

Mattole River Juvenile Coho Salmon Spatial Structure Monitoring 2016



Looking for coho salmon in Ancestor Creek, Mattole River watershed, August 2016.

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Abstract

To assess coho salmon (*Onchorynchus kisutch*) population spatial structure in the Mattole River watershed, we used multi-pass snorkel surveys to gather information on the presence of coho and other aquatic vertebrates, and a suite of habitat parameters, during the summer baseflow period in 2015. Possible survey reaches were pre-defined to include all likely coho rearing habitat in the watershed, based on GIS-calculated reach gradient, valley width, and mean annual discharge. We surveyed a total of 47 reaches. In 2016 coho were detected in 11 of 47 reaches. Multi-scale occupancy models were used to calculate the proportion of area occupied (PAO) and the probability of species occurrence at both the reach and sample unit scale. PAO in 2015 was 0.11, less than the PAO of 0.13 in both 2013 and 2014, but greater than the PAO of 0.08 in 2015. Unit-level occupancy (within occupied reaches) was 0.45, while reach-level occupancy was 0.47. Chinook Salmon PAO was 0.04. Juvenile *O. mykiss* were widely distributed, present in 46 of 47 reaches and nearly every sample unit.

Patterns of coho spatial distribution appeared similar to all years in the last three decades for which data exists, with 90-95% of the coho observed concentrated in the mainstem Mattole and a few tributaries in the extreme southernmost portion of the watershed.

Introduction

Spatial structure, along with abundance, diversity, and productivity, is one of the key population characteristics that need to be assessed in order to evaluate trends in salmon population viability (Adams et al. 2011, McElhany et al. 2000). To assess coho salmon (*Oncorhynchus kisutch*) population spatial structure in the Mattole River watershed, we used multi-pass snorkel surveys to gather information on the presence of coho and other aquatic vertebrates, and a suite of habitat parameters, during the summer baseflow period in 2016. Surveys were also conducted in 2013, 2014, and 2015 using the same protocol.

Study Area

The project took place in the 304 mi² Mattole River watershed, in coastal Humboldt and Mendocino counties.

Objectives

The primary project objective was to complete surveys and data analysis to estimate the occupancy of juvenile coho at both reach and population scales, and determine distribution (spatial structure) of juvenile coho salmon in Mattole River watershed. Additional objectives were to assess trends in coho salmon spatial structure, and provide information for restoration and species management.

Methods

Field methods followed Garwood and Ricker (2016), and those described in detail in that document are reviewed only briefly here. Prior to the survey season, surveyors attended the protocol training conducted by CDFW in early June. Following this training, multiple days of additional training were conducted surveying a reach not among the GRTS-drawn reaches, focused particularly on species identification.

Reach Selection

Survey reaches were all potential coho salmon spawning reaches in the sample frame that was developed for Mattole River adult salmonid spawner surveys by CDFW with input from the MSG (Garwood and Ricker 2008) (Figure 1). Reaches attributed as potential coho habitat in this sample frame have a maximum stream gradient of five percent or less, and a minimum estimated mean annual discharge of greater than 0.05 cubic meters per second. A handful of reaches that fall outside of these parameters were included based on past documentation of coho presence (Garwood and Ricker 2008).

Reaches were surveyed in order from a spatially-balanced random draw made using the generalized random tessellation stratified (GRTS) algorithm. We did not use a rotational visitation scheme with a fixed panel as recommended in the Coastal Monitoring Plan

(Adams et al. 2011), due to the lack of multi-year funding for this survey effort. A fixed panel survey scheme could be instituted at a future time.

Landowners were contacted for access permission by both mail and phone (when phone numbers were obtainable). Any segment of a reach where access permission was obtained was surveyed, unless the segment required additional travel time of greater than one hour to access (was not adjacent to another surveyed reach) and was so short that it may not have contained any qualifying units.

Field work and data handling

Every other pool within a reach was sampled that met specific depth, width, area, and temperature criteria, in addition to descriptive morphologic criteria, as described in Garwood and Ricker (2016). In “large river” reaches, defined as mean annual discharge of $>10 \text{ m}^3 \text{ s}^{-1}$ (which in the Mattole sample frame is mainstem river reaches with reach ID #'s 273-299), qualifying units were defined by the presence of cover in addition to the above criteria. Every fourth pool in a reach meeting these criteria was snorkeled using an independent double-pass, with divers identifying and tallying all fish species present, as well as other relevant aquatic or amphibious species. Every pool meeting the criteria was sampled in “large river” reaches, due to the infrequent occurrence of qualifying units.

The following physical parameters were recorded for each sampled unit: pool type, length, average width, maximum depth, cover rating, instream shelter, and woody debris. In reaches where coho were observed, surveyors were instructed to obtain photographic documentation of coho presence.

Data from paper field data sheets was entered into the *Microsoft Access* database provided by CDFW. QA/QC checks were completed based on procedures provided by CDFW staff.

Data analysis – occupancy and spatial structure

Population spatial structure was assessed by using detection probabilities from the independent double-pass dives to calculate the probability of species occupancy at the sample unit and sample reach scale. The single-season multi-method approach in program PRESENCE (USGS 2017) was used to calculate estimates of occupancy (ψ), estimates of conditional occupancy (θ), and detection probability (p) for each species and age class category. P was assumed to remain constant in pools between the two snorkel passes. The proportion of area occupied (PAO) was calculated by multiplying the estimate of occupancy (ψ) and the estimates of conditional occupancy (θ) (Garwood and Larson 2014).

Unlike in reports from 2015 and 2014 detailing results from these surveys in the Mattole, we did not complete any analysis linking coho presence/absence with habitat data. Since coho distribution was broadly similar to the past three years, it seemed unlikely that results of the analysis would be substantively different.

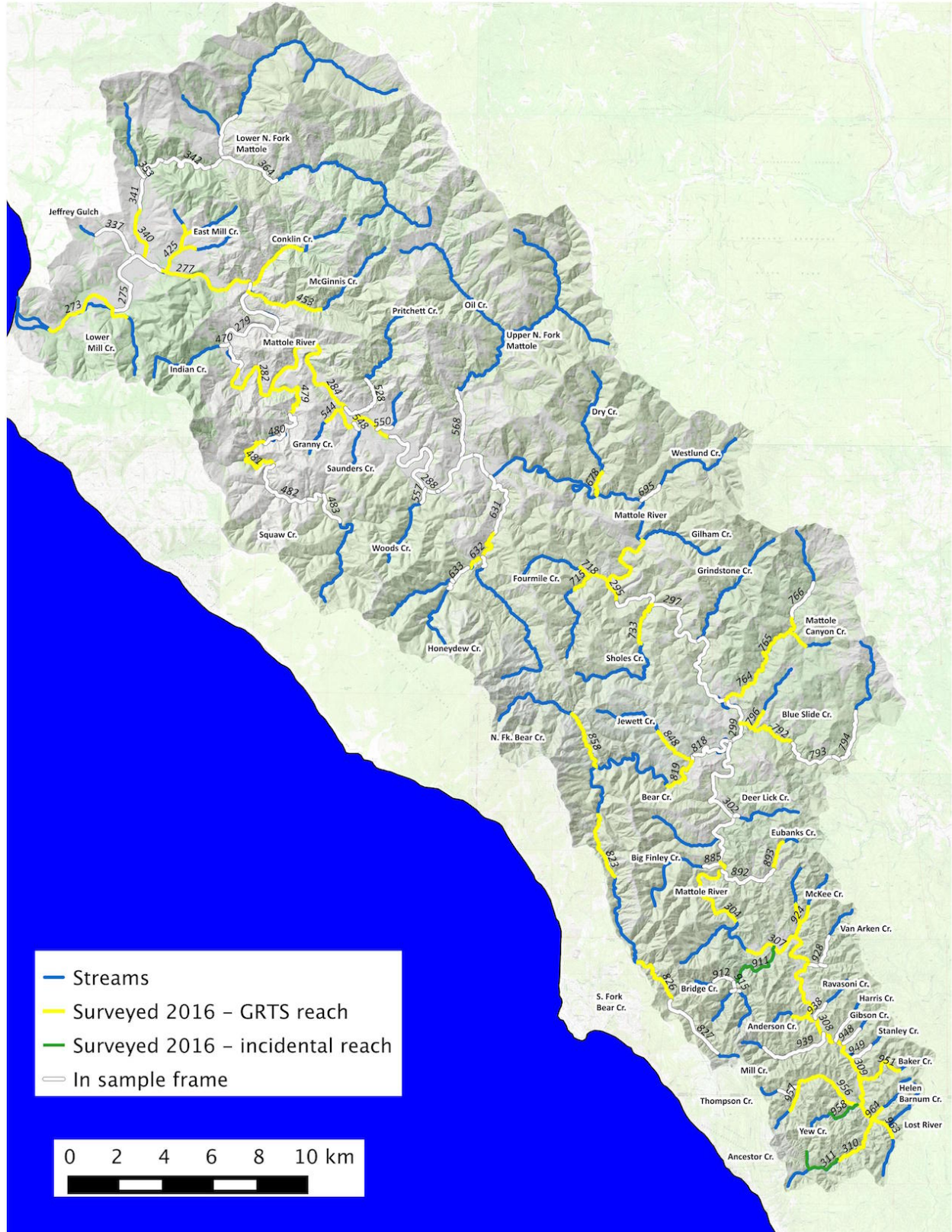


Figure 1. 2016 Mattole Coho summer spatial structure sample frame with reach ID #'s.

