CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Doolin Creek
Report Revised April 14, 2005
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted beginning August 8 and ended August 30, 2001 on Doolin Creek. The survey began at the confluence with the Russian River and extended upstream 17,060 feet.

The Doolin Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Doolin Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for 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

Doolin Creek is a tributary to the Russian River, a tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Doolin Creek's legal description at the confluence with Russian River is T15N R12W S28. Its location is 39.1353800007901° north latitude and 123.185236794995° west longitude. Doolin Creek is a third order stream and has approximately 4.26 miles of solid blue line stream according to the USGS Ukiah 7.5 minute quadrangle. Doolin Creek drains a watershed of approximately 2.63 square miles. Elevations range from about 587 feet at the mouth of the creek to 2,730 feet in the headwater areas. Hardwood dominates the watershed. The watershed is primarily privately owned. Steelhead trout (*Oncorhynchus mykiss*) are a threatened salmonid species present in the Doolin Creek watershed. Vehicle access exists via Highway 101 to Talmage Road river crossing. Foot access is available from the bridge crossing, approximately 200 feet north.

METHODS

The habitat inventory conducted in Doolin Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The California Department of Fish and Game field crew that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Doolin Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote temperature recorders which log temperature at set intervals, 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". Doolin Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Doolin 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, bedrock, or other considerations.

6. Shelter Rating:

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

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Doolin 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 and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Doolin Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Doolin Creek. In addition, three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following tables:

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

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

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 28 to 30, 2001, was conducted by Jake Newell and Corey Sangiacomo (DFG). The total length of the stream surveyed was 17,060 feet.

Stream flow was not measured on Doolin Creek.

Doolin Creek is an F3 channel type for 8,803 feet, a B3 for 3,452 feet, an A2 for 2,779 feet, and a G3 for 936 feet of the stream surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B3 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools; very stable plan and profile, stable banks and cobble-dominant substrates. A2 channels are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils; boulder-dominant substrates. G3 channels are entrenched “gully” step-pool and low width/depth ratio on moderate gradient.

Water temperatures taken during the survey period ranged from 61to 67 degrees Fahrenheit. Air temperatures ranged from 66 to 94 degrees Fahrenheit. Summer temperatures were also

measured using a remote temperature recorder placed in a pool (see Temperature Summary graph at end of report). The recorder logged temperatures every two hours from July 4 – October18, 2001. The highest temperature recorded was 69.7°F in August and the lowest was 51.8°F in October.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 15% riffle units, 48% flatwater units, 28% pool units, 5% dry units, and 3% culvert units (Graph 1). Based on total *length* of Level II habitat types there were 2% riffle units, 39% flatwater units, 3% pool units, 55% dry units, and 1% culvert units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent *occurrence* were runs, 25%; step runs, 18%; and mid-channel pools, 18% (Graph 3). Based on percent total *length*, dry made up 52%, runs 22%, and step runs 13%.

A total of 27 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 78%, and comprised 79% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seventeen of the 25 measured pools (68%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 25 pool tail-outs measured, twelve had a value of 2 (44%); nine had a value of 3 (33%); one had a value of 4 (4%); and five had a value of 5 (19%), (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 15 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 23. Main-channel pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Doolin Creek. Graph 7 describes the pool cover in Doolin Creek. Bedrock ledges are the dominant pool cover type followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Small cobble was the dominant substrate observed in 59% of pool tail-outs while gravel was the next most frequently observed substrate type, at 19%.

The mean percent canopy density for the surveyed length of Doolin Creek was 82%. The mean percentages of evergreen and deciduous trees were 65% and 17%, respectively. Eighteen percent of the canopy was open. Graph 9 describes the mean percent canopy in Doolin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 28%. The mean percent left bank vegetated was 26%. The dominant elements composing the structure of the stream banks consisted of 39% bedrock, 13% boulder, 27% cobble/gravel, and 21% sand/silt/clay (Graph 10). Evergreen trees were the dominant vegetation type observed in 48% of the units surveyed. Additionally, 21% of the units surveyed had deciduous trees as the dominant vegetation type, and 16% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

On 09/25/01 a biological inventory was conducted at three sites on Doolin Creek to document fish species composition and distribution. The site, Lat. 39:7'53.4", Long. 123:12'41.0" was triple pass seine netted. Fish from the site were counted by species, and returned to the stream. The air temperature ranged from 62-63ºF and the water temperature ranged from 59-60ºF.

The inventory began at 08:45 hours in Reach 1 and ended at 09:32 hour. Habitat types surveyed were lateral scour pool - bedrock formed, mid-channel pools, runs and glides. The following table displays the information yielded from this site.

Species Observed	**Numbers Recorded at Site 1**
Steelhead (YOY, Y+)	6
Crawfish	1

Site 2 on Doolin Creek at Lat. 39:7'36.8", Long. 123:13'23", was triple pass seine netted. Fish from the site were counted by species, and returned to the stream. The air temperature ranged from 63-64ºF and the water temperature was 60ºF.

The inventory began at 10:02 hours in Reach 2 and ended at 10:56 hours. Habitat types surveyed were lateral scour pool - bedrock formed, mid-channel pools, runs and glides. The following table displays the information yielded from this site.

Species Observed	**Numbers Recorded at Site 2**
Steelhead (YOY, Y+, 2+)	17
Yellow-legged Frog	1
Crawfish	3
Newt	2
Salamander	103

Site 3 on Doolin Creek at Lat. 39:7'40.0", Long. 123:13'39.9" was triple pass seine netted. Fish from the site were counted by species, and returned to the stream. The air temperature ranged from 64-68ºF and the water temperature ranged from 59-60ºF.

The inventory began at 11:12 hours in Reach 3 and ended at 12:30 hours. Habitat types surveyed were lateral scour pool - bedrock formed, mid-channel pools, runs and glides. The following table displays the information yielded from this site.

