CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Howell Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Howell Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Howell Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions, and 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

Howell Creek is a tributary of the Russian River, located in Mendocino County, California (see Howell Creek map, page 2). The legal description at the confluence with the Russian River is T14N, R12W, S4. Its location is 39°05'48" N. latitude and 123°10'36" W. longitude. Year round vehicle access exists from Highway 101 near Ukiah, via River Road.

Howell Creek and its tributaries drain a basin of approximately 8.19 square miles. Howell Creek is a third order stream and has approximately 5.5 miles of blue line stream, according to the USGS Elledge Peak 7.5 minute quadrangle. Major tributaries include two unnamed tributaries and are included in this report. Summer flow was measured as approximately 0.27 cfs at the survey start location. Elevations range from about 546 feet at the mouth of the creek to 2200 feet in the headwaters. Oak-woodland forest dominates the watershed, but there are zones of grassland in the watershed. The watershed is entirely privately owned and is managed for grazing and vineyard purposes.

METHODS

The habitat inventory conducted in Howell Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 Howell Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote Temperature recorders which log temperature every two hours, 24 hours/day.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "DRY". Howell Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Howell Creek, embeddedness was visually

estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4) or "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Howell Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Howell Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated visually into percentages of evergreen or deciduous trees.

9. Bank Composition:

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 Howell Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1)

stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Howell Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

No historical stream surveys exist for Howell Creek.

HABITAT INVENTORY RESULTS FOR HOWELL CREEK

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

The habitat inventory of July 8 - 14, 1998 was conducted by Janet Lester and Jennifer Jenkins (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with the Russian River and extended up Howell Creek to the end of survey. The total length of the stream surveyed was 14254 feet, with an additional 11 feet of side channel.

A flow of 0.27 cfs was measured July 14, 1998 at the survey start location with a Marsh-McBirney Model 2000 flowmeter.

This section of Howell Creek has 1 channel type: from the mouth to 14254 feet a B4. B4 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly gravel substrate.

Water temperatures ranged from 64°F to 69°F. Air temperatures ranged from 65°F to 87°F. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 1 logged temperatures every 2 hours from July 13 - September 5, 1998. The highest temperature recorded was 78°F in July and the lowest was 62°F in August.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 58% flatwater units, 28% pool units, 11% riffle units, and 2% dry streambed units. Based on total **length** there were 53% flatwater units, 39% dry streambed units, 4% pool units, and 3% riffle units (Graph 1).

Ninety-six habitat units were measured and 16% were completely sampled. Thirteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were glides at 25%, runs 22%, mid-channel pools 16% and step runs 11% (Graph 2). By percent total **length**, dry streambed made up 39%, glides 29%, runs 13%, and step runs 11%.

Twenty-seven pools were identified (Table 3). Main Channel pools were most often encountered at 56%, and comprised 64% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One of the 27 pools (4%) had a depth of three feet or greater (Graph 4). These deeper pools comprised <1% of the total length of stream habitat.

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. Flatwater types had the highest shelter rating at 28. Pool had the lowest rating with 11 and riffle rated 13 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 16, backwater pools rated 13, and main channel pools rated 6 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were undercut banks at 42%, boulders 28%, aquatic vegetation 11%, and root masses 10%. Graph 5 describes the pool shelter in Howell Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 2 of the 2 low gradient riffles measured. Small cobble was dominant in 0 of the low

gradient riffles (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 27 pool tail-outs measured, two had a value of 1 (7%); six had a value of 2 (22%); seven had a value of 3 (26%); and ten had a value of 4 (37%). Two (7%) pool tail-outs rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 60% (100% deciduous). Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 87% and the mean percent left bank vegetated was 86%. For the habitat units measured, the dominant vegetation types for the stream banks were: 60% grass, 35% deciduous trees, and 5% brush. The dominant substrate for the stream banks were: 95% silt/clay/sand and 5% cobble/gravel (Graph 10).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY #1

The habitat inventory of Unnamed Tributary #1 was conducted on July 15, 1998 by Jennifer Jenkins and Janet Lester (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with Howell Creek and extended up Unnamed Tributary #1 to the end of survey. The total length of the stream surveyed was 13792 feet. Flows were not measured on Unnamed Tributary #1.

This section of Unnamed Tributary #1 has 1 channel types: from the mouth to 13792 feet a B4. Water temperatures ranged from 64 °F to 70 °F. Air temperatures ranged from 81 °F to 84 °F.

*Based on frequency of **occurrence** there were 50% dry streambed units, 44% flatwater units, and 6% pool units. Based on total **length** there were 88% dry streambed units and 12% flatwater units. The most frequent habitat types by percent **occurrence** were dry streambed at 50%, glide 38%, runs 6% and corner pools 6%. By percent total **length**, dry streambed made up 88%, glides 6%, and runs 6%. The one pool identified was a scour pool, less than two feet deep.*

Flatwater types had the highest shelter rating at 5. The one pool identified had no available shelter. No low gradient riffles were observed during the survey. The one pool tail-out measured had a value of 4 (100%). Gravel was the dominant substrate observed at the pool tail-out.

The mean percent canopy density for the stream reach surveyed was 83% (100% deciduous). Mean percent right bank vegetated was 48% and the mean percent left bank vegetated was 38% (dominant vegetation type was: 100% deciduous trees). The dominant substrate for the stream banks was: 100% silt/clay/sand.

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY #2

The habitat inventory of Unnamed Tributary #2 was conducted on July 8 and 21, 1998 by Jennifer Jenkins and Janet Lester (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with Howell Creek and extended up Unnamed Tributary #2 to the end of survey. The total length of the stream surveyed was 13972 feet.

A flow of 0.1 cfs was measured July 15, 1998 at habitat unit #018 with a Marsh-McBirney Model 2000 flowmeter.

The water temperature was 90 ℉. Air temperatures ranged from 89 ℉ to 102 ℉.

Based on frequency of ***occurrence*** *there were 47% flatwater units, 32% pool units, and 21% dry streambed units. Based on total* ***length*** *there were 74% dry streambed units, 25% flatwater units, and 2% pool units. The most frequent habitat types by percent* ***occurrence*** *were corner pools at 21%, dry streambed 21%, glides 16% and runs 16%. By percent total* ***length****, dry streambed made up 74%, runs 11%, step runs 11%, and glides 3%.*

Twelve pools were identified. Scour pools were most often encountered at 67%, and comprised 64% of the total length of pools. All had a depth of two feet or less.

