



## Initial Summary of Steelhead Sampling Results in Santa Cruz County Streams and the Pajaro Lagoon in 2021

November 2021

This summary is preliminary to analysis of steelhead rearing habitat conditions and calculation of juvenile densities at fish sampling sites. The summary is based on numbers of juvenile steelhead electrofished or observed by snorkeling prior to calculation of actual juvenile densities. A more detailed annual summary report of juvenile steelhead monitoring will follow this initial report. All data will be entered into a County spreadsheet, including presence/absence data on other fish species. Densities of larger juveniles (Size Class II and III) are most important in producing adult spawners, rather than densities of smaller YOY fish. The annual differences in juvenile numbers in **Table 1** reflect mostly differences in YOY numbers between years.

### San Lorenzo River Watershed

Based on NOAA Fisheries' best estimate of only modest adult returns over the 2020/2021 winter and spring to Scott Creek (**Joseph Kiernan pers. comm.**), we suspect that numbers of returning adult steelhead may also have been similarly low in the San Lorenzo River watershed as in other recent years, excepting 2019. Winter and spring adult steelhead passage and spawning flows were very limited during the very dry 2020/2021 winter and spring. Over the past winter, there had been only one significant stormflow occurring in late January during a relatively very mild winter. In November 2020 until late January 2021, only 4 small stormflows of less than 100 cfs at Big Trees gage occurred in the San Lorenzo River (SLR) (40 cfs in Soquel Creek). The late January stormflow reached near 1,800 cfs in the SLR and 2,000 cfs in Soquel Creek, which was below bankfull in the SLR and above bankfull in Soquel Creek. Then 4 more small stormflows between 90 and 160 cfs in the SLR (30 and 100 cfs in Soquel Creek) occurred from February to mid-March, with 3 coming in the first 3 weeks of March. No stormflows occurred after that which could have provided upstream steelhead spawning passage later in the season (**Figures 1 and 2**).

YOY steelhead numbers in the SLR mainstem were lower than in 2020 (also a dry year) in the lower mainstem below the gorge and upper mainstem above Boulder Creek confluence but higher in between (**Table 1**). In SLR tributaries, YOY numbers were generally higher at the lower most sites and lower at the uppermost sites compared to 2020. An exception was Branciforte Creek where YOY numbers were higher at the upper site compared to 2020. YOY numbers continued to be low in Newell and upper Fall creeks, as in 2020. No YOY were detected at the 2 uppermost SLR mainstem sites near Teihl Road and above Highway 9 and at the uppermost Bean Creek site, which was partially dry. Only 1 YOY was detected at the uppermost Zayante and Bear Creek sites. In 2020, juvenile numbers had been generally higher at lower mainstem and lower tributary sites than higher in the mainstem and tributary headwaters, as we were again seeing in 2021. This may indicate continued limited 2021 adult spawning

passage access upstream of the Boulder Creek confluence on the mainstem and to the uppermost sites in Zayante, Bean and Fall creeks, as in 2020. Or the geographic distribution of YOY numbers may have also been due to low adult returns and/or poor egg survival from early spawners. Spring-summer-fall baseflows were well below the median in 2021, to provide limited rearing habitat and a shortage of food for YOY. YOY growth rate was slow throughout the watershed except in the lower mainstem (where faster growth rate is typical with higher baseflow and more sunlight than elsewhere), in sunny middle Zayante 13c, and in middle Bean 14b and lower Bear Creek 18a with mixed sun and deciduous shade (**Table 1**). At sites where 1 lone YOY was found, it was larger than usual.