Species Observed	Numbers Recorded at Site 3
Steelhead (YOY, Y+)	21
Salamander	15
Newt	1

Historical records reflect that steelhead fingerlings were rescued/transferred from Doolin Creek and released in Dooley Creek in 1962.

Table 1. Summary of fish rescues/transfers from Doolin Creek

YEAR	RELEASE LOCATION	SPECIES	#	SIZE
1962	Dooley Creek	SH	1,037	FING

SH = steelhead
FING = fingerling

DISCUSSION

Doolin Creek is an F3 channel type for 8,803 feet, a B3 channel type for 3,452 feet, an A2 for 2,779 feet, and a G3 for 936 feet for the stream surveyed. The suitability of F3, B3, A2, and G3 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors; fair for plunge weirs, boulder clusters, channel constrictors and log cover. B3 channel types are excellent for bank-placed boulders and good for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. A2 channel types are generally not suitable for fish habitat improvement structures. G3 channel types are good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors and log cover; poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days August 28 to 30, 2001, were above the suitable range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 39% of the total length of this survey, pools 3%, and riffles 2%. The pools are relatively deep, with 17 of the 27 (63%) measured pools having a maximum depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Twelve of the 27 pool tail-outs measured had embeddedness ratings of 1 or 2. Ten of the pool tail-outs had embeddedness ratings of 3 or 4. Five of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Doolin Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

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

The mean shelter for flatwater was 2. The mean shelter rating for pools was 15. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, boulders contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 82%. Reach 1 had a canopy density of 41% while Reach 2, 3, 4, and 5 had canopy densities of 84%, 84%, 84%, 88%, respectively. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 28% and 26%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic trees species, in conjunction with bank stabilization, is recommended.

GENERAL RECOMMENDATIONS

Doolin 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.

RECOMMENDATIONS

1. Increase the canopy on Doolin Creek in Reach 1 by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

2. Doolin Creek 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. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from aquatic vegetation. Adding high quality complexity with woody cover is desirable.

4. Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

5. Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6. Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

COMMENTS AND LANDMARKS

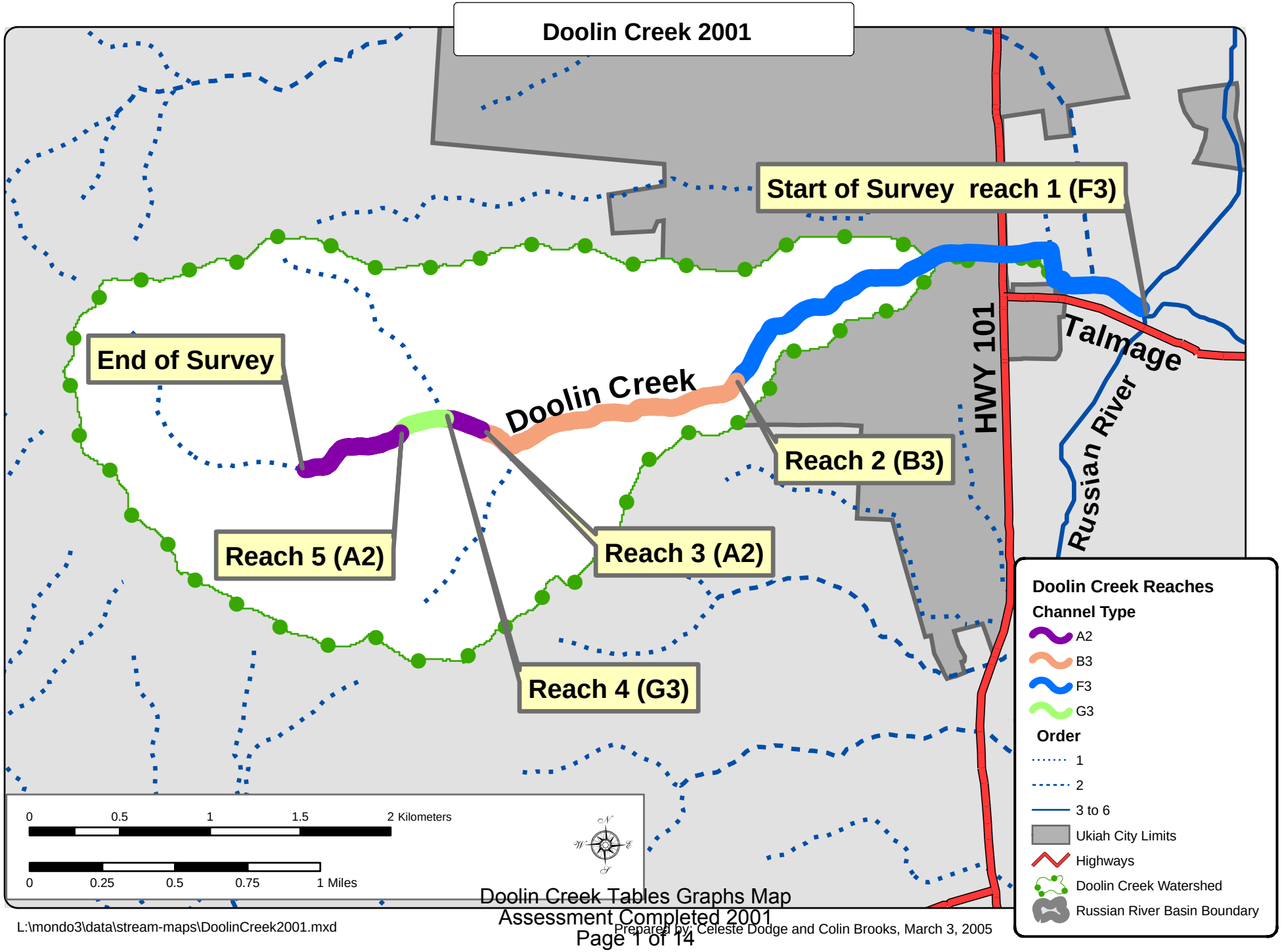
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey.

