

CALIFORNIA DEPARTMENT OF FISH AND GAME  
STREAM INVENTORY REPORT

Russian River

Assessment Completed 2003

Report Completed 2006

Report Revised April 14, 2006

## INTRODUCTION

A stream inventory was conducted during 7/22/2003 to 10/29/2003 on Russian River. The survey began at the confluence with the East Branch Russian River and extended upstream 14.9 miles. The West Branch Russian River 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 Russian River. 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 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

West Branch Russian River is a tributary to the mainstem Russian River, located in Sonoma County, California (Map 1). Russian River's legal description at the confluence with the East Branch Russian River is T17N R12W S17. Its location is 38°27'02.0" N latitude and 123°07'40.0" W longitude, LLID number 1231278384506. Vehicle access exists via Lake Mendocino Drive and Tomki Road.

West Branch Russian River is a sixth order stream and has approximately 15.9 miles of blue line stream according to the USGS Ukiah, Orrs Springs, Laughlin Range, Greenough Ridge, Foster Mountain and Redwood Valley 7.5 minute quadrangles. Russian River drains a watershed of approximately 101.13 square miles. Elevations range from about 614 feet at the mouth of the creek to 3340 feet in the headwater areas. Stream flow was measured near the Lake Mendocino Drive bridge with a Marsh-McBirney Model 2000 flowmeter at 1.85 cfs on July 22, 2003 and 0.86 cfs on October 6, 2003. Oak forest dominates the watershed. The watershed is primarily privately owned and is managed for recreation. Sensitive plants and animals listed from the CNPS Inventory and CDFG's Natural Diversity Database within Dooley Creek watershed are: *Navarretia leucocephala ssp. Bakeri* (Baker's navarretia), *Fritillaria roderickii* (Roderick's fritillary), and *Clemmys marmorata marmorata* (northwestern pond turtle)

Salmonid fish species historically present in the West Branch Russian River include Chinook salmon, coho salmon and steelhead trout.

## METHODS

The habitat inventory conducted in Russian River 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.

## 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 Russian River to record measurements and observations. There are eleven components to the inventory form.

### 1. Flow:

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

### 2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

### 3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Additionally, a recording thermograph was deployed in Russian River from June 6 to October 9, 2003 to record temperatures on a 24 hour basis during warm summer months.

### 4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Russian River 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 Russian River, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

#### 6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Russian River, 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 Russian River, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

#### 9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Russian River, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from

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

#### 10. Large Woody Debris Count:

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

#### 11. Average Bankfull Width:

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

### BIOLOGICAL INVENTORY

Biological sampling 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 Russian River. In addition, three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

### DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.16, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for the West Branch Russian River include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

## HABITAT INVENTORY RESULTS

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

The habitat inventory of 7/22/2003 to 10/29/2003, was conducted by S. Ganas (WSP), B. Leisse (WSP), J. Newell (CDFG), N. Wenner (WSP), and D. Acomb (CDFG). The total length of the stream surveyed was 78,783 feet with an additional 1,674 feet of side channel.

Stream flow was measured near the Lake Mendocino Drive bridge with a Marsh-McBirney Model 2000 flowmeter at 1.85 cfs on July 22, 2003 and 0.86 cfs on October 6, 2003. Russian River is a F4 channel type for 38,369 feet of the stream surveyed (Reach 1), a F3 channel type for 11,610 feet of the stream surveyed (Reach 2), a C3 channel type for 2,525 feet of the stream surveyed (Reach 3), a F3 channel type for 11,966 feet of the stream surveyed (Reach 4), a C3 channel type for 2,332 feet of the stream surveyed (Reach 5), a F3 channel type for 2,509 feet of the stream surveyed (Reach 6), a B3 channel type for 6,257 feet of the stream surveyed (Reach 7), a F2 channel type for 3,215 feet of the stream surveyed (Reach 8).

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

G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel dominant substrates.

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

C4 channels are meandering point-bar riffle/pool alluvial channels with broad well defined floodplain on low gradients and gravel dominant substrates.

A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 53 to 93 degrees Fahrenheit. Air temperatures ranged from 55 to 98 degrees Fahrenheit. Water temperatures taken with a recording thermograph deployed from June 6 to October 9, 2003, ranged from 55 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39.5% flatwater units, 23.2% riffle units, 26.4% pool units, 10.4% dry units, 0.4% no survey units, 0.1% culvert units, (Graph 1). Based on total **length** of Level II habitat types there were 46% flatwater units, 15.6% riffle units, 13.9% pool units, 20.7% dry units, 3.7% no survey units, 0.1% culvert units, (Graph 2).

Seven Hundred Twenty one Level IV habitat types were identified (Table 2). The habitat types by percent **occurrence** were 15% Glide units, 18% Run units, 22% Low Gradient Riffle units, 18% Mid-Channel Pool units, 1% Lateral Scour Pool - Boulder Formed units, 2% Lateral Scour Pool - Root Wad Enhanced units, 10% Dry units, 1% Lateral Scour Pool - Bedrock Formed units, 2% Corner Pool units, 7% Step Run units, 1% High Gradient Riffle units, 1% Trench Pool units, 1% Step Pool units (Graph 3).

Based on percent total **length**, 16% Glide units, 22% Run units, 15% Low Gradient Riffle units, 10% Mid-Channel Pool units, 1% Lateral Scour Pool - Root Wad Enhanced units, 21% Dry units, 1% Lateral Scour Pool - Bedrock Formed units, 4% Not Surveyed units, 1% Corner Pool units, 8% Step Run units, 1% Step Pool units, (Table 2).

A total of 190 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 74%, and comprised 80% 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. Sixty four of the 187 pools (34% ) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 187 pool tail-outs measured, 26 had a value of 1 (13.9%); 67 had a value of 2 (35.8%); 51 had a value of 3 (27.3%); 15 had a value of 4 (8%); 28 had a value of 5 (15%), (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, or 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 6 , flatwater habitat types had a mean shelter rating of 15 , and pool habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 22, Scour pools had a mean shelter rating of 36, Backwater pools had a mean shelter rating of 8, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in the West Branch Russian River. Graph 7 describes the pool cover in Russian River. Boulders

are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel observed in 56% of pool tail-outs, small cobble observed in 19% of pool tail-outs, and bedrock observed in 11% of pool tail-outs.

The mean percent canopy density for the surveyed length of Russian River was 57%. The mean percentages of hardwood and coniferous trees were 67% and 33%, respectively. Forty-three percent of the canopy was open. Graph 9 describes the mean percent canopy in Russian River.

For the stream reach surveyed, the mean percent right bank vegetated was 48%. The mean percent left bank vegetated was 48%. The dominant elements composing the structure of the stream banks consisted of 33% bedrock, 2% boulder, 45% cobble/gravel, 20% sand/silt/clay, (Graph 10). Brush was the dominant vegetation type observed in 16% of the units surveyed. Additionally, 56% of the units surveyed had hardwood trees as the dominant vegetation type, and 15% had coniferous trees as the dominant vegetation (Graph 11).

### BIOLOGICAL INVENTORY RESULTS

One site was electrofished for species composition and distribution in Russian River on August 9, 2002. Water temperatures taken during the electrofishing period (10:30 – 12:30) ranged from 58 to 60 degrees Fahrenheit. Air temperatures ranged from 72 to 84 degrees Fahrenheit. The sites were sampled by J. Smith, M. Shugars and K. Grossman (DFG).

In reach 1, seven habitat units were sampled, a distance of 291 feet. The reach sites yielded twenty-two young-of-the-year steelhead, four age 1+ and zero age 2+.

Two sites were electrofished for species composition and distribution in Russian River on August 4, 2003. Water temperatures taken during the electrofishing period (11:30- 15:00) ranged from 72 to 74 degrees Fahrenheit. Air temperatures ranged from 72 to 76 degrees Fahrenheit. The sites were sampled by J. Smith and M. Shugars (DFG).

In reach 1, two runs were sampled between habitat units 111 and 114, a distance of 291 feet. The reach sites yielded zero young-of-the-year steelhead, zero age 1+ and zero age 2+.

Also in reach 1, eleven habitat units were sampled between habitat units 187 and 196, a distance of 987 feet. The reach sites yielded zero young-of-the-year steelhead, zero age 1+ and zero age 2+.

One site was electrofished for species composition and distribution in Russian River on August 7, 2003. Water temperatures taken during the electrofishing period (15:19-16:22) ranged from 65 to 71 degrees Fahrenheit. Air temperatures ranged from 72 to 74 degrees Fahrenheit. The sites were sampled by J. Smith and D. Acomb (DFG).

In reach 7, twelve habitat units were sampled between habitat units 603 and 604, a distance of 351 feet. The reach sites yielded twenty-nine young-of-the-year steelhead, two age 1+ and one age 2+.

One site was electrofished for species composition and distribution in Russian River on August 11, 2003. Water temperatures taken during the electrofishing period (13:30- 15:00) ranged from 69 to 76 degrees Fahrenheit. Air temperatures ranged from 75 to 85 degrees Fahrenheit. The sites were sampled by J. Smith and M. Shugars (DFG).

In reach 3, thirteen habitat units were sampled between habitat units 420 and 430, a distance of 2120 feet. The reach sites yielded six young-of-the-year steelhead, seven age 1+ and zero age 2+.

The following chart displays the information yielded from these sites:

2002 RUSSIAN RIVER e-fish observations

Date	Site #	Hab. Type	Coho		Steelhead		
			YOY	1+	YOY	1+	2+
Reach 1 F4 Channel Type							
08/09/2002	1	4.2	0	0	6	0	0
08/09/2002	1	3.3	0	0	6	1	0
08/09/2002	1	3.3	0	0	2	0	0
08/09/2002	1	4.2	0	0	6	1	0
08/09/2002	1	3.2	0	0	1	1	0
08/09/2002	1	3.2	0	0	1	1	0

2003 RUSSIAN RIVER e-fish observations

Date	Site #	Hab. Type	Coho		Steelhead		
			YOY	1+	YOY	1+	2+
Reach 1 F4 Channel Type							
08/04/2003	1	3.3	0	0	0	0	0
08/04/2003	2	3.3	0	0	0	0	0
Reach 3 C3 Channel Type							
08/11/2003	3	4.2	0	0	5	0	0

2003 RUSSIAN RIVER e-fish observations

Date	Site #	Hab. Type	Coho		Steelhead		
			YOY	1+	YOY	1+	2+
08/11/2003	3	4.2	0	0	1	0	0
Reach 7 B3 Channel Type							
08/07/2003	4	3.3	0	0	2	0	0
08/07/2003	4	3.3	0	0	2	1	0
08/07/2003	4	1.1	0	0	1	0	0
08/07/2003	4	3.4	0	0	7	0	0
08/07/2003	4	4.2	0	0	2	1	0
08/07/2003	4	3.3	0	0	6	0	1
08/07/2003	4	1.1	0	0	1	0	0
08/07/2003	4	3.3	0	0	3	0	0
08/07/2003	4	3.4	0	0	3	0	0
08/07/2003	4	3.2	0	0	3	0	0

DISCUSSION

West Branch Russian River is a F4 channel type for 38,369 feet (Reach 1), a F3 channel type for 11,610 feet (Reach 2), a C3 channel type for 2,525 feet (Reach 3), a F3 channel type for 11,966 feet (Reach 4), a C3 channel type for 2,332 feet (Reach 5), a F3 channel type for 2,509 feet (Reach 6), a B3 channel type for 6,257 feet (Reach 7), a F2 channel type for 3,215 feet (Reach 8).

According to the DFG Salmonid Stream Habitat Restoration Manual, B3 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. 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.

C3 channel types are excellent for bank-placed boulders and good for low-stage weirs, boulder clusters, single and opposing wing deflectors and log cover. They are fair for medium-stage weirs.

