

**CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT**

Icaria Creek

Report Revised April 14, 2006

Report Completed 2005

Assessment Completed 2002

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Icaria Creek, a stream in the Russian River Basin. Stream inventories and subsections to this report were also completed for two tributaries. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Icaria Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

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

WATERSHED OVERVIEW

Icaria Creek, located in Sonoma County, California, is a tributary to the Russian River (see Icaria Creek map, APPENDIX A). The legal description at the confluence with the Russian River is T11N, R10W, S29. Its location is 38°46'30.18"N latitude and 122°59'24.24"W longitude. Access to the mouth of Icaria Creek exists from Airport Road in Cloverdale. Access upstream exists from Hiatt Road and Kelley Road, west of Cloverdale, which follow close to the creek.

Icaria Creek and its tributaries drain a basin of approximately 3436.5 acres (5.4 square miles). Icaria Creek is a maximum third order stream and has approximately 24471.8 feet (4.63 miles) of blue line stream, according to the USGS "Asti" 7.5 minute quadrangles. One unnamed first order tributary (Trib B) was surveyed and is included in this report. Elevations range for Icaria Creek mainstem range from about 259 feet at the mouth of to 1860 feet in the headwaters. The vegetation is primarily hardwood (55%) with some herbaceous (15%), mixed hardwood/conifer (14%) and shrub (6%) with minor amounts of conifer forest (2%). Eight percent of the watershed is agricultural and only 5.57 acres is considered urban. Salmonid fish species historically present include steelhead trout. The watershed is 91.7% privately owned and 8.3% federal land. The upper portion of Icaria Creek extends into the Lake Sonoma Wildlife Management Area.

METHODS

The habitat inventory conducted in Icaria Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi, et al., 1998). The California Department of Fish and Game (DFG) field crew that conducted the inventory was trained in standardized habitat

inventory methods by DFG. This inventory was conducted by two person teams and was supervised by Derek Acomb, Russian River Planner (DFG).

SAMPLING STRATEGY

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

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Icaria Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, air and water temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

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. Flows were also measured or estimated at major tributary confluences.

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:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in 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. Icaria 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 were in feet to the nearest tenth. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a hip chain and a stadia rod.

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 Icaria Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (value 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Icaria Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. 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 measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes which are defined in the California Salmonid Stream Habitat Restoration Manual.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the California Salmonid Stream Habitat Restoration Manual. Canopy density relates to the amount of stream shaded from the sun. In Icaria Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the top 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 visually into percentages of evergreen 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 Icaria Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured 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.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electro fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

IMPACT INVENTORY & ANALYSIS

Problems such as migration barriers, streambed erosion, poor water quality or temperatures are noted in the comments and landmarks section. In some cases measurements are taken, an analysis of what caused the problem is made and restoration potential and alternatives are recommended.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat for data storage and analysis. Habitat is a Visual Basic extension to Microsoft Access, developed by Zebulon Young, University of California, Berkeley. This program processes and summarizes the data, and produces the following tables and appendices:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of shelter by habitat types
- Summary of dominant substrates by habitat types
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Icaria Creek include:

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools

- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game has not conducted previous surveys of Icaria Creek.

HABITAT INVENTORY RESULTS FOR ICARIA CREEK

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of Icaria Creek, 7/30/2002 - 8/8/2002, was conducted by Kate Hall (CCC) and Amy Livingston (Americorps) with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with the Russian River and extended up Icaria Creek near the headwaters. The total length of stream surveyed was 20845 feet.

Flows were not measured on Icaria Creek.

Icaria Creek is a F4 channel type for 17,898 feet of the stream surveyed (Reach 1), a B4 channel type for 2,946 feet of the stream surveyed (Reach 2).

F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

B4 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 67 degrees Fahrenheit. Air temperatures ranged from 62 to 88 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 28% dry units, 22% pool units, 28% flatwater units, 20% riffle units, 2% culvert units, (Graph 1). Based on total **length** of Level II habitat types there were 76% dry units, 6% pool units, 10% flatwater units, 7% riffle units, 1% culvert units, (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were 28% Dry units, 5% Mid-Channel Pool units, 1% Channel Confluence Pool units, 15% Run units, 11% Glide units, 20% Low Gradient Riffle units, 2% Lateral Scour Pool - Root Wad Enhanced units, 3% Lateral Scour Pool - Bedrock Formed units, 5% Corner Pool units, 2% Trench Pool units, 2% Lateral Scour Pool - Log Enhanced units, 2% Culvert

units, 2% Step Run units, (Graph 3). Based on percent total **length**, 76% Dry units, 1% Mid-Channel Pool units, 6% Run units, 3% Glide units, 7% Low Gradient Riffle units, 1% Lateral Scour Pool - Root Wad Enhanced units, 1% Lateral Scour Pool - Bedrock Formed units, 2% Corner Pool units, 1% Trench Pool units, 1% Lateral Scour Pool - Log Enhanced units, 1% Culvert units, 1% Step Run units.

A total of 26 pools were identified (Table 3). Scour pools were the most frequently encountered, at 62%, and comprised 62% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-two of the 26 pools (85%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 26 pool tail-outs measured, eleven had a value of 1 (42.3%); twelve had a value of 2 (46.2%); three had a value of 3 (11.5%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

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 8 , flatwater habitat types had a mean shelter rating of 23 , and pool habitats had a mean shelter rating of 56 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 62, Scour pools had a mean shelter rating of 52, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Root Mass are the dominant cover types in Icaria Creek. Graph 7 describes the pool cover in Icaria Creek. Root Mass is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 40% of pool tail-outs and small cobble was observed in 56% of pool tail-outs.

The mean percent canopy density for the surveyed length of Icaria Creek was 79%. The mean percentages of hardwood and coniferous trees were 36% and 64%, respectively. Twenty-one percent of the canopy was open. Graph 9 describes the mean percent canopy in Icaria Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 59%. The mean percent left bank vegetated was 51%. The dominant elements composing the structure of the stream banks consisted of 12% bedrock, 11% cobble/gravel, 77% sand/silt/clay, (Graph 10). Brush was the dominant vegetation type observed in 15% of the units surveyed. Additionally, 40% of the units surveyed had hardwood trees as the dominant vegetation type, and 35% had coniferous trees as the dominant vegetation (Graph 11).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY B

** ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT **

The habitat inventory of Icaria Creek, Trib B, 9/24/2002, was conducted by Derek Acomb and Sarah Green (DFG) with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with Icaria Creek and extended up Icaria Creek, Trib B to the end of anadromous fish passage at a reservoir dam. The total length of stream surveyed was 5594 feet.

Flows were not measured on Icaria Creek, Trib B.

Icaria Creek, Trib B is a B6 channel type for 5,594 feet of the stream surveyed (Reach 1).

B6 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and sand/silt/clay dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 52 to 86 degrees Fahrenheit.

*Table 1b summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 9% riffle units, 34% pool units, 6% culvert units, 30% dry units, 19% flatwater units, 2% no survey units, (Graph 1b). Based on total **length** of Level II habitat types there were 1% riffle units, 8% pool units, 1% culvert units, 63% dry units, 15% flatwater units, 12% no survey units, (Graph 2b).*

*Eight Level IV habitat types were identified (Table 2b). The most frequent habitat types by percent **occurrence** were 9% Low Gradient Riffle units, 2% Plunge Pool units, 6% Culvert units, 30% Mid-Channel Pool units, 30% Dry units, 6% Run units, 2% Trench Pool units, 9% Glide units, 4% Step Run units, 2% Not Surveyed units, (Graph 3b). Based on percent total **length**, 1% Low Gradient Riffle units, 1% Culvert units, 7% Mid-Channel Pool units, 63% Dry units, 3% Run units, 1% Trench Pool units, 3% Glide units, 9% Step Run units, 12% Not Surveyed units.*

A total of 16 pools were identified (Table 3b). Main Channel pools were the most frequently encountered, at 94%, and comprised 95% of the total length of all pools (Graph 4b).

Table 4b is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Six of the 16 pools (38%) had a residual depth of two feet or greater (Graph 5b).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 15 pool tail-outs measured, seven had a value of 2 (46.7%); four had a value of 3 (26.7%); two had a value of 4 (13.3%); two had a value of 5 (13.3%); (Graph 6b). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills,

boulders.

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 0, flatwater habitat types had a mean shelter rating of 33, and pool habitats had a mean shelter rating of 16, (Table 1b). Of the pool types, the Scour pools had a mean shelter rating of 20, Main Channel pools had a mean shelter rating of 16, (Table 3b).

