

(From: Annual Report for 2009)

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MEMORANDUM TO THE FILE—#092

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 30-31, 2008, the first complete survey of the Index Reach for the 2009 Spawning Season.

Personnel, Survey Timing and Methods

I conducted this, a standard survey (by boat) of the Index Reach, alone, on the last two days of December 2008. On day one (December 30th), I arrived at the mouth of House Creek at 0900 hrs, started the survey of the upper 9.3-mile reach at 0945 hrs, and completed it at 1430 hrs, for an average survey rate of 1.96 mph. On day two, I floated the lower 9.4-mile reach from 0832 to 1232 hrs, for an average survey rate of 2.35 mph.

Standard procedures, as documented in my previous reports, were followed both days. On the first day, I used my duping device (empty gasoline can) to secure a quick ride back to the put-in at the end of the day. The following morning, local Gualala (Sea Ranch) resident John Nelson ferried me back to the starting location at the Annapolis Road bridge, where my boat had been concealed and was waiting from the day before.

Weather, General Stream Conditions and Observer Efficiency

The weather was sunny, calm, T-shirt weather, except for some patchy fog in low-lying areas during the first hour or two each morning. Also, overnight between day one and two, a brief, light rain shower occurred, depositing about 0.04 of an inch of precipitation, but having no discernable effect on either stream flow or water clarity. Air temperature was above normal, at about 65 degrees, by mid-day each day. Stream flow was in the moderate category, declining from about 110 to 95 cfs, based on the Navarro River gage at Navarro over the 2-day period. (The South Fork Gualala gage declined from 100 to 80 cfs over the same period.) Water clarity was excellent and I had good views of the bottoms of all the deepest pools. With the excellent weather conditions, moderate flows, and excellent water clarity, estimated Observer Efficiency (OE) was 60%, based on an MEE classification (see Methods, 2007 Annual Report).

Rainfall and River Hydrology Prior to the Survey

Based on the Venado gage (Russian River watershed), the Gualala River watershed received about 15.2 inches of rainfall between October 1st, the start of the rainfall season, and the survey dates. A four-day rainfall event starting October 31st deposited 7.4 inches, with a maximum 1-day accumulation of 3.9 inches; however, this event resulted in relatively insignificant runoff and stream flow increases which were not considered substantial enough to trigger the start of the steelhead spawning season (i.e., the start of adult migration; see Methods, 2007 Annual Report). However, a spawning-migration-triggering rainfall and flow event did begin on December 22nd bringing the flow up briefly to about 4,000 cfs. Thus, the start of the 2009 spawning season was considered to be December 22, 2008, the latest date in 8 years (and, based on an assumed April 30th end-of-season date, the shortest spawning season in 8 years of just 130 days). During the five days prior to the survey, no rainfall occurred (except for the December 30th minor amount) in

the watershed and the hydrograph remained in steep decline. Thus, migration conditions for adult steelhead were likely good between December 22 and the survey dates.

Results and Discussion

A total of 82 adult steelhead—a moderately high number for so early in the season—were counted during the two-day, 18.7-mile survey of the Index Reach (Table 1). Most (72=88%) of these fish were recorded along the downstream half of the survey reach, with only 10 fish (12%) recorded on the upstream half. Thirty-seven of the fish were recorded in four named pools (two each in each half of the Index Reach) where counts are being tracked, while 45 fish were recorded in various un-named pools and flatwater areas. Such counts suggest that a moderate proportion of the fish were still actively moving, while the rest may have been starting to “stack” into favored holding sites.

At least four (5%) of the fish appeared to be spent. Thus, if the flow spike of December 22 was truly the start of the spawning season, at least some adults had moved quickly upstream, spawned, and were already moving back downstream, just a few days later.

The adult fish recorded were almost exclusively in two size classes: ≥ 32 inches TL=42 fish (51%); and 25-31 inches TL=37 fish (45%). In addition, three (4%) very large adult fish estimated to be ≥ 34 inches TL were observed, the first such unusually large fish recorded in several surveys.

There were no steelhead or lamprey redds found, nor any fish carcasses. However, throughout both days, a few scattered, individual juvenile steelhead were seen.

The mouth of the river was checked at about 1600 hrs on day one and was just barely open and flowing to sea. The estuary stage was still very high. Both wind and surf conditions were low. No photos were taken.

Conclusions

A moderate number of adult steelhead were present. Most were fresh-run adults moving upstream and fresh and/or spent fish starting to stack and hold at favored sites. In addition, at least a few adult fish had already spawned and were moving back downstream. However, spawning had not yet occurred within the Index Reach, thus all spawning to date had occurred upstream of the survey area. Stream flow was moderate, water clarity was excellent, and weather factors were excellent for surveying. OE was thus 60% (MEE), based on established (2007 Annual Report) criteria.

