

STREAM INVENTORY REPORT

Juan Creek (Including Little Juan Creek)

INTRODUCTION

In the summer of 2000, the California Department of Fish and Game (DFG), in partnership with the Americorps Watershed Stewards Project (WSP), conducted a stream fishery inventory of Juan Creek and its tributary Little Juan Creek. The inventory included a *habitat* inventory to assess the quantity and quality of habitat for salmonids (steelhead trout and coho salmon), and a *biological* inventory to determine which salmonid species were actually present. This report presents the inventory results and recommends options for potential improvements.

Fishery surveys of Juan Creek and Little Juan Creek were conducted by DFG in 1961 (California Department of Fish and Game 1961a, 1961b), and again in 1966 (California Department of Fish and Game 1966a, 1966b). Steelhead were found in both streams in both years, but coho salmon were found only in the 1966 surveys. The 1961 Juan Creek survey reported good spawning area in the lower and mid-sections of the stream and good pool development throughout. Possible limiting factors were several barriers preventing access to otherwise suitable habitat (no fish were found above the first of the barriers). Limiting factors discussed in the 1966 Juan Creek report include lack of streamside vegetation and low pool-riffle ratio. Juan Creek was described as “abnormally clean and free of logging debris” which may indicate inadequate instream cover. The 1961 Little Juan Creek survey reported fair to good spawning habitat in the lower and mid-sections of the stream. The report noted small, deep pools in the upper regions and wide, long and deep pools in the lower regions. Cover was abundant but not diverse. At least five migration barriers in the upper and middle sections were identified. The 1966 Little Juan report found good spawning gravels with “no silt” with debris barriers a main factor limiting salmonid abundance (Department of Fish and Game 1966.)

Fish population surveys of Juan Creek and Little Juan Creek were made by Louisiana-Pacific Corporation each year in 1994 through 1996 (Louisiana-Pacific Corporation 1997). Steelhead were found in all 3 years; coho salmon were absent in all 3 years.

WATERSHED OVERVIEW

Juan Creek is located in Mendocino County, California and drains into the Pacific Ocean (Map 1). Its mouth sits about 3 miles south of the town of Rockport and 17 miles north of Fort Bragg. The mouth of Juan Creek is in T21N, R18W, S1 MDB&M, at 39° 42' 13" north latitude and 123° 48' 11" west longitude. Juan Creek's basin (including Little Juan Creek sub basin) is about 7 square miles in area, and elevation ranges from sea level to 2325 feet. Little Juan Creek flows into Juan Creek about ¼ mile above Juan Creek's mouth, in T21N R17W S6 MDB&M, at 39° 42' 8' north latitude and 123° 47' 49' west longitude. Elevations range from sea level to 800 feet in the headwaters. The Juan Creek watershed, including Little Juan Creek, is dominated by coniferous forest, and the watershed has been managed primarily for timber production since at least the early 1960's. The watershed is currently almost entirely owned by Mendocino Redwood Company. Access to the watershed is from Highway 1 via private roads.

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METHODS

The stream inventory followed the methodology presented in detail in the *California Salmonid Stream Habitat Restoration Manual* (Flosi *et al.* 1998). The following summarizes the methods.

HABITAT INVENTORY COMPONENTS

The standardized habitat inventory has nine components:

1. Stream flow:

Stream flow is measured in cubic feet per second (cfs) using standard flow measuring equipment.

2. Channel Type:

Channel type classification is based on five measured parameters: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. The channel type can indicate of the stability of the bed and banks, and the suitability of various channel restoration treatments.

3. Temperatures:

Water and air temperatures are taken in degrees Fahrenheit at the middle of the habitat unit, within one foot of the water surface. Generally, stream temperatures should not exceed 60° F for coho salmon, and 70° F for steelhead.

4. Habitat Unit Type and Dimensions:

Habitat units are numbered sequentially and assigned a habitat type selected from a standard list of 24 habitat types (Appendix 1). Dewatered units are labeled "dry". The length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Habitat unit dimensions of mean length, mean width, mean depth, and maximum depth are measured. In pool units, maximum depth at the pool tail crest is also measured. Measurements are taken to the nearest 1/10 foot using hip chains, measuring tapes, or stadia rods. Good salmonid habitat generally has a fairly even mix of riffle and pool habitat types, with pools greater than 2 feet deep.

5. Shelter Rating:

In stream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density-related competition. The shelter rating is calculated by multiplying shelter value and percent cover. Using an overhead view, a visual estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. A standard qualitative shelter value of 0 (none), 1 (low), 2

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(medium), or 3 (high) is assigned according to the complexity of the cover. Thus shelter rating can range from 0-300. A minimum shelter value of 100 is desirable for quality salmonid habitat.

6. Substrate Composition:

Streambed substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. Dominant and sub-dominant substrate elements in the habitat unit are estimated by eye using a list of seven size classes. In addition, the dominant substrate composing the pool tail outs is recorded in pool habitat units. Gravel and cobble substrates are needed for spawning, and high levels of fine sediments can suffocate salmonid eggs in the gravel and impair production of aquatic insects eaten by juvenile salmonids.

