ADULT AND JUVENILE STEELHEAD POPULATION SURVEYS, GUALALA RIVER, CALIFORNIA, 2005

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December 31, 2005

Elevated stream flows after a 6-inch rain in early December 2004. L/R (Top)–Wolf Creek, 0.5-mile upstream of confluence with Wheatfield Fork; and mouth of House Creek (left side) at Wheatfield Fork (right side) confluence; **L/R (Bottom)**–North Fork, just upstream of mouth; and mainstem, just downstream of North Fork mouth.

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SUMMARY: Seasonal steelhead spawning surveys (counts of adults and redds) conducted in 2002-2004 along an 18.3-mile reach (index reach) of the Wheatfield Fork, from House Creek downstream to the South Fork, were continued in the 2005 season. The index reach was surveyed seven times (128 miles) between December 23, 2004 and April 25, 2005 from a small, aluminum drift-boat. A total of 433 adult steelhead–a new seasonal record–and 17 redds (the same as in 2004) were recorded. Adult numbers peaked (163 fish=38%) during a mid-February survey. A large proportion of the adults recorded were very large fish (>30 inches and 15 pounds), possibly owing their size (and overall high numbers) to an additional year of ocean growth acquired after adults were prevented from spawning in the river late in the 2004 season by low flows. An early rainy-season start in late October, with repeated high-flow events through April likely facilitated most of the spawning upstream of the index reach. Results continued to show the need for weekly spawning surveys when feasible, extended to bi-weekly surveys at the end of the spawning season or during extended dry periods. Spawning survey data from 2005 will be coalesced with long-term results for later analysis and publication. In addition, during early July to early October 2005, four monthly snorkeling surveys of juvenile steelhead (JSH) were conducted at nine study sites in the watershed. Results indicated that: (1) both the extent and severity of impairment of JSH production in the watershed, due to excessive water temperatures, were greatly reduced compared to 2004; (2) extensive stream reaches that went dry (or lacked continuous surface flow) in summer 2004 flowed continuously through the summer of 2005; (3) Gualala roach (GR) and threespine stickleback (TSS) were less numerous than in 2004; (4) the Wheatfield Fork, which supported very low levels of JSH in summer 2004, became an important JSH producer in summer 2005; (5) Wolf Creek, found to be an important JSH producer in 2004, continued this role in 2005; and (6) owing to much more summertime rearing in upstream reaches in 2005 versus 2004, the importance of the estuary to JSH summer rearing (and overall annual production) diminished greatly in 2005. The very good JSH rearing conditions of summer 2005 were tied to much higher summer flows (compared to recent years), the result of well-above-average late-season precipitation. In concert with the very good spawning flows and conditions also experienced in 2005, this year was clearly an exceptionally good one for the rivers's steelhead population.

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INTRODUCTION AND BACKGROUND

Because of a relative dearth of current information on the population status of steelhead in the Gualala River, a relatively small northern California coastal stream, I initiated annual steelhead spawning surveys in 2001 (DeHaven 2001). In 2002 (DeHaven 2002), 2003 (DeHaven 2003) and 2004 (DeHaven 2004), these surveys were continued, focusing on an 18.3-mile reach of the Wheatfield Fork selected as a long-term population-indexing reach. This report presents results of 2005 winter-early spring spawning surveys conducted along this indexing reach.

In addition, during summer and fall 2004, I initiated reconnaissance-level snorkeling surveys of juvenile steelhead (JSH) at various locations in the watershed. Based on results of these initial snorkeling surveys, I developed and implemented, in 2005, a long-term snorkeling-survey protocol to complement the spawning surveys. The first annual results of the snorkeling protocol are presented here.

Snorkeling survey data together with the spawning survey data already being gathered may allow attainment of my goal: to understand the present status and trend of the steelhead population of the river. A more extensive discussion of this goal and its basis in need is given in my 2002 annual report (DeHaven 2002).

METHODS

The spawning surveys entail periodic counts of adult steelhead and their redds. The 18.3-mile-long index reach on the Wheatfield Fork extends from House Creek downstream to the South Fork. This reach, which is navigable, has roughly equal upper (8.9 miles) and lower (9.4 miles) sections separated by the Annapolis Road bridge. Both sections are surveyed from small aluminum drift-boats. Complete details of the spawning-survey protocol are given in my 2002 annual report (DeHaven 2002).

For the snorkeling surveys, a protocol was designed that could easily be conducted over a 2-day period by a two-person team, with one person snorkeling while the other person recorded data and measured temperatures. Typical snorkeling gear, including a wetsuit (various pieces, depending on water temperature), diving mask, and snorkel, was employed. All snorkeling, which involved either swimming or crawling (i.e., in very shallow water) slowly along the bottom, was done while moving upstream. The snorkeler "panned" his head from side-to-side and upstream to observe and record all fish visible in the water column. Fish were recorded by species; JSH (juvenile steelhead) were also recorded by age-group (based on length) when feasible. When a whole study site or portion of a sample reach was too shallow for any snorkeling (i.e., fish could not be seen by the snorkeler), the observer(s) walked slowly upstream along the bank and recorded any fish that could be seen. Water and air temperatures at each site were recorded in degrees F using both a mercury thermometer and a Minn Kota digital electronic temperature device with sensor. Temperatures were re-measured, as necessary, until agreement ($<0.5^0$ F difference) was achieved between the two devices.

Each snorkeling site comprised a 100-ft-long section of stream measured with a tape measure placed along the thalweg. Both ends of each site were marked with engineer's tape and/or spray paint on the bank. An attempt was made to select sites in which the 100-ft-long sample included at least two of the three basic Level II (DFG 1998 California Salmonid Stream Habitat Restoration Manual) stream habitat types (i.e., riffle, flatwater and pool).

The nine study sites were spread across eight widely scattered locations in the watershed: Site 1-Wolf Creek, about 0.5-mile upstream of its confluence with the Wheatfield Fork; Site 2–mouth of House Creek, with roughly half the 100-ft sample in House Creek and half in the Wheatfield Fork just downstream of the confluence; Site 3–Wheatfield Fork, about 4.5 miles downstream of the House Creek/Wheatfield Fork confluence, at a site called "Lady-in-the Car;" Site 4–Wheatfield Fork immediately upstream of the Annapolis Road bridge; Site 5–the main stem, about 0.25-mile downstream of the North Fork mouth, where two 100-ft-long samples were marked, one in a pool (downstream end at the rope-swing) and flatwater complex (site 5B) and another about 100 yards upstream in a riffle and flatwater complex (site 5A); Site 6–Wheatfield Fork at Twin Bridges, at a site just downstream of the Wheatfield Fork bridge and about 500 feet upstream of the Wheatfield Fork/South Fork confluence; Site 7–South Fork, directly underneath the Stewart's Point-Skaggs Springs Road bridge; and Site 8–Haupt Creek, about 1,000 feet upstream of its confluence with the Wheatfield Fork. A few other scattered locations near these sites were also snorkeled, irregularly, as time permitted. Additional physical details of these sites appear in my 2004 annual report (DeHaven 2004).

Several measurements were taken to derive estimates of water volumes and average maximum water velocities on each snorkeling visit to each sample site; these measurements were designed to be taken quickly, without the need for any sophisticated tools or equipment. First, as soon as the snorkeling was completed at each site, ten equally-spaced cross-sections were established perpendicular to flow. The edge (of water)-to-edge distance of each cross-section was measured with a tape measure. Next, seven depth measurements (in feet) were taken at equal intervals along the cross-section using wooden yardsticks or PVC poles (in deeper areas). And finally, the velocity at the maximum-velocity location (as visually determined) on each cross-section was estimated from the time (measured by stop-watch) required to float an orange 3 feet. Volumes were then calculated as the product of average cross-sectional area (i.e. width x average depth) x 100 ft.

After data had been recorded at each site on each visit, one or more digital still photographs were taken to record stream conditions. Also, during the late afternoon of day 1 of each survey, the river mouth was checked (to determine whether it was open or closed by a sandbar) and photographed.

For both the snorkeling surveys and spawning surveys, a Memorandum to the File (File Memo) with basic data and findings, was prepared after each survey. These File Memos are diary-type reports. File Memos 041-055 for the 2005 spawning and snorkeling surveys are attached (Appendix 1).

RESULTS AND DISCUSSION

Following is an abbreviated discussion of 2005 results and findings. In many instances, the individual File Memos (Appendix 1) contain additional discussion, and some or all of the field data that were collected. In addition, 12 miscellaneous photographs, selected from among the dozens of photos taken during 2005, appear in the photo gallery at the end of Appendix 1. Each photo is digitally-captioned so as to be self-explanatory.

2005 Spawning Surveys.

Number and Temporal Spacing of Surveys–The index reach was surveyed a total of seven times between December 23, 2004 and April 25, 2005 (Table 1), for a total of 128 miles surveyed. The December survey was the earliest seasonal spawning survey conducted to date.

Table 1. Steelhead spawning survey results, Wheatfield Fork index reach, Gualala River, 2005 season. *(Further detail is provided in the individual survey reports [Appendix 2]. Conditions defined as follows:* ***flow****:* ***H****igh=>200 cfs;* ***M****oderate=75-200 cfs;* ***L****ow=<75 cfs.* ***clarity****:* ***E****xcellent=bottom of all pools visible;* ***F****air=bottom of up to one-half of the deepest pools not visible.* ***weather****:* ***E****xcellent=sunny and clear, with little or no wind during most of day;* ***F****air=clouds, rain, fog, wind, or other adverse weather factors hampered visibility of the bottoms of the deepest pools during half of more of the survey*.)

DATE(S)/ OBSERVER(S)	CONDITIONS			NUMBER ADULTS		NUMBER REDDS	
	flow	clarity	weather	Upper Reach	Lower Reach	Upper Reach	Lower Reach
12/23-24; RD	L	E	E	13	6	0	4
01/22-23; RD	M	E	E	37	26	0	3
02/4-5; RD	H	F	F	4	20	0	2
02/10-11; RD	M	E	E	74	89	2	2
03/11-12; RD	M	F	F	6	80	0	0
03/17; RD	M	E	F	8	69	3	0
04/24-25; RD	M	F	F	1	0	0	1
TOTALS	--			143	290	5	12

This year, due to being retired the entire year, I was available to conduct the surveys whenever optimal survey conditions arose. However, this unfortunately resulted in most of the surveys occurring on weekdays, when it was difficult to obtain any help from my colleagues. As a result, I ended up conducting all seven surveys alone.

Each survey was a 2-day event, except the March 17th survey, which was a 1-day, 18.3-mile marathon (*see* File Memo #049). This season's rainfall and flows allowed the desirable 1-2-week interval between surveys on three occasions, but for the four other surveys, 4-5 weeks elapsed before flows were suitable for another survey.

Spawning-Season Precipitation and River Hydrology–As during the past 2 years, seasonal rainfall was tracked from both the Venado (VEN) and Fort Ross (FRR) rain-gage data. However, the usual 7-month (Oct-Apr) analysis period had to be extended to 8 months–i.e., through May (Figure1)–due to unusually high late-spring/early-summer rainfall. Results showed that: November was drier than average; January, February and April were close to average; and October, December, March and May were above average in precipitation. In fact, May was far above average with 5.8 (FRR) and 7.5 (VEN) inches recorded at the two tracking sites compared to the 1.1-inch average (for FRR). Nevertheless, total rainfall for the 8-month season, based on the FRR data, was 37.0 inches and thus close (98 %) to the 55-year average of 37.8 inches. Thus, both 2004 and 2005 had roughly average precipitation overall, but as shown below (and in discussion of the snorkeling results), the two years ultimately produced far different results in terms of summertime flows and water temperatures in the watershed (and therefore, resulting JSH rearing conditions).

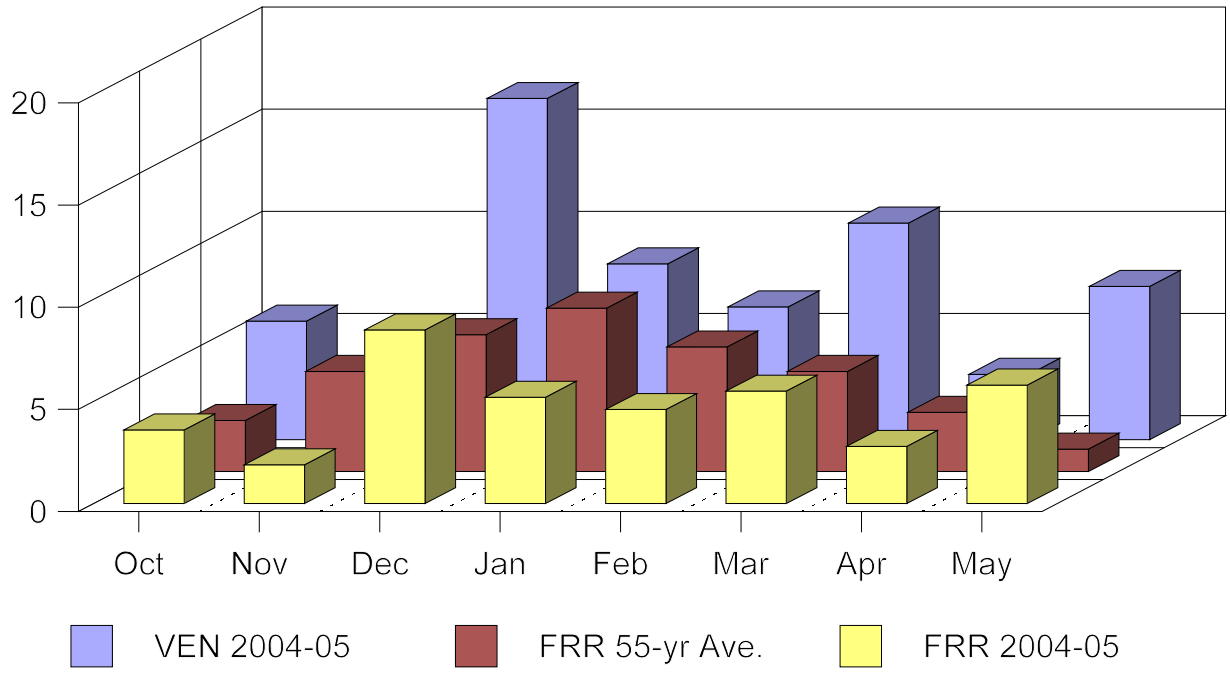


Figure 1. Gualala River steelhead spawning-season monthly rainfall pattern (VEN=Blue; FRR=Yellow), in inches, 2005 spawning season, compared to average (FRR 55-yrs=Rust) *(Months: Oct-May; VEN 2004-05=blue; FRR 55-Yr=Rust; and FRR 2004-05=yellow)*

The 2005 spawning season was jump-started by an early beginning to the rainy season and hydrograph increases. The first rain, about 1 inch as recorded from the VEN gage on October 17-18 (i.e., 2004), was followed by about 4 inches more on October 19-20. The four above-average rainy months had the following numbers of days with rain: October–7; December–12; March–11, and May–7. Spring/early-summer rainfall for the months of March, April and May combined totaled 14.1 inches (FRR) and 21.4 inches (VEN) versus the 8.9-inch average based on the FRR gage. In contrast, the same three months (Mar-May) of 2004 produced only 3.9 inches (FRR) and 4.0 inches (VEN) at the two tracking gages. Noteworthy 1-day rainfall events of 2005 (at VEN) included 2.8 inches on October 19, 4.1 inches on December 6, 3.2 inches on December 26, and 4.5 inches on May 18.

The annual hydrograph for the river, based on USGS provisional gaging data (daily mean discharge) for the Wheatfield Fork gage, exhibited a peak to more than 5,000 cfs (cubic feet/second) in December and to over 4,000 cfs in May (Figure 2; Note: there are some obvious errors in this provisional graph as presented here, which will be corrected–when corrected by USGS). And in contrast to 2004, there were more and longer periods with daily flows in excess of 1,000 cfs recorded, despite the near-average overall rainfall in each of the two years.

The index-reach results (i.e., numbers of adults and redds; *see* below) for 2005 and the three previous years were likely highly influenced by precipitation and river hydrology. The index reach is a relatively large, fourth- or fifth-order stream. And adult steelhead returning to spawn characteristically "go with the flow." Thus, during periods of low rainfall and low or rapidly-declining hydrograph, they are much more likely to congregate and hold in pools where they can be counted and/or to spawn within the index reach. High rainfall and hydrograph, on the other hand, facilitate relatively quick movement through, and little spawning in, the index reach as the adults migrate relatively quickly to the uppermost accessible reaches of the watershed. These premises will be further addressed when the data from this multi-year study are eventually coalesced and published.

However, to aid the understanding of these premises now, in 2005 I began describing in detail the rainfall and hydrology preceding each spawning survey. These descriptions are now routinely included in the File Memos (Appendix 1).

***Number of Redds*–**A total of 17 redds (0.9/mile) was found (Table 1)–the same number as in 2004. The 2004-2005 numbers compare with: 123 (6.7/mile) in the same general area during three surveys in 2001 (before the index reach was delineated); 145 (7.9/mile) during eight surveys in 2002; and 9 (0.5/mile) during four surveys in 2003. Thirteen (76 %) of the 17 redds were found during the first four surveys conducted through February 11th. The upper and lower survey sections of the index reach had 5 and 12 redds, respectively. Clearly, based on the large number of adults counted (*see* below) in contrast to the relatively low number of redds found, most spawning in 2005 occurred upstream of the index reach.