Prepared: June 22, 2009 (RWD)

Edited: July 27, 2009 (RWD)

Table 1. Index Reach observations of adult steelhead on December 30-31, 2008.

Reach	Time (hrs)	Total # Adults	Number by Size Class				# Spent	Location
			C1	C2	C3	*		
Upper	1212	8	0	5	3	0	0	YMCA Pool
Upper	1250	2	0	0	1	1	2	Park Pool
Lower	0850	11	0	6	5	0	0	un-named pool
Lower	1019	7	0	3	4	0	0	Yellow-Rope Pool
Lower	1051	15	0	10	5	0	0	un-named pool
Lower	1130	20	0	10	10	0	0	A-Frame Run
Lower	1140	2	0	0	2	0	2	un-named pool
Lower	1202	6	0	1	5	0	0	un-named run
Lower	1226	11	0	2	7	2	0	un-named run
TOTALS		82	0	37	42	3	4	

MEMORANDUM TO THE FILE #093

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 31-February 1, 2009, *the second complete survey of the Index Reach for the 2009 Spawning Season.*

Personnel, Survey Timing and Methods

I conducted this survey of the Index Reach with Michael Bower, a native Gualala resident, now a UC Davis graduate student and environmental consultant. Due to the record low flow (for this time of year), which prevented navigation, we had to walk the entire 18.7-mile survey reach during the 2-day survey. On day one (January 31st), we arrived at the mouth of House Creek at 0900 hrs, started the survey of the upper 9.3-mile reach at 0945 hrs and completed it at 1615 hrs, for an average survey rate of 1.43 mph. On the second day, we began walking the lower 9.4-mile reach at 0908 hrs and completed it at 1520 hrs, for an average survey rate of 1.76 mph.

Except that we were walking along the stream instead of navigating via the boats, standardized survey procedures, as documented in my previous reports, were followed (to the extent possible) both days. At the end of the first day, I used my duping device (empty gasoline can) to secure us a quick ride back to the mouth of House Creek. On the second morning, local Gualala resident John Nelson shuttled us up from town (Gualala) to the day two starting point at the Annapolis Road bridge

Weather, General Stream Conditions and Observer Efficiency

Weather was near-perfect for surveying both days, with warm air temperatures (58-60^oF max), clear skies, and no wind. Stream flow was very low, probably in the range of 15-20 cfs. Flows on the Navarro River at Navarro and the South Fork Gualala River during the same period were about 31 and 18 cfs, respectively. The flow appeared to hold relatively steady over the two days. Water clarity was excellent and we had good views of the bottoms of all the deepest pools both days. With the excellent weather conditions, very low flow, and high degree of water clarity, estimated Observer Efficiency (OE) was 80%, based on an LEE classification (*see* Methods in 2007 Annual Report).

Rainfall and River Hydrology From Prior Survey to this Survey

Based on the Venado gage (Russian River watershed), the Gualala River watershed received just a small fraction of average rainfall for the month of January (generally, the wettest month of the rainfall season), with only four minor (0.04-0.36-inch) one-day rainfall events totaling 0.64 inch. Thus, just prior to the survey, the seasonal rainfall total had risen only from 15.2 (prior to the first survey) to 15.8 inches. Lack of precipitation resulted in very low stream flow, which prevented navigation. Moreover, none of the four minor rainfall events in January caused any noticeable runoff or measurable rise in the stream hydrograph.

Results and Discussion

Twenty-two adult steelhead were recorded, including 1 (size 2; spent) the first day and one group of 21 fresh-run fish (20 size 2; 1 size 3) in the Angle-Log Pool the second day. Sixteen new steelhead redds were also found, including 2 the first day and 14 the second day. These were flagged to be recorded by GPS at the end of the season. No lampreys or lamprey redds were recorded. Also, no juvenile steelhead were observed.

The mouth of the river was checked at about 1600 hrs on day one and was closed to the sea by a huge sandbar. The estuary stage was very high—probably about as high as I have ever seen, indicating that it had been closed for some time. Both wind and surf conditions were moderate. No photos were taken.

Conclusions

A relatively low number of adult steelhead were present. Most were fresh-run adults stacked and holding in one pool of the lower Index Reach. At least one spent fish was also present. A moderate amount of spawning had occurred in the Index Reach since the prior survey at the end of December. Stream flow was extremely low, due to lack of rainfall. With the low flow, excellent water clarity, and excellent weather conditions, OE during the survey was an estimated 80% (LEE), based on established (2007 Annual Report) criteria.