Pool types had the highest shelter rating at 5. Of the pool types, the main channel pools had the highest mean shelter rating at 5 and scour pools rated 5. By percent area, the dominant pool shelter types were terrestrial vegetation at 38%, undercut banks 36%, and aquatic vegetation 26%. No low gradient riffles were observed during the survey.

Of the 12 pool tail-outs measured, none had a value of 1 (0%); three had a value of 2 (25%); one had a value of 3 (8%); and six had a value of 4 (50%). Two (17%) pool tail-outs rated a 5 (unsuitable substrate type for spawning). Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 38% (100% deciduous). Mean percent right bank vegetated was 93% and the mean percent left bank vegetated was 94% (dominant vegetation type: 100% grass). The dominant substrate for the stream banks was: 100% silt/clay/sand.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On September 9, 1998 a recent biological inventory was conducted in two sites of Howell Creek to document the fish species composition and distribution at several locations. Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream. At the time of the biological inventory, Howell Creek had dried up except for the pools. The air temperature was 71°F and the water temperature ranged from 67°F to 69°F. The observers were Janet Lester and Paul Retherford (AmeriCorps).

The inventory of Reach 1 started 10,011 feet upstream from the confluence with the Russian River and continued for approximately 29 feet upstream. In pool habitat types two 1+ steelhead were observed along with many unidentified frogs.

The inventory of Reach 1 was continued starting 11,322 feet upstream from the confluence with the Russian River and ending approximately 39 feet upstream. In pool habitat types one 0+, three 1+, and two 2+ steelhead were observed along with many unidentified frogs.

Unnamed Tributary #1 and Unnamed Tributary #2 were not electrofished.

During the habitat inventory, no salmonids were observed in Unnamed Tribuatary #1.

A summary of recent data collected appears in the table below.

Table 1. Species Observed in Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1998	Steelhead	DFG	N
1998	California Newt	DFG	N

Historical records reflect that no hatchery stocking, transfers, or rescues have occurred in the watershed.

ADULT SURVEYS:

A spawning/carcass survey was conducted in Howell Creek and Unnamed Tributary #2 on March 3, 1999. The air temperature was 49°F and the water temperature was 47°F. The observers were Sean Higgins and Mike Lucas (AmeriCorps). The survey started at the mouth of Howell Creek and ended approximately three miles upstream in Unnamed Tributary #2. No fish, carcasses, or redds were observed during the survey.

DISCUSSION FOR HOWELL CREEK

Howell Creek has one channel type, B4 (14254 ft.).

There are 14254 feet of B4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, B4 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.

These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

The water temperatures recorded on the survey days July 8 - 14, 1998 ranged from 64°F to 69°F. Air temperatures ranged from 65°F to 87°F. These temperatures are slightly above the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 62° to 78°F for Reach 1. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures above the optimal for salmonids.

Our electrofishing samples found steelhead more frequently in the upper, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and\or more extensive biological sampling conducted.

Pools comprised 4% of the total **length** of this survey. In third and fourth order streams a primary pool is defined to have a maximum 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. In Howell Creek, the pools are relatively shallow with 4% having a maximum depth of at least 3 feet. These pools comprised <1% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 11. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by undercut banks (42%), boulders (28%), aquatic vegetation (11%), and root masses (10%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Two of the two low gradient riffles measured (100%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Sixty-three percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 7% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The higher percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Howell Creek, Reach 1 sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 60%. This is a low percentage of canopy, since 80

percent is generally considered desirable. Cooler water temperatures are desirable in Howell Creek. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

The riparian buffer is thin or nearly absent in areas with livestock and agriculture development. Riparian removal and intensive grazing within the riparian corridor leads to less stream canopy and channel migration causing bank erosion and higher water temperatures.

DISCUSSION FOR UNNAMED TRIBUTARY #1

Howell Creek - Unnamed Tributary #1 has one channel type: B4 (13792 ft.).

The water temperatures recorded on the survey day July 15, 1998 ranged from 64 °F to 70 °F. Air temperatures ranged from 81 °F to 84 °F. These temperatures, if sustained, are above the threshold stress level (65 °F) for salmonids.

*Pools comprised <1% of the total **length** of this survey. The one pool identified had no available shelter.*

No low gradient riffles were observed, which typically provide the habitats and substrates which are ideal for salmonid spawning habitat.

One-hundred percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. The mean percent canopy for the survey was 83%. This is good, since 80 percent is generally considered desirable. However, there are numerous bank erosion problems. This reach as well as other areas with bank erosion could benefit from bio-technical re-vegetation techniques using native species.

DISCUSSION FOR UNNAMED TRIBUTARY #2

Howell Creek - Unnamed Tributary #2 has one channel type: B4 (13972 ft.).

The water temperature recorded on the survey days July 8 and July 21, 1998 was 90 °F. Air temperatures ranged from 89 °F to 102 °F. These temperatures, if sustained, are above the threshold stress level (65 °F) for salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the upper, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and\or more extensive biological sampling conducted.

*Pools comprised only 2% of the total **length** of this survey, and were less than 2 feet deep. The mean shelter rating for pools was 5. The relatively small amount of pool shelter that now exists is being*

provided primarily by terrestrial vegetation (38%), undercut banks (36%), and aquatic vegetation (26%).
No low gradient riffles were observed. Fifty-eight percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4.

The mean percent canopy for the survey was 38%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

SUMMARY

The 1998 summer surveys documented 0+ fish indicating successful spawning in the middle and upper reaches of Howell Creek. However, few 1+ fish were observed indicating poor rearing conditions and poor holding-over conditions in general. No prior surveys have been conducted by (DFG), however, landowners indicate overall habitat conditions for steelhead have declined over time.

The only spawning and rearing habitat in the watershed exists within the upper portion of the creek, where livestock and vineyard development is absent.

In the middle portion of the creek spawning and rearing habitat quality is low due to the effects of eroding stream banks, lack of riparian habitat, and increased temperatures and nutrient runoff from agriculture and livestock.