Table 5b summarizes mean percent cover by habitat type. Undercut Banks are the dominant cover types in Icaria Creek, Trib B. Graph 7b describes the pool cover in Icaria Creek, Trib B. Undercut Banks is the dominant pool cover type followed by root mass.

Table 6b summarizes the dominant substrate by habitat type. Graph 8b depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 27% of pool tail-outs and small cobble was observed in 53% of pool tail-outs.

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

For the stream reach surveyed, the mean percent right bank vegetated was 8%. The mean percent left bank vegetated was 34%. The dominant elements composing the structure of the stream banks consisted of 15% bedrock, 19% cobble/gravel, 65% sand/silt/clay, (Graph 10b). Brush was the dominant vegetation type observed in 38% of the units surveyed. Additionally, 12% of the units surveyed had hardwood trees as the dominant vegetation type, and none had coniferous trees as the dominant vegetation (Graph 11b).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

Department of Fish and Game has not conducted previous biological inventories of Icaria Creek nor are there any records of hatchery releases or fish rescues in the Icaria Creek watershed. A biological inventory was conducted in 2002. Surveyors seine netted a small section in Reach 1. Although the surveyors observed fish, none were caught or identified. During the stream habitat inventory the surveyors observed roach, rough fish, suckers, sculpin, and bass.

DISCUSSION FOR ICARIA CREEK

Icaria Creek is a F4 channel type for 17,898 feet of the stream surveyed (Reach 1), and a B4 channel type for 2,946 feet of the stream surveyed (Reach 2) Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter.

According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good

for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

B4 channel types are excellent for bank-placed boulders and log cover. They are also good for low-stage weirs, single and opposing wing-deflectors and channel constrictors. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

The water temperatures recorded on the survey days 7/30/2002 - 8/8/2002 ranged from 56°F to 67°F. Air temperatures ranged from 62°F to 88°F. The warmest water temperatures were recorded in Reach 1. Water temperatures above 65°F, if sustained, are above the threshold stress level for salmonids.

Flatwater habitat types comprised 10% of the total length of this survey, riffles 7%, and pools 6%. The pools are relatively deep, with only 22 of the 26 (85%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended 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-three of the 26 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Icaria Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twenty-four of the 25 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 56. The shelter rating in the flatwater habitats was 23. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Root Mass in Icaria Creek. Root Mass are the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 79%. Reach 1 had a canopy density of 79.2%, Reach 2 had a canopy density of 82.3%. 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 59% and 51%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

DISCUSSION FOR UNNAMED TRIBUTARY B

Icaria Creek, Trib B is a B6 channel type for 5,594 feet of the stream surveyed (Reach 1).

According to the DFG Salmonid Stream Habitat Restoration Manual, B4 channel types are excellent for bank-placed boulders and log cover. They are also good for low-stage weirs, single and opposing wing-deflectors and channel constrictors. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

The water temperatures recorded on the survey days 9/24/2002 to 9/24/2002, ranged from 55 to 64 degrees Fahrenheit. Air temperatures ranged from 52 to 86 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 15% of the total length of this survey, riffles 1%, and pools 8%. The pools are relatively shallow, with only 6 of the 16 (38%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended 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.

Seven of the 15 pool tail-outs measured had embeddedness ratings of 1 or 2. Six of the pool tail-outs had embeddedness ratings of 3 or 4. Two of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Icaria Creek, Trib B should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twelve of the 15 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 16. The shelter rating in the flatwater habitats was 33. A

pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Undercut Banks in Icaria Creek, Trib B. Undercut Banks are the dominant cover type in pools followed by root mass. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 8% and 34%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

GENERAL MANAGEMENT RECOMMENDATIONS

Icaria Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1. Access for migrating salmonids is a potential problem, therefore, fish passage should be monitored, and improved where possible.
2. Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.
3. In Icaria Creek, active and potential sediment sources related to the road system need to be mapped and treated according to their potential for sediment yield to the stream and its tributaries.
4. There are sections of the stream where it is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner,

and developed if possible.

5. Increase the canopy on Icaria Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The non-anadromous reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
6. Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.
7. Where feasible, design and engineer pool enhancement structures to increase the number of pools in Icaria Creek. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

COMMENTS AND LANDMARKS

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

- 0' Poor riparian vegetation, primarily arundo. Invasive plants in riparian zone include *vinca*, *arundo*, yellow star thistle, and wild grape. BRIDGE at 1589 ft. At 2800 ft is a low water crossing. Vineyards on both sides of channel. BRIDGE at 3600 ft, riparian zone starts. At 5074 ft small puddle with fish.
- 5275' LOG ACCUMULATION, abundant shelter, dimensions: 30'W x 6'H x 3'L.
- 5394' Tributary comes in on left bank (LB), no access on tributary.
- 5662' Estimated - no access
- 5674' 200ft estimated dry - no access (observed from Asti Road).
- 5874' Unit contains a pool, a dry section, then a glide - no access on this 250 ft stretch.
- 6024' BRIDGE Asti Road
- 6058' Abundant rough fish and sculpin rough fish (2-8 inches) observed 6058' to 8911'. Sculpin observed from 6058' to 9246'. EROSION on left bank leaving tree roots exposed.
- 6153' Bridge Hwy 101 and Dutcher Creek Rd.
- 6440' 20-25 unidentified fish (3-4 inches). Right bank (RB) chicken coop threatening to fall into the creek, exposed roots.
- 7031' EROSION on RB exposing roots.
- 7320' RB very eroded, old dump site and old car on bank.
- 7712' EROSION on the RB, large oak tree will eventually fall in, many exposed oak and bay roots.
- 7905' EROSION on RB throughout unit.

8045' END OF ACCESS
 8082' ACCESS
 8174' LOG ACCUMULATION, canopy is willow.
 8256' Under cut bank and old structure remnants creating shelter and good habitat.
 8348' DEBRIS ACCUMULATION causing erosion and other log jams.
 8401' EROSION and LOG ACCUMULATION
 8434' 100% canopy on deep parts
 8472' 2 old (1950's) cars, embedded and grown over.
 8764' LOG ACCUMULATION on LB causing erosion.
 8911' 1 or 2 sucker fish
 9035' A dozen roach. CULVERT on RB.
 9080' 40% of unit is covered with root mass shelter, utilized by roach.
 9134' EROSION begins on RB, 15ft high, erosion continues for about 100ft ending at height of 8 ft.
 9246' Cattle presence.
 9276' GULLY (small) on LB, gunnite on RB with chicken wire holding it.
 9385' CULVERT
 9546' House on LB close to creek.
 9618' Cattle presence. Wood and wire fence crossing creek.
 9795' Summer dam (after HU 076), dimensions: H 4.4 ft, L 14 ft, W(0) 6.2 ft, W(D) 22 ft, flashboards, downcutting at sill 3 ft, 2ft plunge, retaining 2 ft of gravel.
 9810' EROSION on LB begins - 13.5 ft high, many exposed roots. At about 235ft into unit the riparian vegetation becomes very thick.
 12508' BRIDGE, LOG ACCUMULATION. Dry tributary on LB.
 14819' Tributary on LB. Madrone forest
 15389' LOG ACCUMULATION, EROSION, tributary
 16087' Low water crossing. Tributary on LB. LOG ACCUMULATION at 645ft.
 17108' CULVERT on RB
 17343' LOG ACCUMULATION
 17393' 2 tributaries on LB
 17879' Instream CULVERT, ranch road crossing creek is discontinued due to washout above culvert.
 17899' Tributary on RB at 441 ft.
 18620' Tributary on RB, at tributary entrance there is significant EROSION. Tributary LB at 1085 ft. Evidence of wild pigs in creek bed.
 20305' Tributary at 64 ft on RB. Shotgun culvert, 15ft up tributary/gully LB at 180ft. Gully RB at 200ft. LOG ACCUMULATION
 20788' END OF SURVEY on Icaria - end of access, very near headwaters.