Prepared: June 23, 2009 (RWD)

Edited: July 27, 2009 (RWD)

MEMORANDUM TO THE FILE #094

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 13-14, 2009, *the third complete survey of the Index Reach for the 2009 Spawning Season.*

Personnel, Survey Timing and Methods

I conducted this, a standard survey (by boat) of the Index Reach, with Greg Benke, a contractor and friend from San Francisco. On day one (March 13th), we arrived at the mouth of House Creek at 0900 hrs, started the survey of the upper 9.3-mile reach at 0950 hrs, and completed it at 1420 hrs, for an average survey rate of 2.07 mph. On day two, we floated the lower 9.4-mile reach from 0840 to 1155 hrs, for an average survey rate of 2.89 mph. These were relatively rapid survey rates, due primarily to high stream flow and velocity.

Standard procedures, as documented in my previous reports, were followed both days. However, as is my practice, all recorded observations of fish were mine alone. On the first day, I used my duping device (empty gasoline can) to secure a quick ride back to the put-in. The following morning, local Gualala resident John Nelson gave me a ride back to the day two starting location at the Annapolis Road bridge, where my boat had been concealed and was waiting from the day before. Greg was already camped (overnight) along the river near this location and I met him there for the start of the day's survey.

Weather, General Stream Conditions and Observer Efficiency

The weather on day one was sunny, clear, and cool (no frost, however), with a strong upstream wind beginning about noon. The second day was a repeat of the first day's weather, except there was no wind. Water clarity on day one was marginal, with the stream still having a green tinge; on day two, water clarity had dramatically improved and was excellent. Stream flow was high, with the Navarro River gage at Navarro dropping from about 275 to 250 cfs, from noon-to-noon, over the two-day period.

With the high flow, marginal weather (wind factor), and marginal water clarity, estimated Observer Efficiency (OE) on day one, based on an HFF classification (*see* Methods, 2007 Annual report), was 20%. With the improved weather and water clarity on day two, estimated OE increased to 50%, based on an HEE classification. Therefore, for the overall Index Reach survey, OE averaged an estimated 35%.

Rainfall and River Hydrology From Prior Survey to this Survey

The Venado (Russian River watershed) rain gage data shows that the 6-week period from the prior survey (January 31-February 1) to the present survey was relatively wet. In particular, rainfall occurred on 23 days and totaled 22.2 inches; the maximum 1-day rainfall event deposited 4.6 inches on February 22nd. Total accumulated watershed rainfall thus increased from 15.8 inches just prior to survey #2 to 38.0 inches prior to this survey. Rainfall during the period resulted in three spikes in flow of from about 1,000 to 3,000 cfs. However, the 9 days prior to

the survey were dry and the hydrograph was in slow-to-moderate decline. Based on rainfall and flows, conditions for adult steelhead migration were likely good from about February 6th, when a 2,000 cfs flow spike occurred, until the present survey was initiated on March 13th.

Results and Discussion

A total of 16 adult steelhead—a low number for this stage of the season—was recorded (Table 1). Except for one group of eight fish in the A-Frame Run and a pair of fish in Shady-Lane Run, all fish were widely scattered, spent individuals. It appeared also that at least four of the eight fish in A-Frame Run were likely spent.

One new steelhead redd was found along the lower half of the survey reach. However, none of the 16 redds previously found (last survey) were still discernable—even when searching directly around the engineer's flagging that marked them.

The size range of the steelhead adults included one size 1, eight size 2, and seven size 3 fish. No very large (≥ 34 inches TL) fish were observed.

There were no lampreys, lamprey redds, or fish carcasses found. The absence of lampreys at this stage of the season was quite unusual and surprising.

The mouth of the river was checked at about 1500 hrs on day one and was open and flowing freely to sea. Ocean wind-chop was quite nasty, however, the waves crashing into the river mouth were relatively small. No photos were taken.

Conclusions

An unusually (for this stage of the season) low number of mostly spent adult steelhead were present. Most of these fish had spawned upstream, as only one new redd was present in the survey area. Sixteen previous redds found in the survey area 6 weeks earlier were no longer discernable. There was an unusual lack of any lampreys or lamprey redds. Based on established stream flow, water clarity, and weather factors, OE averaged an estimated 35% for the 2-day survey.

Prepared: June 23, 2009 (RWD)

Edited: July 27, 2009 (RWD)

Table 1. Index Reach observations of adult steelhead on March 13-14, 2009.

