APPENDIX 1: File Memos #082-091 for 2008 Surveys.

MEMORANDUM TO THE FILE–#082

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), December 25-26, 2007, *my first survey (a complete survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

I conducted this, a standard survey (by boat) of the Index Reach alone, on Christmas day and the following day. I arrived at the mouth of House Creek at 0845 hrs, began survey of the 9.3-mile upper section of stream at 0920 hrs, and completed it at 1348 hrs, for an average survey rate of 2.07 mph. On day two, I surveyed the lower 9.4-mile stream reach from 0845 to 1315 hrs, for an average rate of 2.08 mph.

Survey Methods

Standard procedures, as documented in my previous reports, were followed. On day one, Christmas day, I used my duping device (empty gasoline can) to secure a ride back to the put-in. Overnight, I concealed and stored my boat and gear near the Clark's Crossing (Annapolis Road) bridge. On the following morning, after depositing my vehicle near the take-out, I used my small motorcycle to ride back to the put-in for the second day's survey.

Weather and General Stream Conditions

NWS's weather forecast–which was for sunny skies and NO precipitation over the 2-day period–was in error. Although daytime each day was clear, cold (30-45^{0}F) and sunny (with an accompanying strong northerly wind blowing down the coast and up the valleys), several hundredths of an inch of rain did fall overnight. Nevertheless, heavy frost coated the ground and vegetation both mornings.

Flow was lower and dropping faster than I had expected, based on the rainfall which had been recorded a few days earlier. Nevertheless, water clarity was less than ideal, with a slight tinge of turbidity each day. In addition, the north wind created surface turbulence both days which limited my visibility into pools and runs. One notable and surprising exception was at the Shady Lane Run, near the take-out for day two; it was flat calm there for the first time in many surveys, so I had an excellent view of the bottom all the way through this important "holding" site for adult fish.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had totaled 14.0 inches at the VEN gage (see *Precipitation and Rainfall Event Log for 2007-2008*). The last significant rainfall event totaling 5.8 inches had begun on December 16th and lasted for 5 days, with a maximum 1-day accumulation of 2.36 inches on December 17th. The December 17-19

rainfall total of 4.8 inches brought the hydrograph for the Wheatfield Fork up by an estimated 2,000 cfs, based on the Navarro River gage hydrograph as an index. From December 21 until the start of the survey on December 25th, the hydrograph was in rapid decline. Over the survey dates, it was reading about 110-90 cfs, based on the Navarro gage as an index. The South Fork, Gualala River gage, which is currently the only real-time gage in operation on the river, was reading about 175-200 cfs during the 2-day survey.

The first significant flow spikes of the season, about 400 cfs and 500 cfs each, occurred on December 2 and December 6, 2007, respectively. Thus, December 2 is about the earliest that upstream spawning migrations may have begun (although, for population estimation purposes using the AUC Method, December 6 [500 cfs] shall be assumed as the start of spawning). From December 2 to the survey start date on December 25th, about one-half of the time steelhead migration conditions were marginal-to-poor, with stream flow either too low or too high (and turbid); during the other one-half of this period, good migration conditions occurred.

Results and Discussion

A total of 119 adult steelhead, a very high number for this early in the season, was recorded (Table 1), including 49 along the upper survey reach and 70 along the lower reach. Only nine of the fish were recorded in named pools and runs–three in Park Pool, one in the Indian Spearing Pool, and five in Lower Cable Run. The other fish were in scattered groups at various un-named locations. This suggests fish were widely scattered and moving upstream at a rapid pace. Based on my limited visibility into many of the best holding places, my BPE (best professional estimate) is that I saw and recorded one-half or less of the actual population (actual AUC methodology estimate=40%).

Only two (1.7 percent) of the adult fish appeared to be spent. Overall, fish averaged relatively large, with 69 (58 %) estimated as size 2 and 50 (42 %) estimated as size 3; no size 1 fish were recorded.

There were no steelhead or lamprey redds found, nor any fish carcasses. Scattered JSH, mostly individual fish, were seen on both days.

The river mouth was checked at 1730 hrs on day one. It was open and flowing into the sea at a good rate; surf conditions were relatively mild and a strong north wind was blowing along the coast.

Conclusions

A relatively high number of fresh-run adult steelhead were moving rapidly upstream. A small number of kelts were moving downstream. Spawning was occurring upstream of the Index Reach, but not in the Index Reach. Stream conditions for fish movement were excellent just prior to the survey. Spawning migrations likely began in early December. About one-half the time from then to the survey, migration conditions (flow; turbidity) were good. Survey rating

factors were: flow=Moderate; clarity=Fair; and weather=Fair; therefor, MFF by my present AUC methodology means that observer efficiency was an estimated 40%.

Table 1. Index Reach observations of adult steelhead on December 25-26, 2007.

Reach	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Spent	Location
Upper	0959	2	0	0	2	0	0	un-named flatwater
Upper	1020	2	0	2	0	0	0	un-named flatwater
Upper	1041	11	0	3	8	0	0	un-named pool
Upper	1120	11	0	11	0	0	0	un-named flatwater
Upper	1216	3	0	0	3	0	0	Park Pool
Upper	1221	9	0	6	3	0	0	un-named pool
Upper	1305	4	0	1	3	0	0	un-named pool
Upper	1342	1	0	0	1	0	0	un-named run
Upper	1348	6	0	2	4	0	0	Bridge Run (not a tracked site)
Lower	0924	5	0	5	0	0	0	un-named flatwater
Lower	0943	3	0	0	3	0	0	un-named flatwater
Lower	0947	6	0	4	2	0	0	un-named flatwater
Lower	1130	13	0	5	8	0	0	un-named pool
Lower	1200	11	0	11	0	0	0	un-named flatwater
Lower	1203	2	0	2	0	0	2	un-named flatwater
Lower	1224	5	0	5	0	0	0	Lower Cable Run
Lower	1244	8	0	4	4	0	0	un-named flatwater
Lower	1307	17	0	8	9	0	0	un-named flatwater
TOTALS		119	0	69	50	0	2	

Prepared: January 19, 2008; RWD
Edited: December 11, 2008; RWD

MEMORANDUM TO THE FILE–#083

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), January 20-21, 2008, *my second survey (a complete survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

I conducted this, a standard survey (by boat) of the Index Reach, with Greg Benke. We arrived at the mouth of House Creek at 0900 hrs, began survey of the 9.3-mile upper section of stream at 1125 hrs, and completed it at 1540 hrs, for an average survey rate of 2.19 mph. On day two, we surveyed the lower 9.4-mile stream reach from 0915 to 1425 hrs, for an average rate of 1.79 mph.

Survey Methods

Standard procedures, as documented in my previous reports, were followed. On day one, I used my duping device (empty gasoline can) to secure a ride back to the put-in. Overnight, we concealed and stored our boats and gear near the Clark's Crossing (Annapolis Road) bridge. On the following morning, after depositing my vehicle near the take-out, I used my small motorcycle to ride back to the put-in for the second day's survey. During both days, Greg followed along closely behind me in my second small boat. All data recorded were my observations alone, however. About 2 miles from the end of the survey on day two, I lost my polarized sunglasses; without a spare pair, my visibility into the water was subsequently hampered.

Weather and General Stream Conditions

NWS correctly "called" the weather forecast for both days–cold, blustery conditions, with scattered light rain showers. This is what we encountered, until about 1600 hours on day two (just after completing the survey), when continuous, moderately heavy rainfall began. Moreover, on my way home past Lake Sonoma an hour later, I encountered heavy snowfall and about 1-4 inches of snow accumulation on the ground at the highest elevations (see attached photograph).

Stream flows both days were relatively high. However, despite the showers and cloudy conditions, water clarity remained relatively good, with the exception of a few of the deepest pools and flatwater areas where the bottom either could not be seen or was marginally viewable. Since the winds were mostly intermittent (accompanying quickly-passing showers), they were not a significant factor in preventing visibility (due to surface turbulence) into the water. In fact, for the second successive survey, it was flat calm through the Shady Lane Run and even though my polarized glasses were gone, I could see bottom very well.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had risen to 27.5 inches, with 13.5 inches of this occurring since the previous survey on December 25-26, 2007

(all rainfall based on the VEN gage; see *Precipitation and Rainfall Event Log for 2007-2008*). The last significant rainfall event totaling 9.0 inches had begun on January 3rd and lasted for 8 consecutive days, with a maximum 1-day accumulation of 5.8 inches on January 4th (preceded by 3.6 inches on January 3rd). Therefore, this was indeed a very large rainfall event. However, except for 2 days with insignificant (≤0.04 inch) rainfall, the 9 days prior to the start of the survey lacked precipitation.

The January 3-4 rainfall resulted in an estimated (based on the Navarro River gage at Navarro as an index) spike to the Wheatfield Fork hydrograph of about 25,000 cfs late on January 4th. Another spike of about 3,000 cfs occurred late on January 8th. Then from January 9th until the start of the survey, the hydrograph remained in rapid decline. At mid-day on the survey dates, the Wheatfield Fork was estimated (based on Navarro) to be flowing at about 200-185 cfs, while the South Fork, Gualala gage was reading about 205-190 cfs.

Results and Discussion

A total of 247 adult steelhead–the highest number for any survey to date of the Index Reach–was recorded (Table 1), including 141 along the upper reach and 106 along the lower reach. A total of 92 of these fish were seen in named locations where numbers are being tracked, including the Concrete Slab Pool (27), YMCA Pool (21), Park Pool (2), Bridge Run (20), Yellow Rope Pool (4), ATV Pool (8), and Angle-Log Pool (12). Seven groups of 20 or more fish were seen. These observations indicate that fish were widely scattered and moving upstream at a relatively rapid pace. Based on my limited visibility into many of the best holding places and several sightings of fish by Greg which I missed, my BPE (best professional estimate) is that I saw and recorded one-half or less of the actual population (actual AUC methodolgy estimate=40%). Sixteen (6.5 percent) of the adult fish appeared to be spent. The estimated size distribution of all adults was 31 (12.6 %) size 1, 115 (46.6 %) size 2; and 101 (40.9) size 3; no very large adults were recorded. However, the estimates of size were in many instances just "ballpark"guesses, due to the fleeting nature (and relatively large numbers of fish) of many sightings.

There were no steelhead redds or steelhead (or other) carcasses found. I did, however, record the first lamprey redd along the lower survey reach on day two (the only one found). No JSH were seen during either day's survey.

The river mouth was checked at 1739 hrs on day one. It was open and flowing into the sea at a good rate into low-to-moderate surf conditions, with almost zero wind along the coast.

Conclusions

The highest number of fresh-run adult steelhead yet recorded along the Index Reach during my 7 years of study were moving rapidly upstream. A moderate number of kelts were also moving downstream. All spawning was still occurring upstream of the Index Reach in the Wheatfield Fork and/or its tributaries. Stream conditions for fish movement were excellent for several days just prior to the survey, but a very high flow peak around January 4th would almost certainly have halted migrations for several days. Overall, about half of the 26 days from the previous survey to

this survey presented good migration conditions (flow; turbidity) for adult steelhead. Survey quality rating factors were: flow=Moderate; clarity=Fair; and weather=Fair, which means that observer efficiency by my present AUC methodology standards (i.e., MFF) was 40%.