Below Eastside Road, the lower reach has been channelized and levied, thus stream velocity has increased resulting in streambank erosion and loss of mature riparian. Little riffle habitat exists for spawning, and what does exist is unsuitable for spawning due to high gravel embeddedness. The unstable banks and effects of channelization in these reaches limits instream habitat improvement alternatives, although some opportunity exists. Any work considered in these reaches will require careful design, placement, and construction that must include protection for the unstable banks and high stream velocities.

GENERAL MANAGEMENT RECOMMENDATIONS

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

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

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Increase the canopy on Howell Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.(Proposed)

2) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff. The section within the exclusion fence and below Eastside Road 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.

3) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches.

RESTORATION IMPLEMENTED

1) An exclusion fence is being installed where the stream is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Only limited cattle access above the exclusion section on the north bank will be permitted by the landowner.

PROBLEM SITES AND LANDMARKS - HOWELL CREEK 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 #	Stream Length(ft)	Comments
1.00	512	Begin survey at confluence with Russian River. This is not the natural mouth of creek, it has been diverted and now runs in a straight line through orchards.
2.00	3184	Cattails / marsh vegetation for first 800'L of unit.
	+ 2182'	Corrugated metal pipe 1' diameter, filled with sediment to 0.5'H. Thick algae and silt covered streambed throughout entire length of unit. Abundance of YOY, frogs and tadpoles. Dry tributary enters lft. bank at end of unit.
		Surveyors walked up the wetted channel for .5 mile, which flows in a straight line through the orchards until the stream dries up and is choked out by marshy vegetation (this stream is intermittent). This survey will follow the dry trib that entered lt. bank
		at the end of habitat unit two, it has blue line further up.
3.00	8274	Ruddick Rd. crossing at beginning of this unit.
4.00	8288	Cow pasture around creek, no fencing around creek.
10.00	8921	+10' rt. bank, dry tributary enters.
11.00	8942	Tadpoles in pool, no canopy.
19.00	9577	rt. bank slide begins with this unit.
20.00	9687	rt. bank slide ends at end of this habitat unit, 223'L x 100'H, depositing sediment onto rt. bank.

Slide goes very far back into hillside.

21.00 9739 rt. bank, dry tributary enters at end of this unit.

24.00 9968 No logs are forming pool, steep dirt bank forming backwater pool.

27.00 10254 Dry tributary enters rt. bank at end of this unit.

31.00 10600 +64' Dry tributary enters rt. bank, 3 fallen trees in stream from small rt. bank failure.

32.00 10780 +38' Dry tributary enters lft. bank

38.00 11079 Sediment/silt in bottom of pool is 1.5'H, possibly deposited by slide on rt. bank.

39.00 11175 rt. bank slide begins with this habitat unit, depositing sediment into creek.

41.00 11283 rt. bank slide ends with the end of this habitat unit, 204'L.

42.00 11322 Two 1+ fish in pool.

46.00 11622 +20 small secondary channel pool.

56.00 12068 Fence along rt. bank at end of this habitat unit.

58.00 12134 Fence running along rt. bank.

60.00 12216 +33' Fence in creek, 4'H, above water 2'H.

62.00 12296 Two fallen oak trees creating some scour.

64.00 12368 Good undercut banks.

70.00 12623 1.5'L back into undercut banks.

71.00 13036 +160' side pool.

71.10 13036 Fish in pool.

81.00 13535 rt. bank tributary enters at end of this unit. Tributary has ~less than 0.1cfs flow. Walked up trib for a few hundred feet, no fish were observed.

85.00 13747 Newts in pool.

88.00 14096 +13' Fence crossing creek.

89.00 14124 Possible channel type change.

91.00 14168 2'H jump.

93.00 14224 6'H jump.

95.00 14254 END OF SURVEY, 5'jump at top of

plunge pool. Bedrock substrate, not a good jump pool, 1'W at top of jump. Pool is not deep, 6'H debris accumulation at top of jump. *Electrofishing data dated 9-9-98 reads that creek has dried up on the lower half except for residual pools.

PROBLEM SITES AND LANDMARKS - HOWELL CREEK TRIB.#1 SURVEY COMMENTS

Habitat Unit #	*Stream Length(ft)*	*Comments*
1.00		*5940 Ruddick Rd. crossing at begin of this unit.*
3.00		*12680 East Side Rd. crossing and house on RB at beginning of this unit. Flow is very low, stream is also very silty.*
		+203' LB, broken concrete blocks and rebar (rip-rap) 55'L.
		+419' active bank failure, filled in creek for 20'L. Creek is 6'W passing through.
		+460' Barbed wire fence across creek, 4'H. Creek is now passing through cow pasture, no fence along creek, no gravel in creek. Gravel deposits along banks from bank failure.
		+639 small debris accumulation, 32'L x 15'W x 4'H, retaining some sediment, not a barrier.
		+774 RB and LB failure is 243'L x 100'L. Debris in stream, no water flowing for 10'L, stream is filled in.
5.00		*13090 +217 bank failure ends.*
11.00		*13334 Salamanders in pool, no fish observed yet.*
16.00		*13792 +44 LB failure, 25'L x 100'H. Debris accumulation at end of unit, 10'L x 9'W x 3'H, retaining gravel*