Reach	Time (hrs)	Total # Adults	Number by Size Class				# Spent	Location
			C1	C2	C3	*		
Upper	1124	1	0	0	1	0	1	un-named flatwater
Lower	0841	1	0	1	0	0	1	un-named flatwater
Lower	0945	1	0	1	0	0	1	un-named pool
Lower	0955	1	0	0	1	0	1	un-named pool
Lower	0959	1	0	0	1	0	1	Yellow-Rope Pool
Lower	1100	8	0	5	3	0	4	A-Frame Run
Lower	1141	2	0	1	1	0	2	Shady-Lane Run
Lower	1145	1	1	0	0	0	1	un-named run
TOTALS		16	1	8	7	0	12	

MEMORANDUM TO THE FILE #095

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 28-29, 2009, *the fourth complete survey of the Index Reach for the 2009 Spawning Season.*

Personnel, Survey Timing and Methods

I conducted this, a standard survey (by boat) of the Index Reach, alone. On day one (March 28th), I arrived at the mouth of House Creek at 0925 hrs, started the survey of the upper 9.3-mile reach at 1000 hrs, and completed it at 1330 hrs, for an average survey rate of 2.66 mph. On day two, I floated the lower 9.4-mile reach from 0822 to 1152 hrs, for an average survey rate of 2.69 mph. These relatively high survey speeds were mainly due to the high flow and velocity—and the relative lack of any adult fish and redds to enumerate.

Standard procedures, as documented in my previous reports, were followed both days. On the first day, I used my duping device (empty gasoline can) to secure a quick ride back to the put-in. The following morning, local Gualala resident John Nelson gave me a ride from town back upstream to the starting location at the Annapolis Road bridge, where my boat had been concealed the day before.

Weather, General Stream Conditions and Observer Efficiency

The weather was beautiful both days—sunny, clear, and unseasonably warm. On day one, there was no wind; on day two, there was wind after 0900 hrs, but it was not a factor reducing my visibility into the water, since it was blowing downstream (at my back). Although the stream was still relatively high, water clarity was excellent both days. My index to flow, the Navarro River gage at Navarro, slowly dropped from about 215 to 200 cfs from noon-to-noon, over the 2-day survey period.

With the moderately high flow, excellent weather, and very clear water, estimated Observer Efficiency (OE), based on an HEE classification (*see* Methods, 2007 Annual report), was 50%.

Rainfall and River Hydrology From Prior Survey to this Survey

The Venado (Russian River watershed) rain gage data showed that the 2-week period from the prior survey (March 13-14) to the present survey had 4 days of precipitation totaling 1.5 inches, with a maximum 1-day total of 0.5 inch on March 16th. Thus, total accumulated watershed rainfall increased from 38.0 inches just prior to survey #3 to 39.6 inches at the start of this survey. However, the 4 days of rainfall during the inter-survey period resulted in no discernable increase in stream flow, at least based on the Navarro gage data.

Results and Discussion

A total of three adult steelhead—a very low number for this stage of the season—was recorded. One size 2 spent fish was recorded at 1235 hrs on day one along the upper half of the survey reach. On day two, along the lower half, two size 1 spent fish were recorded at 1105 hrs. Also,

one new steelhead redd was found at 1005 hrs on day one. There were no lampreys or lamprey redds recorded during either day—another very unusual result for this stage of the season.

I did record a moderate number of breeding rough-skin newts along the upper half of the survey reach. An immature bald eagle and several pond turtles—the first of each for the season—were also recorded along this reach.

The mouth of the river was checked at 1600 hrs on day one and was open and flowing freely into the sea. Both the NW wind and surface wind-chop were quite nasty, with good-sized waves crashing into the river mouth. No photos were taken.

Conclusions

The stream was nearly devoid of adult steelhead, a very unusual condition for this stage of the spawning season. Very little spawning had occurred in the survey reach since the previous survey 2 weeks earlier. The lack of any lampreys or lamprey redds was also quite unusual and a first for this late stage of the season. Based on established criteria for stream flow, water clarity, and weather factors, OE in recording the adult steelhead that were present was an estimated 50%.

Prepared: June 24, 2009 (RWD)

Edited: July 27, 2009 (RWD)

MEMORANDUM TO THE FILE #096

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 11-12, 2009, *the fifth-and-final-complete survey of the Index Reach for the 2009 Spawning Season.*

Personnel, Survey Timing and Methods

I conducted this, a standard survey (by boat) of the Index Reach, alone. On day one (April 11th), I arrived at the mouth of House Creek at 0922 hrs, started the survey of the upper 9.3-mile reach at 1000 hrs, and completed it at 1510 hrs, for an average survey rate of 1.80 mph. On day two, I floated the lower 9.4-mile reach from 0830 to 1330 hrs, for an average survey rate of 1.88 mph.