Estimate of coho abundance

The use of data collected under this protocol to make watershed-level juvenile coho abundance estimates incorporating detection probabilities and within- and between-reach variance has not yet been completed, but is under development (J. Garwood, pers com. January 2017).

With the highly skewed dataset and a majority of reaches with no coho presence, accounting for between-reach variance and developing a confidence interval would require the use of a bootstrapping technique, which is beyond the scope of this report. To develop an idea of how many juvenile coho were in the watershed in 2016, we calculated a simple watershed-wide “abundance” estimate that does not incorporate detection probability nor provide a confidence interval.

$$\text{Estimated abundance} = \frac{\text{Sum of coho observed (single dive pass)}}{\text{Percentage of total frame length surveyed}} * 2 * 100$$

The total number of coho observed was multiplied by two since only every other qualifying unit was sampled.

This number should not be construed as a population estimate, but does allow for a relative comparison of year-to-year abundance, and provides context for interpreting spatial structure and distribution results.

Results

Reaches surveyed

Ninety-four landowners were contacted for stream access permission. Fifty-five gave permission, while 35 did not respond, or we were unable to find a valid address or phone number to reach them. Four landowners replied and denied access permission.

Out of a total of 97 reaches in the Mattole coho summer spatial structure sample frame, 47 reaches were surveyed in GRTS draw order, 48% of all possible reaches (Table 1). An additional five reaches were surveyed incidentally as training reaches, and with additional funding. Of these 47 reaches, 34 were main reaches and 13 sub-reaches (surveyed by implication with the main reach. In reach 295, on the mainstem Mattole River downstream of Ettersburg, no qualifying units were encountered (all water temperatures were > 22° C), so that reach is not included in PAO calculations, below.

Table 1. Summary to number of reaches and units surveyed by year 2013 -2016.

| Year | # of reaches surveyed | Length surveyed (km) | # of units surveyed | % of reaches in frame surveyed | % of frame surveyed by length |
|------|-----------------------|----------------------|---------------------|--------------------------------|-------------------------------|
| 2013 | 27 | 83.8 | 588 | 29% | 33% |
| 2014 | 37 | 98.7 | 716 | 39% | 39% |
| 2015 | 52 | 141.2 | 915 | 51% | 51% |
| 2016 | 47 | 109.7 | 868 | 47% | 43% |

Coho salmon occupancy

In 2016, coho were observed in 11 of 46, or 23%, of the GRTS reaches surveyed. The calculated percent area occupied (PAO), the product of reach and pool-level occupancy probabilities, was 0.11, greater than the value of 0.08 in 2015 but less than the PAO of 0.13 in 2013 and 2014 (Table 2). The probability of reach-level occupancy, Ψ (psi), was 0.25, also midway between a low value of 0.14 in 2015, and 0.31 and 0.35 in 2013 and 2014, respectively. The probability of coho detection in a given pool in a reach where coho were present, θ (theta), was 0.45, lower than 0.57 in the previous year, but higher than values of 0.43 and 0.37 in 2013 and 2014 (Table 2). Detection probability, p , was 0.83 in 2016.

Chinook occupancy

Young-of-the-year Chinook were detected in only eight stream reaches in 2016, with a PAO of 0.04 (Table 2). Most detections were of a single fish in a pool, with a median count of one. The reaches with the greatest number of Chinook observed were at the downstream and upstream ends of the mainstem – mainstem reach 273 just upstream of the Mattole estuary, Thompson Creek reach 956, and Bridge Creek reach 911, which was not in this year’s sample draw but was surveyed as a training reach (Figure 3).

Steelhead occupancy

Young-of-the-year (YOY) *O. mykiss* (either rainbow trout or steelhead) were present in 46 out of 47 reaches surveyed (Table 2, Figure 4), with a PAO of 0.98. Mean and median counts per pool were 22.5 and 13, respectively. *O. mykiss* judged to be from older age classes, lumped together as 1+ fish, were slightly less widespread and abundant, but still present in 45 out of 46 reaches, with a PAO of 0.96. These results are similar to the last three years, with juvenile steelhead present in nearly every Mattole stream reach that spawning adults can access, and that contains at least some water throughout the summer.

Table 2. Summer juvenile occupancy estimates by salmonid species, Mattole River basin, 2013-2016.

| Species and Year | Psi | SE | 95% CI | Theta | SE | 95% CI | p | SE | 95% CI | PAO | # of Reaches present | Mean pool count | Median pool count |
|---------------------------|------|------|-------------|-------|------|-------------|------|-------|-------------|------|----------------------|-----------------|-------------------|
| Coho salmon 2013 | 0.31 | 0.10 | 0.15 - 0.52 | 0.43 | 0.03 | 0.36 - 0.50 | 0.86 | 0.03 | 0.80 - 0.91 | 0.13 | 7 of 24 | 5.7 | 4 |
| Coho salmon 2014 | 0.35 | 0.08 | 0.21 - 0.53 | 0.37 | 0.05 | 0.28 - 0.46 | 0.68 | 0.07 | 0.53 - 0.80 | 0.13 | 12 of 37 | 10.3 | 4 |
| Coho salmon 2015 | 0.14 | 0.05 | 0.07 - 0.27 | 0.57 | 0.04 | 0.50 - 0.60 | 0.98 | 0.02 | 0.90 - 1.00 | 0.08 | 7 of 51 | 13.3 | 6 |
| Coho salmon 2016 | 0.25 | 0.06 | 0.14 - 0.39 | 0.45 | 0.03 | 0.39 - 0.52 | 0.83 | 0.04 | 0.73 - 0.90 | 0.11 | 11 of 46 | 5.8 | 3 |
| Chinook Salmon 2013 | 0.47 | 0.11 | 0.27 - 0.68 | 0.22 | 0.03 | 0.17 - 0.28 | 0.71 | 0.06 | 0.58 - 0.81 | 0.10 | 10 of 25 | 3.4 | 1 |
| Chinook Salmon 2014 | 0.15 | 0.06 | 0.06 - 0.30 | 0.29 | 0.08 | 0.15 - 0.47 | 0.79 | 0.11 | 0.50 - 0.94 | 0.04 | 5 of 37 | 2.1 | 2 |
| Chinook Salmon 2015 | 0.39 | 0.08 | 0.25 - 0.55 | 0.22 | 0.03 | 0.16 - 0.29 | 0.69 | 0.08 | 0.52 - 0.81 | 0.09 | 16 of 51 | 4.8 | 1 |
| Chinook Salmon 2016 | 0.22 | 0.07 | 0.11 - 0.38 | 0.19 | 0.05 | 0.11 - 0.32 | 0.60 | 0.13 | 0.34 - 0.82 | 0.04 | 8 of 46 | 3.0 | 1 |
| YOY <i>O. mykiss</i> 2013 | 1.00 | - | - | 0.95 | 0.01 | 0.93 - 0.97 | 0.98 | <0.01 | 0.97 - 0.99 | 0.95 | 25 of 25 | 27.2 | 15 |
| YOY <i>O. mykiss</i> 2014 | 1.00 | - | - | 0.82 | 0.02 | 0.78 - 0.85 | 0.97 | <0.01 | 0.95 - 0.98 | 0.82 | 37 of 37 | 44.8 | 23 |

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| Species and Year | Psi | SE | 95% CI | Theta | SE | 95% CI | p | SE | 95% CI | PAO | # of Reaches present | Mean pool count | Median pool count |
|---------------------------|------|------|-------------|-------|-------|-------------|------|-------|-------------|------|----------------------|-----------------|-------------------|
| YOY <i>O. mykiss</i> 2015 | 1.00 | - | - | 0.89 | 0.01 | 0.87 - 0.91 | 0.96 | <0.01 | 0.94 - 0.97 | 0.89 | 50 of 51 | 34.6 | 12 |
| YOY <i>O. mykiss</i> 2016 | 0.98 | 0.02 | 0.86 - 1.00 | 0.96 | <0.01 | 0.94 - 0.97 | 0.97 | <0.01 | 0.96 - 0.98 | 0.94 | 45 of 46 | 22.5 | 13 |
| 1+ <i>O. mykiss</i> 2013 | 1.00 | - | - | 0.94 | 0.01 | 0.91-0.95 | 0.93 | 0.01 | 0.91 - 0.95 | 0.93 | 25 of 25 | 10.7 | 6 |
| 1+ <i>O. mykiss</i> 2014 | 0.92 | 0.04 | 0.78 - 0.98 | 0.76 | 0.03 | 0.70 - 0.81 | 0.79 | 0.03 | 0.73 - 0.84 | 0.73 | 34 of 37 | 4.8 | 3 |
| 1+ <i>O. mykiss</i> 2015 | 0.95 | 0.03 | 0.83 - 0.98 | 0.75 | 0.02 | 0.66 - 0.75 | 0.82 | 0.02 | 0.77 - 0.86 | 0.67 | 47 of 51 | 5.4 | 3 |
| 1+ <i>O. mykiss</i> 2016 | 0.96 | 0.03 | 0.84 - 0.99 | 0.72 | 0.03 | 0.66 - 0.76 | 0.78 | 0.03 | 0.73 - 0.82 | 0.68 | 45 of 46 | 3.2 | 2 |

Psi Ψ - The probability a species is detected in a given reach for the survey year.