Table 1. Observations of adult steelhead along the index reach on January 20-21, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Spent	Location
Upper	1148	27	0	17	10	0	0	un-named flatwater
Upper	1228	3	1	2	0	0	3	un-named flatwater
Upper	1223	27	5	11	11	0	0	Concrete Slab Pool
Upper	1247	4	0	1	3	0	0	un-named pool
Upper	1253	5	1	2	2	0	5	un-named riffle and flatwater
Upper	1307	23	0	12	11	0	0	un-named pool and flatwater
Upper	1355	21	5	8	8	0	0	YMCA Pool
Upper	1409	1	0	1	0	0	1	un-named riffle
Upper	1423	2	0	0	2	0	0	Park Pool
Upper	1435	5	0	2	3	0	0	un-named flatwater
Upper	1506	3	0	2	1	0	0	un-named flatwater
Upper	1538	20	4	8	8	0	0	Bridge Run (not a tracked site)
Lower	0915	25	5	10	10	0	0	un-named flatwater
Lower	0917	1	1	0	0	0	1	un-named flatwater
Lower	1019	20	5	7	8	0	0	un-named flatwater
Lower	1040	3	0	3	0	0	3	un-named flatwater
Lower	1105	5	0	3	2	0	0	un-named flatwater
Lower	1129	4	0	2	2	0	0	Yellow Rope Pool
Lower	1140	8	0	3	5	0	0	ATV Pool
Lower	1219	11	0	6	5	0	0	un-named flatwater
Lower	1258	2	0	1	1	0	2	un-named flatwater
Lower	1301	12	0	6	6	0	0	Angle-Log Pool
Lower	1309	1	0	1	0	0	1	un-named flatwater
Lower	1420	5	0	2	3	0	0	un-named flatwater
Lower	1425	9	4	5	0	0	0	un-named flatwater
TOTALS		247	31	115	101	0	16	

SNOW ON THE HILLS ABOVE LAKE SONOMA, JANUARY 21, 2008.

Prepared January 25, 2008; RWD
Edited December 11, 2008; RWD

MEMORANDUM TO THE FILE–#084

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), February 16-17, 2008, *my third survey (a complete survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

I conducted this, a standard survey (by boat) of the Index Reach, with Greg Benke. We arrived at the mouth of House Creek at 0845 hrs on February 16th and began the survey at 1107 hrs., completing the 18.7-mile-route the following day at 1300 hrs.

Survey Methods

Standard procedures, as documented in my previous reports, were followed, except for one new aspect–we camped out along the river overnight, then continued and completed the survey the next morning. Prior to starting the float, I used my small motorcycle to ride back to the put-in at House Creek, after "spotting" my SUV and boat trailer at the final take-out at Twin Bridges. On day one, we covered from House Creek to 1.5 miles downstream of the Annapolis Road Bridge, a distance of 10.8 miles in 4.3 hrs (2.5 mph). On the second day, we covered the remainder of the route (7.9 miles) in 3.5 hrs (2.3 mph). During both days, which involved relatively fast survey rates due to high flow, I took the lead and Greg followed along closely behind in the second small boat. However, all data recorded were my observations alone.

Weather and General Stream Conditions

Weather prediction for day one was for calm, overcast conditions, with no precipitation; the prediction for day two was for sunny and calm, with no precipitation. And these were essentially the weather conditions that we encountered.

Stream flows both days were relatively high, near the limit for survey feasibility. The Navarro River gage at Navarro read about 280-250 cfs over the survey period, while the South Fork, Gualala River gage read about 300-280 cfs; both hydrographs were in slow decline. During both days, the water still had a slight tinge of green, which was diminishing by the end of the second day.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had risen to 40.2 inches (about the same as for all of the 2006-2007 season), with 12.8 inches of this occurring since the previous survey on January 20-21, 2008 (all rainfall based on the VEN gage; see *Precipitation and Rainfall Event Log for 2007-2008*).

The inter-survey rainfall of 12.8 inches was the result of one long 14-day rainfall event starting on January 21st; this event had a maximum 1-day accumulation of 4.7 inches on January 25th and 5 days with more than 1 inch recorded. Therefore, this was moderately large rainfall event that (due to its length) contributed significantly to watershed recharge. The last rainfall from this event occurred on February 3rd, with the 13 consecutive days prior to the survey lacking any rainfall. Nevertheless, during the survey, the stream was still quite high, making the survey barely feasible.

The January 25th rainfall resulted in an estimated (based on the Navarro River gage at Navarro as an index) spike to the Wheatfield Fork hydrograph of about 11,000 cfs over the following 1.5 days. Two other similar spikes occurred between February 1st and 3rd. Then, from January 4th until the start of the survey, the hydrograph remained in slow decline.

Results and Discussion

A total of 192 adult steelhead was recorded–the second highest number to date for the Index Reach (Table 1)–including 64 along the upper reach and 128 along the lower reach. A total of 78 (41%) of these fish were seen in named locations where numbers are being tracked, including Bedrock Run (2), Concrete Slab Pool (10), Park Pool (12), Indian Spearing Pool (8), Yellow Rope Pool (30), ATV Pool (7), Angle-Log Pool (8), and Lower Cable Run (1). The two largest groups of fish were 20 and 30. Fish were clearly in widely scattered and moving rapidly upstream.

Eleven (6 percent) adults appeared to be kelts. The estimated size distribution of all adults was 4 (2%) size 1, 99 (52%) size 2; and 89 (46%) size 3; no very large adults were recorded. However, the estimates of size were in many instances just "ballpark" guesses, due to the fleeting nature of many of the sightings–combined with the relatively low visibility.

There were no steelhead redds or steelhead (or other) carcasses found. I did, however, record two steelhead "test redds" on day two at 1136 hrs. No JSH were seen during either day.

The river mouth was not checked during this survey, but based on the high flow, it was certainly open and flowing to the sea.

Conclusions

The second-highest number of fresh-run adult steelhead yet recorded were tallied and they were moving rapidly upstream. A small number of kelts were also moving downstream. All spawning was still occurring upstream of the Index Reach in the Wheatfield Fork and/or its tributaries. Stream conditions for fish movement were excellent for about 12 days prior to the survey, but a moderately high flow peak of about 8,000 cfs about February 4th may have halted or slowed migrations briefly. Overall, during about 18-20 days of the 26 days from the previous survey to this survey, adult steelhead migration conditions (flow; turbidity) were good-to-excellent; only the 6-8 days of high flow during this inter-survey period may have delayed or halted fish movements. Survey quality rating factors for day one were: flow=High; clarity=Fair; and weather=Fair, which means that observer efficiency (OE) by my current AUC standards was 20% (i.e., for 10.8 miles). During the second day, the weather element improved (sunny), thus the rating factors were:

flow=High; clarity=Fair; and weather=Excellent, with a resulting OE of 40% (i.e., for 7.9 miles). Thus, the weighted mean OE over the whole survey reach was 28%.

Prepared February 28, 2008; RWD
Edited December 12, 2008; RWD

Table 1. Adult steelhead counted along the Index Reach on February 16-17, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Spent	Location
Upper	1124	5	1	2	2	0	0	un-named flatwater
Upper	1133	2	2	0	0	0	2	Bedrock Run
Upper	1215	10	0	10	0	0	0	Concrete Slab Pool
Upper	1220	8	0	3	5	0	0	un-named pool
Upper	1257	10	0	5	5	0	0	un-named flatwater
Upper	1358	12	0	6	6	0	0	Park Pool
Upper	1359	3	0	1	2	0	0	un-named flatwater
Upper	1504	3	0	2	1	0	3	un-named riffle
Upper	1516	8	0	4	4	0	0	Indian Spearing Pool
Upper	1518	2	0	0	2	0	0	un-named flatwater
Upper	1519	1	0	1	0	0	0	un-named flatwater
Lower	1537	20	0	10	10	0	0	Mouth of Haupt Cr. (not a tracked site)
Lower	0938	1	0	1	0	0	1	un-named flatwater
Lower	0950	9	0	7	2	0	0	un-named flatwater
Lower	0954	9	0	2	7	0	0	un-named flatwater
Lower	0955	1	0	0	1	0	1	un-named flatwater
Lower	1015	2	0	2	0	0	2	un-named riffle
Lower	1101	30	0	15	15	0	0	Yellow Rope Pool
Lower	1113	7	0	4	3	0	0	ATV Pool
Lower	1130	12	0	6	6	0	0	un-named flatwater
Lower	1140	1	1	0	0	0	1	un-named flatwater
Lower	1151	7	0	4	3	0	0	un-named flatwater
Lower	1153	8	0	6	2	0	0	Angle-Log Pool
Lower	1156	12	0	2	10	0	0	un-named flatwater
Lower	1205	8	0	5	3	0	0	un-named flatwater
Lower	1218	1	0	1	0	0	1	Lower Cable Run
TOTALS		192	4	99	89	0	11	

MEMORANDUM TO THE FILE–#085

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), March 6-7, 2008, *my fourth survey (a complete survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

I conducted this, a standard survey (by boat) of the Index Reach, alone. I arrived at the mouth of House Creek at 0900 hrs on March 6th and began the survey at 0930 hrs, completing the 9.3-mile upper survey reach at 1245 hrs. On March 7th I started survey of the lower 9.4-mile reach at 0818 hrs, completing it at 1131 hrs. Thus, for the entire survey, I was on the water for just 6.5 hours.

Survey Methods

Standard procedures, as documented in my previous reports, were followed. The average survey speeds of 2.86 mph (upper reach) and 2.89 mph (lower reach) were remarkably fast, reflecting the relatively high, fast flow both days and the fact I was traveling alone.

Weather and General Stream Conditions

Weather was mostly fully overcast both days. However, this was a bright overcast which proved to be excellent for viewing into the water. The water was still colored very slightly green on day one, but was clear on day two.

Stream flows both days were relatively high, up towards the top end of where survey is feasible. The Navarro River gage at Navarro dropped from about 260-225 cfs over the survey period, while the South Fork, Gualala River gage declined from about 225-210 cfs over the same period; both hydrographs were in relatively slow decline.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had risen to 44.4 inches (about 4 inches more than in all of the 2006-2007 season), with 4.2 inches of this occurring since the previous survey on February 16-17, 2008 (all rainfall based on the VEN gage; see *Precipitation and Rainfall Event Log for 2007-2008*).

The inter-survey rainfall of 4.2 inches was the result of two rainfall events. The first was an insignificant (i.e., no change to hydrograph) 1-day event on February 19th. The second was a 4-day event beginning on February 21 in which 4.08 inches of rainfall occurred, with a maximum 1-day accumulation of 2.16 inches. This latest event raised the hydrograph by about 9,000 cfs. Then, the period from February 25th to the start of the survey was dry, with a declining hydrograph.

Results and Discussion

The inter-survey rainfall and flow between survey three and four likely resulted in excellent migration conditions for adult steelhead during about 14-15 days of the 17 total days between surveys. During the other 2-3 days of the period, flow was above 2,500 cfs and high turbidity may have delayed fish movements somewhat.

A total of 276 adult steelhead was recorded–the highest number recorded to date for the Index Reach–including 91 along the upper reach and 185 along the lower reach (Table 1). A total of 180 (65%) of the fish were counted in named spots where counting is being tracked, including Concrete Slab Pool (40), YMCA Pool (16), Indian Spearing Pool (9), Bridge Run (13), Yellow-Rope Pool (14), ATV Pool (40), Angle-Log Pool (8), Lower Cable Run (14), and Shady Lane Run (26).