### **Soquel Creek Watershed**

Based on NOAA Fisheries' best estimate of only modest adult returns over the 2020/2021 winter and spring to Scott Creek (**Joseph Kiernan pers. comm.**), we suspect that numbers of returning adult steelhead to Soquel Creek may also have been similarly low as in other recent years, excepting 2019. In Soquel Creek, winter and spring adult steelhead passage and spawning flows were limited and followed the same pattern as in the SLR, except the largest stormflow in late January was slightly larger in Soquel Creek and greater than bankfull. Since the Soquel Creek watershed is half the size of the SLR watershed and lower gradient, adult steelhead likely had better spawning access to upper sites in Soquel than in the SLR. 2021 YOY juvenile steelhead numbers at mainstem and lower East and West Branch sites were very low and similar to those at most sites in 2015-2018 and 2020, with some increase in 2021 at upper mainstem sites 10 and 12 (**Table 1**). YOY numbers at upper East Branch sites and both West Branch sites were less than in 2020 and equally low below Mill Pond on the East Branch, but indicated that adults successfully spawned as far upstream as the Spanish Ranch site on the East Branch and above Girl Scout Falls I on the West Branch. YOY numbers were relative high at the one Soquel Demonstration State Forest site at Spanish Ranch (sampled under a separate contract funded by CAL Fire (300-foot long site) compared lower watershed sites except the upper mainstem sites 10 and 12. Despite the much below median baseflow in late spring and summer, YOY steelhead growthrate was probably about average in the lower mainstem and some YOY reached the soon-to-smolt size (at least 75 mm SL) due to low densities (**Table 1**). But elsewhere in the upper mainstem and the Branches, growthrate was slow, and most YOY's were much smaller than soon-to-smolt size. The Soquel Lagoon juvenile steelhead population estimate of 2,500 was above average (1,529) and above the median at 928. This was greater than previous years since 2009 except 2019. This indicated higher spawning effort and success closer to the lagoon than many recent years. Yearlings also made up a good portion of the lagoon population in 2021. Size of captured lagoon juveniles shifted larger with all juvenile steelhead > 75 mm SL in 2021 compared to those in 2019 when the lagoon had a larger juvenile population.

### **Aptos Creek Watershed**

Based on NOAA Fisheries' best estimate of only modest adult steelhead returns over the 2020/2021 winter and spring to Scott Creek (**Joseph Kiernan pers. comm.**), we suspect that numbers of returning adult steelhead to Aptos Creek may also have been similarly low as in other recent years, excepting 2019. As in nearby Soquel Creek (**Figure 2**), adult winter/spring passage flows and spawning conditions were likely limited but adequate in late January, February and early March for adult spawning access to all 4 sampling sites. But the absence of YOY at the upper Aptos site 4 indicated that a wood cluster may exist downstream that hinders

adult passage at lower stormflows. We recommend that Aptos Creek be surveyed for steelhead passage impediments. Total juvenile and YOY numbers were low and less in 2021 than 2020 at all 4 stream sites and the lagoon (**Table 1**). Spring/summer rearing flows were likely below median in the Aptos watershed in 2021. Despite YOY numbers being low in Aptos Creek, they did not reach soon-to-smolt size during the first growing season, as some did in 2020. Only 7 juvenile steelhead were captured in Aptos Lagoon on 2 days in 2021 (only 1 likely a YOY), compared to 276 in 2020. The size of the Aptos Estuary juvenile steelhead population could not be estimated in 2021 because too few fish were captured on the first day and none were recaptured on the second. This low capture rate and no recaptures also occurred in another drought year, 2014. The 2020 lagoon estimate was 365 and third highest in 9 annual censusing since 2011. The highest estimate was in 2019 with 707. The estuary was likely very important in producing smolt-sized juveniles in such years as 2011 and 2017–2020, producing significant numbers of larger juveniles to return as adults. The 2021 estuary had poor water quality conditions with saline and temperature stratification and very hot water ( $>24^{\circ}\text{C}$ ) at depths greater than 0.75 m on 1 October and depths greater than 1.0 meter on 8 October. The estuary was 0.96 feet deeper the second week of sampling, and the sandbar was closed during both fish sampling days in early October.

**Pajaro Estuary**

Pajaro Estuary was sampled with a closed sandbar in early October 2021. No steelhead were captured in 2021, as was the case in all previous annual fall sampling, 2012-2020. In 2021, the estuary was dominated again by smelt, with no YOY northern anchovy at the model airplane site or at the Thurwachter Bridge site, where they had been common in previous years 2018-2020 when the sandbar was open. No fish were captured in the upper lagoon from the model airplane site upstream in 2021 except for 5 threespine stickleback. Other fish species captured in the lower lagoon along the beach bar in order decreased occurrence included shiner surfperch (8), arrow goby (8), starry flounder (2), staghorn sculpin (1), threespine stickleback (1), Pacific herring (1) longnose mudsucker (1). Captured invertebrates included crabs (yellow shore and Dungeness). No tidewater gobies were captured at 8 sites in 2021, though 11 were found at our 2 upper sites at Thurwachter Bridge and the boat ramp (0.8 miles upstream of Thurwachter Bridge and 2.9 miles upstream of Watsonville Slough). They were seemingly absent in the estuary along the beach as in 2015–2020 and in the lagoon along the beach in 2021, with a scarcity of submerged algae and other aquatic vegetation present. Where tidewater goby was common at the uppermost boat ramp prior to 2016, none were captured in 2017–2019 or 2021 there or at any other sampling sites.