F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover. 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. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 7/22/2003 to 10/29/2003, ranged from 53 to 93 degrees Fahrenheit. Air temperatures ranged from 55 to 98 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 46% of the total length of this survey, riffles 16%, and pools 14%. The pools are relatively shallow, with only 64 of the 187 (32% ) pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth of at least three feet, 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.

Ninety-three of the 187 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixty-six of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-eight 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 the West Branch Russian River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One hundred forty of the 187 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 26. The shelter rating in the flatwater habitats was 15. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in the West Branch Russian River. Boulders are the dominant cover type in pools followed by bedrock ledges . 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 57%. Reach 1 had a canopy density of

47%, Reach 2 had a canopy density of 42%, Reach 3 had a canopy density of 11%, Reach 4 had a canopy density of 48%, Reach 5 had a canopy density of 42%, Reach 6 had a canopy density of 79%, Reach 7 had a canopy density of 83%, and Reach 8 had a canopy density of 92%. 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 48% and 48%, 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 RECOMMENDATIONS**

Russian River 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.

## **RECOMMENDATIONS**

- 1) Increase the canopy on Russian River by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
- 2) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazer and developed if possible.
- 3) The West Branch Russian River would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.
- 4) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.
- 6) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

- 7) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.
- 8) The limited water temperature data available suggest that maximum temperatures are above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

RUSSIAN RIVER, WEST BRANCH SURVEY COMMENTS

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

HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
1	181	BFW, GPS 002
9	805	Water pump on RB
13	1385	2 CCC weirs, separate pools; Erosion LB 100x25x50
15	1529	CCC boulder weir causing scour
16	1757	Stream flow measurement, GPS 001
19	2036	10 cars used to stabilize LB; GPS 004
22	2664	Lake Mendocino Dr. Bridge (see form), GPS 005
25	3507	LB small side pool leads to unidentified tank
26	3599	BFW; Channel Type F4, GPS 006
29	3875	GPS 007
34	4682	Large hose enters stream from LB
35	4758	100' past first hose, another hose pump on LB; 3 small dead fish sighted
39	5311	BFW; GPS 008
40	5537	GPS 009
41	5783	RB Trib, d/s temp 72°F, trib 72°F, u/s trib 86°F, York Creek?
47	6462	Erosion (see form)
49	6596	GPS 010
55.01	7790	Unit goes dry @ 192', wet again @ 300', so split into separate units in computer (combined together on data sheet)
55.02	7898	Unit goes dry @ 192', wet again @ 300', so split into separate units in computer (combined together on data sheet)
55.03	7951	Unit goes dry @ 192', wet again @ 300', so split into separate units in computer (combined together on data sheet)
58	8236	GPS 011
59	8538	LB corrugated metal shed
67	9842	GPS 012
73	10841	Weir made of small cobble crosses river, creates pool tail out
75	11739	Small trib RB 444' into unit; BFW
77	12116	GPS 013
87	13376	GPS 014

92	14469	Erosion LB cliff 50' long, 40' high, 10' deep
93	14636	Dry trib LB
97	15646	Metal riprap on RB, look like jacks; GPS 015
98.01	15976	Unit goes dry @125', split into 2 separate units in database (combined together on data sheet)
98.02	16051	Unit goes dry @125', split into 2 separate units in database (combined together on data sheet)
101	16894	Large pump RB
106	17468	GPS 016
116	18364	Calpella bridge; GPS 017
117	18457	Large boulders under the bridge create this pool
126	20734	BFW; GPS 018
128	20996	8 LWD on RB tied together w/ cable, not instream
129	21114	Boulder riprap RB
132	21643	Erosion LB landslide w/ road above, L 96', H 70', D 5'
136	22294	Hwy 20 Bridge; GPS 019
137	22390	Under bridge
142	22734	Small - Large cobble weir crosses stream
146	23331	GPS 020
153	24351	Trib- Forsythe Creek LB
156	24767	GPS 023
162	25597	Bridge crosses @ 42' into unit, GPS 021
163	25638	Live tree perched on LB >12" diameter
166	25894	GPS 022
169	26418	Erosion RB (see form)
170	26510	LB trib- Salt Hollow Creek, 92' into unit
176	27039	GPS 026
177	27149	Erosion RB (see form)
179	27276	Scouring small pool, but still a riffle.
186	27838	GPS
191	28215	Erosion RB failure (see form)
196	28825	GPS 029
197	28878	Erosion RB failure
206	29880	GPS 030
216	30804	Foot bridge crosses river creating tailout; GPS 031
220	31297	2 cars: 1 instream, 1 LB
223	31465	Old car is creating shelter in the pool (counted as LWD in shelter rating)
224	31526	8 old cars used to stabilize LB
226	31804	Redwood Valley Bridge; GPS 032
229	32021	RB unknown trib at 89' into unit
236	32673	GPS 033; Confluence w/ unknown trib.
237	32794	Unknown trib RB 20' into unit, trib temp 61°F, u/s 65°F, WP 033; BFW
239	32977	Railroad bridge crosses river, WP 034
244	33515	Pump on
246	33655	GPS 035
253	34544	LB erosion 100' L, 50' H, 6' D; Sonoma County Water Agency

		restoration project u/s, major changes scheduled for bank stabilization and fish passage.
254	34544	Mumford dam renovation
255	34624	Continue survey @ u/s end of renovation, WP #138 (F4)
261	35129	RB erosion (see form), WP #139
263	35374	WP #140 (F4) 39*16' 33.1", 123*12' 26.0"; LB water tube
266	35539	RB boulder riprap, Alder plantings 20' tall
273	36099	WP #142 (F4) 39*16' 38.3", 123*12' 23.7"
274	36144	Enhanced by SWD, root wad scour
276	36204	LB erosion (see form)
278	36329	Debris accumulation (see form)
279	36384	LB spring 58°F
281	36569	Increase in amount of cobble substrate
283	36784	WP #145 (F4) 39*16' 44.1", 123*12' 23.7"
287	37044	Erosive RB
288	37094	RB large water intake pipe 0.7' wide
290	37454	RB wire fence stabilization 10' H, 100' L
292	37584	WP #137 (F4) 39*16' 49.9", 123*12' 30.2"; LB erosion (see form)
296	37709	Willow/alder overgrown in channel
302	38439	CT change to F3 WP #199; WP #148 (F4) 39*16' 56.1", 123*12' 37.3"
303	38629	Evidence of horses in stream channel; LB DFG access pt.
305	38704	LB erosive, stream migration 50' (see form)
309	38869	RB dirt road access point
312	39019	WP #150 (F4) 39*17' 00.6", 123*12' 34.8"
314	39289	LB 1.5" water pump
317	39589	First occurrence of bay tree
319	39724	LB old cars- stabilization
320	39734	LB old cars- stabilization
322	39844	LB fallen willow 12" diameter, cut to reduce accumulation, presently loose logs 2' long; 10/14/03: WP #200 (F4) 39*17' 86", 123*12' 33.8"
325	39929	Tire tracks in channel
327	39974	Erosive RB (see form)
329	40219	LB small trib @ u/s end, trib 56*, main channel 58*, confluence 58*, WP #202
331	40324	LB erosion (see form), WP #203
332	40379	WP #204 (F4) 39*17' 14.1", 123*12' 34.5"
336	40624	LB old burn; Dead trees
339	40759	CT X-Section, Reach 2: F3, WP#205
340	40834	RB 1 acre of excavation, upper bank, see notebook, WP#206
341	40919	Calibration pt. 10/14/03 WP#207 (F4), 39*17' 19.2", 123* 12' 32.6"
341.01	40949	Side-pool shaped by landowner for water pump 5"
343	41294	Note serious lack of pools for several thousand feet; RB <i>Arundo</i> WP#208
345	41699	<i>Arundo</i> RB WP#209; LB springs

347	41814	LB springs
348	41864	LB erosion (see form) WP#210 (F4)
351	42129	WP#211 (F4) 39*17' 30.9", 123*12' 31.8"
352	42174	Severe erosion LB (see form) WP#212 (F4); Note: extreme amount of roach or pike minnow throughout entire reach
355	42454	RB erosion (see form) WP#213, old concrete block in creek
361	43259	WP#214 (F4) 39*17' 41.7", 123*12' 34.3"
363	43429	Semi-bare erosive LB (see form) WP#215 (F4)
367	43829	Tree frog
370	43949	Upper RB wood pallets for stabilization; LB bare (erosion form) WP#216
371	44184	WP#217 (F4) 39*17' 48.9", 123*12' 30.1"
375	44639	Yellow-legged frog
376	44699	RB erosion (see form) WP#218 (F4)
378	45089	LB 12" well w/ 4" pump
379	45404	RB erosion (see form) WP#219 (F4)
381	45449	WP#152 (F4) 39*17' 59.3", 123*12' 24.3"
382	45519	LB severe erosion (see form) WP#153
384	45729	5" pipe across creek 15' above bankfull, LB small dry trib
385	45794	RB erosion (see form) WP#154
388	46034	RB dry trib WP#157 (F4)
390	46129	WP#155 (F4) 39*18' 03.0", 123*12' 30.9"
393	46344	Both banks: hardened silt
395	46554	Yellow-legged frog
396	46584	End access WP#156 (F4) 39*18' 06.1", 123*12' 34.7"
398	49784	Begin access WP#158 39*18' 25.4", 123*12' 49.9",
399	49824	Pool scoured down to bare earth- little mobile substrate
400	49979	WP#159 (F4) 39*18' 28.8", 123*12' 52.5"
401	50029	CT change to C, WP#169 (F4), Note: stream path has changed- streams layer is out of date
410	50554	WP#160 (F4) 39*18' 33.6", 123*12' 56.2"
411	50599	Note increasing water temp. w/ decreasing canopy. However, large-scale willow regeneration under way.
413	50679	RB boulder weirs, Photo #5
414	50709	2" PVC pipe across creek
417	52504	RB boulder/willow; Bridge (see form) East Rd. WP#161
418	52532	WP#162: End of dry stretch & CT change to F3; concrete footing from old dam or bridge
419	55372	<i>Arundo</i> RB WP#163; some true bedrock in channel
420	55435	D/S Bridge(see form) WP#164; 2" water pump LB; DFG Hobotemp in this pool; Rocky Creek confluence RB WP#165; Calibration WP#166 (F4) 39*19' 05.9", 123*13' 21.3"
426	56970	Increase in evergreens: bay, madrone, evergreen oaks
430	57555	WP#191 (F4) 39*19' 23.8", 123*13' 20.9"
431	59855	RB Mariposa Creek confluence WP#192; LB Fisher Creek confluence WP#193; R side channel @ 150'-900'
431.01	60605	Very large side channel, side & main are similar size, BFW ~25'
433	61025	LB erosion (see form) WP#194 Photo#6, WP#195 Photo#7