A relatively large number–71 (26%)–of adult fish appeared to be spent and for the first time, spent fish were recorded among several of the groups of fresh-run fish that were encountered. The estimated size distribution of all adults was 11 (4%) size 1, 156 (57%) size 2; and 109 (39%) size 3; as during the previous survey, no very large adults were recorded.

On adult steelhead carcass and one new redd were found, both along the upper survey reach on day one. Also, a few scattered individual JSH were seen each day.

The river mouth was checked just before sunset on day one and was open and flowing to the sea. Surf was relatively low and mild. No photographs were acquired, either of the river mouth or other features.

Conclusions

The largest number of adult steelhead recorded to date was tallied. With the previous high counts this season, 2008 will now almost certainly end up as a record annual return of adult fish–at least during my 7-year tenure on the river. In addition to a relatively large number of fresh-run fish moving upstream, a relatively large number of kelts were moving downstream. Almost all spawning was still occurring upstream of the Index Reach in the Wheatfield Fork and/or its tributaries, as only one redd (the first this season) was found. Stream conditions for fish movement were excellent for at least 2 weeks prior to the survey. Survey quality rating factors for day one were: flow=High; clarity=Fair; and weather=Excellent, which means that observer efficiency (OE) by my current AUC standards was 40% for the upper half of the survey reach. During the second day, water clarity improved to Excellent (the two other variables remained unchanged), resulting in OE of 50% for the downstream half of the survey. Thus, the mean OE for the whole survey=45%.

Prepared March 16, 2008; RWD
Edited December 12, 2008; RWD

Table 1. Number of adult steelhead counted along the Index Reach on March 6-7, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Spent	Location
Upper	0935	2	1	0	1	0	2	un-named flatwater
Upper	1004	3	1	2	0	0	3	un-named flatwater
Upper	1018	40	5	10	25	0	10	Concrete Slab Pool
Upper	1051	2	0	2	0	0	2	un-named pool
Upper	1104	1	1	0	0	0	1	un-named flatwater
Upper	1116	16	0	8	8	0	6	YMCA Pool
Upper	1146	1	0	1	0	0	1	un-named flatwater
Upper	1153	1	1	0	0	0	1	un-named riffle
Upper	1225	3	0	3	0	0	3	un-named flatwater
Upper	1240	9	0	3	6	0	3	Indian Spearing Pool
Upper	1243	13	0	5	8	0	3	Bridge Run
Lower	0827	8	0	7	1	0	3	Mouth of Haupt Cr. (not a tracked site)
Lower	0832	6	2	4	0	0	0	un-named flatwater
Lower	0844	23	0	16	7	0	0	un-named flatwater–(our campsite)
Lower	0914	3	0	3	0	0	3	un-named flatwater
Lower	0932	7	0	7	0	0	0	un-named flatwater
Lower	0936	14	0	10	4	0	0	Yellow-Rope Pool
Lower	0945	40	0	20	20	0	10	ATV Pool
Lower	1006	3	0	3	0	0	1	un-named flatwater
Lower	1009	4	0	4	0	0	0	un-named flatwater
Lower	1027	8	0	8	0	0	8	Angle-Log Pool
Lower	1029	1	0	1	0	0	1	un-named flatwater
Lower	1034	24	0	18	6	0	0	un-named pool
Lower	1058	14	0	8	6	0	0	Lower Cable Run
Lower	1110	3	0	2	1	0	3	un-named flatwater
Lower	1121	26	0	11	15	0	6	Shady Lane Run
Lower	1130	1	0	0	1	0	1	un-named flatwater
TOTALS		276	11	156	109	0	71	

MEMORANDUM TO THE FILE–#086

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), March 23-24, 2008, *my fifth survey (a complete survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

I conducted this, a standard survey (by boat) of the Index Reach, alone. I arrived at the mouth of House Creek at 0845 hrs on March 23rd and began the survey at 0930 hrs, completing the 9.3-mile upper survey reach at 1417 hrs. On March 24th I started survey of the lower 9.4-mile reach at 0755 hrs, completing it at 1248 hrs. Thus, for the entire survey, I was on the water for about 9.75 hours.

Survey Methods

Standard procedures, as documented in my previous reports, were followed. The average survey speeds of 1.96 mph (upper reach) and 1.88 mph (lower reach) were about 1 mile per hour slower than for the previous survey, due to the markedly reduced flow and the fact I was stopping frequently to take underwater photographs of adult steelhead (using an underwater camera attached to a 2-ft pole).

Weather and General Stream Conditions

These two days afforded near-perfect survey conditions. It was dry, sunny and the only wind encountered was at the Shady Lane Run, where surface rippling obscured portions of the fish-holding area. Overall, wind was not a significant factor during either survey day, however. And the stream was extremely clear both days.

Stream flow both days was moderately low. The Navarro River gage at Navarro dropped from about 135-125 cfs over the survey period, while the South Fork, Gualala River gage declined from about 95-90 cfs over the same period; both hydrographs were in gradual decline.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had risen to 44.68 inches, about 4 inches more than in all of the 2006-2007 season, but only 0.28 inch of this had occurred since the previous survey on March 6-7, 2008 (all rainfall based on the VEN gage; see *Precipitation and Rainfall Event Log for 2007-2008*). Thus, up to the survey dates (and as this is being written on March 26, 2008), the month of March 2008 is recording as one of the driest March's on record. The inter-survey rainfall of just 0.28 inch was the result of one rainfall event of 3 days duration starting on March 13th in which the maximum 1-day amount was just 0.12 inch. This 3-day event (the 14th event of the 2007-2008 rainfall season) brought about a 25 cfs rise to the flow, based on the Navarro River gage as an index.

Results and Discussion

Despite the low rainfall during March 2008, the inter-survey migration conditions for adult steelhead were excellent during the 16 days between this survey and the previous survey. Over this period, the stream flow dropped slowly by only about 100 cfs, based on both the Navarro and South Fork, Gualala River stream gages.

A total of 474 adult steelhead was recorded, including 167 (35%) and 307 (65%), respectively, along the upper and lower survey reaches (Table 1). This is a remarkably high count. It eclipses the previous record high count (276 fish) for the March 6-7, 2008 survey by nearly 200 fish. Further perspective comes from comparison with previous annual counts for entire spawning seasons. The most striking example is 2004, when eight seasonal surveys of the Index Reach yielded just 121 total adult fish. And in 2005–a much better season–seven surveys yielded 433 total fish. Last season (2007), a very good year, nine surveys yielded 762 total fish. To date in 2008, 1,308 adult steelhead have been counted during five surveys.

A total of 338 (71%) of the fish were counted in named holding spots where counts are being tracked, including Concrete Slab Pool (50; *see* attached photo), YMCA Pool (35), Park Pool (1), Mossy Rock Pool (43), Big Landslide Pool (15), Yellow-Rope Pool (4), ATV Pool (20), Angle-Log Pool (50), Lower Cable Run (40), Shady Lane Run (75), and Snagging Pool (5). The counts of 50 fish at each of three sites (two named and one un-named) and 75 fish at one site eclipsed the previous record single-pool count of 45 fish from a survey (FM #073) conducted March 16-17, 2007. (Note: Sixty fish were counted in one estuary pool in 2007, however.) Moreover, the 75 fish recorded in Shady Lane Run was likely a "low" count, due to wind rippling the surface over parts of this holding area; I suspect that the "real" number easily exceeded 100 adult fish.

A relatively small number–37 (8%)–of the adult fish appeared to be kelts, but I do not consider this to be a very reliable observation, due to the large numbers of fish seen for only a few moments during this survey. The estimated size distribution was 38 (8%) size 1, 284 (60%) size 2; and 152 (32%) size 3 adult fish; as during the previous survey, no very large adults were recorded.

One adult steelhead carcass was observed at the bottom of the Indian Spearing Pool on day one. Eight new steelhead redds were found, four each on the upper and lower survey reaches, bringing the total for the season to nine. Clearly, the number of redds is going to soar soon if dry conditions persist; I would expect to see the Index Reach total going to over 100 if that happens. I intend to "GPS" the locations of all redds found in 2008 during my last survey of the season, about mid-April. No JSH were observed over the 2-day survey period.

However, I did have two very exciting "moments" with adult steelhead observed moving upstream through shallow riffle areas. While I have experience from 35 years of angling for them, I have still long-wondered about such things as, do they always tend to ascend in a group? Do fish in a group all follow the same route? What is their rate of movement? How quickly and easily do they pass the shallowest obstacles? I got some insight to the answers to these questions during the middle of day one and again on day two of this survey.

The first event occurred along the upper survey reach at 1208 hours, when about 75 yards downstream, I spotted fish splashing upstream through a shallow riffle. I knew they hadn't seen me yet, so I exited the boat, shoved it towards the shoreline, and quickly kneeled down in the water (about 1-ft deep) where I remained motionless. The twenty adults in the group ascended the next riffle, just below me, as a group, with about half following up one "braid" while the rest came up an adjacent one about 12 feet away. At the top of the farthest braid, three of the largest fish took a "wrong" left turn into very shallow water and nearly beached themselves. Two-thirds of their upper bodies were exposed. Then, all of the fish quickly regrouped and continued swimming rapidly upstream directly in front of me; all twenty of the group passed by me within 5 seconds. As they did, I snapped off some underwater photos, one of which is attached hereto.

The second event occurred at 1042 hours along the lower survey reach. This time 13 adult fish were seen coming upstream before they spotted me. I rowed to shore, stayed in the boat, and watched. Their ascent mirrored that of the group the day before, except that they all came up the same places in the riffles. Average movement rate along the 150-yard reach where I watched them was about the same as that of a person walking normally–just as observed the day before.

These two highlights of the survey demonstrate that fish were still actively moving upstream. Nevertheless, the large numbers of fish in "favored" pools suggests that upstream movement rate may have been declining and fish were starting the "stack up." I will thus need to revisit the Survey Life (SL) assumption made in my 2007 Annual Report that movements do not slow or halt until a flow of ≤50 cfs is reached. I shall adjust that assumption by adding that migration rate slows in a linear fashion, when flow drops below about 125-130 cfs.

Other wildlife observations from the 2-day survey were: (1) one adult bald eagle seen at 0941 hours on day one; (2) the first of the season, but a relatively low number, of rough-skin newts seen along the upper survey reach only, starting at 1025 hours on day one; (3) a very low number of lamprey redds, about 15 total, seen along the upper survey reach only; and (4) the first pond turtles of the season, about 10 total, scattered along the upper and lower survey reaches both days.

The river mouth was checked during late afternoon of day one and was flowing to the sea. Surf was relatively low and mild, but there was a serious northwesterly wind-chop.

Survey conditions by my current AUC methodology standards were MEE both days, which means that Observer Efficiency averaged 60% over the survey period.

Conclusions

The record spawning return of 2008 was continuing and surging to yet new highs. A large number of fresh-run fish were still moving upstream and a relatively low number were moving back downstream after spawning. Spawning was beginning to intensify in the Index Reach in response to falling stream flow and/or ending of the spawning season. Excellent conditions occurred for adult steelhead migration during the inter-survey period after the previous survey. Observer

efficiency averaged an estimated 60% over the two days. SL assumptions used in my 2007 Annual Report need modifications, reflecting a slowing of the migration rate at flow below 125 cfs.