Theta Θ Conditional occupancy - the probability a species is detected in a given sample pool conditional to the species being present in the reach for the survey year.

p-Individual species detection probability if present in a given sample pool.

PAO-Proportion of area occupied. (Psi * Theta) Overall occupancy value; incorporates reach-level- and pool-level occupancy for the entire sample frame in a given year

Coho salmon distribution

Coho observations in 2016 were concentrated in the Southern portion of the watershed, upstream of Thorn Junction (Table 3, Figure 2). Among the 11 GRTS drawn reaches where coho were detected, over 95% of the fish observed were in just four reaches: 308, 309, and 310 on the mainstem Mattole River, and reach 951 in Baker Creek, a tributary to the Mattole in reach 309. The only coho observations downstream of Thorn Junction/Bridge Creek, all judged to be non-natal rearing based on low numbers of coho and their distribution, were in mainstem reach 304, mainstem reach 284 near Pritchett Creek between Petrolia and Honeydew, and in the lower reaches of Fourmile Creek #715.

Table 3. Drainage area, length surveyed, # of units surveyed, and coho occupancy and Chinook presence by reach, 2015

| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|----------|-------------------------------|-------------------------------|---------------------|---------------------|-----------------------------|-------------------------|--------------------------|-----------------------------|------------------|
| 273 | Mattole River | 762.5 | 3990 | 12 | 0 | | | | X |
| 277 | Mattole River | 633.8 | 4699 | 4 | 0 | | | | x |
| 282 | Mattole River | 572.4 | 4602 | 6 | | | | | |
| 284 | Mattole River | 522.4 | 11580 | 10 | 1 | 1 | 1 | non-natal | x |
| 295 | Mattole River | 306.1 | 5118 | 0 | 0 | | | | |
| 304 | Mattole River | 126.1 | 3504 | 21 | 5 | 8 | 1.6 | non-natal | x |
| 307 | Mattole River | 79.4 | 5091 | 25 | 5 | 7 | 1.4 | non-natal | x |
| 308 | Mattole River | 52.3 | 6731 | 40 | 21 | 156 | 7.4 | natal | |
| 309 | Mattole River | 30.3 | 3513 | 32 | 26 | 195 | 7.5 | natal | |
| 310 | Mattole River | 9.3 | 2721 | 44 | 38 | 220 | 5.8 | natal | |
| 328 | Lower Mill Creek | 5.4 | 912 | 9 | 0 | | | | |
| 340 | Mattole Lower N. Fork | 97.6 | 1900 | 4 | 0 | | | | |
| 425 | East Mill Creek | 7.4 | 456 | 11 | 0 | | | | |
| 428 | East Mill Creek | 2.1 | 699 | 8 | 0 | | | | |
| 430 | East Mill Creek | 2.1 | 386 | 8 | 0 | | | | |
| 432 | East Mill Creek | 2.3 | 619 | 3 | 0 | | | | |
| 440 | Conklin Creek | 14.4 | 757 | 5 | 0 | | | | |
| 453 | McGinnis Creek | 15.6 | 3719 | 26 | 0 | | | | |
| 479 | Squaw Creek | 42.5 | 345 | 4 | 0 | | | | |
| 481 | Squaw Creek | 37.0 | 2590 | 18 | 0 | | | | |
| 544 | Granny Creek | 2.4 | 889 | 9 | 0 | | | | |
| 632 | Honeydew Creek | 33.8 | 2540 | 10 | 0 | | | | x |
| 641 | Honeydew Creek, Lower E. Fork | 13.5 | 579 | 4 | 0 | | | | |
| 678 | Dry Creek | 14.8 | 1385 | 11 | 0 | | | | |
| 715 | Fourmile Creek | 14.1 | 2072 | 17 | 2 | 2 | 1 | non-natal | |
| 718 | Fourmile Creek, N. Fork | 4.6 | 560 | 7 | 0 | | | | |
| 733 | Sholes Creek | 10.5 | 2268 | 21 | 0 | | | | |

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| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|---------------|---------------------------------|-------------------------------|---------------------|---------------------|-----------------------------|-------------------------|--------------------------|-----------------------------|------------------|
| 764 | Mattole Canyon Creek | 26.8 | 3050 | 15 | | | | | |
| 765 | Mattole Canyon Creek | 24.2 | 3218 | 25 | 0 | | | | |
| 770 | Panther Creek | 6.7 | 996 | 13 | 0 | | | | |
| 792 | Blue Slide Creek | 25.8 | 2163 | 23 | 0 | | | | |
| 796 | Crooked Prairie (Bick's) Creek | 2.4 | 245 | 1 | 0 | | | | |
| 819 | Bear Creek | 45.3 | 2177 | 5 | 0 | | | | |
| 823 | Bear Creek, S. Fork | 15.3 | 2986 | 29 | | | | | |
| 826 | Bear Creek, S. Fork | 6.7 | 2911 | 43 | 0 | | | | |
| 848 | Jewett Creek | 6.1 | 2177 | 26 | 0 | | | | |
| 858 | N. Fork Bear Creek | 13.4 | 3040 | 22 | 0 | | | | |
| 893 | Eubanks Creek | 3.8 | 1178 | 14 | 0 | | | | |
| 924 | McKee Creek | 5.4 | 915 | 12 | 0 | | | | x |
| 926 | Painter Creek | 1.6 | 70 | 3 | 0 | | | | |
| 937 | Anderson Creek | 1.8 | 755 | 19 | 0 | | | | |
| 938 | Ravishoni (East Anderson) Creek | 1.8 | 290 | 7 | 0 | | | | |
| 939 | Upper Mill Creek | 6.0 | 1170 | 22 | 2 | 5 | 2.5 | non-natal | |
| 951 | Baker Creek | 4.0 | 2501 | 69 | 42 | 258 | 6.1 | natal | |
| 956 | Thompson Creek | 9.5 | 2845 | 65 | 4 | 15 | 3.8 | non-natal | x |
| 957 | Thompson Creek | 2.3 | 1159 | 49 | 0 | | | | |
| 963 | Lost River | 5.1 | 1367 | 34 | 3 | 4 | 1.3 | non-natal | |
| 964 | Helen Barnum Creek | 1.6 | 583 | 10 | 0 | | | | |
| Totals | | | | 875 | 149 | 871 | | | |

Incidental Surveys – non-GRTS Reaches

| | | | | | | | | | |
|-----|---------------------|------|------|----|----|----|-----|-------|---|
| 311 | Mattole River | 5.8 | 1594 | 44 | 26 | 89 | 3.4 | natal | |
| 908 | Buck/Sinkyone Creek | 1.9 | 610 | 12 | 0 | | | | |
| 911 | Bridge Creek | 11.1 | 2400 | 14 | 0 | | | | x |
| 958 | Yew Creek | 2.4 | 657 | 13 | 11 | 59 | 5.4 | natal | |
| 972 | Ancestor Creek | 2.6 | 778 | 16 | 10 | 51 | 5.1 | natal | |