0’	Begin survey at confluence with the Russian River.
8600'	Water Bridge (F1)
8640'	Culvert-SEE FORM
8715'	Gabion banks.
8803'	Channel Type Change to B3
9248'	Steelhead-1+ & 2+, Hobo Temp.
9265'	Large coble embedded in concrete (helps passage)
9275'	2 bridges; 2' culvert RB; 1.5' culvert LB.
9475'	Channel change to F1
10060'	Exit Residential, Enter Hills.
10173'	Erosive RB; YOY
10347'	Steelhead-1+ & 2+
10419'	Blackberry overgrowth; Bridge; YOY & 1+
10619'	Length Estimated. Impassable Blackberry; Bridge @ End of unit
11619'	Enter Private neighborhood
11734'	1+ & 2 YOY
11745'	Brush clippings in creek; YOY; Bridge; RB Dry Trib. Channel change to F1
12071'	Culvert-Passable
12101'	Footbridge; Poss.
12185'	1+, 3 YOY
12195'	LB water faucet
12431'	F1; this unit 'A2' characteristics; 2" water pipes in creek-active
12631'	Cluster of large boulders; old dam; Fish upstream
12908'	3+ Steelhead & 1+
12922'	RB Dry Trib; Debris Accumulation (HWL/20/0.5/F/3)
13027'	Blown-out Dam, F1; 4' jump, poor pool
13032'	5" pipe travels down channel to home downstream
13345'	End of road (Old Log Crossing); Channel Change to A2
13622'	Passable @ high flow
13676'	Sizable leak in water pipe

13767' Intermittent
13820' No Fish
13841' (Dry) Bedrock sheet 9'H, 10'L, 15'W; (F1)
13885' End Water pipe (Drawn from this pool)
13911' 6-7' jump w/ 4' pool below
14069' Channel change to G3
14269' Large Trib bank
14542' Debris Accumulation (CO/1.0/10/C/1)
14731' Small Dry Trib LB WP# 14(F1)
14811' Debris Accumulation (CO/1.5/20/C/3)
14941' 5' Plunge; Debris Ja Accumulation m (CO/1.5/30/C/2)
14996' Gully RB
15005' Debris Accumulation (CO/2/20/C/2); Channel Change to A2
15351' Debris Accumulation -All SWD, no LWD
15415' 7' high 8' long. Notch may be passable in high flow
15457' 6' vertical / 9' horizontal jump
15559' LB-source of sharp cobble-Road 100' up bank
15622' WP# 15(f1); N39`7'38.4"/W123`14'2.7"; Newt
15901' Gully, tribs both banks
16233' Dry Side Channel; Debris Accumulation (CO/1.0/5/C/2)
16367' 6' Vertical jump
16377' Redwoods thinning out. Bay and Oak Dominant
16567' LB Dry small trib/gully
16657' PACIFIC GIANT SALAMANDER using SWD shelter
16720' END OF SURVEY, F1, Debris Accumulation (1.0/10/C/2);

REFERENCES

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



Doolin Creek Tables Graphs Map
Assessment Completed 2001

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Prepared by: Celeste Dodge and Colin Brooks, March 3, 2005

Doolin Creek

Drainage:

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

Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: LEGAL DESCRIPTION:

LATITUDE:0°0'0" LONGITUDE:0°0'0"

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
14	8	RIFFLE	15	26	359	2	4.9	0.2	40	559	8	110	0	0
46	12	FLATWATER	48	136	6275	39	5.4	0.3	844	38830	285	13109	0	2
27	27	POOL	28	16	426	3	8.4	1.2	127	3423	167	4497	108	15
5	0	DRY	5	1772	8859	55	0.0	0.0	0	0	0	0	0	0
3	2	CULVERT	3	47	141	1	2.3	0.2	105	315	18	54	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
95	49	16060	43126	17770

Doolin Creek

Drainage:

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: LEGAL DESCRIPTION:

LATITUDE:0°0'0" LONGITUDE:0°0'0"

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 %
3	1	LGR	3	56	169	1	5	0.2	0.5	100	300	20	60	0	0	80
5	3	CAS	5	25	125	1	7	0.2	0.6	48	239	11	57	0	0	88
6	4	BRS	6	11	65	0	4	0.1	0.6	19	114	2	13	0	0	88
5	2	GLD	5	56	281	2	7	0.3	1.0	363	1817	95	473	0	3	55
24	7	RUN	25	155	3721	22	5	0.3	0.9	1016	24379	339	8140	0	2	83
17	3	SRN	18	134	2273	13	5	0.4	1.1	764	12989	285	4852	0	2	86
17	17	MCP	18	13	215	1	9	1.2	3.0	110	1870	136	2308	101	15	87
4	4	STP	4	30	120	1	8	1.6	5.5	223	892	373	1492	152	6	88
2	2	LSR	2	22	44	0	8	1.1	2.2	145	290	160	320	138	35	90
2	2	LSBo	2	13	25	0	8	0.9	2.0	89	178	79	159	66	18	78
2	2	PLP	2	11	22	0	9	1.1	2.1	97	194	109	218	92	18	88
5	0	DRY	5	1772	8859	52	0	0.0	0.0	0	0	0	0	0	0	45
3	2	CUL	3	47	141	1	2	0.2	0.3	105	315	18	54	0	0	100

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
95	49	16060	43576	18146

Doolin Creek

Drainage:

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: LEGAL DESCRIPTION:

LATITUDE:0°0'0" LONGITUDE:0°0'0"

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
21	21	MAIN	78	16	335	79	8.5	1.3	131	2761	181	3800	111	13
6	6	SCOUR	22	15	91	21	8.0	1.0	110	662	116	697	99	23

