Final Report
Summer Steelhead Survey, 2005 Season
Mattole River Watershed

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Introduction

The 10th annual Summer Steelhead Dive surveys were conducted in the Mattole Watershed (Figure 1) on July 22 and 28-29, 2005. Additional Summer Steelhead Snorkel surveys were conducted on August 4, 2005 and September 26, 2005.

The purpose of the summer steelhead survey was to enumerate summer-run steelhead and "half-pounders" holding in the Mattole in the summer months and identify their preferred holding habitat in the mainstem Mattole River and the lower sections of two major tributaries, Bear Creek and Honeydew Creek. In addition, locating "cold-water areas" in the survey reaches and identifying the distribution of three species of juvenile salmonids was of prime concern.

Summer steelhead are adult steelhead that enter the river in spring, before the river mouth closes for the summer. They spend the summer instream before spawning during the ensuing rainy season usually between January and March. Half-pounders are 99% immature male and female steelhead that enter the river in the spring, ascend the mainstem and some large tributaries, and feed instream through the winter, after which they return to the ocean. Some half-pounders spend only a few months in the ocean before they return to freshwater as maturing fish (Barnhart and Gerstung 1996), while others spend 1-2 years in the ocean before returning to spawn (Busby et al. 1996). Half-pounders are typically steelhead between 12 and 16 inches (12-16in.) in length without parr marks.

Thirty-seven surveyors, working in teams of two or three, performed direct underwater observation counts in approximately 55.4 miles of the Mattole River and 6.25 miles of tributaries (61.65 total stream miles). The survey comprised twenty-two reaches, varying in length from 1.3 to 6.5 miles (See Table 1). A total of twenty (20) adult summer steelhead (>16 inches in length) and thirty-four (34) half-pounders (12-16 inches in length) were counted during the 2005 surveys. The number of adult summer steelhead counted in 2005 was higher than those counted in 2004 (16); however, more "half-pounders" were observed in 2004 (40). The lowest number of adult sightings per stream mile ever recorded over the past ten years of summer steelhead surveys was in 2003 (0.19 adults per mile), Figure 4). The greatest number of adults counted was 45 in 44.9 miles surveyed in 1998 (Figure 3). The maximum count for "half-pounders" was in 2000; 96 were observed in 32.7 miles surveyed (Table 2).

Juvenile steelhead were noted in all survey reaches, while juvenile coho salmon were observed in only five reaches (see Table 3). Juvenile coho were observed exclusively in the upper mainstem. Juvenile Chinook salmon were observed in the upper most reach and in four reaches in the middle and lower mainstem during this year's summer steelhead survey. Cold areas were noted in all survey reaches (see Appendix B, Table B-2). Temperatures recorded in 2005 were slightly lower than typical temperatures documented over the last few years of summer steelhead surveys.

This report includes information on survey reach lengths, location and personnel (Table 1), observations of steelhead greater than or equal to 12 inches in fork length (Table 3), and 1996-2005 summer steelhead counts (Table 2). In addition, the presence of all observed juvenile steelhead and coho and Chinook salmon was noted (Table 3). This report also includes discussion, habitat descriptions and future recommendations. Appendices include background information on steelhead in the Mattole River (Appendix A), 1996-2005 results by reach (Appendix B), and observations of other species and temperatures recorded in the 2005 summer steelhead surveys (Appendix C, Tables C-1 and C-2.) This type of information can be useful in determining the needs and habits of local riverine fauna, and establishing land-use practices that promote stewardship and conservation.

Figure 1. Mattole Watershed and Key Tributaries

Methods

Summer steelhead surveys were conducted in as few consecutive days as possible to ensure similar hydrologic and thermal conditions on survey days. Each reach was surveyed by a team of two or more people, at least one of which had prior experience participating in summer steelhead surveys and/or experience identifying juvenile salmonids. At least one surveyor from each team participated in an in-field juvenile salmonid identification workshop with a qualified biologist in waters bearing juvenile coho salmon and steelhead, and was oriented to field methods and protocols with the project coordinator.

Surveyors snorkeled every area of the mainstem in their assigned reach that was deep enough to snorkel. Steelhead observations were recorded by size class. Steelhead with an estimated fork length of greater than sixteen inches (>16in.) were designated summer steelhead, and those with a fork length between 12 and 16 inches (12-16 in.) were recorded as "half-pounders". Length was the primary feature used in identifying "half-pounders", therefore some number of the observed "half-pounders" may have been resident rainbow trout. It is unknown whether 12"-16" steelhead seen in the Mattole are true half-pounders, but the term is used hereafter in this report for this size-class of fish.

Each summer steelhead sighting was marked on a topographic map with a corresponding case number. For each individual sighted fork length was estimated and recorded, and the location and habitat in which it was sighted was described. For each half-pounder sighting, a fork length estimate and habitat description was recorded. Juvenile salmonids were not counted, rather noted for presence or absence, the habitat and location in which they were observed was recorded. In a few cases where surveyors did count juvenile salmonids, that data is provided in Table 3.

When possible, air and water temperatures were recorded at the beginning and end of each survey reach with calibrated hand-held thermometers. Temperatures were also recorded in tributaries, cold pools and seeps throughout the reach (See Appendix B, Table B-2). The time of day of the temperature reading was noted. Additionally, crayfish, bullfrog tadpole, and freshwater mussel sightings were recorded and mapped (see Appendix B, Table B-1).

Results

In 2005, MSG divers observed 20 adult summer steelhead (>16"), and 34 "half-pounders" (12"-16") in 61.65 miles surveyed (See Table 1). Nineteen adult summer steelhead and twenty-six "half-pounders" were observed in the Mattole mainstem, while one adult summer steelhead and eight "half pounders" were observed in Bear Creek.

Adult summer steelhead (>16") were distributed throughout the mainstem in 2005 (See Figure 2). One adult summer steelhead and eight "half-pounders" were observed in Bear Creek, while the Honeydew Creek survey did not yield any observations of steelhead greater than 12 inches. Upstream of Big Finley Creek (RM 47.4, start of reach 6), surveyors located only three summer steelhead. The greatest number of adult summer steelhead observations were in the middle Mattole, in river miles 47.4 to 32.8 (reaches 6 , 20, 21, & 22 yielded 12 sightings,). Five summer steelhead were observed downstream of the Honeydew Slide (RM 27.0).

"Half-pounders" (12"-16" steelhead) were also observed throughout the Mattole mainstem. There were more observations of this size-class of steelhead in than adults, and they were more widely distributed ("half-pounders" were sighted in 15 reaches, while adults were observed in 10).

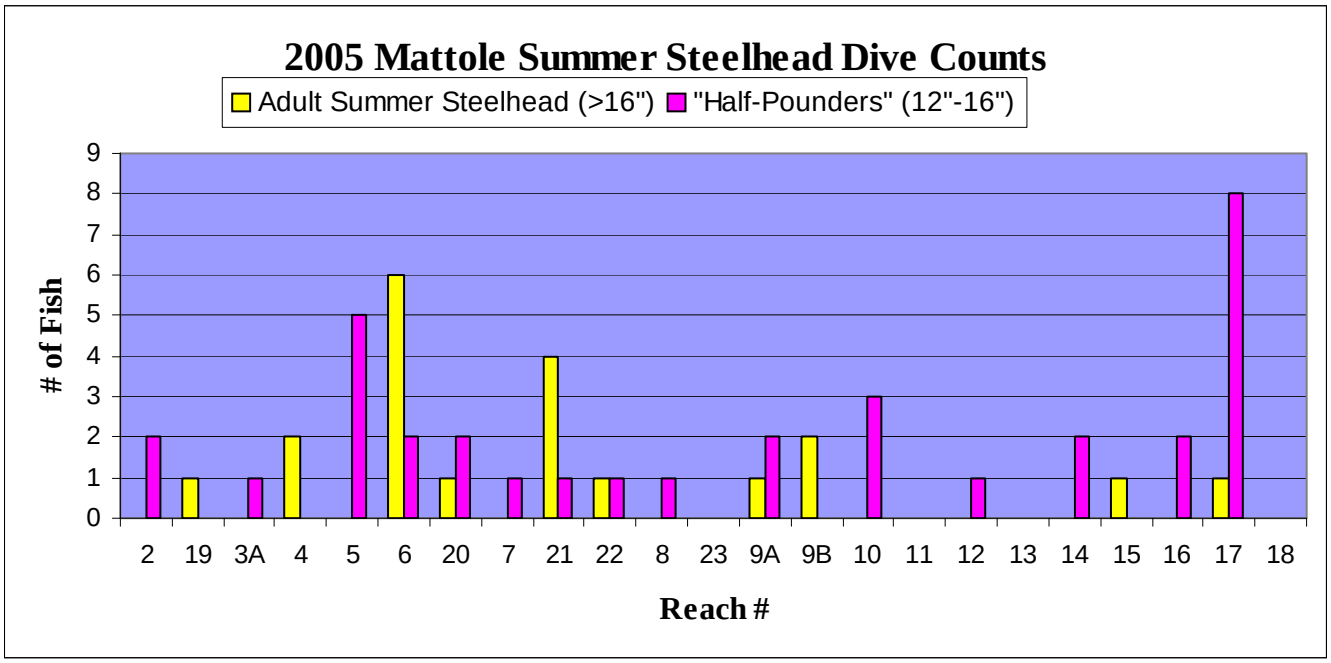
Table 1. 2005 Summer Steelhead Dive Results

Reach #	Reach Name and Location	Survey Date	Personnel	Mileage	Adult Summer Steelhead (>16")	"Half-Pounders" (12"-16")
1	Phillips Cr. (RM 60.4) to Lost River Cr. (RM 58.8)	N/A	N/A	N/A (1.6)	N/A	N/A
2	Lost River Cr. (RM 58.8) to Stanley Cr. (RM 57.1) & Thompson Cr. (RM 58.4 + 0.15, mouth to confluence with Yew Cr.)	7/28	Maureen Roche*, Josh MacDonald	1.7 + 0.15	0	2
19	Stanley Cr. (RM 57.1) to ds Anderson Cr. (RM ~55.6)	7/29	Tom Campbell*, Tony Heacock*	~1.5	1	0
3A	McKee Cr. (RM 52.8) to Bridge Cr. (RM ~51.3)	7/28	Jessica DeKelver*, Lisa Schepman	~1.5	0	1
4	Crook's (RM ~51.3) to Tom's Hole (Patty's) (RM ~49.4)	7/28	Colum Coyne*, Dan Free*	~1.9	2	0
5	Tom's Hole (RM ~49.4) to Big Finley Cr. (RM 47.4)	7/29	Colum Coyne*, Jay Ogawa*	~2.0	0	5
6	Big Finley Cr. (RM 47.4) to Schepp's (RM ~46.0)	8/4	Jen Peters*, Jody Pennycook*	~1.4	6	2
20	Schepps' (RM ~46.0) to us Bear Cr. (RM 42.7)	7/29	Campbell Thompson*, Jody Pennycook*, Noah Stafslien*	~3.3	1	2
7	Us. Bear Cr. (RM 42.7) to Klossen's Hole (ds Mattole Canyon Cr) (RM ~39.9)	7/28	Amy Baier*, Andy Chitick, Jay Ogawa*, Tony Heacock*	2.8	0	1
21	Mattole Canyon Cr. (RM 41.1) to Fourmile Cr. (RM 34.6)	7/28, 7/29	Grant Gardner, Garren White*, Ayana White	6.5	4	1
22	Fourmile Cr. (RM 34.6) to Gilham Cr. (RM 32.8)	7/28	Jody Pennycook*, Jeff Holten*, Gwyndolyn Ozard	1.8	1	1
8	Gilham Cr. (RM 32.8) to Dry Cr. (RM 30.4)	7/28	Campbell Thompson*, Elizabeth Curran	2.4	0	1
23	Dry Cr. (RM 30.4) to Honeydew Slide (RM 27.0)	7/29	Sean James*, Keitra Meiers*	3.4	0	0
9A	Honeydew Slide (RM 27.0) to Honeydew Bridge (RM 25.7)	7/22	Maureen Roche*, Gregg Nicoll, Zach Ribby, Ryan Manfredonia	1.3	1	2
9B	Honeydew Bridge (RM 25.7) to Bundle Prairie Cr. (RM 24.4)	7/22	Campbell Thompson*, Boo MacDonald, Travis Burgh	1.3	2	0
10	Bundle Prairie Cr. (RM 24.4) to Triple Junction High School (RM 21.3)	7/22	Jody Pennycook*, S. Olsen, J. Heady, Gwyndolyn Ozard	2.9	0	3