Standard procedures, as documented in my previous reports, were followed both days. On the first day, I used my duping device (empty gasoline can) to secure a quick ride back to the put-in. The following morning, local Gualala resident John Nelson gave me a ride from town back upstream to the starting location at the Annapolis Road bridge, where my boat had been concealed and was waiting from the day before.

Weather, General Stream Conditions and Observer Efficiency

Weather was warm and sunny, with scattered cirrus clouds filtering the sunshine both days. On the first day, a strong wind began blowing upstream against me at 1000 hrs; during day two, this wind was present throughout the survey. The wind definitely hampered my ability to see the bottoms of all the deepest pools and thus any adult steelhead that were present. Estimated stream flow, based on the Navarro River gage at Navarro, was about 95 and 90 cfs, respectively, at noon on days one and two. Water clarity was excellent for seeing fish both days. Thus, based on established criteria for flow, weather, and water clarity, Observer Efficiency (OE) for the survey was an estimated 50%, given the MEF classification (*refer to Methods, 2007 Annual Report*).

Rainfall and Stream Hydrology from the Prior Survey to this Survey

In the 2 weeks that elapsed between the prior survey (March 28-29) and this survey, the watershed received 2 days of rainfall totaling 0.9 inch, with a maximum 1-day accumulation of 0.6 inch on April 9th. The April 9th event brought the stream flow up about 10 cfs, based on Navarro River (at Navarro) stream gage data; the other rainfall event had no effect on flow. The hydrograph was in relatively steep decline from the prior survey to this survey.

Results and Discussion

A total of three adult steelhead was recorded—all during the second day along the lower survey reach. Two spent, size 1 fish were seen at 1154 hrs in the Angle-Log Pool and one spent, size 2 fish was recorded at 1212 hrs in an un-named pool. In addition, one new steelhead redd was recorded 1/4-mile upstream of the downstream boundary of the survey reach on day two. That brought to 19 the total number of steelhead redds recorded in the survey reach during the 2009 spawning season. However, I found evidence that someone on a quadrunner ATV had removed some of my flags marking redd locations. As a result, I found only 15 of the 19 redd locations;

these 15 were recorded by GPS and are attached hereto as Appendix A. Twelve of the 15 redds were along the lower half and three were along the upper half of the Index Reach.

The surprising and unusual lack of lampreys and lamprey redds continued, with none being found. Also, no fish carcasses were found.

The mouth of the river was checked at 1800 hrs on day one and was open, with the estuary still at a very high stage. Wind and surf conditions were moderate. No photos were taken.

Conclusions

The established seasonal trends of very low numbers of adult steelhead and a complete lack of adult lampreys (and lamprey redds) continued. The trend of low numbers of steelhead redds in the survey area also continued, with just 19 recorded for the entire season. Based on established criteria for stream flow, water clarity, and weather, OE in enumerating adult steelhead during the survey was estimated at 50%. Overall, the five spawning surveys of the Index Reach conducted during the season pointed to a very low adult steelhead return and a nonexistent (or nearly so) return of adult, spawning lamprey in 2009, both quite remarkable outcomes given the record return of spawning steelhead recorded in 2008.

Prepared: June 24, 2009 (RWD)

Edited: July 27, 2009 (RWD)

APPENDIX A.

GPS Locations for 15 of the 19 Steelhead Redds found on the Index Reach, Wheatfield Fork,
Gualala River, during the 2009 Spawning Season
(flags marking four other steelhead redds were removed by a vandal)

001	11-APR-09 10:05:21AM	N38 39.914 W123 13.964	281 ft
002	11-APR-09 11:05:15AM	N38 40.578 W123 15.358	250 ft
003	11-APR-09 12:40:55PM	N38 40.716 W123 17.136	652 ft
004	12-APR-09 9:10:00AM	N38 40.140 W123 19.982	123 ft
005	12-APR-09 9:25:05AM	N38 40.491 W123 20.416	137 ft
006	12-APR-09 9:34:51AM	N38 40.621 W123 20.674	111 ft
007	12-APR-09 9:36:59AM	N38 40.639 W123 20.694	103 ft
008	12-APR-09 9:52:49AM	N38 41.036 W123 20.648	114 ft
009	12-APR-09 11:07:49AM	N38 41.785 W123 22.22	880 ft
010	12-APR-09 12:11:20PM	N38 42.467 W123 23.317	78 ft
011	12-APR-09 12:21:25PM	N38 42.734 W123 23.397	90 ft
012	12-APR-09 12:33:49PM	N38 42.576 W123 23.621	52 ft
013	12-APR-09 12:57:39PM	N38 42.579 W123 24.282	123 ft
014	12-APR-09 1:12:35PM	N38 42.288 W123 24.479	67 ft
015	12-APR-09 1:15:52PM	N38 42.268 W123 24.492	79 ft