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
27	27	426	3423	4497

Doolin Creek | Drainage:

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES | Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE:0°0'0" LONGITUDE:0°0'0"

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
17	MCP	63	0	0	7	41	8	47	2	12	0	0
4	STP	15	0	0	1	25	2	50	0	0	1	25
2	LSR	7	0	0	1	50	1	50	0	0	0	0
2	LSBo	7	0	0	1	50	1	50	0	0	0	0
2	PLP	7	0	0	0	0	2	100	0	0	0	0

TOTAL UNITS
27

Doolin Creek | Drainage:

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE | Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE:0°0'0" LONGITUDE:0°0'0"

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
3	0	LGR	0	0	0	0	0	0	0	0	0
5	0	CAS	0	0	0	0	0	0	0	0	0
6	0	BRS	0	0	0	0	0	0	0	0	0
5	1	GLD	0	40	0	0	0	0	0	30	30
24	3	RUN	0	67	0	0	0	0	0	33	0
17	1	SRN	0	0	0	0	0	0	0	50	50
17	15	MCP	20	32	1	0	0	0	1	35	12
4	4	STP	10	0	0	25	0	0	0	5	60
2	2	LSR	0	0	15	85	0	0	0	0	0
2	2	LSBo	0	15	3	5	0	0	0	30	48
2	2	PLP	30	0	10	0	0	0	0	10	50
5	0	DRY	0	0	0	0	0	0	0	0	0
3	0	CUL	0	0	0	0	0	0	0	0	0

Doolin Creek | Drainage:

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 08/28/01 to 08/30/01

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE:0°0'0" LONGITUDE:0°0'0"

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
3	1	LGR	0	0	0	100	0	0	0
5	2	CAS	0	0	0	0	0	100	0
6	4	BRS	0	0	0	0	0	0	100
5	2	GLD	0	0	50	50	0	0	0
24	7	RUN	0	0	14	86	0	0	0
17	3	SRN	0	0	33	67	0	0	0
17	4	MCP	0	0	50	0	25	25	0
4	2	STP	0	50	0	0	0	0	50
2	1	LSR	0	0	100	0	0	0	0
2	1	LSBo	0	0	100	0	0	0	0
2	2	PLP	0	50	0	0	0	0	50
5	1	DRY	0	0	100	0	0	0	0
3	2	CUL	0	0	50	0	0	0	50

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Doolin Creek
SAMPLE DATES: 08/28/01 to 08/30/01
STREAM LENGTH: 17060 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F3	Canopy Density: 41%
Channel Length: 8803 ft.	Coniferous Component: 70%
Riffle/flatwater Mean Width: 8 ft.	Deciduous Component: 30%
Total Pool Mean Depth: 0.1 ft.	Pools by Stream Length: 0%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: **********%
Water: 66- 66°F Air: 94- 94°F	Mean Pool Shelter Rtn: **********
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Undercut Banks
Vegetative Cover: 5%	Occurrence of LOD: **********%
Dom. Bank Substrate: Bedrock	Dry Channel: 8600 ft.

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

STREAM REACH 2

Channel Type: B3	Canopy Density: 84%
Channel Length: 3542 ft.	Coniferous Component: 82%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 18%
Total Pool Mean Depth: 1.0 ft.	Pools by Stream Length: 4%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: 64- 67°F Air: 88- 94°F	Mean Pool Shelter Rtn: 16
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Small Woody Debris
Vegetative Cover: 43%	Occurrence of LOD: 4%
Dom. Bank Substrate: Bedrock	Dry Channel: 105 ft.

Embeddness Value: 1. 0% 2.50% 3. 38% 4. 13% 5. 0%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 1000 ft.

STREAM REACH 3

Channel Type: A2	Canopy Density: 84%
Channel Length: 724 ft.	Coniferous Component: 66%
Riffle/flatwater Mean Width: 1 ft.	Deciduous Component: 34%
Total Pool Mean Depth: 1.7 ft.	Pools by Stream Length: 11%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 40%
Water: 64- 64°F Air: 85- 89°F	Mean Pool Shelter Rtn: 5
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 14%	Occurrence of LOD: 0%
Dom. Bank Substrate: Bedrock	Dry Channel: 91 ft.

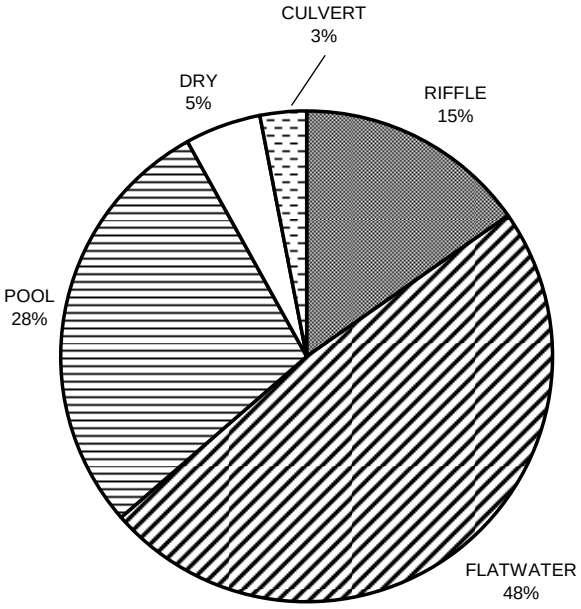
Embeddness Value: 1. 0% 2.40% 3. 0% 4. 0% 5. 60%

STREAM REACH 4

Channel Type: G3	Canopy Density: 84%
Channel Length: 936 ft.	Coniferous Component: 79%