434	61050	End Access WP#196 (F4) 39*19' 55.2", 123*13' 20.4"
436	61240	Begin Access WP#222 @ bridge (see form) WP#223
445	61610	WP#224 (F4) 39*20' 19.4", 123*13' 29.4"
453	62100	Bridge (see form) WP#225 (F4)
455	62350	WP#226 (F4) 39*20' 25.5", 123*13' 31.4"
456	62715	Wet road crossing WP#227 (F4)
457	62770	Fence across creek WP#228 (F4) not retaining debris
465	63155	WP#229 (F4) 39*20' 33.4", 123*13' 30.9"
466	63190	Fence across creek WP#230, not retaining debris
468	63495	LB erosion (see form) WP#231
469	63515	RB erosion (see form)
470	63810	RB dry trib WP#233; Bridge (see form) WP#232
470.01	63835	Water 54*
471	63845	LB dry trib WP#235
473	63925	LB erosion (see form) WP#236; Fence across creek WP#237; Calibration WP#238 39*20' 38.6", 123*13' 32.8"
477	64190	1.7% gradient
478	64210	Yellow-legged frog
482	64445	LB erosion (see form) WP#239 (F4) Photo#10
483	64470	Fence across creek WP#240; Calibration WP#241 (F4) 39*20' 43.8", 123*13' 34.4"
484	64570	CT change to C3 WP#243; CT X-Section WP#242
485	64720	Intermittent
493	65175	WP#244 (F4) 39*20' 48.9", 123*13' 37.8"
495	65350	RB 1 dozen sheep 100' from creek, separated by fence
496	65560	Livestock trails indicate grazing in creek; large amount of algae
498	65760	Bare banks due to grazing
500	65795	Wood pallet fence across creek
501	65820	Sheep in creek, Photo #11; SH 2+
502	65870	WP#245 (F4) 39*20' 54.8", 123*13' 38.6"
509	66300	LB <i>Arundo</i> WP#248 (F4)
512	66540	WP#247 (F4) 39*21' 00.9", 123*13' 41.3"
514	66692	Small recreational dam- cobble and wood boards
516	66802	LB <i>Arundo</i> ; Dry LB trib?; Bedrock outcrop @ corner
517	66889	CT change to B3 @ corner @ cinderblock house, WP#249
521	67055	SH?; Old car in creek- retaining gravel
522	67081	WP#250- 39*21' 03.2"N, 123*13' 46.0"W
523	67174	SH 0+, Photo#12
527	67383	CT X-Section, Reach 6 (F1), WP#251, Photo#13
530	67484	Old car in channel
531	67549	Station wagon in creek channel
532	67833	Trash in creek, Photo#14; No WP- not enough satellites
534	68020	Trash dumped in creek; Lots of sedge present
536	68337	WP#252
537	68413	LB dry trib
539	68460	Good site for possible barrier removal of wood plugging bedrock notch opening
542	68597	No WP coverage

547	68851	Could pull boulder out of bedrock notch for better fish passage
552	69084	WP#253- 39*21' 18.8"N, 123*13' 50.5"W
553	69113	CT X-Section Reach 6 (F1), No WP (close to last WP)
561	69302	Small cobble recreational dam
562	69311	Crayfish w/o white band on claws present; WP#254- 39*21' 20.6"N, 123*13' 51.5"W, No flag hung
563	69379	CT change to B3 (WP#254)
569	70010	Begin Redwoods on banks
572	70177	WP#255- 39*21' 28.4"N, 123*13' 53.6"W
573	70399	Could use pool enhancement structures throughout this area; CT X-Section, Reach 7 (B3)
577	70618	SH? 0+; Houses near creek RB
580	70705	Wet spring RB
582	70752	WP#256- 39*21' 33.1"N, 123*13' 53.2"W
586	70935	LB old appliance riprap
588	70999	RB pond upslope
589	71019	3" PVC pipe crossing creek
590	71044	Wet RB trib- appears to be significant source of water, trib 57*, d/s 57*, u/s 51*
591	71101	End Redwoods on banks (see notebook)
592	71138	WP#257- 39*21' 36.7"N, 123*13' 55.1"W
593	71180	Bridge (see form) WP#257
594	71319	<i>Arundo</i> RB- just u/s of bridge; Macroinvertebrate sample 20' into unit
595	71385	Large residential bridge, No form, No WP, (not influencing channel)
597	71483	End macroinvert. Site
600	71821	Vegetation change from redwoods consists of willow, blackberry, scotchbroom (see notebook)
601	72195	Some oaks on banks, sedge still in creek
602	72245	Open bottom culvert and bridge (see bridge form); WP#258- 39*21' 46.7"N, 123*13' 56.2"W
603	72486	SH YOY
604	73543	Took canopy readings throughout unit); LB dry trib ~100' into unit; LB boulder riprap ~200' into unit; Veg. change (in 2nd 1/2 of unit) to bay, Oregon ash, Live oak, scotchbroom
612	73983	WP#259- 39*22' 02.5"N, 123*14' 03.1"W
613	74003	Road assessment?
616	74172	SH YOY; Bridge (see form)
619	74369	RB wet trib - 55*, d/s 57*, u/s 57*
622	74420	WP#260 39*22' 05.8", 123*14' 04.3"
623	74441	Photo #15 & 16; Veg.= toyon, blue oak, buckeye, manzanita, fir trees, ash, big leaf maple, alder, black oak, scotch broom, sedges, blackberry- Himalayan & native
627	74574	SH YOY
631	74762	Fish present
632	74827	WP#261 39*22' 10.0"N, 123*14' 05.8"W
633	74835	Natural boulder weir!; Newt- orange underbelly up to eyes

635	74862	SH YOY
638	75016	RB old road
639	75028	RB old road
640	75067	RB old road
641	75078	RB old road
642	75199	RB old road; LB gully- probably caused by road upper bank (see form); WP#262 39*22' 12.9"N, 123*14' 05.9"W
651	75503	Dead SH YOY, & Live
652	75568	SH YOY present; No WP coverage
653	75659	Increase gradient, more boulder; CT change to F2 Reach 7-8, No GPS coverage
655	75760	RB dormant landslide, not contributing, stable
658	75861	3-4 SH yoy
661	75973	Dry RB trib
662	76001	SH YOY; No WP coverage
668	76108	SH YOY
669	76249	LB dry trib
670	76268	Newt present
672	76342	SH YOY; CT X Sect. (Reach 8 - F2) at end of unit; No WP coverage
673	76412	LB gully (see form)
674	76420	SH YOY
675	76745	SH YOY throughout; LB gully - blue flag
676	76757	Approximately 5 SH; Pool appears to be spring-fed
677	76932	RB wet trib - seems like significant source of water; WP#263 39*22' 29.4"N, 123*14' 06.3"W
681	77300	Fish present
682	77329	WP#264 39*22' 31.9"N, 123*14' 05.6"W
684	77389	Two SH YOY
690	77755	Fish present
692	77853	WP#265 39*22' 37.9"N, 123*14' 04.3"W
694	77908	Fish present
696	77932	Fish present
697	77963	LB Dead Horse Canyon - dry; WP#266
698	77975	Increase gradient and LWD
702	78079	WP#267 39*22' 38.6"N, 123*14' 05.4"W
706	78383	RB spring
707	78783	Channel opens up 100' into unit; End of Survey WP#268

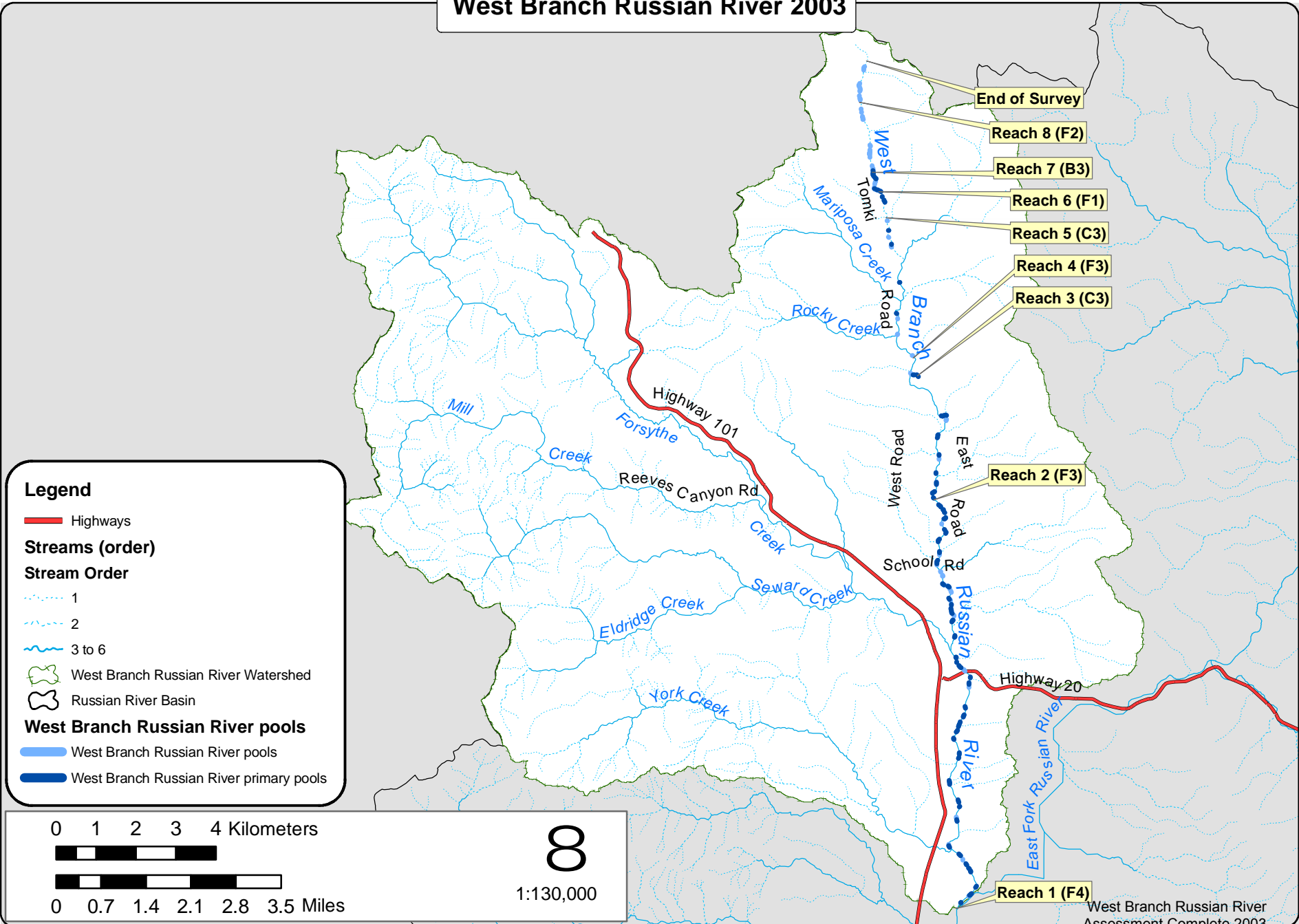
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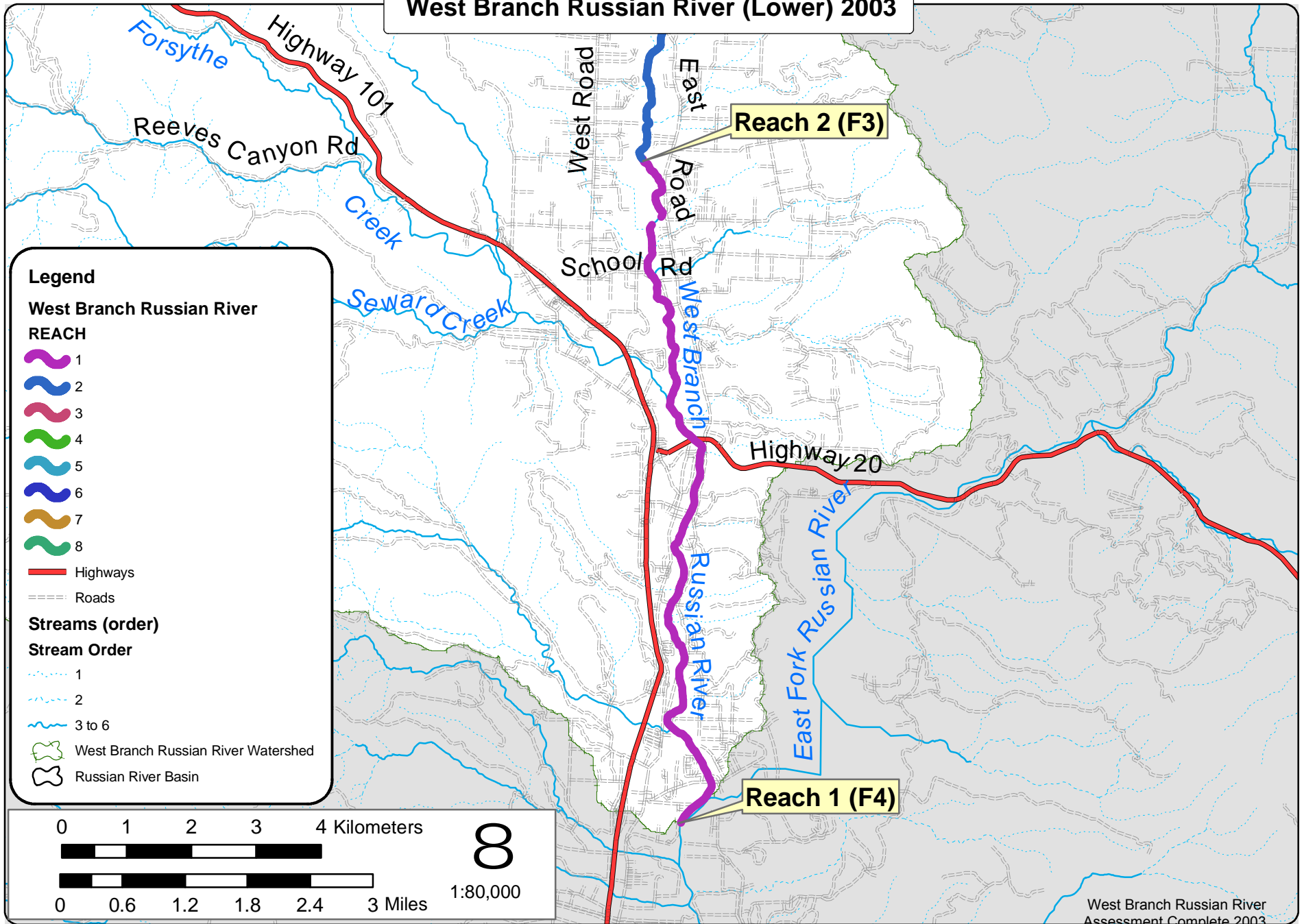
Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