7. Embeddedness:

Embeddedness is defined as the percent of a cobble that is surrounded or embedded within fine sediment. The values are recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 is assigned to substrates deemed unsuitable for spawning due to inappropriate substrate particle size (e.g. bedrock) or other considerations. On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail crest is not suitable for spawning. Embeddedness, estimated by eye, is taken in pool habitat units at the pool tail crest.

8. Streambank Substrate and Vegetation:

Streambank substrate ranges from bedrock to silt/clay/sand, and may be covered with vegetation that indicates and enhances streambank stability. The dominant substrate type and the dominant vegetation type of both the right and left banks of the habitat unit are estimated by eye and recorded. Additionally, the percent of each bank covered by vegetation is estimated by eye and recorded.

9. Canopy:

Canopy density relates to the amount of stream shaded from the sun. Percentage canopy is measured using a handheld spherical densiometer. Within that percentage, the percentages of coniferous and deciduous trees are estimated by eye. Generally, a minimum of 80% canopy is desired to prevent excessively high stream temperatures, especially over streams not in the coastal fog belt.

SAMPLING STRATEGY

The samplers start at the stream mouth and proceed upstream. Stream flow is measured once, usually near the stream mouth. Channel type is determined near the stream mouth, and again at upstream locations where channel shape changes significantly. Air temperature and water temperature are recorded at every tenth habitat unit (the first unit on each field form page). At a minimum, all habitat units encountered are classified according to habitat type and measured for length. The first time a particular habitat type is encountered in the survey, it is fully sampled for

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components 4 through 9 above. Additionally, from the ten habitat units on each field form page, one is randomly selected for full sampling. All pool units are surveyed for maximum depth, pool tail crest depth, pool tail crest dominant substrate type, and pool tail crest substrate embeddedness. Canopy density is recorded for every third unit, in addition to every fully sampled unit. The survey ends where the samplers determine anadromous salmonid habitat ends.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence is observed from the stream banks during the habitat inventory survey. Additionally, selected sites are sampled using a Smith-Root Model 12-B electrofisher.

DATA ANALYSIS

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

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Standard tables and graphics are selected for inclusion in the stream inventory report based on their importance to the particular stream.

HABITAT INVENTORY RESULTS

Juan Creek

Ky Carnell and Sarah Adams (WSP) surveyed Juan Creek on June 27-30, July 25 and August 2, 2000. They surveyed 20,637 feet of main channel and 1144 feet of side channel.

The flow of Juan Creek on June 27, 2000 was measured at 3 cfs.

The Juan Creek channel type was classified as F4 throughout the survey. This signifies a well entrenched, meandering riffle/pool channel on low gradients (<2%) with high width/depth ratio and a gravel-dominated bottom.

Water temperatures taken during the survey period ranged from 50 to 60 degrees Fahrenheit; air temperatures ranged from 49 to 73 degrees Fahrenheit (Table 8).

At Level II habitat type resolution and by percent occurrence, Juan Creek had 37% riffle units, 25% flatwater units and 38% pool units (Table 1). By percent total length surveyed, Level II habitat types were 42% riffle, 30% flatwater, and 27% pool (Table 1).

Thirteen Level IV habitat types were found (Table 2). The most common types by percent occurrence were low-gradient riffles 35%, mid-channel pools 29% and runs 23%. By percent length these were 40% low-gradient riffle, 21% mid-channel pool and 27% run.

A total of 162 pools were identified (Table 3). Of those, 128 (79%) were main-channel pools, 32 (20%) were scour and 2 (1%) were backwater. Of the 162 pools, 96 (59%) had a maximum depth of 2 feet or more (Table 4).

In a first order and second order streams, a primary pool is defined as a pool with a maximum depth of at least 2 feet, occupies at least half the width of the low flow channel, and is as long as the low flow channel width. In Juan Creek, primary pools totaled 3917 feet, or 19% of the total stream surveyed.

Riffle habitat types had a mean shelter rating of 12, flatwater had a rating of 6 and pools had a rating of 26 (Table 1). Main-channel pools (the most common type) had a mean shelter rating of 29 (Table 2). Most of the in-stream cover in Juan Creek as a whole was large woody debris, small woody debris, and roots. There was also some cover provided by undercut banks, boulders, bedrock ledges, white water and terrestrial vegetation (Table 5).

Streambed substrate was dominated by gravel in the main habitat types (Table 6). Gravel was also the most common dominant substrate in pool tail-outs (48%), followed by small cobble (39%) and large cobble (9.3%).

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Pool tail crest embeddedness was estimated for 162 pools. Of those, 9 had a value of 1 (6%), 44 had a value of 2 (27%), 72 had a value of 3 (44%), 29 had a value of 4 (18%) and 8 had a value of 5 (5%) (Table 8). Of the pools with embeddedness 5, one had a silt substrate, one had sand substrate, two had boulder, two had bedrock, one had large cobble and one had gravel; two of those tail-outs were also covered by woody debris.