COMMENTS AND LANDMARKS FOR UNNAMED TRIBUTARY B

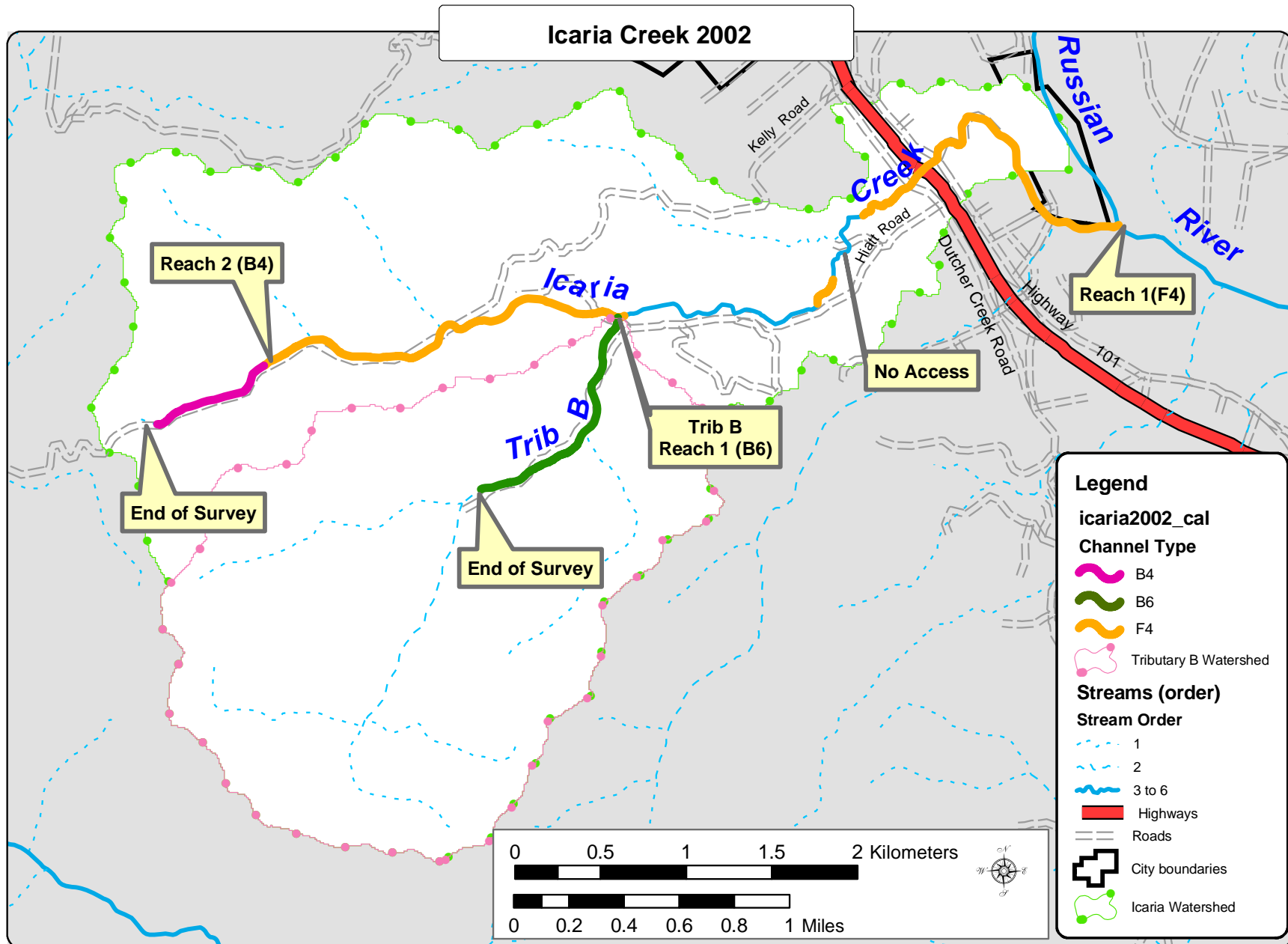
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the confluence with Icaria Creek.

0' Survey began at confluence with Icaria Creek.

- 28' Pool tail-out is bedrock clay, caused by BRIDGE.
- 49' Road crossing, fence in stream. Instream CULVERT (unit 003) Cartwright property, dimensions: 14'L x 14'W x 8'H, downcutting, 2.4' plunge, not retaining gravel.
- 264' Vineyard on LB. Riparian zone is narrow on LB.
- 284' Canopy mainly bay and alder with some coast live oak.
- 371' Channel flows through a bedrock outcrop. Two roach observed.
- 375' Fence instream. At 693' into unit the RB is a cut bank, 12' tall. At 743' into the unit there is a gully RB, active, dimensions: 8'D x 58'L x 12'W.
- 1414' Scotch broom RB, blackberry LB.
- 1433' Chicken coop and barn on RB. One tall concrete retaining wall 20' long.
- 1651' Instream CULVERT (unit 013), dimension: 12'L x 9.3'W x 5.7'H, not downcutting, retaining 1.2' gravel. Throughout there is very little canopy on the LB which is a vineyard with avenue along riparian.
- 1663' Barns on LB. This unit was surveyed from the bank because it became impassable due to blackberry. At 281 ft into the unit there is a 3' tall retaining wall. At 1001' into this unit there is a dry tributary RB. From 1663' to approximately 3196' is a concrete and wood retaining wall confining channel.
- 3126' Roach present.
- 3354' End of LB retaining wall.
- 3362' Dry RB ephemeral tributary.
- 3475' Pools have been anoxic with flies and fleas.
- 3495' RB clay, active EROSION 15'H x 100'L.
- 3627' LB dry, ephemeral tributary.
- 4018' Concrete retaining wall, RB. Water line crossing.
- 4191' Riprap on LB. This is the first flow seen.
- 4320' Instream CULVERT (unit 041), diameter 6', not downcutting, retaining 0.5' gravel, maintenance required.
- 4475' Two twelve inch bass observed.
- 4518' Two RB gullies from road.
- 4889' RB erosion, 11' high.
- 4919' RB apple orchard. Reservoir reached. 70ft spillway. END OF SURVEY. Dam dimensions: Height: 25% of slope, Length 70', Width(o) 14', Width (d) 25', not downcutting at sill.

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.



APPENDIX B: GRAPHS

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Icaria Creek

LLID:

1229865387721

Drainage:

Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T000R000S00

Latitude: 38:46:20.0N

Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
3	1	CULVERT	2.5	37	111	0.5	3.0	0.0							
33	1	DRY	27.5	482	15894	76.2	10.0								10
34	18	FLATWATER	28.3	61	2064.2	9.9	4.2	0.4	1.0	172	5849	53	705		23
26	26	POOL	21.7	51	1323	6.3	7.9	1.3	2.5	387	10059	550	14311	503	56
24	13	RIFFLE	20.0	61	1452.5	7.0	2.0	0.3	1.1	63	1510	14	130		8
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
120	59				20844.7					17417			15146		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Icaria Creek

LLID:

1229865387721

Drainage: Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T000R000S00

Latitude: 38:46:20.0N

Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
24	13	LGR	20.0	61	1453	7.0	2	0.3	2.5	63	1510	14	130		8	77
13	6	GLD	10.8	47	606	2.9	5	0.2	0.8	128	1660	12	52		20	85
18	9	RUN	15.0	71	1278	6.1	4	0.5	1.8	193	3482	44	353		25	84
3	3	SRN	2.5	60	180	0.9	4	0.5	0.95	197	590	173	173			88
3	3	TRP	2.5	61	183	0.9	4	1.3	2.8	257	771	375	1125	349	53	85
6	6	MCP	5.0	49	296	1.4	12	1.7	4	500	3000	867	5202	813	75	74
1	1	CCP	0.8	26	26	0.1	11	1.5	2	229	229	343	343	343	5	100
6	6	CRP	5.0	65	389	1.9	7	1.2	3.3	478	2865	640	3842	582	51	77
3	3	LSL	2.5	35	105	0.5	7	1.4	2.9	238	715	313	938	289	122	82
3	3	LSR	2.5	50	149	0.7	9	0.9	2.6	521	1563	668	2004	576	30	73
4	4	LSBk	3.3	44	175	0.8	5	0.9	2.1	229	915	214	857	178	18	85
33	1	DRY	27.5	482	15894	76.2	10			0	0				10	74
3	1	CUL	2.5	37	111	0.5	3	0.0		0	0					100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
120	59	20844.7	17299	15019

Table 3 - Summary of Pool Types

Stream Name: Icaria Creek

LLID:

1229865387721

Drainage: Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T000R000S00

Latitude: 38:46:20.0N

Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
10	10	MAIN	38	51	505	38	9.4	1.6	400	4000	627	6270	62
16	16	SCOUR	62	51	818	62	7.1	1.1	379	6058	425	6795	52
Total Units	Total Units Fully Measured				Total Length (ft.)				Total Area (sq.ft.)			Total Volume (cu.ft.)	
26	26				1323				10058			13065	

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

Stream Name: Icaria Creek

LLID:

1229865387721

Drainage: Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location:

Quad: CLOVERDALE

Legal Description:

T000R000S00

Latitude: 38:46:20.0N

Longitude: 122:59:11.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
3	TRP	12	0	0	0	0	3	100	0	0	0	0
6	MCP	23	0	0	0	0	3	50	2	33	1	17
1	CCP	4	0	0	0	0	1	100	0	0	0	0
6	CRP	23	0	0	1	17	4	67	1	17	0	0
3	LSL	12	0	0	1	33	2	67	0	0	0	0
3	LSR	12	0	0	1	33	2	67	0	0	0	0
4	LSBk	15	0	0	1	25	3	75	0	0	0	0