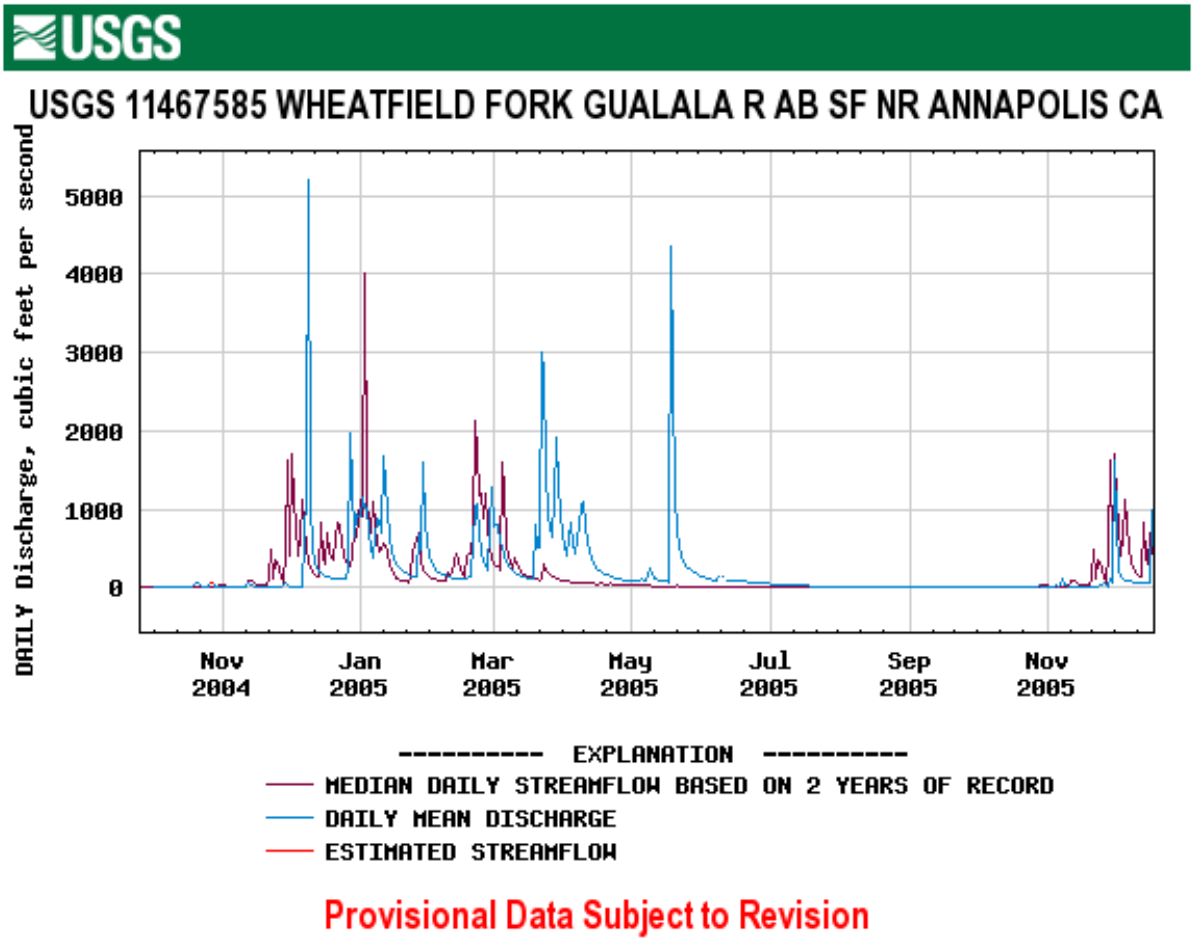


Figure 2. Wheatfield Fork spawning-survey index-reach hydrology during the 2005 season, as indicated by the USGS Wheatfield Fork realtime gage data. *(Based on provisional data from the Internet on 12/15/2005.)*

***Number of Live Adults and Carcasses*–**Two adult steelhead carcasses were found, one underneath the Annapolis Road bridge on March 11th and one about half-way down the lower survey reach on March 17th. This compares with no carcasses found in either 2003 or 2004, five in 2001 and one in 2002.

Despite the high-flow conditions over much of the spawning season (including several relatively long periods when surveys were infeasible) which afforded upstream-migrating adults comparatively easy and quick movement through the index reach, a large number of adults–433–were counted (Table 1). This was a new spawning-seasonal record, surpassing the previous record of 377 adults counted during eight surveys of the index reach in 2002. Among the highlights of adult counts were the 163 fish counted during the February 10-11 survey (previous single-survey record=148 fish), 86 counted on the next survey March 11-12, and 32 counted in a single pool on February 10th.

Another result unique to the 2005 season was the large number of very large adults observed and counted (*see* File Memos 041-042, 045, 048-049 in Appendix 1). The Gualala River is known to have relatively large adults. Creel surveys by CDFG in the 1970s showed about 40 % of the catch were fish exceeding 10 pounds. At least one individual weighing 21 pounds and measuring 38 inches has been recorded. During my 35 years on the river, I have personally taken (by angling) two fish exceeding 17 pounds (1976 and 2001) and seen (or observed photos, e.g., in the Gualala Hotel) a number of other fish caught by angling that were in the range of 15-19 pounds. Nevertheless, the relatively large number of such very large adults that I observed this season was unique and unprecedented during the 4 years to date of this study.

An obvious question is what type of life history (i.e., combination of years of fresh- and salt-water residency) of the 12-15 possible life-history combinations could potentially produce large numbers of such very large fish? It is unlikely that repeat spawners would be the source, since fish spawning three or four times are rare and the spawning event itself is a negative drain on size and growth compared to remaining in the ocean. I believe that a much more likely explanation is that these may have been mainly 3-salt (after either 1 or 2 years in the stream) individuals spawning for the first time.

During 2004, due to the low rainfall as previously discussed, conditions for adult migrations and spawning were poor during most of March and April (*see* 2004 overall report and File Memos #030-#033). Not only did drought-like conditions prevail, but ambient air temperatures were also unusually high. The stream was at a very low (40-75 cfs) stage, nearly unnavigable and only rising above 75 cfs (as measured at the Wheatfield Fork gage) on two brief occasions, once to a maximum of 277 cfs. As a result, I recorded relatively few adults and redds during this 2-month period and believe that the mouth was closed (preventing fish from entering) during most of the time.

This in turn may have resulted in a significant number of adults attempting to return and spawn late in the 2004 season that were excluded from the river. These would likely have been largely 1 (fresh)-2 (salt) and 2-2 adults that were forced to remain in the sea where they acquired another full year of ocean growth. These adults would have then returned to the river in the 2005 season as 1-3 and 2-3 adults spawning for the first time. If this is indeed the scenario, it would help explain both the record number of adults I counted and the unprecedented numbers of very large adults.

Temporal Distribution of Spawning–The most redds found during any survey was four during the December 23-24 survey. At least one redd was located during each survey, except the March 11-12 survey, when 86 adults were nevertheless counted. Clearly, therefore, spawning spanned at least a 5-month period. How much earlier than December 23 spawning may have begun is unknown, but given the early, relatively high flows adults may have been moving upstream up to several weeks before Christmas 2004, in which case spawning would have spanned about 6 months. Any spawning earlier than Christmas 2004 was likely concentrated upstream of the index reach, due to the high-flow conditions that prevailed.

Spatial Distribution of Spawning–Of the 17 redds found, 5 were on the upper survey reach and 12 were on the lower reach. As in 2004, these numbers were to low to allow any meaningful discussion of spatial distribution withing the index reach. However, the 2005 data will, at the conclusion of the overall study, be coalesced with the other results and all redd locations from all years will be plotted using appropriate GIS (Geographic Information System) maps.

Discernability of Redds–Despite relatively few redds being found, the 2005 results (*see* File Memos #041-042, 044-045, 048-049, and 051, Appendix 1) continued to provide incremental findings in support of my previous 2002-2004 findings and conclusions. Three key topics are being examined:

1. Length of Discernability. Length of redd discernability continued to show an inverse relationship to declining hydrograph. Thus, discernability also tends (in an average water year) to increase as the season progresses and flows begin to subside. Under high-flow conditions, discernability is generally about 1 week, although some redds are not discernable that long. Low flows, which were earlier shown to extend discernability to 2-4 weeks, were not experienced in 2005. Nevertheless, 2005 findings generally continued to support a recommendation that surveys generally should be conducted weekly. They can then be extended to bi-weekly during prolonged dry periods when the index-reach hydrograph is low and stable, or rapidly declining.

2. Observer Variation. Because I was the sole surveyor during the seven surveys of the 2005 spawning season, nothing can be added to previous findings regarding observer variation. I have previously shown that observer variation in redd detection and identification, and in counts of live adults, is frequently substantial. Some likely reasons for this were discussed in my 2002 report (DeHaven 2002). Missed and mis-identified (i.e., lamprey redds incorrectly called steelhead redds) steelhead redds have occurred despite the considerable experience that my assistants and I are gaining as our survey experience accumulates. In addition, in 2004, I had assistance of a lamprey expert on one survey (April 10th) and redd identification controversies still arose. In recognition of the problem, I believe that surveys should be conducted only by well-trained and experienced individuals working (and collaborating on findings) in two-person teams whenever possible.

3. Misidentification of Lamprey versus Steelhead Redds. This season, I recorded relatively few steelhead or lamprey redds, thus there is nothing further to add to this issue of misidentification. Nevertheless, the 2002-2004 spawning surveys provided ample evidence of lampreys superimposing their redds onto steelhead redds. And as I have previously discussed, I believe this is a relatively common phenomenon–and not just an occasional anomaly–at least within the index reach of this river and especially late in the spawning season when the lamprey arrive to spawn. I have also previously reported that sometimes large lamprey redds are mistaken for steelhead redds. In addition, in 2004 I recorded the first instance of a steelhead redd superimposed onto a previous steelhead redd that had become indiscernible during a high-flow period. Such findings further highlight the need to adhere to the recommendations in #1 and #2 above.

Angling Survey Results–In addition, this season, for the first time in 3 years, and primarily because of the large number of large adults I was recording, I made four angling trips to the river (*see* File Memos 043, 046-047, and 050; Appendix 1). I hooked, landed and released a total of nine adults up to 15 pounds during the four trips, and lost a few others. I also observed roughly two dozen adults landed and released by other anglers I encountered along the river. I also caught and released a relatively small number of JSH (smolts and pre-smolts) while angling for the adults.

2005 Snorkeling Surveys.

A total of four snorkeling surveys was conducted at roughly monthly intervals from early July to early October 2005. Unlike 2004, a survey in June was deemed unnecessary, due to high flows (from the record May rainfall) and my confidence that neither flows nor water temperatures had yet become critical issues for JSH summertime rearing.

Each of the first three surveys was a 2-day event (i.e., July 2-3; July 30-31; and August 27-28) in which water volume and JSH density were measured at each sample site. The fourth and final survey was a 1-day event (October 6) in which snorkeling was done and JSH were counted at each site, but water volumes–and thus JSH densities–were not measured.

Tables 2a-c summarize the first three snorkeling survey results. These results, along with results of the fourth survey, are discussed in detail in File Memos 052-055 (Appendix 1). Key findings and conclusions, based on the File Memos and the related tabular data from each site, are briefly given below.

Wolf Creek–The site maintained a relatively high, continuous surface flow–much higher than in 2004–throughout the survey period. Water temperatures were cooler than in 2004. Densities of JSH remained high and relatively stable. Numbers of GR and TSS were generally reduced compared to 2004.

House Creek Mouth–The site maintained a relatively stable, continuous surface flow throughout the survey period, despite having become intermittent during the 2004 season (in these discussions, "season" refers to the summer JSH rearing/snorkeling period). Water temperatures were cooler than in 2004. JSH rearing, in moderately high densities, was supported throughout the season, whereas JSH had disappeared from the site and nearby areas by late in the 2004 season. Numbers of GR and TSS were reduced compared to 2004.

Wheatfield Fork (Lady-in-the Car)– The site maintained a relatively high, continuous surface flow–much higher than in 2004–throughout the survey period. Water temperatures were cooler than in 2004. JSH rearing, here and at a nearby location 1,000 ft upstream, was supported throughout the season in contrast to the 2004 season.

Wheatfield Fork (Annapolis Road bridge)–Flow at the site remained higher this season than inthe 2004 season, when the stream became intermittent in late summer. Water temperatures did not appear to vary much, if any, from 2004. JSH were present in low numbers late in the season in contrast to their complete disappearance late in the 2004 season. Also, about 1/4-mile downstream (i.e., just upstream of the mouth of Haupt Creek) multiple age-classes of JSH reared throughout the 2005 season.

Near North Fork mouth (Upper Section)–The flow at the site remained much higher than in 2004. Water temperatures were cooler than in 2004. JSH of multiple age-classes were present throughout the season, but in lower numbers than during the 2004 season.

Near North Fork mouth (Lower Section)–The flow here also remained much higher than in 2004. Water temperatures were also cooler than in 2004. A low level of JSH rearing–much lower than in the 2004 season–was supported through the period. Several nearby sites, including the vicinity of the boat-lauching area downstream of the Highway 1 bridge, supported similar low levels of JSH rearing in 2005 compared to 2004 and other years.

Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)–The site had continuous surface flow throughout the survey period, whereas the whole reach became dry in late summer 2004. Water temperatures were much lower than in 2004. A low level of JSH rearing was maintained through the survey period. However, just upstream in an area with dense woody debris, a higher density of JSH rearing was maintained through the summer.

South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)–The site and adjacent reaches remained much higher, with continuous surface flow, throughout the 2005 season, versus 2004 when the stream became intermittent in late summer. Water temperatures remained hospitable to JSH rearing through the season. JSH numbers were low, but relatively steady, through the 2005 season.

Haupt Creek–The flow at the site was much higher than in 2004. The gradual shift to intermittent flow also occurred much later in the season. Water temperatures remained hospitable to JSH over the season. Moderate numbers of JSH were supported for most of the summer. And unlike 2004, some proportion of the JSH likely escaped when the first fall rains occurred, restoring continuous surface flow.

Related Early December 2005 Observations–On December 12-13, 2005, I conducted the first spawning survey of the 2006 spawning season. This survey will be reported on later in a File Memo and my 2006 annual report.

It is mentioned here because of the unusual observations I also made regarding JSH. Normally, during such early-season spawning surveys few, if any, JSH are seen. Any JSH that are seen are invariably scattered individual fish (except in late spring when YOY begin to emerge). However, such was not the case during the December 12-13, 2005 spawning survey. I recorded, for the first time ever in this reach, several large schools of JSH containing hundreds of fish each; these were

Table 2a. July 2-3, 2005 juvenile steelhead snorkeling survey results at nine sampling locations, Gualala River, California.

#	LOCATION	FLOW [2]	AVE. WDT (ft)	AVE. VEL.[3] (ftps)	PERCENT[4]			VOLUME[5]		H_2O TEMP[6]	JSH #s			DENSITY/	
					Pool	FH_20	Rif	$100ft^3$	m^3		yoy	1+	2+	$100ft^3$	m^3
1	Wolf Cr.	CF	15.6	0.8	40	45	15	6.2	17.4	70	125	15	-0-	22.8	8.0
2	House Cr.	CF	18.4	1.4	50	50	-0-	13.5	38.3	76-84[7]	500	50	1	40.7	14.4
3	WF Fk. (Ldy)	CF	15.4	1.2	50	50	-0-	17.7	50.2	82	5	-0-	5	0.6	0.2
4	WF Fk. (Bdg)	CF	69.4	<0.5	30	70	-0-	97.3	275.5	80	0	0	0	0.0	0.0
5A	Nr. N. Fork-U	CF	73.8	2.0	0	50	50	85.0	240.8	60	25	-0-	50	0.9	0.3
5B	Nr. N. Fork-L	CF	74.0	1.1	15	85	-0-	138.2	391.3	60	-0-	5	-0-	<0.1	<0.1
6	Twin Bridges	CF	48.4	2.2	-0-	45	55	16.3	46.2	64	5	-0-	-0-	0.3	0.1
7	S. Fork Brdg.	CF	34.8	1.0	35	65	-0-	39.5	111.7	65	5	-0-	10	0.4	0.1
8	Haupt Cr.	CF	12.7	1.1	30	25	45	5.5	15.7	66	32	3	-0-	6.3	2.2

[2] CF=Continuous surface flow; IF=Intermittent surface slow; D=Dry (except for, in some cases, drying pools)–No surface flow present.

[3] Equivalent to average maximum velocity, as measured at the point of maximum velocity (usually at or near the center of thalweg) along each stream cross-section.

[4] Percentages of these three basic habitat types making up the 100-ft-long sample reaches.

[5] Total volume of the 100-ft-long sample (snorkeled) reach, as measured by the ten cross-sections.

[6] Maximum water temperature, in ^{0} F, recorded at the site during the data gathering.

[7] At this site, temperatures are recorded at three locations: in House Creek above confluence; and in Wheatfield Fork above and below confluence. All temperatures are time-of-day dependent. Please see text for when temperature were recorded.

Table 2b. July 30-31, 2005 juvenile steelhead snorkeling survey results at nine sampling locations, Gualala River, California.

