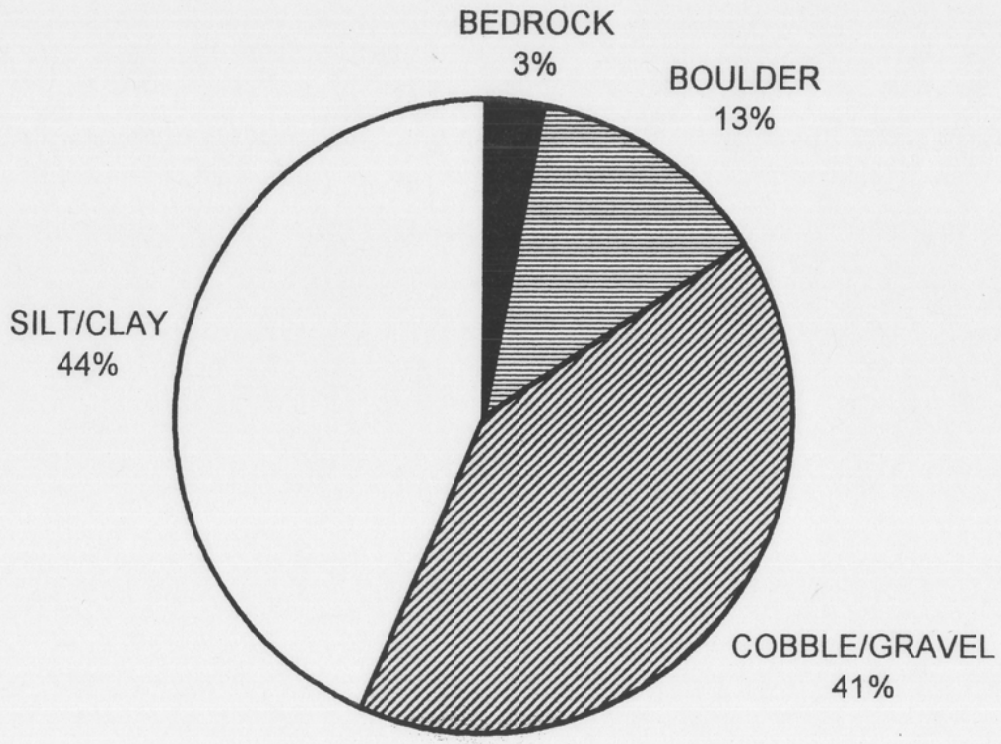
# KANGAROO CREEK 2002
## MEAN PERCENT CANOPY