Total Units

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Foot Max Resid. Depth	Total 1 < 2 Foot % Occurrence	Total 2 < 3 Foot Max Resid. Depth	Total 2 < 3 Foot % Occurrence	Total 3 < 4 Foot Max Resid. Depth	Total 3 < 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
26	0	0	4	15	18	69	3	12	1	4

Mean Maximum Residual Pool Depth (ft.): 2.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Icaria Creek LLID: 1229865387721 Drainage: Russian River - Middle
 Survey Dates: 7/30/2002 to 8/8/2002 Dry Units: 33
 Confluence Location: Quad: CLOVERDALE Legal Description: T000R000S00 Latitude: 38:46:20.0N Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
24	2	LGR	50	50	0	0	0	0	0	0	0
24	2	TOTAL RIFFLE	50	50	0	0	0	0	0	0	0
13	1	GLD	30	30	0	0	30	0	0	0	0
18	2	RUN	20	80	0	0	0	0	0	0	0
3	0	SRN									
34	3	TOTAL FLAT	23	63	0	0	10	0	0	0	0
3	3	TRP	32	0	0	57	0	0	0	0	12
6	6	MCP	17	17	10	44	3	0	0	3	8
1	1	CCP	0	0	0	100	0	0	0	0	0
6	6	CRP	23	21	3	26	0	3	0	17	7
3	3	LSL	0	60	32	3	2	3	0	0	0
3	3	LSR	7	13	5	75	0	0	0	0	0
4	4	LSBk	13	0	0	11	0	1	0	6	69

Table 5 - Summary of Mean Percent Cover By Habitat Type (cont)

Stream Name: Icaria Creek LLID: 1229865387721 Drainage: Russian River - Middle
 Survey Dates: 7/30/2002 to 8/8/2002 Dry Units: 33
 Confluence Location: Quad: CLOVERDALE Legal Description: T000R000S00 Latitude: 38:46:20.0N Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges	
26	26	TOTAL POOL		16	17	7	37	1	1	0	6	15
3	0	CUL										
120	32	TOTAL		18	26	6	30	2	1	0	5	13

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Icaria Creek LLID: 1229865387721 Drainage: Russian River - Middle
 Survey Dates: 7/30/2002 to 8/8/2002 Dry Units: 33
 Confluence Location: Quad: CLOVERDALE Legal Description: T000R000S00 Latitude: 38:46:20.0N Longitude: 122:59:11.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
24	5	LGR	60	0	0	0	20	0	20
13	2	GLD	0	50	0	0	0	0	50
18	4	RUN	0	75	0	0	25	0	0
3	1	SRN	0	0	0	0	0	0	100
3	3	TRP	0	100	0	0	0	0	0
6	6	MCP	67	17	17	0	0	0	0
1	1	CCP	0	100	0	0	0	0	0
6	6	CRP	33	17	33	17	0	0	0
3	3	LSL	100	0	0	0	0	0	0
3	3	LSR	67	33	0	0	0	0	0
4	4	LSBk	50	50	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Icaria Creek
 LLID: 1229865387721
 Drainage: Russian River - Middle
 Survey Dates: 7/30/2002 to 8/8/2002
 Confluence Location: Quad: CLOVERDALE
 Legal Description: T000R000S00
 Latitude: 38:46:20.0N
 Longitude: 122:59:11.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
79	64	36	0	59	51

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Icaria Creek

LLID:

1229865387721 Drainage: Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T000R000S00

Latitude: 38:46:20.0N Longitude: 122:59:11.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	0	0	
Boulder	0	0	
Cobble / Gravel	0	0	
Sand / Silt / Clay	0	0	

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	2	4	
Brush	8	5	
Hardwood Trees	14	20	
Coniferous Trees	17	12	
No Vegetation	1	1	

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Icaria Creek

LLID:

1229865387721 Drainage: Russian River - Middle

Survey Dates: 7/30/2002 to 8/8/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T000R000S00 Latitude: 38:46:20.0N Longitude: 122:59:11.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	50	23	16
SMALL WOODY DEBRIS (%)	50	63	17
LARGE WOODY DEBRIS (%)	0	0	7
ROOT MASS (%)	0	0	37
TERRESTRIAL VEGETATION (%)	0	10	1
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	6
BEDROCK LEDGES (%)	0	0	15

APPENDIX B: TRIB B GRAPHS

Table 1b - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664

Drainage:

Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T11NR10WS30

Latitude: 38:45:59.0N

Longitude: 123:01:12.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
3	1	CULVERT	6.4	15	44	0.8	14.0	0.1	0.1						0
14	0	DRY	29.8	252	3534	63.2									
9	3	FLATWATER	19.1	91	821	14.7	5.0	0.4	1.0	286	2571	130	1174		33
1	0	NOSURVEY	2.1	675	675	12.1									
16	16	POOL	34.0	28	442	7.9	6.0	0.9	1.8	162	2595	222	3544	213	16
4	3	RIFFLE	8.5	20	78	1.4	2.0	0.1	0.1	14	56	1	2		0
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)			Total Volume (cu.ft.)		
47	23			5594						5222			4720		

Table 2b - Summary of Habitat Types and Measured Parameters

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664

Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location:

Quad: CLOVERDALE

Legal Description: T11NR10WS30

Latitude: 38:45:59.0N

Longitude: 123:01:12.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
4	3	LGR	8.5	20	78	1.4	2	0.1	0.1	14	56	1	2		0	94
4	1	GLD	8.5	39	156	2.8	6	0.6	1.5	450	1800	270	1080		0	92
3	1	RUN	6.4	59	178	3.2	7	0.5	0.9	133	399	67	200		100	75
2	1	SRN	4.3	244	487	8.7	2	0.2	0.6	274	548	55	110		0	100
1	1	TRP	2.1	34	34	0.6	2	0.8	1.8	68	68	54	54	54	0	84
14	14	MCP	29.8	28	387	6.9	5	0.8	3	149	2086	174	2431	167	17	91
1	1	PLP	2.1	21	21	0.4	21	2.3	3.7	441	441	1058	1058	1014	20	92
14	0	DRY	29.8	252	3534	63.2										88
3	1	CUL	6.4	15	44	0.8	14	0.1	0.1	0	0				0	100
1	0	NS	2.1	675	675	12.1										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
47	23	5594	5398	4935

Table 3b - Summary of Pool Types

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664

Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T11NR10WS30

Latitude: 38:45:59.0N

Longitude: 123:01:12.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
15	15	MAIN	94	28	421	95	5.0	0.8	144	2154	160	2394	16
1	1	SCOUR	6	21	21	5	21.0	2.3	441	441	1014	1014	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
16	16	442	2595	3408

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

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664 Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T11NR10WS30 Latitude: 38:45:59.0N Longitude: 123:01:12.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
1	TRP	6	0	0	1	100	0	0	0	0	0	0
14	MCP	88	3	21	6	43	4	29	1	7	0	0
1	PLP	6	0	0	0	0	0	0	1	100	0	0

Total Units

	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
16	3	19	7	44	4	25	2	12	0	0

Mean Maximum Residual Pool Depth (ft.): 1.8

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

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664 Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Dry Units: 14

Confluence Location: Quad: CLOVERDALE

Legal Description: T11NR10WS30

Latitude: 38:45:59.0N

Longitude: 123:01:12.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
4	2	LGR	0	0	0	0	0	0	0	0	0
4	2	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
4	1	GLD	0	0	0	0	0	0	0	0	0
3	1	RUN	0	20	0	0	80	0	0	0	0
2	1	SRN	0	0	0	0	0	0	0	0	0
9	3	TOTAL FLAT	0	7	0	0	27	0	0	0	0
1	1	TRP	0	0	0	0	0	0	0	0	0
14	14	MCP	26	0	0	12	18	0	0	0	1
1	1	PLP	0	10	0	90	0	0	0	0	0
16	16	TOTAL POOL	23	1	0	16	16	0	0	0	1
3	1	CUL	0	0	0	0	0	0	0	0	0
1	0	NS									
47	22	TOTAL	16	1	0	12	15	0	0	0	1