11	Saunders Cr. (RM 19.7) to Squaw Cr. (RM 14.9)	7/29	Reid Bryson*, Lisa Schepman, Gwyndolyn Ozard	4.8	0	0
12	Squaw Cr. (RM 14.9) to Lindley Bridge (RM 12.6)	7/28	Drew Barber*, Amanda Malachesky*	2.3	0	1
13	Lindley Bridge (RM 12.6) to Conklin Cr. (RM 7.8)	7/29	Cisco Benneman*, Deva Wheeler*	4.8	0	0
14	Conklin Cr. (RM 7.8) to Hideaway Bridge (RM 5.2)	7/29	Jen Peters*, Sean Smith	2.6	0	2
15	Hideaway Bridge (RM 5.2) to Stansberry Cr. (RM 1.3)	7/28	Jen Peters*, Sean Smith	3.9	1	0
16	Stansberry Cr. (RM 1.3) To Ocean (RM 0.0)	7/29	Maureen Roche*, Dan Free*, Michael Evenson, Nathan	1.3	0	2
17	Bear Cr. (Geppert/Spence's to mouth)	9/26	Jody Pennycook*, Jeff Holten*	(+~3.6)	1	8
18	Honeydew Cr. (Maureen Catalina's to 2.5 miles us Bear Wallow Slide	7/28	Sean James*, Keitra Meiers*	2.5	0	0
	Totals		61.65 miles total	~55.4 in Mainstem ~6.25 in tribs	20	34

Key: *denotes prior survey experience, + denotes tributary mileage, RM= River Mileage, us=upstream, ds=downstream, N/A=not applicable

Figure 2. Mattole Salmon Group Summer Steelhead Dive Observations by reach.



See Table 1 for 2005 reach locations. Reaches 2 through sixteen are Mattole mainstem reaches, listed from the headwaters (2) to the Pacific Ocean (16). Reaches 17 and 18 are the tributaries, Bear Creek (17) and Honeydew Creek (18), respectively. Letter codes refer to variations of past reaches (See Appendix A, Table A-1, for reach locations surveyed in 1996-2005).

1996-2005

The greatest number of summer steelhead seen in the Mattole was 44 in 1998 (See Table 2). The greatest number of half-pounders was 96 in 2000. In 2003, divers saw only nine adult summer steelhead and 21 "half-pounders." Adult summer steelhead observations over the past ten years have been at a consistent low; approximately 14-20 individuals have been seen in most years of the Summer Steelhead Dive despite more miles surveyed over the past three years (See Figure 3).

Figure 3. Mattole Salmon Group Summer Steelhead Dive Counts. Direct dive observation of adult steelhead (>16"), "half-pounders" (12"-16") and miles surveyed in the summer months, 1996-2005.

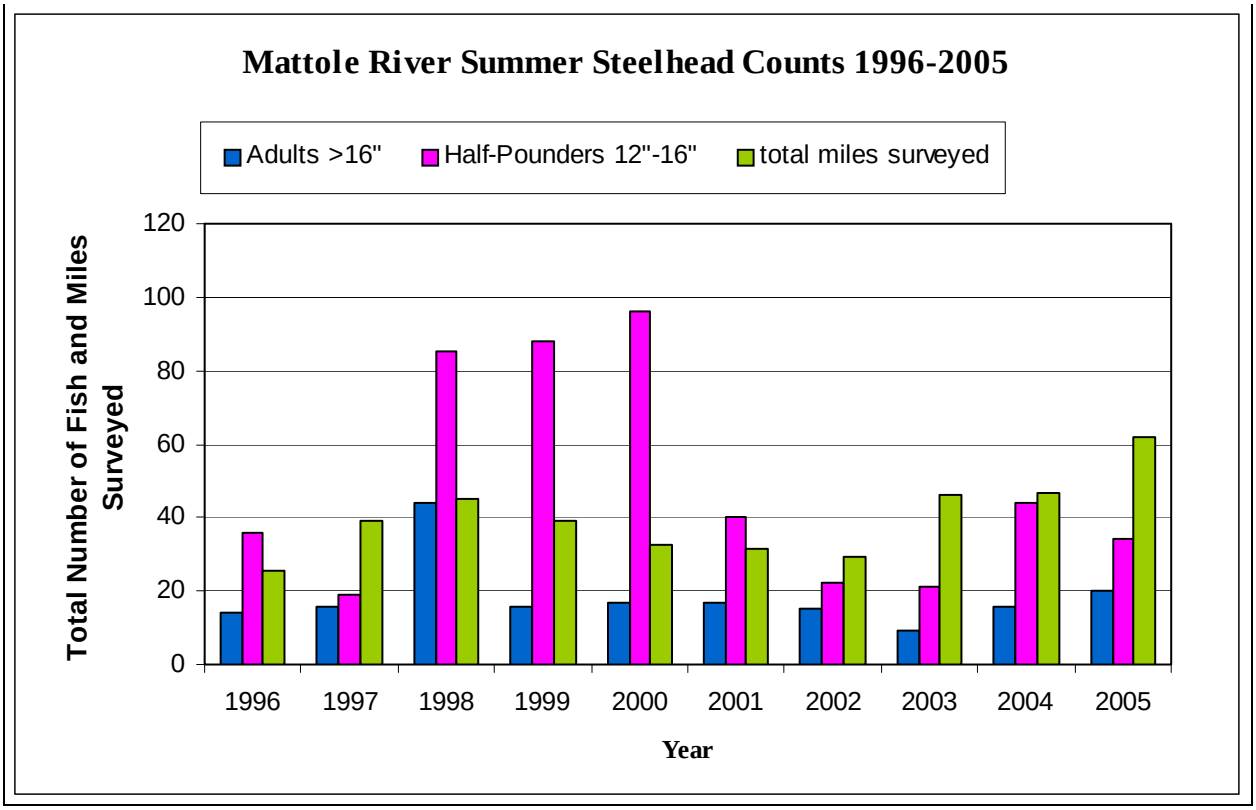
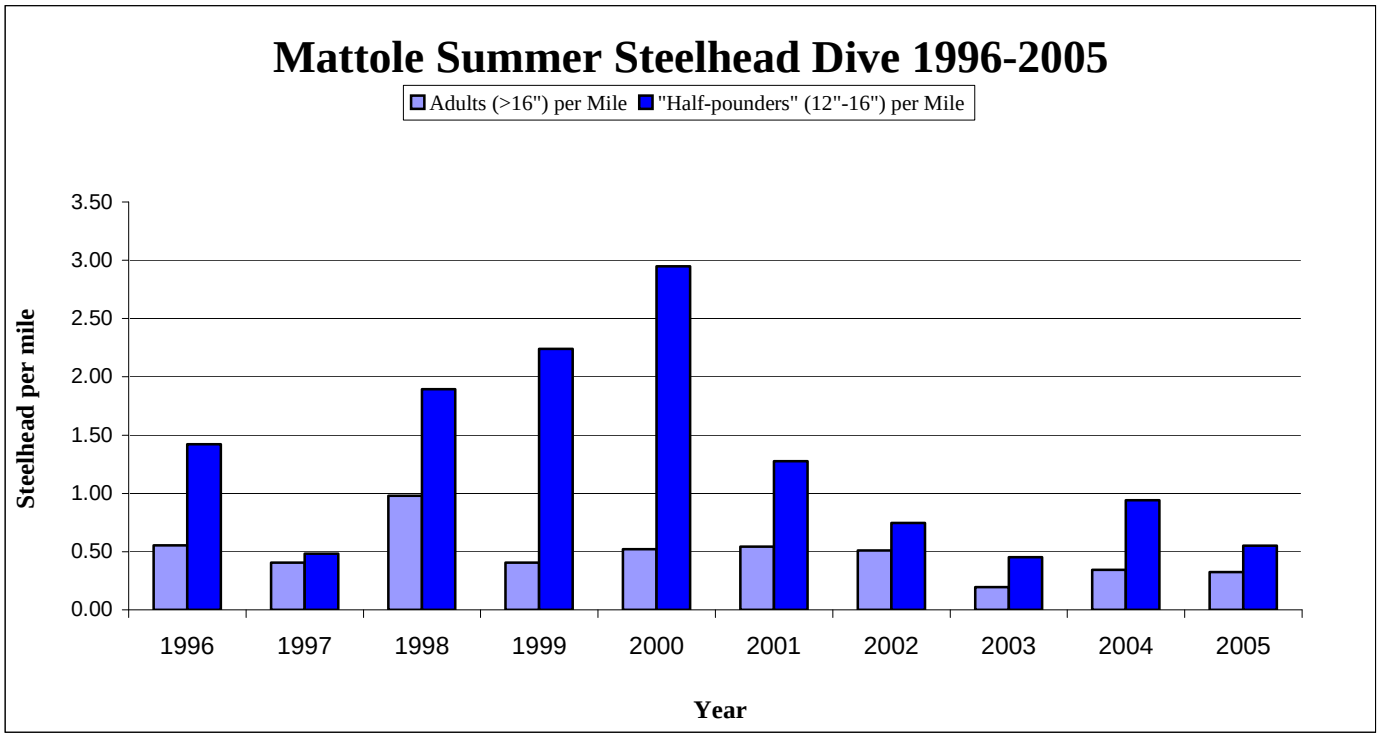


Table 2. Adult Summer Steelhead and "half-pounder" Counts in the Mattole River and tributaries, 1996-2005.