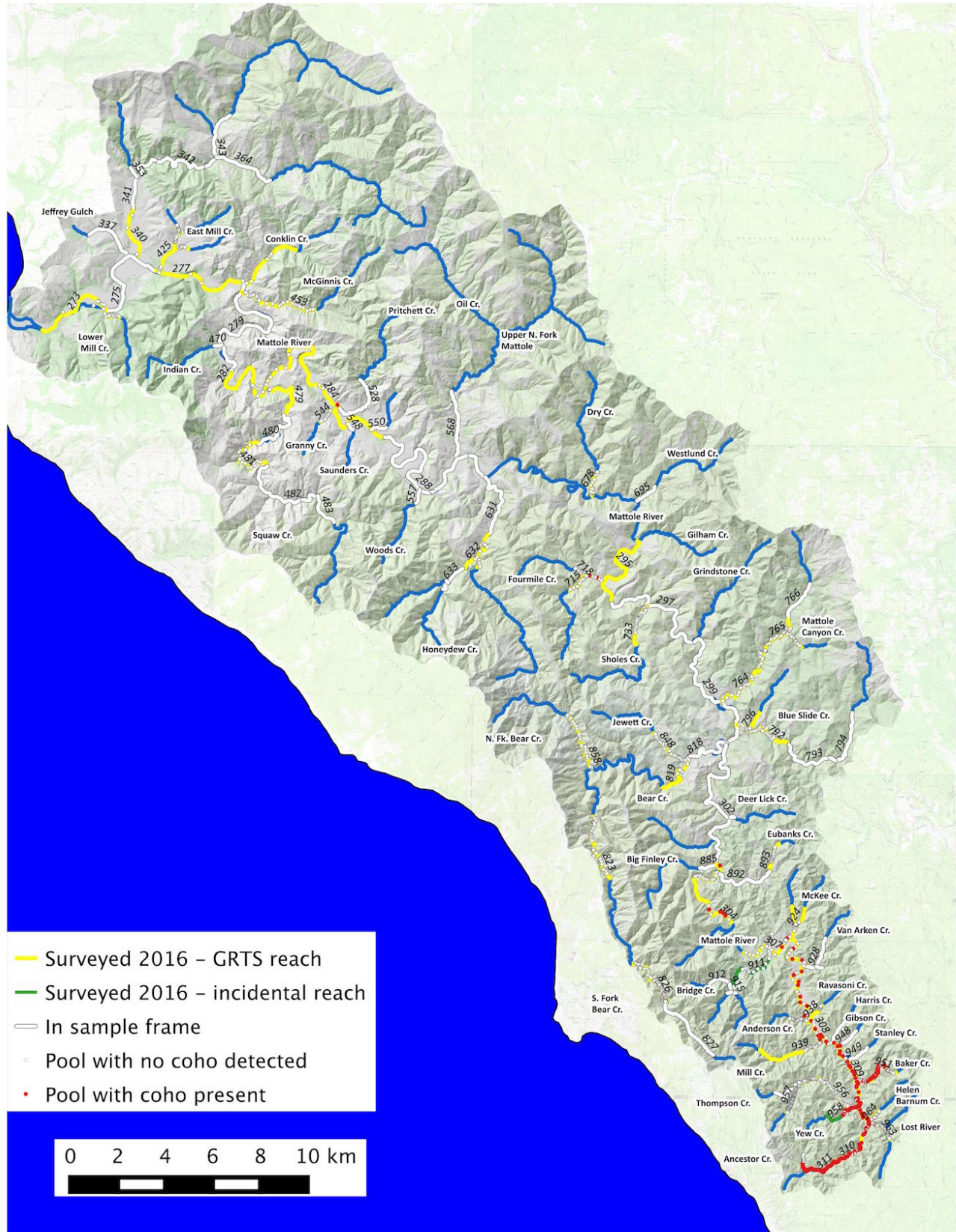


Figure 2. All pools surveyed and coho detections, 2016.

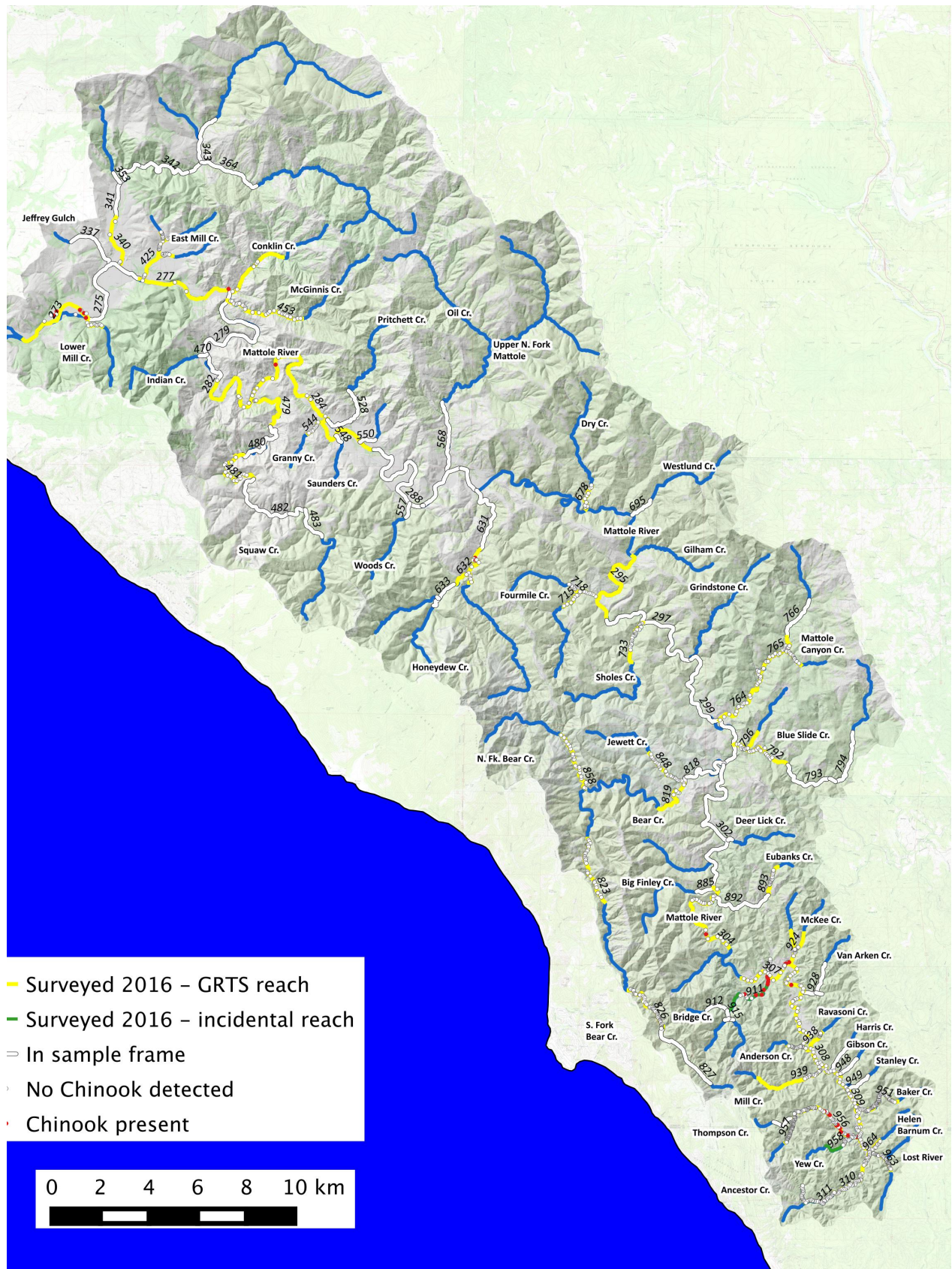


Figure 3. All pools surveyed and Chinook detections 2016.