Table 6b - Summary of Dominant Substrates By Habitat Type

Stream Name: Icaria Creek, Trib B LLID: 1230200387664 Drainage: Russian River - Middle
 Survey Dates: 9/24/2002 to 9/24/2002 Dry Units: 14
 Confluence Location: Quad: CLOVERDALE Legal Description: T11NR10WS30 Latitude: 38:45:59.0N Longitude: 123:01:12.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
4	2	LGR	50	0	0	50	0	0	0
4	1	GLD	100	0	0	0	0	0	0
3	1	RUN	100	0	0	0	0	0	0
2	1	SRN	100	0	0	0	0	0	0
1	1	TRP	0	0	0	0	0	0	100
14	2	MCP	50	50	0	0	0	0	0
1	1	PLP	0	100	0	0	0	0	0

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

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664

Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T11NR10WS30

Latitude: 38:45:59.0N

Longitude: 123:01:12.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	28	72	0	8	34

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9b - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Icaria Creek, Trib B

LLID:

1230200387664 Drainage: Russian River - Middle

Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T11NR10WS30 Latitude: 38:45:59.0N Longitude: 123:01:12.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	3	1	15.4
Boulder	0	0	0.0
Cobble / Gravel	0	5	19.2
Sand / Silt / Clay	10	7	65.4

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	2	3	19.2
Brush	4	6	38.5
Hardwood Trees	1	2	11.5
Coniferous Trees	0	0	0.0
No Vegetation	6	2	30.8

Total Stream Cobble Embeddedness Values: 3

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

StreamName: Icaria Creek, Trib B

LLID:

1230200387664 Drainage: Russian River - Middle

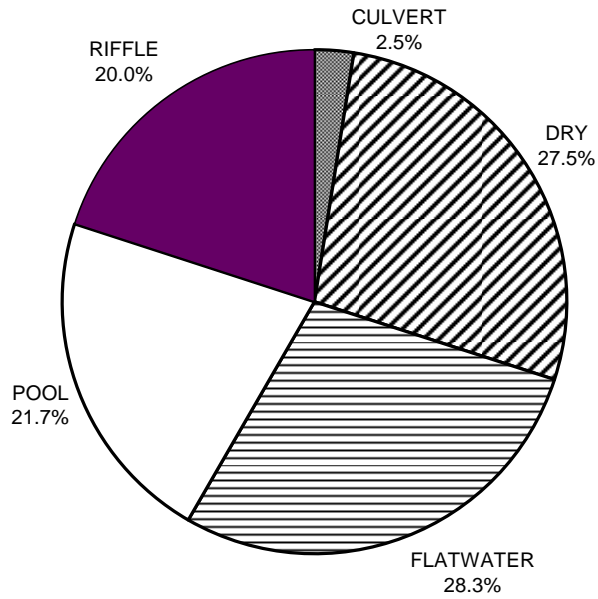
Survey Dates: 9/24/2002 to 9/24/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T11NR10WS30 Latitude: 38:45:59.0N Longitude: 123:01:12.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	23
SMALL WOODY DEBRIS (%)	0	7	1
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	16
TERRESTRIAL VEGETATION (%)	0	27	16
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	1

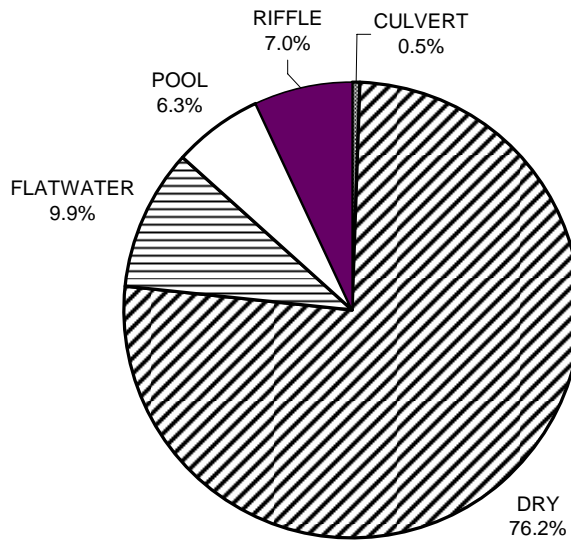
APPENDIX D: GRAPHS

**ICARIA CREEK 2002
HABITAT TYPES BY PERCENT OCCURRENCE**



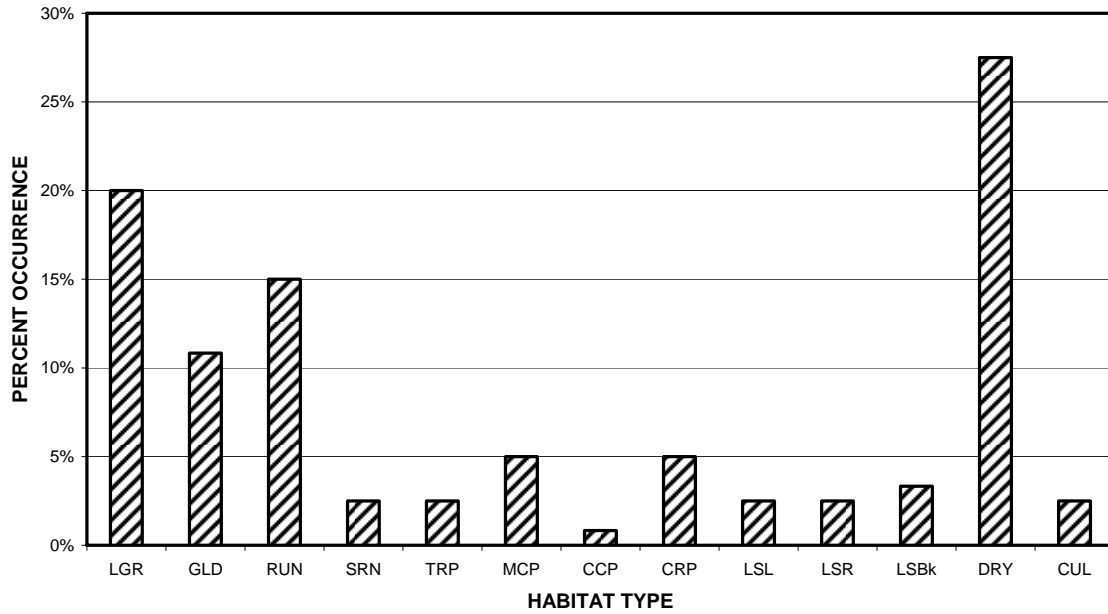
GRAPH 1: Level II habitat types by percent occurrence

**ICARIA CREEK 2002
HABITAT TYPES BY PERCENT TOTAL LENGTH**



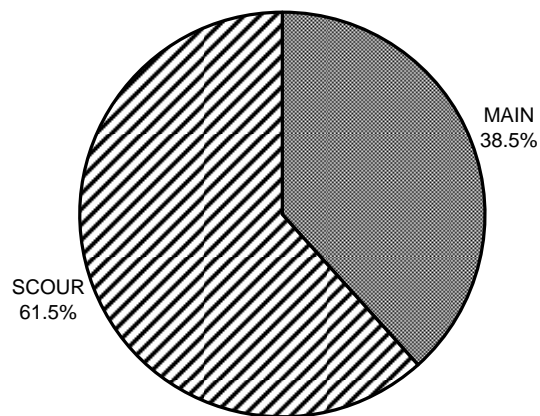
GRAPH 2: Level II habitat types by percent total length

**ICARIA CREEK 2002
HABITAT TYPES BY PERCENT OCCURRENCE**



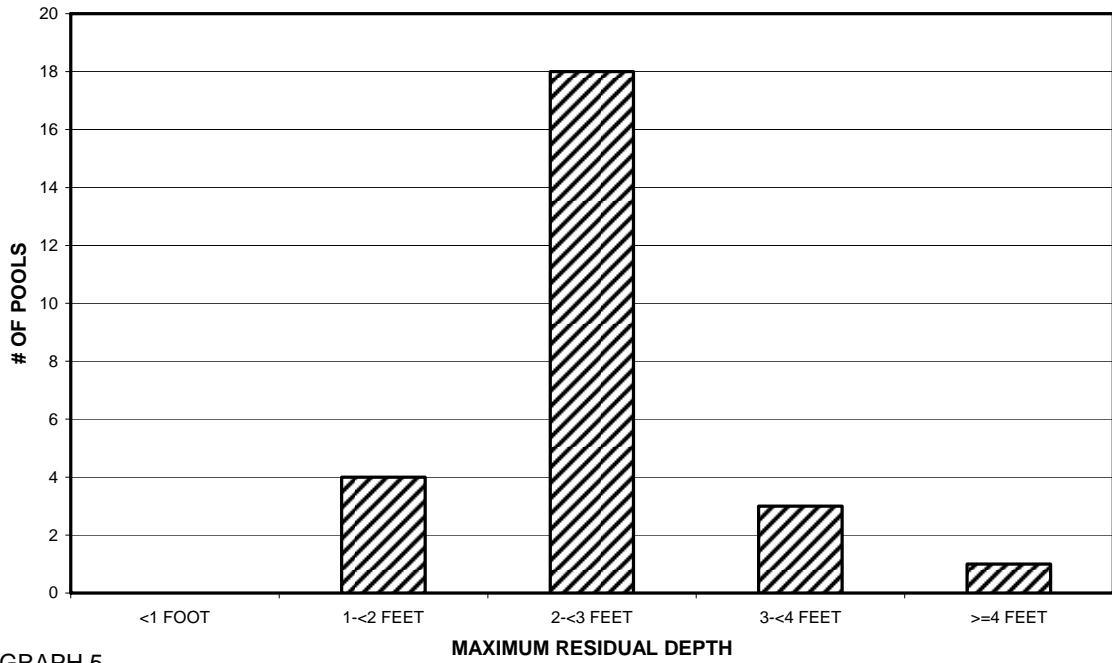
GRAPH 3: Level IV habitat types by percent occurrence