# West Branch Russian River 2003



West Branch Russian River Assessment Complete 2003

# West Branch Russian River (Lower) 2003



**Legend**

**West Branch Russian River**

**REACH**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Highways

Roads

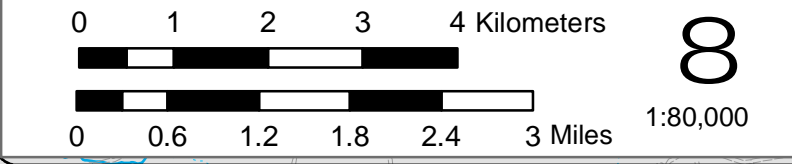
**Streams (order)**

**Stream Order**

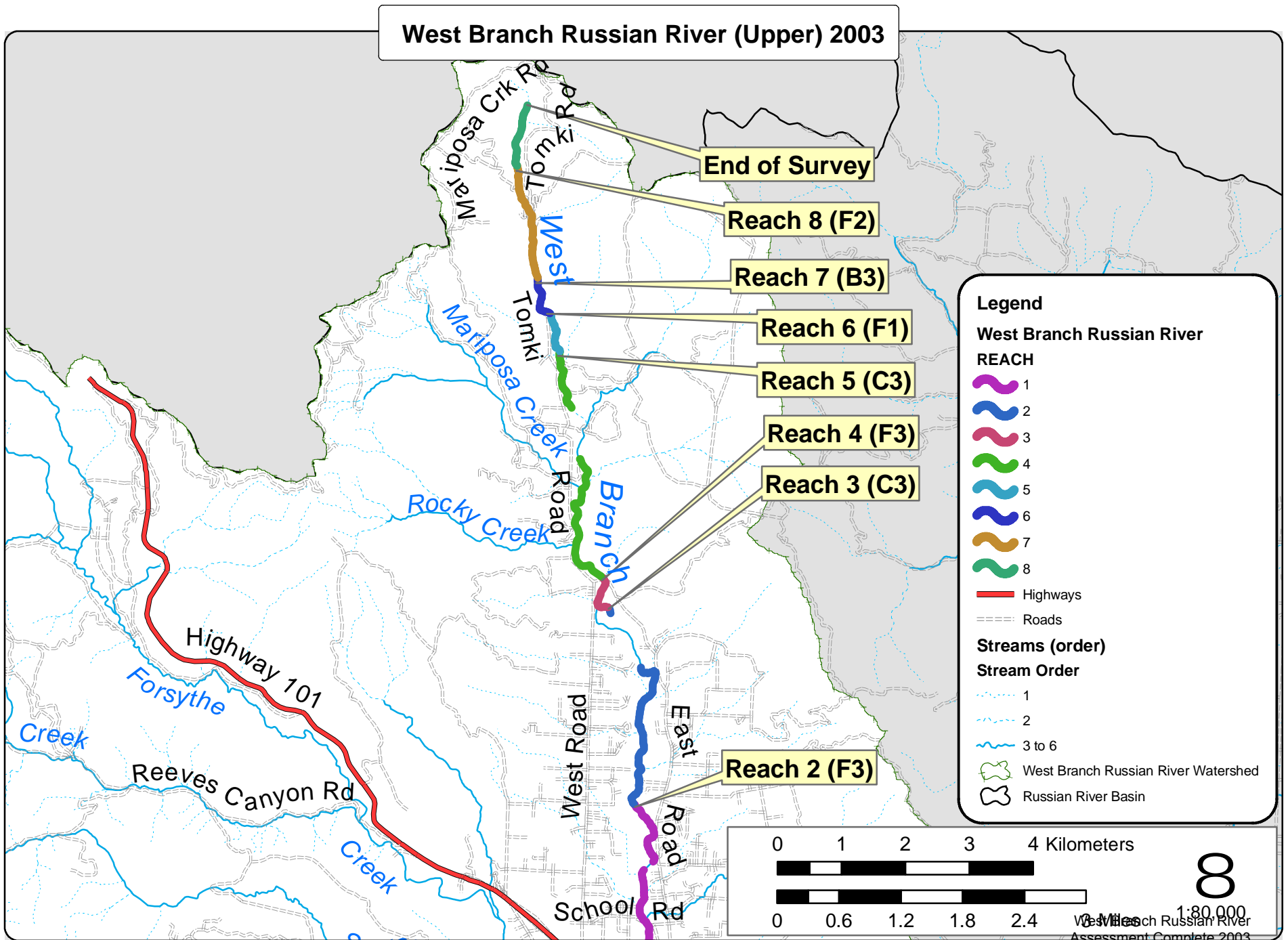
- 1
- 2
- 3 to 6

West Branch Russian River Watershed

Russian River Basin



# West Branch Russian River (Upper) 2003



**Legend**

**West Branch Russian River**

**REACH**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Highways

Roads

**Streams (order)**

**Stream Order**

- 1
- 2
- 3 to 6

West Branch Russian River Watershed

Russian River Basin

0 1 2 3 4 Kilometers

0 0.6 1.2 1.8 2.4 Miles

Scale 1:80,000

North Arrow

## APPENDIX B: TABLES

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

Stream Name: West Branch Russian River

LLID:

1231278384506

Drainage:

Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

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
1	0	CULVERT	0.1	50	50	0.1									
75	0	DRY	10.4	222	16644	20.7									
285	53	FLATWATER	39.5	130	37032	46.0	13.1	0.8	1.4	2142	610372	2466	689502		15
3	0	NO SURVEY	0.4	1000	3000	3.7									
190	189	POOL	26.4	59	11174	13.9	16.4	1.6	2.6	1182	224559	3296	619689	2550	26
167	28	RIFFLE	23.2	75	12557	15.6	11.8	0.3	0.6	889	148385	415	69238		6
<b>Total Units</b>	<b>Total Units Fully Measured</b>			<b>Total Length (ft.)</b>						<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
721	270			80457						983315			1378429		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: West Branch Russian River

LLID:

1231278384506

Drainage: Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

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 (%)
159	22	LGR	22.1	77	12273	15.3	14	0.3	1.6	1118	177703	522	82998		6	48
6	4	HGR	0.8	43	260	0.3	2	0.2	1.1	56	334	13	79			86
2	2	CAS	0.3	12	24	0.0	4	0.9	1.6	34	68	36	72			75
107	20	GLD	14.8	117	12529	15.6	15	0.9	2.9	3253	348077	4263	456118		21	46
128	20	RUN	17.8	138	17655	21.9	16	0.8	3.2	1975	252854	2062	250706		9	51
49	12	SRN	6.8	139	6828	8.5	6	0.5	1.5	733	35926	305	14923		13	63
1	1	EDW	0.1	20	20	0.0	7	1.0	1.4	140	140	140	140		10	35
5	5	TRP	0.7	42	209	0.3	5	1.8	5.5	224	1121	474	2368	436	10	83
127	126	MCP	17.6	62	7832	9.7	18	1.7	6.8	1419	180213	4156	527755	3298	22	65
2	2	CCP	0.3	44	88	0.1	12	1.3	2.1	541	1082	932	1864	914	40	55
7	7	STP	1.0	119	836	1.0	3	0.7	2	104	726	119	712	106		89
13	13	CRP	1.8	48	619	0.8	14	2.0	5.2	690	8974	1602	20822	1442	28	49
3	3	LSL	0.4	47	140	0.2	18	1.9	3.5	867	2600	1807	5420	1677	67	35
14	14	LSR	1.9	42	595	0.7	14	1.3	3.6	870	12173	2033	28467	1029	53	71
10	10	LSBk	1.4	46	458	0.6	14	1.6	5.6	909	9092	1367	13666	1221	20	57
4	4	LSBo	0.6	42	169	0.2	27	1.4	2.7	1348	5394	3251	13004	961	28	11
2	2	PLP	0.3	24	47	0.1	11	1.9	9.1	250	499	563	1125	476	40	79

**Table 2 - Summary of Habitat Types and Measured Parameters (continued)**

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 (%)
2	2	SCP	0.3	52	105	0.1	14	1.6	3.4	848	1695	4275	4275	2280	10	64
1	1	BPB	0.1	76	76	0.1	17	-0.7	0.6	1227	1227	1105	1105	-859	5	73
75	0	DRY	10.4	222	16644	20.7										57
1	0	CUL	0.1	50	50	0.1										100
3	0	NS	0.4	1000	3000	3.7										0
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>			
721	270				80457					1039898			1425619			

**Table 3 - Summary of Pool Types**

Stream Name: West Branch Russian River

LLID:

1231278384506

Drainage:

Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

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
141	140	MAIN	74	64	8965	80	16.9	1.6	1298	183021	3023	423181	22
46	46	SCOUR	24	44	2028	18	15.2	1.6	842	38731	1200	55191	36
3	3	BACKWATER	2	60	181	2	15.0	0.5	974	2922	710	1421	8
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>		<b>Total Volume (cu.ft.)</b>	
190	189				11174					224675		479792	

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

Stream Name: West Branch Russian River

LLID:

1231278384506

Drainage: Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location:

Quad: REDWOOD VALLEY

Legal Description:

T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

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
5	TRP	3	0	0	1	20	2	40	1	20	1	20
126	MCP	67	8	6	38	30	38	30	24	19	18	14
2	CCP	1	0	0	1	50	1	50	0	0	0	0
6	STP	3	1	17	4	67	1	17	0	0	0	0
13	CRP	7	0	0	0	0	4	31	6	46	3	23
3	LSL	2	0	0	0	0	2	67	1	33	0	0
14	LSR	7	2	14	4	29	5	36	3	21	0	0
10	LSBk	5	0	0	1	10	5	50	3	30	1	10
4	LSBo	2	0	0	1	25	3	75	0	0	0	0
2	PLP	1	0	0	0	0	0	0	1	50	1	50

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
187	12	6	50	27	61	33	40	21	24	13

Mean Maximum Residual Pool Depth (ft.): 2.6

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

Stream Name: West Branch Russian River

LLID:

1231278384506

Drainage:

Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Dry Units: 75

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

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
159	6	LGR	2	0	7	11	43	25	12	2	0
6	0	HGR									
2	0	CAS									
167	6	TOTAL RIFFLE	2	0	7	11	43	25	12	2	0
107	17	GLD	3	16	0	10	29	14	0	16	12
128	15	RUN	3	9	3	5	44	20	0	14	1
49	7	SRN	0	9	0	8	40	14	0	29	1
1	1	EDW	0	0	0	0	0	100	0	0	0
285	40	TOTAL FLAT	2	12	1	8	36	19	0	17	6
5	2	TRP	0	0	0	0	0	0	0	5	95
127	106	MCP	6	12	5	16	9	7	0	27	18
2	1	CCP	10	50	0	0	20	0	0	10	10
7	0	STP									
13	12	CRP	8	20	5	14	21	4	0	13	16

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

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
3	3	LSL	3	30	15	25	20	7	0	0	0
14	13	LSR	25	14	3	36	15	7	0	0	0
10	10	LSBk	3	12	1	4	11	3	0	2	67
4	4	LSBo	0	3	0	0	0	4	0	94	0
2	2	PLP	33	0	0	0	0	0	3	0	65
2	2	SCP	0	0	0	0	3	10	0	38	50
1	1	BPB	10	0	0	90	0	0	0	0	0
190	156	TOTAL POOL	7	12	4	16	10	6	0	22	21
1	0	CUL									
3	0	NS									
721	202	TOTAL	6	12	4	14	16	9	0	21	17

**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: West Branch Russian River LLID: 1231278384506 Drainage: Russian River - Upper  
 Survey Dates: 7/22/2003 to 10/29/2003 Dry Units: 75  
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T17NR12WS17 Latitude: 38:27:02.0N Longitude: 123:07:40.0W

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
159	21	LGR	0	5	38	38	19	0	0
6	4	HGR	0	0	0	0	25	25	50
2	2	CAS	0	0	0	0	0	0	100
107	21	GLD	5	24	38	19	10	0	5
128	20	RUN	0	20	50	25	5	0	0
49	12	SRN	0	0	0	42	25	8	25
1	1	EDW	0	0	100	0	0	0	0
5	5	TRP	0	0	0	0	0	0	100
127	127	MCP	2	27	46	6	3	3	13
2	2	CCP	0	50	0	0	50	0	0
7	7	STP	0	0	0	0	14	71	14
13	13	CRP	8	46	31	15	0	0	0
3	3	LSL	0	0	100	0	0	0	0

**Table 6 - Summary of Dominant Substrates By Habitat Type  
(Continued)**

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
14	14	LSR	0	50	36	7	7	0	0
10	9	LSBk	11	22	11	33	0	0	22
4	4	LSBo	25	50	0	25	0	0	0
2	2	PLP	0	0	100	0	0	0	0
2	2	SCP	0	50	0	50	0	0	0
1	1	BPB	0	0	100	0	0	0	0

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

Stream Name: West Branch Russian River LLID: 1231278384506 Drainage: Russian River - Upper  
 Survey Dates: 7/22/2003 to 10/29/2003  
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T17NR12WS17 Latitude: 38:27:02.0N Longitude: 123:07:40.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
57	33	67	2	48	48

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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: West Branch Russian River

LLID:

1231278384506 Drainage: Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location: Quad: REDWOOD VALLEY Legal Description: T17NR12WS17 Latitude: 38:27:02.0N Longitude: 123:07:40.0W

**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	91	92	32.6
Boulder	5	5	1.8
Cobble / Gravel	133	122	45.4
Sand / Silt / Clay	52	62	20.3

**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	10	10	3.6
Brush	44	44	15.7
Hardwood Trees	165	148	55.7
Coniferous Trees	41	41	14.6
No Vegetation	20	38	10.3

**Total Stream Cobble Embeddedness Values:** 3

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

StreamName: West Branch Russian River

LLID:

1231278384506

Drainage: Russian River - Upper

Survey Dates: 7/22/2003 to 10/29/2003

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T17NR12WS17

Latitude: 38:27:02.0N

Longitude: 123:07:40.0W

	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	2	2	7
SMALL WOODY DEBRIS (%)	0	12	12
LARGE WOODY DEBRIS (%)	7	1	4
ROOT MASS (%)	11	8	16
TERRESTRIAL VEGETATION (%)	43	36	10
AQUATIC VEGETATION (%)	25	19	6
WHITewater (%)	12	0	0
BOULDERS (%)	2	17	22
BEDROCK LEDGES (%)	0	6	21

## APPENDIX C - Fish Habitat Inventory Data

Stream Name: West Branch Russian River      LLID: 1231278384506      Drainage: Russian River -  
 Survey Dates: 7/22/2003 to 10/29/2003      Survey Length (ft.): 80457      Main Channel (ft.): 78783      Side Channel (ft.): 1674  
 Confluence Location: Quad REDWOOD VALLEY Legal Description: T17NR12WS17      Latitude: 38:27:02.0N      Longitude: 123:07:40.0W

### Summary of Fish Habitat Elements By Stream Reach

#### STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 46.9	Pools by Stream Length (%): 17.8
Reach Length (ft.): 38369	Coniferous Component (%): 11.2	Pool Frequency (%): 25.2
Riffle/Flatwater Mean Width (ft.): 27.1	Hardwood Component (%): 88.8	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 26.7
Range (ft.): to	Vegetative Cover (%): 80.3	2 to 2.9 Feet Deep: 30.7
Mean (ft.):	Dominant: Boulders	3 to 3.9 Feet Deep: 29.3
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 13.3
Base Flow (cfs): 0	Occurrence of LWD (%): 5.8	Mean Max Residual Pool Depth (ft.): 2.78
Water (F): 56 - 93    Air (F): 58 - 98	LWD per 100 ft.:	Mean Pool Shelter: 19
Dry Channel (ft.): 0	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 13.3    Gravel: 78.7    Sm Cobble: 2.7    Lg 1.3    Boulder: 0.0    Bedrock: 4.0		
Embeddedness Values (%): 1. 1.3    2. 29.3    3. 42.7    4. 17.3    5. 9.3		

#### STREAM REACH: 2

Channel Type: F3	Canopy Density (%): 42.2	Pools by Stream Length (%): 7.4
Reach Length (ft.): 11610	Coniferous Component (%): 14.6	Pool Frequency (%): 17.2
Riffle/Flatwater Mean Width (ft.): 9.5	Hardwood Component (%): 85.4	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 5.9
Range (ft.): to	Vegetative Cover (%): 51.5	2 to 2.9 Feet Deep: 29.4
Mean (ft.):	Dominant: Terrestrial Veg.	3 to 3.9 Feet Deep: 29.4
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 35.3
Base Flow (cfs): 0	Occurrence of LWD (%): 1.2	Mean Max Residual Pool Depth (ft.): 3.55
Water (F): 56 - 65    Air (F): 58 - 76	LWD per 100 ft.:	Mean Pool Shelter: 30
Dry Channel (ft.): 90	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 5.9    Gravel: 76.5    Sm Cobble: 17.6    Lg 0.0    Boulder: 0.0    Bedrock: 0.0		
Embeddedness Values (%): 1. 11.8    2. 52.9    3. 29.4    4. 5.9    5. 0.0		

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 3

Channel Type: C3	Canopy Density (%): 11.2	Pools by Stream Length (%): 9.3
Reach Length (ft.): 2525	Coniferous Component (%): 10.0	Pool Frequency (%): 23.5
Riffle/Flatwater Mean Width (ft.): 6.5	Hardwood Component (%): 90.0	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 0.0
Range (ft.): to	Vegetative Cover (%): 55.5	2 to 2.9 Feet Deep: 50.0
Mean (ft.):	Dominant: Boulders	3 to 3.9 Feet Deep: 25.0
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 25.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 3.55
Water (F): 66 - 70	Air (F): 77 - 78	LWD per 100 ft.:
Dry Channel (ft.): 1913		Riffles:
		Pools:
		Flat:
Pool Tail Substrate (%): Silt/Clay: 0.0	Sand: 0.0	Gravel: 25.0
Embeddedness Values (%): 1. 0.0	2. 75.0	3. 25.0
	4. 0.0	5. 0.0
		Sm Cobble: 75.0
		Lg 0.0
		Boulder: 0.0
		Bedrock: 0.0

### STREAM REACH: 4

Channel Type: F3	Canopy Density (%): 47.8	Pools by Stream Length (%): 3.7
Reach Length (ft.): 11966	Coniferous Component (%): 37.4	Pool Frequency (%): 21.2
Riffle/Flatwater Mean Width (ft.): 5.7	Hardwood Component (%): 62.6	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 7.1
Range (ft.): to	Vegetative Cover (%): 45.5	2 to 2.9 Feet Deep: 64.3
Mean (ft.):	Dominant: Terrestrial Veg.	3 to 3.9 Feet Deep: 21.4
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 7.1
Base Flow (cfs): 0	Occurrence of LWD (%): 0.2	Mean Max Residual Pool Depth (ft.): 2.61
Water (F): 53 - 70	Air (F): 60 - 77	LWD per 100 ft.:
Dry Channel (ft.): 9727		Riffles:
		Pools:
		Flat:
Pool Tail Substrate (%): Silt/Clay: 0.0	Sand: 0.0	Gravel: 35.7
Embeddedness Values (%): 1. 28.6	2. 57.1	3. 7.1
	4. 0.0	5. 7.1
		Sm Cobble: 57.1
		Lg 0.0
		Boulder: 0.0
		Bedrock: 7.1

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 5

Channel Type: C3	Canopy Density (%): 42.3	Pools by Stream Length (%): 9.2
Reach Length (ft.): 2332	Coniferous Component (%): 46.7	Pool Frequency (%): 24.2
Riffle/Flatwater Mean Width (ft.): 8.4	Hardwood Component (%): 53.3	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 0.0
Range (ft.): to	Vegetative Cover (%): 29.0	2 to 2.9 Feet Deep: 50.0
Mean (ft.):	Dominant: Root masses	3 to 3.9 Feet Deep: 50.0
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 4.7	Mean Max Residual Pool Depth (ft.): 3.025
Water (F): 57 - 63    Air (F): 63 - 75	LWD per 100 ft.:	Mean Pool Shelter: 40
Dry Channel (ft.): 355	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 0.0    Gravel: 75.0    Sm Cobble: 25.0    Lg 0.0    Boulder: 0.0    Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0    2. 87.5    3. 12.5    4. 0.0    5. 0.0		

### STREAM REACH: 6

Channel Type: F3	Canopy Density (%): 79.2	Pools by Stream Length (%): 35.5
Reach Length (ft.): 2509	Coniferous Component (%): 62.4	Pool Frequency (%): 52.2
Riffle/Flatwater Mean Width (ft.): 4.0	Hardwood Component (%): 37.6	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 20.8
Range (ft.): to	Vegetative Cover (%): 5.9	2 to 2.9 Feet Deep: 37.5
Mean (ft.):	Dominant: Boulders	3 to 3.9 Feet Deep: 16.7
Std. Dev.:	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 25.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 3.12
Water (F): 53 - 58    Air (F): 56 - 65	LWD per 100 ft.:	Mean Pool Shelter: 15
Dry Channel (ft.): 0	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 0.0    Gravel: 25.0    Sm Cobble: 8.3    Lg 8.3    Boulder: 0.0    Bedrock: 58.3		
Embeddedness Values (%): 1. 8.3    2. 16.7    3. 12.5    4. 0.0    5. 62.5		