Stream bank substrate was dominated by cobble/gravel (68%) followed by silt/clay (27%) and bedrock (5%) (Table 9). Vegetation types on the streambank were mainly deciduous trees (78%) with some coniferous trees (11.4%), brush (8.8%) and a small amount of grass (1.75%) (Table 9).

The riparian canopy density averaged 81%, with 85% deciduous and 15% coniferous components (Table 8).

Little Juan Creek

Ky Carnell and Sarah Adams (WSP) partially surveyed Little Juan Creek on August 1, 2000, and Ky Carnell and D. Leibel completed the survey on August 23, 2000. They surveyed 3609 feet of main channel and 78 feet of side channel.

The flow in Little Juan Creek on July 28, 2000 was 0.6 cubic feet per second.

The Little Juan channel type was classified as C4 throughout the system. This signifies a slightly entrenched, low gradient, meandering, riffle-pool channel with a well-defined floodplain and gravel-dominated substrate.

Water temperatures taken during the survey period ranged from 53 to 59 degrees Fahrenheit; air temperatures ranged from 57 to 70 degrees Fahrenheit (Table 8).

At Level II habitat type resolution and by percent occurrence, Little Juan Creek had 38% riffle units, 30% flatwater units and 33% pool units (Table 1). By percent total length surveyed, the habitat types were 42% riffle, 41% flatwater, and 17% pool (Table 1).

Seven Level IV habitat types were found (Table 2). The most common types by percent occurrence were low-gradient riffles 38%, mid-channel pools 22% and runs 24%. By percent length these were 42% low-gradient riffle, 11% mid-channel pool and 22% run.

A total of 39 pools were identified (Table 3). Of those, 26 (67%) were main-channel pools and 13 (33%) were scour. Of the 39 pools, 3 (7%) had a maximum depth of 2 feet or more (Table 4). Those primary pools totaled 42 feet, or 1% of the total stream length surveyed.

Shelter rating averages were 8 for riffles, 16 for flatwater and 40 for pools (Table 1). Main-channel pools (the most common type) had a mean shelter rating of 46 (Table 2). Most instream cover in Little Juan Creek was large woody debris, small woody debris, and terrestrial vegetation with some roots (Table 5).

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Streambed substrate was dominated by gravel and cobble in the low-gradient riffles and the runs. Mid-channel pools were dominated by sand and gravel (Table 6). Gravel was the most common dominant substrate in pool tail-outs (95%), followed by small cobble (5%).

Pool tail crest embeddedness was estimated for 39 pools. Of those, 4 had a value of 1 (10%), 11 had a value of 2 (28%), 20 had a value of 3 (51%), 4 had a value of 4 (10%) and 0 had a value of 5 (Table 8).

Stream bank substrate was dominated by silt/clay (63%) followed by gravel/cobble (37%) (Table 9). Vegetation types on the streambank were mainly deciduous trees (50%) and brush (44%) (Table 9).

The riparian canopy density averaged 81%, with 85% deciduous and 15% coniferous components (Table 8).

BIOLOGICAL INVENTORY RESULTS

On October 17, 2000, three sites on Juan Creek and 3 sites on Little Juan Creek were electrofished by Doug Albin (DFG) and Bethany Lourie (WSP). On Juan Creek the sites were habitat units 35, 37 and 39, all above the Little Juan confluence. On Little Juan the sites were habitat units 10, 11 and 14. The sampling yielded 2 age 1+ steelhead, 4 young-of-year steelhead and 3 coast range sculpin from Juan Creek from 120 feet of stream, and 6 young-of-year steelhead on Little Juan from 90 feet of stream. No coho salmon were found.

DISCUSSION

Juan Creek

With respect to instream fish habitat improvements, as an F4 channel type Juan Creek is very well suited for bank-placed boulders, and is fairly well suited for plunge weirs, single/opposing wing deflectors, channel constrictors and log cover.

Water temperatures recorded on the survey days were within acceptable range for steelhead and coho rearing. However continuous monitoring of stream temperature throughout the warm season would be necessary to verify temperature suitability. Given the stream's location in the coastal fog belt stream and the high density of canopy coverage, it is unlikely that temperatures are unsuitable.

DFG data indicate that better coastal coho streams have as much as 40% of their length in primary pools. Juan Creek had 27% of its length in pools, and 20% in primary pools. Thus the creation of pools or pool enhancement is desirable.

The dominance of gravel (48%) and small cobble (39%) in Juan Creek pool tail-outs would generally indicate good spawning habitat for salmonids. However embeddedness ratings were

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high, suggesting a lower spawning substrate quality due to the presence of fine sediments. Only 6% of pool tail-outs had an embeddedness rating of 1 while 67% had a rating of 3 or higher. A riparian road above the creek could be a major source of sediment.

The mean shelter ratings for pool, flatwater and riffle habitats were all much below the minimum desirable rating of 100.

The mean canopy density of 81% places canopy revegetation at a relatively low priority. The mean stream bank vegetative cover values do not indicate a high priority for bank revegetation efforts, except perhaps in local areas.