#	LOCATION	FLOW [8]	AVE. WDT (ft)	AVE. VEL.[9] (ft/s)	PERCENT[10]			VOLUME[11]		H_2O TEMP[12]	JSH #s			DENSITY/	
					Pool	FH_20	Rif	$100ft^3$	m^3		yoy	1+	2+	$100ft^3$	m^3
1	Wolf Cr.	CF	12.7	0.9	40	45	15	3.7	10.5	68	300	5	-0-	82.7	29.2
2	House Cr.	CF	18.0	1.4	55	20	25	12.5	35.5	74-80[13]	500	50	2	44.0	15.5
3	WF Fk. (Ldy)	CF	15.0	0.4	70	30	-0-	17.1	48.3	77	25	4	1	1.8	0.6
4	WF Fk. (Bdg)	CF	68.6	<0.5	50	50	-0-	95.0	269.0	80	0	0	1	<0.1	<0.1
5A	Nr. N. Fork-U	CF	61.3	1.2	0	45	55	70.0	198.1	62	200	200	100	7.2	2.5
5B	Nr. N. Fork-L	CF	69.8	0.7	15	85	-0-	111.7	316.3	62	-0-	5	-0-	<0.1	<0.1
6	Twin Bridges	CF	31.3	2.1	-0-	45	55	11.3	31.9	64	10	3	-0-	1.2	0.4
7	S. Fork Brdg.	CF	33.0	0.6	35	65	-0-	32.7	92.6	64	10	-0-	2	0.4	0.1
8	Haupt Cr.	CF	10.6	0.7	50	35	15	4.8	13.7	67	100	5	-0-	21.7	7.7

[8] CF=Continuous surface flow; IF=Intermittent surface slow; D=Dry (except for, in some cases, drying pools)–No surface flow present.

[9] Equivalent to average maximum velocity, as measured at the point of maximum velocity (usually at or near the center of thalweg) along each stream cross-section.

[10] Percentages of these three basic habitat types making up the 100-ft-long sample reaches.

[11] Total volume of the 100-ft-long sample (snorkeled) reach, as measured by the ten cross-sections.

[12] Maximum water temperature, in ^{0} F, recorded at the site during the data gathering.

[13] At this site, temperatures are recorded at three locations: in House Creek above confluence; and in Wheatfield Fork above and below confluence. All temperatures are time-of-day dependent. Please see text for when temperature were recorded.

Table 2c. Aug. 27-28, 2005 juvenile steelhead snorkeling survey results at nine sampling locations, Gualala River, California.

#	LOCATION	FLOW[14]	AVE. WDT (ft)	AVE. VEL.[15] (ftps)	PERCENT[16]			VOLUME[17]		H_2O TEMP[18]	JSH #s			DENSITY/	
					Pool	FH_20	Rif	$100ft^3$	m^3		yoy	1+	2+	$100ft^3$	m^3
1	Wolf Cr.	CF	11.2	0.6	50	35	15	3.0	8.6	62	200	1	2	67.2	23.7
2	House Cr.	CF	20.2	0.8	45	10	45	13.4	37.8	66-73[19]	75	25	5	7.9	2.8
3	WF Fk. (Ldy)	CF	15.0	0.3	50	50	-0-	17.0	48.1	70	25	3	7	2.1	0.7
4	WF Fk. (Bdg)	CF	62.0	<0.5	70	30	-0-	87.5	247.7	75	10	-0-	3	0.2	<0.1
5A	Nr. N. Fork-U	CF	63.8	1.0	0	45	55	52.4	148.4	62	30	20	5	1.1	0.4
5B	Nr. N. Fork-L	CF	65.2	0.3	15	85	-0-	124.6	352.7	59	-0-	30	6	0.3	0.1
6	Twin Bridges	CF	24.6	1.1	25	25	50	6.6	18.8	63	3	4	-0-	1.1	0.4
7	S. Fork Brdg.	CF	28.0	0.5	35	65	-0-	28.0	79.3	64	30	4	3	1.3	0.5
8	Haupt Cr.	IF	6.1	0.2	50	35	15	2.8	7.8	63	75	-0-	-0-	27.1	9.6

primarily larger, older (age 1+ or 2+) juveniles. The observations occurred along both the upper and lower spawning-survey index

[14] CF=Continuous surface flow; IF=Intermittent surface slow; D=Dry (except for, in some cases, drying pools)–No surface flow present.

[15] Equivalent to average maximum velocity, as measured at the point of maximum velocity (usually at or near the center of thalweg) along each stream cross-section.

[16] Percentages of these three basic habitat types making up the 100-ft-long sample reaches.

[17] Total volume of the 100-ft-long sample (snorkeled) reach, as measured by the ten cross-sections.

[18] Maximum water temperature, in ^{0} F, recorded at the site during the data gathering.

[19] At this site, temperatures are recorded at three locations: in House Creek above confluence; and in Wheatfield Fork above and below confluence. All temperatures are time-of-day dependent. Please see text for when temperature were recorded.

reaches. These unique observations are, I believe, the direct result of upstream river reaches, including the Wheatfield Fork and its tributaries (instead of the estuary), becoming highly important to JSH rearing–likely for the first time in many years–during the 2005 rearing season.

CONCLUSIONS

- Immigration and spawning of adult steelhead occurred throughout the 5-month (December-April) 2005 spawning-survey period, with peak numbers of adults recorded during February and March.

- The record number of adults counted (433) and the unusual proportion of very large adults (>32 inches and 15 pounds) observed may reflect an extra year of ocean growth by adults excluded from spawning in the river late in the 2004 spawning season, due to low precipitation and flows.

- Extended periods with above-average hydrograph during the 2005 spawning season were likely conducive to (1) relatively rapid spawning and emigration of adults, and (2) most spawning occurring upstream of the 18.3-mile index reach.

- Additional evidence accrued that spawning surveys should be conducted weekly when feasible, with extension to bi-weekly intervals late in the spawning season and/or under prolonged dry conditions.

- Wolf Creek continued to demonstrate its importance as a JSH rearing stream.

- Compared to 2004, JSH rearing was much less impaired and limited by adverse water temperatures and lack of surface flows (i.e. aquatic habitat) during the critical summer season.

- The Wheatfield Fork, which supported very low levels of JSH rearing through the summer of 2004, became an important JSH producer in summer 2005, due to higher flows and lower water temperatures.

- The importance of the estuary to JSH rearing and production declined in summer 2005 (versus 2004 and other drier years) as upstream rearing significantly increased.

- Good JSH rearing conditions of summer 2005 owed to well-above-average late-spring precipitation, especially during May. Late-season rains greatly elevated summertime flows and limited the extent of summer drying (and intermittent flows) that were problems in summer 2004.

- With both good adult spawning conditions and good JSH rearing conditions, 2005 was clearly a banner year for the river's steelhead population.

LITERATURE CITED

DeHaven, R. W. 2001. Reconnaissance-level spawning and habitat surveys of steelhead trout, Gualala River, California, 2001. Prepared by the author (Richard_DeHaven@fws.gov), April 2001, for use by agencies, groups and individuals involved in steelhead recovery efforts. 23pp.

DeHaven, R. W. 2002. Steelhead spawning surveys, Wheatfield Fork and other selected reaches, Gualala River, California, 2002. Prepared by the author (Richard_DeHaven@fws.gov or drdehave@hotmail.com), September 2002, for use by agencies, groups and individuals involved in steelhead recovery efforts. 42pp.

DeHaven, R. W. 2003. Steelhead spawning surveys, Wheatfield Fork, Gualala River, California, 2003. Prepared by the author (Richard_DeHaven@fws.gov or drdehave@hotmail.com), December 2003, for use by agencies, groups and individuals involved in steelhead recovery efforts. 14pp.

DeHaven, R. W. 2004. Adult and juvenile steelhead population surveys, Gualala River, California, 2004. Prepared by the author (drdehave@hotmail.com), December 2004, for use by agencies, groups and individuals involved in steelhead recovery efforts. 56pp.

APPENDIX 1.

Individual File Memos for the Seven Spawning Surveys,
Four Snorkeling Surveys and Four Angling Trips

AND

Photo Gallery with 12 of the 2005 Photographs

MEMORANDUM TO THE FILE–#041

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, December 23-24, 2004, *my first complete survey of the index reach for the 2005 spawning season.*

Personnel

This was my first complete survey of the 2005 season, a 2-day effort conducted alone. I arrived at the House Creek/Wheatfield Fork confluence at 0830 hrs on December 23 and began survey of the upper reach at 0915 hrs. The second day–Christmas eve–I started the lower-reach survey at 0905 hrs. This involved some real Christmas-eve luck, however, after I was nearly forced to abort the survey.

On day two, after dropping the car off at the take-out point, I was using the 'gas-can-duping-device' method to hitch a ride back to the put-in point, where the boat and gear were already waiting. I stepped onto the road, gas can in hand, at 0645 hrs, just as it was getting daylight. The good news is that the first car along the road–a middle-aged woman headed to Santa Rosa –stopped for me. The bad news is that the first car–her car–did not appear for nearly 2 hours! The relatively short length of daylight at this time of year make an early starting time an important consideration in survey planning. I had already decided to abort if a ride did not appear by 0845 hrs. Saving the day, this lady appeared on the road and picked me up at exactly 0844 hrs.

Survey Methods

Both reaches of the index reach were floated using my 8-foot aluminum driftboat. Procedures were the same as all other surveys in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed (day one) from 0915-1442 hrs for an average survey rate of about 1.62 mph. The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed (day two) from 0905-1415 hrs, for an average survey rate of about 1.82 mph.

Weather and Stream Conditions

From both a weather and stream-flow perspective, the 2-day survey conditions could not have been finer. The sky was cloudless both days and there was zero wind along either of the two reaches. Both mornings were frosty, but warmed to a mild 50-55^{0}F at mid-day. The stream was perfectly clear and very low, greatly limiting any surface turbulence, which might have limited visibility.

Rainfall and Hydrology Preceding the Survey

The watershed received a major storm and rainfall totaling over 6 inches (as measured at the Venado gage) during the period from December 6 to 8. The weather pattern then turned extremely dry and warm, with no rain recorded from December 9 to the survey dates. Thus, the watershed had been rainless for 14 and 15 days, respectively, on the survey dates.

Hydrographs from the three USGS gages located in the Gualala River watershed peaked on December 8-9: the South Fork at 8,000 cfs; the North Fork at 9,000 cfs; and the Wheatfield Fork at 10,000 cfs. All of these flows dropped steadily and rapidly to the survey dates, when the South Fork gage indicated about 1-2 cfs, the North Fork about 8-10 cfs, and the Wheatfield Fork about 125-130 cfs. Given the earlier peaks of about 10,000 cfs each, these values represented extremely low flows and really surprised me. Clearly, the watershed had not been well-charged by the December 6-8 rainfall events. In addition, the Wheatfield Fork data, indicating 125-130 cfs, was clearly in error and may have been affected by considerable sub-surface flow through aggregate at the gaging site. The stream was so low both days as to be nearly unnavigable. I estimate it was flowing at no more than 40 cfs on the upper survey reach on December 23 and no more than 50 cfs along the lower survey reach on December 24. Accordingly, I notified USGS of my concerns regarding the accuracy of the Wheatfield Fork gaging data for this period.

The low flow in the Wheatfield Fork (and other two gaged forks) was also evidenced by the river mouth being closed by a sandbar during both survey dates. This created a huge backwater effect upstream nearly to the North Fork mouth. Photos were taken of the sandbar across the river mouth.

Nevertheless, the hydrology during the period from about December 9 or 10 (when the flow on the Wheatfield Forks receded to below 1,000 cfs) until the survey dates (and/or until the river mouth became closed) was highly conducive to adult steelhead migrations. Accordingly, I suspect that a considerable number of fish may have moved up- and down-river during the 2-week pre-survey period.

Results

Nineteen adult steelhead and four redds were recorded. I have high confidence in the relative accuracy (in contrast to previous surveys) of both counts (although, most certainly, not *every* adult was seen), due to the excellent survey conditions. (Several individual age 1+ JSH {juvenile steelhead} were also recorded, mainly in shallow riffles and runs.)

What was most notable about the adults was their generally very large size–mostly in excess of 30 inches total length. These were generally fish that would have weighed at least 12 pounds, with several approaching the 15-18-pound range. I do not recall seeing such a large percentage of very large adults in the past, except during a survey of the South Fork in 2001.

Upper 8.9 miles–No redds were found on this reach. However, 13 adults were recorded as follows: 0941 hrs–2 very large, fresh adults in a shallow run; 1210–7 very large, fresh adults in the YMCA Pool; 1239–1 medium-size adult of unknown status in a shallow run; 1435–3 very large, fresh adults in the Indian Spearing Pool. (Several individual JSH were also seen at scattered locations.)

Lower 9.4 **miles–**Four redds were found along the upper portion of this reach at the following times: 0929 hrs; 0955; 1016; and 1122. Six adults were recorded as follows: 0949 hrs–two large, fresh adults in a shallow, slack-water area; and 1056–four very large, fresh adults in the large, deep pool just downstream of the landslide. (Several individual JSH were also seen at scattered locations.)

Conclusions

Survey conditions (*see* 2004 annual report, Table 1 and erratum) were ideal, with a low flow, excellent water clarity, and excellent weather. The river mouth was checked (and photographed) and was definitely closed both days. Nevertheless, overall, a low-to-moderate number of very large, fresh-run, adult steelhead were moving upstream through the index reach and a low level of spawning was occurring in the lower half of the index reach.

Prepared: December 25, 2004; RWD
Edited: January 26, 2005; RWD
Edited: February 8, 2005; RWD

MEMORANDUM TO THE FILE–#042

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, January 22-23, 2005*, my second complete survey of the index reach for the 2005 spawning season.*

Personnel

This was my second complete survey of the 2005 season, a 2-day effort conducted alone. I arrived at the House Creek/Wheatfield Fork confluence at 0900 hrs on Saturday, January 22 and began the survey of the upper index reach at 0930 hrs. The second day–Sunday the 23rd–I started the lower index reach survey at 0755 hrs. I used the gas-can-duping-device trick to secure a ride back to the starting point on Saturday and my new 110 cc mini dirt-bike (which easily fits into my SUV) as the shuttle device for the second day's float-trip.

Survey Methods

Both halves of the index reach were floated using my 8-foot aluminum mini-driftboat. Procedures were the same as during all other surveys in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed from 0930-1322 hrs for an average survey rate of about 2.22 mph. The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed from 0755-1210 hrs, for an average survey rate of about 2.21 mph. These were comparatively rapid rates, reflecting both the ideal survey conditions (see below) and my ever-growing familiarity with the survey reaches.

Weather and Stream Conditions

From both a weather and stream-flow perspective, the 2-day survey conditions could not have been much better. Weather both days was relatively mild and sunny. Frost was not encountered either morning. Wind was also nonexistent, except for the last 20-30 minutes of the lower reach survey on Sunday. The stream was perfectly clear and had a perfect flow for floating (with a minimum of dragging the boat) and surveying–a flow which I now intend to use as a target for such surveys.

Over the 2-day survey period, flows (as measured at the respective USGS Realtime gages) were: roughly 210-154 cfs on the Wheatfield Fork, 80-75 cfs on the South Fork, and 40-33 cfs on the North Fork. These ranges illustrate the relatively rapidly-declining hydrograph at each gaging site. These are definitely good target flows to shoot for in the future; the bottoms of all pools (except where there was surface turbulence due to wind) could be seen. At any flows much higher than these, the bottoms of some of the deepest pools would not be readily visible.

Rainfall and Hydrology for 1 Month Preceding the Survey

The last survey was conducted on December 23-24, 2004, so almost exactly 1 month had elapsed. Conditions did not allow a survey any sooner. Rainfall (as indexed from the Venado realtime gage data) and hydrology over the 1-month period can be summarized as follows:

- On 16 of the 17 days between December 26 and January 11 measurable rainfall was recorded and the total precipitation during this 17-day period was 13.08 inches.
- Weather then turned very dry, with zero precipitation recorded during January 12-23.
- Accordingly, the hydrograph of the Wheatfield Fork started up on December 26th and remained moderately high at ≥400 cfs (2,000 cfs maximum) during December 27th-January 15th.
- Then, during January 15-22, the Wheatfield Fork hydrograph was in steady decline, finally reaching the ideal survey conditions I encountered on January 22.

It is likely that the entire month, but especially the January 15-22 period, provided ideal migration conditions for adult steelhead moving up and down the river. A considerable number of fish may have thus moved through prior to this second survey of the index reach.

Results

Sixty-three adult steelhead and four redds were recorded. I have relatively high confidence in the accuracy (in contrast to previous surveys) of both counts (although clearly, not *every* adult was seen), due to the excellent survey conditions. In addition, a few individual age 1+ JSH (juvenile steelhead) were recorded, mainly in widely scattered shallow riffles and runs.

What was most notable–just as on the December 23-24 survey–was the generally very large size (>30 inches) of many of the adults. These were generally fish that would have weighed at least 12 pounds, with several approaching the 15-18-pound (or greater) range. In particular, two or three of the adults I recorded in the YMCA pool may have even exceeded 18 pounds! I do not recall seeing such a large percentage of very large adults in the past, except possibly during a survey along a portion of the South Fork in 2001.

Upper 8.9 miles–No redds were found on this reach. However, 37 mostly fresh-run (not yet spent) adults were recorded as follows: 0949 hrs–3 very large, fresh adults in a moderate run; 0957–11 large and very large, fresh adults in a moderate run; 1047–5 large, fresh adults in a deep run; 1134–15 large and very large, fresh adults in the YMCA Pool; 1147–1 large, spent adult in a moderate run; 1212–1 large unknown status adult in a deep pool; and 1231–1 large unknown status adult in a deep pool. No adults were present in the Indian Spear Pool near the end of survey.