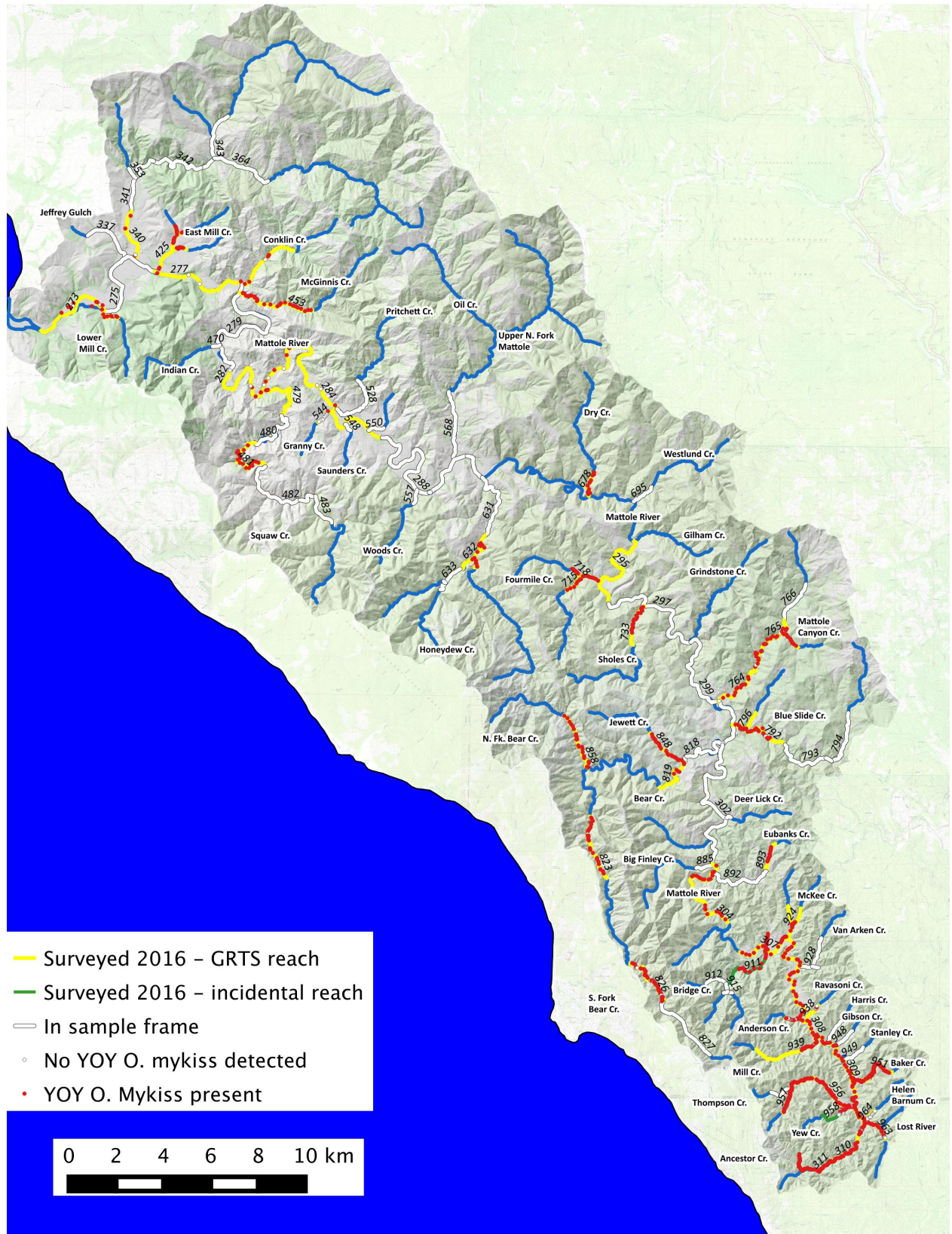


Figure 4. All pools surveyed and YOY trout detections, 2015.

Estimate of coho abundance

In 2016, the sum of all coho observed with 43% of the frame surveyed was 871, resulting in an abundance estimate of 4,060. In 2015 the sum of all coho observed was 1,615 (*Coho salmon distribution*

Coho observations in 2016 were concentrated in the Southern portion of the watershed, upstream of Thorn Junction (Table 3, Figure 2). Among the 11 GRTS drawn reaches where coho were detected, over 95% of the fish observed were in just four reaches: 308, 309, and 310 on the mainstem Mattole River, and reach 951 in Baker Creek, a tributary to the Mattole in reach 309. The only coho observations downstream of Thorn Junction/Bridge Creek, all judged to be non-natal rearing based on low numbers of coho and their distribution, were in mainstem reach 304, mainstem reach 284 near Pritchett Creek between Petrolia and Honeydew, and in the lower reaches of Fourmile Creek #715.

Table 3) with 51% of the total reach length in the sample frame surveyed, yielding a basin wide abundance estimate of 6,294 coho parr, compared to estimates of 2,851 and 3,072 in 2014 and 2013.

Other biological observations

Pacific lamprey redds, and live and dead adult lamprey were notably abundant during the survey period. Lamprey redds were recorded in 19 survey reaches, with a total of 1,406 individual redds counted. Mainstem reaches 307, 308, and 309, in the Whitethorn valley, accounted for 908 of these redds. Other streams/reaches with recorded lamprey activity were Mattole River 304 and 310, Squaw Creek 481. Honeydew Creek 632 and 641, Mattole Canyon Creek 764, 765, and 770; Blue Slide Creek 792, Bear Creek 819, South Fork Bear Creek 823 and 826, Jewett Creek 848, McKee Creek 924, Mill Creek 939, and Thompson Creek 956.

Red-legged frogs (*Rana aurora*) were documented in the south branch of East Mill Creek, reach # 428 (Figure 5). This is one of only a handful of confirmed sightings of this species in the Mattole watershed.



Figure 5. Red-legged Frog in East Mill Creek near Petrolia, September 9, 2016.

Other native species encountered including three-spine stickleback, Western pearlshell mussels, yellow-legged frogs, rough-skinned newts, and coastal giant salamander.

Non-native species were bullfrogs in reach 307 on the mainstem Mattole, and green sunfish in Mattole River reach 273, and Buck Creek reach 908, which enters the Mattole River within reach 307. Both bullfrogs and sunfish are known to occur in a private pond on Buck Creek, and have for many years. It is possible that a lack of slow-water winter habitat in streams and the mainstem Mattole has prevented their establishment and dispersal in the watershed, but their continued presence is a concern.

Discussion

Patterns of coho distribution and abundance in the Mattole watershed 2013-2016

From 2013-2016, 73 unique reaches were surveyed under this protocol (Table 4). Coho were detected at least once in 23 of the 73 reaches. Observations from all four years (2013-2016) of surveys completed using this protocol show that coho salmon distribution in the Mattole watershed is limited to less than 15% of the potentially suitable habitat. In all four years, the vast majority of coho have been concentrated within a core area in the southernmost portion of the watershed, upstream of Bridge Creek and the town of Thorn Junction. Within this area (which is 10% of the entire Mattole watershed), there were 11 stream reaches where coho were detected in multiple years, but only 3 stream reaches where more than 100 individuals were tallied in multiple years, in mainstem reaches 308 and 309 (between Van Arken Creek and Lost River), and Baker Creek #951 (Figure 2,

Figure 6, Figure 7, Table 4). Just seven reaches – 308, 309, 951, and mainstem reaches 310, 311, Ancestor Creek 972, and Thompson Creek 956 – contained over 93% of all the coho observed in the four years of surveys. Current coho spawning and rearing is disproportionately concentrated in a very small area of the Mattole watershed. These results are also broadly similar to conclusions drawn from all other surveys conducted in the Mattole for coho juveniles from ~1995-2012 (See appendix E for compilation of survey data).

Having four years of data allows for the comparison of distribution and abundance among a brood year, since fish observed in 2016 were likely the progeny of those observed in 2013. PAO in 2016 was marginally lower (0.11) than in 2013 (0.13), although our simple estimate of watershed-wide “abundance” was higher in 2016 (4,060 vs. 3,072). However, the 2013 total is likely skewed low by the fact that in 2013 the sample reach draw did not include any of the mainstem Mattole reaches 308-311, nor Baker Creek, and incidental dives in these reaches showed some of the highest coho counts in the watershed that year. Perhaps most concerning is the apparent absence of coho spawning in Thompson Creek in 2016 (as well as 2014 and 2015). Thompson was previously considered a coho stronghold in the Mattole, but since 2013, only a few coho juveniles have been observed in the first few pools of Thompson, likely non-natal fish from the mainstem Mattole.

Streamflow and differences in distribution among years

Despite the broad similarities among years, there were some notable differences in distribution. In 2014, juvenile distribution appeared to be strongly influenced by the limited ability of spawning adults to access the upper watershed the previous winter due to very low flows until mid-February 2014. Coho presence in Bear Creek reaches 818 and 819, and in the Mattole River between Big Finley Creek and Ettersburg (reach 302) (Figure 7) was likely primarily a product of spawning within those reaches by fish that were blocked from upstream migration by low flow.

In 2013, 2015, and 2016, winter rainfall was average or greater, and based on juvenile distribution it appeared that spawning coho were generally able to access preferred habitat. In 2015, juvenile distribution was the most restricted among all years, with a PAO of 0.08, and no coho observed downstream of Bridge Creek (Figure 8) despite the greatest survey effort among all years. In contrast, in 2013 and 2016 a handful of non-natal rearing fish were seen throughout the watershed (Figure 2, Figure 6). In 2015, mean and median pool counts of coho were also the highest among all years. It appeared that parr dispersed much less in this year than in the others.

The most likely reasons for more or less dispersal among years would seem to be density of parr, with higher densities encouraging greater dispersal due to competition, and stormflows displacing and dispersing juveniles – as well as synergistic interaction among those two factors. In 2015, spring flows (within the period fry would be likely to have emerged from the gravel) were very low, with only a single brief flow event above median flow (Figure 9). In 2016 spring flows were much higher, with several very large events. 2013 was more similar to 2015, although with an extended period in April with small stormflows that may have been sufficient to push more fish out of their natal reaches.

With additional years of distribution data we may be able to come to stronger conclusions about the interaction between flow and downstream dispersal. The distribution of coho in the mainstem in reaches 308, 307, and 304, downstream of the core spawning and rearing areas, is of particular interest. In 2016, in reach 304 we were surprised to find multiple pools with multiple coho that appeared to be in good condition in mid-September. Temperatures in this reach have been considered to be too high for successful oversummer rearing, with previously measured MWATs of up to 21 C, but these fish were apparently able to find suitable thermal microclimates or ingest sufficient food to survive in these temperatures.

What does juvenile coho distribution indicate about restoration priorities?

Analysis of coho presence with habitat data from 2013-2015 showed that reaches and units with coho present had greater cover, cover area, LWD, and unit depth than reaches and units where coho were absent (Queener 2015), in line with broadly accepted ideas about what constitutes good coho rearing habitat. Accordingly, continuing efforts to increase the abundance of LWD, the primary agent of habitat complexity and cover, seem appropriate.