Little Juan Creek

With respect to restoration efforts, as a C4 channel, Little Juan Creek lends itself very well to bank-placed boulders. It is fairly suitable for plunge weirs, single and opposing wing deflectors, channel constrictors and log cover.

Water temperatures recorded in Little Juan Creek were within acceptable range for salmonids, although, as in Juan Creek, further monitoring throughout the summer months would be needed to verify temperature suitability.

Little Juan Creek had a very low percentage of its length in primary pools. Thus pool creation and enhancement appear desirable in restoring salmonid habitat.

Little Juan Creek's pool tail-outs were largely gravel-dominated (95%) with some cobble-dominated sites (5%). This would generally be accepted as suitable spawning habitat, except that embeddedness values were high, with only 10% of sites having value 1 and 62% having values of 3 or 4.

The mean shelter ratings for pool, flatwater and riffle habitats were all much below the minimum desirable rating of 100.

A high percentage of pools were dominated by either sand or silt/clay, which presents further evidence of bed filling and fine sediment impacts. Like Juan Creek, Little Juan Creek has a road running along much of the stream, which could be a major source of sediment.

The mean canopy density of 81% places canopy revegetation at a relatively low priority. The mean stream bank vegetative covers place streambank vegetation at a low priority as well, except perhaps in specific areas.

RECOMMENDATIONS

- 1) Juan Creek and Little Juan Creek should be managed as an anadromous, natural production streams. If habitat conditions sufficiently recover, consideration should be given to introduction of a compatible strain of coho salmon.

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- 2) Active and potential sediment delivery from roads and other sources in the watershed should be identified, mapped, and quantified. Sources should be treated according to their potential for sediment yield to the stream and its tributaries. This kind of source control will hasten stream recovery from excess sedimentation.
- 3) Instream wood should be increased to improve shelter rating, help sort sediments, and increase the depths of existing pools.

COMMENTS AND LANDMARKS

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

Juan Creek

Position

(ft): Comments:

0	Start of survey 148 feet east of bridge.
84	Canopy is sparse, banks are steep.
436	Young-of-the-year (YOY) and 1+ salmonids observed.
1,017	Large debris accumulation (LDA) measures 30' long x 30' wide x 5' high. Fish passage under LDA.
1,167	LDA measures 12' long x 10' wide x 3' high. LDA is not blocking flow.
1,208	Lot of downed trees, mostly alders.
1,497	LDA measures 3' long x 10' wide x 5' high.
1,548	LDA measures 15' long x 28' wide x 4' high. The LDA is not blocking flow.
1,715	Little Juan Creek enters on left bank.
2,065	Road 30' above creek on left bank.
2,801	Standing pool on right bank probably forms a side channel at higher flows.
3,491	LDA measures 35' long 8' high x 30' wide. Some of the logs are cabelled. Fish passage under the LDA.
3,511	1+ observed.

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- 4,160 LDA measures 14' long x 18' wide x 3' high. Water flows under the LDA.
- 4,174 Old redd. Steelhead YOY observed.
- 4,458 Part flowing underground (mostly small cobble).
- 6,144 Left bank slide on steep slope, many fallen trees in creek. Approximately 50' from creek, at the end of unit 0123 & start of 0124.
- 6,236 LDA measures approx. 8' high.
- 6,334 Many steelhead observed.
- 6,441 LDA measures 8' long x 28' wide x 3' high. Fish passage under LDA.
- 6,610 LDA.
- 6,623 LDA.
- 6,674 LDA measures 8' long x 5' high
- 6,695 Large left bank slide on steep slope extends over next few units.
- 6,783 LDA measures 52' long 20' wide x 7' high. Water flows under the LDA on the left bank side. The debris is very dense on the upstream end.
- 6,876 Pool tail crest covered by woody debris. Many fish observed, mostly 1+ salmonids. Slide on steep slope all along unit. A tributary enters on the right bank. The tributary parallels the creek for next unit and half. The tributary is not accessible to fish.
- 7,419 LDA measures 60' long x 30' wide x 6' high.
- 7,829 LDA measures 10' long x 20' wide x 2' high.
- 8,306 LDA.
- 8,462 Small woody debris accumulation.
- 9,360 LDA on left bank half of the channel measures 6' high.
- 9,422 Trib enters on the left bank.
- 10,813 Two steps, the first measures two feet high, the second measures one foot high. The maximum depth below the steps is 0.8 feet. LDA measures 40' long x 25' wide x 8'high.