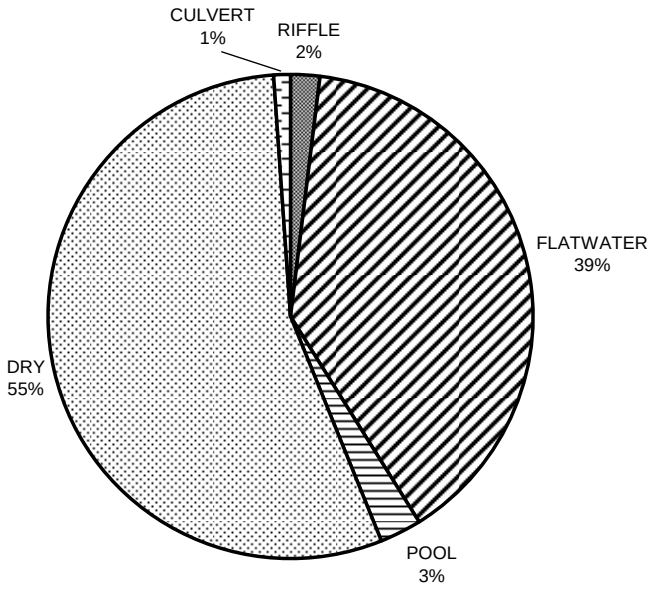
```
  Riffle/flatwater Mean Width: 5 ft.     Deciduous Component: 21%
  Total Pool Mean Depth: 1.0 ft.         Pools by Stream Length: 4%
  Base Flow: 0.0 cfs                     Pools >=3 ft.deep: 0%
  Water:  61-  64°F  Air:  66- 85°F      Mean Pool Shelter Rtn: 35
  Dom. Bank Veg.: Coniferous Trees       Dom. Shelter: Small Woody Debris
  Vegetative Cover: 21%                  Occurrence of LOD: 5%
  Dom. Bank Substrate: Bedrock           Dry Channel: 0 ft.

  Embeddness Value: 1. 0%   2.75%   3. 25%  4. 0%   5.  0%

STREAM REACH  5
  Channel Type: A2                       Canopy Density: 88%
  Channel Length: 2055 ft.               Coniferous Component: 83%
  Riffle/flatwater Mean Width: 7 ft.     Deciduous Component: 17%
  Total Pool Mean Depth: 1.2 ft.         Pools by Stream Length: 8%
  Base Flow: 0.0 cfs                     Pools >=3 ft.deep: 10%
  Water:  61-  62°F  Air:  73- 77°F      Mean Pool Shelter Rtn: 12
  Dom. Bank Veg.: Coniferous Trees       Dom. Shelter: Bedrock Ledges
  Vegetative Cover: 22%                  Occurrence of LOD: 0%
  Dom. Bank Substrate: Bedrock           Dry Channel: 63 ft.

  Embeddness Value: 1. 0%   2.30%   3. 50%  4. 0%   5.  20%
```