However, there are also streams and reaches with apparently suitable habitat that are not utilized or under-utilized by coho. The most glaring example is Thompson Creek, which has (in large part due to LWD placement projects) the highest cover rating and greatest incidence of LWD among all reaches surveyed in the past four years, as well as suitable temperatures and relatively robust summer flow. The absence of coho spawning in this stream the last three years seems to indicate further decline of the Mattole coho population to a critical level, and raises doubts about the ability of habitat restoration alone, especially solely in spawning reaches, to recover the population. The overall low numbers of coho, coupled with their absence from this seemingly prime habitat, seem to support the idea that the deleterious genetic effects unavoidable in a very small population may be a primary constraint on recovery.

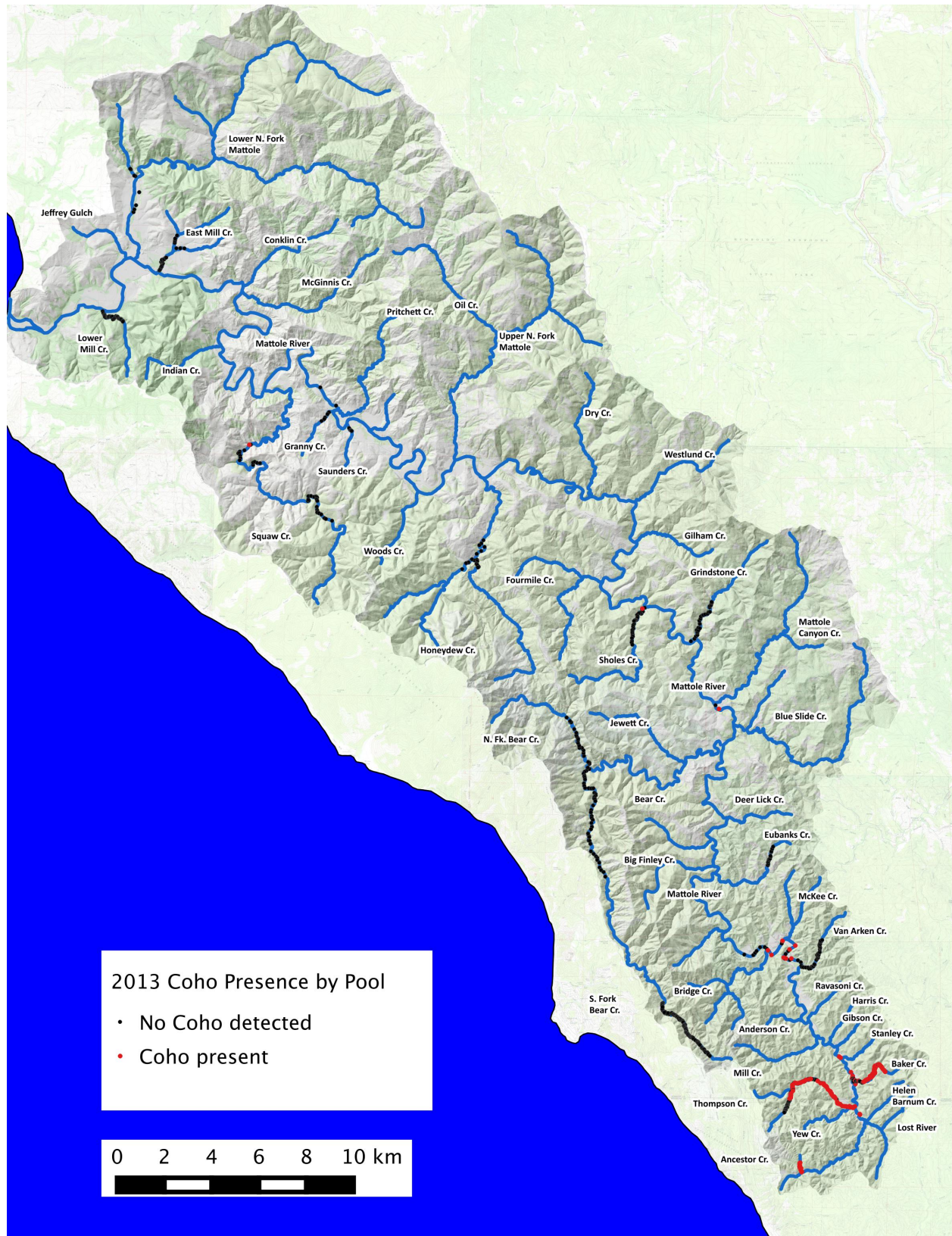


Figure 6. All pools surveyed and coho detections in 2013. This map shows both GRTS-drawn and incidental reaches.



Figure 8. All pools surveyed and coho detections in 2015. This map shows both GRTS-drawn and incidental reaches.

Table 4. Comparison of total coho counts by reach and year, 2013-2016.

| Reach ID | Stream Name | 2013 | 2014 | 2015 | 2016 |
|----------|-------------------------------|-------|------|------|------|
| 273 | Mattole River | | 0 | 0 | 0 |
| 275 | Mattole River | | 1* | 0 | |
| 277 | Mattole River | | 0 | 0 | 0 |
| 282 | Mattole River | | 0 | | |
| 284 | Mattole River | 0 | | 0 | 1 |
| 288 | Mattole River | | 0 | 0 | |
| 291 | Mattole River | 0 | 0 | 0 | |
| 293 | Mattole River | | 0 | 0 | |
| 295 | Mattole River | | 0 | | 0 |
| 297 | Mattole River | 0 | | 0 | |
| 299 | Mattole River | 1 | | 0 | |
| 302 | Mattole River | 3** | 24 | | |
| 304 | Mattole River | | 3** | 0 | 8 |
| 307 | Mattole River | 10 | 2** | 6 | 7 |
| 308 | Mattole River | 86** | 32 | 175 | 156 |
| 309 | Mattole River | 150** | 290 | 925 | 195 |
| 310 | Mattole River | | 1 | 72 | 220 |
| 311 | Mattole River | | 14 | 367 | 89 |
| 328 | Lower Mill Creek | 0 | 0 | 0 | 0 |
| 340 | Lower N. Fork Mattole | | 0 | 0 | 0 |
| 341 | Lower N. Fork Mattole | 0 | | | |
| 353 | Grizzly Creek | 0 | | | |
| 425 | East Mill Creek | 0 | | 0 | 0 |
| 428 | South Branch, East Mill Creek | 0 | | | 0 |
| 430 | East Mill Creek | | | | 0 |
| 432 | East Mill Creek | | | | 0 |
| 440 | Conklin Creek | | | | 0 |
| 453 | McGinnis Creek | | 1 | | 0 |
| 479 | Squaw Creek | | | | 0 |
| 481 | Squaw Creek | 3 | | | 0 |

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| Reach ID | Stream Name | 2013 | 2014 | 2015 | 2016 |
|----------|---------------------------|------|------|------|------|
| 483 | Squaw Creek | 0 | | 0 | |
| 544 | Granny Creek | 0 | | 0 | 0 |
| 548 | Saunders Creek | 0 | | | |
| 557 | Woods Creek | | 0 | 0 | |
| 632 | Honeydew Creek | 0 | | 0 | 0 |
| 633 | Honeydew Creek | | 0 | 0 | |
| 641 | Honeydew Creek, East Fork | 0 | | 0 | 0 |
| 646 | Honeydew Creek, West Fork | | | 0 | |
| 715 | Fourmile Creek | | 0 | 0 | 2 |
| 718 | Fourmile Creek, N. Fork | | 0 | 0 | 0 |
| 733 | Sholes Creek | 1 | | 0 | 0 |
| 764 | Mattole Canyon Creek | | 0 | | 0 |
| 765 | Mattole Canyon Creek | | 0 | 0 | 0 |
| 770 | Panther Creek | | | 0 | 0 |
| 792 | Blue Slide Creek | | | 0 | 0 |
| 796 | Crooked Prairie Creek | | | 0 | 0 |
| 818 | Bear Creek | | 46 | 0 | |
| 819 | Bear Creek | | 7 | 0 | 0 |
| 823 | Bear Creek, S. Fork | 0 | | | 0 |
| 824 | Bear Creek, S. Fork | | 0 | | |
| 825 | Bear Creek, S. Fork | | 0 | 0 | |
| 826 | Bear Creek, S. Fork | | 0 | 0 | 0 |
| 827 | Bear Creek, S. Fork | 0 | | 0 | |
| 848 | Jewett Creek | | 0 | 0 | 0 |
| 858 | Bear Creek, N. Fork | 0 | | 0 | 0 |
| 885 | Big Finley Creek | | 0 | | |
| 892 | Eubanks Creek | | 0 | 0 | |
| 893 | Eubanks Creek | 0 | | | 0 |
| 911 | Bridge Creek | | 1 | | 0 |
| 924 | McKee Creek | | 0 | 0 | 0 |
| 926 | Painter Creek | | | | 0 |
| 928 | Van Arken Creek | 0 | | 0 | |