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- 11,173 Tributary enters on left bank.
- 11,481 9 foot high plunge. The maximum depth below the plunge is 6.3 feet.
- 12,360 Tributary enters on right bank.
- 12,630 12" salmonids observed.
- 13,502 LDA measures 11' long x 25' wide x 3' high.
- 13,576 LDA measures 18' long x 18' wide x 6' high.
- 13,861 Right bank slide.
- 14,211 North Fork Juan Creek enters on right bank.
- 15,798 3' high plunge.
- 16,502 Tributary enters on left bank.
- 17,560 Pool tail crest mostly wood. Waterfall consists of a 6 foot high jump to first ledge then gains 10 feet in elevation over 8 feet in length with little ledges along the way. Bedrock and small woody debris on the banks.
- 17,776 LDA measures 7' long x 22' wide x 4' high.
- 18,204 4' high jump to next unit.
- 18,529 Tributary enters on right bank.
- 19,303 3' high jump to next unit.
- 19,713 Tributary enters on right bank.
- 19,762 LDA in middle of unit measures 10' high. The LDA is retaining sediment. A tributary enters on the left bank.
- 20,637 End of survey. Barrier at top of unit is a large LDA with vegetation growing out of top of it and little water flowing through. No fish were observed in 100 feet upstream of the LDA.

Little Juan Creek

Position
(ft): Comments:

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- 102 YOY observed. LDA measures 5' long x 15' wide x 2' high.
- 150 LDA measures 13' wide x 2' long x 3' high.
- 189 Bridge through unit, 6.5' above water.
- 368 Flow and channel type measured.
- 692 LDA measures 10' wide x 2' long x 2' high.
- 707 Hollow tubing 1" diameter in unit.
- 849 LDA measures 25' long x 3' wide x 2' high.
- 1,259 Rusted metal sheets in creek.
- 2,406 LDA measures 9' high 20' wide x 51' long, possible beginning of end of anadromy. Many pieces of large wood extend for a very long time, not much small.
- 2,493 Tributary enters on left bank. No fish observed in the tributary.
- 2,550 Fish observed, unsure if salmonid.
- 2,809 LDA at top of unit measures 8' high 18' wide 25' long. Gravel is backed up behind the LDA,.
- 3,162 LDA at top of unit measures 4' high x 15' wide x 5' long.
- 3,173 Old road on right bank, 20' up(off and on for entire survey).
- 3,360 Large fish seen, not likely salmonid.
- 3,433 LDA measures 6' high x 30' wide x 18' long. Water is very still under LDA. Vegetation (ferns, billberries) is growing out of top of LDA. Water goes subsurface and trickles in one part. Part that is trickling -hole to jump through is 3'tall then 4'tall, 2nd part is dry. Water does not go over LDA, all water goes under.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]
High Gradient Riffle	(HGR)	[1.2]

CASCADE

Cascade	(CAS)	[2.1]
Bedrock Sheet	(BRS)	[2.2]

FLATWATER

Pocket Water	(POW)	[3.1]
Glide	(GLD)	[3.2]
Run	(RUN)	[3.3]
Step Run	(SRN)	[3.4]
Edgewater	(EDW)	[3.5]

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]
Mid-Channel Pool	(MCP)	[4.2]
Channel Confluence Pool	(CCP)	[4.3]
Step Pool	(STP)	[4.4]

SCOUR POOLS

Corner Pool	(CRP)	[5.1]
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]
Plunge Pool	(PLP)	[5.6]

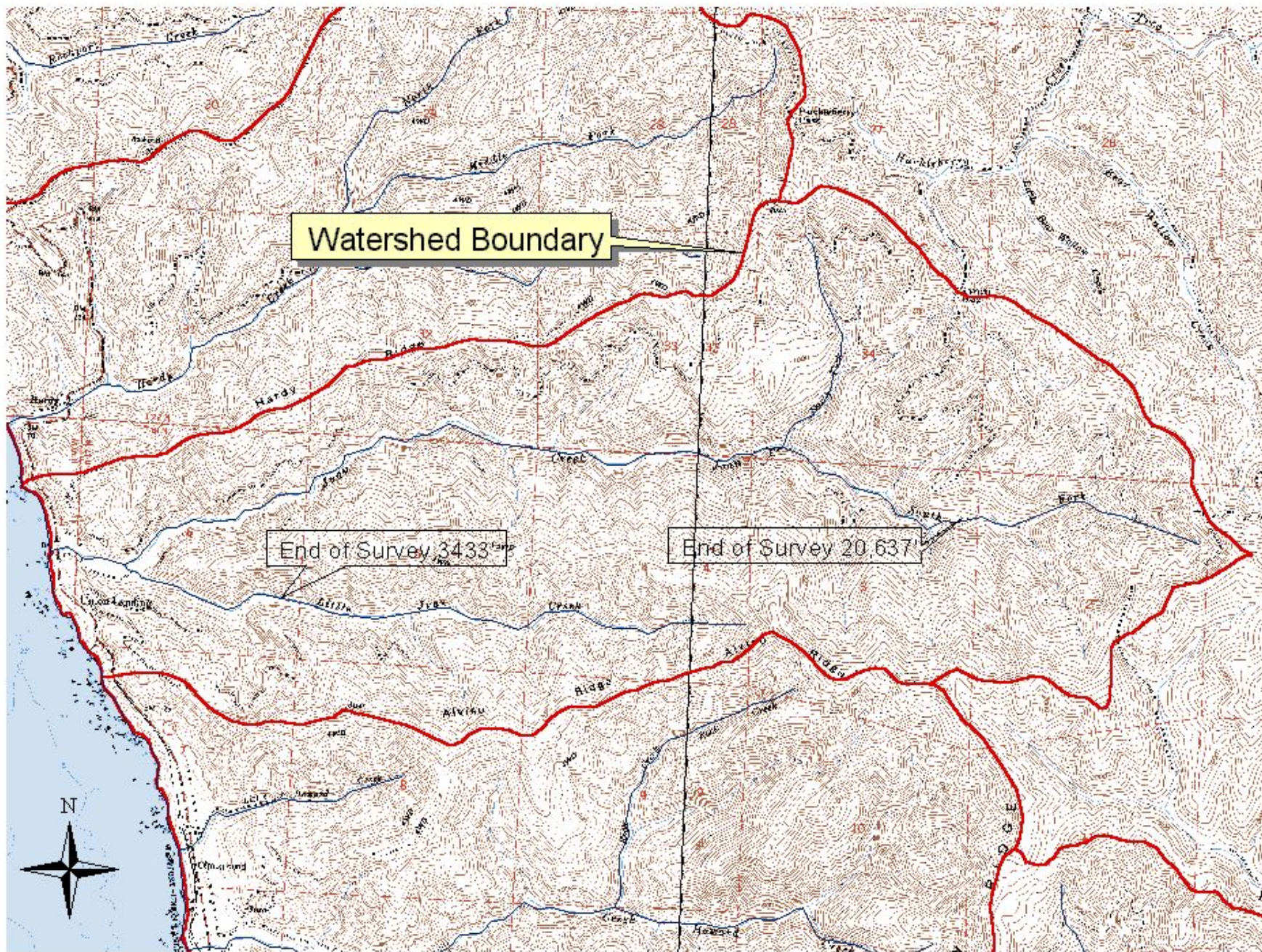
BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]
Backwater Pool - Boulder Formed	(BPB)	[6.2]
Backwater Pool - Root Wad Formed	(BPR)	[6.3]
Backwater Pool - Log Formed	(BPL)	[6.4]
Dammed Pool	(DPL)	[6.5]