DOOLIN CREEK
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



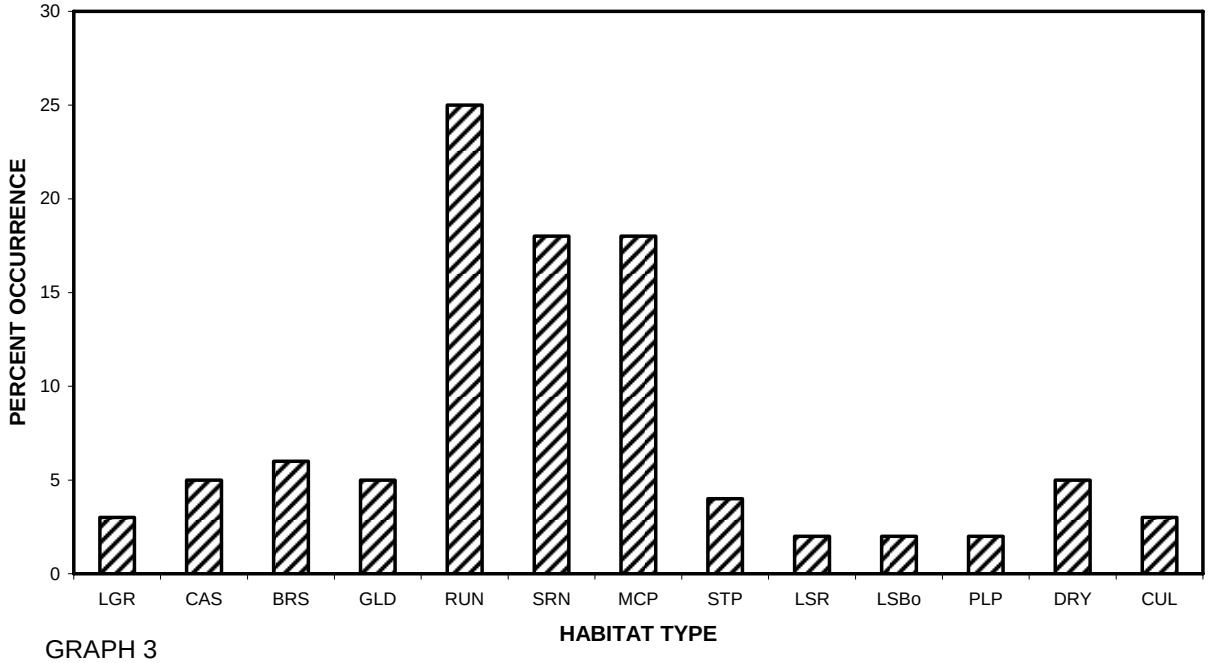
GRAPH 1

DOOLIN CREEK
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



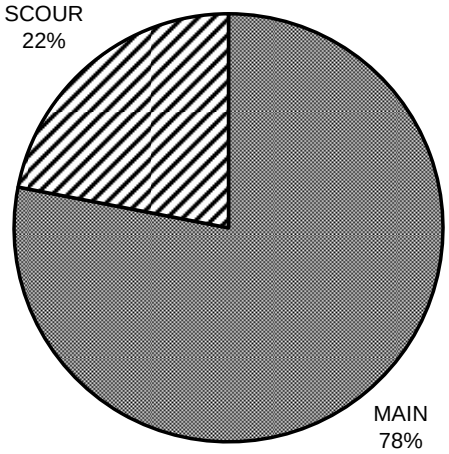
GRAPH 2

DOOLIN CREEK
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



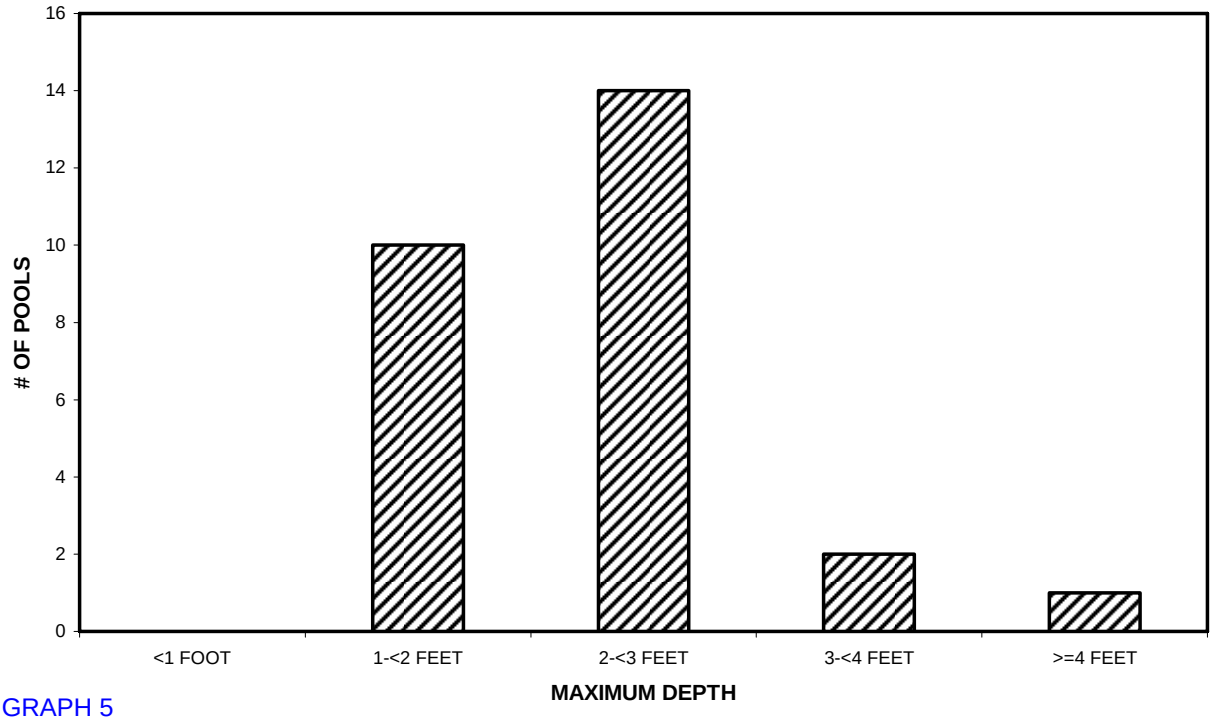
GRAPH 3

DOOLIN CREEK
LEVEL I POOL HABITAT TYPES BY PERCENT OCCURRENCE



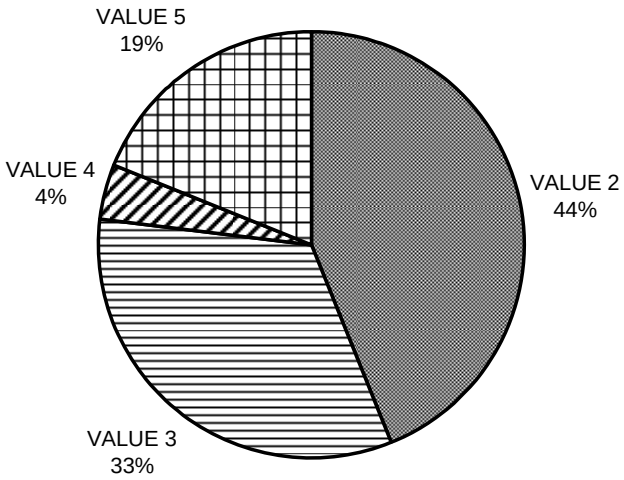
GRAPH 4

DOOLIN CREEK
MAXIMUM DEPTH IN POOLS