Table 1. Adult steelhead counted along the Index Reach on March 23-24, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Spent	Location
Upper	1003	2	0	1	1	0	2	un-named flatwater
Upper	1035	50	0	50	0	0	20	Concrete Slab Pool
Upper	1133	4	0	4	0	0	4	un-named riffle
Upper	1158	35	10	15	10	0	0	YMCA Pool
Upper	1209	20	6	14	0	0	0	Group moving up shallow riffles
Upper	1230	3	0	2	1	0	3	Riffle–and moving rapidly downstream
Upper	1238	1	0	1	0	0	0	Park Pool
Upper	1309	43	13	15	15	0	0	Mossy Rock Pool
Upper	1328	2	0	2	0	0	0	un-named riffle
Upper	1414	7	0	5	2	0	2	Pool just below Indian Spearing Pool
Lower	0825	25	0	15	10	0	0	Campsite Pool (not a tracked site)
Lower	0937	15	3	6	6	0	0	Big Landslide Pool
Lower	0947	6	1	3	2	0	0	un-named flatwater
Lower	0952	3	0	3	0	0	0	un-named flatwater
Lower	1000	4	1	0	3	0	0	Yellow-Rope Pool
Lower	1016	20	0	10	10	0	0	ATV Pool
Lower	1039	1	0	1	0	0	1	un-named flatwater
Lower	1042	13	4	9	0	0	0	Group moving up shallow riffles
Lower	1123	50	0	30	20	0	0	Angle-Log Pool
Lower	1137	50	0	25	25	0	0	un-named flatwater
Lower	1205	40	0	25	15	0	5	Lower Cable Run
Lower	1235	75	0	45	30	0	0	Shady Lane Run
Lower	1242	5	0	3	2	0	0	Snagging Pool
TOTALS		474	38	284	152	0	37	

Prepared March 26, 2008; RWD Edited December 11, 2008; RWD

Photos Which Follow: #1-#2–Part of the group of 50 fish in the Concrete Slab Pool; #3–Part of the 20 fish which moved upstream past me at noon on day one.

MEMORANDUM TO THE FILE–#087

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from Clark's Crossing (Annapolis Road Bridge) Downstream 9.4 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), March 30-31, 2008, *my sixth survey (a partial survey) of the index reach for the 2008 spawning season.*

Personnel, Survey Timing and Purpose

I conducted this, a standard survey (by boat) of the lower half of the Index Reach, alone. I arrived at Clark's Crossing at 0845 hrs on March 30th and began the survey at 0907 hours, completing it at 1330 hours (2.19 mph). On March 31st, I re-surveyed the same reach again, starting at 0745 hours and ending at 1230 hours (1.98 mph). Thus, for the two consecutive surveys, I was on the water a total of about 9.0 hours.

The chief purpose of these back-to-back surveys was to attempt to determine whether adult steelhead within the Index Reach were still freely moving up-and-downstream, or whether movements had ceased or slowed (and to what degree), in response to lack of precipitation and falling stream flow. To determine this, I counted the adults present in key "favored" resting and holding areas on day one and compared the results to counts in the same places on day two. The assumption was that large and/or widespread changes in numbers would indicate fish were still moving; the same, or similar numbers both days, would suggest that fish were "stacking" and holding and thus curtailing movements. The record spawning return of adults in 2008 afforded a perfect opportunity to make such comparisons.

This information (i.e., flow at which fish curtail movements) is important to the population estimates I am now making with AUC-T methodology, specifically the issue of Survey Life (SL). Previously, in my 2007 Annual Report, I had assumed that weekly survey life in the Index Reach was 6 days, plus the number of days that the stream flow was either high at ≥3,000 cfs or very low at ≤50 cfs, that is the number of "zero movement" days. In other words, 50 cfs was considered to be the "low flow" at which most adult fish movements completely ceased. However, during the March 23-24, 2008 survey I conducted (FM #86) at a flow of about 135-125 cfs (Navarro gage), there was already evidence (very high counts at key "favored" sites) that some "stacking" was beginning. The back-to-back surveys reported here were designed to examine the issue further.

Survey Methods

Standard procedures, as documented in my previous reports, were followed, except that only the lower half of the Index Reach was surveyed, back-to-back, on two consecutive days. On day two, I knew ahead of time which spots had held fish the day before, however, I avoided looking at the count numbers, the estimates of size classes, or the estimates of kelt numbers during the second

day. The goal–albeit one that was not truly achievable–was to attempt, to the degree possible, to conduct two more or less independent consecutive surveys of the 9.4-mile lower index reach.

Weather and General Stream Conditions

The weather was dry, relatively cool (35-55^{0}F) and sunny both days, with no clouds. However, there was considerable wind (strong westerly flow aloft, following passage of a weak cold front through northern California the day before). On day one the wind was as bad as I have ever encountered along this reach; on day two the wind had diminished, but was still a factor limiting the counting of fish, due to rippling on the water surface.

The stream was low and very clear both days. Between noon of day one and noon of day two, the Navarro River gage at Navarro (an index to flow) dropped from about 95 to 90 cfs, while the South Fork, Gualala River gage declined from about 90 to 80 cfs over the same period; as these values indicate, both hydrographs were in moderate decline.

Rainfall and River Hydrology Prior to the Survey

Season-to-date rainfall (starting October 1st) in the watershed prior to the survey had risen to 44.92 inches, about 5 inches more than in all of the 2006-2007 season, but only 0.24 inch of this had occurred since the previous survey on March 23-24, 2008 (all rainfall based on the VEN gage; see *Precipitation and Rainfall Event Log for 2007-2008*). Thus, up to the survey dates, the month of March 2008 was one of the driest–if not the driest–March's on record. The inter-survey rainfall of just 0.24 inch was the result of one 1-day rainfall event on March 13th which deposited the 0.24 inch. This event bought a barely noticeable rise of about 10 cfs to the flow, based on the Navarro River gage as an index.

Results and Discussion

Counts of Adult Steelhead. A total of 491 adult steelhead were counted, including 235 on day one and 256 on day two (Table 1). All but four (<1%) of these fish were in various named pools or flatwater areas where I am tracking fish utilization. Observations of adults at nine of these sites (Table 1) were notable and can be used in addressing the study objective:

1. Campsite Pool–This site is wind-sheltered and I had an excellent view throughout the length of it both days. I am reasonably confident that some, if not all, of the difference in numbers (2 vs 7 fish) was real and not due to Observer Error (OE) alone. Thus, results from this site suggest that a few fish were still actively moving up and/or downstream.

2. Big Landslide Pool–Wind hampered visibility at this site on day one. On day two, wind was not a factor and I had an excellent view of the entire bottom. I am reasonably confident that the zero fish recorded on day two (vs 3 on day one) was real and not due to OE alone. Thus, results from this site suggest that a few fish were still actively moving up and/or downstream.

3. Yellow Rope Pool–This is one of the most consistently used pools on the Index Reach. I had very good visibility of it both days and no adult fish were recorded. If large numbers of adult fish were still actively moving, I would have expected some recordings here. Thus, results from this site suggest that if fish were still moving, there were not large numbers doing so.

4. ATV Pool–This site is also wind-sheltered, and so I had good visibility and an excellent count both days. The similarity of results (23 vs 22 fish) suggests that this may have been the same group of fish and that it was "stacked" and not moving during the survey period.

5. Angle-Log Pool–Visibility was fair on day one but excellent on day two. Thus, the 25% difference in numbers (60 vs 80 fish) could be real or OE-generated. I did, however, record more smaller fish and more kelts on day two than day one. Thus, results for this site may, or may not, suggest that movements were still occurring. Nevertheless, the similar order of magnitude of the two counts suggest that at least some "stacking" was probably underway.

6. A-Frame Run–Visibility was fair on day one but excellent on day two. Thus, the difference in numbers (40 vs 45 fish) could either be real or OE-generated. I did, however, record more smaller fish on day one than day two. Thus, results for this site may, or may not, suggest that movements were still occurring. Nevertheless, the closeness of the numbers tends to suggest that at least some "stacking" was probably underway.

7. Lower Cable Run–On day one wind was calm and visibility was excellent. On day two, a strong breeze arose just as I floated over the deepest parts of the flatwater and only 15 fish were counted. Then, as I started downstream, I noted that the breeze had completely (but briefly) subsided. I beached the boat and walked back along the site where I got an excellent view and another much larger count (50-which I used). The nearness of the numbers (45 vs 50 fish) and similarity of size classes and kelt numbers suggests that this may have been primarily one group of fish that was "stacked" and holding during the survey period.

8. Shady Lane–Visibility and counts at this site were severely hampered both days by wind. Size classes could not be estimated. Kelt numbers were only estimated on the first day–at this was at best, an informed guess. Thus, while the similarity of the counts (60 vs 50 fish) would tend to suggest mostly one "stacked" and holding group, there could also have also been minor movements occurring.

9. Snagging Pool–My view of this pool was excellent both days and no fish were seen. This tends to be a site used mostly in the springtime, especially by smaller adult fish known as "bluebacks." If large numbers of adults were still actively moving, I would have expected some recordings here.

Results from these nine sites thus appear to show that a relatively small percentage of adult steelhead–perhaps mostly kelts–were still actively moving and that most fish had ceased, or dramatically slowed, their movements and were "stacked" in favored holding sites. The flow during observations ranged from about 90 to 95 cfs. In contrast, during my last survey of the Index Reach on March 23-24, 2008 (FM#086) at flows of about 125-135 cfs, considerably more

movements were still in evidence (although some "stacking" was also indicated). Nevertheless, the 50 cfs "zero movement" low-flow criterion used in my 2007 Annual Report for initial population estimates using AUC-T methodology now clearly appears to be too low.

A more reasonable "zero movement" low-flow value is probably about 75 cfs. Moreover, it appears that a transitional flow dimension likely exists as the flow declines from about 150 cfs down to 75 cfs. This is when stacking begins to appear. This transitional period can be expressed as a linear function, with zero movement days (i.e., added to the basic 6-day SL) varying from zero (150 cfs) to 1.0 (75 cfs). The resulting descriptive equation is:

> ***a=(-0.0133)b + 2****, where a=days added to SL for each day of designated stream flow and b=average daily stream flow in cfs for any given date.*

Several representative zero movement values derived with this function are: 135 cfs=0.2; 120 cfs=0.4; 105 cfs=0.6; 90 cfs=0.8; and 75 cfs=1.0.

Counts of Steelhead Redds. Ten new steelhead redds were found, including eight on the first day and two on the second day. One of the two found the second day was clearly at least several days old, thus it was missed on day one. This illustrates how OE can occur, even for an experienced, well-trained observer. The other redd found on day two was very fresh and could either have been missed on day one, or constructed during the 24 hours between surveys. This redd was only 1/4-mile upstream of the Wheatfield Fork bridge, which is the farthest downstream spawning location recorded on the Index Reach to date. The GPS coordinates of all spawning sites will be recorded during my final spawning survey of the 2008 season, tentatively scheduled for April 12-13, 2008.

Other Observations. Only about six lamprey redds (and no live lampreys) were observed. This is an extremely low number for this late in the season.

A total of three pond turtles were recorded during the first day. Rough-skin newts were not observed. A moderate amount of fresh gravel bar "turning" by wild pigs (presumably searching for acorns deposited and buried in river eddies) was observed. Such diggings appear to contribute a significant source of fine sediment to the river.