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]
Culvert	(CUL)	[8.0]
Not Surveyed	(NS)	[9.0]
Not Surveyed due to a marsh	(MAR)	[9.1]

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Map 1



Juan Creek (including Little Juan Creek)

Juan Creek

Drainage: Pacific Ocean

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

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN ESTIMATED VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
157	15	RIFFLE	37	59	9187	42	11.7	0.3	545	85562	186	29216	0	12
108	15	FLATWATER	25	61	6611	30	13.7	0.6	719	77615	505	54588	0	6
162	162	POOL	38	37	5985	27	14.6	1.1	641	103839	866	140227	614	26
1	0	DRY	0	13	13	0	0.0	0.0	0	0	0	0	0	0
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)				TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)			
428	192				21796				267016		224031			

Juan Creek

Drainage: Pacific Ocean

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN MAXIMUM DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN EST. VOLUME (cu.ft.)	TOTAL EST. VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING	MEAN CANOPY	
151	14	LGR	35	57	8655	40	12	0.3	1.2	582	87868	198	29955	0	13	81
6	1	HGR	1	89	532	2	4	0.5	0.7	28	168	14	84	0	0	88
2	1	GLD	0	90	179	1	24	1.0	1.5	3408	6816	3408	6816	0	10	79
100	13	RUN	23	58	5847	27	13	0.6	1.9	449	44904	250	25024	0	6	82
6	1	SRN	1	98	585	3	14	0.6	1.7	1534	9206	921	5524	0	5	90
125	125	MCP	29	36	4488	21	15	1.1	6.3	670	83706	929	116072	667	29	80
3	3	STP	1	78	233	1	14	1.1	3.6	1295	3884	1669	5006	1079	38	66
2	2	CRP	0	44	88	0	14	0.7	1.7	657	1313	504	1009	242	13	87
3	3	LSL	1	18	53	0	14	0.7	1.9	229	686	140	419	44	22	79
1	1	LSR	0	38	38	0	20	0.8	2.9	760	760	608	608	304	50	92
23	23	LSEK	5	43	984	5	12	1.2	3.9	535	12296	688	15821	482	8	89
3	3	PLP	1	25	75	0	13	1.2	2.8	321	963	377	1130	247	12	86
2	2	SCP	0	13	26	0	9	0.7	1.2	115	230	82	163	51	0	60
1	0	DRY	0	13	13	0	0	0.0	0.0	0	0	0	0	0	0	0
TOTAL UNITS	TOTAL UNITS				LENGTH (ft.)				AREA (sq. ft)		TOTAL VOL. (cu. ft)					
428	192				21796				252801		207630					

Juan Creek (including Little Juan Creek)

Juan Creek

Drainage: Pacific Ocean

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
128	128	MAIN	79	37	4721	79	15.2	1.1	684	87591	946	121078	677	30
32	32	SCOUR	20	39	1238	21	12.7	1.1	501	16018	593	18986	398	11
2	2	BACKWATER	1	13	26	0	8.5	0.7	115	230	82	163	51	0
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)				TOTAL AREA (sq.ft.)			TOTAL VOL. (cu.ft.)		
162	162				5985				103839			140227		