Lower 9.4 **miles–**Three new redds were found along the upper half of this reach at the following times: 0827 hrs–Marked #5, 8 paces from the right (downstream aspect) bank; 0847–Marked #6, 12 paces from left bank, just downstream of Fuller Creek mouth; and 0859–Marked #7, 8 paces

from the left bank. None of the four pre-existing redds in the same general area, found on the December 23-24 survey, were still visible. In fact, each area had been completely re-leveled, leaving no indication of the previous redds.

The 26 adults were recorded as follows: 0800 hrs–4 (3 fresh; 1 spent) large and very large, in a pool tail-out; 0839–2 (spent) large, in a shallow pool tail-out; 0906–4 (fresh) large and very large, in a deep run; 0931–2 (spent) large, in a brushy run; 0954–6 (fresh) huge adults in the Yellow Rope Pool; 1010–3 (unknown status) in the ATV Pool; 1033-2 (spent) in a shallow riffle; and 1130–3 (fresh) large/very large, in the Power Cable Run.

About 1140 hrs, I began encountering a headwind, which limited my ability to see to the bottoms of the deepest pools.

Conclusions

Survey conditions (see my 2004 annual report, Table 1 and erratum) were ideal, with a moderate-to-high flow, excellent water clarity and visibility, and excellent weather conditions.
The river mouth was checked (and photographed) and was definitely open both days. Overall, the index reach had a moderate number of large and very large, fresh-run adults moving upstream; a low number of spent adults moving downstream; and a low level of spawning in the lower survey reach.

Prepared: January 27, 2005; RWD
Edited: February 8, 2005; RWD

MEMORANDUM TO THE FILE–#043

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

Subject: Angling survey, from Twin Bridges downstream to 3/8-mile below the North Fork mouth, January 31-February 1, 2005.

Personnel

I conducted this, my first steelhead angling trip to the Gualala River in 3 years, alone.

Survey Methods

This was strictly a fishing trip–both for myself and to observe other anglers' success. On the 31st, I floated from Twin Bridges to the North Fork, fishing at the best runs and pools along the way, from roughly 0830-1530 hrs. On the morning of the 1st, I fished the long run just downstream of the mouth of the North Fork from about 0800 to 1100 hrs. Both days I was angling was with my favorite traditional bait: a thumb-nail-sized piece of salmon roe behind a red and white number 10 or 12 spin-n-glow.

Weather and Stream Conditions

The weather was beautiful–sunny and warm–both days. The hydrograph was declining after a series of moderate storms. I couldn't have timed it more perfectly for my angling effort. When I arrived at the put-in at Twin Bridges at 0700 hrs, the river was relatively high–but the perfect green color–for steelhead fishing. The perfect angling conditions, which I can now say with some certainty are in the range of 350-450 cfs at the Wheatfield Fork (USGS) gage (while the South Fork shows about 250-275 cfs and the North Fork shows about 150-200 cfs), were gently rolling along. And even more exciting (in terms of having a nice day) there was no one else at the put-in and very few anglers on the river; I only two others (both were walking and wading, not boating) during the 8.8-mile float.

Catch and Observations

I didn't hook any adult (or juvenile) steelhead until reaching a relatively long run about 1/2-mile upstream of the North Fork mouth. The first fish at 1422 hrs turned out to be a spent, 10-12-pound female, which I quickly photographed, revived and released. A few casts later, I hooked a larger adult, which may have been a fresh-run (based on the fight, aerial action, and silver-bright color), but which spit the hook back at me after about 1 minute. The same run produced two other take-downs, but no additional hook-ups. However, after I left this run, another lone angler also hooked and lost one adult of unknown size or condition. That was it for day one. There were no other anglers in the vicinity of the take-out when I loaded the boat.

The following morning, I failed to elicit any additional take-downs. However, the 8-10 other anglers working the general area caught and released at least three adults (one fresh male and two

spent females) weighing 10-12-pounds each and lost two or three other adults after brief hook-ups. I photographed the fish that were caught and released, then headed home.

Prepared: February 3, 2005; RWD

MEMORANDUM TO THE FILE–#044

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, February 4-5, 2005, *my third complete survey of the index reach for the 2005 spawning season.*

Personnel

This was my third complete survey of the 2005 season, a 2-day effort conducted alone. I arrived at the House Creek/Wheatfield Fork confluence at 0900 hrs on Friday, February 4, and began the survey of the upper index reach at 0920 hrs. The second day–Saturday the 5th–I started the lower index reach survey at 0830 hrs. On Friday, I had a real 'sinking feeling' upon discovering, at the end of the float, that my empty gas can (used as a duping device to secure a quick ride back to the put-in) had been forgotten in the vehicle. But luck was with me this time: I stepped onto the road hitchhiking, and the first car (in about 15 minutes) stopped and picked me up. For the second day's float, I used my 110 cc mini dirt-bike (which fits into the back of my SUV) as the shuttle method to deploy my car at the take-out prior to starting the survey.

Survey Methods

Both halves of the index reach were floated using my 8-foot aluminum mini-driftboat. Procedures were the same as during all other surveys in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed from 0920-1250 hrs, for an average survey rate of about 2.54 mph. The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed from 0830-1215 hrs, for an average survey rate of about 2.51 mph. These were very fast rates, reflecting both my growing familiarity with the survey routes and the relatively high, fast-moving, flows.

Weather and Stream Conditions

Survey conditions were less than ideal. On day one, visibilities were hampered both by the high flows, which were still slightly green, and by the intermittent cloudiness, which limited sunlight penetration. On day two, the relatively high flow (which had completely cleared), with its associated surface turbulence, and dense fog during the first 2 hours, prevented visibility to the bottoms of several of the deepest pools.

Over the 2-day survey period, the declining flows (as measured at the respective USGS Realtime gages) were roughly: 225-250 cfs on the Wheatfield Fork, 160-145 cfs on the South Fork, and 80-57 cfs on the North Fork. These hydrographs were declining much more slowly than during the two earlier surveys this season. Also, the flows were well above the ideal target flows identified during the January 22-23 survey (*see* Memo Report #042), thus velocities and surface turbulence were both relatively high.

Rainfall and Hydrology for the 12 Days Preceding the Survey

Twelve days elapsed between the end of the previous survey on January 22-23 and the start of this survey. Conditions did not allow a survey any sooner. Rainfall (as indexed from the Venado realtime gage data) and hydrology over the 12-day period can be summarized as follows:

- Rainfall totaling 3.44 inches occurred on 4 consecutive days from January 25-28. The largest daily total during this period was 1.36 inches on January 27th.
- Weather then turned dry, with zero precipitation recorded during January 29-February 5.
- The hydrograph response on the Wheatfield Fork was as follows: a sharp upwards spike on January 26; a peak flow of about 2,500 cfs on January 28th; and a steady, uniform flow decline from January 29 to February 4-5, when the 225-250 cfs survey level was attained.

The declining hydrograph during January 29 to the survey dates likely provided ideal migration conditions for adult steelhead moving up and down the river. A considerable number of fish may have thus moved through prior to this 2-day survey of the index reach.

Results

Twenty-four adult steelhead and two new redds were recorded. I have high confidence that few, if any, redds were missed. However, a substantial number of adults, which occurred largely as spent singles, could have been missed because of the sub-optimal survey conditions. Most notable in terms of adult counts, was that none of the very large fish seen on the first two 2005 surveys were seen on this survey. The sizes of fish were much more typical of past years' sizes.

Upper 8.9 miles–No redds were found on this reach. However, four adult steelhead were recorded: two spent adults in a run-pool complex at 0944 hrs; one spent adult in an undercut bank area at 1031 hrs; and one spent adult in a shallow riffle at 1230 hrs. No fish were observed in either of the two most significant pools on this reach–the YMCA Pool and the Indian Spearing Pool.

Lower 9.4 **miles–**Two new redds were found along the upper half of this reach at the following times: 0837 hrs–Marked #9, 16 paces from the left (downstream aspect) bank; and 1037 hrs–Marked #10, 6 paces from the left bank, in the left channel split, just downstream of the ATV Pool. None of the three pre-existing redds in the same general area, found on the January 22-23 survey, were still visible. In fact, each area had been completely re-leveled, leaving no indication of any previous steelhead spawning activity.

The 20 adults recorded occurred as follows: single, spent adults were seen at 0912, 0913, 0924, 0926, 1010, 1012, 1053, 1109, 1142, and 1215 hrs (10 adults total); five fresh-run adults were recorded in the Yellow Rope Pool at 1018 hrs; and five fresh-run adults were recorded in the Cable Run at 1139 hrs. Each of these counts may have been on the low side, due to sub-optimal survey conditions.

Conclusions

Survey conditions (*see* my 2004 annual report, Table 1 and associated erratum) were sub-optimal, with a high flow, fair water clarity and visibility, and fair weather conditions hampered by clouds (day 1) and fog (day 2). The river mouth was checked (and photographed) and was definitely open both days. Overall, the index reach had a low-to-moderate number of fresh-run adults moving upstream; a moderate number of spent adults moving downstream; and a low level of on-site spawning in the lower survey reach.

Prepared: February 9, 2005; RWD
Edited: February 14, 2005; RWD

MEMORANDUM TO THE FILE–#045

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, February 10-11, 2005*, my fourth complete survey of the index reach for the 2005 spawning season.*

Personnel

This was my fourth complete survey for the 2005 steelhead spawning season, another 2-day effort I conducted alone. I arrived at the House Creek/Wheatfield Fork confluence at 0915 hrs on Thursday, February 10th, and began survey of the upper half of the index reach at 0942 hrs. The second day–Friday the 11th–I started survey of the lower half of the index reach at 0850 hrs. I used the empty gas can trick to secure a ride back to my vehicle (picked up by the director of Camp Gualala [referred to as the YMCA Camp throughout my records and notes]) on Thursday. As often occurs when using this duping device, the first car along the road stopped to give me a ride. The only problem was, as is also common along this road, that the first car did not appear for some time–about 43 minutes! The shuttling device for the second day's float was my 110 cc mini dirt-bike, which is small enough to fit easily into the back of my SUV and can be readily hidden in the underbrush near the put-in.

Survey Methods

Both halves of the index reach were floated using one of my 8-foot aluminum mini-drift-boats. All procedures were the same as used during my previous surveys in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed from 0942-1331 hrs, for an average survey rate of 2.32 mph. The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed from 0850-1253 hrs, for an average survey rate of 2.35 mph. These were relatively quick survey rates, reflecting my growing familiarity with the survey routes, moderately fast-moving flows, and minimal portaging and dragging of the boat being necessary.

Weather and Stream Conditions

Weather and stream conditions were absolutely perfect. Both days were relatively warm, sunny, and windless. Neither fog nor frost was encountered during either morning.

Flows, as indexed from the three USGS realtime gages, were slowly declining and indicating (between noon on the 10th and noon on the 11th) levels of roughly 160-155 cfs on the Wheatfield Fork, 102-95 cfs on the South Fork, and 33-30 cfs on the North Fork. These flows were thus very close to the ideal flows that I identified during my second 2005-season survey on January 22-23 (*see* Memo Rept. #042). With the flows and conditions encountered, the bottoms of every pool

could be easily seen and surface turbulence which could prevent visibility in certain runs and riffles was not excessive.

Rainfall and Hydrology over the 5 Days Preceding the Survey

Only 5 days had elapsed between the end of the previous survey on February 4-5 (*see* Memo Rept. #044) and the start of this survey. Rainfall and hydrology over this 5-day period was as follows:

- There was no rainfall and very little, if any, fog during the period.
- The three realtime hydrographs were slowly declining during the period, from about 210-155 cfs on the Wheatfield Fork, 145-110 cfs on the South Fork, and 55-35 cfs on the North Fork.

The entire period from about January 29 to the survey dates likely provided ideal migration conditions for adult steelhead moving up and down the stream. A potentially considerable but unknown number of fish may have thus moved through the index reach between the February 4-5 survey and this 2-day survey.

Results

A total of 163 adults and 4 redds were recorded. This is a new record number of adults for any single survey of the index reach that I have conducted over the past 4 years; the total eclipses the previous high count of 148 adults recorded during a 1-day survey of the index reach on February 15, 2002 (*see* Memo Rept #016). Also, the highest single-pool count of 32 adults (*see* below) very nearly matched the previous single-pool record count of 33 adults, which was also recorded (at the ATV Pool) during the February 15, 2002 survey.

In addition, I recorded several more (about 25 % of total) of the unusually large adults as seen during the first two index-reach surveys of 2005 (*see* Memo Repts #041 and #042). These fish were absolute giants that would have easily measured at least 32 inches or more in total length and weighed in excess of 15 pounds each! Such observations are unique to this season; I have seen only an occasional (<5 %) adult this large during my previous Gualala River spawning surveys.

I also recorded one lamprey redd, the first of the 2005 season, in the upper half of the index reach.

Upper 8.9 miles–Two steelhead redds (flagged as #1 and #2) were found, the first recorded on the upper half of the index reach this season. These were large redds, about 10 feet apart, in a single pool tail-out encountered at 1305 hrs. This is a reach where, because of an abundance of bedrock substrate, very few, if any, redds have been previously recorded. The single lamprey redd was found in a pool tail-out at 1240 hrs.

Seventy-four adults were recorded as follows: 1001 hrs–1 Unknown status (UKN) in small pool; 1008 hrs–23 fresh-run (FR) in long run (Bedrock Run); 1058 hrs–32 FR in large pool (Log Pool; these are the first adults I have ever recorded in this pool); 1121 hrs–4 FR in very shallow pool tail-out; 1217 hrs–2 UKN in moderate-depth pool; 1230 hrs–1 spent (SP) in deep pool; 1237 hrs–1 SP in run; 1247 hrs–3 FR in pool tail-out; and 1325 hrs–7 FR in deep pool (Indian Spearing Pool).

The 32 adults seen in the Log Pool involved a good count made on the second pass of the boat through the pool. On the first pass, I recorded only 10 adults. This is the first time in 4 years of surveys of the index reach that the second pass through a major pool has resulted in more fish being detected and counted than on the first pass. More typically, the response of the fish is to hide and/or become skittish after the first pass, thus fewer are normally seen on the second or third time through. This is why my protocol is generally to make only one pass and one count, a protocol which I broke in this case because this is the first time, despite its large size and substantial (estimated 10-12 feet) depth, that I've seen any adult steelhead in the Log Pool.

Lower 9.4 **miles–**Two large, new redds were found along the upper half of this reach at the following times: 0853 hrs–Marked #10A, 3 paces from the left (downstream aspect) bank; and 1022 hrs–Marked #11, 8 paces from the left bank. Both of the pre-existing redds (#9 and #10) in the same general area, found on the February 5, 2005 survey, were still clearly visible and would have been easily detected if seen today for the first time. I did not find any lamprey redds in this half of the index reach today.

Eighty-nine adults were recorded as follows: 0902 hrs–16 FR in pool tail-out; 0902 hrs–1 FR in shallow run; 1023–2 SP in pool tail-out near redd #11; 1030 hrs–17 FR in Yellow Rope Pool; 1055 hrs–3 FR in ATV Pool; 1110 hrs–1 SP in shallow, slack-water; 1131 hrs–1 SP in medium-size pool; 1136 hrs–10 FR in willow-lined run; 1154 hrs–10 FR in long, deep left-bank pool below cabin on north hillside (a first-time record of adults in this pool); 1217 hrs–17 FR Cable Pool; 1220 hrs–2 FR in pool with dense woody in-stream cover; 1229 hrs–7 FR in willow-lined run; and 1241 hrs–2 FR in shallow pool tail-out.

Conclusions

Survey conditions (*see* my 2004 annual report, Table 1 and associated erratum) were definitely optimal, with a moderate stream flow, excellent water clarity and visibility, and excellent weather conditions. Both adults and redds were readily detected. Although it is unknown what proportion of total adults present were actually recorded, it is likely that all or most of the redds were found. The river mouth was checked (and photographed) and was definitely open both days. Overall, the index reach had an unusually large number of fresh-run adults moving upstream; a small number of spent adults moving downstream; and a low level of on-site

spawning, with two new redds each in the upper and lower halves of the survey reach. The first lamprey redd of the season was also recorded.

Prepared: February 14, 2005; RWD
Edited and Revised: March 15, 2005; RWD

MEMORANDUM TO THE FILE–#046

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

Subject: Angling survey, from Twin Bridges downstream to 3/8-mile below the North Fork mouth on February 24, 2005, and from there to Highway 1 bridge on February 25, 2005.

Personnel

I conducted this, my second angling trip for Gualala River steelhead in 3 years, with Phyllis DeHaven (who was taking photographs and not angling) and Mako, the dog. We floated the river both days in my Lil'Willie 11-foot drift boat, with me getting out of the boat to fish the traditional adult steelhead holding spots and Phyllis digitally recording the effort and catch.

Survey Methods

This was strictly a fishing trip–both for myself and to observe other anglers' success. On the 24th we floated from Twin Bridges to the North Fork, between roughly 1000 and 1600 hrs. We were behind (based on vehicles at the put-in and take-out) roughly six other boats and 10 total anglers. On the morning of the 25th, we floated and fished the North Fork-to-Highway 1-reach, from roughly 0830 to 1130 hrs. Fishing both days was with my favorite traditional bait: a thumb-nail-sized piece of salmon roe behind a red and white number 10 or 12 spin-n-glow.