MEMORANDUM TO THE FILE #097

File: Gualala River Steelhead Study

From: Richard W. DeHaven

Subject: 2009 Juvenile Steelhead Snorkeling Survey #1 on June 28, 2009—*the only snorkeling survey conducted in 2009.*

Personnel

I conducted this, the only survey of the 2009 summer season, with Larry Thompson, a fishery biologist with NOAA Fisheries in Sacramento. The survey was a long, 1-day event in which all 15 snorkeling sites were visited and snorkeled. I had planned to conduct the usual two additional surveys later in the summer. However, a neck injury (herniated disc) sustained while albacore tuna fishing alone, 39 miles offshore from Bodega Bay in mid-summer, restricted my mobility—and thus ability to conduct *any* further snorkeling surveys (or, in fact, to even leave my house)—for over 3 months.

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, once again we did not measure water volumes at the sample sites. Thus, JSH density can only be judged in relative, subjective terms compared to results of previous surveys at the same sites at roughly the same time(s).

At all 15 of the sites, I conducted the snorkeling and Thompson measured water/air temperatures and recorded data.

Rainfall and Hydrology Prior to the Survey

Overall, 2008-2009 seasonal rainfall was below average in the watershed, with a maximum (rainfall varies widely across the watershed, based on location) of about 45 inches recorded, based on the Venado (VEN) realtime gage in the upper Russian River watershed. However, as I have learned and tried to convey over the course of this study, total seasonal rainfall alone is not a metric useful in predicting all-important (to JSH [juvenile steelhead] summertime rearing) summer hydrology patterns (i.e., amount of stream flow). Often, intra-seasonal rainfall pattern is the greater determinant of summertime hydrology.

For further enlightenment, consider what actually unfolded. The start of this rainfall season was characterized by an October (2008) with well above average rainfall, whereas November and December followed with drier than average conditions. Then, January was still drier yet, but February had slightly above average rainfall. Finally, both March and April returned to drier than average precipitation.

In most years, such patchy, uneven seasonal rainfall, including a dry springtime, would have resulted in a low summertime hydrograph for the stream; this in turn usually sets up poor rearing conditions for JSH by early or mid summer. However, the first 6 days of May (2009) yielded a rather miraculous rainfall recovery, with about 5 inches of precipitation in the wettest areas of the

watershed, based on the VEN gage. As a result, stream flow dramatically increased for several days by up to 1,100 cfs and critical recharging of groundwater aquifers occurred just before the onset of harsh summertime conditions (i.e., the long day lengths, maximum solar radiation, and high ambient air temperatures typical of summer—all of which combine to raise water temperatures beyond JSH tolerances). Moreover, water needs of vineyards in the watershed were simultaneously dramatically reduced by the late-season rainfall, providing a further potential benefit to stream flows heading into the critical summer season.

As a result, the 15 sites snorkeled on June 28th were all still flowing continuously. In fact, most sites had flows as high—or higher—than I have previously seen (at the same sites) at this stage of summer.

Pre-Survey Weather Conditions

The relatively high early-summer flows likely significantly benefitted JSH rearing (i.e., because the greater the *mass* of water, the less warming occurs, given the same weather conditions), because several (ambient air) heat waves had already occurred by the survey date. The first event occurred April 20-22, when maximum daily air temperatures (Note: Just as with rainfall, air temperatures also vary widely, based on watershed location.) soared to about 90-95^oF and nighttime temperatures also remained well above average at about 65-70^o. These unusual springtime conditions were the result of a warm, tropical air mass and associated thin cirrus cloud cover pushing northward up along the California coast.

A second, more intense early-season heat wave, with maximum daily temperatures in the $\pm 100^{\circ}\text{F}$ range, occurred May 16-17. This was followed by an unusually mild period from May 18th through June 23rd, with maximum daily air temperatures remaining well below average. Then, however, except for a minor decline June 25th, the 6-day period from June 24th through June 29th had maximum air temperatures again well above average in the $\pm 100^{\circ}\text{F}$ range.

Thus, when we arrived to conduct the snorkeling on the morning of the 29th, the stream environment was already 5 days into a potentially critical (to JSH) 6-day water temperature event. With June 28th being just after the longest day of the year (i.e., June 22nd), JSH rearing conditions were probably about as harsh as they could have been at the stream flows being incurred.