Juan Creek

Drainage: Pacific Ocean

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

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
125	MCP	77	2	2	48	38	53	42	16	13	6	5
3	STP	2	0	0	2	67	0	0	1	33	0	0
2	CRP	1	0	0	2	100	0	0	0	0	0	0
3	LSL	2	0	0	3	100	0	0	0	0	0	0
1	LSR	1	0	0	0	0	1	100	0	0	0	0
23	LSBk	14	0	0	6	26	10	43	7	30	0	0
3	PLP	2	0	0	1	33	2	67	0	0	0	0
2	SCP	1	1	50	1	50	0	0	0	0	0	0

TOTAL

UNITS

162

Juan Creek (including Little Juan Creek)

Juan Creek

Drainage: Pacific Ocean

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN ‡ UNDERCUT BANKS	MEAN ‡ SWD	MEAN ‡ LWD	MEAN ‡ ROOT MASS	MEAN ‡ TERR. VEGETATION	MEAN ‡ AQUATIC VEGETATION	MEAN ‡ WHITE WATER	MEAN ‡ BOULDERS	MEAN ‡ BEDROCK LEDGES
151	9	LGR	6	27	23	15	19	0	0	10	0
6	0	HGR	0	0	0	0	0	0	0	0	0
2	1	GLD	0	45	30	0	25	0	0	0	0
100	6	RUN	22	24	12	6	13	0	0	23	0
6	1	SRN	0	0	0	0	0	0	0	100	0
125	108	MCP	10	27	38	14	3	0	0	6	1
3	3	STP	0	15	10	35	0	0	2	35	3
2	2	CRP	0	18	78	0	5	0	0	0	0
3	3	LSL	0	40	47	13	0	0	0	0	0
1	1	LSR	0	15	0	85	0	0	0	0	0
23	14	LSBk	14	7	4	45	8	0	0	7	15
3	3	PLP	0	3	62	18	13	0	3	0	0
2	0	SCP	0	0	0	0	0	0	0	0	0
1	0	DRY	0	0	0	0	0	0	0	0	0

Juan Creek

Drainage: Pacific Ocean

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 06/27/00 to 08/02/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR18WS1 LATITUDE:39°42'13" LONGITUDE:123°48'11"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	‡ TOTAL SILT/CLAY DOMINANT	‡ TOTAL SAND DOMINANT	‡ TOTAL GRAVEL DOMINANT	‡ TOTAL SM COBBLE DOMINANT	‡ TOTAL LG COBBLE DOMINANT	‡ TOTAL BOULDER DOMINANT	‡ TOTAL BEDROCK DOMINANT
151	14	LGR	0	0	71	21	7	0	0
6	1	HGR	0	0	0	0	0	0	100
2	1	GLD	0	0	100	0	0	0	0
100	13	RUN	0	8	54	38	0	0	0
6	1	SRN	0	0	0	0	100	0	0
125	18	MCP	39	0	50	11	0	0	0
3	2	STP	0	0	50	0	50	0	0
2	1	CRP	0	0	100	0	0	0	0
3	2	LSL	0	0	100	0	0	0	0
1	1	LSR	0	0	100	0	0	0	0
23	3	LSBk	33	0	67	0	0	0	0
3	2	PLP	50	0	50	0	0	0	0
2	1	SCP	0	0	100	0	0	0	0
1	0	DRY	0	0	0	0	0	0	0

Juan Creek (including Little Juan Creek)

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Juan Creek
 SAMPLE DATES: 06/27/00 to 08/02/00
 STREAM LENGTH: 20652 ft.
 LOCATION OF STREAM MOUTH:
 USGS Quad Map: Westport Latitude: 39°42'13"
 Legal Description: T21NR18WS1 Longitude: 123°48'11"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1
 Channel Type: F3 Canopy Density: 81%
 Channel Length: 20652 ft. Coniferous Component: 15%
 Riffle/flatwater Mean Width: 13 ft. Deciduous Component: 85%
 Total Pool Mean Depth: 1.2 ft. Pools by Stream Length: 27%
 Base Flow: 3.0 cfs Pools >=3 ft.deep: 20%
 Water: 50 - 60 °F Air: 49 -73 °F Mean Pool Shelter Rtn: 30
 Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Large Woody Debris
 Vegetative Cover: 85% Occurrence of LOD: 33%
 Dom. Bank Substrate: Cobble/Gravel Dry Channel: 0 ft.