**Table 1. Number of Santa Cruz County Steelhead Either Captured by Electrofishing or Observed by Snorkeling – 2015-2021 and number of Unintentional Mortalities in 2021. (With same or similar average habitats and stream lengths sampled between years at each site but not between sites, preventing comparisons between sites because densities (fish/ stream length) are not included).**

Stream	Site #	Number* of Steelhead 2015 (drought year)/ % YOY in Size Class II/III from E-fishing	Number*of Steelhead 2016 (below average flow year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2017 (wet year)/ % YOY in Size Class II/III from E-fishing	Number*of Steelhead 2018 (drought year)/ % YOY in Size Class II/III from E-fishing	Number*of Steelhead 2019 (wet year)/ % YOY in Size Class II/III from E-fishing	Number*of Steelhead 2020 (below average year)/ % YOY in Size Class II/III from E-fishing	Number*of Steelhead 2021 (drought year)/ % YOY in Size Class II/III from E-fishing	Number of Unintentional Steelhead Mortalities in 2021
SLR Mainstem	0a	13/85%	8/100%	16/100%	15/100%	16/93%	9/80%	4/100%	0
SLR Main	1	49(+2 snorkeling)/ 69%	40(+4 snorkeling)/ 87%	60(+51 snorkeling)/ 99%	49(+8 snorkeling)/ 76%	87(+71 snorkeling)/ 80%	136 (+3 snorkeling)/ 64%	59 (+4 snorkeling)/ 53%	1
SLR Main	2	50(+2 snorkeling)/ 44%	61(+14 snorkeling)/ 92%	110(+37 snorkeling)/ 87%	30(+11 snorkeling)/ 81%	182(+164 snorkeling)/ 46%	124(+41 snorkeling)/ 62%	46(+11 snorkeling)/ 23%	0
SLR Main	4	84(+4 snorkeling)/ 16%	52(+0 snorkeling)/ 67%	110(+6 snorkeling)/ 61%	105(0 snorkeling)/ 38%	204(+37 snorkeling)/ 41%	133(+4 snorkeling)/ 57%	169(+2 snorkeling)/ 28%	1
SLR Main	6	79(+6 snorkeling)/ 4%	26(+0 snorkeling)/ 12%	25(+22 snorkeling)/ 49%	51(0 snorkeling)/ 2%	52(+65 snorkeling)/ 8%	36(+5 snorkeling)/ 0%	63(+6 snorkeling)/ 0%	1
SLR Main	8	61(+4 snorkeling)/ 0%	24(+1 snorkeling)/ 29%	49(+15 snorkeling)/ 31%	48(0 snorkeling)/ 16%	81(+29 snorkeling)/ 14%	53(+2 snorkeling)/ 0%	53(+0 snorkeling)/ 4%	0