Moreover, it is also reasonable to assume that those JSH which survived through this critical period of early summer had a good chance of surviving through the rest of the summer.

Expectations of JSH Numbers and Density

Based on the extremely low return of adult steelhead I recorded on the stream during the 2009 spawning season, I had low expectations of numbers and densities of JSH the snorkeling might reveal. In fact, during the long drive from my home to the river on June 28th I was mentally preparing myself for a worst (and first)-case scenario: that we might not record *any* JSH.

Results and Discussion

My apprehension about a potential lack of *any* JSH on this survey quickly proved to be unfounded. We recorded fish at every site and counts at several sites were relatively high.

As usual, most of the fish recorded, were, based on size criteria I have developed, identified as YOY (young-of-year). However, many of these fish were clearly unusually large and robust. It is quite possible, perhaps even likely, that a sizeable percentage of what I called YOY were actually age 1+ fish. Such an outcome would be consistent with the very large spawning return of 2008 and record high snorkeling counts of JSH recorded that summer (i.e., a significant carryover of the 2008 year-class). If so, this is yet another example of how a wild population of fish is so marvelously adapted to carry itself through hard times (i.e., with benefits of a great spawning year carrying forward for at least 2 years and maybe longer).

At any rate, overall, and despite the lack of a robust spawning return in 2009, a moderate to large number of JSH were tallied for the 15 sample sites. Observations at each site are briefly summarized below. Further analyses will be provided in future reports.

#1-Wolf Creek: We arrived at 1030 hrs. Water and air temperatures were 66 and 78⁰F, respectively. Surface flow was still continuous and relatively high. JSH numbers were relatively low, with 10 rather large YOY recorded (9 in upstream pool; 1 in downstream riffle). One large TSS (three-spine stickleback) and 50 very small, unidentified fry (not JSH) were also recorded. Two photos were taken of the site.

#2-House Creek: We arrived at 1110 hrs. Air temperature was 88⁰F. Water temperatures were: Wheatfield Fork–77⁰; House Creek–73⁰; and confluence area–73⁰F. Both stream forks and the downstream confluence area had moderate, continuous surface flows. JSH were in low abundance, with just one age 1+ fish recorded. About 500 GR (Gualala Roach) and 2,000 unidentified, very small fry (possibly TSS) were also recorded. Four photos were taken.

#3-Wheatfield Fork (Lady-in-the Car): We arrived at 1145 hrs. Air temperature was 93⁰F. Water temperature ranged from 66⁰ in the spring-fed upstream refugia area to 75⁰F over the majority of the site. Flow was relatively high. JSH numbers were moderate, with 20 YOY and 5 age 1+ recorded—all in fast water of the plunge pool (surprisingly, none in the cold-water refugia); these fish were relatively large and robust. Also, 150 GR and 300 very small, unidentified fry were recorded. One photo was taken.

At nearby site #3a, just upstream, which was snorkeled 15 minutes before the main site, air and water temperatures were 95⁰ and 75⁰F, respectively. Twelve relatively large, robust YOY JSH were recorded, all in the fastest-moving water. About 150 GR were also recorded. Two photos were taken.

#4-Wheatfield Fork (Annapolis Road bridge): We arrived at 1220 hrs. Water and air temperatures were 76⁰ and 95⁰F, respectively. Surface flow was relatively high and continuous. JSH were in relatively high abundance, with 200 YOY, 20 age 1+, and 5 age 2+ fish recorded—all in the deep, left-bank area with thermal refugia and abundant woody cover; the YOY were mostly relatively large and robust. Also recorded were: about 1,000 GR; 250 TSS; 5,000 small,

unidentified fry; 2 very large tadpoles, and 5,000 small (1-2-inches) tadpoles. Two photos were taken.

At adjacent site #4a, comprising the riffle and pool beneath the Annapolis Road bridge, at 1235 hrs, the air temperature was 87⁰ and the water was 75⁰F. Flow was relatively high and continuous. JSH were in relatively high abundance, with 200 YOY and 5 age 1+ recorded—all in fast water beneath the overhanging woody cover (mostly willows) of the right bank; the YOY were mostly relatively large and robust. We also recorded about 1,000 relatively large GR; 250 TSS; 1,000 very small tadpoles; and 250 small tadpoles. A noticeable sea breeze could be felt starting to blow upstream; it was clearly beginning to ameliorate the high air temperature. Two photos were taken.