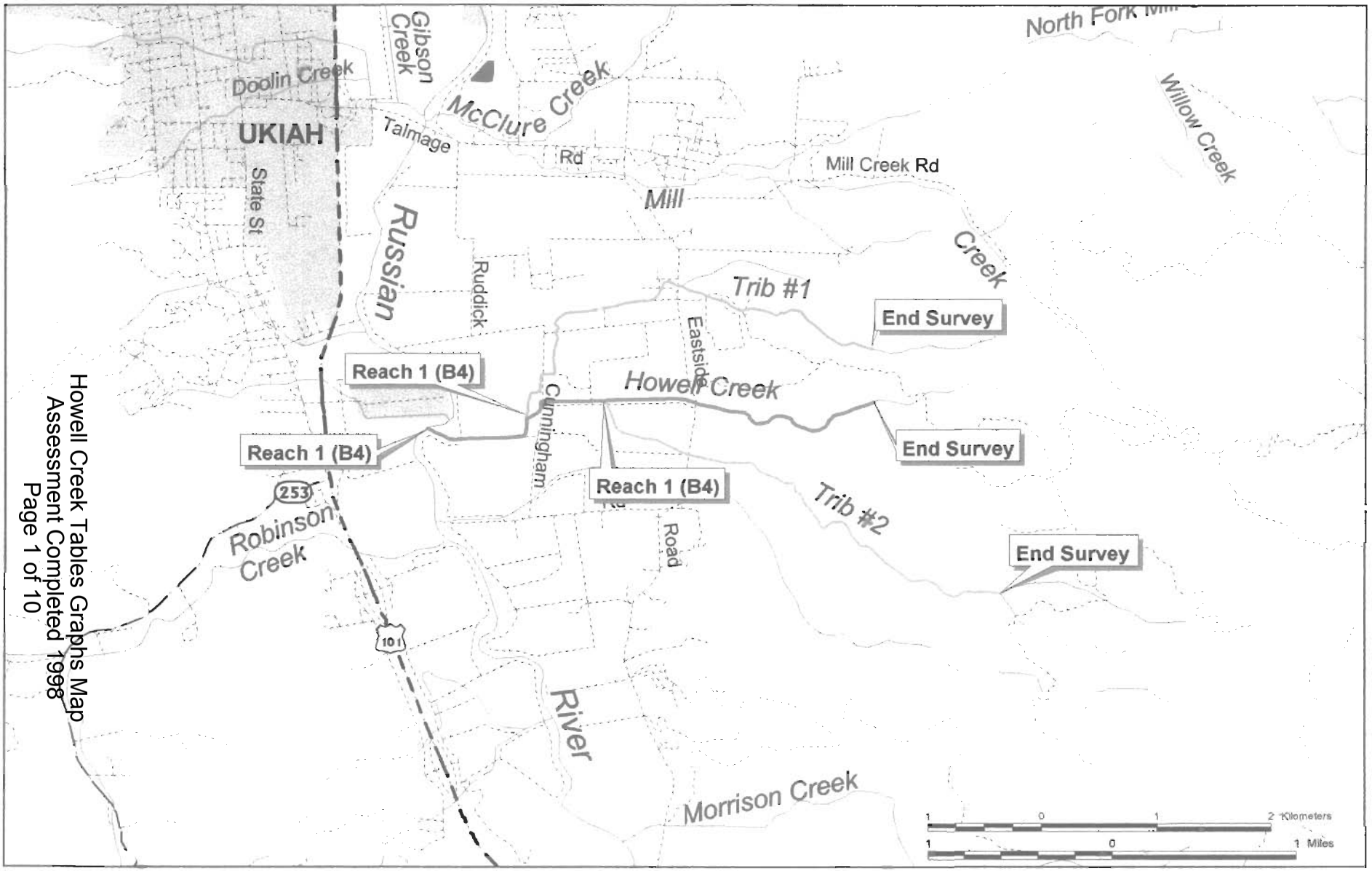
and sediment 3'H behind. Water is not flowing through this accumulation, no water found above it. No fish were observed in this creek.
**** END OF SURVEY ****

PROBLEM SITES AND LANDMARKS - HOWELL CREEK TRIB.#2 SURVEY COMMENTS

Habitat Unit #	*Stream Length(ft)*	*Comments*
	1.00	*6600 Ruddick Rd. crossing at begin of this unit.*
2.00	*7743*	*Ruddick/East Side Rd. crossing at begin of this unit. Cow pasture around creek, no fencing around creek.*
6.00	*8094*	*Fish in pool.*
7.00	*8152*	*Underground springs bubbling in creek, possibly sulphur.*
11.00	*10289*	*+650' Barbed wire fence across creek.*
	+1904	*Dry tributary enters LB.*
12.00	*10306*	*Tadpoles in pool.*
14.00	*11144*	*+479 RB tributary. Very low flow in this unit.*
15.00	*11161*	*YOY in pool.*
17.00	*11287*	*YOY in pool.*
21.00	*11520*	*YOY, frogs and tadpoles in pool.*
23.00	*11638*	*YOY, tadpoles and frogs in pool.*
27.00	*11991*	*Newts in pool.*
28.00	*12040*	*Slide on LB begins with this unit.*
29.00	*12117*	*LB slide ends with this unit, 124'L x 100'H.*
33.00	*13125*	*YOY in pool.*
34.00	*13802*	*+265 LB slide begins, 30'L x 100'H.*
35.00	*13819*	*Lots of YOY in pool.*
37.00	*13908*	*Fish in pool.*
38.00	*13972*	*END OF SURVEY, LB and RB failure at begin of unit, trees fallen in stream. 5'H x 11'W log/gravel accumulation at end of unit. Small 6" hole with water trickling through. Above, creek is dry. Walked up a little ways and*

saw water again, it must go underground. No fish observed above. Approximately 500' above end of survey there is another major failure, stream blocked.