## Summary of Fish Habitat Elements By Stream Reach

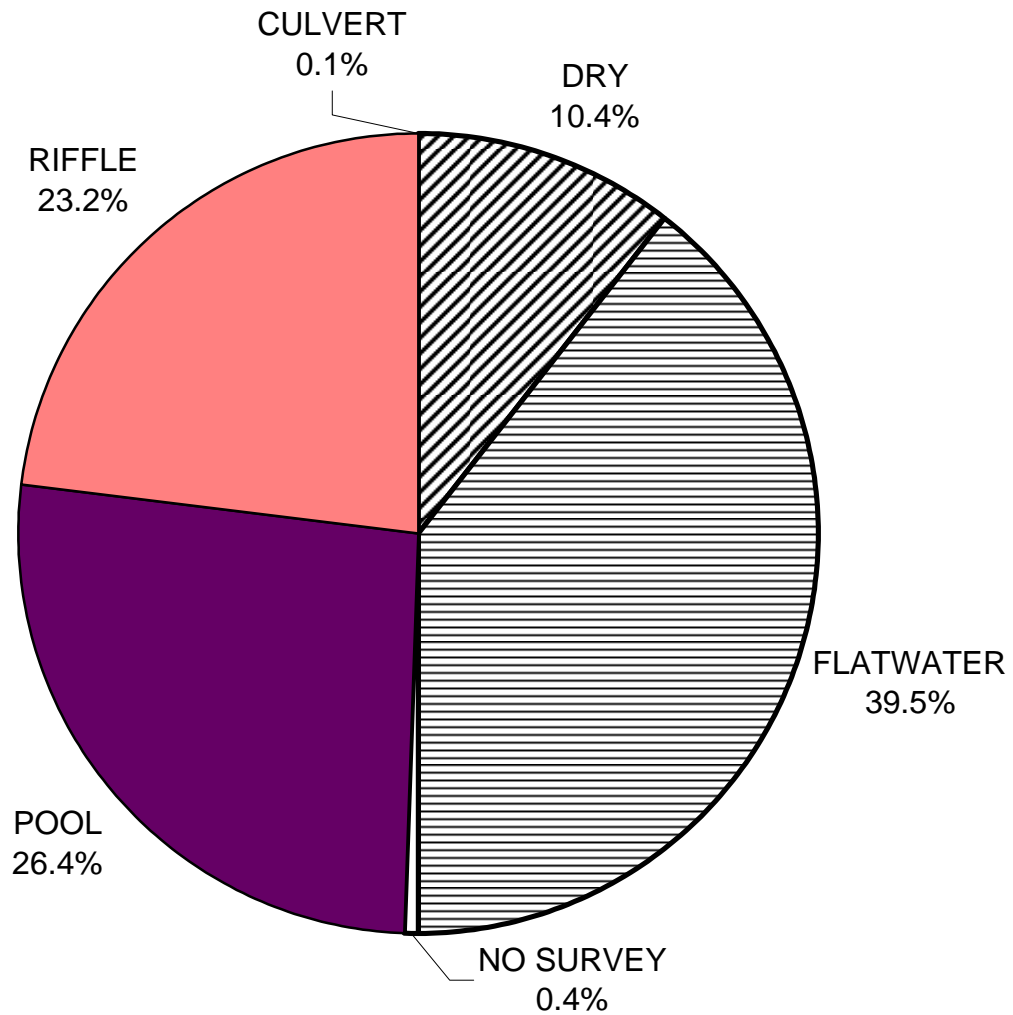
### STREAM REACH: 7

Channel Type: B3	Canopy Density (%): 82.9	Pools by Stream Length (%): 12.1
Reach Length (ft.): 6257	Coniferous Component (%): 60.8	Pool Frequency (%): 27.8
Riffle/Flatwater Mean Width (ft.): 5.1	Hardwood Component (%): 39.2	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 68.0
Range (ft.): to	Vegetative Cover (%): 30.1	2 to 2.9 Feet Deep: 32.0
Mean (ft.):	Dominant: Boulders	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 1.8	Mean Max Residual Pool Depth (ft.): 1.68
Water (F): 53 - 59    Air (F): 55 - 79	LWD per 100 ft.:	Mean Pool Shelter: 51
Dry Channel (ft.): 2034	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 0.0    Gravel: 32.0    Sm Cobble: 36.0    Lg 20.0    Boulder: 0.0    Bedrock: 12.0		
Embeddedness Values (%): 1. 24.0    2. 36.0    3. 20.0    4. 4.0    5. 16.0		

### STREAM REACH: 8

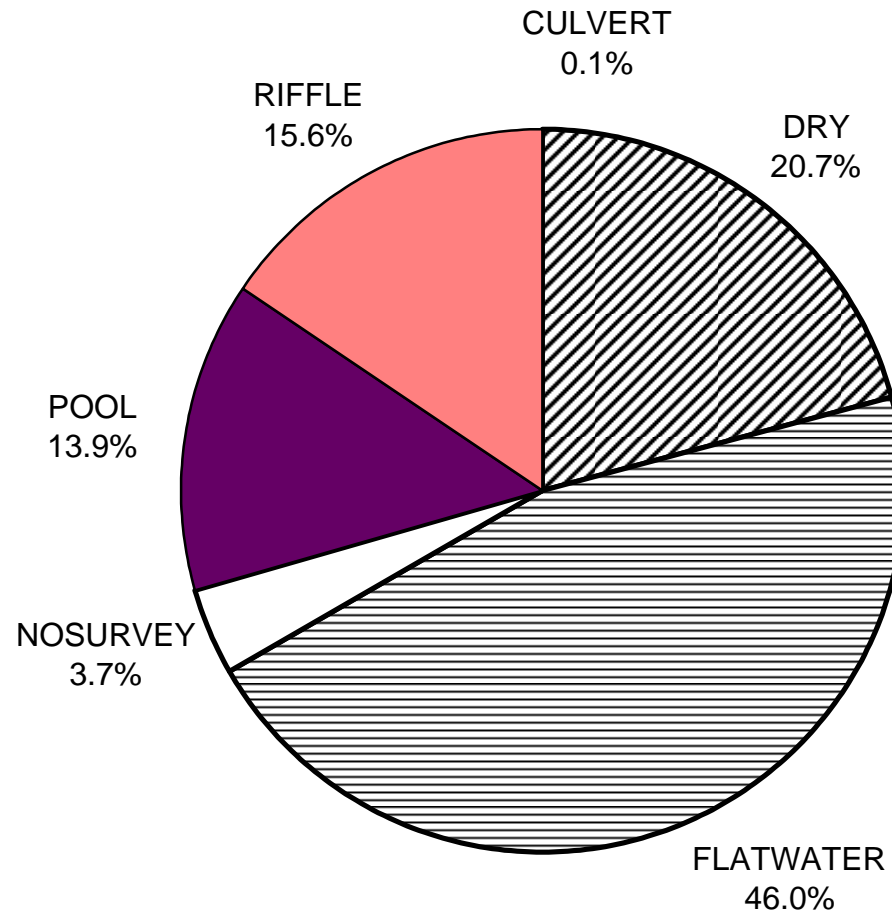
Channel Type: F2	Canopy Density (%): 91.6	Pools by Stream Length (%): 29.0
Reach Length (ft.): 3215	Coniferous Component (%): 78.1	Pool Frequency (%): 38.2
Riffle/Flatwater Mean Width (ft.): 3.2	Hardwood Component (%): 21.9	Residual Pool Depth (%):
BFW:	Dominant Bank: Coniferous Trees	< 2 Feet Deep: 90.0
Range (ft.): to	Vegetative Cover (%): 6.5	2 to 2.9 Feet Deep: 5.0
Mean (ft.):	Dominant: Boulders	3 to 3.9 Feet Deep: 5.0
Std. Dev.:	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 0.0
Base Flow (cfs):	Occurrence of LWD (%): 0.2	Mean Max Residual Pool Depth (ft.): 1.195
Water (F): 0 - 54    Air (F): 57 - 65	LWD per 100 ft.:	Mean Pool Shelter: 17
Dry Channel (ft.): 1517	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0    Sand: 0.0    Gravel: 30.0    Sm Cobble: 35.0    Lg 20.0    Boulder: 15.0    Bedrock: 0.0		
Embeddedness Values (%): 1. 55.0    2. 25.0    3. 15.0    4. 0.0    5. 5.0		

# RUSSIAN RIVER 2003 HABITAT TYPES BY PERCENT OCCURRENCE



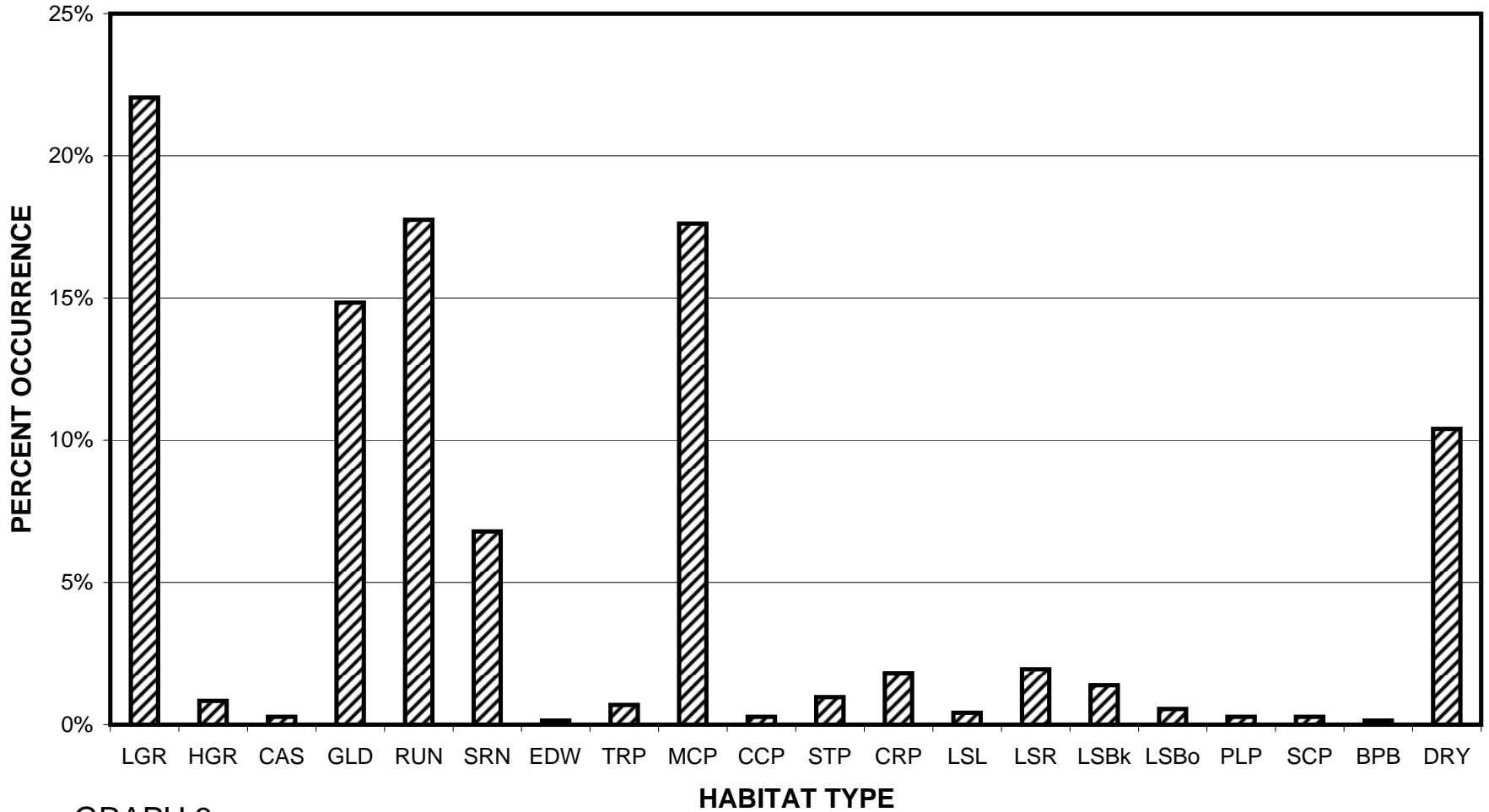
GRAPH 1: Level II habitat types by percent occurrence