YEAR	ADULTS (>16″)	HALF-POUNDERS (12″-16″)	Mainstem Miles	Trib Miles	Total Miles	Adults/Mile	Half-pounders/Mile
1996	14	36	23.6	1.7	25.3	0.55	1.42
1997	16	19	38	1.3	39.3	0.41	0.48
1998	44	85	44.6	0.3	44.9	0.98	1.89
1999	16	88	37.4	1.9	39.3	0.41	2.24
2000	17	96	32.4	0.15	32.55	0.52	2.95
2001	17	40	31.2	0.15	31.35	0.54	1.28
2002	15	22	29.3	0.15	29.45	0.51	0.75
2003	9	21	40	6.25	46.25	0.19	0.45
2004	16	44	40.5	6.25	46.75	0.34	0.94
2005	20	34	54.0	6.25	61.65	0.32	0.55

In 2005, MSG surveyors located 0.32 adult summer steelhead per mile (20 adults in 61.65 miles), slightly more than the 0.19 and 0.34 adults per mile seen in 2003 and 2004, respectively (See Table 2);. However, over the past three years, MSG divers observed less steelhead per mile (both adults and "half-pounders") than in the seven years prior (See Figure 4).

Figure 4. Steelhead per mile observed during MSG Summer Steelhead Dives, 1996-2005.



Results by Reach, 1996-2005

Mattole mainstem

(See Appendix B, 1996-2005 Summer Steelhead Dive Tables and Figures)

Summer steelhead are rarely spotted in the upper headwaters of the Mattole. MSG surveyors have never observed steelhead (>16") in the uppermost reach (1), despite 6 years of surveys (1997-2000, 2002, 2004), possibly due to the small size of the stream itself and lack of deep pool habitat. Naturally occurring and MSG-constructed complex large woody debris structures provide relatively abundant cover in reach 1, however; a small population of elusive summer steelhead may have evaded observation.

Over ten years of surveys, two adult steelhead have been observed in reach 2/2A (1999 & 2003). Both of these observations occurred in the same location, which is the largest, deepest pool in the entire Mattole basin upstream of Upper Mill Cr. (RM 56.2) and features two complex LWD structures constructed by the MSG (MSG 2005).

Prior to 2005, 4.3 miles of unsurveyed river separated reach 2 and reaches 3 due to lack of landowner access. Some deep pools are present in this stretch of the river, but there had never been a confirmed

summer steelhead sighting due to the lack of surveys. In 2005, MSG added Reach 19 (Stanley Creek to downstream of Anderson Creek) to the Summer Steelhead Dive (2.8 miles, RM 57.1 – RM 55.6). During the survey on 7/29/05 one adult steelhead (22") was sighted in a 6' deep pool at a creek mouth near large woody debris.

Multiple sightings of summer steelhead and "half-pounders" have occurred in reaches 3 through 6 every year since 1996. This 7-mile stretch of the Mattole River contains habitat considered favorable for summer steelhead. Here the river flows through bedrock gorges and contains deep cold pools. In addition to large deep pools, this stretch of the Mattole also contains numerous large boulders and logs, which improve cover and habitat complexity. Water temperatures remain cooler here than in the lower Mattole, thus it is more favorable for oversummer rearing. Out of a total of 184 adult summer steelhead observed in the Mattole River over the past ten years of surveys, 79 of those sightings occurred in reaches 3 through 6, representing 43% of total summer steelhead sightings over ten years of surveys. Eight of 20 adult summer steelhead sightings in 2005 occurred in these reaches.

Reaches 7 and 8 are widely separated from each other as well as other reaches. This section of the mid-Mattole is notable for few road access points and relatively large property ownerships. In the 2005 State of the Salmon report, the MSG recommended efforts to add survey reaches in this part of the river. Winter survey work by boat revealed the presence of many large deep pools in this area, which are relatively well shaded by steep ridges on both sides, making this likely habitat for summer steelhead.

The MSG surveyed Reach 7 every year from 1996-2005. A total of nine adult summer steelhead (>16") were seen in the past ten years of dives. The greatest number of adults seen in reach 7 was 4 in 1999. In the past three years of surveys, MSG divers observed one adult summer steelhead in reach 8 (2003). Although no summer steelhead were seen in reaches 7 & 8 in 2005, relatively consistent sightings over previous years support the conclusion that these reaches do provide suitable habitat which is utilized by summer steelhead.

Reaches 20-22 were added in 2005 as part of efforts to expand the MSG Summer Steelhead Dive and quantify summer steelhead presence/absence throughout the Mattole mainstem. Reach 20 is the stretch of the Mattole River between reaches 6 & 7 (RM 46.0 to RM 42.7). Reach 21 (RM 41.1-RM 34.6) and reach 22 (RM 34.6 to RM 32.8) comprise the stretch between reaches 7 & 8. Combined, reaches 20-22 represent 11.6 miles previously unsurveyed in the steelhead dive.

In reach 20, surveyors saw one adult summer steelhead in the bottom of a deep pool this year. Reach 21 (6.5 miles) is the longest reach ever surveyed by MSG divers in the Summer Steelhead Dive. A crew of 3 divers with a canoe escort saw 4 summer steelhead and one half-pounder in reach 21 on a two-day survey from 7/28 to 7/29, 2005. All four adults (>16") were seen in deep pools present in the reach. Three sightings actually took place in the same pool. MSG surveyors observed one more summer steelhead (>16") in reach 22, downstream of a deep pool under the cover of a rootwad.

In comparison with the 0.36 adults observed per mile during the 2005 Summer Steelhead Dive, surveyors observed 0.52 fish/mile in reaches 20-22. In reaches 3 through 8 and reaches 20-22, the middle 23.6 mile section of the Mattole, summer steelhead sightings were 0.55 fish/mile in 2005, suggesting that deep, cool pools in the mid-river are crucial habitat for summer steelhead in the Mattole. Cooler summer water temperatures than the lower mainstem Mattole and presence of deep pools in the mid-river represent some of the best oversummering habitat for steelhead. Additionally,

summer fishing is prohibited in this area, and its remoteness makes poaching less likely. Survey observations support that Mattole summer steelhead utilize these favorable conditions for oversummering.

Reaches 9/9A and 10/10A mark the emergence of the river from the mid-river canyon into the broad valley of the lower Mattole that stretches from Honeydew to the ocean. The river channel here is frequently wide and shallow, lacking sufficient riparian cover or proximity to hillslopes to provide shade from solar radiation. From the confluence of Honeydew Creek and further on downstream, the county road is in close proximity to the river. Fishing is also legal here in summer from the confluence of the upper North Fork Mattole downstream to 200 yards from the mouth. Despite these issues, one or two adult steelhead have been spotted every year in these reaches.

During the survey in 2000, five adults were observed in reach 9. Eight summer steelhead total were observed in the two reaches in 1998. In 2005, two separate teams surveyed reach 9 (due to length) and saw a total of 3 summer steelhead. In reach 10, surveyors found 3 "half-pounders" but did not see any summer steelhead (>16"). In total, thirty five summer steelhead were seen in reaches 9/9A and 10/10A in 1996-2005 (19% of 184 sightings over the ten years of surveys).

Summer steelhead sightings are infrequent in the lower 20 miles of the Mattole River (reaches 11-16). The lower mainstem has a wide, shallow, meandering channel, and deep pool habitat is rare. High air and water temperatures characterize the lower river, and there is a lack of riparian cover or habitat for summer steelhead, although a few deep pools and cold refugia do exist. Nevertheless, there are a small number of sightings in each reach over the years. Sightings of summer steelhead in the lower river tend to occur in isolated pools where local conditions have permitted coexistence of complex cover with a localized cold seep. In 2005, there was a single summer steelhead sighting in reach 15; the steelhead was observed downstream of the lower North Fork, hiding along the bank in vegetation.

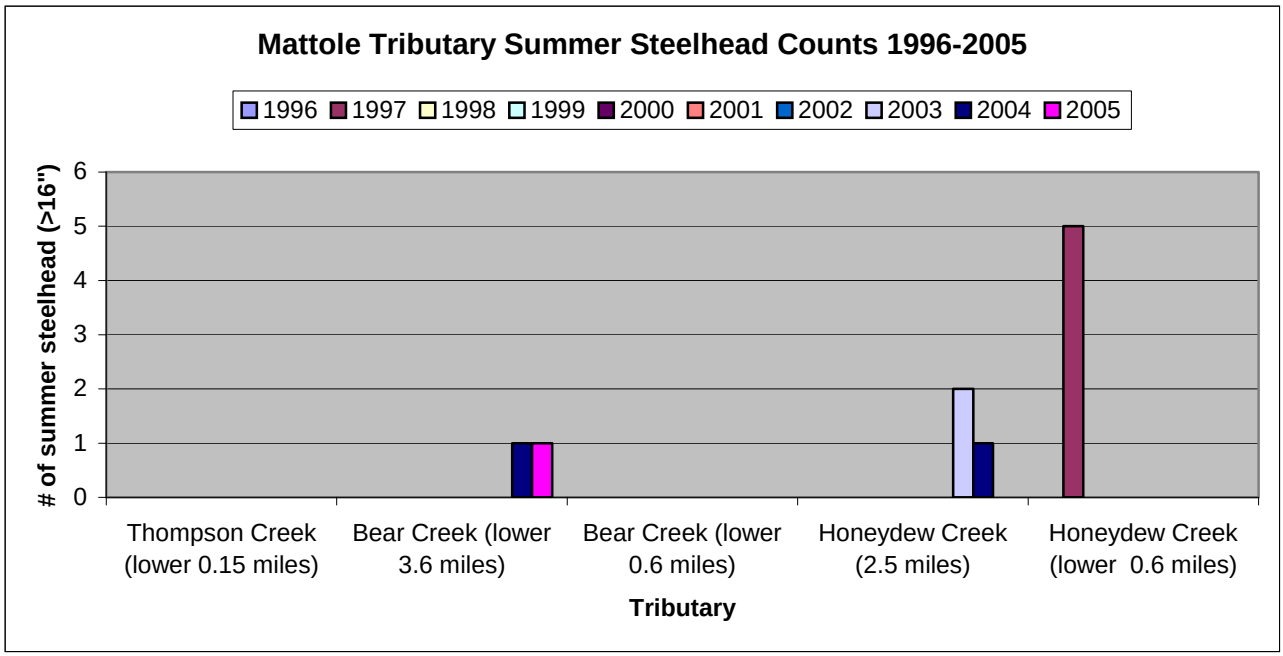
Mattole Tributaries

The MSG has also examined presence of summer steelhead in tributaries of the Mattole by conducting snorkel surveys in three creeks over the past ten years (See Figure 5). The tributaries include Thompson Cr., Bear Cr. and Honeydew Cr. Only the largest, lower portions of each are surveyed.

Despite ten years of surveys, Thompson Cr. (which enters the Mattole at RM 58.4) has never produced an observation of a summer steelhead. Thompson Creek is near the Mattole headwaters. Relative to the Mattole's major tributaries it is small, lacking large, deep pools, which are usually prime summer steelhead habitat. The small size of the stream may prevent large numbers of summer steelhead from oversummering in Thompson Creek. Nonetheless, a small population of summer steelhead may have eluded observation in Thompson Creek and may be present in other tributaries that have not been surveyed.

The lower 0.6 miles of Bear Creek was surveyed in 1996, although no summer Steelhead were located. In 2003-2005, MSG divers surveyed the lower 3.6 miles of Bear Creek; two summer steelhead were found in Bear Creek over the three years. MSG surveyors located 1 summer steelhead and 8 "half-pounders" in the lower 3.6 miles of Bear Creek in 2005. Bear Creek maintains significant summer flow and cool temperatures throughout the summer, thus it meets the minimum requirements for summer steelhead habitat.