Weather and Stream Conditions

The weather was overcast and cloudy both days. The hydrograph was declining after a series of small-to-moderate storm events. Flows were nearly perfect for angling, however, dropping from about 350 cfs to 275 cfs (Wheatfield Fork USGS Realtime gage) over the 2-day period.

Catch and Observations

During day one, I hooked and beached (and then promptly released) five adult steelhead, weighing roughly 8-13 pounds and lost two other hook-ups; the hotspot was the mouth of Buckeye Creek, where four of the seven were hooked. On day two, one adult was hooked and beached about half-way down to the Highway 1 bridge. All six of the adults I landed during the 2 days were spent.

In talking with and observing about 15 other anglers over the 2 days, I estimate about 10-12 other adults were caught, the majority (or all) of which were also spent.

I did not catch or observe any bluebacks (smaller, very bright, late-winter-run adults) during this trip. I did catch and release about a dozen smolts and pre-smolts, however.

Prepared: March 4, 2005; RWD

MEMORANDUM TO THE FILE–#047

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

Subject: Angling survey, from Twin Bridges downstream to 3/8-mile below the North Fork mouth on March 6, 2005, and from there to the Highway 1 bridge on March 7, 2005.

Personnel

I conducted this, my third angling trip this season, alone. I floated the river both days in my Lil'Willie 11-foot drift boat. Day one was an all-day (0930-1600 hrs) trip downstream from the put-in at Twin Bridges. The morning (0900-1300 hrs) of day two I did the North Fork-to-Highway 1 float.

Survey Methods

On the first day, I was behind roughly five other drift boats and 10 total anglers. On day two, there were two other boats on this lowermost float and a total of about 12 anglers; the majority of these were fly-fishers. During both days I fished with my favorite traditional bait: a thumb-nail-sized piece of salmon roe behind a red and white or chartreuse number 12 spin-n-glow.

Weather and Stream Conditions

The weather was clear and sunny both days. The hydrograph was rapidly dropping after a series of small-to-moderate storm events. Flows were identical to my last angling trip and nearly perfect for angling at 350 cfs to 275 cfs (Wheatfield Fork USGS Realtime gage) over the angling period.

Catch and Observations

On day one, I didn't get my first take-down until 1500 hrs when I was only 200 yards from the car and take-out. This fish, which I beached and released, was a mint-bright fresh-run female weighing about 15 pounds–my biggest adult steelhead in years. At the same spot (just below the North Fork mouth) I also landed a spent 10-pound female and lost what I believe was another fresh-run adult. On day two, I had no runs, hits, or errors. Over both days, I caught and released about a half-dozen smolts and pre-smolts, however.

In talking with and observing the other anglers over the 2 days, I estimate about 5-7 other adults were caught, the majority (or all) of which were also spent.

I did not catch or observe any bluebacks (the generallly smaller, very bright, late-winter-run adults) during this trip. The mouth of the river was open both days, but the surf was high and very knarly.

Prepared: March 10, 2005; RWD

MEMORANDUM TO THE FILE–#048

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, March 11-12, 2005, *my fifth complete survey of the index reach for the 2005 spawning season.*

Personnel

This was my fifth complete survey for the 2005 steelhead spawning season, another 2-day effort I conducted alone. I arrived at the House Creek/Wheatfield Fork confluence on Friday, March 11 at 0830 hrs and began survey of the upper half of the index reach at 0900 hrs. The second day–Saturday the 12th–I started survey of the lower half of the index reach at 0930 hrs. I used the same techniques to shuttle back to my vehicle both days as used during my last survey on February 10-11, 2004.

Survey Methods

Both halves of the index reach were floated using one of my 8-foot aluminum mini-drift-boats. All procedures were the same as used during my previous surveys in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed from 0900-1230 hrs, for an average survey rate of 2.54 mph. The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed from 0930-1315 hrs, for an average survey rate of 2.51 mph. These were very fast survey rates, reflecting: my growing familiarity with the survey routes; the relatively high, fast-moving flows; minimal portaging and dragging of the boat being necessary; and the lack of any redds being found.

Weather and Stream Conditions

Weather and stream conditions over the 2-day period varied from sub-optimal to very good and were certainly not perfect, overall, as encountered during the last survey on February 10-11. Day one was sunny, calm and very warm (about 10-15^{0}F >average for this date, with no fog along the coast), but the relatively high stream flow resulted in turbulence obscuring the bottoms of some of the deepest pools. Overnight, fog returned along the coast and pushed several miles inland. As a result, day two was sunny and mild over about the upper half of the lower survey reach, and overcast and breezy during survey along the lower half. The turbulence due to high flow, breezy conditions, and lack of direct sunlight prevented seeing the bottoms of some of the deepest pools.

Flows, as indexed from the three USGS realtime gages located on the stream, were slowly declining and indicating (between roughly noon on the 10th and noon on the 11th) levels of roughly 180-170 cfs on the Wheatfield Fork, 185-175 cfs on the South Fork, and 53-45 cfs on the

North Fork. These flows were slightly above the ideal survey flows that I identified during my second 2005-season survey on January 22-23 (*see* Memo Rept. #042).

Rainfall and Hydrology over the 27 Days Preceding the Survey

About 1 month (27 days) had elapsed between the end of the previous survey on February 10-11 (*see* Memo Rept. #045) and the start of this survey. Due to rain and elevated hydrograph, this was the soonest that another survey could reasonably be conducted. Rainfall (based on the Venado gage realtime preliminary data as an index) and hydrology over this 27-day period were as follows:

- A rainy period of 9 consecutive days began on February 13th, resulting in 0.08 to 1.08 inches per day and 4.08 inches total precipitation.
- A second rainy period began on February 26th, resulting in rain on 6 of 7 consecutive days (0.12 to 2.00 inches per day) with 3.68 inches recorded overall.
- The watershed was rainless for the 6 days prior to start of this survey.
- The hydrograph, as indicated from the Wheatfield Fork realtime gage provisional data remained well above 200 cfs during most of the 27-day period, spiking up to roughly 1,300 cfs and 2,700 cfs on February 21 and 28, respectively.
- The hydrograph was in a moderately rapid decline from March 2 to the survey start on March 11.

It is likely that at least half of the 27-day period between surveys provided good-to-ideal migration conditions for adult steelhead moving up and down the stream. A considerable but unknown number of fish may have thus moved through the index reach between the February 10-11 survey and this 2-day survey starting on March 11.

Results

The first day I recorded only six adults along the upper survey reach. I was expecting a similar low number on day two along the lower survey reach, but was pleasantly surprised by a relatively large count of 80 adults. Although 86 total adults were thus recorded, I did not find any new steelhead redds. Clearly, due to the relatively high flows, adults were moving through the index reach to upstream spawning locations. Also, each of the previously-marked steelhead redds in the index reach were found to be no longer discernable, so their identifying flags were removed.

After locating the first lamprey redd of the season during the previous survey, I expected more lamprey redds during this survey, but found none. However, I did record a small group (4) of steelhead adults near the end of the survey that may have been the season's first blue-backs, based on their smallish size, chunkiness, and very bright (and contrasting above/below lateral line) coloring. All other adults seen were on the large side, including several more of the 15+pound monsters I have been recording this season.

I did find one adult steelhead carcass during this survey; it was an intact skeleton, located directly underneath the Annapolis Road bridge. The river mouth was checked (and photographed) after the first day's survey and was definitely open, but with very rough surf conditions.

Upper 8.9 miles–The six adults occurred, by time, as follows: 0911 hrs-1 unknown (UKN) status in small pool; 0950-2 UKN in Concrete Slab Pool; 1003-2 fresh-run (FR), including 1 very large, in run; 1154-1 FR in run. Both the YMCA Pool and Indian Spearing Pool were devoid of adults, however, for the latter pool I had restricted visibility and could have easily missed some adults.

Lower 9.4 **miles–**The 80 adults occurred, by time, as follows: 1058 hrs-1 spent down-streamer (DS) in run; 1109-21 FR in Yellow Rope Pool; 1112-1 FR in deep pool; 1115-7 FR in deep left-bank pool (a first record for this pool); 1135-3 DS in run; 1137-1 DS in run; 1209-17 FR in deep right-bank pool 3/4-mile upstream of power-line crossing; 1210-1 DS in pool; 1217-17 FR in deep left-bank pool 1/2-mile upstream of power-line crossing; 1234-1 DS in run; 1249-2 FR in willow-lined run; 1300-1 DS in pool tail-out; 1303-3 DS in run; and 1312-4 FR likely blue-backs in willow-lined run. I did not record any adults in either the lower Cable Pool or the ATV Pool. The ATV Pool appears to be filling in with sand; its use as holding and resting water for adults may decline if the filling-in continues.

Conclusions

Survey conditions (*see* my 2004 annual report, Table 1 and associated erratum) were less than optimal, with a moderately high stream flow, only fair water clarity and visibility, and only fair weather conditions. Most redds would have been readily detected, but adult-counting conditions were clearly not ideal and thus a considerable number may have been missed. The river mouth was open. Overall, the index reach had a moderately large number of fresh-run adults moving upstream; a small number of spent adults moving downstream; and no detected on-site spawning. The season's first indication of the arrival of blue-backs was recorded. Neither lampreys nor their redds were found. The total number of adults now recorded during five surveys this season is 355, only 22 short of the record 377 adults tallied during eight surveys of the index reach in 2002.

Prepared: March 15, 2005; RWD

MEMORANDUM TO THE FILE–#049

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, March 17, 2005, *my sixth complete survey of the index reach for the 2005 spawning season.*

Personnel and Mission Statement

This was my sixth complete survey for the 2005 steelhead spawning season, a 1-day effort I conducted alone.

This was definitely the most physically and mentally challenging survey I have conducted this season. It was prompted, despite the previous survey being done only 1 week before, by a number of burning questions begging to be answered: With the hydrograph continuing its steady decline, would the flow (cfs) threshold at which spawning begins to occur in the index reach (as opposed to adults merely passing through to upstream spawning areas) finally be reached? Would more of the >32-inch-long (and >15-pound) very large adults I have been seeing this season be recorded? Would this season's trend of relatively large numbers of adults continue? Would bluebacks and lampreys begin their appearances in any significant numbers? Would rough-skinned newts and western pond turtles make their usual springtime appearances?

Thus, despite the ebbing symptoms of a bad cold or flu bug, I departed home at 0330 hrs. For the first time in several years, I drove via Highway 1 through Bodega Bay, mainly as a means of avoiding the potential eardrum-imploding rise in altitude that taking my standard route via Skaggs Springs Road past Sonoma dam and lake would have ensured.

Due to the lack of traffic at that early hour, I made it to Twin Bridges at 0645 hrs–a record time–then quickly unloaded, locked, and concealed my mini-dirt-bike in the nearby foliage. I then continued the 21-mile drive to House Creek, where I quickly unloaded the boat and gear, and began survey of the upper index reach at 0730 hrs. The threat of not completing the whole index reach before darkness necessitated that all eating, drinking, and note-taking be done on the fly–i.e., float–with stopping permitted only as needed for peeing and marking redds. Following this protocol and after twenty thousand or so hectic pulls of the oars, I rolled up under the Wheatfield Fork bridge (i.e., at Twin Bridges), spent but quite elated, only 7.5 hours later.

I immediately left the boat and gear and started the hardest (body-wise) part of the whole day–the 21-mile ride back to House Creek (and my vehicle) on that tiny little motorcycle! By the time I returned to House Creek, retrieved my vehicle, drove the 21-miles back down to Twin Bridges, and reloaded the boat and gear, it was 1830 hrs and nearly dark. I gladly called it a day and headed to my usual overnight spot at a nearby motel. The following morning at 0900 hrs, rain

began falling. I was happy that the heroic 1-day survey effort had been completed without incident or insurmountable obstacles.

Survey Methods

Both halves of the index reach were floated using one of my 8-foot aluminum mini-drift-boats. All procedures were the same as used during my previous surveys this season and in 2002-2004.

The upper half (8.9 miles) of the Wheatfield Fork was surveyed from 0730-1100 hrs, for an average survey rate of 2.54 mph (the same as last week, despite the lower flow). The lower half (9.4 miles) of the Wheatfield Fork downstream to Twin Bridges was surveyed from 1100-1500 hrs, for an average survey rate of 2.35 mph (0.2-mph slower than last week, due to the lower flow). The overall survey rate was still quite fast, reflecting: the need to get done quickly, before rainfall began or darkness ensued; my growing familiarity with the survey route; the lower (than last week) but still moderately fast-moving flow, with minimal (only about 1 dozen) portages and boat-dragging necessary.

Weather and Stream Conditions

The sky was totally overcast throughout the day, except for about a 1-hour period in the afternoon when partial sunlight broke through. Periodic (not continuous) upstream wind-squalls of 5-15 knots were also encountered, but the total time with significant wind during the survey was <1 hour. Overall, weather conditions for survey were only fair. Nevertheless, I estimate that <5 % of the deepest pools were partly or wholly visually obscured due to poor sunlight or surface turbulence.

Flows, as indexed from the three USGS realtime gages located on the stream, were very slowly declining and indicating (between roughly 0600 and 1800 hrs on the 17th) levels of roughly 125-120 cfs on the Wheatfield Fork, 45-41 cfs on the South Fork, and 30-27 cfs on the North Fork. These flows were well below the ideal survey flows that I identified during my second 2005-season survey on January 22-23 (*see* Memo Rept. #042), thus water clarity was excellent for observing and counting adults. Also, because of the relatively low flow, I believe that all or most of the redds would likely have been found.

It was too dark to check the river mouth when I arrived there on the 17th. However, when I checked (and photographed) it the following morning, it was open but just barely flowing through a long (500-600 feet), very narrow (10-foot-wide) channel to the sea.

Rainfall and Hydrology During the 5 Days Between Surveys

Only 5 days had elapsed between the end of the previous survey on March 11-12 (*see* Memo Rept. #048) and this survey. There was no rain in the watershed during this 5-day period and the hydrograph continued its previous decline. This survey was conducted because of the likelihood that rainfall, projected for the March 18-22 period, would very likely make the river too high and turbid for surveys for at least several days.

It is likely that the 5-day period between surveys provided good-to-excellent migration conditions for adult steelhead moving up and down the stream. A considerable but unknown number of fish may have thus moved through the index reach over this time.

Results

Seventy-seven adults were recorded, including 8 and 69, respectively, on the upper and lower halves of the survey reach. About 10 % of these were very large (>32 inches and 15 pounds) fish such as I have been recording during earlier surveys this season and about 10 % had characteristics typical of late-run spring steelhead often referred to as blue-backs. Also, one carcass of a large adult steelhead was found in the bottom of a run near the end of the lower survey reach. In addition, one adult lamprey was seen along the middle-portion of the upper survey reach.

Three new steelhead redds were found along the upper reach, but none were found along the lower reach. All of the previously-found and marked steelhead redds had been completely re-leveled and were no longer discernable. Over both sub-reaches, a total of eight lamprey redds (the first of the season) were recorded (but not marked).

Dozens of rough-skinned newts were seen, also another first for this season. These occurred mostly along the upper survey reach, however. No pond turtles or frog egg masses were observed.

Upper 8.9 miles–The eight adults occurred, by time and habitat, as follows: 0757 hrs-1 FR (fresh-run) in Bedrock Run; 0800-2 DS (downstreamers) in run; 0806-1 DS in riffle; 0920-1 DS in shallow, slack-water; 0926-1 DS in YMCA Pool; 0939-1 FR, likely blueback in willow-lined run; and 1005-1 DS in pool. The Indian Spearing Pool was devoid of adults today.

The three new redds (marked #6-1 through #6-3) were found at 0850, 0947, and 0952 hrs, respectively. Redd #6-3 also had two new lamprey pits nearby (<10 feet away).

Lower 9.4 **miles–**The 69 adults occurred, by time and habitat, as follows: 1219 hrs-1 DS in shallow, pool tail-out; 1244-13 FR in Yellow Rope Pool; 1247-2 DS in pool; 1250-8 FR (including 3 giants!) in left-bank pool; 1345-5 FR in right-bank pool; 1353-14 FR (including some giants!) in left-bank pool; 1358-3 DS in pool tail-out; 1410-17 FR (including at least 2 giants!) in Cable Pool; 1435-2 DS in willow-lined run; 1442-1 DS in pool tail-out; 1449-2 DS in pool tail-out; and 1501-1 FR in run.

Conclusions

Despite poor sunlight conditions due to overcast skies, overall survey conditions were still good-to-excellent due to the relatively low flow. Most redds would have been readily detected and adult-counting conditions were nearly ideal. The river mouth was open. Overall, the index reach had a relatively large number of adults moving both upstream (FR) and downstream (DS), but a

relatively low level of spawning actually occurring within the index reach. Several more very large adults were again recorded; these may be fish that were excluded (by low flows) from spawning in the river in March-April 2004 and have thus returned to spawn this season for the first time after 3 uninterrupted years of ocean growth. A few bluebacks, lampreys, and lamprey redds were recorded. Rough-skinned newts started making their breeding appearance. The total number of adults now recorded during six surveys this season is 432–a new record compared to the previous record seasonal-total of 377 adults tallied during eight surveys of the index reach conducted in 2002.

Prepared: March 20, 2005; RWD
Edited and Corrected: December 20, 2005; RWD

MEMORANDUM TO THE FILE–#050

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

Subject: Angling survey, from 3/8-mile below the North Fork mouth to the Highway 1 bridge on March 26 and March 27, 2005.