Conclusions

This 2-day survey of the lower half of the Index Reach (together with results from the previous whole Index-Reach survey) provides a basis for modifying the "zero movement" low-flow criteria used in making spawning population estimates using AUC-T methodology. The absolute zero movement low flow criterion should be increased from 50 to 75 cfs. Also, a linear transitional reduced movement, low-flow relationship from 75 to 150 cfs, represented by a=(-0.0133)b + 2, should be instituted and used in conjunction with the new zero movement value. This survey also demonstrated that even a very experienced observer may have OE in steelhead redd detection.

Table 1. Adult steelhead counted along the lower half of the index reach on March 30-31, 2008.

Date (March)	Time (hrs)	Total # Adults	Number by Size Class C1	C2	C3	*	# Kelts	Location
–Observations at "Favored" Pools and Flatwater Locations–								
30	0938	2	0	2	0	0	2	Campsite Pool
31	0818	7	0	7	0	0	3	Campsite Pool
30	1039	3	1	1	1	0	3	Big Landslide Pool
31	0925	0	0	0	0	0	0	Big Landslide Pool
30	1055	0	0	0	0	0	0	Yellow Rope Pool
31	0940	0	0	0	0	0	0	Yellow Rope Pool
30	1108	23	0	13	10	0	3	ATV Pool
31	0953	22	0	3	19	0	3	ATV Pool
30	1202	60	0	30	30	0	0	Angle-Log Pool
31	1055	80	15	40	25	0	20	Angle-Log Pool
30	1212	40	15	25	0	0	0	A-Frame Run
31	1109	45	0	30	15	0	0	A-Frame Run
30	1234	45	0	25	20	0	5	Lower Cable Run
31	1131	50	0	30	20	0	5	Lower Cable Run
30	1317	60	-	-	-	-	10	Shady Lane Run
31	1217	50	-	-	-	-	-	Shady Lane Run
30	1323	0	0	0	0	0	0	Snagging Pool
31	1223	0	0	0	0	0	0	Snagging Pool
–All Other Locations–Combined Totals for the Date(s)–								
30	(two)	2	1	1	0	0	1	Two Locations
31	(two)	2	1	1	0	0	2	Two Locations
–Totals by Survey Date–								
30	-	235	17	97	61	0	24	Favored and All Other Locations
31	-	256	16	111	79	0	33	Favored and All Other Locations
2-Day Averages		245.5	16.5	104	70	0	28.5	11.6% Kelts–Average for 2 Days

MEMORANDUM TO THE FILE–#088

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.7 Miles to Wheatfield Fork Bridge (just upstream of South Fork confluence), April 12-13, 2008, *my seventh survey (a complete, final survey) of the index reach for the 2008 spawning season.*

Personnel and Survey Timing

Due to low stream flow which precluded efficient navigation, I conducted this final, 2-day survey of the 2008 spawning season by walking along the stream on foot. During day 1, I walked the upper half of the survey reach alone; during the second day, I was accompanied by Mark Felton.

I arrived at the mouth of House Creek at 0800 hrs on April 12th, began the survey at 0845 hrs, and completed the 9.3-mile upper reach at 1515 hrs for an average rate of 1.43 mph. On the second day, Felton and I began walking the stream at 0755 hrs and completed the lower 9.4-mile reach at 1345 hrs, for an average rate of 1.61 mph. The overall survey thus took 12.3 hrs.

Survey Methods

My standard procedures, as previously documented, were followed–except that the survey was conducted on foot instead of by boat.

A GPS waypoint was recorded for each steelhead redd encountered (i.e., all new and previously marked redds). On day 1, I carried a remote GPS antenna atop a 4-foot pole attached to my backpack; this allowed relatively accurate (±25 ft) GPS "fixes." On day 2, the GPS's built-in antenna had to be used, due to loss of the remote antenna (which was inadvertently left in the bed of a pick-up truck, when I hitched a ride back to House Creek) at the end of day 1, and this resulted in less accurate "fixes" (i.e., up to ±250 ft) in many instances.

Weather and General Stream Conditions

Both days were clear, sunny and dry. Day 1 was calm throughout the survey; during day 2 a moderate upstream breeze was encountered from about 1230 hrs until the end of the survey. The resulting "rippling" effects on the water surface hampered counts of fish at several locations, including Lower Cable Run and Shady Lane Run where adult fish were holding. The water was extremely clear both days, however.

Stream flow was quite low for this stage of the season (i.e., >100 cfs below average). Over the 2-day period, the Navarro River gage at Navarro dropped from about 82-78 cfs, while the South Fork, Gualala River gage declined from about 50-49 cfs. However, based on my experience, I do not believe that the Navarro River flow was an accurate index to the Wheatfield Fork, Gualala

River flow. It is my estimate that the Wheatfield Fork flow was no greater than about 60-75 cfs over the 2-day period.

Rainfall and River Hydrology Prior to the Survey

No rainfall had occurred since the previous (sixth seasonal) survey conducted on March 30-31, 2008. Thus, season-to-date rainfall (starting October 1st) in the watershed still totaled 44.92 inches and the landscape was relatively dry for this stage of the season. In the 2 weeks between surveys, the Navarro River and South Fork flows had dropped about 15 and 35 cfs, respectively.

Results and Discussion

A total of 94 adult steelhead was recorded, including 69 (73%) and 25 (27%), respectively, along upper and lower survey reaches (Table 1). This was a relatively low total, given the record numbers of adult fish I had been recording this season and the low flows which I had surmised (*see* FM 087) would essentially halt their movements (resulting in prolonged "stacking"). In contrast, during the back-to-back surveys of the lower 9.4-mile reach on March 30-31, 491 adult fish ($\bar{x}$=245.5) were counted, versus only 25 fish on this survey. Also, during the last survey of the *entire* Index Reach on March 23-24, 474 adults were counted versus the 94 total adults from the present survey. These observations show that while "stacking" is definitely an issue to be considered in deriving Survey Life (SL) estimates at low stream flows, there is also a springtime "tipping point" beyond which adult fish begin dispersing and moving out of the survey area regardless of low-flow stage or duration. In short, it is pretty clear that fish eventually sense that they had better either "do their thing" or perish. And I suspect that the tipping point "cue" for them is most likely related to either increasing day length or water temperature, or some combination of both.

At any rate, the six complete Index Reach surveys for 2008 yielded a total count of 1,402 adult steelhead. The most striking comparison occurred in 2004, when eight complete surveys yielded only 121 total adult fish. And in 2005–a much better season–seven surveys yielded 433 total fish. The 2007 season, which was also a relatively good year, yielded 762 total fish. Clearly, 2008 was an exceptionally good year for adult steelhead spawning in the river and by far the best of the 7 years I have been surveying the Index Reach. Such a banner year may not repeat again anytime soon, since the source was likely the unseasonably high springtime rainfall of both 2005 and 2006, which in themselves were rare events (*see* my previous reports and website) not likely to be repeated soon.

A total of 83 (88%) of the 94 fish were counted in named holding spots where counts are being tracked, including Concrete Slab Pool (17), YMCA Pool (23), Park Pool (2), Mossy Rock Pool (23), Lower Cable Run (12), and Shady Lane Run (6). The adult fish in the YMCA Pool were "rolling" or "boiling," a phenomenon I have not seen for several years. At Angle-Log Pool, A-Frame Run and several other named sites where visibility was good-to-excellent, no adult fish were recorded. These results contrast sharply with the March 30-31 surveys of the lower Index Reach in

which the average (2-day) counts for some key sites were: Angle-Log Pool-70; A-Frame Run-42.5; Lower Cable Run-47.5; and Shady Lane Run-55.

A relatively large number–58 (62%)–of the fish were, in my best judgement, kelts, however I do not consider this to be a reliable observation; a large percentage of fish recorded had dark coloration, which may have indicated either they were indeed kelts or merely well-colored from a relatively long stream residency. Estimated size distribution was: 1 (1%) size 1; 57 (61%) size 2; and 36 (38%) size 3 adult fish; as during the previous survey, very large adults were not recorded.

No adult steelhead carcasses were found. However, steelhead redds (recorded by GPS) totaled 47, including 22 and 25 along the upper and lower survey reaches, respectively. As in previous seasons, redds well-distributed throughout the survey area. However, one redd about 1/4-mile upstream of the Wheatfield Fork bridge set a new record for the lowermost spawning site. Raw data (downloaded from the GPS) for the 47 steelhead redd locations is attached in Appendix 1.

I did find one lamprey carcass (head removed), two live lampreys constructing a redd, and about 25 total lamprey redds. Thus, lamprey presence in the Index Reach continued to remain well below that observed in previous seasons. I also recorded about 8-10 pond turtles (scattered along both reaches), about a dozen rough-skin newts (along upper reach only), and two immature bald eagles (both in the "loop" away from the road along the upper reach).

The river mouth was not checked during this survey, but based on the low flow I suspect that it was either closed or alternating between open and closed status.

Survey conditions using my current standards (and assuming a flow < 75 cfs for both days) were LEE for day 1 and LEF for day 2, which means that Observer Efficiency (OE) was an estimated 80% and 70%, for an average of 75% overall for the survey.

Conclusions

Despite continued low stream flow, adult steelhead were dispersing from the survey area and the spawning season was clearly drawing to a close. A record seasonal total count of 1,402 fish from six surveys–a total far surpassing any of the six previous seasons–was recorded. Spawning intensified in the Index Reach late in the season in response to falling stream flow and/or ending of the spawning season. Conditions for adult steelhead migration during the inter-survey period after the previous survey were fair-to-poor, due to low stream flows. OE was an estimated 75% over the 2-day survey. Status of the river's mouth was unknown, but it was likely closed.

Table 1. Adult steelhead counts along the index reach on April 12-13, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class				# Spent	Location
			C1	C2	C3	*		
Upper	1035	17	0	14	3	0	9	Concrete Slab Pool
Upper	1036	4	1	2	1	0	4	un-named riffle
Upper	1213	23	0	13	10	0	10	YMCA Pool
Upper	1302	2	0	2	0	0	0	Park Pool
Upper	1350	23	0	10	13	0	23	Mossy Rock Pool
Lower	0819	1	0	1	0	0	0	un-named flatwater
Lower	0852	2	0	2	0	0	2	un-named flatwater
Lower	1035	1	0	1	0	0	1	un-named riffle
Lower	1118	1	0	1	0	0	1	un-named flatwater
Lower	1157	1	0	1	0	0	1	un-named pool
Lower	1200	1	0	1	0	0	1	un-named flatwater
Lower	1250	12	0	6	6	0	0	Lower Cable Run
Lower	1329	6	0	3	3	0	6	Shady Lane Run
TOTALS		94	1	57	36	0	58	

Prepared April 24, 2008; RWD

Edited December 14, 2008; RWD

APPENDIX 1. GPS Waypoint Data for 47 Steelhead Redd Locations (total for season) Recorded along the Index Reach, Wheatfield Fork, Gualala River on April 12-13, 2008.