Figure 5. 1996-2005 Summer Steelhead Counts in Mattole Tributaries



Honeydew Creek has produced observations of adult Steelhead (record number of summer steelhead sightings was 5 in 1997). The lower 0.6 miles of Honeydew Creek was surveyed from 1996 to 1999, and a 2.5 mile mid-section of Honeydew Creek was surveyed in 2003 -2005. Three summer steelhead were located over the past three years in the mid-section of Honeydew, suggesting that summer Steelhead utilize habitat throughout this tributary.

It is likely that additional survey effort in lower reaches of the largest Mattole tributaries may increase our observed population size. It should be noted however that these two streams are the least impacted by human land practices of all the large tributaries due the large proportion of their watersheds that are part of the King Range National Conservation Area (MSG 2005).

Juvenile Salmonid Distribution

Juvenile steelhead were found in all survey reaches in 2000 through 2005. Juvenile coho were observed in five reaches in 2005, while juvenile chinook were observed in found in four reaches (See Table 3). The difference in distribution of coho and chinook was noticeable. Juvenile coho were found in five of the six uppermost reaches, all upstream of RM 46.0. Juvenile Chinook were distributed throughout the river. The highest number of juvenile Chinook were recorded in the uppermost reach (2). Isolated, small schools of juvenile Chinook were observed in reaches 8 and 10, near the confluences of Gilham Creek, Middle Creek, and Bundle Prairie Creek. A small number of juvenile Chinook were also spotted in the Wingdam Hole, near river mile 3.

In the summer months, juvenile salmonids are exposed to increased water temperature, low flows and lack of riparian shading in the Mattole. Temperatures of 68°F and higher have been documented as stressful to juvenile Chinook and coho, while temperatures over 77°F may result in mortality (Brett 1952). In the summer months, some reaches of the lower Mattole regularly reach 78°F, and

temperatures over 66°F in many locations are not uncommon. Thermal refugia such as tributaries, cold seeps, and isolated pools provide critical summer habitat for juvenile salmonids.

Table 3. Summary of summer steelhead, half-pounders and juvenile salmonid observations between the headwaters and the mouth of the Mattole River and tributaries, July 22, 28-29, August 4, and September 26, 2005.

Reach #	Reach Name and Location	Adults (>16")	"Half-Pounders" (12-16")	Juvenile COHO	Juvenile CHINOOK	Juvenile STEELHEAD (<12")
1	Phillips Cr. (RM 60.4) to Lost River Cr. (RM 58.8)	N/A	N/A	N/A	N/A	N/A
2	Lost River Cr. (RM 58.8) to Stanley Cr. (RM 57.1) & Thompson Cr. (RM 58.4 + 0.15, mouth to confluence with Yew Cr.)	0	2	394	595	227, throughout most of reach
19	Stanley Cr. (RM 57.1) to ds Anderson Cr. (RM ~55.6)	1	0	684	No	753
3A	McKee Cr. (RM 52.8) to Bridge Cr. (RM ~51.3)	0	1	Yes, a couple in first pool	No	Yes, entire reach
4	Crook's (RM ~51.3) to Tom's Hole (Patty's) (RM ~49.4)	2	0	Yes, a few in uppermost of reach	No	Yes, entire reach
5	Tom's Hole (RM ~49.4) to Big Finley Cr. (RM 47.4)	0	5	No	No	Yes, entire reach
6	Big Finley Cr. (RM 47.4) to Schepp's (RM ~46.0)	6	2	45, upper 2/3 of reach	No	Yes, throughout entire reach
20	Schepps' (RM ~46.0) to us Bear Cr. (RM 42.7)	1	2	No	No	Yes
7	Us. Bear Cr. (RM 42.7) to Klossen's Hole (ds Mattole Canyon Cr)(RM ~39.9)	0	1	No	No	269, throughout entire reach
21	Mattole Canyon Cr. (RM 41.1) to Fourmile Cr. (RM 34.6)	4	1	No	No	Yes, entire reach
22	Fourmile Cr. (RM 34.6) to Gilham Cr. (RM 32.8)	1	1	No	No	Yes, entire reach but patchy distribution
8	Gilham Cr. (RM 32.8) to Dry Cr. (RM 30.4)	0	1	No	35, 2 schools near Gilham/ Middle Cr.	Yes
23	Dry Creek (RM 30.4) to Honeydew Slide (RM 27.0)	0	0	No	No	Yes
9A	Honeydew Slide (RM 27.0) to Honeydew Bridge (RM 25.7)	1	2	No	No	Yes, entire reach
9B	Honeydew Bridge (RM 25.7) to Bundle Prairie Cr. (RM 24.4)	2	0	No	No	Yes, throughout reach
10	Bundle Prairie Cr. (RM 24.4 to Triple Junction High School (RM 21.3)	0	3	No	Yes, 100 yards ds Bundle Prairie Cr.	Yes
11	Saunders Cr. (RM 19.7) to Squaw Cr. (RM 14.9)	0	0	No	No	Yes, entire reach

12	Squaw Cr. (RM 14.9) to Lindley Bridge (RM 12.6)	0	1	No	No	Yes, entire reach
13	Lindley Bridge (RM 12.6) to Conklin Cr. (RM 7.8)	0	0	No	No	Yes, near live vegetative cover
14	Conklin Cr. (RM 7.8) to Hideaway Bridge (RM 5.2)	0	2	No	No	Yes, entire reach
15	Hideaway Bridge (RM 5.2) to Stansberry Cr. (RM 1.3)	1	0	No	Yes, only noticed at Wingdam	Yes, entire reach
16	Stansberry Cr. (RM 1.3) To Ocean (RM 0.0)	0	2	No	No	Yes, most of reach
17	Bear Cr. (Geppert/Spence's to mouth)	1	8	No	No	Yes, entire reach
18	Honeydew Cr. (Maureen Catalina's to 2.5 miles us Bear Wallow Slide	0	0	No	No	Yes
	Totals	10 reaches	15 reaches	5 reaches	4 reaches	All reaches

Other observations, including freshwater mussels, bull frog tadpoles, crayfish, western pond turtles, other species, and notes recorded by divers during the 2005 Summer Steelhead Dives are summarized in Appendix C, Table C-1.

Temperatures

A summary of incidental stream and air temperature data gathered during the Summer Steelhead Dive are also provided in Appendix C, Table C-2. The temperatures recorded during this year's Summer Steelhead Dive were in many cases a few degrees lower than water temperatures recorded during the Dive in past years.

Several late rain events in June resulted in a greater flow and lower water temperatures in the Mattole during the summer of 2005 than in the past few years. These conditions were generally more favorable for both migration and oversummering salmonids. However, summer water temperatures in the Mattole remained warmer than ideal for oversummering juveniles and summer steelhead.

Habitat Utilization

Although steelhead are highly-adaptable, watersheds must meet certain habitat requirements to support these fish. Steelhead have a greater physiological tolerance to water temperature than other salmonids; nevertheless, they require cool water throughout their life history (Israel 2003). Habitat complexity is also important. According to Nakamoto (1994), "Adult summer steelhead typically oversummer in the deepest pools (Jones 1980; Freese 1982) where instream cover or riparian shading is available. Maximum water temperature may also determine habitat use (Hooper 1973; Freese 1982; Barnhardt 1986)."

During the MSG 2005 dives, summer steelhead were observed in characteristic oversummering habitat: deep pools, under large wood or riparian cover, and in thermal refugia such as stratified pools and cold seeps. Over the past ten years of dive surveys on the Mattole, identification of summer steelhead distribution, habitat and cold water refugia indicate that temperature is a major factor influencing summer steelhead distribution in the Mattole.

Nielsen and Lisle (1994) found thermally stratified pools provided refuge for young-of –the-year, yearling, and adult steelhead in marginal habitats of the Eel River, where water temperatures reached "upper incipient lethal levels." Past Summer Steelhead Dives have documented some pools in the Mattole with thermal stratification of up to ten degrees Fahrenheit.

Habitat utilization by adult summer steelhead is affected by habitat complexity as well as temperature. While many of the adult steelhead (>16")observed in the Mattole during the summer were seen in cold pools, they were also observed in shallow water in areas with riparian cover. Nakamoto (1994) reported that distribution of adult summer steelhead was more strongly correlated with physical stream characteristics than available thermal refugia. Boulder, large woody debris, and undercut banks create physical structure and provide hydraulic heterogeneity, increasing the habitat available for steelhead in the form of cover from predators, visual separation of juvenile territories, and refuge during high flows (Everest et al., 1985).

According to Bjornn and Reiser ((1991) in Spence et al. 1996), steelhead require approximately 18cm water depth for passage. Thus the river's small channel size near its source and discontinuous pools increasingly observed in late summer present a threat to both juvenile and adult summer Mattole steelhead.

While the extent to which water temperature or physical habitat characteristics affect the distribution of summer steelhead in the Mattole is unknown, a combination of thermal stress, habitat preferences and migratory barriers are likely to guide their habitat selection. Results seem to indicate mid-river pools, thermal refugia and vegetative cover are vital habitat needs of the species. Further study is needed to quantify the habitat needs of Mattole summer steelhead in order to ensure the efficacy of future restoration efforts.

Conclusion

While there is some uncertainty about the true genetic lineage of Mattole summer steelhead, consistent observations combined with historical evidence strongly suggest that a summer run of Mattole steelhead does exist. Given the extent of habitat degradation within the watershed and the increased susceptibility of summer steelhead to threats ranging from elevated water temperatures to poachers, it is quite likely that the current summer steelhead population may be but the last vestige of what was once the epitome of diversity and strength among Mattole salmonids.

Analysis of summer steelhead and "half-pounders" observed per mile, as a measure of relative abundance, is one of the MSG's most consistent means of evaluating annual summer steelhead returns (Table 2). For the period from 1996 through 2002 the average number of summer steelhead observed per mile was 0.56. Over the past three survey years, 2003 to 2005, that average has fallen to 0.30 summer steelhead per mile. An even more dramatic reduction can be seen in the average "half-pounders" per mile during the same periods. From 1996 to 2002 an average of 1.57 "half-pounders" were seen per mile. Since 2003 the average per mile has been 0.67.

Recognizing the need to learn more about Mattole summer steelhead the MSG has initiated discussions with Research Geneticist Dr. Carlos Garza, NOAA Fisheries – Santa Cruz, CA. Dr. Garza, among whose specialties are genetic population analyses of Pacific salmonids, has indicated a strong interest in incorporating the study of Mattole summer steelhead into his current research. According to his preliminary assessment based on data supplied by the MSG and his extensive knowledge of current

summer steelhead populations, Dr. Garza believes that the Mattole summer steelhead population may be the southernmost of coastal summer steelhead populations on the Pacific Coast (Carlos Garza, pers comm.).

With potential sample sizes likely to be below 50 individuals for any given year it is clear that any sample collection must be performed with the utmost respect and concern for the individual fish sampled. Needless to say, the mortality rate for sample collection must be kept to a minimum. Fortunately, Dr. Garza is collaborating with a graduate student who is particularly adept at taking small tissue samples from live summer steelhead in the wild. The MSG is confident that with proper precautions threats to fish being sampled can be sufficiently reduced.