**ICARIA CREEK 2002
POOL TYPES BY PERCENT OCCURRENCE**



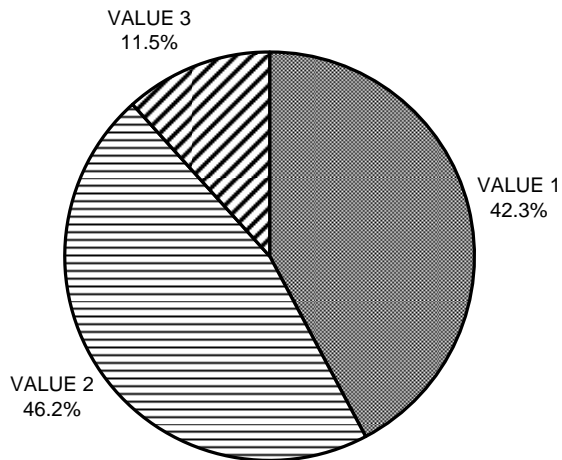
GRAPH 4: Level I pool types by percent occurrence

**ICARIA CREEK 2002
MAXIMUM DEPTH IN POOLS**



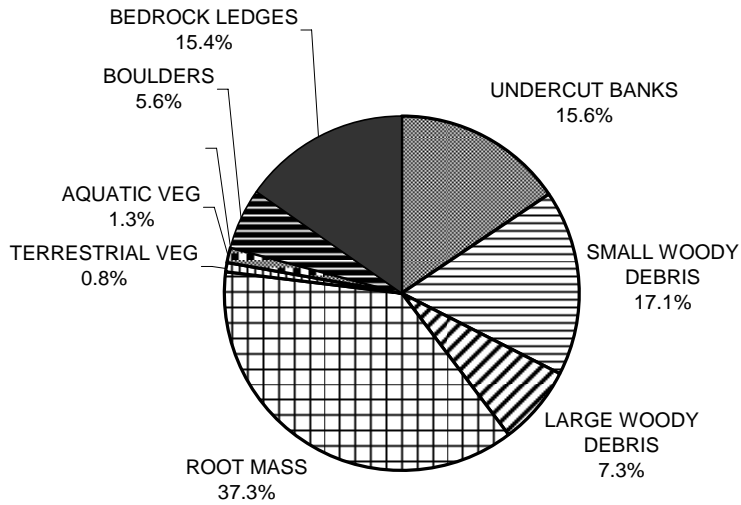
GRAPH 5

**ICARIA CREEK 2002
PERCENT EMBEDDEDNESS**



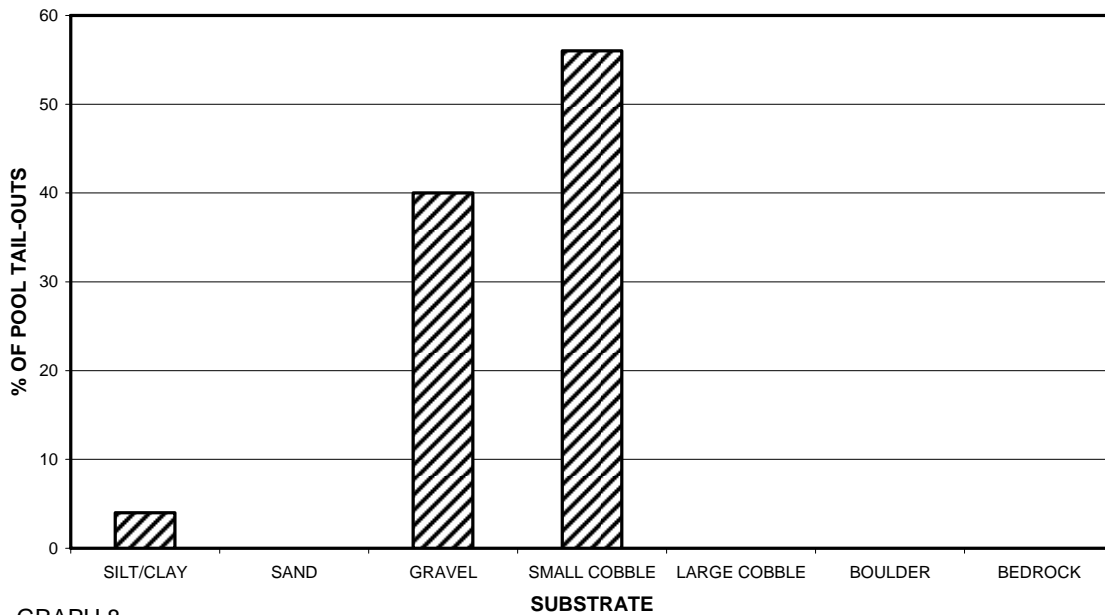
GRAPH 6

**ICARIA CREEK 2002
MEAN PERCENT COVER TYPES IN POOLS**



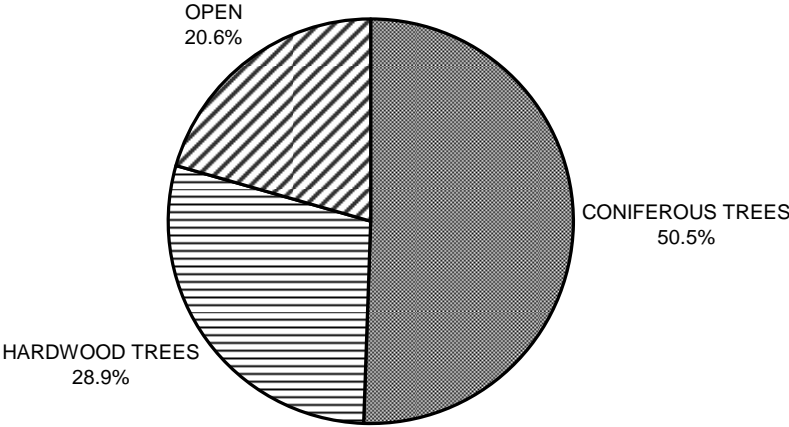
GRAPH 7

**ICARIA CREEK 2002
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



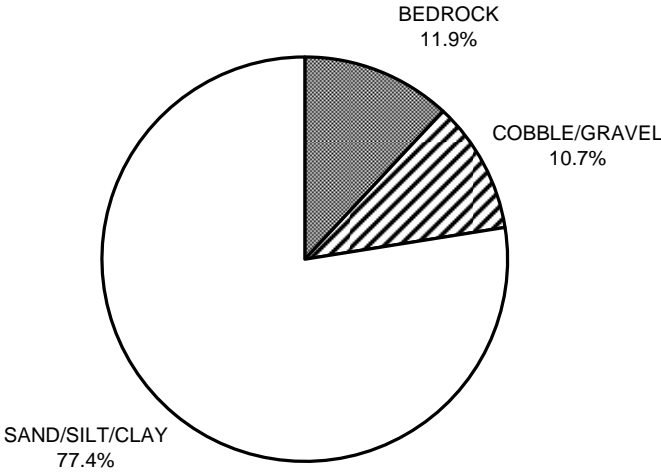
GRAPH 8

**ICARIA CREEK 2002
MEAN PERCENT CANOPY**



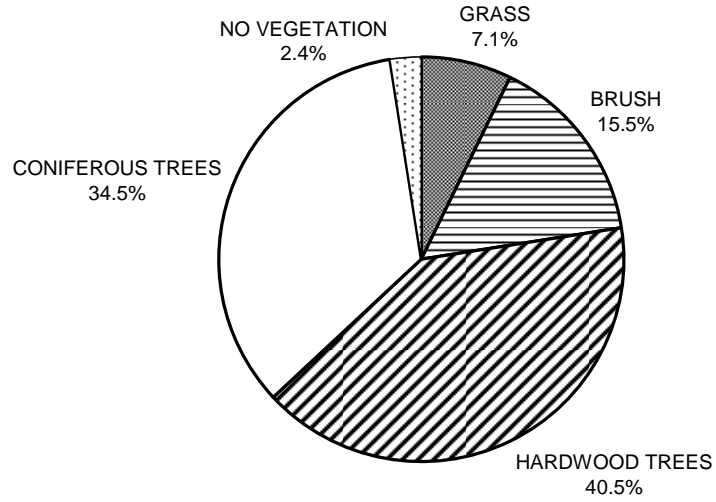
GRAPH 9