SYMBOL	WP	DATE	LAT/LONG	ELEV.
Flag, Blue	001	12-APR-08 8:54:04AM	N38 39.915 W123 13.963	274 ft
	Symbol & Name	4/21/2008 10:37:37 AM		
Flag, Blue	002	12-APR-08 8:55:08AM	N38 39.944 W123 13.957	269 ft
	Symbol & Name	4/21/2008 10:37:14 AM		
Flag, Blue	003	12-APR-08 9:02:44AM	N38 40.125 W123 13.949	267 ft
	Symbol & Name			
Flag, Blue	004	12-APR-08 9:50:39AM	N38 40.546 W123 14.795	240 ft
	Symbol & Name			
Flag, Blue	005	12-APR-08 10:39:11AM	N38 40.704 W123 15.645	274 ft
	Symbol & Name			
Flag, Blue	006	12-APR-08 10:39:20AM	N38 40.706 W123 15.648	270 ft
	Symbol & Name			
Flag, Blue	007	12-APR-08 10:51:14AM	N38 40.553 W123 15.874	262 ft
	Symbol & Name			
Flag, Blue	008	12-APR-08 11:15:41AM	N38 40.345 W123 16.066	243 ft
	Symbol & Name			
Flag, Blue	009	12-APR-08 11:21:21AM	N38 40.466 W123 16.163	274 ft
	Symbol & Name			
Flag, Blue	010	12-APR-08 11:49:50AM	N38 40.692 W123 16.535	233 ft
	Symbol & Name			
Flag, Blue	011	12-APR-08 12:30:08PM	N38 40.741 W123 17.153	289 ft
	Symbol & Name			
Flag, Blue	012	12-APR-08 12:34:51PM	N38 40.615 W123 17.108	216 ft
	Symbol & Name			

Flag, Blue	013	12-APR-08 12:53:45PM	N38 40.285 W123 17.517	185 ft
	Symbol & Name			
Flag, Blue	014	12-APR-08 1:45:19PM	N38 40.804 W123 17.792	257 ft
	Symbol & Name			
Flag, Blue	015	12-APR-08 1:51:19PM	N38 40.702 W123 17.833	179 ft
	Symbol & Name			
Flag, Blue	016	12-APR-08 1:51:32PM	N38 40.693 W123 17.838	226 ft
	Symbol & Name			
Flag, Blue	017	12-APR-08 1:51:47PM	N38 40.691 W123 17.844	230 ft
	Symbol & Name			
Flag, Blue	018	12-APR-08 2:02:39PM	N38 40.521 W123 18.053	221 ft
	Symbol & Name			
Flag, Blue	019	12-APR-08 2:08:22PM	N38 40.378 W123 17.959	608 ft
	Symbol & Name			
Flag, Blue	020	12-APR-08 2:34:00PM	N38 40.073 W123 17.914	131 ft
	Symbol & Name			
Flag, Blue	021	12-APR-08 2:40:44PM	N38 40.028 W123 18.105	154 ft
	Symbol & Name			
Flag, Blue	022	12-APR-08 3:15:17PM	N38 39.938 W123 18.778	143 ft
	Symbol & Name			
Flag, Blue	023	13-APR-08 8:56:36AM	N38 40.153 W123 19.883	166 ft
	Symbol & Name			
Flag, Blue	024	13-APR-08 8:57:22AM	N38 40.145 W123 19.895	131 ft
	Symbol & Name			
Flag, Blue	025	13-APR-08 9:00:23AM	N38 40.142 W123 19.978	139 ft
	Symbol & Name			
Flag, Blue	026	13-APR-08 9:11:45AM	N38 40.337 W123 20.220	177 ft
	Symbol & Name			
Flag, Blue	027	13-APR-08 9:21:41AM	N38 40.489 W123 20.422	120 ft
	Symbol & Name			

Flag, Blue	028	13-APR-08 9:30:06AM	N38 40.622 W123 20.673	120 ft
	Symbol & Name			
Flag, Blue	029	13-APR-08 9:30:57AM	N38 40.636 W123 20.693	78 ft
	Symbol & Name			
Flag, Blue	030	13-APR-08 9:31:07AM	N38 40.637 W123 20.696	80 ft
	Symbol & Name			
Flag, Blue	031	13-APR-08 9:39:22AM	N38 40.836 W123 20.577	217 ft
	Symbol & Name			
Flag, Blue	032	13-APR-08 10:30:36AM	N38 41.388 W123 21.607	95 ft
	Symbol & Name			
Flag, Blue	033	13-APR-08 11:24:56AM	N38 41.760 W123 22.124	37 ft
	Symbol & Name			
Flag, Blue	034	13-APR-08 11:34:19AM	N38 41.940 W123 22.324	373 ft
	Symbol & Name			
Flag, Blue	035	13-APR-08 11:37:01AM	N38 42.021 W123 22.386	140 ft
	Symbol & Name			
Flag, Blue	036	13-APR-08 11:39:10AM	N38 42.082 W123 22.436	49 ft
	Symbol & Name			
Flag, Blue	037	13-APR-08 11:49:49AM	N38 42.066 W123 22.792	52 ft
	Symbol & Name			
Flag, Blue	038	13-APR-08 11:58:44AM	N38 42.027 W123 23.049	41 ft
	Symbol & Name			
Flag, Blue	039	13-APR-08 11:59:02AM	N38 42.026 W123 23.055	25 ft
	Symbol & Name			
Flag, Blue	040	13-APR-08 11:59:25AM	N38 42.025 W123 23.061	31 ft
	Symbol & Name			
Flag, Blue	041	13-APR-08 12:24:26PM	N38 42.317 W123 23.377	60 ft
	Symbol & Name			
Flag, Blue	042	13-APR-08 12:43:38PM	N38 42.702 W123 23.294	76 ft
	Symbol & Name			

Flag, Blue	043	13-APR-08 12:51:49PM	N38 42.746 W123 23.403	126 ft
	Symbol & Name			
Flag, Blue	044	13-APR-08 12:58:12PM	N38 42.632 W123 23.569	70 ft
	Symbol & Name			
Flag, Blue	045	13-APR-08 1:06:45PM	N38 42.604 W123 23.784	180 ft
	Symbol & Name			
Flag, Blue	046	13-APR-08 1:07:01PM	N38 42.623 W123 23.803	114 ft
	Symbol & Name			
Flag, Blue	047	13-APR-08 1:37:09PM	N38 42.290 W123 24.488	11 ft
	Symbol & Name			

MEMORANDUM TO THE FILE–#089

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: 2008 Juvenile Steelhead Snorkeling Surveys, *seasonal survey #1 on June 16, 2008.*

Personnel

I conducted this, the first survey of the 2008 summer season, alone. The survey was a long, 1-day event in which all 15 snorkeling sites were visited.

Survey Methods

Methods and snorkeling sites were the same as previously established and modified in 2006. Refer to File Memo #60 and my 2006 annual report for details. However, on this first survey of 2008 and during all three 2007 snorkeling surveys, I did not measure water volumes at the sample (snorkeling) sites. Thus, JSH density can be judged only in relative terms, by contrasting the numbers to numbers obtained during earlier surveys as the same sites.

Rainfall and Hydrology Prior to the Survey

Rainfall for the watershed to date for the season has been 45.48 inches (VEN gage). This is about 83% of average and about 11% more than the 40.88 inches received in 2007.

The big news, however, has been the extremely dry springtime conditions of 2008, with only 5.28 inches occurring during February through April. Moreover, only 6 days with minor rainfall occurred in March and April, with the whole months totaling only 0.52 inch and 0.56 inch, respectively. Thus, 2008 has been one of the driest, if not the driest, spring seasons on record throughout most northern California weather recording stations.

Weather and Stream Conditions

In terms of air temperatures, the summer season prior to the survey had been relatively mild. Only two inland heat waves with air temperatures $\geq 98^0$F had occurred, one during May 15-18 and one about a month later, during June 11-13, 2008. However, on the survey date (and for 2-3 days before), significant marine air intrusion, in the form of a sea breeze, was prevalent throughout the watershed.

As expected, stream flows at the various sites were very low. However, only the Haupt Creek site was drying (i.e., lacking continuous surface flow); all other sites still had continuous surface flows. The South Fork, Gualala gage was reading about 4 cfs, while the Navarro River gage at Navarro (an index to the Wheatfield Fork, Gualala flow) was reading about 18 cfs. Both gage readings were well below average for this date.

The river mouth was not checked, but was assumed to be closed, based on the moderately high estuary stage. No photos were taken during this survey.

Results and Discussion

Observations are briefly summarized below. Additional detail and analysis will be provided in my 2008 annual report issued in December 2008. References to abundance of JSH at individual sites are qualitative and based on comparisons to observations during my previous surveys *at the same site*.

I embarked on this survey with great anticipation, uncertain of what would I find. The largest spawning run in many years had come home last winter and spring. Would the counts of juvenile steelhead (JSH) reflect this? Or would the drought (this springtime) and two serious hot spells already experienced this summer equate to an average or below average JSH density?

Fortunately, I quickly discovered that so far, at least, JSH were still alive and well, and in far greater abundance and density overall than during any previous survey I have made on the river. In addition, at least for the moment (due to the present marine air intrusion), water temperatures were generally within JSH-tolerable ranges. However, a long, potentially hot summer has yet to unfold and its severity (and the related extent and severity of summertime dewatering) will ultimately regulate the size of the JSH population going into winter.

Site-by-site observations were:

#1-Wolf Creek*:* I arrived at 1000 hrs. Water and air temperatures were 58 and 65^{0}F, respectively. Surface flow was still continuous, but very low. JSH numbers were low-to-moderate, with 75 YOY, 5 age 1+ and 2 age 2+ recorded. No GR (Gualala roach) or TSS (three-spine stickleback) were recorded. JSH were mostly within the two pools of the site, but a few were scattered in shallow water in between them.

#2-House Creek: I arrived at 1015 hrs. Water and air temperatures were 64-66 (three locations) and 68^{0}F, respectively. Surface flows were still continuous in the three locations where temperatures are recorded. JSH numbers were the highest I have yet recorded for a 100-ft-long snorkeling sample on the Gualala River sites–3,000 YOY and 12 age 1+; these JSH were distributed throughout the site. However, many of them had fin rot and appeared to be in poor condition, a likely result of recent thermal stress. A total of 500 GR was also recorded.

#3-Wheatfield Fork (Lady-in-the Car): I arrived at 1050 hrs. Water and air temperatures were 65 and 74^{0}F, respectively. Surface flow was continuous, but low. The highest number of JSH–400 YOY, 50 age 1+ , and 10 age 2+ –I have yet recorded at this site were tallied in the sample reach. JSH were scattered throughout the site (very unusual), but all of the larger fish were within the plunge pool. GR (100) and TSS (1,000) were also recorded.

At nearby site #3a, just upstream, which was snorkeled 10 minutes before the main site, JSH (450 YOY; 25 age 1+) were also in very high abundance. Water temperature was 65 and air temperature was 78^{0}F. GR (100) and TSS (25) were also recorded.

#4-Wheatfield Fork (Annapolis Road bridge)**:** I arrived at 1125 hrs. Water and air temperatures were 69 and 80^{0}F, respectively. Surface flow was low, but still continuous. Twenty-five YOY JSH were recorded (a moderate number), along with GR (200) and TSS (50). All of the JSH were in the deep, wood-enhanced, thermal refuge spot near the middle of the site.

At adjacent site #4a, located beneath the Annapolis Road bridge, at 1135 hrs, a large number of JSH were recorded–350 YOY; 25 age 1+; and 5 age 2+. GR (350) were also present. The JSH were scattered throughout the site. Temperatures were the same as at site #4.