Personnel

I conducted this, my fourth angling trip to the Gualala River this season, alone. I floated the river both days in one of my 8-foot mini-drift-boats, getting out to fish the traditional holding spots along the way. Day one was an afternoon float from 1300 to 1630 hrs and day two was a morning float from 0830 to 1130 hrs.

Survey Methods

During both days, I fished with my favorite traditional bait: a thumb-nail-sized piece of salmon roe behind a red and white or chartreuse number 10 spin-n-glow, with enough weight (sliding egg-weight) to properly bounce along the bottom. Despite the river being in very nice condition for angling, I saw a total of only about eight other anglers during the 2 days.

Weather and Stream Conditions

The weather was clear, sunny and breezy on day one. The hydrograph was slowly dropping after a series of moderate storm events. Flows were higher than on my last angling trip, but still quite suitable for angling at about 550 cfs to 675 cfs (Wheatfield Fork USGS Realtime gage) over the angling period. At precisely 1100 hrs on day two, heavy rain began falling. I was off the river at 1130 hrs, just before the hydrograph began another rise.

Catch and Observations

This 2-day event could be characterized as a perfect ball game: no runs, no hits, and no errors. In short, I did not have even one legitimate "take" by either an adult or juvenile steelhead, nor did I observe or talk with another angler who had any success. Two anglers I spoke to did claim, however, that they had caught several blue-backs on Alder Creek on the morning of March 26th.

Prepared: April 8, 2005; RWD

MEMORANDUM TO THE FILE–#051

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

Subject: Spawning survey, Wheatfield Fork, from House Creek Confluence Downstream 18.3 Miles to South Fork Confluence, April 24-25, 2005*, my seventh and final complete survey of the index reach for the 2005 spawning season.*

Personnel and Survey Timing

I conducted this, my seventh and final complete survey for the 2005 steelhead spawning season, alone. Unlike my rather heroic sixth survey this season, which was an 18.3-mile 1-day effort, this survey was done over the usual–and much more leisurely–2-day period.

I arrived at House Creek at 0930 hrs on April 24th and surveyed the 8.9-mile upper index reach from 1000 hrs to 1320 hrs for an average survey rate of 2.70 mph. On April 25th, I surveyed the 9.4-mile lower index reach from 1005-1435 hrs, for an average survey rate of 2.09 mph. The relatively slow rate on day two was a result of taking my time and savoring the last survey of the season through this unique wilderness area. And, as usual, not another human was seen, except at the put-in and take-out.

Survey Methods

Surveys both days were conducted from one of my 8-foot aluminum mini-drift-boats. All procedures were the same as during my previous surveys this season and in the 2002-2004 spawning seasons.

Weather and Stream Conditions

The sky was 90-100 % overcast, with a few intermittent light showers, throughout day one. Day two was sunny after the usual canyon fog burned off about 1030 hrs; however, I encountered intermittent stiff head-winds, from about 1100 hrs to the end of the survey.

Stream flow was slowly declining. Values at mid-day for the USGS realtime gage located on the Wheatfield Fork were roughly 120 cfs on the 24th and 115 cfs on the 25th. These values compared with about 90 cfs (24th) and 80 cfs (25th) on the North Fork, and 52 cfs (24th) and 47 cfs (25th) on the South Fork, as measured by the two USGS realtime gages there. Due to the cloudy conditions on day one, wind on day two, and relatively high flows on both days, the bottoms of several of the deepest pools could not be completely observed.

The river mouth was checked and photographed on the afternoon of the 24th, and was open and flowing to the sea.

It is worth noting that flows were about three times greater than on the final spawning survey of 2004, which was also conducted (a 1-day survey) on April 24th. On April 24, 2004 we were

forced to walk the entire 18.3-mile index reach, due to a record (during my 4-years of spawning surveys) low flow of 37 cfs, which prevented navigability via my survey boats.

Rainfall and Hydrology Between the Sixth and Seventh Surveys

Thirty-eight days elapsed between surveys. Nevertheless, this was the earliest another survey could be conducted, due to prolonged high flows. As indicated by the Wheatfield Fork gage, flow ranged from near to well above 500 cfs (3,000 cfs maximum) from March 19 to April 14 with a steady decline, without any subsequent rises, from April 10 to the start of this survey.

Rainfall between surveys, as indexed from DWR's realtime Venado gage, occurred on 16 days and totaled more than 12 inches. More than 2 inches fell on 2 days and more than 1 inch fell on 5 days.

Clearly, rainfall and related flows would have provided excellent conditions for adult steelhead movement up- and down-stream over this 38-day period. It is likely that, due to the relatively high flows, most adults passed through the index reach to upstream spawning locations, however.

Flows and rainfall over this period of 2005 were in stark contrast to the relative drought conditions that prevailed during the same period in 2004.

Results

I can say with a degree of certainty that this spawning season is truly over. I recorded only one adult steelhead and one new steelhead redd. Other typically-related observations were also low (compared to previous years) in values: only 15 total lamprey redds; only 1 lamprey pair seen digging a redd; only 2 western pond turtles; and no newts, frogs, or salamanders observed at all. However, I did observe young-of-year (YOY) juvenile steelhead (JSH) in moderate numbers in nearly every shallow back- or edge-water area that I took the time to visually check along the index reach.

Upper 8.9 miles–A single adult was recorded at 1250 hrs–a downstreamer–in a pool tail-out area. One lamprey redd and one pond turtle (basking on a log) were observed.

Lower 9.4 **miles–**A single steelhead redd was recorded at 1236 hrs. A total of 14 widely scattered lamprey redds were recorded. At 1200 hrs, a single pair of lamprey were observed (and photographed) constructing a redd. At 1234 hrs, a single pond turtle was seen basking on a log.

The ATV Pool, one of the primary pools in which adult steelhead have been counted since 2002, was observed to be gradually (starting on survey #4 this season) filling in with sand. As a result, it may not provide suitable holding cover and depth for adults much longer.

Conclusions

Despite relatively poor sunlight conditions from overcast skies on day one and wind causing surface turbulence on day two, overall survey conditions were still fairly good due to the moderate flow level. All or most redds would have been readily detected and adults would have been seen in most (but not all) of the deepest pools. The river mouth was open. Results showed that overall, the index reach had a relative dearth of adult steelhead and steelhead redds. Nevertheless, the total number of adults now recorded during seven surveys this season is 433, a record high compared to the previous seasonal-total of 377 adults recorded during eight index-reach spawning surveys in 2002. But even more important, the relatively high flows at the time of this season-ending survey and as this report is being prepared on May 9, 2005 (with the Wheatfield Fork gage at over 200 cfs), may portend excellent JSH rearing conditions through the summer of 2005. This thesis will be examined during JSH snorkeling surveys scheduled to start in June or early July 2005.

Prepared: May 9, 2005; RWD
Corrections Made: December 20, 2005; RWD
Edited: December 27, 2005; RWD

MEMORANDUM TO THE FILE–#052

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

Subject: 2005 Juvenile Steelhead Snorkeling Surveys*, survey #1 on July 2-3, 2005.*

Purpose and Objectives

Snorkeling surveys are a proven and effective method of observing and counting juvenile salmonids in streams of various sizes. During June to November of 2004, I conducted six reconnaissance-level snorkeling surveys at nine locations in the Gualala River watershed (DeHaven 2004). From these initial surveys, a long-term (several-year) snorkeling survey protocol was developed for implementation at nine study sites at eight locations. Here I report the first snorkeling survey of the 2005 season at these nine sites. Eventually, such snorkeling survey results, or these results in combination with the spawning surveys I have been conducting annually since 2002, may help achieve the goal I am pursuing: to determine the present status and trend of the Gualala River's steelhead population.

Personnel

This survey was conducted with Douglas Hampton, a former biologist and colleague of mine from the U. S. Fish and Wildlife Service in Sacramento (now employed by Wildlands Inc. of Sacramento). Mr. Hampton has a MS degree in fisheries, but to date, only limited experience working with salmonids. He measured temperatures and recorded data, while I conducted all of the snorkeling activity.

Survey Methods

A detailed description of the snorkeling study sites and methods is provided in my 2005 annual report (DeHaven 2005).

Weather and Stream Conditions

Typical summer weather prevailed both days of this initial survey. Skies were clear, air temperatures were warm-to-hot, and there was little or no wind. Maximum air temperatures ranged into the upper 80s (^{0}F) and low 90s in the afternoon, depending on location, and about 50-60^0 F at night. As usual, the higher air temperatures occurred along the more easterly portions of the watershed, while the westerly portion remained cooler, due to ocean influence. However, there was minimal intrusion of coastal fog along the westerly portion of the watershed over this particular 2-day sampling period.

Flows at the three USGS realtime stream gages in the watershed over the 2-day period were: Wheatfield Fork–about 48-50 cfs; South Fork–about 16-18 cfs; and North Fork–about 24-26 cfs. These flows were substantially greater than during the July 3-4, 2004 reconnaissance-level snorkeling survey (*see* Memo Rept #036), due to the much greater-than-average rainfall the watershed received during the spring and early summer of 2005.

In addition, the river mouth was still open and flowing when viewed (and photographed) during the evening of July 2, 2005. In contrast, from late March through the end of summer 2004, the mouth remained mostly closed by sandbars, a result of the well-below-average rainfall and runoff during that period.

Results and Discussion

Results from snorkeling at the nine sites are summarized in Table 2a of my 2005 annual report. Brief site-by-site discussions also follow below. All discussions refer to observations made along the 100-ft-long transects, unless otherwise noted.

#1-Wolf Creek*:* Stream flow upon our arrival at 1215 hrs on July 2 was at least several times greater than during the comparable (July 3rd) survey in 2004. All of the 100-ft sample, except the shallowest portions of the riffle area was snorkeled. A total of 140 JSH were observed in roughly equal numbers in the pool and flatwater; none were recorded in the riffle area. JSH were also by far the most abundant fish present; the only other species recorded was TSS (threespine stickleback=5). Water temperature at 1245 hrs was 70^0F (air temp=88^0F) compared to 79^0F recorded during July 3, 2004 at 1300 hrs. The estimated water volume of the sample was 17 m^3, the average maximum velocity was 0.8 fps (ft/second), and the total density of JSH was 8.0/m^3. This density was surpassed during this 2-day survey at only the House Creek site.

#2-House Creek: Stream flows upon our arrival at 1345 hrs on July 2 were at least several times greater than during the comparable (July 3rd) survey in 2004. The site was snorkeled over its entire length. A total of 551 JSH of various ages were counted; these fish were in both House Creek and along the cooler southwesterly side of the channel below the confluence, with roughly equal numbers in pool and flatwater areas. JSH and GR (Gualala roach) occurred at roughly a 5:1 ratio. TSS were not observed. Unlike the survey on July 3, 2004, water visibility was relatively good, due to low algae growth. Water temperature at 1400 hrs in House Creek was 76^0F (air temp=90^0F) compared to 78-79^0F recorded on July 3, 2004. Water temperature in the Wheatfield Fork was 84^0F–the same as recorded on July 3, 2004. Water temperature in the confluence area averaged about 80-82^0F. The estimated water volume of the sample was 38 m^3, the average maximum velocity was 1.4 fps, and the total density of JSH was 14.4/m^3. This density was the highest recorded at the nine sample sites during this initial 2-day sampling period.

#3-Wheatfield Fork (Lady-in-the Car): Stream flow upon our arrival at 1500 hrs on July 2 was at least double the flow observed during the comparable (July 3rd) survey in 2004. The site was snorkeled over its entire length. A total of 10 JSH of various ages were counted in both the bedrock flatwater area and at the base of the small waterfall. No other fish species were recorded. Water temperature at 1515 hrs was 82^0F (air temp=86^0F), which was 2^0 lower than recorded during the July 3, 2004 survey. The estimated water volume of the sample was 50 m^3, the average maximum velocity was 1.2 fps, and the total density of JSH was 0.2/m^3.

#4-Wheatfield Fork (Annapolis Road bridge)**:** Stream flow at the site upon our arrival at 1545 hrs was noticeably higher than observed during the comparable (July 3rd) survey in 2004. The site consisted of a pool and flatwater, whereas on July 3, 2004, despite the geomorphology, it was essentially one large pool. The entire site was snorkeled. JSH were not recorded, whereas a few age 2+ JSH in poor condition (with obvious fin erosion) were observed in the deepest parts of the pool on July 3, 2004. Water temperature at 1600 hrs was 80^0F (air temp=92^0F), compared to 79^0F recorded in the warmest parts of the pool at 1500 hrs on July 3, 2004. The estimated water volume of the sample was 276 m^3, the average maximum velocity was <0.5 fps, and the density of JSH was zero. A total of 500 GR were recorded, however.

#5A-Near North Fork mouth (Upper Section)**:** This mainstem section of the river was flowing noticeable higher when we arrived at 0800 hrs on July 3rd than during the comparable (July 4th) survey in 2004. The site consisted of a riffle and flatwater, whereas on July 4, 2004 it was essentially one large pool with zero velocity (due to closed river mouth). The entire site, except for the shallowest parts of the riffle, were snorkeled. However, average maximum velocity at the site was 2.0 fps, making upstream snorkeling both strenuous and difficult; as a result, certain fast-flowing sections of the site were snorkeled in the downstream aspect. Water temperature at 0830 hrs was 60^0F (air temp=67^0F), compared with 62^0F recorded at 0915 hrs on July 4, 2004. JSH of various ages totaling 75 fish were the only species recorded. Most of these fish were found in the transition from riffle to flatwater. The estimated water volume of the sample was 241 $m^3$and the total density of JSH was 0.3/m^3.

#5B-Near North Fork mouth (Lower Section)**:** Just as at the upper site, the flow was markedly higher than on July 4, 2004. The site consisted of a pool and flatwater complex, whereas on July 4, 2004 it was essentially one large pool with zero velocity (due to closed river mouth). The entire site was snorkeled. Average maximum velocity was 1.1 fps. Water temperature at 0915 hrs. was the same (60^0F) as at Site #5A. Age 1+ JSH totaling 5 fish were recorded in the pool and were the only fish seen. The estimated water volume of the sample was 391 $m^3$and the total density of JSH was <0.1/m^3.

Sites 5A and 5B are on the upstream fringes of the river's estuary zone. Based on my past experience, the low numbers and densities of JSH recorded at these sites initially surprised me. However, upon further reflection, I believe these results are indeed in accordance with the good flow and temperature conditions the river is experiencing in 2005 compared to more typical water years. It is quite likely that, due to the high flows and good water quality, significant numbers of JSH were still remaining and rearing in upstream areas. In contrast, under the lower flows and higher temperatures characteristic of most summers, many such fish would have already moved downstream into the estuary to complete their rearing. Moreover, in most summers the estuary would typically be formed by a sandbar completely blocking the river's mouth at the ocean, whereas during this survey the mouth was open and flowing. I anticipate that during subsequent surveys this summer, numbers and densities of JSH may undergo dramatic increases, as rearing

conditions in upstream reaches gradually become more inhospitable. Or, they may not, if upstream reaches remain hospitable all summer.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** Upon our arrival at 1000 hrs on July 3rd this section was flowing noticeable higher than during the comparable (July 3rd) survey in 2004. The site consisted of a riffle and flatwater, whereas on the July 3, 2004 reconnaissance survey two pool-riffle areas were examined (and snorkeled) under a dramatically lower flow. Except for the shallowest parts of the riffle, the entire site was snorkeled. A total of 5 JSH YOY (Young-of-Year) were counted. No other fish were recorded. Water temperature at 1020 hrs was 64^0F (air temp=66^0F), compared to 70^0F recorded during the July 3, 2004 survey. The estimated water volume of the sample was 46 m^3, the average maximum velocity was 2.2 fps, and the total density of JSH was 0.1/m^3.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** In 2004, this site was not examined during either the July or August reconnaissance surveys (DeHaven 2004). It was first examined on September 14 and 15, 2004, at which time the flow was extremely low (est.<1cfs) and intermittent; nevertheless, JSH of various ages were moderately abundant in the few remaining pools.

This year, upon our arrival at the site at 1130 hrs on July 3, 2005, the stream had a significant and continuous flow of at least several cfs. Water temperature at 1145 hrs was 65^0F (air temp=77^0F). The sample site consisted of flatwater and a deep pool which contained abundant large woody debris (LWD). The entire site was snorkeled. Both JSH YOY (5 in flatwater) and age 2+ JSH (10 under LWD in pool) were recorded. Other fish recorded included 500 GR and 1 sculpin spp. The estimated water volume of the sample was 112 m^3, the average maximum velocity was 1.0 fps, and the total density of JSH was 0.1/m^3.

#8-Haupt Creek: During the reconnaissance survey 1 year ago (July 4, 2004) Haupt Creek upstream of the bridge had already become intermittent and JSH were relegated to the few remaining, rapidly-drying pools. Nevertheless, in 2004 JSH were relatively abundant and water temperature at 1030 hrs was hospitable, at 64-65^0F (DeHaven 2004).

This year, upon our arrival at the sample site at 1215 hrs on July 3, 2005, the stream still had a continuous surface flow of perhaps a few cfs. The sample site comprised all three basic Level II habitat types. The shallowest riffles could not be snorkeled; all other reaches were snorkeled. Water temperature, at 1235 hrs was 66^0F (air temp=75^0F). A total of 35 JSH, mostly YOY, were recorded in pools and flatwater areas. Other fish recorded included 20 GR and 1 sculpin spp. The estimated water volume of the sample was 16 m^3, the average maximum velocity was 1.1 fps, and the total density of JSH was 2.2/m^3.