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| Reach ID | Stream Name | 2013 | 2014 | 2015 | 2016 |
|----------|--------------------|------|------|------|------|
| 937 | Anderson Creek | | 0 | 0 | 0 |
| 938 | Ravishoni Creek | | 0 | | 0 |
| 939 | Upper Mill Creek | | 1 | 2 | 5 |
| 947 | Harris Creek | | 0 | 0 | |
| 951 | Baker Creek | 717 | 228 | 30 | 258 |
| 956 | Thompson Creek | 249 | 20 | 5 | 15 |
| 957 | Thompson Creek | 10 | | 0 | 0 |
| 958 | Yew Creek | | 10 | | 59 |
| 963 | Lost River | | 0 | 93 | 4 |
| 964 | Helen Barnum Creek | | 0 | 0 | 0 |
| 972 | Ancestor Creek | 213 | 9 | 37 | 51 |

*Coho seen outside of sample unit

**Reach not surveyed using spatial structure protocol, total shown from MSG Summer Steelhead Dive

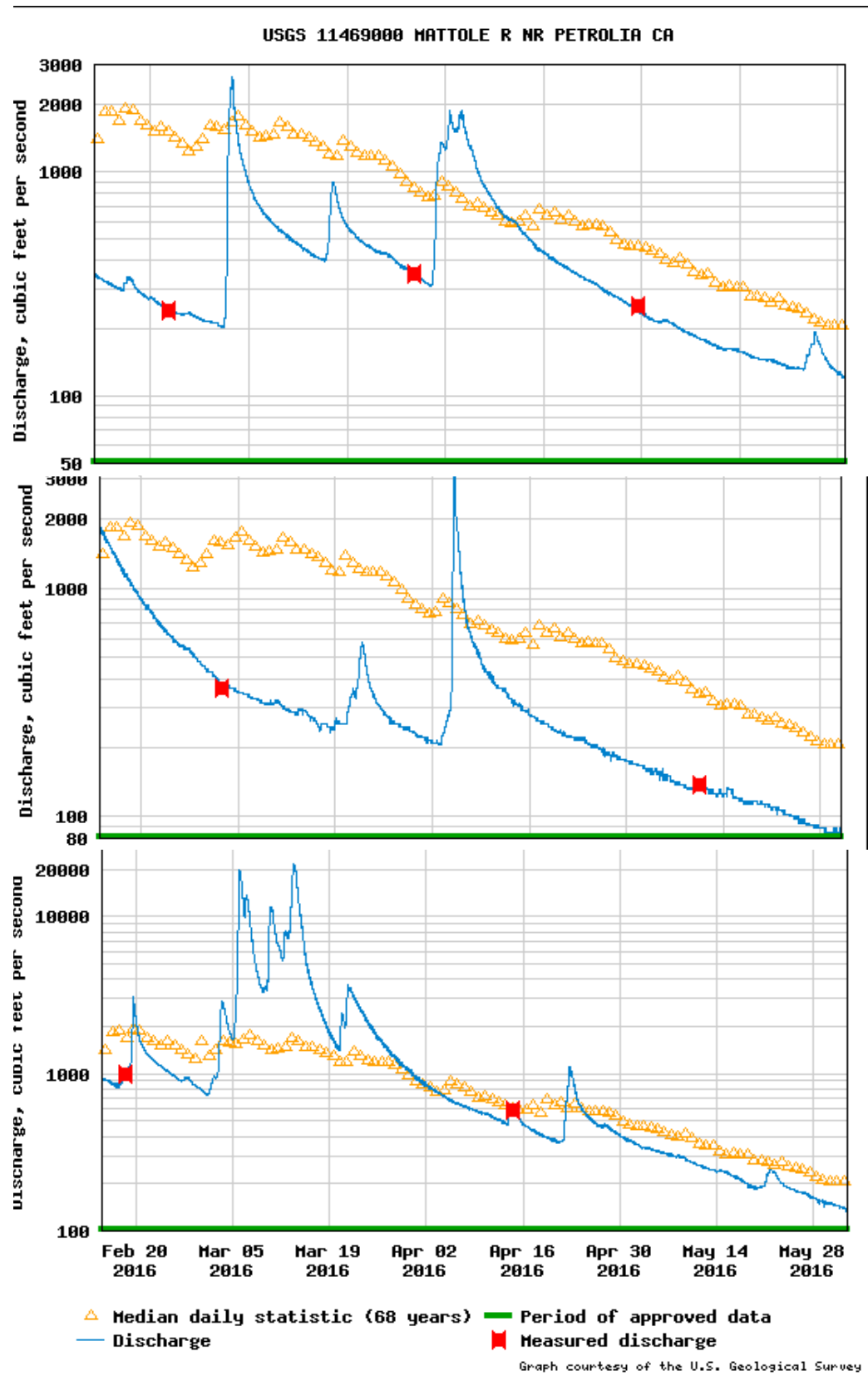


Figure 9. Mattole River streamflow at the Petrolia USGS gage from February 15 to May 31 for (from top) 2013, 2015, and 2016. Note order of magnitude difference on y-axis for 2016.

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Appendix A – Summary of Chinook and *O. mykiss* counts by reach, 2017

| Reach ID | Stream | # of pools surveyed | Total # Chinook observed | Chinook per pool | Mean # of Chinook per pool | Total # YOY Trout Observed | Mean # of YOY Trout per pool | Total # 1+ Trout Observed | Mean # of 1+ Trout per pool |
|----------|---------------------------------|---------------------|--------------------------|------------------|----------------------------|----------------------------|------------------------------|---------------------------|-----------------------------|
| 273 | Mattole River | 12 | 23 | 4.6 | 4.6 | 374 | 37.4 | 185 | 26.4 |
| 277 | Mattole River | 4 | 4 | 4.0 | 4.0 | 148 | 74.0 | 17 | 8.5 |
| 282 | Mattole River | 6 | 0 | 0.0 | 0.0 | 17 | 4.3 | 4 | 2.0 |
| 284 | Mattole River | 10 | 1 | 1.0 | 1.0 | 40 | 8.0 | 6 | 3.0 |
| 304 | Mattole River | 21 | 7 | 7.0 | 7.0 | 1128 | 53.7 | 63 | 3.5 |
| 307 | Mattole River | 25 | 5 | 2.5 | 2.5 | 1538 | 61.5 | 74 | 4.1 |
| 308 | Mattole River | 40 | 0 | 0.0 | 0.0 | 2988 | 76.6 | 150 | 4.4 |
| 309 | Mattole River | 32 | 0 | 0.0 | 0.0 | 1677 | 54.1 | 62 | 4.1 |
| 310 | Mattole River | 44 | 0 | 0.0 | 0.0 | 1170 | 27.2 | 96 | 2.8 |
| 311 | Mattole River | 26 | 0 | 0.0 | 0.0 | 274 | 10.5 | 24 | 1.6 |
| 328 | Lower Mill Creek | 9 | 0 | 0.0 | 0.0 | 100 | 12.5 | 18 | 2.6 |
| 340 | Lower North Fork Mattole River | 4 | 0 | 0.0 | 0.0 | 32 | 10.7 | 2 | 2.0 |
| 425 | East Mill Creek | 11 | 0 | 0.0 | 0.0 | 143 | 14.3 | 11 | 1.8 |
| 428 | East Mill Creek, South Branch | 8 | 0 | 0.0 | 0.0 | 42 | 5.3 | 5 | 2.5 |
| 430 | East Mill Creek, West Branch | 8 | 0 | 0.0 | 0.0 | 26 | 3.3 | 0 | 0.0 |
| 432 | East Mill Creek, East Branch | 3 | 0 | 0.0 | 0.0 | 10 | 3.3 | 1 | 1.0 |
| 440 | Conklin Creek | 5 | 0 | 0.0 | 0.0 | 29 | 7.3 | 5 | 2.5 |
| 453 | McGinnis Creek | 28 | 0 | 0.0 | 0.0 | 728 | 28.0 | 34 | 2.0 |
| 479 | Squaw Creek | 4 | 0 | 0.0 | 0.0 | 35 | 8.8 | 4 | 1.3 |
| 481 | Squaw Creek | 18 | 0 | 0.0 | 0.0 | 768 | 42.7 | 71 | 4.4 |
| 544 | Granny Creek | 9 | 0 | 0.0 | 0.0 | 5 | 5.0 | 9 | 9.0 |
| 632 | Honeydew Creek | 10 | 2 | 1.0 | 1.0 | 302 | 30.2 | 45 | 6.4 |
| 641 | Honeydew Creek, Lower East Fork | 4 | 0 | 0.0 | 0.0 | 111 | 27.8 | 6 | 2.0 |
| 678 | Dry Creek | 11 | 0 | 0.0 | 0.0 | 155 | 14.1 | 23 | 2.6 |
| 715 | Fourmile Creek | 17 | 0 | 0.0 | 0.0 | 661 | 38.9 | 65 | 4.6 |
| 718 | Fourmile Creek, North Fork | 7 | 0 | 0.0 | 0.0 | 50 | 7.1 | 6 | 1.5 |