# RUSSIAN RIVER 2003 HABITAT TYPES BY PERCENT TOTAL LENGTH



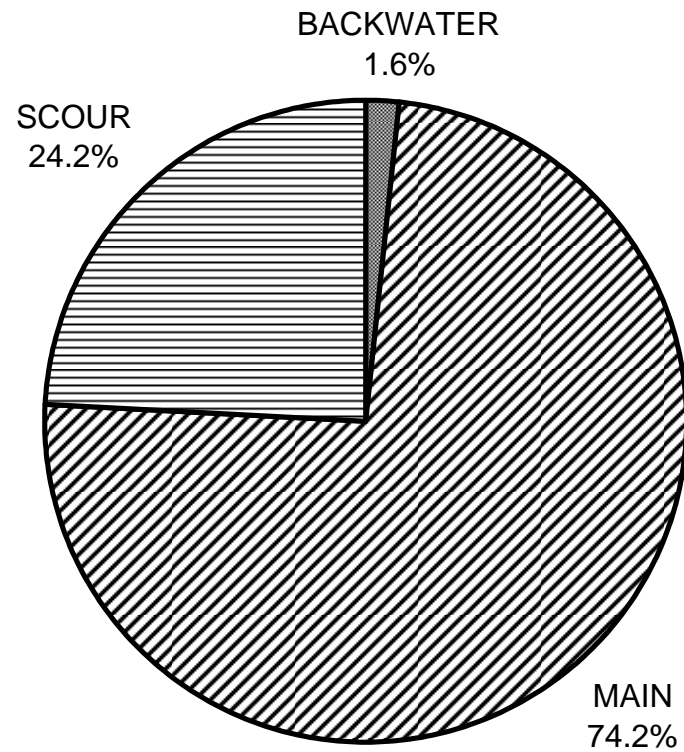
GRAPH 2

# RUSSIAN RIVER 2003 HABITAT TYPES BY PERCENT OCCURRENCE



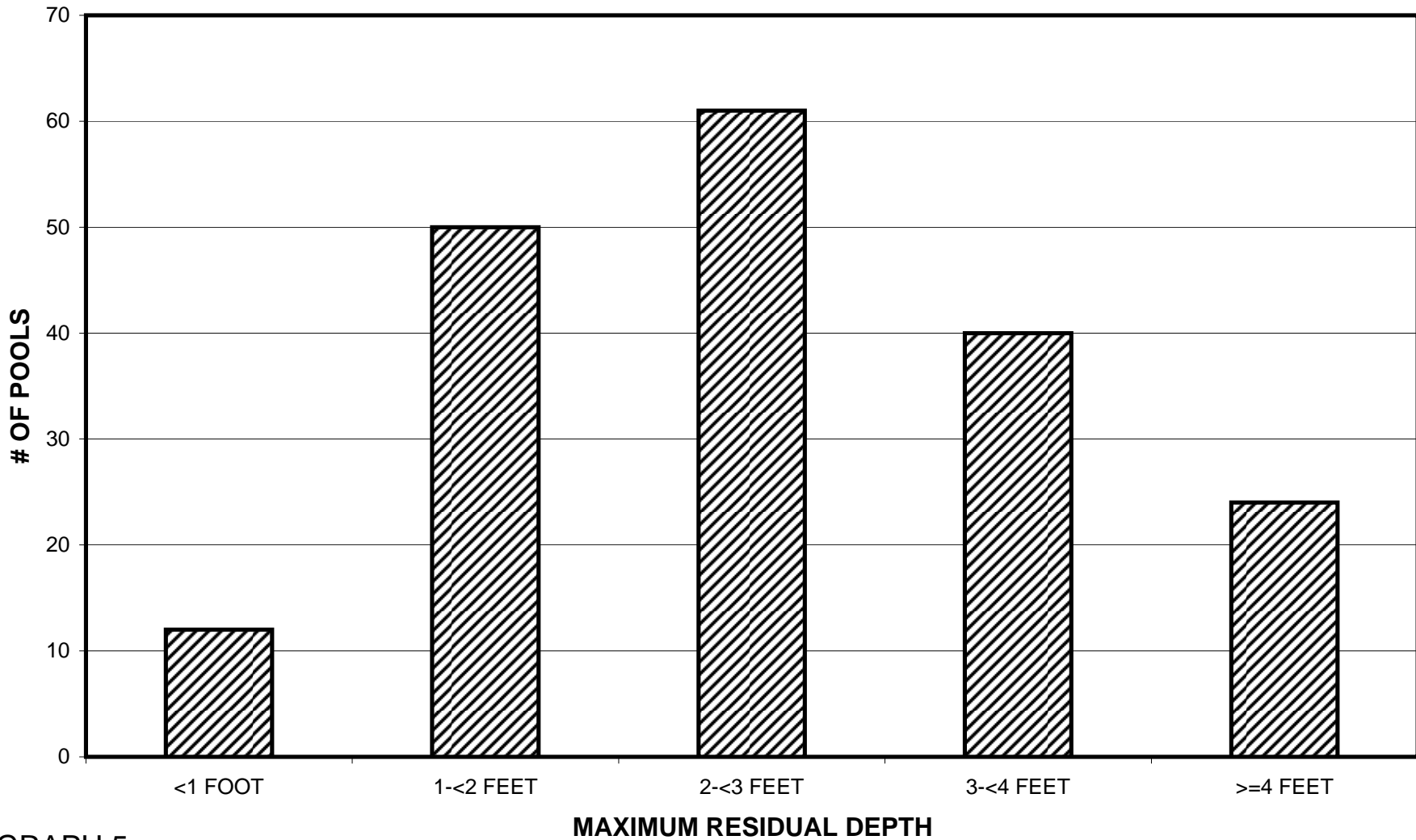
GRAPH 3

# RUSSIAN RIVER 2003 POOL TYPES BY PERCENT OCCURRENCE



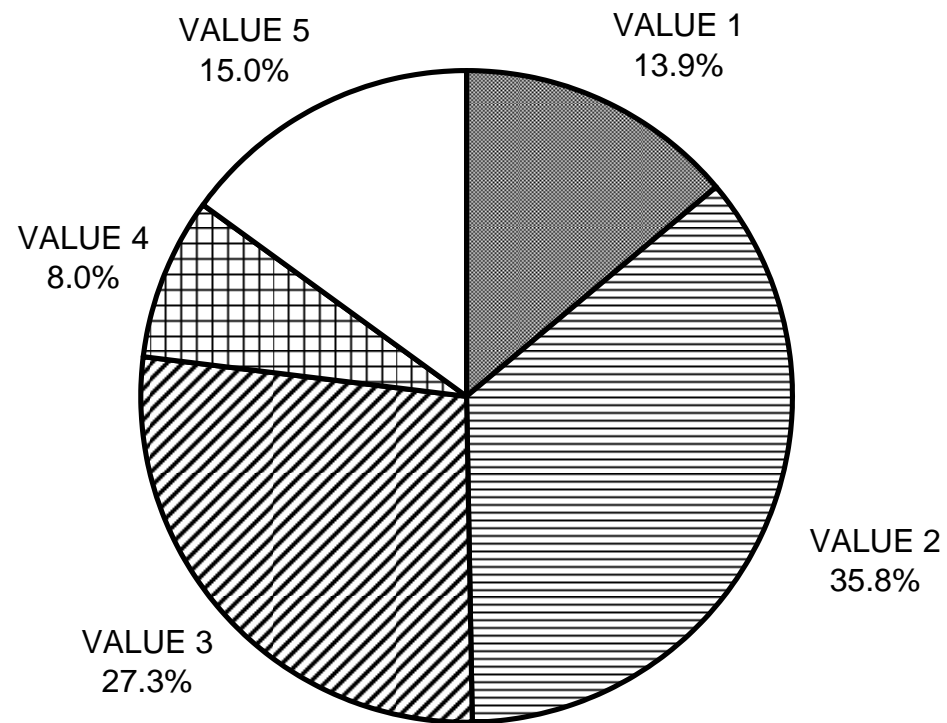
GRAPH 4

# RUSSIAN RIVER 2003 MAXIMUM DEPTH IN POOLS



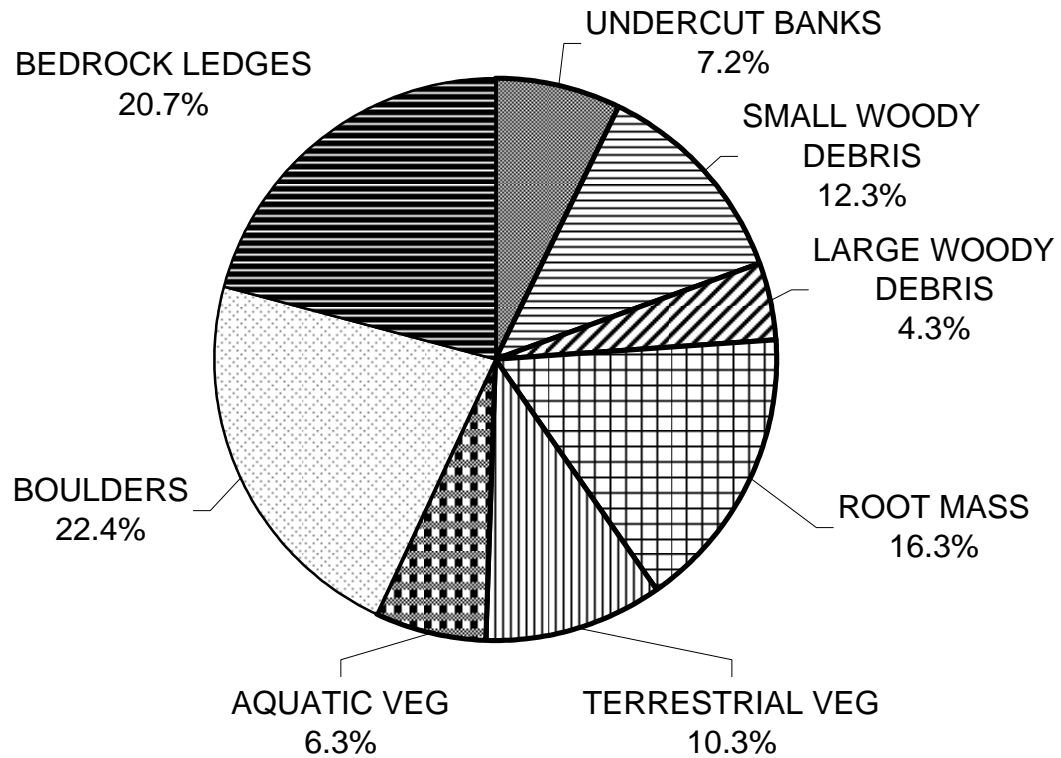
GRAPH 5

# RUSSIAN RIVER 2003 PERCENT EMBEDDEDNESS



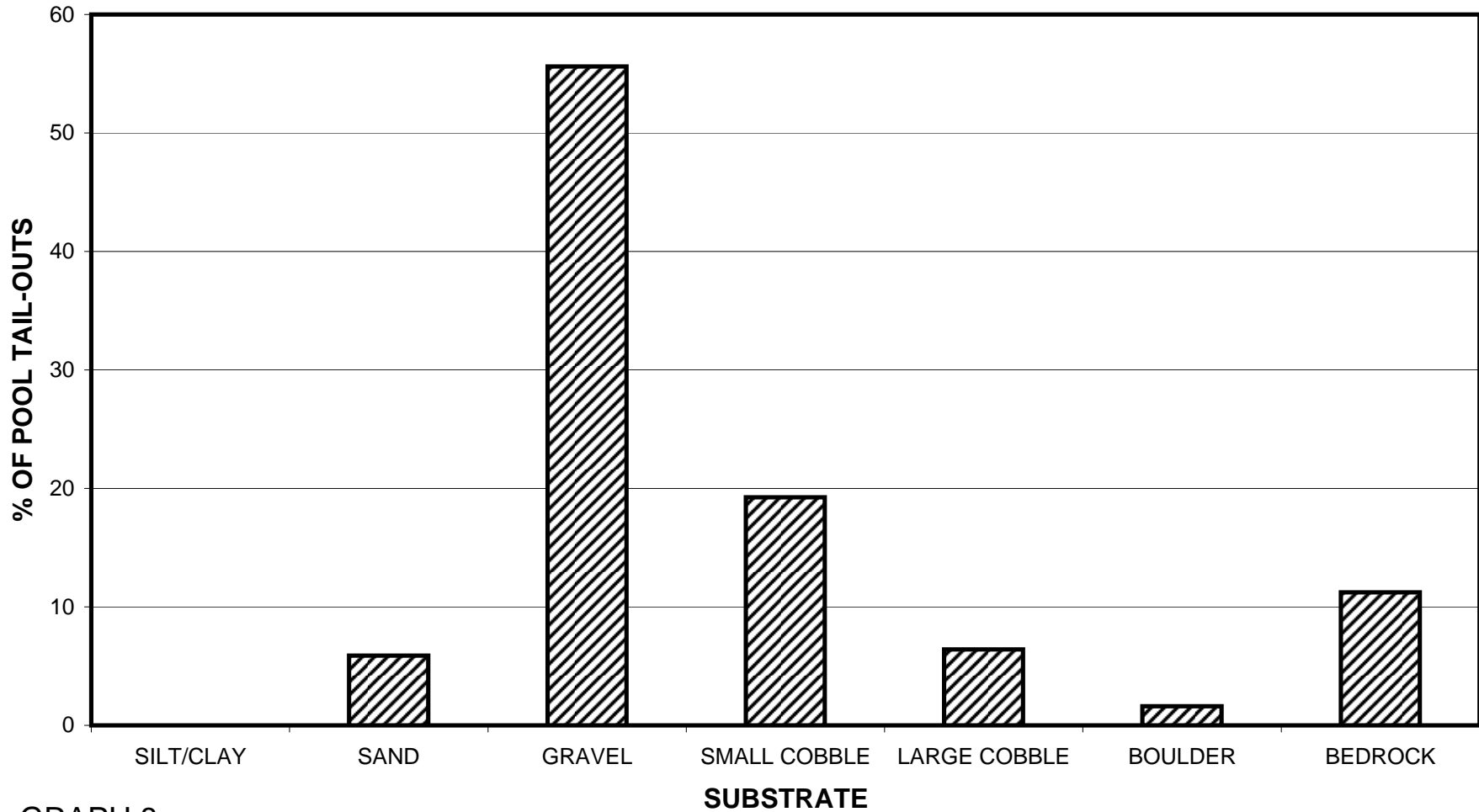