Howell Creek



Howell Creek Tables Graphs Map
Assessment Completed 1998
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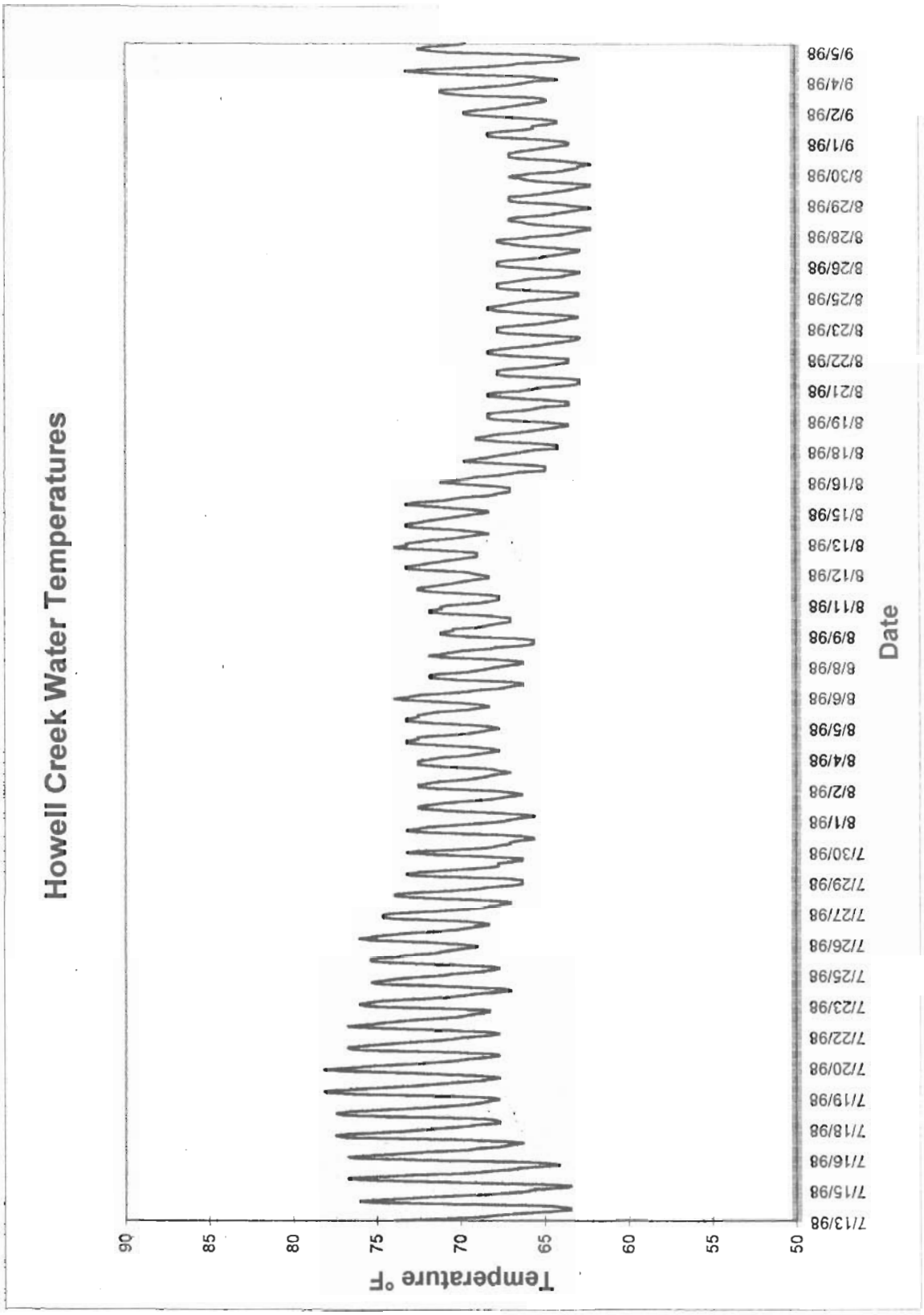
Central Coast Region
Department of Fish and Game

Howell Creek
Howell Creek, Trib #1
Howell Creek, Trib #2
Streams (russ-routed)
Roads, Mendocino Co. (mendords-alb)

Scale = 1:48,000

Map prepared by: Z. Jacob Young; June 27, 2001
I:/mondo3/data/stream-projects/howell.apr


Howell Creek Water Temperatures
Temperature °F
90
85
80
75
70
65
60
55
50
Date
7/13/98
7/15/98
7/16/98
7/18/98
7/19/98
7/20/98
7/22/98
7/23/98
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8/21/98
8/22/98
8/23/98
8/25/98
8/26/98
8/28/98
8/29/98
8/30/98
9/1/98
9/2/98
9/4/98
9/5/98

Howell Creek

Drainage: Russian River

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

Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
11	2	RIFFLE	11	38	421	3	4.7	0.3	264	2905	75	820	0	13
56	3	FLATWATER	58	136	7605	53	6.4	0.6	4431	248129	4364	244364	0	28
27	10	POOL	28	24	637	4	8.5	1.1	204	5506	229	6188	180	11
2	0	DRY	2	2801	5602	39	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.)
96	15	14265	256540	251371

Howell Creek

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
9	2	LGR	9	37	332	2	6	0.3	0.6	319	2873	81	729	0	5	47
2	0	HGR	2	45	89	1	3	0.4	1.1	154	308	62	123	0	30	90
24	2	GLD	25	175	4201	29	8	0.7	3.0	7326	175816	7253	174060	0	23	39
21	0	RUN	22	89	1859	13	4	0.3	0.4	103	2155	31	647	0	0	55
11	1	SRN	11	140	1545	11	4	0.4	1.0	75	823	30	329	0	40	58
15	3	MCP	16	27	406	3	9	1.0	2.5	227	3398	235	3530	177	6	70
3	0	CRP	3	35	105	1	9	1.4	3.0	349	1048	492	1476	426	5	15
1	1	LSR	1	23	23	0	11	1.6	2.0	253	253	405	405	354	20	65
2	2	LSBo	2	16	31	0	10	1.1	2.0	147	294	162	325	123	10	78
4	2	PLP	4	10	41	0	7	0.8	1.2	72	287	57	227	39	23	94
1	1	SCP	1	22	22	0	7	0.9	1.9	154	154	139	139	108	20	95
1	1	BPL	1	9	9	0	8	1.2	1.5	72	72	86	86	65	5	45
2	0	DRY	2	2801	5602	39	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)
96	15	14265	187480	182075

Howell Creek

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
15	3	MAIN	56	27	406	64	8.5	1.0	227	3398	235	3530	177	6
10	5	SCOUR	37	20	200	31	8.7	1.1	188	1882	243	2433	203	16
2	2	BACKWATER	7	16	31	5	7.5	1.1	113	226	113	225	86	13

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
27	10	637	5506	6188

Howell Creek — Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

UNITS MAX DPTH 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
15	MCP	56	0	0	11	73	4	27	0	0	0	0
3	CRP	11	0	0	0	0	2	67	1	33	0	0
1	LSR	4	0	0	0	0	1	100	0	0	0	0
2	LSBo	7	0	0	1	50	1	50	0	0	0	0
4	PLP	15	0	0	4	100	0	0	0	0	0	0
1	SCP	4	0	0	1	100	0	0	0	0	0	0
1	BPL	4	0	0	1	100	0	0	0	0	0	0

TOTAL UNITS 27

Howell Creek

Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
9	2	LGR	0	0	0	0	3	0	0	97	0
2	1	HGR	0	0	0	40	0	0	10	50	0
24	2	GLD	0	0	0	0	50	50	0	0	0
21	0	RUN	0	0	0	0	0	0	0	0	0
11	1	SRN	5	0	0	0	0	0	5	45	45
15	5	MCP	72	0	0	0	0	16	0	12	0
3	1	CRP	50	0	0	0	0	50	0	0	0
1	1	LSR	0	0	0	50	0	0	0	50	0
2	1	LSBo	30	0	0	0	0	0	0	30	40
4	2	PLP	0	0	0	0	0	0	17	48	35
1	1	SCP	20	0	0	20	0	0	0	60	0
1	1	BPL	50	0	0	0	0	50	0	0	0
2	0	DRY	0	0	0	0	0	0	0	0	0
96	18	ALL HABITAT TYPES	1	0	0	0	49	49	0	1	0
27	12	POOLS ONLY	42	0	0	10	0	11	2	28	7