**ICARIA CREEK 2002
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

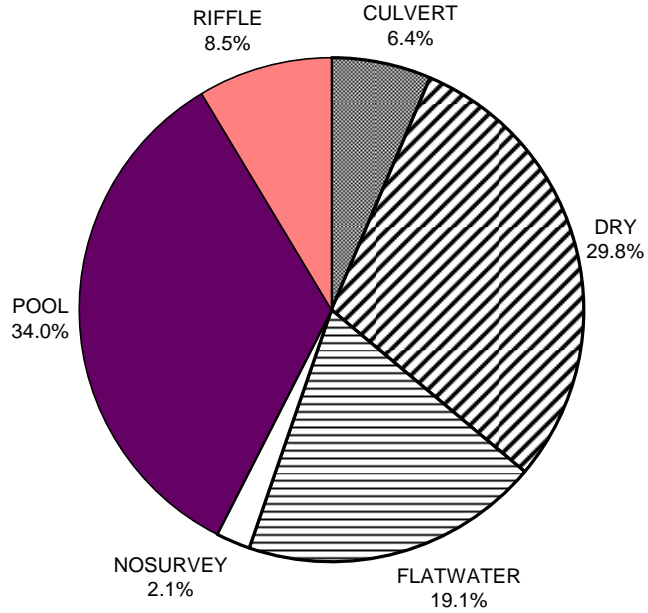
**ICARIA CREEK 2002
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

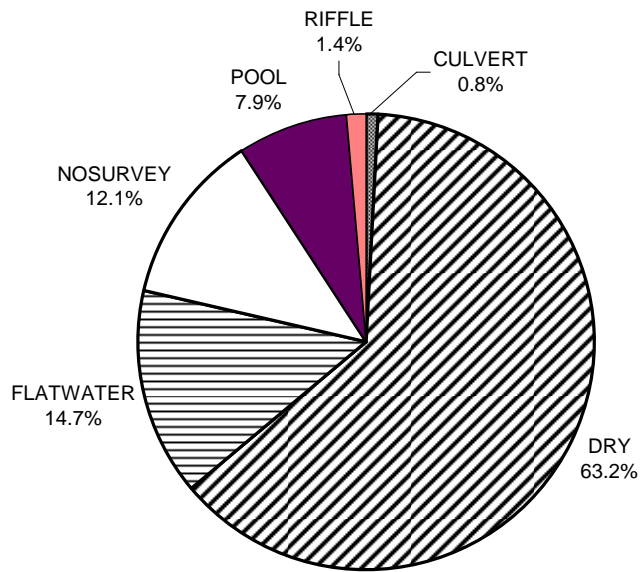
APPENDIX 2D: TRIB B GRAPHS

**ICARIA CREEK, TRIB B
HABITAT TYPES BY PERCENT OCCURRENCE**



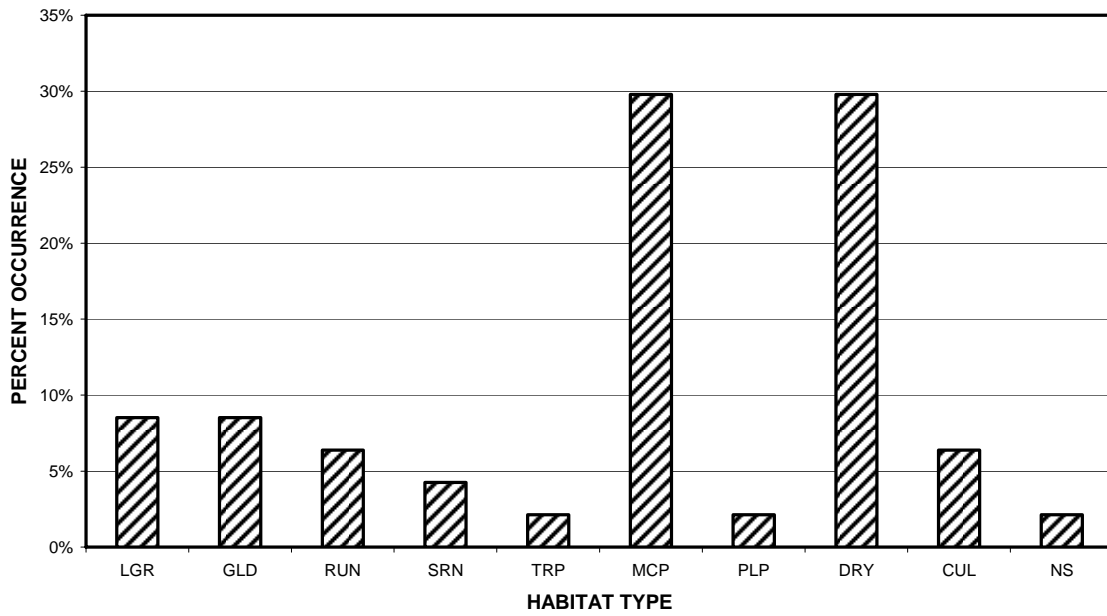
GRAPH 1b: Level II habitat types by percent occurrence

**ICARIA CREEK, TRIB B
HABITAT TYPES BY PERCENT TOTAL LENGTH**



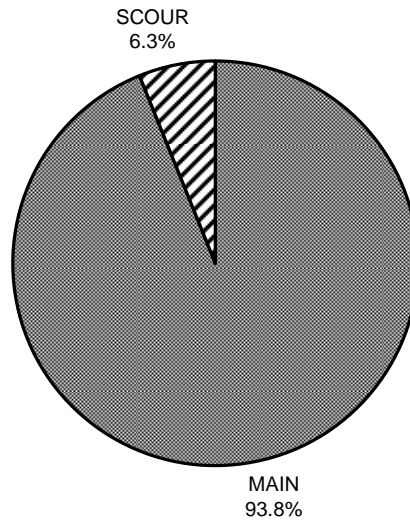
GRAPH 2b: Level II habitat types by percent total length

**ICARIA CREEK, TRIB B
HABITAT TYPES BY PERCENT OCCURRENCE**



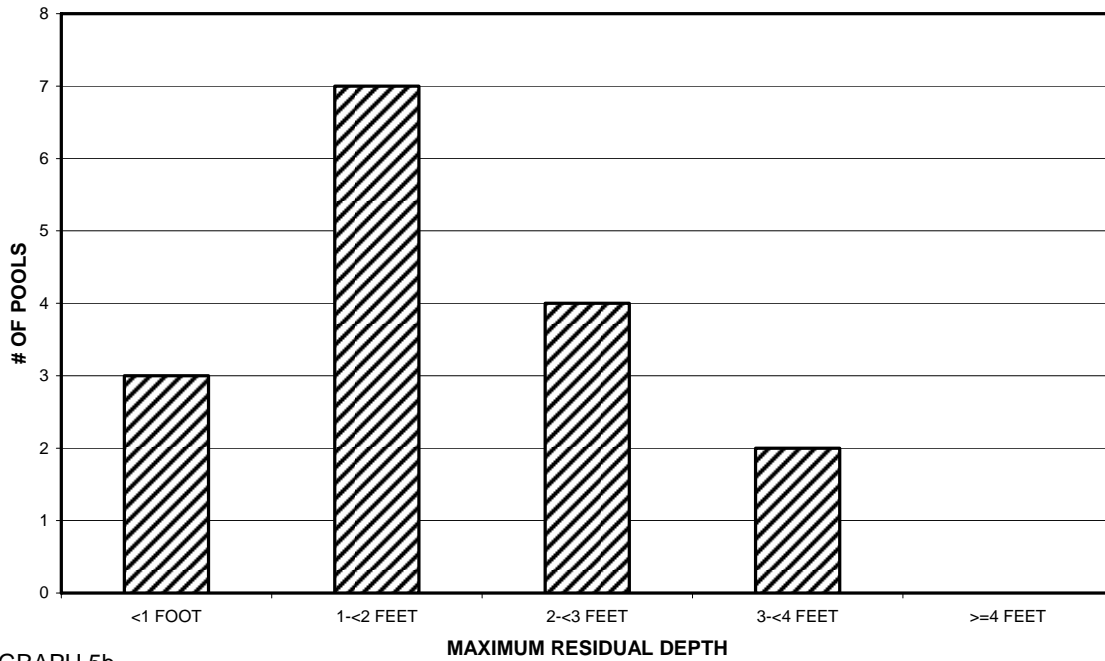
GRAPH 3b: Level IV habitat types by percent occurrence