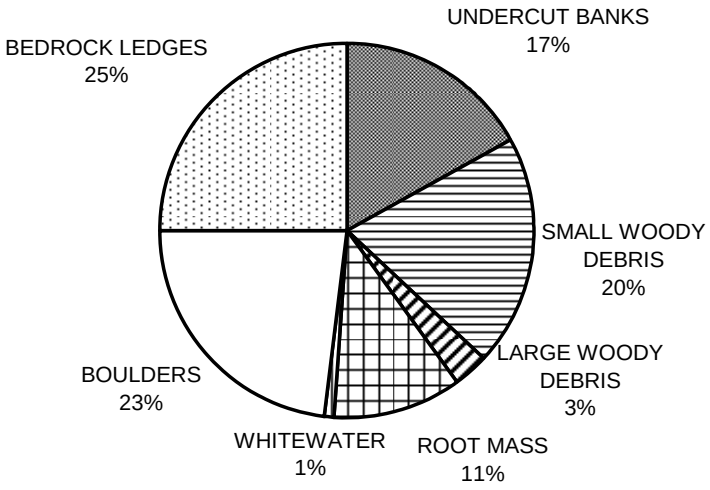
GRAPH 5

DOOLIN CREEK
PERCENT EMBEDDEDNESS



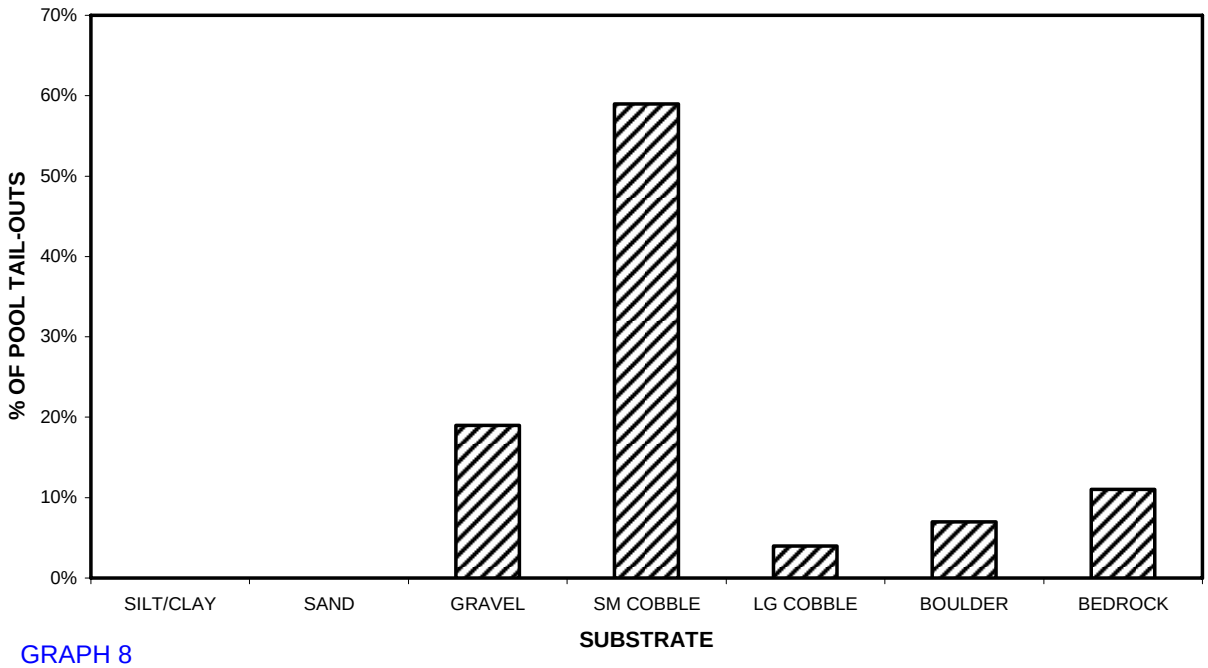
GRAPH 6

DOOLIN CREEK
MEAN PERCENT COVER TYPES IN POOLS



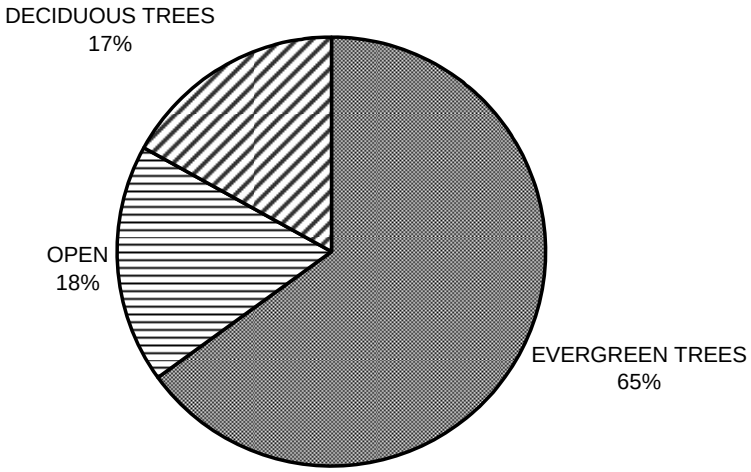
GRAPH 7

DOOLIN CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



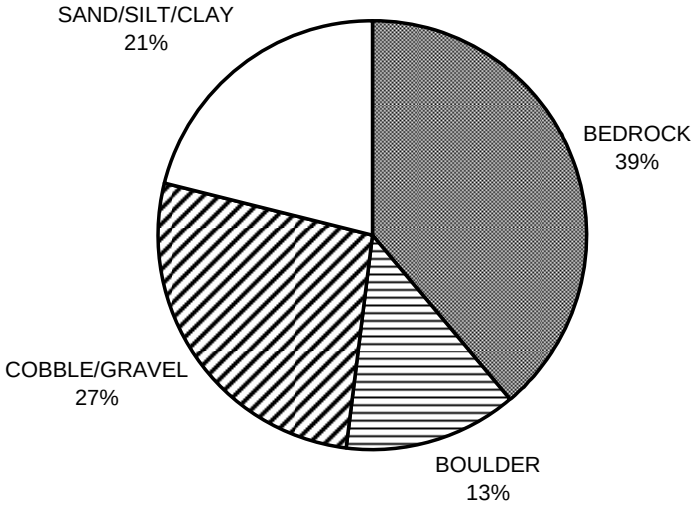
GRAPH 8

DOOLIN CREEK
MEAN PERCENT CANOPY



GRAPH 9

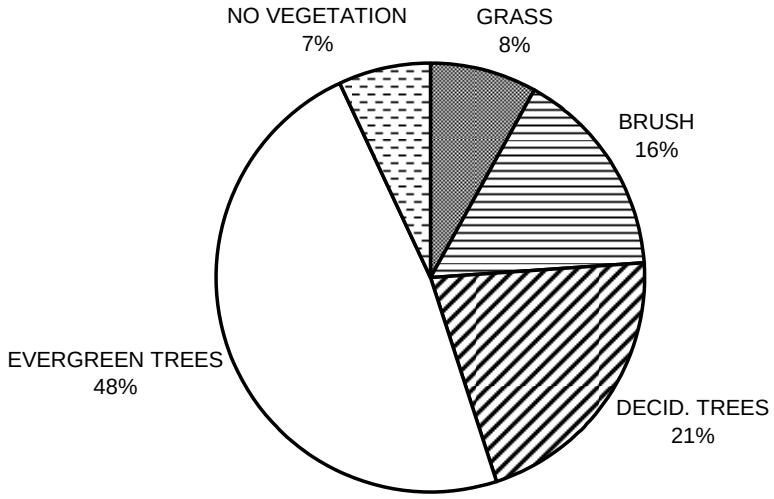
DOOLIN CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