Howell Creek

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/08/98 to 07/14/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS4 LATITUDE: 39°5'48" LONGITUDE: 123°10'36"

TOTAL HABITAT UNITS	UNITS SUBSTRATE 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
9	2	LGR	0	0	100	0	0	0	0
2	1	HGR	0	0	100	0	0	0	0
3	3	GLD	33	0	67	0	0	0	0
1	1	RUN	0	0	100	0	0	0	0
1	1	SRN	0	0	0	0	100	0	0
5	5	MCP	0	40	60	0	0	0	0
1	1	CRP	0	100	0	0	0	0	0
1	1	LSR	100	0	0	0	0	0	0
2	2	LSBo	0	0	100	0	0	0	0
2	2	PLP	0	0	50	0	50	0	0
1	1	SCP	0	100	0	0	0	0	0
1	1	BPL	100	0	0	0	0	0	0
0	0	DRY	0	0	0	0	0	0	0

Howell Creek

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
59.69	0.00	100.00	86.90	86.00

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	1	1	5
Silt/clay	19	19	95

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	13	11	60
Brush	1	1	5
Deciduous Trees	6	8	35
Evergreen Trees	0	0	0
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Howell Creek
SAMPLE DATES: 07/08/98 to 07/14/98
SURVEY LENGTH:
MAIN CHANNEL: 14254 ft. SIDE CHANNEL: 11 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Elledge Pk Latitude: 39°5'48"
Legal Description: T14NR12WS4 Longitude: 123°10'36"

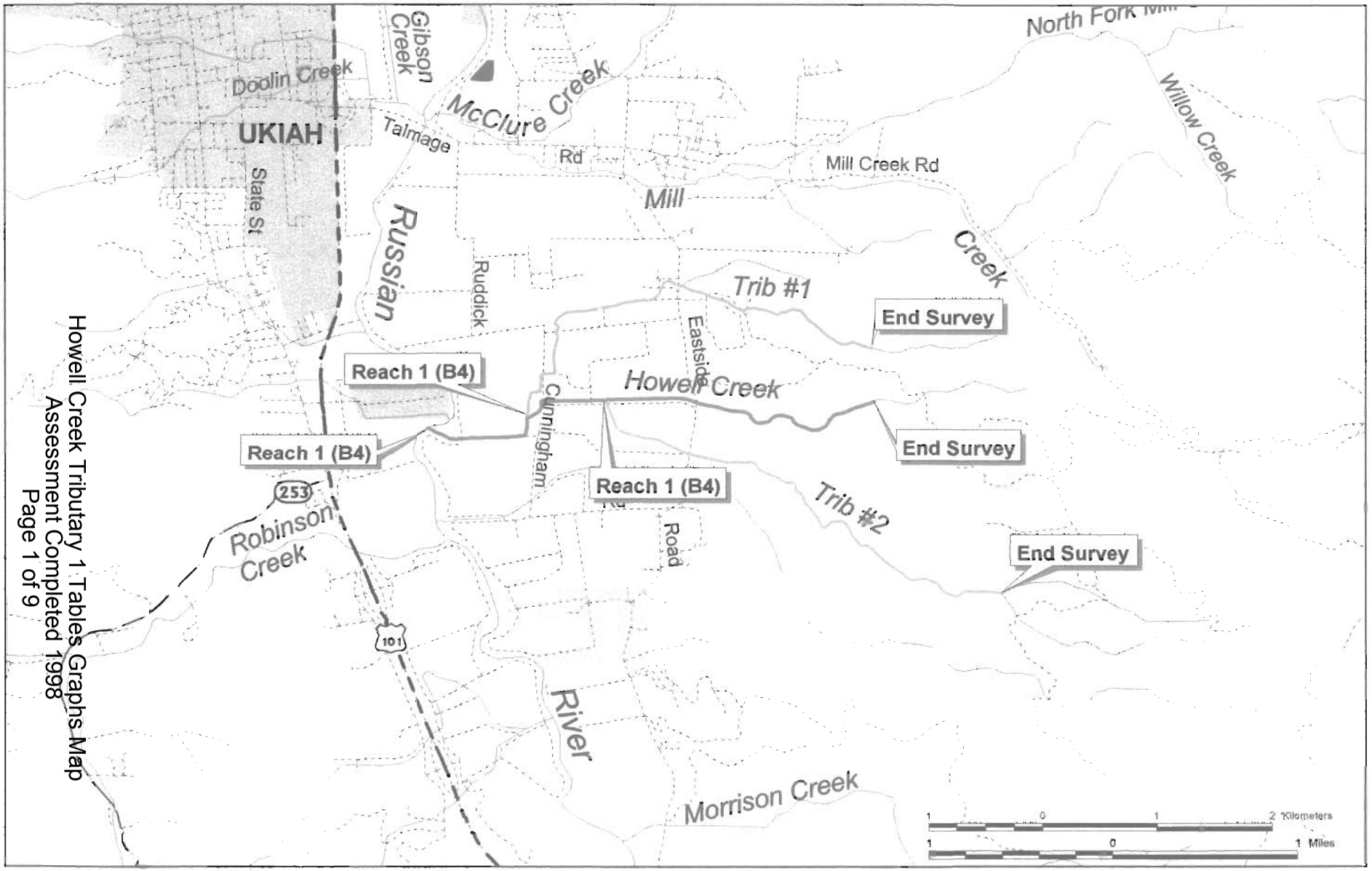
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-95)

Channel Type: B4	Mean Canopy Density: 60%
Main Channel Length: 14254 ft.	Evergreen Component: 0%
Side Channel Length: 11 ft.	Deciduous Component: 100%
Riffle/Flatwater Mean Width: 5.8 ft.	Pools by Stream Length: 4%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 35%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 4%
Water: -69°F Air: 65-87°F	Mean Pool Shelter Rtn: 11
Dom. Bank Veg.: Grass	Dom. Shelter: Boulders
Bank Vegetative Cover: 86%	Occurrence of LOD: 90%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 5602 ft.