The research proposed by Dr. Garza offers great potential for increasing our understanding of Mattole summer steelhead in a manner that minimally impacts the survival of each individual fish. However, if the benefits of a partnership with Dr. Garza are to be realized the MSG must first insure the support of all applicable government agencies, including CDFG.

However, directed research alone will not improve the recovery prospects for Mattole summer steelhead. In order to ensure their survival in the short-term it is imperative to restore known mainstem and tributary habitat. Many of the instream habitat and riparian revegetation projects proposed in the Mattole Watershed Plan (2005) are designed to benefit known summer steelhead habitat. Instream habitat enhancement projects can provide nearly immediate benefits by deepening pools, providing complex cover and adding organic debris to the river channel. Riparian revegetation projects keep water temperatures cool and provide bank stability once mature.

With over two decades of habitat restoration experience, the Mattole Salmon Group is uniquely familiar with the opportunities for restoration in the Mattole Watershed and the steps needed to make restoration a reality.

Recommendations

- A genetic microsatellite investigation of Mattole steelhead to determine the variability in life history, migration, and behavior of Mattole summer and winter steelhead runs.
    - Depending on results from genetic analysis revise appropriate management plans (Mattole Watershed Plan, California Steelhead Restoration and Management Plan, protections, King Range Management Plan, etc.) and protections (ESA, CESA, etc.).

- Develop and implement a quantitative monitoring protocol for determining specific habitat needs for recovery of the Mattole summer steelhead population.

- Continue the MSG Summer Steelhead Dive in future years. Continue monitoring of the thirteen index reaches, tributary reaches in Honeydew and Bear Creeks, and new mainstem reaches added in 2005.

- Expand the MSG Summer Steelhead Dive to include previously unsurveyed areas, and expand summer steelhead monitoring in creeks whose habitat and thermal conditions could support summer steelhead.

- Implement habitat restoration projects developed and proposed in the Mattole Watershed Plan (2005) to protect and enhance known summer steelhead habitat
  - Include consideration of summer steelhead populations and habitat needs in future restoration projects.

- Educate the local community about this rare neighbor and encourage community stewardship of the small summer steelhead population.

References

Barnhardt, R.A., and D.A. Young. 1985. *An Investigation of the Mattole River Estuary, May 1984 to March 1985.* California Cooperative Fisheries Research Unit, Humboldt State University. Arcata, CA.

Barnhardt, R.A. 1986. "Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)- steelhead." USFWS Biological Report. **82** (11.60).

Barnhart, R., Gerstung, E. 1996. Half-Pounders. Streamkeepers Log (Newsletter of California Trout), Special Steelhead Edition, Entry No. 72.

Brett, J.R. 1952. Temperature tolerance in young Pacific salmon, genus *Oncorhynchus*. Journal of the Fisheries Research Board of Canada 9(6): 265-30.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitiz, and I.L. Lagomarsino. 1996. "Status review of west coast steelhead from Washington, Idaho, Oregon, and California." National Marine Fisheries Technical Memorandum NMFS-NWFSC-27. Seattle, WA.

Downie, S.T., C.W. Davenport, E. Dudik, F. Yee, and J. Clemens (multi-disciplinary team leads. 2002. *Mattole River Watershed Assessment Report.* California Resources Agency, and California Environmental Protection Agency. Sacramento, CA.

Everest, F.H. and D.W. Chapman. 1972. "Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams." Journal of the Fisheries Research Board of Canada. **29**:91-100.

Garza, Carlos. *Personal Communication*, April, 2005.

Gerstung, E. Unpublished Draft. *Status of Summer Steelhead in the Mattole River as of 2000*. CDFG.

High, B., C. Perry, D.H. Bennet, T. Bjornn, and M. Jepson. 2002. "Effect of Water Temperature on Adult Steelhead Migration Behavior and Survival in the Columbia River Basin." Idaho Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey. University of Idaho, Moscow, ID.

Israel, J. (2003) Life History, Ecology, and Status of Klamath River Steelhead. UC Davis. Davis, CA.

Klamath River Information Systems (KRIS)- Mattole River. Version 1. Bibliography, Historical References.

McLaughlin, R.J., W.V. Sliter, N.O. Fredericksen, W.P. Harbert, and D.S. McCulloch. 1994. Plate Motions recorded in tectonostratigraphic terranes of the Franciscan complex and evolution of the Mendocino Triple Junction, northwestern California. U.S. Geologic Survey, Bulletin 1997.

Mattole Restoration Council (MRC). 1995. *Dynamics of Recovery: A Plan to Enhance the Mattole Estuary.* Mattole Restoration Council. Petrolia, CA.

Mattole Salmon Group (MSG), 2005. *State of the Salmon Report 2005*. Mattole Salmon Group. Petrolia, California**.**

Mattole Salmon Group (MSG), 2004. *Summary Report of Water Temperature Monitoring, May-December 2004*. Mattole Salmon Group. Petrolia, California**.**

Moyle, P. 2002. *Inland Fishes of California. 2nd Ed*. University of California Press. Berkeley, CA.

Nakamoto, R.J. 1994. "Characteristics of Pools Used by Adult Summer Steelhead Oversummering in the New River, California." Transactions of the American Fisheries Society **123**: 757-765.

Nielsen, J.L. and T.E. Lisle. 1994. "Thermally stratified pools and their use by steelhead in Northern California streams." Transactions of the American Fisheries Society **123:** 613-626.

Roelofs, T.D. 1983. "Current Status of California summer steelhead (*Salmo gairdnerii*) stocks, and habitat, and recommendations for their management." Report to the U.S. Forest Service, Region 5.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitki. 1996. An ecosystem approach to salmonid recovery. TR-4501-96-6057. ManTech Environmental Research Service Corp.. Corvallis, OR.

Appendix A: Summer steelhead in the Mattole River

Drainage

The Mattole River Watershed encompasses approximately 304 square miles in northern Mendocino and southern Humboldt counties (See Figure 1). The Mattole River originates as a small stream in the King Range National Conservation Area (on the eastern slope of Chemise Mountain), flows due east for a few miles, then turns northwesterly towards Petrolia, where it veers sharply to the west and discharges into the Pacific Ocean about 10 miles south of Cape Mendocino. Seventy-four perennial tributaries join the Mattole as it flows into the estuary, then the Pacific Ocean (Barnhardt and Young 1985). The mainstem Mattole is approximately 62 river miles long.

The Mattole Watershed lies in an area prone to geologic activity, including several active fault zones. Located near the Mendocino Triple Junction, where three tectonic plates converge, the area near the Mattole Estuary is rising at least 1.0 m/1000 years (McLaughlin et al. 1994).

The Mattole experiences high averages of annual precipitation, approximately 60-90 inches, with most occurring in the winter months (Busby et al. 1996). A broad discrepancy between winter and summer flow creates seasonal challenges for salmonids in the river. Winter storm events result in frequent natural disturbance to the Mattole River and its floodplain. Low late-summer flows represent a threat to rearing and oversummering salmonids, as well as other aquatic life. In recent dry years the rearing habitat in the headwaters has been reduced to a series of disconnected pools.

Past land uses in the Mattole Watershed have compounded the impacts of natural instabilities. Timber was harvested throughout the watershed; as of 1988 only 9% of old growth forest remained (MRC 1995). The removal of vegetation in the watershed in conjunction with high recurrences of natural disturbance have drastically changed the nature of the lower river. Subsequent to flood events in 1955 and 1964, the watershed experienced high rates of erosion, unknown prior to logging. Flooding swept away riparian vegetation, and deep pools filled with gravel and fine sediment (MRC 1995). Resultant high water temperatures and lack of adequate habitat have created conditions unfavorable to salmonid life.

Salmonids in the Mattole

The Mattole River is home to three species of salmonids, Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*). In 1960, USFWS estimated average annual runs in the Mattole were approximately 12,000 steelhead, 5,000 Chinook, and 2,000 coho (KRIS Mattole, Misc. References).

Steelhead in the Mattole

Mattole River steelhead are a part of the Northern California Evolutionary Significant unit (ESU). Steelhead in northern California are grouped into a single ESU based on genetic differences between steelhead in this region and those to the north and south (Busby et al. 1996). Steelhead within the northern California ESU include both winter and summer steelhead (Busby et al. 1996). Present data indicates population abundances of steelhead in northern California are very low relative to historical estimates (Busby et al. 1996). This is especially true in the case of summer steelhead, which are particularly susceptible to freshwater habitat deterioration due to sedimentation and land use practices.

Currently, Mattole steelhead are listed as threatened under the Endangered Species Act. NMFS recognizes two distinct reproductive ecotypes of coastal steelhead based on reproductive biology and freshwater spawning strategy; however, steelhead "races" are not classified based on run-timing for the purposes of the ESA (Busby et al. 1996). Current protection of steelhead under the ESA may not conserve steelhead life history diversity on a subbasin or watershed scale (Israel 2003).

The observed Mattole population is believed to be the southernmost summer steelhead population to inhabit a watershed without significant snowmelt during spring and summer (Carlos Garza, pers comm.). As the Mattole is located at or near the southern extent of the species, warmer water temperatures in the Mattole as well as limited habitat due to watershed disturbance threaten summer steelhead.

Steelhead Life History

Anadromous steelhead are much more complex than salmon in terms of life history diversity. According to Busby et al. (1996), "*Oncorhynchus mykiss*, more commonly known as steelhead or rainbow trout, is considered by many to have the greatest diversity of life history patterns of any Pacific salmonid species (Shapovalov and Taft 1954, Barnhardt 1986), including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations."

Juvenile steelhead typically rear for 1-3 years in freshwater streams before smolting and migrating to the ocean (Moyle 2002). From there their life history diverges, including differing times of ocean residence, different run-timings, and different biological strategies. Steelhead are iteroparous; they may make several ocean migrations and spawn more than once.

Steelhead are divided into two runs/races "based on the state of sexual maturity at the time of river entry and duration of spawning migrations" (Busby et al. 1996). Winter steelhead (ocean-maturing) are sexually mature upon entering freshwater in fall or winter. They migrate upstream and spawn shortly thereafter in the winter and spring. Summer/stream maturing steelhead enter freshwater sexually immature and may reside in freshwater for up to several months before spawning.

"It appears that the summer, or stream maturing steelhead, occur where habitat is not is not fully utilized by winter steelhead; summer steelhead usually spawn farther upstream than winter steelhead" (Wilther 1966, Roelfs 1983, Behnke 1992 in Busby et al. 1996).

The "half pounder" life strategy (terminology of Snyder 1925) in steelhead is found only in the Rogue, Mad, Klamath, and Eel Rivers of southern Oregon and northern California (Busby et al. 1996). After smolting, half-pounders reside in the ocean for 2-4 months before returning to freshwater. They overwinter in the river, then return to the ocean in the spring. This is sometimes called a "false migration;" half-pounders are usually sexually immature (Busby et al. 1996). After maturing in the ocean for 1-2 years, they return to the river to spawn. Presence of "half-pounders" in the Mattole is anomalous; other watersheds with half-pounder migrations have significant snowmelt. However, life history similarities between steelhead of the Northern California ESU and those of the Klamath Mountains Province ESU do exist (Busby et al.1996), so it is possible there may be true half-pounders in the Mattole.