**ICARIA CREEK, TRIB B
POOL TYPES BY PERCENT OCCURRENCE**



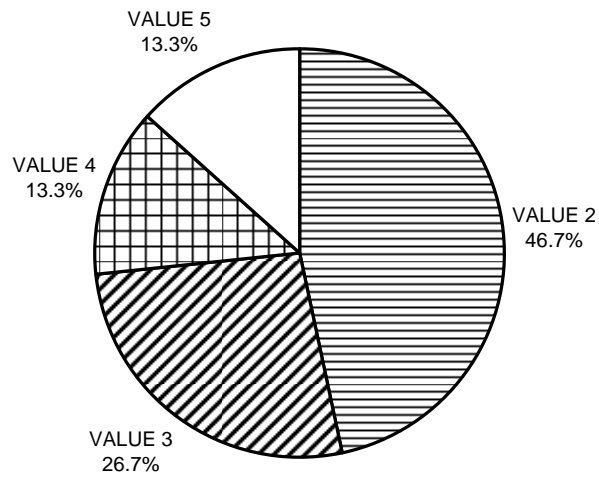
GRAPH 4b: Level I pool types by percent occurrence

**ICARIA CREEK, TRIB B
MAXIMUM DEPTH IN POOLS**



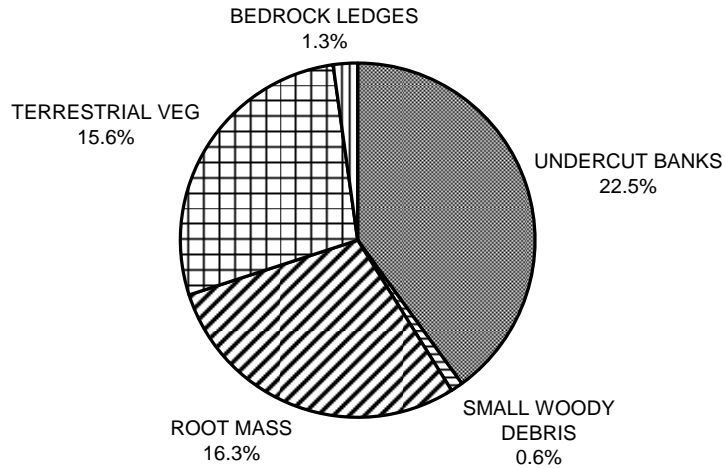
GRAPH 5b

**ICARIA CREEK, TRIB B
PERCENT EMBEDDEDNESS**



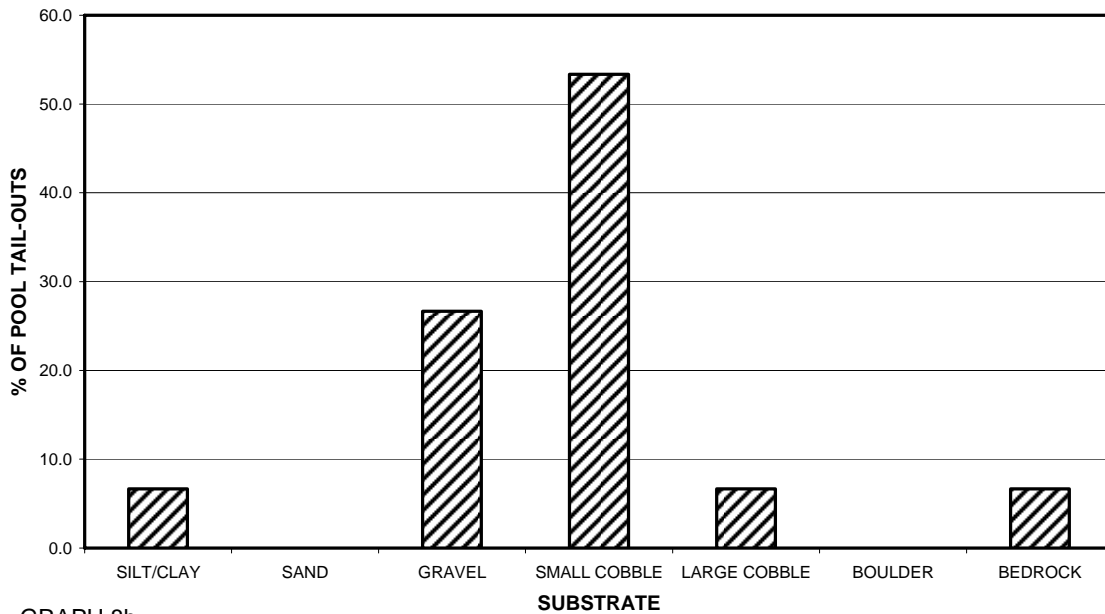
GRAPH 6b

**ICARIA CREEK, TRIB B
MEAN PERCENT COVER TYPES IN POOLS**



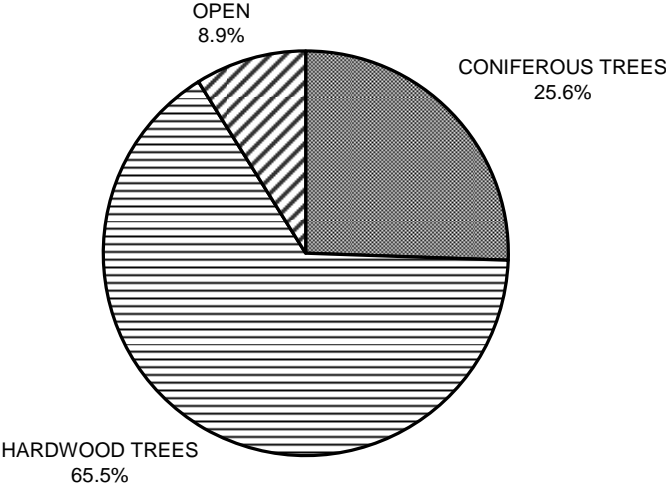
GRAPH 7b

**ICARIA CREEK, TRIB B
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



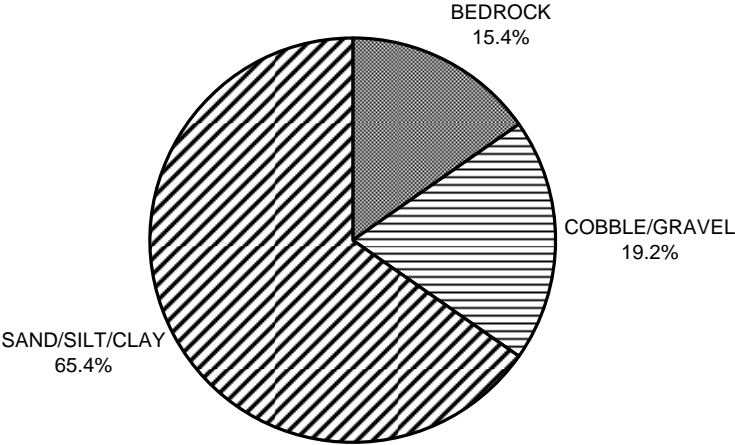
GRAPH 8b

**ICARIA CREEK, TRIB B
MEAN PERCENT CANOPY**



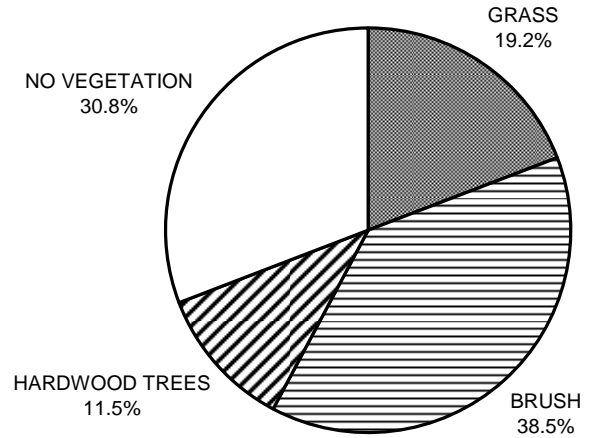
GRAPH 9b

**ICARIA CREEK, TRIB B
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10b

**ICARIA CREEK, TRIB B
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11b