At 1155 hrs, at nearby site #4b, 1/4-mile farther downstream, I record 75 YOY JSH and 5 age 1+ JSH, all in the deeper areas with maximum (for the site) flow velocities. GR (50) were also recorded. Water temperature was 68^{0}F; air temperature was 72^{0}F.

#5A-Near North Fork mouth (Upper Section)**:** I arrived at 1415 hrs. Water and air temperatures were 69 and 78^{0}F, respectively. JSH were in low-to-moderate abundance, with 200 YOY, 25 age 1+, and 2 age 2+ recorded. No other species were recorded. JSH were concentrated in the woody cover and faster water near the upstream end of the site. The moderate flow was still continuous.

#5B-Near North Fork mouth (Lower Section)**:** I arrived at this site at 1425 hrs. Temperatures were assumed to be the same as at site #5A. Surface flow was moderate and continuous. JSH numbers were low, with 25 YOY, 5 age 1+, and 2 age 2+ recorded, exclusively in the deep, easterly side of the site with woody cover. No other species were recorded

#5C-North Fork Mouth Pool: I arrived at 1355 hrs. Water and air temperatures were 60 (North Fork)-64^0 F (just downstream of confluence) and 66^{0}F (plunge pool), respectively. Surface flows of both the North Fork and main stem were continuous. Twenty-five YOY JSH were recorded in the plunge pool. However, the water was murky, due to a plankton bloom, thus the count has low reliability. No other species were recorded.

#5D-100 Yards Upstream of North Fork Mouth in the Main Stem: I arrived at the site at 1345 hrs. Water and air temperatures were 64 and 66^{0}F, respectively. Surface flow was still continuous and moderate. Fish were not recorded.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** I arrived at this site at 1600 hrs. Water and air temperatures were 68 and 78^{0}F, respectively. Surface flow was continuous and moderate. JSH were in moderate abundance, with 75 YOY recorded. No other species were recorded. At the nearby bridge over the South Fork, the stream was just barely still flowing continuously; it will surely go dry soon.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** I arrived at 1230 hrs. Water and air temperatures were 63 and 65^{0}F, respectively. Surface flow was continuous, but low. JSH were in relatively low abundance, with 75 YOY recorded, exclusively downstream of the deep, woody pool. No other fish were recorded

#8-Haupt Creek: I arrived at 1205 hrs. The sample site, and the stream reach downstream to the confluence with the Wheatfield Fork, were drying. There was no continuous surface flows, only

drying pools. Water and air temperatures were 64 and 72^{0}F, respectively. Every drying pool contained JSH. The total JSH numbers for the site was moderate, with 350 YOY recorded; these were exclusively very small fish (in otherwise good condition), however.

#9-Highway 1 Bridge Area: I arrived at the site at 1315 hrs. The stage was moderate, indicating that the river mouth was closed. Water and air temperatures were 68 and 64^{0}F, respectively. A moderate-to-high number of JSH–200 YOY–was recorded in the shallow shoreline areas of the site. GR (200) were also recorded.

Conclusions

Owing to the largest number of JSH I have to date recorded at a single 100-ft-long Gualala River snorkeling site (i.e., 3,012 at the House Creek site) and higher-than-normal JSH numbers at several other sites, this survey clearly reflects the highest overall JSH population I have yet recorded in the stream. Results appear to reflect the record spawning return of 2007-2008. Stream conditions (water temperatures and dewatering extent and severity) for the rest of the summer remain to be seen. A relatively cool summer could result in fair to good over-summer survival. A harsher summer, on the other hand, will almost certainly result in low over-summer survival. Whatever Mother Nature decides to deliver to us should be obvious by the end of August.

Prepared July 1, 2008; RWD

Edited December 17, 2008: RWD

MEMORANDUM TO THE FILE–#090

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: 2008 Juvenile Steelhead Snorkeling Surveys, *seasonal survey #2 on July 12, 2008.*

Personnel

I conducted this, the second survey of the 2008 summer season, with Tom Cannon, a fishery biologist with Wildlands, Inc. and the Fishery Foundation of California. The survey was a long, 1-day event in which all 15 snorkeling sites were visited.

Survey Methods

Methods and snorkeling sites were the same as previously established and modified in 2006. Refer to File Memo #60 and my 2006 annual report for details. However, I did not measure water volumes at the sample (snorkeling) sites. Thus, JSH density can be judged only in relative (to previous surveys at the same sites) terms. Although Cannon did snorkel along with me (immediately afterwards) at several of the sites, all of the count results that were recorded are mine alone.

Rainfall and Hydrology Prior to the Survey

No rainfall was recorded since the previous snorkeling survey on June 16, 2008. Due to the extremely dry spring in 2008, stream flows were rapidly diminishing and already becoming intermittent at several of the sampling sites and vicinities.

Weather and Stream Conditions

Ambient air temperatures to date this summer season continue to be relatively mild. Only four inland heat waves with air temperatures $\geq 98^0$F had occurred, roughly during May 15-18, June 11-13, June 19-21, and July 6-11, 2008. On the day of the survey, however, the most recent hot spell had ended and significant marine air intrusion was occurring well into the interior of the watershed. As expected, stream flows at the various sites were dramatically lower than normal for this early in summer. However, only the Haupt Creek site was completely dried and lacked any surface flow whatsoever; the other sites still had continuous flows or were just becoming intermittent. The South Fork, Gualala realtime gage was indicating less than 1 cfs flow, while the Navarro River gage at Navarro (a good index to the Wheatfield Fork, Gualala flow) indicated about 7.5 cfs. The river mouth was checked, but not photographed, and was closed. However, the estuary stage was relatively low, indicating that the mouth had recently been open, allowing for at least some drainage to sea.

Results and Discussion

Observations are briefly summarized below. Additional detail and analyses will be provided in my 2008 Annual Report to be issued December 31, 2008.

#1-Wolf Creek*:* We arrived at 1015 hrs. Water and air temperatures were 64 and 74^{0}F, respectively. Surface flow was still continuous, but very low. JSH numbers were relatively high, with 250 YOY, 10 age 1+ and 2 age 2+ recorded. All JSH were in the site's upper pool. Ten TSS (three-spine stickleback) and zero GR (Gualala roach) were also recorded.

#2-House Creek: We arrived at 1030 hrs. Water and air temperatures were 67-71 (three locations) and 77^{0}F, respectively. Surface flows were becoming discontinuous in the Wheatfield Fork upstream of the confluence. JSH numbers were relatively high, with 750 YOY recorded in House Creek and at the House Creek-Wheatfield Fork confluence; none were seen in a section of the main Wheatfield Fork just above the confluence (outside of the 100-ft sample reach) that was snorkeled. A total of 250 GR and 10 TSS were also recorded.

#3-Wheatfield Fork (Lady-in-the Car): We arrived at 1050 hrs. Water and air temperatures were 71 and 78^{0}F, respectively. Surface flow was continuous, but low. JSH numbers were relatively high, with 150 YOY and 20 age 1+ recorded; these fish were scattered throughout the site, but most, including 100 % of the larger fish, were in the plunge pool. GR (100) and TSS (500) were also recorded.

At nearby site #3a, just upstream, which was snorkeled 10 minutes before the main site, JSH (275 YOY; 10 age 1+) were also in relatively high abundance, mostly in high-velocity areas. Water temperature was 71 and air temperature was 85^{0}F. One dead (floating downstream) JSH was also found. GR (1,000), TSS (50), and unidentified sculpins (2) were also recorded.

#4-Wheatfield Fork (Annapolis Road bridge)**:** We arrived at 1230 hrs. Water and air temperatures were 73 and 80^{0}F, respectively. Surface flow was low and starting to go intermittent. A moderate number of JSH–50 YOY–were recorded, along with GR (150) and TSS (500). The JSH were widely scattered throughout the site.

At adjacent site #4a, comprising the riffle and pool beneath the Annapolis Road bridge, at 1235 hrs, a very high number of JSH–1,000 YOY–were recorded in the fastest-moving water directly beneath the bridge. GR (150) and TSS (500) were also recorded. Temperatures were the same as at site #4.

At site #4b, 1/4-mile farther downstream, at 1300 hours, another high JSH count–300 YOY and 10 age 1+ –was made, with the fish concentrated in the fastest-moving water with abundant woody debris. GR (150) and TSS (300) were also recorded. Water temperature was 68^0F; air temperature was 73^0F.

#5A-Near North Fork mouth (Upper Section)**:** We arrived at 1530 hrs. Water and air temperatures were 74 and 84^0F, respectively. JSH were in low-to-moderate abundance, with 200 YOY, 10 age 1+, and 5 age 2+ recorded. GR (100) and unidentified sculpin (1) were also recorded. JSH were concentrated in the woody cover and faster water near the upstream end of the site. Flow was still continuous, but low, reflecting the low estuary stage.

#5B-Near North Fork mouth (Lower Section)**:** We arrived at this site at 1520 hrs. Temperatures were assumed to be the same as at site #5A. Surface flow was low and continuous. JSH numbers were moderate-to-high, with 180 YOY and 8 age 1+ recorded, mainly in the deep, easterly side of the site with woody cover. GR (2), TSS (2) and unidentified sculpin (1) were also recorded.

#5C-North Fork Mouth Pool: We arrived at 1500 hrs. Water and air temperatures were 64^0 F (just downstream of confluence) and 70^0F, respectively. Surface flows of both the North Fork and main stem were continuous but relatively low. A moderate number of JSH–30 YOY, 2 age 1+ and 2 age 2+–were recorded in the woody cover along the north bank. GR (100) and unidentified sculpin (1) were also recorded.

#5D-100 Yards Upstream of North Fork Mouth in the Main Stem: We arrived at the site at 1505 hrs. Water and air temperatures were 70 and 75^0F, respectively. Surface flow was still continuous. Ten JSH YOY, 100 GR and 250 TSS were recorded. The JSH were confined to the woody cover along the south bank.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** We arrived at this site at 1600 hrs. Water and air temperatures were 68 and 78^0F, respectively. Surface flow was still continuous, but very low. JSH were in moderate-to-high abundance, with 150 YOY and 10 age 1+ recorded throughout the site, but mostly in the dense woody cover. GR (500) and TSS (1,000) were also recorded. At the nearby bridge over the South Fork, the stream was completely dry for as far upstream of the mouth as could be seen.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** We arrived at 1330 hrs. Water and air temperatures were 67 and 68^0F, respectively. Surface flow was just starting to become intermittent in the area. JSH were in moderate abundance, with 150 YOY and 4 age 2+ recorded, mainly in the woody cover of the deep pool. GR (500) were also recorded.

#8-Haupt Creek: We arrived at 1305 hrs. The sample site and the stream reach downstream to the confluence with the Wheatfield Fork were completely dry.

#9-Highway 1 Bridge Area: We arrived at the site at 1415 hrs. The river mouth was closed but the stage was low, indicating that the mouth may have recently opened to the sea. Water and air temperatures were 71 and 84^0F, respectively. A moderate-to-high number of JSH–150 YOY–were recorded in the shallow, wood-enhanced shoreline areas of the site. GR (500) and TSS (100) were also recorded.

Conclusions

Despite rapidly deteriorating habitat conditions (i.e., dewatering and elevated water temperatures), overall the survey sites held the most JSH I have recorded to date during a mid-summer snorkeling survey. Results clearly continue to reflect the record spawning return of 2007-2008. The type of summer (mild or hot) which occurs now through the end of August and corresponding habitat conditions will determine the number of these fish which survive their first year of life in the stream.