Mattole River Summer Steelhead

In the Mattole, summer steelhead enter the river between March and June (Downie et al. 2002). Mattole summer steelhead oversummer in deep, cold pools before spawning during the following late winter and spring. Deposition of eggs in spawning gravel takes place in early spring; juveniles hatch within about 50 days (Downie et al. 2002). Juvenile steelhead typically spend two years in the Mattole before migrating to the ocean for one to three years. Ninety percent of returning steelhead spawners are three to four years old (Downie et al. 2002). Summer steelhead in the Mattole can be large; the average size is approximately 26" for males 24" for females (Downie et al. 2002.).

Spawner survey and dive observations of steelhead provide evidence of different life history patterns among Mattole steelhead. According to local restorationists, most steelhead in the Mattole spawn from late-December to May, with the peak of spawning activity believed to be in February and March. Infrequent observations of steelhead spawning in June have also been reported by MSG surveyors. Very small emergent SH fry have been observed by MSG divers in July and even Aug. However, overlaps in migration and spawning periods of winter and summer steelhead makes distinction difficult (Roelfs 1983).

Historical Summer Steelhead Populations in the Mattole

Historical records concerning summer steelhead populations in the Mattole are scarce (MSG 2005). Newspaper records, accounts by longtime watershed residents, and testimony by past surveyors support the existence of a historical summer steelhead population in the Mattole.

In a letter to the California Department of Fish and Game (CDFG) (1943), longtime Mattole resident Albert Etter described great numbers of steelhead migrating up the Mattole River in the months of January through April. He went on to detail observation of as many as 300 steelhead in a single pool. In October of 1942, Etter observed 100-200 large trout (16-24") near his farm in Ettersburg. Although these may have been early-run winter steelhead, it is unlikely that adult winter steelhead would be observed so early in the spawning season as Ettersburg is located 42 miles upstream of the mouth of the Mattole (Gerstung 2000). Etter described the large summer trout as full-bodied, not emaciated like spawned-out winter steelhead. According to Gerstung (2000), "resident rainbow trout of the size noted are generally not found, at least in the numbers observed, in northern California coastal streams." It follows that Etter may have observed summer steelhead holding in the Ettersburg area.

In 1980, a local game warden observed 44 summer steelhead near the confluence of Fourmile Creek and the mainstem Mattole (24 miles from the mouth) and in close proximity to Ettersburg.

Mattole Salmon Group Summer Steelhead Dives, 1996-2005

The Mattole Salmon Group (MSG) Summer Steelhead Dive is the primary source of information and monitoring of summer observations of adult steelhead in the Mattole River.

The first diving survey for summer steelhead on the Mattole, organized by CDFG, took place in l982; three sixteen inch steelhead were observed near Ettersburg (Gerstung 2000). In l991, Humboldt State University's Cooperative Fishery Research Unit organized a second dive, but it was unsuccessful.

Between 1996 and 2005, direct dive observation counts of steelhead were conducted in thirteen to twenty-two reaches of the mainstem Mattole and the lower reaches of three tributaries during the summer months. Thirteen index reaches were monitored throughout the ten years of surveys, although landowner access and volunteer personnel limited surveys in some cases. Divers were organized by the Mattole Salmon Group with volunteers from CalTrout, Americorps Watershed Stewards Project, Humboldt Fish Action Council, NOAA Fisheries, and US Fish and Wildlife Service over the years.

The purpose of the Mattole Summer Steelhead Dive has been to enumerate adult steelhead and "half-pounders" holding in the Mattole over the summer months and identify their preferred holding habitat in the mainstem and lower sections of three tributaries. Other objectives included locating "cold-water" areas and identifying the distribution of three species of juvenile salmonids.

Appendix B, Mattole Salmon Group Summer Steelhead Dive Summary Tables, 1996-2005

Table B-1. Adult Summer Steelhead Observations, MSG Summer Steelhead Dives

Number	Reach Description	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total
1	Phillips Cr.(RM 60.4) to Lost River Cr.(RM 58.8)		0		0		0	0	0	0		**0**
2	Lost River Cr.(RM 58.8) to Stanley Cr. (RM 57.1) & Thompson Cr. (RM 58.4+ 0.15, mouth to confluence with Yew Ck.)	0	0	1	0							**1**
2A	Lost River Cr.(RM 58.8) to Stanley Cr. (RM 57.1)					0	0	1	0	0	0	**1**
2B	Thompson Cr. (RM 58.4+.15, mouth to confluence with Yew Cr.)		0			0	0	0	0	0	0	**0**
19	Stanley Cr. (RM 57.1) to ds Anderson Cr. (RM ~55.6)	1										**1**
3	McKee Cr. (RM 52.8) to Crooks (RM 51.3)			0	0	0	4	3	5	0		**12**
3A	McKee Cr. (RM 52.8) to Bridge Cr. (RM 52.1)	0	1									**1**
4	Crook's (RM ~51.3) to Tom's Hole (Patty's) (RM ~49.4)	2	0	3	5							**10**
4A	Crooks RM (51.3) to Big Finley Ck. (RM 47.4)					2	3	1	9	7	4	**26**
5	Tom's Hole (RM ~49.4) to Big Finley Cr. (RM 47.4)	0	4	0	1							**5**
6	Big Finley Cr. (RM 47.4) to Shepp's (RM~46.0)	6	0	0	2							**8**
6A	Big Finley Cr. (RM 47.4) to Deer Lick Cr. (RM 45.8)					1	1	2	7	0	6	**17**
20	Schepps' (RM ~46.0) to us Bear Cr. (RM 42.7)	1										**1**
7	Us. Bear Cr. (RM 42.7) to Klossen's Hole (ds Mattole Canyon Cr.)(RM~39.9)	0	0	0	3	0	1	4	1	0	0	**9**
21	Mattole Canyon Cr. (RM 41.1) to Fourmile Cr. (RM 34.6)	4										**4**

22	Fourmile Cr. (RM 34.6) to Gilham Cr. (RM 32.8)	1										**1**
8	Gilham Cr. (RM 32.8) to Dry Cr. (RM 30.4)	0	0	1								**1**
23	Dry Creek (RM 30.4) to Honeydew Slide (RM 27.0)	0										**0**
9	Honeydew Slide (RM 27.0) to Bundle Prairie Cr. (RM 24.4)	3	1	2		3	5				2	**16**
9A	Honeydew Slide (27) to Woods Ck.(24.1)							2	4	1		**7**
10	Bundle Prairie Cr. (RM 24.4 to Triple Junction High School (RM 21.3)	0	3	0	0	3						**6**
10A	Woods Ck.(RM 24.1 to Triple Junction HS (RM 21..3)						0		5	1		**6**
11	Saunders Cr. (RM 19.7) to Squaw Cr. (RM 14.9)	0	1	0		0		0	0		0	**1**
12	Squaw Cr. (RM 14.9) to Lindley Bridge (RM 12.6)	0	0	0	1	1	0	0	1	0	0	**3**
13	Lindley Bridge (RM 12.6) to Conklin Cr. (RM 7.8)	0	0	0	2		1	1	1	0		**5**
14	Conklin Cr. (RM 7.8) to Hideaway Bridge (RM 5.2)	0	2	0	0	1	1	0	8	1		**13**
15	Hideaway Bridge (RM 5.2) to Stansberry Cr. (RM 1.3)	1	0	0	1	3	0	2	3		2	**12**
15A	Hideaway Bridge (RM 5.2) to Rex's (MSG Office)(RM 3.0)									1		**1**
16	Stansberry Cr. (RM 1. 3) to Ocean (RM 0.0)	0	2	0		3	1	0	0		0	**6**
16A	Rex's (MSG Office)(RM 3.0) to Ocean									0		**0**
17	Bear Cr. (Geppert/Spencer's to mouth) (lower 3.6 miles)	1	1	0								**2**
17A	Bear Creek (lower 0.6 miles)										0	**0**
18	Honeydew Cr. Maureen Catalina's to 2.5 miles us Bear Wallow Slide	0	1	2								**3**
18A	Honeydew Creek (lower 0.6 miles)							0	0	5	0	**5**
	Totals	**20**	**16**	**9**	**15**	**17**	**17**	**16**	**44**	**16**	**14**	**184**

Table B-2. "Half-pounder" (12"-16" steelhead) Observations, MSG Summer Steelhead Dive

Number	Reach Description	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total
1	Phillips Cr.(RM 60.4) to Lost River Cr.(RM 58.8)		0		0		0	4	3	0		**7**
2	Lost River Cr.(RM 58.8) to Stanley Cr. (RM 57.1) & Thompson Cr. (RM 58.4+ 0.15, mouth to confluence with Yew Ck.)	2	3	2	1							**8**
2A	Lost River Cr.(RM 58.8) to Stanley Cr. (RM 57.1)					0	8	24	0	1	0	**33**
2B	Thompson Cr. (RM 58.4+.15, mouth to confluence with Yew Cr.)		0			0	0	0	0	0	0	**0**
19	Stanley Cr. (RM 57.1) to ds Anderson Cr. (RM ~55.6)	0										**0**
3	McKee Cr. (RM 52.8) to Crooks (RM 51.3)			2	2	7	13	9	1	3		**37**
3A	McKee Cr. (RM 52.8) to Bridge Cr. (RM 52.1)	1	0									**1**
4	Crook's (RM ~51.3) to Tom's Hole (Patty's) (RM ~49.4)	0	3	2	5							**10**
4A	Crooks RM (51.1) to Big Finley Ck. (RM 47.4)					3	5	10	21	0	3	**42**
5	Tom's Hole (RM ~49.4) to Big Finley Cr. (RM 47.4)	5	3	1	2							**11**
6	Big Finley Cr. (RM 47.4) to Shepp's (RM~46.0)	2	4	0	0							**6**
6A	Big Finley Cr. (RM 47.4) to Deer Lick Cr. (RM 45.8)					5	1	1	9	0	6	**22**
20	Schepps' (RM ~46.0) to us Bear Cr. (RM 42.7)	2										**2**
7	Us. Bear Cr. (RM 42.7) to Klossen's Hole (ds Mattole Canyon Cr.)(RM~39.9)	1	0	2	1	1	30	17	3	2	1	**58**
21	Mattole Canyon Cr. (RM 41.1) to Fourmile Cr. (RM 34.6)	1										**1**
22	Fourmile Cr. (RM 34.6) to Gilham Cr. (RM 32.8)	1										**1**
8	Gilham Cr. (RM 32.8) to Dry Cr. (RM 30.4)	1	0	1								**2**