Embeddness Value: 1. 7% 2. 22% 3. 26% 4. 37% 5. 7%

Howell Creek



Howell Creek Tributary 1 Tables Graphs Map
Assessment Completed 1998
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Central Coast Region
Department of Fish and Game

Howell Creek
Howell Creek, Trib #1
Howell Creek, Trib #2
Streams (russ-routed)
Roads, Mendocino Co. (mendords-alb)

Scale = 1:48,000

Map prepared by: Z. Jacob Young; June 27, 2001
I:/mondo3/data/stream-projects/howell.apr

Howell Creek - 1st Trib — Drainage: Howell Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
7	2	FLATWATER	44	237	1656	12	2.5	0.2	826	5782	130	913	0	5
1	0	POOL	6	28	28	0	3.5	0.7	98	98	69	69	59	0
8	0	DRY	50	1514	12108	88	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.)
16	2	13792	5880	981

Howell Creek Tributary 1 Tables Graphs Map
Assessment Completed 1998

Howell Creek - 1st Trib

Drainage: Howell Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
6	1	GLD	38	143	856	6	3	0.3	0.7	639	3834	136	814	0	0	83
1	1	RUN	6	800	800	6	2	0.1	0.2	1200	1200	120	120	0	5	80
1	0	CRP	6	28	28	0	4	0.7	1.5	98	98	69	69	59	0	85
8	0	DRY	50	1514	12108	88	0	0.0	0.0	0	0	0	0	0	0	82

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
16	2	13792	5132	1002

Howell Creek - 1st Trib

Drainage: Howell Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
1	0	SCOUR	100	28	28	100	3.5	0.7	98	98	69	69	59	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
1	0	28	98	69

Howell Creek - 1st Trib — Drainage: Howell Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

UNITS MAX DEPTH 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
1	CRP	100	0	0	1	100	0	0	0	0	0	0

TOTAL UNITS 1

Howell Creek - 1st Trib Drainage: Howell Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
6	0	GLD	0	0	0	0	0	0	0	0	0
1	1	RUN	0	0	100	0	0	0	0	0	0
1	0	CRP	0	0	0	0	0	0	0	0	0
8	0	DRY	0	0	0	0	0	0	0	0	0
16	1	ALL HABITAT TYPES	0	0	100	0	0	0	0	0	0
1	0	POOLS ONLY	***	***	***	***	***	***	***	***	***

Howell Creek - 1st Trib

Drainage: Howell Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/15/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T15NR12WS34 LATITUDE: 39°6'46" LONGITUDE: 123°10'23"

TOTAL HABITAT UNITS	UNITS SUBSTRATE 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
	2	GLD	50	0	50	0	0	0	0
	1	RUN	100	0	0	0	0	0	0
	1	CRP	0	0	100	0	0	0	0
	0	DRY	0	0	0	0	0	0	0

Howell Creek - 1st Trib

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
82.50	0.00	100.00	47.50	37.50

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	4	4	100

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	0	0
Deciduous Trees	4	4	100
Evergreen Trees	0	0	0
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Howell Creek - 1st Trib
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 13792 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Elledge Pk Latitude: 39°6'46"
Legal Description: T15NR12WS34 Longitude: 123°10'23"

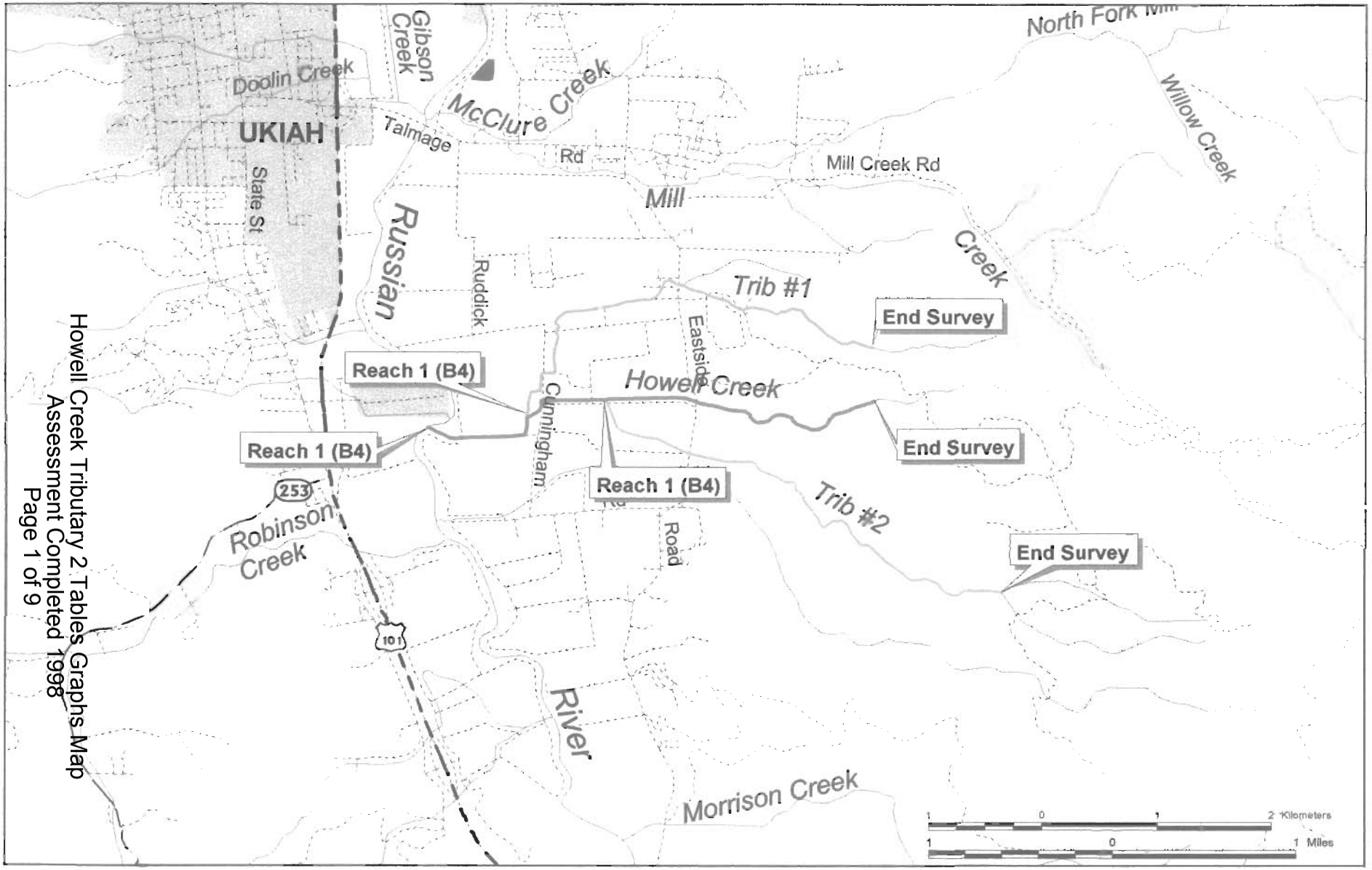
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-16)