Embeddness Value: 1. 6% 2. 2.27% 3. 44% 4. 18% 5. 5%

Table 9.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	5	1	5.26
Boulder	0	0	0
Cobble/Gravel	35	42	67.54
Silt/clay	17	14	27.19

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	2	0	1.75
Brush	6	4	8.77
Decid. Trees	44	45	78.07
Conif. Trees	5	8	11.40
No Vegetation	0	0	0

Total stream average embeddedness value for pool 2.86

Juan Creek (including Little Juan Creek)

Little Juan Creek

Drainage: Juan Creek

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

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN ESTIMATED VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
45	5	RIFFLE	38	35	1564	42	7.4	0.2	123	5522	36	1607	0	8
36	5	FLATWATER	30	42	1506	41	8.0	0.5	335	12048	143	5134	0	16
39	39	POOL	33	16	617	17	10.0	0.7	158	6154	122	4748	86	40
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)					TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)		
120	49				3687					23725		11490		

Little Juan Creek

Drainage: Juan Creek

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	TOTAL LENGTH (%)	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN MAXIMUM DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING	MEAN CANOPY (%)
45	5	LGR	38	35	1564	42	7	0.2	0.8	123	5522	36	1607	0	8	75
29	3	RUN	24	28	821	22	9	0.4	0.9	140	4070	58	1696	0	13	84
7	2	SRN	6	98	685	19	7	0.5	1.1	626	4383	269	1882	0	20	83
26	26	MCP	22	16	424	11	10	0.7	2.1	171	4436	135	3499	99	46	83
1	1	CRP	1	14	14	0	8	0.4	1.0	101	101	40	40	10	20	88
7	7	LSL	6	15	107	3	7	0.7	2.6	110	768	82	574	49	45	80
5	5	PLP	4	14	72	2	12	0.8	1.9	170	849	127	635	90	7	92
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)					AREA (sq.ft)		TOTAL VOL. (cu.ft)				
120	49				3687					20129		9933				

Juan Creek (including Little Juan Creek)

Little Juan Creek

Drainage: Juan Creek

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
26	26	MAIN	67	16	424	69	10.4	0.7	171	4436	135	3499	99	46
13	13	SCOUR	33	15	193	31	9.2	0.7	132	1718	96	1249	62	28
TOTAL UNITS	TOTAL UNITS				TOTAL LENGTH (ft.)				TOTAL AREA (sq.ft.)		TOTAL VOL. (cu.ft.)			
39	39				617				6154		4748			

Juan Creek (including Little Juan Creek)

Little Juan Creek

Drainage: Juan Creek

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

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT		1-<2 FT.		2-<3 FT.		3-<4 FT.		>=4 FEET	
			MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE	MAXIMUM DEPTH	PERCENT OCCURRENCE
26	MCP	67	4	15	20	77	2	8	0	0	0	0
1	CRP	3	0	0	1	100	0	0	0	0	0	0
7	LSL	18	0	0	6	86	1	14	0	0	0	0
5	PLP	13	1	20	4	80	0	0	0	0	0	0
TOTAL UNITS												
39												

Little Juan Creek

Drainage: Juan Creek

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
			BANKS								
45	3	LGR	0	10	17	0	70	0	0	3	0
29	2	RUN	35	20	0	0	45	0	0	0	0
7	2	SRN	5	0	70	20	5	0	0	0	0
26	19	MCP	20	19	41	8	11	0	0	0	0
1	1	CRP	20	10	0	0	70	0	0	0	0
7	7	LSL	9	19	48	0	25	0	0	0	0
5	4	PLP	13	13	50	0	25	0	0	0	0

Little Juan Creek

Drainage: Juan Creek

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/01/00 to 08/23/00

Confluence Location: QUAD: Westport LEGAL DESCRIPTION: T21NR17WS6 LATITUDE:39°42'8" LONGITUDE:123°47'49"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
			45	5	LGR	0	0	40	40
29	3	RUN	0	0	67	33	0	0	0
7	2	SRN	0	100	0	0	0	0	0
26	9	MCP	11	44	33	11	0	0	0
1	1	CRP	0	0	0	100	0	0	0
7	4	LSL	0	0	25	75	0	0	0
5	1	PLP	0	100	0	0	0	0	0

Juan Creek (including Little Juan Creek)

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Little Juan Creek
 SAMPLE DATES: 08/01/00 to 08/23/00
 STREAM LENGTH: 3609 ft.
 LOCATION OF STREAM MOUTH:
 USGS Quad Map: Westport Latitude: 39°42'8"
 Legal Description: T21NR17WS6 Longitude: 123°47'49"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH
 Channel Type: C4 Canopy Density: 81%
 Channel Length: 3609 ft. Coniferous Component: 11%
 Riffle/flatwater Mean Width: 8 ft. Deciduous Component: 89%
 Total Pool Mean Depth: 0.7 ft. Pools by Stream Length: 17%
 Base Flow: 0.6 cfs Pools >=3 ft.deep: 0%
 Water: 53 - 59 °F Air: 57 -70 °F Mean Pool Shelter Rtn: 42
 Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Large Woody Debris
 Vegetative Cover: 73% Occurrence of LOD: 40%
 Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.

Embeddness Value: 1. 10% 2.28% 3. 51% 4. 10% 5. 0%

Table 9.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	11	8	36.5
Silt/clay	15	18	63.5

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	3	0	5.8
Brush	10	13	44.2
Decid. Trees	13	13	50
Conif. Trees	0	0	0
No Vegetation	0	0	0

Total stream average embeddedness value for pool 2.6