Stream	Site #	Number* of Steelhead 2015 (drought year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2016 (below average flow year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2017 (wet year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2018 (drought year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2019 (wet year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2020 (below average year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2021 (below average year)/ % YOY in Size Class II/III from E-fishing	Number of Unintentional Steelhead Mortalities in 2021
SLR Main	9	110(+0 snorkeling)/ 13%	126(+1 snorkeling)/ 24%	122(+4 e-fish pools) 49%	51(1 snorkeling)/ 10%	151(+29 snorkeling)/ 29%	70(+2 snorkeling)/ 1%	26(+4 snorkeling)/ 9%	0
SLR Main	10	41/10%	28/31%	84/36%	28/8%	76/ 10%	13/38%	5/33%	0
SLR Main	11	52/23%	55/10%	84/19%	44/6%	150/ 4%	9/0%	6/0%	0
SLR Main	12a	29/34%	78/0%	104/0%	No sample	No sample	No sample	No sample	
SLR Main	12b			233/0%	143/0%	185/ 0%	34/53%	10 (no YOY)	0
Zayante	13a	114/6%	18/75%	60/48%	60/0%	217/ 6%	143/1%	162/3%	1
Zayante	13c	317/32%	84/54 %	176/45 %	176/6%	361/ 2%	158/3%	135/9%	1
Zayante	13d	119/9%	272/0%	80/32%	208/0%	111/ 4%	105/0%	126/0%	2
Zayante	13i	84/13%	82/0%	114/0%	62/0%	163/ 0%	43/58%	13/0% (1 YOY)	0
Lompico	13e			No sample	60/0%	No sample	No sample	No sample	
Bean	14a	146/1%	17/73%	57/31%	40/0%	114/ 4%	71/0%	104/2%	1
Bean	14b	67/22%	11/100%	66/50%	25/67%	131/ 8%	62/0%	26/16%	0
Bean	14c-1	0 (dry)	0 (dry)	Wetted	0 (dry)	Wetted	0 (dry)	0 (dry)	
Bean	14c-2		70/2%	106/0%	208/1%	177/ 5%	43/67%	7 (no YOY)	0
Fall	15a	75/15%	86/9%	125/7%	115/0%	133/ 6%	79/17%	106/3%	0
Fall	15b	19/84%	77/0%	97/3%	51/11%	84/ 2%	33/65%	28/0%	0
Newell	16	8/88%	17/79%	63/63%	31/29%	108/ 24%	27/69%	19/6%	0
Boulder	17a	34/6%	65/31%	72/36%	38/12%	113/ 7%	51/0%	55/2%	1
Boulder	17b	50/22%	83/3%	91/9%	76/0%	115/ 8%	113/0%	94/0%	0
Bear	18a	43/7%	17/31%	42/34%	27/0%	165/ 2%	45/0%	85/0%	2
Bear	18b			47/89%	104/1%	301/ 3%	90/0%	12/0% (1 YOY)	0
Branciforte	21a-2			99/14%	77/0%	166/ 4%	56/0%	37/0%	1
Branciforte	21b	15/73%	71/2%	No sample	No sample	153/ 1%	39/24%	82/0%	1
Branciforte	21c	15/53%	41/0%	108/1%	No sample	No sample	No sample	No sample	
Total- San Lorenzo Watershed (E-fishing + visual snorkeling)		1,707 (2 sites added, 2 removed)	1,547 (1 site added, 1 segment and site moved)	2,535 (3 sites added, 2 sites removed)	1,942 (2 sites removed)	4,193 (1 site added, 1 site removed)	1,775+57= 1,832	1,534+27= 1,561	13 (0.8% mortality rate from e-fishing 1,534 steelhead)
Soquel	1	17	1	9	12/38%	60/ 54%	10/88%	30/35%	0
Soquel	4	13	2	9	8/14%	43/ 24%	18/43%	20/17%	0
Soquel	6						15/45%	33/21%	0
Soquel	10	108	12	57	73/25%	149/ 23%	24/38%	78/6%	0
Soquel	12	222 + 8 Coho	50	38	132/16%	339/ 17%	60/11%	115/1%	2
E. Br. Soquel	13a	66	19	10	35/12%	160/ 6%	13/30%	13/17%	0
E. Br. Soquel	16 SDSF	0 (dry)	35	155	44/0%	133/ 6%	64/4%	44/0% Below Amaya	0