Channel Type: B4	Mean Canopy Density: 83%
Main Channel Length: 13792 ft.	Evergreen Component: 0%
Side Channel Length: 0 ft.	Deciduous Component: 100%
Riffle/Flatwater Mean Width: 2.5 ft.	Pools by Stream Length: 0%
Pool Mean Depth: 0.7 ft.	Pools >=2 ft. Deep: 0%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: -70°F Air: 81-84°F	Mean Pool Shelter Rtn: 0
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Small Woody Debris
Bank Vegetative Cover: 43%	Occurrence of LOD: 100%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 12108 ft.

Embeddness Value: 1. 0% 2. 0% 3. 0% 4. 100% 5. 0%

Howell Creek



Howell Creek Tributary 2 Tables Graphs Map
Assessment Completed 1998
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Central Coast Region
Department of Fish and Game

Howell Creek
Howell Creek, Trib #1
Howell Creek, Trib #2
Streams (russ-routed)
Roads, Mendocino Co. (mendords-alb)

Scale = 1:48,000

Map prepared by: Z. Jacob Young; June 27, 2001
I:/mondo3/data/stream-projects/howell.apr

Howell Creek - 2nd Trib — Drainage: Howell Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
18	0	FLATWATER	47	190	3426	25	3.5	0.3	544	9800	120	2151	0	0
12	3	POOL	32	18	213	2	5.0	0.9	89	1065	77	926	56	5
8	0	DRY	21	1292	10333	74	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.)
38	3	13972	10865	3077

Howell Creek Tributary 2 Tables Graphs Map
Assessment Completed 1998
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Howell Creek - 2nd Trib — Drainage: Howell Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA EST.	MEAN VOLUME	TOTAL VOLUME EST.	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
#			%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
6	0	GLD	16	63	377	3	2	0.3	0.4	110	660	33	198	0	0	22
6	0	RUN	16	254	1525	11	5	0.2	0.3	876	5258	175	1052	0	0	7
6	0	SRN	16	254	1524	11	3	0.3	0.4	315	1890	95	567	0	0	85
4	1	MCP	11	19	77	1	7	0.8	1.7	130	521	109	437	74	5	39
8	2	CRP	21	17	136	1	4	0.9	1.8	68	544	61	489	48	5	49
8	0	DRY	21	1292	10333	74	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)
38	3	13972	8673	2743

Howell Creek - 2nd Trib

Drainage: Howell Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
4	1	MAIN	33	19	77	36	7.0	0.8	130	521	109	437	74	5
8	2	SCOUR	67	17	136	64	4.0	0.9	68	544	61	489	48	5

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
12	3	213	1065	926

Howell Creek - 2nd Trib — Drainage: Howell Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

UNITS MAX DPTH 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
4	MCP	33	1	25	3	75	0	0	0	0	0	0
8	CRP	67	1	13	7	88	0	0	0	0	0	0

TOTAL UNITS
12

Howell Creek - 2nd Trib — Drainage: Howell Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type — Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
6	0	GLD	0	0	0	0	0	0	0	0	0
6	0	RUN	0	0	0	0	0	0	0	0	0
6	0	SRN	0	0	0	0	0	0	0	0	0
4	1	MCP	20	0	0	0	80	0	0	0	0
8	1	CRP	50	0	0	0	0	50	0	0	0
8	0	DRY	0	0	0	0	0	0	0	0	0
38	2		36	0	0	0	38	26	0	0	0
12	2		36	0	0	0	38	26	0	0	0

Howell Creek - 2nd Trib

Drainage: Howell Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/08/98 to 07/21/98

Confluence Location: QUAD: Elledge Pk LEGAL DESCRIPTION: T14NR12WS34 LATITUDE: 39°6'47" LONGITUDE: 123°9'58"

TOTAL HABITAT UNITS	UNITS SUBSTRATE 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
	1	GLD	0	0	100	0	0	0	0
	2	RUN	0	0	100	0	0	0	0
	1	SRN	0	0	100	0	0	0	0
	1	MCP	0	100	0	0	0	0	0
	2	CRP	0	100	0	0	0	0	0
	0	DRY	0	0	0	0	0	0	0

Howell Creek - 2nd Trib

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
38.06	0.00	100.00	92.86	94.29

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	7	7	100

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	7	7	100
Brush	0	0	0
Deciduous Trees	0	0	0
Evergreen Trees	0	0	0
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Howell Creek - 2nd Trib
SAMPLE DATES: 07/08/98 to 07/21/98
SURVEY LENGTH:
MAIN CHANNEL: 13972 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Elledge Pk Latitude: 39°6'47"
Legal Description: T14NR12WS34 Longitude: 123°9'58"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-38)

Channel Type: B4	Mean Canopy Density: 38%
Main Channel Length: 13972 ft.	Evergreen Component: 0%
Side Channel Length: 0 ft.	Deciduous Component: 100%
Riffle/Flatwater Mean Width: 3.5 ft.	Pools by Stream Length: 2%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 0%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 0%
Water: -90°F Air: 102-98°F	Mean Pool Shelter Rtn: 5
Dom. Bank Veg.: Grass	Dom. Shelter: Aquatic Vegetation
Bank Vegetative Cover: 94%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 10333 ft.

Embeddness Value: 1. 0% 2. 25% 3. 8% 4. 50% 5. 17%