At site #4b, 1/4-mile farther downstream, at 1330 hours, air temperature was 90⁰ and water temperature was 74⁰F; flow was continuous and moderately high. JSH were distributed throughout the site (entire site is shaded by overhanging left-bank woody cover—mostly red alders) and in relatively high abundance, with 150 YOY, 10 age 1+, and 2 age 2+ recorded; the YOY were of mixed sizes, with many relatively small fish present. Other species recorded included 1,000 GR of mixed sizes and 50 TSS. Two photos were taken.

#5A-Near North Fork mouth (Upper Section): We arrived at 1640 hrs. Flow was continuous and relatively high for this stage of summer. Water and air temperatures were 72 and 76⁰F, respectively. JSH were in moderate abundance, with 175 YOY recorded (variable sizes), mostly in the upstream riffle, but scattered throughout the site as well. About 300 very large GR and 2 TSS were also recorded. Two photos were taken.

#5B-Near North Fork mouth (Lower Section): We arrived at this site at 1650 hrs. Flow was relatively high. Temperatures were 84⁰ (air) and 72⁰F (water). JSH numbers (distributed throughout site) were low-to-moderate, with 100 YOY and 25 age 1+ and 2 age 2+ recorded. About 250 GR were also recorded. Heavy recreational use (swimming, sun-bathing, BBQing, and boating) by about 100 people was occurring at and near the site. Three photos were taken.

#5C-North Fork Mouth Pool: We arrived at 1605 hrs. Air temperature was 82⁰F. Water temperature was 64⁰ in the North Fork and 73⁰F in the mainstem. Flows in both streams were about as high as I have observed at this stage of summer. JSH abundance was relatively low, with 5 YOY and 1 age 1+ recorded, all the confluence pool. (A short distance upstream in the North Fork [outside of the sample area] a moderate number of YOY JSH were also observed.) About 100 GR were also recorded. Two photos were taken.

#5D-100 Yards Upstream of North Fork Mouth in the Main Stem: We arrived at the site at 1620 hrs. Water and air temperatures were 73 and 80⁰F, respectively. Surface flow was still continuous and at, or above, the highest level I have seen at this stage of summer. JSH were low in abundance, with 12 YOY recorded in the riffle at the top of the site. No other fish were observed. Two photos were taken.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge): We arrived at this site at 1500 hrs. Water and air temperatures were 70 and 93⁰F, respectively. Surface flow was relatively high and continuous. JSH were in low-to-moderate abundance, with 35 YOY observed in the upstream riffle area. TSS (25) were also recorded. Four photos were taken in the area.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge): We arrived at 1410 hrs. Water and air temperatures were 71⁰ and 84⁰F, respectively. Surface flow was continuous and at, or above, the highest level I have seen at this stage of summer. JSH were in moderate-to-low abundance, with 30 large, robust YOY and 2 age 1+ recorded—all amongst the instream woody debris pile directly beneath the bridge. About 250 relatively large GR were also recorded in this woody debris pile. Three photos were taken.

#8-Haupt Creek: We arrived at 1345 hrs. Air temperature was 92⁰ and water temperature was 68⁰F. The flow was still continuous and relatively high, with deeper than average (for this stage of summer) pools. JSH were the only fish present and were in moderate abundance, with 35 YOY and 2 age 1+ recorded. The YOY were of mixed sizes, but many were relatively large and robust. Two photos were taken.

#9-Highway 1 Bridge Area: We arrived at the site at 1545 hrs. The river mouth was not checked, but was likely closed, because river stage was extremely high. Water and air temperatures were 73⁰ and 86⁰F, respectively. A high number of JSH, including 200 YOY (widely variable sizes), 200 age 1+, and 5 age 2+, were recorded, mostly in vegetation-enhanced (both overhead and instream) shoreline reaches of this site. About 500 GR were also recorded. No photos were taken.

Conclusions

Stream flow at sample sites was relatively high for this stage of summer, a direct benefit of a “miracle May” in which 5 inches of rainfall occurred the first six days of the month. JSH were present in surprisingly high numbers, given the very low spawning return in 2009. Although most JSH were classified as YOY, their relatively large sizes suggests that many may have actually been age 1+ fish. This outcome would be consistent with a very large spawning return and year-class production in 2008 creating a large carryover of JSH to 2009. JSH distribution across the sample sites, particularly (a) low numbers at key upstream sites 1 and 2, (b) high numbers at key middle-watershed sites 4, 4a, and 4b, and (c) low numbers at most estuary sites (except for the Hwy 1 bridge site) is suggestive of a mass downstream migration of JSH underway on the survey date. This movement was likely triggered by the 5-day heat wave and resulting high water temperatures underway on the survey date.

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