Stream	Site #	Number* of Steelhead 2015 (drought year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2016 (below average flow year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2017 (wet year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2018 (drought year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2019 (wet year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2020 (below average year)/ % YOY in Size Class II/III from E-fishing	Number* of Steelhead 2021 (below average year)/ % YOY in Size Class II/III from E-fishing	Number of Unintentional Steelhead Mortalities in 2021
E. Br. Soquel	Long-ridge						90/4%	Dry	
E. Br. Soquel	Spanish Ranch						147/1%	85/0	2
E. Br. Soquel	Ashbury						249/0	No sample	
Amaya							28/20%	No sample	
W. Br. Soquel	19	60 + 3 Coho	19	31	44/5%	64/ 8%	28/0%	13/17	0
W. Br. Soquel	21	60	91	84	127/1%	172/ 9%	55/0%	44/0%	3
Total		546 + 11 Coho	179	384	475	1,120	800	543	7 (1.3% mortality rate)
Soquel Lagoon Estimate***		Could not estimate due to no recaptures	237	256	46	3,353	1,283	2,500 (catch/unit effort)	(Under separate permit)
Aptos	3	10	2 (no YOY)	44	39/61%	115/ 15%	34/75%	27/0%	0
Aptos	4	6 (no YOY)	54	77	57/8%	178/ 5%	31/53%	6 (no YOY)	0
Valencia	2		29	27	49/0%	98/ 0%	38/36%	17/50%	0
Valencia	3		14	39	69/0%	118/ 0%	38/75%	10/0%	0
Aptos Lagoon/ Estuary		Not Sampled	Not Sampled	164 (114 on 11 Oct; 50 on 18 Oct; 31 recap.)	92 (22 on 9 Oct; 70 on 16 Oct; 7 recap.)	328 (170 on 9 Oct; 158 on 15 Oct; 38 recap.)	276 (129 on 1 Oct; 147 on 8 Oct; 52 recap.)	7 (4 on 1 Oct; 3 on 8 Oct; 0 recap.)	0
Total		16 (less 2 sites and lagoon)	99 (added 2 sites)	351	306	837	417	67	0 (0% mortality rate)
Aptos Lagoon Estimate**				184	220	707	365	Could not estimate due to no recaptures	
Pajaro Lagoon		0	0	0	0	0	0	0	0

\* These totals lump small YOY fish with the number of valuable steelhead in the larger size classes II and III that will likely smolt to the ocean the following winter/spring.

\*\* Red print indicates low numbers of YOY for the site.

\*\*\*Soquel Lagoon and Aptos Lagoon/Estuary estimates were based on mark and recapture, using a large bag seine except estimate by catch/unit effort in 2021. Soquel Lagoon steelhead captures were not part of the Santa Cruz County's federal permit. Soquel Lagoon sampling occurred under separate permits and was contracted with the City of Capitola.



Figure 1. Hydrograph of Discharge at the Felton Big Trees Gage on the San Lorenzo River, 1 October 2020 to 30 September 2021.

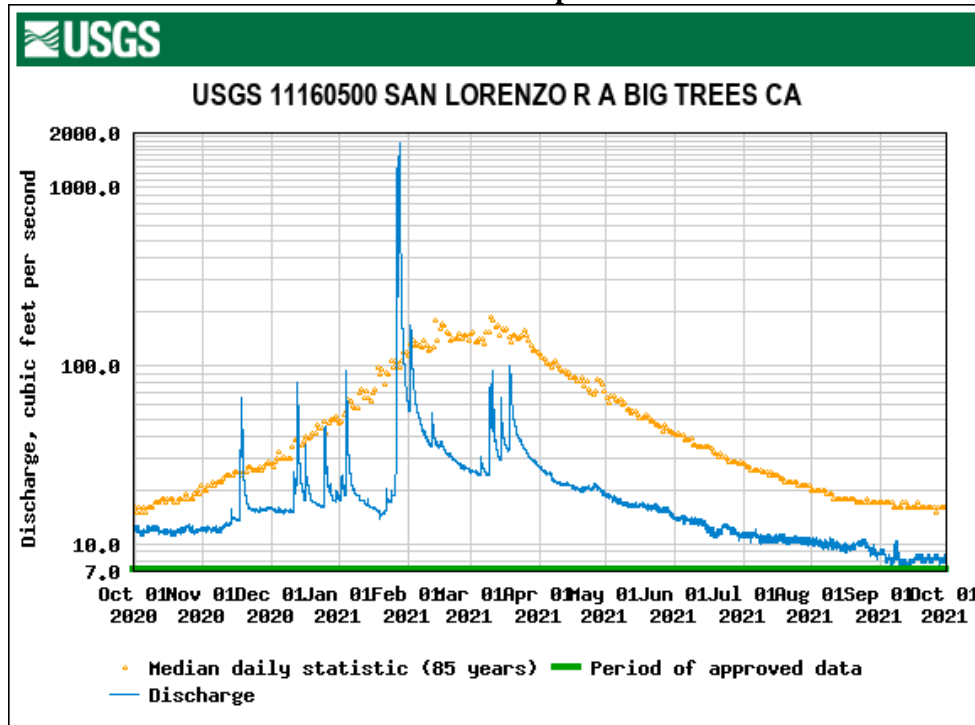


Figure 2. Hydrograph of Discharge at the Soquel Village Gage on Soquel Creek, 1 October 2020 to 30 September 2021.