Prepared: August 24, 2005; RWD
Edited and Revised: September 4, 2005; RWD
Edited and Revised: November 11, 2005; RWD
Edited and Revised: December 27, 2005; RWD

MEMORANDUM TO THE FILE–#053

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

Subject: 2005 Juvenile Steelhead Snorkeling Surveys*, survey #2 on July 30-31, 2005.*

Purpose, Objectives and Survey Methods

Refer to Memorandum to the File #052 and my 2005 annual report in which the purpose, objectives and methods of the snorkeling surveys are described in detail.

Personnel

I conducted this survey with Phyllis DeHaven. She measured temperatures and recorded data, while I conducted all of the snorkeling activity. All nine of the snorkeling sites (although not the whole site in every case), and several other nearby selected sites, were snorkeled.

Weather and Stream Conditions

Typical summer weather prevailed both days. Skies were clear, air temperatures were warm-to-hot, and there was little or no wind. Maximum air temperatures ranged into the upper 80s (^{0}F) and low 90s in the afternoon, depending on location, and about 50-60^0 F at night. As usual, the higher air temperatures occurred along the easterly portion of the watershed, while the westerly portion remained cooler, due to ocean influence. On the morning of day two, coastal fog intruded extensively along the westerly portion of the watershed.

I inadvertently failed to record the flows at the three USGS realtime stream gages in the watershed at the time of the survey. And now, at the time this report is being prepared (December 2005), they are not yet available on the internet from USGS. Thus, I can only say that actual flows, as recorded at the three gages during the survey, were no doubt somewhere in between the values recorded on the previous survey (July 2-3, 2005) and subsequent survey (August 27-28, 2005). These (previous/subsequent) flows were: South Fork–17 versus 3 cfs; North Fork–25 versus 4 cfs; and Wheatfield Fork–49 versus 13 cfs. Thus, significant continuous surface flows existed at all nine of the snorkeling sites and the nearby areas that were snorkeled. Also, continuous surface flows still existed in both the South Fork and Wheatfield Fork in the vicinity of Twin Bridges. Flows at all of the sites were clearly substantially higher than during the comparable sample period (July 31) of 2004.

The river mouth was just barely closed when viewed (and photographed) during the evening of July 30, 2005. Based on the very small sand bar blocking the mouth, I believe that it was probably still opening and closing to some degree on a fairly regular basis in response to tidal changes and oscillating estuary impoundment volumes. In contrast, from late March through the end of summer 2004, the mouth remained mostly closed by sandbars, a result of the well-below-average rainfall and runoff during that period.

Results and Discussion

The snorkeling results are summarized in Table 2b of my 2005 annual report. In addition, brief site-by-site discussions of each site follow below. These discussions refer to observations made along the 100-ft-long transects, unless otherwise stated.

#1-Wolf Creek*:* Stream flow upon our arrival at 1130 hrs on July 30 was at least several times greater than during the comparable (July 31st) survey in 2004. All of the 100-ft sample, except the shallowest portions of the riffle area, was snorkeled. A total of 305 JSH (juvenile steelhead) were counted. JSH were the most abundant fish present; the only other species recorded were GR (Gualala roach=150) and TSS (threespine stickleback=3). Water temperature at 1150 hrs was 68^{0}F (air temp=86^{0}F). The estimated volume of water sampled was 11 m^3, the average maximum velocity was 0.9 fps (ft/second), and the resulting density of JSH was 29.0/m^3, nearly four times greater than during the previous (July 2) survey. This density of JSH was also the highest density observed among the eight snorkeling sites during this 2-day survey.

#2-House Creek: Stream flows (both forks) upon our arrival at 1300 hrs on July 30 were at least several times greater than during the comparable (July 31st) survey in 2004. The site was snorkeled over its entire 100-ft length. A total of 552 JSH of various ages were counted; these fish were in the House Creek portion of the sample reach only. GR (=250) and TSS (=50) were also recorded, spread throughout the sample site. Water visibility was good, due to relatively low algae growth. Water temperatures at 1310 hrs (air temp=93^{0}F) were: House Creek–74^{0}F; Wheatfield Fork–80^{0}F; and in the confluence (mixing) section–77^{0}F. The estimated water volume of the sample was 36 m^3, the average maximum velocity was 1.4 fps, and the total density of JSH was 15.5/m^3, which was, along with the count of JSH, similar to the value recorded on the previous (July 2) survey. This density of JSH was the second-highest recorded among the nine sites during this 2-day survey.

#3-Wheatfield Fork (Lady-in-the Car): Stream flow upon our arrival at 1345 hrs on July 30 was markedly higher than I have observed at this general time of year in the past. The site was snorkeled over its entire length. A total of 30 JSH of various ages were counted in both the bedrock flatwater area and at the base of the small waterfall. Another 500 YOY unidentified (but not JSH) fish were also counted in scattered groups throughout the site. Water temperature at 1400 hrs was 77^{0}F (air temp=90^{0}F). The estimated water volume of the sample was 48 m^3, the average maximum velocity was 0.4 fps, and the density of JSH was 0.6/m^3–a value of the same order of magnitude as the previous survey on July 2nd.

A 20-ft-long reach about 1,000 ft upstream of the site was also briefly snorkeled. JSH (YOY) were present in the fastest-moving water, but were not enumerated.

#4-Wheatfield Fork (Annapolis Road bridge)**:** Stream flow upon our arrival at 1500 hrs on July 30 was substantially higher than observed during the comparable (July31st) survey in 2004. The site comprised equal lengths of pool and flatwater. The entire site was snorkeled. Only one JSH–a large age 2+ fish–was observed. About 500 unidentified (not JSH) YOY fish were also recorded in several groups spread throughout the site. Water temperature at 1515 hrs was 80^{0}F

(air temp=87^{0}F). The estimated water volume of the sample was 269 m^3, the average maximum velocity was <0.5 fps, and the density of JSH was <0.1.

#5A-Near North Fork mouth (Upper Section): This site was also flowing noticeable higher when we arrived at 0845 hrs on July 31 than during the comparable (July 31st) survey of 2004. The site still consisted of a riffle and flatwater. The entire site, except for the shallowest parts of the riffle, was snorkeled. Water temperature at 0850 hrs was 62^{0}F (air temp=61^{0}F). JSH of various ages totaling 500 fish were counted. As during the previous survey on July 3rd, most of these fish were found in the transition from riffle to flatwater. The only other species recorded was GR, totaling 25 fish. The estimated water volume of the sample was 198 m^3, the average maximum velocity was 1.2 fps, and the density of JSH was 2.5/m^3–a marked increase from the previous survey on July 3rd. This increase, if real and not an anomaly of sampling variation, could be due to JSH rearing conditions in upstream reaches gradually becoming more inhospitable as the summer progressed, resulting in migration of fish downstream to the river's estuary zone, where site #5A is located.

#5B-Near North Fork mouth (Lower Section)**:** Just as at the upper site, the flow was markedly higher than on July 31st, 2004. The site still consisted of a pool-flatwater complex. The entire site was snorkeled. The only fish recorded were five age 1+ JSH, the same number recorded on the previous (July 3rd) survey. Average maximum velocity was 0.7 fps. Water temperature at 0945 hrs. was 62^{0}F (air temp=63^{0}F). Age 1+ JSH totaling 5 fish were recorded in the pool and were the only fish seen. The estimated water volume of the sample was 316 m^3 and the density of JSH was <0.1/m^3.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** Upon our arrival at 1030 hrs on July 31st this sample site was flowing noticeable higher than during the comparable (July 31st) survey in 2004. The site still consisted of a riffle-and-flatwater complex. Except for the shallowest parts of the riffle, the entire site was snorkeled. Totals of 13 JSH and 50 GR were recorded. No other fish were seen. Water temperature at 1040 hrs was 64^{0}F (air temp=66^{0}F). The estimated water volume of the sample was 32 m^3, the average maximum velocity was 2.1 fps, and the density of JSH was 0.4/m^3–a value similar to the previous (July 3rd) survey.

About 50 feet of a brushy pool located 100 feet upstream were also snorkeled. JSH of various ages were relatively abundant, but not enumerated.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** Upon our arrival at 1135 hrs on July 31st, the stream still had a significant and continuous surface flow of at least several cfs. Water temperature at 1145 hrs was 64^{0}F (air temp=62^{0}F). The site still consisted of a pool-flatwater complex, with abundant large woody debris (LWD in the pool. The entire site was snorkeled. Twelve JSH were recorded in the brushy area of the pool. About 50 GR were alsorecorded in the pool. The estimated water volume of the sample was 93 m^3, the average maximum velocity was 0.6 fps, and the density of JSH was 0.1/m^3–the same value recorded on the previous (July 3rd) survey.

I also snorkeled the next pool upstream from the site. JSH were present in relatively low numbers, but were not enumerated.

#8-Haupt Creek: Upon our arrival at the site at 1540 hrs on July 30th, the stream still had a continuous surface flow and still consisted of a pool-flatwater-riffle complex. The pools and most of the flatwater were snorkeled; riffle areas, however, were far too shallow for any snorkeling. Water temperature, at 1545 hrs was 67^0F (air temp=80^0F). A total of 105 JSH, mostly YOY, and about 25 GR were recorded. All of the JSH were in pools. The estimated water volume of the sample was 14 m^3, the average maximum velocity was 0.7 fps, and the density of JSH was 7.7/m^3–an apparent moderate increase from the previous survey on July 3rd.

I also snorkeled about 50 ft of the Wheatfield Fork, just upstream from the mouth of Haupt Creek. JSH of various ages were present and relatively common, but not enumerated.

Prepared: December 7, 2005; RWD
Edited and Revised: December 10, 2005; RWD
Edited: December 28, 2005; RWD

MEMORANDUM TO THE FILE–#054

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

Subject: 2005 Juvenile Steelhead Snorkeling Surveys*, survey #3 on August 27-28, 2005.*

Purpose, Objectives and Survey Methods

Refer to Memorandum to the File #052 and my 2005 annual report for a complete description of the purpose, objectives and methods of the snorkeling surveys.

Personnel

I conducted this survey with a biologist, who wishes to remain anonymous, from my former office (U.S. Fish and Wildlife Service {USFWS}, Sacramento, California). He has more than 10 years of professional work experience (USFWS and U.S. Forest Service), including extensive snorkeling experience involving salmonids. The two of us shared the snorkeling (only one snorkeled each site, however) and data recording duties. All nine of the snorkeling sites, and several other nearby selected sites, were snorkeled.

Weather and Stream Conditions

Typical summer weather prevailed both days. Skies were clear, maximum daily air temperatures were in the high 80s (^{0}F), and there was little or no wind. The minimum nighttime air temperature, depending on location, was about 50-55 ^{0}F. As usual, the higher air temperatures occurred along the easterly portion of the watershed, while the westerly portion remained cooler, due to ocean influence. A moderate layer of marine fog intruded along the coast during the night and morning of the 2-day sampling period.

Continuous surface flows were still present at all of the sites, except the Haupt Creek (#8) site which had become intermittent. Flows at the three realtime USGS gages on the watershed at the time of survey were roughly: Wheatfield Fork–13.0 cfs; South Fork–3.1 cfs; and North Fork–4.0 cfs.

The river mouth was closed when viewed (and photographed) during the evening of August 27, 2005. However, the sand bar was relatively low and I suspect that the mouth may have still been opening and closing in response to tide and estuary impoundment levels. In any case, it was unusual to see such a low sand bar across the mouth this late into the summer.

Results and Discussion

The snorkeling results are summarized in Table 2c of my 2005 annual report. In addition, brief site-by-site discussions of each site follow below. These discussions refer to observations made along the 100-ft-long sample transects, unless otherwise noted.

#1-Wolf Creek*:* Stream flow upon our arrival at 1138 hrs on August 27 was not noticeably lower than on the last survey on July 30th. All of the 100-ft sample, except the shallowest

portions of the riffle was snorkeled. A total of 203 JSH (juvenile steelhead) were observed; 90 % of these were in two pools. In addition, 50 GR and 15 TSS were recorded. Water temperature at 1150 hrs was 62^0F (air temp=83^0F), substantially cooler than the 68^0 recorded on the previous survey. The estimated volume of water sampled was 9 m^3, the average maximum velocity was 0.6 fps (ft/second), and the resulting density of JSH was 23.7/m^3. This value was a similar order of magnitude to the value (29.2/m^3) recorded on the previous survey and was also the highest density observed among the nine snorkeling sites over this 2-day sampling.

#2-House Creek: Stream flows (both forks) upon our arrival at 1257 hrs on August 27 were similar to flows observed during the previous survey. The site was snorkeled over the entire 100-ft length, except for shallow flatwater areas of the confluence. The local resident had constructed a small summer dam across House Creek (within the sample site) just above the confluence. As a result of the impoundment, the estimated volume of water sampled was 38 m^3, a slight (6 %) increase over the previous survey. A total of 105 JSH of various ages were counted, mostly in the flatwater of the confluence area. About 2,000 GR and 50 TSS were also distributed throughout the sample site. Water visibility was somewhat reduced, due to moderate algae growth. Water temperatures at 1310 hrs (air temp=86^0F) were: House Creek–66^0F; Wheatfield Fork–73^0F; and the confluence (mixing) area–67^0F. These values were markedly lower than during the previous survey. The average maximum velocity was 0.8 fps, and the total density of JSH was 2.8/m^3, a substantial reduction from the 15.5 recorded on the previous survey. Nevertheless, the recorded density raked third among the nine locations for this particular 2-day survey.

#3-Wheatfield Fork (Lady-in-the Car): Stream flow upon our arrival at 1350 hrs on August 27th appeared very similar to flow during the previous survey. The site was snorkeled over its entire length, except for a short reach of the bedrock flatwater which was too shallow. A total of 35 JSH of various ages were counted. YOY were found only in a thermal refuge area (cold spring water entering through the bedrock) at the upstream end of the site; older JSH were all in the turbulent area at the base of the small waterfall. About 1,000 GR were counted in groups scattered over the site. Water temperature at 1400 hrs was 70^0F (air temp=89^0F). The estimated water volume of the sample was 48 m^3 (the same as the previous survey), the average maximum velocity was 0.3 fps, and the density of JSH was 0.7/m^3–a value close to that of the previous survey on July 30th.

In addition, a 20-ft-long reach about 1,000 ft upstream of the site was also briefly snorkeled. A few JSH (YOY) were confirmed to be present.

#4-Wheatfield Fork (Annapolis Road bridge)**:** In contrast to the intermittent surface flows at the end of summer in 2004, there was still a continuous surface flow upon our arrival at 1503 hrs on August 27th. The site still consisted of pool and flatwater habitats. The whole site, except for the shallowest flatwater at the downstream end, was snorkeled. Thirteen JSH, 300 GR, 500 TSS and 1 pond turtle were recorded. Water temperature at 1518 hrs was 75^0F (air temp=88^0F). The estimated water volume of the sample was 248 m^3, the average maximum velocity was <0.5 fps, and the density of JSH was <0.1.

#5A-Near North Fork mouth (Upper Section): When we arrived at 1000 hrs on August 28th, flow appeared to have subsided somewhat from the previous survey on July 31st. The site still consisted of flatwater and riffle habitats, however. The entire site, except for the shallowest parts of the riffle, was snorkeled. Water temperature at 1010 hrs was 62^0F (air temp=60^0F)–the same as recorded on the previous survey. A total of 55 JSH of various ages were counted in the flatwater only. The only other fish besides JSH recorded were TSS (6). The estimated water volume of the sample was 148 m^3, the average maximum velocity was 1.0 fps, and the density of JSH was 0.4/m^3–which was lower than the 2.5/m^3 on the previous survey on July 31st.

The deep pool at the mouth of the North Fork was also snorkeled. Four age 1+ JSH were observed.

#5B-Near North Fork mouth (Lower Section)**:** Upon our arrival at 0900 hrs, the site still consisted of a pool-flatwater complex. The entire site was snorkeled. Thirty-six JSH (and no other fish) were recorded. However, in one area within the sample, extensive surface feeding by at least 30-50 additional JSH was observed by the data recorder, yet at the feeding sites, the snorkeler failed to record any JSH. This illustrates the bias that may be introduced under such snorkeling situations.

Water temperature at 0905 hrs. was 59^0F (air temp=62^0F). Average maximum velocity was 0.3 fps. Estimated sample volume was 353 m^3, which was greater than on the previous survey, likely due to a higher impoundment stage of the estuary caused by a closed river mouth. JSH density was 0.1/m^3.

In route to the next site–the Twin Bridges site–we also stopped and snorkeled for about 20 minutes in the estuary downstream (100-500 yards) of the Highway 1 bridge. A total of eight JSH were recorded, all in the vicinity of the unimproved boat-launching/loading area, despite snorkeling over a relatively large area.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** Upon our arrival at noon on August 28th the sample site and vicinity still had a continuous surface flow of several cfs. This was in stark contrast to 2004, when flows became intermittent in late August-to-early-September and the whole reach became completely dry (of surface flow) during late September and early October. The character of the site had changed with declining flow since the previous survey, however, transforming to a pool-flatwater-riffle complex. None of the riffle had sufficient depth for snorkeling, so snorkeling was limited to the pool and flatwater habitats. Seven JSH, 100 GR and 12 TSS were recorded. Water temperature at 1212 hrs was 63^0F (air temp=77^0F). The estimated water volume of the sample was 19 m^3, the average maximum velocity was 1.1 fps, and the density of JSH was 0.4/m^3–a value close to those recorded on each of the two previous two surveys.