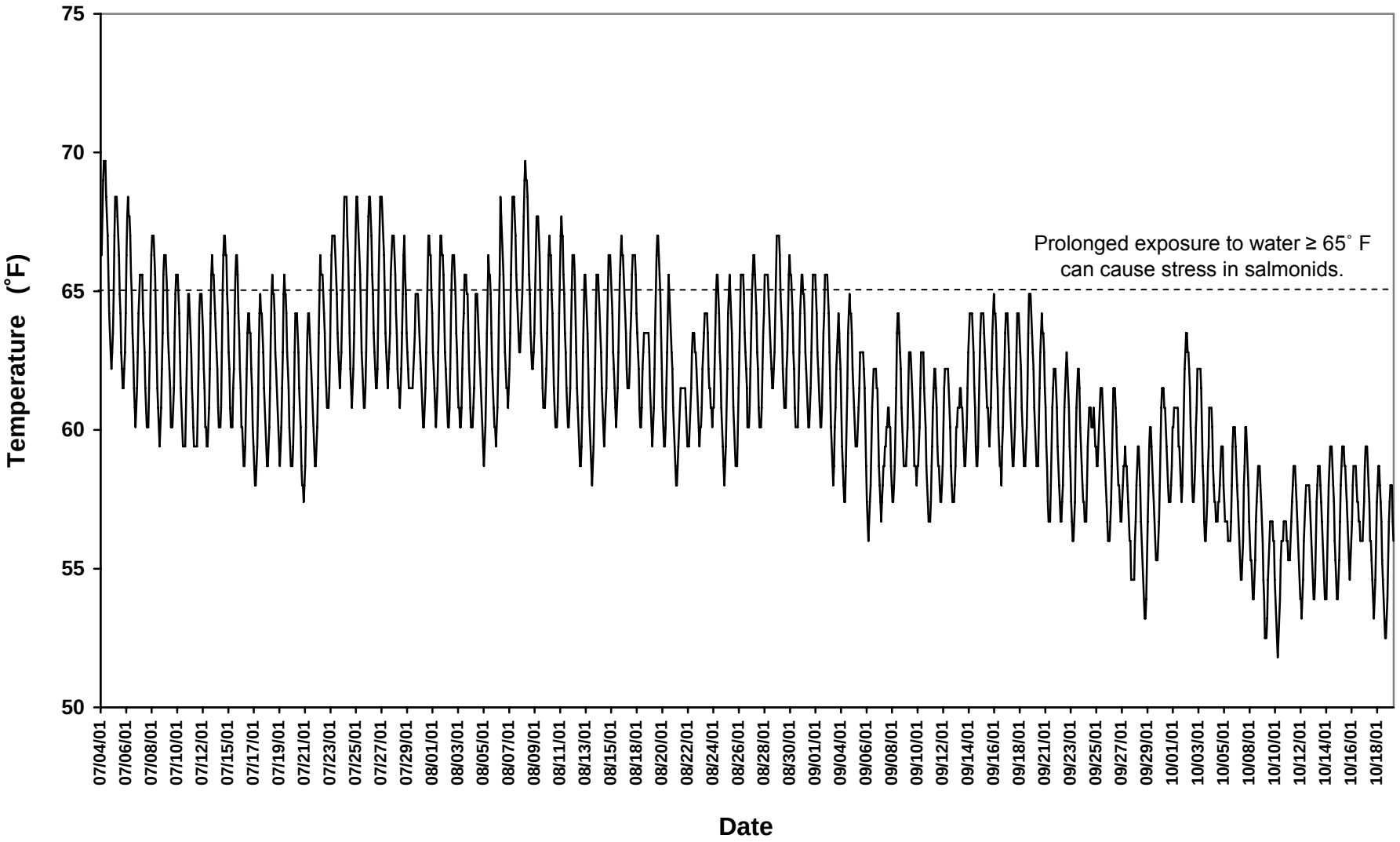
DOOLIN CREEK

DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Doolin Creek Water Temperatures



Watershed Hydroid **414** Doolin Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:	Tributary to	Russian River
Doolin Creek	1231852391353	Mendocino	Tributary to	
			Tributary to	

Location: **T:** 15N **R:** 12W **S:** 28 **Latitude:** 39.1353800007901 **Longitude** 123.185236794995

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: 3 **Total Length:** 4.26 Miles 6.86 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 683 Hectares; 1689 Acres; 2.63 sq. mi.

Elevations: Mouth: 587 feet; Headwaters: 2730 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): Steelhead

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.5 acres	0.0	21.5	1666.7
0.00 %	0.00 %	1.27 %	98.73 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
275.52 acres	714.74	186.71	3.08	193.66
16.3 %	42.4 %	11.1 %	0.2 %	11.5 %

Shrub:	Herbaceous:	Barren/rock:	Water:
240.15	71.19	0.00	0.00
14.2 %	4.2 %	0.0 %	0.0 %

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

Watershed Hydroid **414** Doolin Creek

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
ELLEDGE PEAK	39123A2
BOONVILLE	39123A3
UKIAH	39123B2
ORRS SPRINGS	39123B3

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Scientific Name	Common Name
Lasthenia burkei	Burke's goldfields

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Ukiah	111431	Upper Russian River	100