Prepared August 25, 2008; RWD

Edited December 19, 2008; RWD

MEMORANDUM TO THE FILE–#091

File: Gualala River Steelhead Study **From:** Richard W. DeHaven

Subject: 2008 Juvenile Steelhead Snorkeling Surveys: ***seasonal survey #3, August 29, 2008, the final 2008 summertime survey.***

Personnel

I conducted this, the third and final survey of the 2008 summer season, with a fishery biologist (EB) from my former U.S. Fish and Wildlife Service office in Sacramento. The survey was a long, 1-day event in which all 15 snorkeling sites were visited.

Survey Methods

Methods and snorkeling sites were the same as previously established and modified in 2006. Refer to File Memo #60 and my 2006 annual report for details. However, I did not measure water volumes at the sample (snorkeling) sites. Thus, JSH density can be judged only in relative (to previous surveys at the same sites) terms. EB snorkeled some of the sites and I snorkeled others. Because EB is highly experienced at this, I used his results for the sites he snorkeled.

Rainfall and Hydrology Prior to the Survey

No rainfall was recorded since the previous snorkeling survey on July 12, 2008. And, due to the extremely dry spring in 2008, stream flows were extremely low–for most sites, the lowest I have observed to date while studying steelhead on the Gualala River.

Weather and Stream Conditions

Ambient air temperatures to date this summer have continued to be less severe than usual, resulting in a relatively mild summer, overall. In addition to just four inland heat waves experienced during May through July (*see* first two seasonal snorkeling reports for 2008), just two (with $\pm 100^0$ F temperatures) were experienced in August, the first on August 13-16 and the second on August 27-29. The present survey thus occurred on the third and final day of the final heat wave of August (and of summer). On August 30, air temperatures dropped, due to marine air intrusion.

As expected, stream flows at the various sites were dramatically lower than normal for an end-of-summer survey. Conditions were especially stark in comparison to 2005 and 2006 (years with abundant springtime rainfall) in which little, if any, summertime dewatering was observed. In contrast, in 2008, extensive dry stream reaches have been observed, many at historical degrees. A number of photographs were taken to document the poor (for JSH) conditions and are attached at the end of this report.

The South Fork, Gualala realtime gage was indicating a flow of about 0.5 cfs (a surprising value, given the completely dry stream in the vicinity of the gage), while the Navarro River gage at Navarro (a good index to the Wheatfield Fork, Gualala flow) indicated about 1.5 cfs on the day of this survey.

The river mouth was checked (but not photographed) and was closed; both the estuary stage and surf were quite low. However, turbidity was high in the estuary, making snorkeling problematic.

Results and Discussion

Observations at the 15 sites are briefly summarized below. Additional detail and analyses will be provided in my 2008 Annual Report to be issued December 31, 2008.

#1-Wolf Creek*:* We arrived at 0955 hrs. Water and air temperatures were 63 and 75^0F, respectively. Surface flow was still continuous, but very low and in fact, the lowest I have to date observed. JSH numbers were relatively low, with 75 YOY, 6 age 1+ and 3 age 2+ recorded. All JSH were in the site's upper pool. On hundred TSS (three-spine stickleback) and 50 GR (Gualala roach) were also recorded. The site was not photographed.

#2-House Creek: We arrived at 1015 hrs. Water and air temperatures were 64-66 (three locations) and 76^0F, respectively. The Wheatfield Fork upstream of the confluence of the site was dry (*see* attached photo). House Creek had intermittent flow on the site (*see* attached photo). Downstream of the confluence, the stream was extremely low, but still flowing continuously. JSH numbers were low-to-moderate for this time of year, with 50 YOY and 10 age 1+ recorded in the House Creek pool. A total of 2,000 GR and 250 TSS were also recorded.

#3-Wheatfield Fork (Lady-in-the Car): We arrived at 1115 hrs. Water and air temperatures were 69 and 75^0F, respectively. Surface flow was continuous, but extremely low (*see* attached photo). No JSH were recorded. However, a total of 1,500 GR and 1,000 TSS were recorded.

At nearby site #3a, just upstream, which was snorkeled 10 minutes before the main site, no JSH were recorded. However, one dead (floating downstream) JSH was found. Water temperature was 66 and air temperature was 78^0F. A total of 500 GR and 150 TSS were recorded. Also, about 100 ft of additional deep, fast water just upstream of the site was snorkeled, but no JSH were found. The flow at and near the site was extremely low, but still flowing continuously (see attached photo).

#4-Wheatfield Fork (Annapolis Road bridge)**:** We arrived at 1213 hrs. Water and air temperatures were 67 and 84^0F, respectively. No JSH were recorded, only GR (1,500) and TSS (500). About 1,000 tadpoles were also recorded. Surface flow was intermittent and the lowest I have to date observed; only one shallow (12-in-deep) pool remained (*see* attached photo) on the site. Downstream of the site (and bridge), the streambed was completely dry as far as could be seen (*see* attached photo). Habitat conditions for JSH were very poor.

At adjacent site #4a, comprising the riffle and pool beneath the Annapolis Road bridge, at 1230 hrs, no JSH were recorded, only GR (100) and TSS (500), along with a large number (5,000) of tadpoles. We also observed hundreds of dead TSS, as somewhat of an exclamation point to the harsh aquatic conditions. Surface flow was intermittent and the lowest I have to date observed; only one small, shallow (8-in-deep) pool remained (*see* attached photo) on the site.

At nearby site #4b, 1/4-mile farther downstream and just upstream of the mouth of Haupt Creek, at 1300 hours, water and air temperatures were 65 and 75^0F, respectively. No JSH were seen; the only fish were 500 GR. Flow was the lowest I have to date observed, with only one small pool

remaining on the site. Just downstream of the site, near the mouth of Haupt Creek, we also snorkeled about a 50 ft reach and did observe eight YOY JSH in dense woody cover.

#5A-Near North Fork mouth (Upper Section)**:** We arrived at 1520 hrs. Water and air temperatures were 69 and 86^{0}F, respectively. JSH were moderately abundant, with 300 YOY, 20 age 1+, and 2 age 2+ recorded in and along the woody cover along the easterly bank. GR (1,000) and TSS (2,000) were also recorded. Flow was still continuous, but relatively low and it reflected the relatively low estuary stage. About 150 feet of the deep run just upstream of the site was also snorkeled but no JSH were recorded. Along the downstream end of the site, several areas of cool-water refugia, with temperatures 5-10^{0}F less than the rest of the site, were found.

#5B-Near North Fork mouth (Lower Section)**:** We arrived at this site at 1537 hrs. Air and water temperatures were assumed to be the same as at site #5A. Surface flow was low, but still continuous, just as at the adjacent site. JSH were moderately abundant, with 200 YOY, 12 age 1+ and 1 age 2+ recorded, mainly in the woody cover along the easterly bank (plus a few at the downstream end of the site). GR (200) and TSS (200) were also recorded.

#5C-North Fork Mouth Pool: We arrived at 1445 hrs. Water and air temperatures were 64-72^0 F (various locations at the site) and 80^{0}F, respectively. Surface flows of both the North Fork and main stem were continuous, but relatively low. A relatively low number of JSH–20 YOY–were recorded in the plunge pool and woody cover along the north bank. GR (200) and TSS (500) were also recorded.

#5D-100 Yards Upstream of North Fork Mouth in the Main Stem: We arrived at the site at 1450 hrs. Water and air temperatures were 72 and 82^{0}F, respectively. Surface flow was still continuous, but extremely low. Six JSH YOY, 200 GR and 500 TSS were recorded. The JSH were confined to the woody cover along the south bank.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** We arrived at the site at 1613 hrs. Water and air temperatures were 75 and 87^{0}F, respectively. No JSH were recorded, nor were any GR or TSS observed. Hundreds of dead TSS were seen, however. The site was nearly dry, with only a single 20-ft-long (10 in deep) pool remaining (*see* attached photo). For at least several hundred yards downstream, only isolated small pools remained (*see* attached photo). At the nearby bridge over the South Fork, the stream was completely dry for as far upstream of the mouth as could be seen (from the bridge).

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** We arrived at 1320 hrs. Water and air temperatures were 63 and 84^{0}F, respectively. Surface flow was intermittent at the site and in the immediate vicinity (*see* attached photo), but was not as severe as I expected or have seen in the past. JSH were in low-to-moderate abundance, with 100 YOY, 4 age 1+ and 3 age 2+ recorded, mainly in the woody cover of the remaining deep pool. GR (1,000) and TSS (500) were also recorded. We also snorkeled 200 ft and 100 ft lengths of stream both upstream and downstream, respectively, of the site, recording about 50-60 JSH, mostly YOY, in each area. Beneath the bridge, evidence was found of possible unauthorized (i.e., w/out a CDFG Streambed Alteration Agreement) cutting of large woody debris (LWD; *see* attached photo). I suspect that this activity may have been from county or State personnel attempting to remove LWD (i.e., sawing it into short pieces which will float away during high flows) from around the bridge piers.

#8-Haupt Creek: We arrived at 1305 hrs. The sample site and the entire stream reach downstream to the confluence with the Wheatfield Fork were completely dry.

#9-Highway 1 Bridge Area: We arrived at the site at 1405 hrs. The river mouth was closed, but the stage was low, indicating that the mouth may have recently opened to the sea. Water and air temperatures were 76 and 86^0F, respectively. A low-to-moderate number of JSH–50 YOY–were recorded in the shallow, wood-enhanced shoreline areas of the site. GR (1,500) and TSS (10,000) were also recorded. The water was quite turbid with low visibility, thus the fish counts were likely significant underestimates. We also observed one adult steelhead of about 15 pounds, the first such summertime observation to date.

Conclusions

The summer of 2008 began with, by far, the highest population of JSH yet recorded–a clear reflection of the record spawning return of winter and spring 2008. By mid-summer, the JSH population was greatly diminished, but still at a record high level. However, now, at the end of summer, the JSH population has declined dramatically to a level similar to past end-of-summer surveys. This dramatic decline of the JSH population was clearly a result of poor habitat conditions, specifically the extensive dewatering and high stream water temperatures which have prevailed this summer due to the extremely dry springtime of 2008. To save the remaining JSH population from further, possibly extensive mortality, we badly need a gift from Mother Nature: early and copious winter rainfall.

PHOTOS FROM THE SURVEY (WHICH INCORRECTLY SHOW THE DATE AS AUGUST 28 INSTEAD OF AUGUST 29) APPEAR ON THE FOLLOWING TWO PAGES.

Prepared August 25, 2008; RWD *Edited December 26, 2008; RWD*

Looking upstream at the House Creek snorkeling site #2, at a completely dry Wheatfield Fork

Looking upstream into House Creek at the House Creek snorkeling site #2

Lady-car auxilliary snorkeling site #3a still flowing

Lady-car snorkeling site #3, with plunge pool barely flowing in from the right

An almost completely dry snorkeling site #4, just above the Annapolis Road bridge

Looking downstream from the Annapolis Road bridge at a mostly dry streambed

Drying pool at snorkeling site #4a,
just below the Annapolis Road brdge

South Fork snorkeling site #7

Drying pool at snorkeling site #6,
just downstream of Wheatfield Fork bridge

EB near the remaining drying pool, just
downstream of snorkeling site #6 and Wheatfield Fork bridge