In addition, about 125 feet of the brushy pool located 100 feet upstream of the site were also snorkeled. Seventy-five JSH of various ages and 50 GR were counted. This area too, was completely dry during late September and early October 2004.

#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** Upon our arrival at 1330 hrs on August 28th, the stream still had a significant and continuous surface flow of at least several cfs. Water temperature at 1345 hrs was 64^0F (air temp=75^0F). The site still consisted of a pool-and-flatwater complex, with abundant large woody debris (LWD in the pool. The entire site was snorkeled. Thirty-seven JSH were recorded in the brushy area of the pool. About 100 GR and 200 TSS were also recorded in the pool. The estimated water volume of the sample was 79 m^3, the average maximum velocity was 0.5 fps, and the density of JSH was 0.5/m^3–an order of magnitude similar to the two previous surveys.

#8-Haupt Creek: Upon our arrival at the site at 1600 hrs on August 27th, the sample reach still consisted of a pool-flatwater-riffle complex, but surface flow had become intermittent. Nevertheless, flow was much greater than on July 31, 2004, when most of the sample reach was already dry and the remainder had only a few disconnected, drying pools of water remaining. (Moreover, on September 15, 2004, the entire sample reach was completely dry.)

The pools and deepest areas of flatwater were snorkeled; all remaining areas with any surface flow were far too shallow for snorkeling. Water temperature, at 1615 hrs was 63^0F (air temp=84^0F). A total of 75 JSH YOY were the only fish recorded–all in pools. The estimated water volume of the sample was 8 m^3, the average maximum velocity was 0.2 fps, and the density of JSH was 9.6/m^3–an order of magnitude similar to the two previous surveys.

We also snorkeled about 50 ft of the Wheatfield Fork 100 yards upstream from the mouth of Haupt Creek. Ten JSH were recorded.

Prepared: December 17, 2005; RWD
Edited and Revised: December 19, 2005; RWD
Edited and Revised: December 28, 2005; RWD

MEMORANDUM TO THE FILE–#055

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

Subject: 2005 Juvenile Steelhead Snorkeling Surveys, *final survey #4 on October 9, 2005.*

Purpose, Objectives and Survey Methods

Refer to Memorandum to the File #052 and my 2005 annual report in which the purpose, objectives and methods of the snorkeling surveys are described in detail. However, this end-of-season survey entailed a 1-day, abbreviated version of the methods. Since the critical summer water temperature period had already elapsed, density data (necessitating estimation of sample volume) was not considered essential. Instead, the sites with sufficient flow were only quickly snorkeled–to obtain a fish count within the 100-ft sample reach; temperatures were also recorded, as more of a matter of interest than of necessity.

Personnel

I conducted this survey with a biologist, who wishes to remain anonymous, from my former office (U.S. Fish and Wildlife Service {USFWS}, Sacramento, California). He has more than 10 years of professional work experience (USFWS and U.S. Forest Service), including extensive snorkeling experience involving salmonids. He recorded data and measured temperatures, and I conducted all of the snorkeling. All sites were snorkeled, except sites #1 (Wolf Creek) and #8 (Haupt Creek), which were too shallow and were only walked.

Weather and Stream Conditions

This was a typical fall day, with maximum air temperatures reaching the upper 70s (^{0}F), plenty of sunshine and little or no wind. Continuous surface flows were still present at all of the sites, except the Haupt Creek (#8) site which was dry, except for two small remaining pools. Flows at the three realtime USGS gages on the watershed were roughly: Wheatfield Fork–4.5 cfs; South Fork–<1.0 cfs; and North Fork–6.5 cfs. The river mouth was closed when viewed (and photographed) late in the afternoon.

Results and Discussion

Results from the nine sites are briefly discussed below. Unless otherwise noted, all discussion pertains to the 100-ft-long sample reaches of each site.

#1-Wolf Creek*:* Stream flow was very low, but continuous. Water temperature at 1256 hrs was 54^{0}F (air=77^{0}F). Dozens of JSH (all or most YOY) were still present, but difficult to enumerate while walking along the stream.

#2-House Creek: Stream flows (both forks and confluence) were low but continuous. Water temperatures in the three branches ranged from 55-60^{0}F (air=77^{0}F) at 1320 hrs. Snorkeling revealed six YOY JSH (House Creek) and at least several hundred GR distributed throughout the site.

#3-Wheatfield Fork (Lady-in-the Car): Stream flow was low but continuous. Water temperature within the site ranged from 52^0 (upstream end at spring inlet) to 60^0F (downstream end) at 1350 hrs (air=70^0F). Snorkeling revealed dozens of GR but no JSH.

#4-Wheatfield Fork (Annapolis Road bridge)**:** Stream flow was low but continuous. At 1419 hrs water temperature was 59^0F (air=75^0F). Snorkeling revealed about 100 GR but no JSH.

#5A-Near North Fork mouth (Upper Section): Stream flow was low but continuous. Water temperature at 1550 hrs was 62^0F (air=75^0F). Snorkeling revealed about 500 GR and 75 JSH of various age-classes.

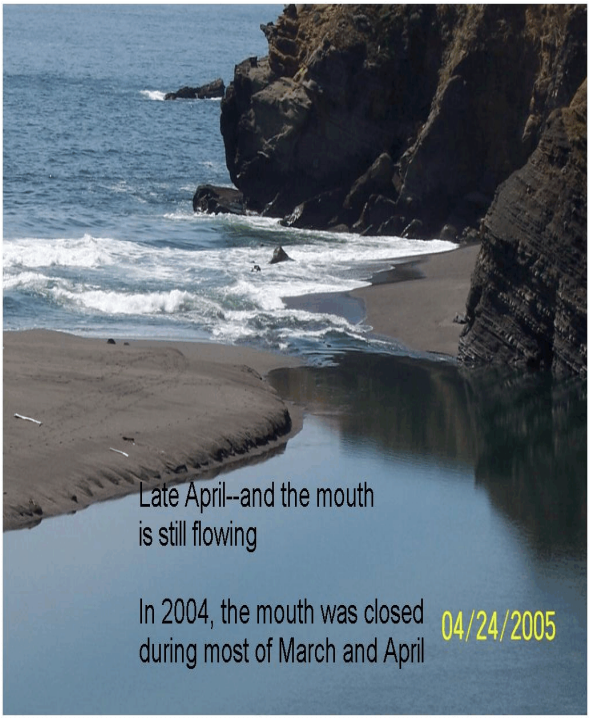
#5B-Near North Fork mouth (Lower Section)**:** Snorkeling revealed no JSH or other fish present. Temperatures were assumed to be the same as at site #5A and were not measured.

#6-Twin Bridges (Wheatfield Fork, beneath the Wheatfield Fork bridge)**:** Although the stream was quite low, a continuous surface flow still existed. At 1500 hrs water temperature was 58^0F (air=83^0F). Snorkeling revealed three YOY JSH in the pool of the study site and three 8-10-inch-long JSH in the brushy pool just upstream of the site. The upstream area also contained about 100 GR.

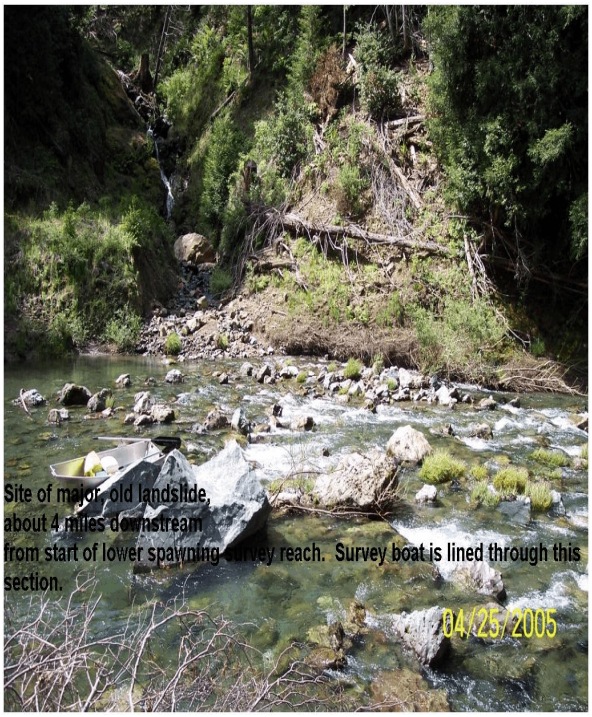
#7-South Fork (beneath the Stewart's Point-Skaggs Springs Road bridge)**:** Stream flow was low but continuous. At 1645 hrs water temperature was 55^0F (air=62^0F). Snorkeling revealed 12 JSH of various age-classes in the pool and several dozen GR. In addition, a 3-inch-long dead JSH was found along the shoreline; its demise was due to strangulation caused by a dragonfly nymph stuck in its throat.

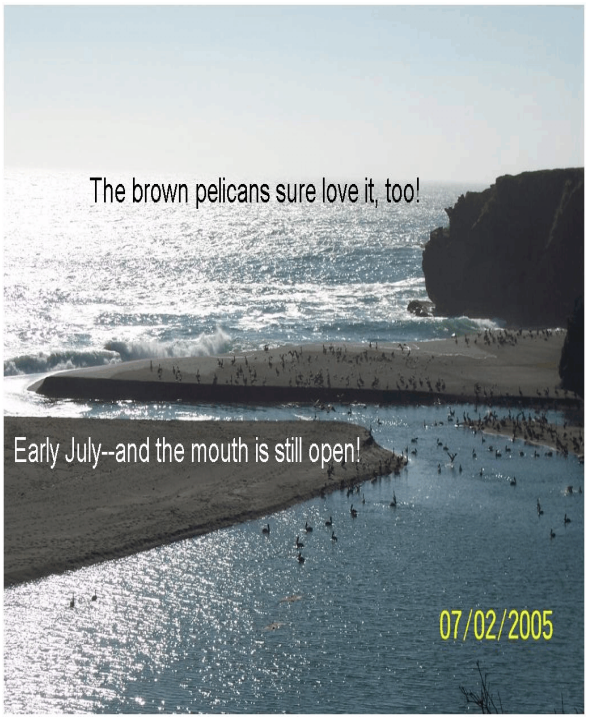
#8-Haupt Creek: The two small pools remaining in the study site were devoid of any fish. However, several small pools located just upstream of the site each contained 6-12 YOY JSH each. Water temperatures in these pools at 1725 hrs were about 57^0F (air=62^0F).

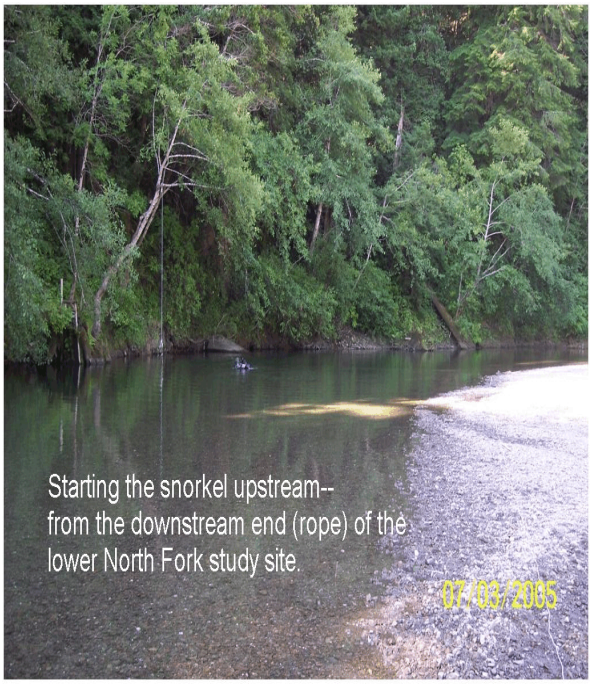
Prepared: December 17, 2005; RWD
Edited and Revised: December 19, 2005; RWD


Late April--and the mouth
is still flowing
In 2004, the mouth was closed
during most of March and April
04/24/2005


A pair of lampreys
beginning redd construction
in late April
04/25/2005

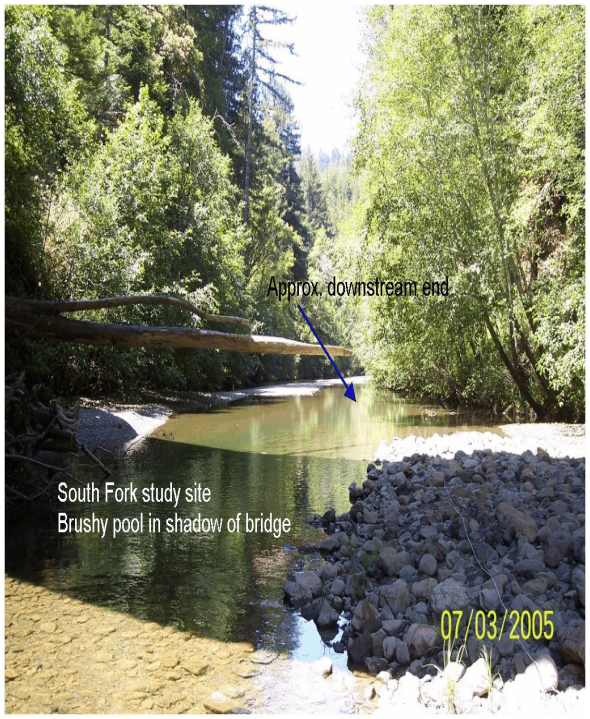

Site of major, old landslide,
about 4 miles downstream
from start of lower spawning survey reach. Survey boat is lined through this
section.
04/25/2005


The brown pelicans sure love it, too!
Early July--and the mouth is still open!
07/02/2005


Starting the snorkel upstream--
from the downstream end (rope) of the
lower North Fork study site.
07/03/2005

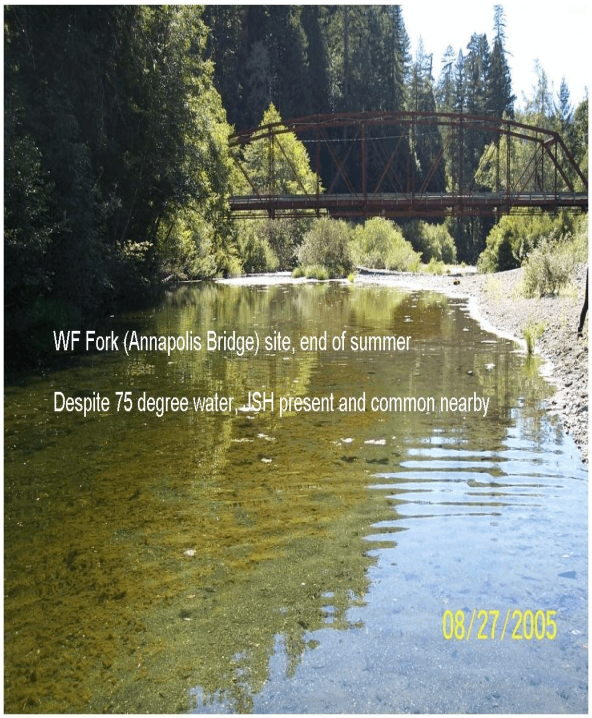

Approx. upstream end of
WF Fork, Annapolis Bridge
study site
Tape measure
07/03/2005

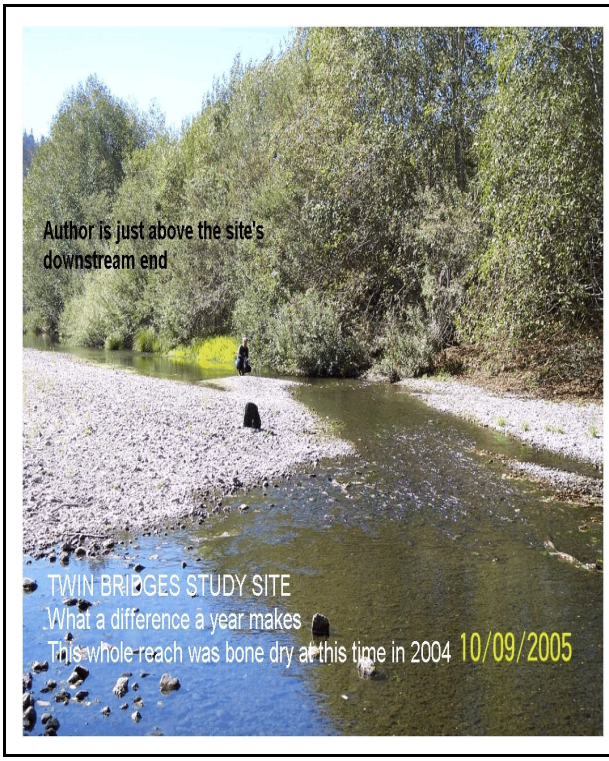

Twin Bridges study site approx. boundaries
07/03/2005


Approx. downstream end
South Fork study site
Brushy pool in shadow of bridge
07/03/2005


House Creek study site,
approx. downstream end
(confluence area)
Wheatfield Fork
House Creek
552 JSH recorded this date
07/30/2005


Lady-in-the-car study site
Small waterfall
Cold spring entering
(refuge area)
07/30/2005


WF Fork (Annapolis Bridge) site, end of summer
Despite 75 degree water, JSH present and common nearby
08/27/2005


Author is just above the site's
downstream end
TWIN BRIDGES STUDY SITE
What a difference a year makes
This whole reach was bone dry at this time in 2004
10/09/2005