GRAPH 9

# KANGAROO CREEK 2002

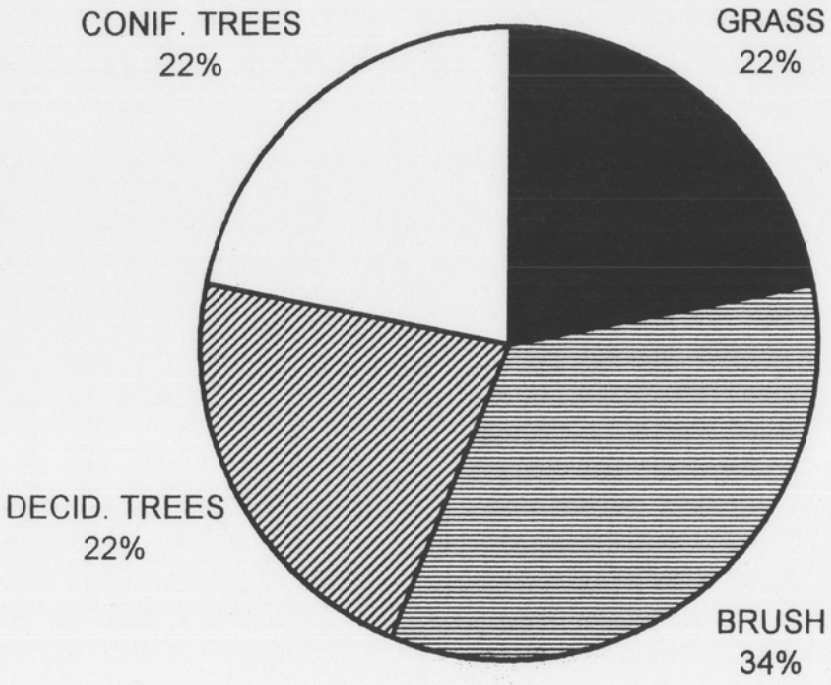
## DOMINANT BANK COMPOSITION IN SURVEY REACH



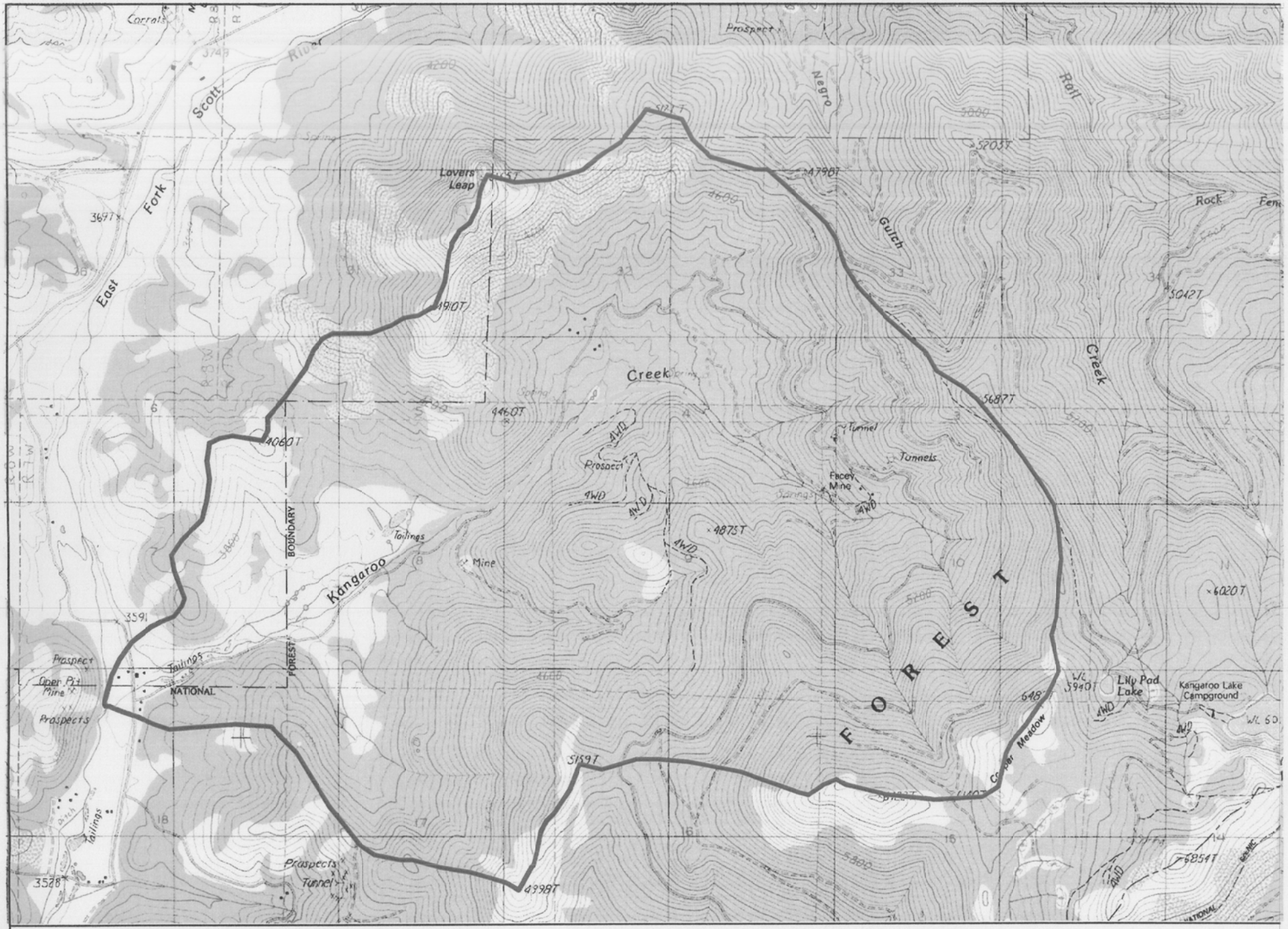

GRAPH 10

# KANGAROO CREEK 2002

## DOMINANT BANK VEGETATION IN SURVEY REACH




GRAPH 11




Name: SCOTT MT
Date: 7/28/2004
Scale: 1 inch equals 2500 feet

Location: 041° 20' 53.2" N 122° 40' 37.2" W
Caption: Kangaroo Creek
2002 Survey