23	Dry Creek (RM 30.4) to Honeydew Slide (RM 27.0)	0										**0**
9	Honeydew Slide (RM 27.0) to Bundle Prairie Cr. (RM 24.4)	2	4	0		2	15				14	**37**
9A	Honeydew Slide (27) to Woods Ck.(24.1)							3	2	4		**9**
10	Bundle Prairie Cr. (RM 24.4 to Triple Junction High School (RM 21.3)	3	3	1	5	11						**23**
10A	Woods Ck.(RM 24.1 to Triple Junction HS (RM 21..3)						0		20	0		**20**
11	Saunders Cr. (RM 19.7) to Squaw Cr. (RM 14.9)	0	0	1		0		1	0		1	**3**
12	Squaw Cr. (RM 14.9) to Lindley Bridge (RM 12.6)	1	0	1	0	8	0	2	0	3	8	**23**
13	Lindley Bridge (RM 12.6) to Conklin Cr. (RM 7.8)	0	0	1	2		3	2	2	1		**11**
14	Conklin Cr. (RM 7.8) to Hideaway Bridge (RM 5.2)	2	4	0	0	1	1	7	12	0		**27**
15	Hideaway Bridge (RM 5.2) to Stansberry Cr. (RM 1.3)	0	2	0	4	0	4	6	12		2	**30**
15A	Hideaway Bridge (RM 5.2) to Rex's (MSG Office)(RM 3.0)									1		**1**
16	Stansberry Cr. (RM 1. 3) to Ocean (RM 0.0)	2	0	0		2	16	2	0		0	**22**
16A	Rex's (MSG Office)(RM 3.0) to Ocean									1		**1**
17	Bear Cr. (Geppert/Spencer's to mouth)	8	5	5								**18**
17A	Bear Creek (lower 0.6 miles)										1	**1**
18	Honeydew Cr. Maureen Catalina's to 2.5 miles us Bear Wallow Slide	0	13	2								**15**
18A	Honeydew Creek (lower 0.6 miles)							0	0	3	0	**3**
	Totals	**34**	**44**	**21**	**22**	**40**	**96**	**88**	**85**	**19**	**36**	**485**

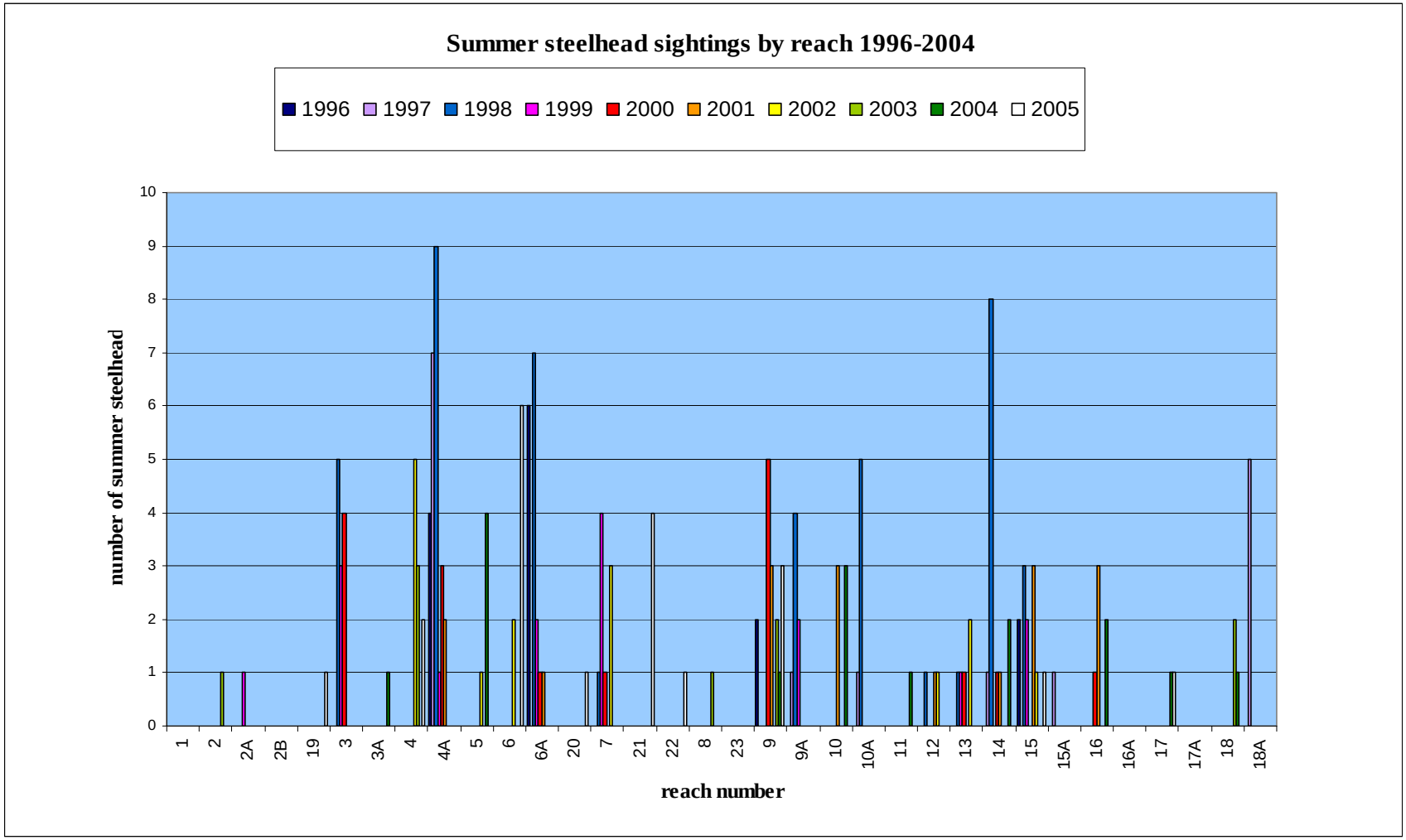


Figure B-1. 184 summer steelhead (>16") were observed in dive surveys in 1996-2005. Adult steelhead were observed throughout the watershed, but seemed to utilize pool habitat and thermal refugia in the mid-river to the greatest extent.

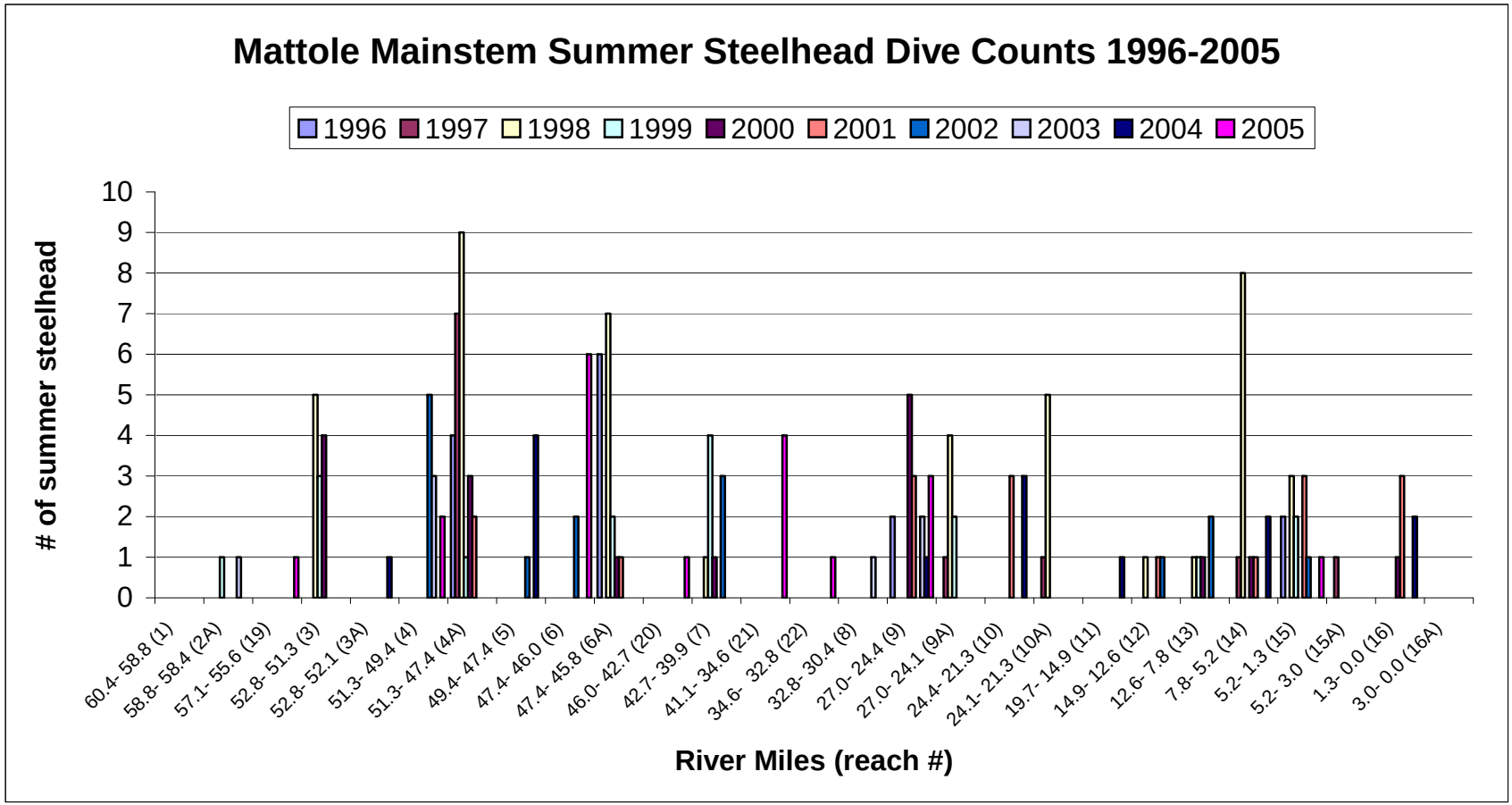


Figure B-2. Mattole mainstem adult summer steelhead observations by river mile, 1996-2005.

Appendix C.
Temperature recordings and other species observed during the MSG 2005 Summer Steelhead Dive

Table C-1. Summary of Freshwater Mussels, Bull Frog Tadpoles, Crayfish, Western Pond Turtles, and other species seen by divers between the headwaters and the mouth of the Mattole River, during summer steelhead surveys, July-September 2005.