GRAPH 6

# RUSSIAN RIVER 2003 MEAN PERCENT COVER TYPES IN POOLS



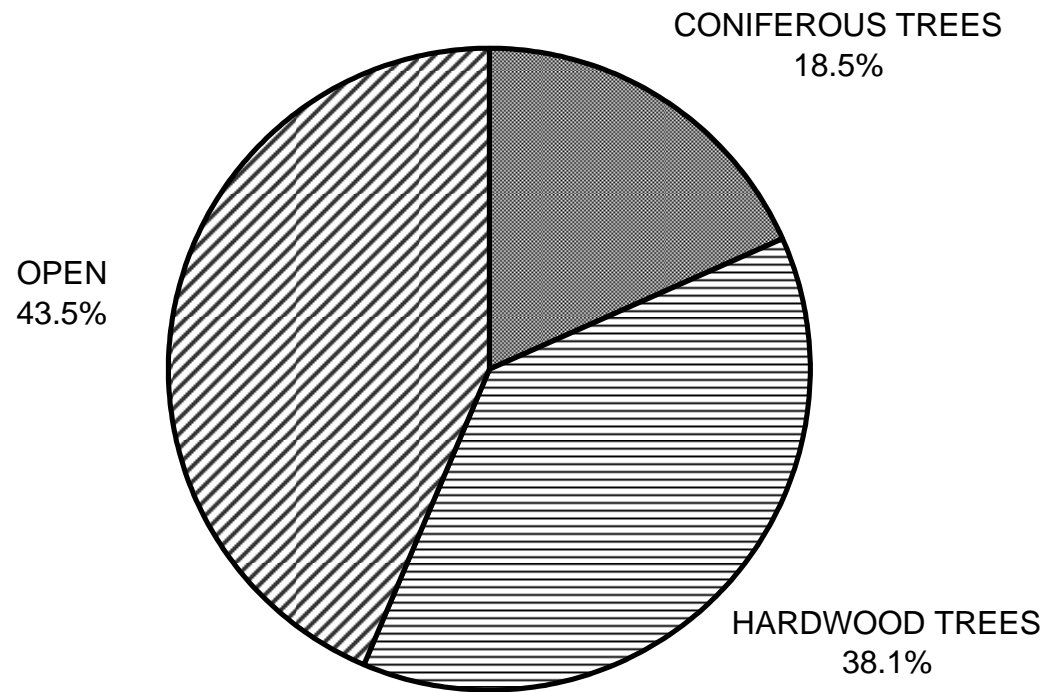
GRAPH 7

# RUSSIAN RIVER 2003 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



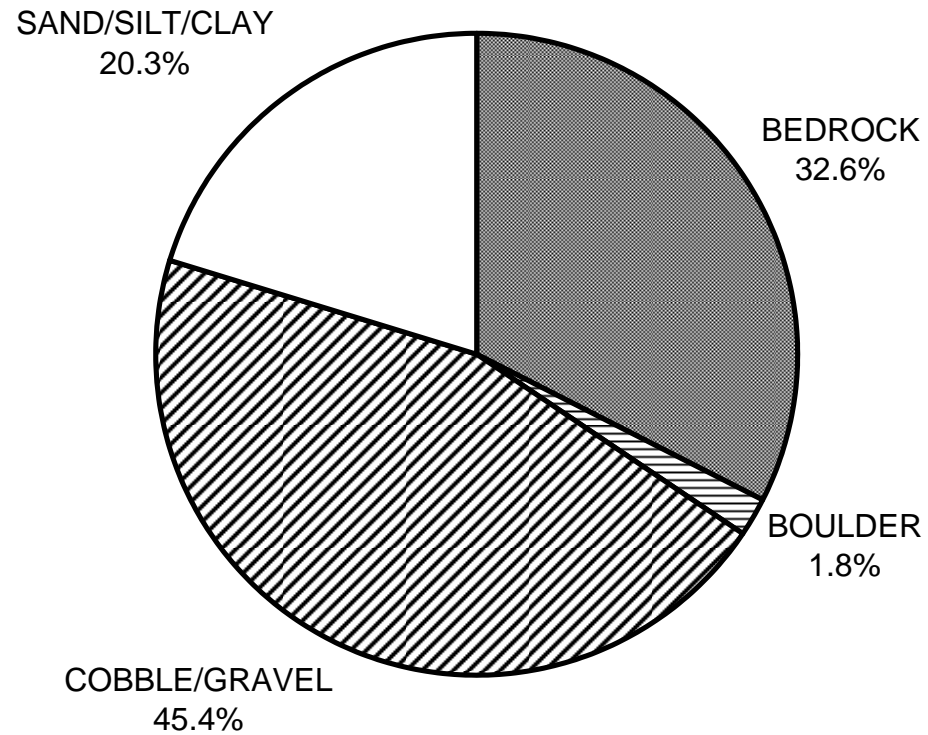
GRAPH 8

# RUSSIAN RIVER 2003 MEAN PERCENT CANOPY



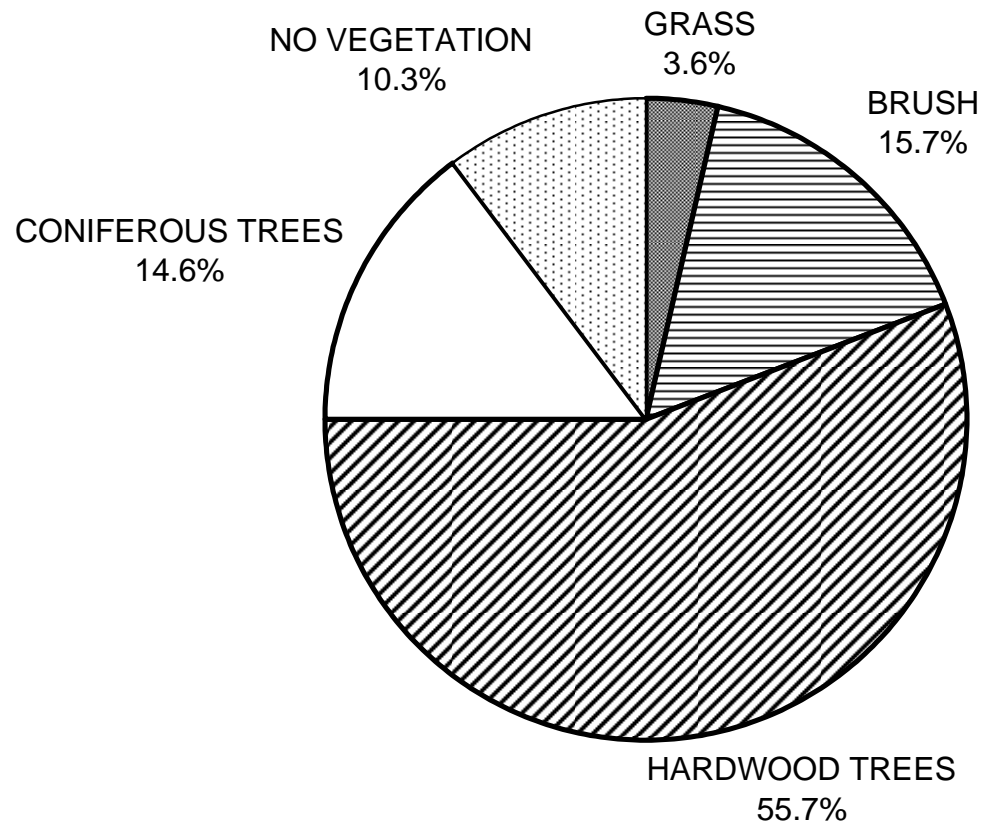
GRAPH 9

# RUSSIAN RIVER 2003 DOMINANT BANK COMPOSITION



GRAPH 10

# RUSSIAN RIVER 2003 DOMINANT BANK VEGETATION



GRAPH 11