Reach #	Reach Name and Location	Freshwater Mussels	Bull Frog Tadpoles	Crayfish	Western Pond Turtles	Other	Notes
1	Phillips Cr. (RM 60.4) to Lost River Cr. (RM 58.8)	N/A	N/A	N/A	N/A	N/A	N/A
2	Lost River Cr. (RM 58.8) to Stanley Cr. (RM 57.1) & Thompson Cr. (RM 58.4 + 0.15, mouth to confluence with Yew Cr.)	>6	No	No	No	Yellow-legged frog, 2 newts, 1 snake, stickleback, lamprey carcasses, scant algae	N/A
19	Stanley Cr. (RM 57.1) to ds Anderson Cr.	No	No	No	No	N/A	N/A
3A	McKee Cr. (RM 52.8) to Bridge Cr. (RM ~51.3)	4	No	No	Yes	Pacific giant salamander + other salamanders, snakes	N/A
4	Crook's (RM ~51.3) to Tom's Hole (Patty's) (RM ~49.4)	Yes	No	Yes	No	N/A	FWM not as abundant in years past
5	Tom's Hole (RM ~49.4) to Big Finley Cr. (RM 47.4)	Yes	No	Yes	1	N/A	N/A
6	Big Finley Cr. (RM 47.4) to Schepp's (RM ~46.0)	Yes	No	Yes	8	newts, garter snakes, scotch broom	N/A
20	Schepps' (RM ~46.0) to us Bear Cr. (RM 42.7)	615	No	No	1	5 garter snakes, rough-skinned newt, turtles, 2 dead lamprey (14", 18"), 6 lamprey	N/A...
7	Us. Bear Cr. (RM 42.7) to Klossen's Hole (ds Mattole Canyon Cr)(RM ~39.9)	No	No	No	No	N/A	N/A
21	Mattole Canyon Cr. To 4 mile Cr.	20	No	No	Yes	Turtle @ put-in, 1 watersnake, newts, snakes, turtles, bullfrog	N/A
22	4 Mile Cr. To Gilham Cr.	No	No	No	5	2 toads, 5 turtles (3 males, 2 females), 2 newts, 12 garter snakes, seemingly few 0-4" SH, All SH dist. Patchy	seemingly few 0-4" SH. All SH distribution very patchy
8	Gilham Cr. (RM 32.8) to Dry Cr. (RM 30.4)	1	No	No	Yes	numerous turtles, newts, garter snakes	2 schools of KS, one near Gilham, one below Middle Cr., high flow
23	Dry Creek (RM 30.4) to Honeydew Slide (RM 27.0)	No	No	No	No	N/A	N/A
9A	Honeydew Slide (RM 27.0) to Honeydew Bridge (RM 25.7)	No	No	No	1	2 merganser, 1 newt, 1 snake	N/A

9B	Honeydew Creek To Bundle Prairie Cr. (RM 24.4)	No	No	No	Yes	garter snake, western pond turtle, newts	more intense searching in good habitat + less looking in warm water
10	Bundle Prairie Cr. (RM 24.4 to Triple Junction High School (RM 21.3)	No	No	No	1	N/A	Turtle @ Woods Creek
11	Saunders Cr. (RM 19.7) to Squaw Cr. (RM 14.9)	No	No	No	4	1 adult large frog (possibly bullfrog), newts.	Reach lacks habitat w/ cover + cold water
12	Squaw Cr. (RM 14.9) to Lindley Bridge (RM 12.6)	No	No	No	Yes	5 turtles, aquatic garter snakes fishing for juveniles	Way less aquatic life than last year, water much deeper throughout reach than last year
13	Lindley Bridge (RM 12.6) to Conklin Cr. (RM 7.8)	No	No	No	2	River otter, newt, snakes, American dipper, cows	N/A
14	Conklin Cr. (RM 7.8) to Hideaway Bridge (RM 5.2)	No	No	No	3 western pond turtles	2 adult prickly sculpin, 1 adult bullfrog, lots of 8-10" resident trout	N/A
15	Hideaway Bridge (RM 5.2) to Stansberry Cr. (RM 1.3)	No	No	No	1 western pond turtle	lots of SH, from juveniles to 10" residents	N/A
16	Stansberry Cr. (RM 1.3) To Ocean (RM 0.0)	No	No	No	No	N/A	N/A
17	Bear Cr. (Geppert/Spence's to mouth)	No	No	No	4 turtles, 2 of which were males, sparring in the water	2 deer, 5 snakes, Band-tailed pigeon, people	N/A
18	Honeydew Cr. (Catalina's) to 2.5 miles us Bear Wallow Slide	No	No	No	No	N/A	N/A
		8 reaches	0 reaches	3 reaches	15 reaches		

Table C-2.. Mattole stream and air temperatures were recorded by handheld thermometers during Summer Steelhead Survey dates, 2005. (°C in red).

Date	Location	Reach # / Letter Code	Time	Tributary Temp (°F)	Mattole Temp (°F)	Air Temp (°F)
7/29	Stanley Creek Falls	19/A	1040	59 @ 1'		70
7/29	Tom's Hole (RM ~49.4)	5/A	1000		62	74
7/29	Eubanks Creek	5/B	1620	63		
7/29	Mattole @ Eubanks Creek	5/C	1620		68	
7/29	Big Finley Creek	5/D	N/A	60		
7/29	Mattole @ Big Finley Creek (RM 47.4)	5/E	N/A		69	
8/4	Big Finley Pool	6/A	1100	61 @ 6"		64
8/4	Pool us Little Finley Creek	6/B	1500		65 @ 1'	71
8/4	Little Finley Creek	6/C	1530	61 @ 3'		71
8/4	Takeout at Schepp's	6/D	1720		68 @ 6"	73
7/29	Shepps	20/A	1100			68
7/28	Mattole @ Mattole Canyon Creek	21/A	1145		19 @ 4'	23
7/28	Cold pool near house LB behind log	21/B	1255		20 @ 5'	25
7/28	Deep (~25') pool RB 200 yds ds house	21/C	1330		19 @ 25'	25
7/28	Small Creek RB	21/D	1700		19 @ 3'	26
7/29	Grindstone Creek RB cold pool	21/E	1100		17 @ 6'	20
7/29	Harrow Creek LB	21/F	1200		19 @ 3'	23
7/29	Small Creek RB deep pool	21/G	1315		24 @ 12'	25
7/29	Creek ~ 0.25 mi ds from Harrow LB	21/H	1345		22 @ 4'	28
7/29	RB trib w/ deep pool	21/I	1500		23 @ 7'	28
7/29	Deep pool (18') trib on RB	21/J	1525		17 @ 18'	28
7/29	Mattole @ 4 Mile Creek	21/K	1730		25 @ 2'	24
7/28	Mattole just ds Shoals Cr. LB @ tail of pool	22/A	1120		68 @ 2'	78
7/28	LB creek us slide (w/gray soil) (us 4 Mi Cr)	22/B	1245	60 @1.5'		84
7/28	mouth of 4 Mile Creek	22/C	1300	64 @ 3'		85
7/28	bottom of hole @ base of rock face	22/D	1330		64 @ 6'	83
7/28	stranded pool 5' from river's edge	22/E	1605	64 @4'		80
7/28	Takeout @ Bob Stansberry's Rd. Access	22/F	1700		76 @ 6'	80
7/28	Gilham Creek	8/A	1220	61@ .5'		79
7/28	Mattole @ Gilham Creek	8/B	1220		73 @ .5'	79
7/28	Westlund Creek	8/C	1438	64 @ .1'		
7/28	Mattole us of Westlund Creek	8/D	1447		76 @ 1.2'	
7/28	Middle Creek	8/E	1516	68 @ 0.2'		
7/28	Mattole @ Middle Creek	8/F	1519		74 @ 1.3'	
7/28	Dry Creek	8/G	1630	71 @ .2'		
7/28	Mattole us of Dry Creek	8/H	1635		77 @ 1'	76
7/22	Mattole @ RM 27.0, RB trib	9A/A	1140	64 @ 4"	70 @ 1'	76
7/22	Top of Honeydew Slide	9A/B	1220		74 @ 3"	
7/22	Honeydew Creek	9A/C	1500	~70		
7/22	Honeydew Creek	9B/A	1134	64 @ 1.5'		75
7/22	Mattole us Honeydew Bridge	9B/B	1145		71 @ .1'	75

7/22	Mattole @ ds end of Honeydew Hole	9B/C	1300		74 @ .1'	85
7/22	Mattole @ Bundle Prairie	9B/D	1530		81 @ .1'	90
7/22	Bundle Prairie Creek 30' ds of Bridge	10/A	1124	61 @ 1"		72
7/22	Mattole at Bundle Prairie Creek	10/B	1128		79 @ 1" (in sun)	70 (in sun)
7/22	Mattole ds Woods Creek	10/C	1230		60.5 @ 5"	82
7/22	In Creek below Blueberry Farm	10/D	1445	61 @ 2"		78
7/22	Across from Dale Huddhston's LB	10/E	1600		70 @ 2'	84
7/22	Takeout at Triple Junction H.S.(bridge)	10/F	1615		74 @ 3'	84
7/29	Mattole @ Saunders Creek	11/A	1020		67 @ .5'	71
7/29	Cook Gulch	11/B			58 @ .25'	
7/29	unnamed RB springs ds of Pritchett Cr.	11/C			54 @ .25'	
7/29	unnamed RB spring	11/D			55 @ .25'	
7/29	Mattole pool @ Thornton Cr. Confluence	11/E			73 @ 8'	
7/29	Mattole pool @ Thornton Cr. Confluence	11/E			74 @ .25'	
7/29	unnamed tributary on RB ds of Thornton	11/F		62 @ .25'		
7/29	Squaw Creek	11/G	1900	68 @ .5'		
7/29	Mattole @ Squaw Creek	11/H	1905		74 @ .5'	62
7/28	Mattole us mouth of Squaw Creek	12/A	1045		68 @ 1'	63
7/28	mouth of Squaw Creek	12/B	1050	61 @ 1.5'		63
7/28	A.W. Way hole, deep	12/C	1115		64 @ 1.2'	62
7/28	1st creek ds of A.W. Way	12/D	1123	58 @ 3'		63
7/28	LB willow, ds of Jimmy Greenfield's hole	12/E	1300		72 @ 2'	69
7/28	mouth of Green Fir Creek	12/F	1333	58 @ 2"		
7/28	Mattole @ Green Fir Creek	12/G	1335		74 @ 2'	69
7/28	Scour Pool @ slide log structure	12/H			74 @ 5'	65
7/28	mouth of Wild Turkey (discontinuous w/ms)	12/I		56		
7/28	Mattole near Wild Turkey	12/J			74 @ 2'	
7/29	Lindley Bridge	13/A	1000		67.5 @ 1'	73
7/29	Indian Creek	13/B	1045	57 @ surface		
7/29	Mattole @ Indian Creek	13/C	1045		68 @ surface	
7/29	RB trib	13/D	1130	56 @ surface		
7/29	RB trib	13/E	1230	56 @ surface		70
7/29	Mattole @ RB trib	13/F	1230		72 @ surface	70
7/29	McGinnnis Cr.	13/G	1345	66 @ surface		
7/29	Mattole @ Conklin/McGinnis	13/H	1400		74 @ surface	
7/29	Conklin Creek	13/I	1400	70.5 @ surface		68
7/29	confluence of Conklin Cr. & Mattole	14/A	1130		64 @ 1'	63
7/29	confluence of Clear Cr. & Mattole	14/B	1400		58 @ 6"	62
7/29	Mattole under Hideaway Bridge	14/C	1500		73.5 @ 6"	62
7/28	Mattole under Hideaway Bridge	15/A	1105		66 @ 6"	69
7/28	Mattole/N. Fork confluence	15/B	1140		66 @ 1'	69
7/29	Stansberry Creek	16/A	1020	48 @ 1'		51
7/29	Mattole BWP	16/B	1020		52 @1'	

7/29	Mattole	16/C	1100		64 @ 1	
7/29	Collins Gulch	16/D	1200	49 @ 1'		
9/26	Bear Creek @ Geppert put-in	17/A	930		50 @ 8"	53
9/26	Bear Creek ds put-in, shallow, south-facing	17/B	1230		52 @ 10"	56
9/26	Bear Creek ds	17/C	1300		52 @ 5"	55
9/26	Bear Creek takeout @ French's bridge	17/D	1700		53 @ 1'	60