Appendix A – Summary of Chinook and *O. mykiss* counts by reach, 2017

| Reach ID | Stream | # of pools surveyed | Total # Chinook observed | Chinook per pool | Mean # of Chinook per pool | Total # YOY Trout Observed | Mean # of YOY Trout per pool | Total # 1+Trout Observed | Mean # of 1+ Trout per pool |
|----------|------------------------|---------------------|--------------------------|------------------|----------------------------|----------------------------|------------------------------|--------------------------|-----------------------------|
| 733 | Sholes Creek | 21 | 0 | 0.0 | 0.0 | 336 | 16.0 | 39 | 3.5 |
| 764 | Mattole Canyon Creek | 15 | 0 | 0.0 | 0.0 | 60 | 4.6 | 7 | 1.2 |
| 765 | Mattole Canyon Creek | 25 | 0 | 0.0 | 0.0 | 420 | 18.3 | 19 | 1.9 |
| 770 | Panther Creek | 13 | 0 | 0.0 | 0.0 | 133 | 10.2 | 9 | 1.8 |
| 792 | Blue Slide Creek | 23 | 0 | 0.0 | 0.0 | 196 | 8.9 | 14 | 1.4 |
| 796 | Crooked Prairie Creek | 1 | 0 | 0.0 | 0.0 | 3 | 3.0 | 0 | 0.0 |
| 819 | Bear Creek | 5 | 0 | 0.0 | 0.0 | 40 | 8.0 | 2 | 2.0 |
| 823 | Bear Creek, South Fork | 29 | 0 | 0.0 | 0.0 | 427 | 15.3 | 76 | 2.9 |
| 826 | Bear Creek, South Fork | 43 | 0 | 0.0 | 0.0 | 368 | 9.4 | 96 | 2.8 |
| 848 | Jewett Creek | 26 | 0 | 0.0 | 0.0 | 468 | 18.0 | 28 | 2.3 |
| 858 | Bear Creek, North Fork | 22 | 0 | 0.0 | 0.0 | 464 | 21.1 | 101 | 5.1 |
| 893 | Eubanks Creek | 14 | 0 | 0.0 | 0.0 | 164 | 11.7 | 11 | 1.8 |
| 908 | Buck/Sinkyone Creek | 12 | 0 | 0.0 | 0.0 | 85 | 7.1 | 32 | 3.6 |
| 911 | Bridge Creek | 14 | 25 | 2.8 | 2.8 | 279 | 19.9 | 24 | 2.2 |
| 924 | McKee Creek | 12 | 2 | 2.0 | 2.0 | 133 | 11.1 | 8 | 2.0 |
| 926 | Painter Creek | 3 | 0 | 0.0 | 0.0 | 19 | 6.3 | 9 | 9.0 |
| 937 | Anderson Creek | 19 | 0 | 0.0 | 0.0 | 30 | 2.3 | 10 | 1.1 |
| 938 | Ravishoni Creek | 7 | 0 | 0.0 | 0.0 | 5 | 1.7 | 4 | 1.3 |
| 939 | Mill Creek | 22 | 0 | 0.0 | 0.0 | 541 | 27.1 | 58 | 3.4 |
| 951 | Baker Creek | 69 | 0 | 0.0 | 0.0 | 550 | 8.1 | 41 | 2.6 |
| 956 | Thompson Creek | 67 | 16 | 1.6 | 1.6 | 787 | 13.1 | 141 | 2.8 |
| 957 | Thompson Creek | 49 | 0 | 0.0 | 0.0 | 558 | 11.6 | 81 | 2.6 |
| 958 | Yew Creek | 13 | 0 | 0.0 | 0.0 | 61 | 6.1 | 17 | 1.7 |
| 963 | Lost River | 34 | 0 | 0.0 | 0.0 | 262 | 8.5 | 29 | 2.2 |
| 964 | Helen Barnum Creek | 10 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 972 | Ancestor Creek | 16 | 0 | 0.0 | 0.0 | 84 | 5.3 | 9 | 1.5 |

Appendix B – Drainage area, length surveyed, # of units surveyed, and coho occupancy and Chinook presence by reach, 2013

| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed ** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|----------|-------------------------------|-------------------------------|---------------------|---------------------|-----------------------------|--------------------------|--------------------------|-----------------------------|------------------|
| 279 | Mattole River | 616.6 | 8084 | 0 | --- | --- | --- | | |
| 284 | Mattole River | 522.4 | 10821 | 2 | 0 | 0 | --- | | yes |
| 292 | Mattole River | 357.1 | 9421 | 0 | --- | --- | --- | | |
| 299 | Mattole River | 261.9 | 10733 | 2 | 1 | 1 | 1 | non-natal | |
| 307 | Mattole River | 79.4 | 4867 | 24 | 8 | 10 | 1.3 | non-natal | yes |
| 341 | Lower N. Fork Mattole | 94.9 | 2152 | 4 | 0 | 0 | --- | | |
| 353 | Grizzly Creek | 5.4 | 520 | 4 | 0 | 0 | --- | | |
| 425 | East Mill Creek | 7.4 | 1238 | 23 | 0 | 0 | --- | | |
| 428 | East Mill Creek, S. Branch | 2.1 | 794 | 3 | 0 | 0 | --- | | |
| 481 | Squaw Creek | 37.0 | 2130 | 14 | 1 | 3 | 3 | natal | yes |
| 483 | Squaw Creek | 18.9 | 2417 | 21 | 0 | 0 | --- | | |
| 544 | Granny Creek | 2.4 | 914 | 5 | 0 | 0 | --- | | yes |
| 548 | Saunders Creek | 2.2 | 311 | 5 | 0 | 0 | --- | | yes |
| 632 | Honeydew Creek | 33.8 | 2539 | 11 | 0 | 0 | --- | | yes |
| 641 | Honeydew Creek, Lower E. Fork | 13.5 | 583 | 7 | 0 | 0 | --- | | |
| 733 | Sholes Creek | 10.5 | 2270 | 31 | 1 | 1 | 1 | non-natal | yes |
| 749 | Grindstone Creek | 9.9 | 2370 | 26 | 0 | 0 | --- | | |
| 822 | S. Fork Bear Creek | 22 | 2758 | 26 | 0 | 0 | --- | | yes |
| 823 | S. Fork Bear Creek | 15.3 | 2986 | 22 | 0 | 0 | --- | | yes |
| 827 | S. Fork Bear Creek | 4.0 | 3522 | 102 | 7 | 20 | 2.9 | non-natal* | |
| 858 | N. Fork Bear Creek | 13.4 | 2990 | 21 | 0 | 0 | --- | | |
| 893 | Eubanks Creek | 3.8 | 1178 | 14 | 0 | 0 | --- | | |
| 928 | Van Arken Creek | 5.2 | 1926 | 35 | 0 | 0 | --- | | |
| 956 | Thompson Creek | 9.5 | 3565 | 79 | 53 | 249 | 4.7 | natal | yes |
| 957 | Thompson Creek | 2.3 | 1120 | 46 | 8 | 10 | 1.3 | natal | yes |
| 972 | Ancestor Creek | 2.6 | 449 | 18 | 18 | 213 | 11.8 | natal | |
| Totals | | | | 545 | 97 | 507 | | | |

*Coho observed in reach #827 were relocated there from Baker Creek due to de-watering associated with a restoration project.

**In double-dive pass units, the maximum count was used.

Appendix D – Drainage area, length surveyed, # of units surveyed, and coho occupancy and Chinook presence by reach, 2015

| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|----------|-------------------------|-------------------------------|---------------------|---------------------|-----------------------------|-------------------------|--------------------------|-----------------------------|------------------|
| 273 | Mattole River | 762.5 | 3990 | 11 | 0 | 0 | | | yes |
| 275 | Mattole River | 748.0 | 4701 | 10 | 0 | 0 | | | yes |
| 277 | Mattole River | 633.8 | 4609 | 5 | 0 | 0 | | | yes |
| 282 | Mattole River | 572.4 | 4192 | 2 | 0 | 0 | | | yes |
| 288 | Mattole River | 490.4 | 10534 | 13 | 0 | 0 | | | |
| 302 | Mattole River | 126.1 | 8549 | 10 | 4 | 24 | 6.0 | natal? | yes |
| 308 | Mattole River | 52.3 | 6351 | 41 | 12 | 32 | 2.7 | non-natal | |
| 309 | Mattole River | 30.3 | 3828 | 34 | 26 | 290 | 11.2 | natal | |
| 310 | Mattole River | 9.3 | 2430 | 43 | 1 | 1 | 1.0 | *natal | |
| 311 | Mattole River | 5.8 | 2013 | 27 | 9 | 14 | 1.6 | *natal | |
| 328 | Lower Mill Creek | 5.4 | 1152 | 36 | 0 | 0 | | | |
| 340 | Lower N. Fork Mattole | 97.6 | 1900 | 5 | 0 | 0 | | | |
| 453 | McGinnis Creek | 15.6 | 2516 | 18 | 1 | 1 | 1.0 | non-natal | |
| 557 | Woods Creek | 5.1 | 180 | 1 | 0 | 0 | | | |
| 633 | Honeydew Creek | 17.9 | 1528 | 12 | 0 | 0 | | | |
| 715 | Fourmile Creek | 14.1 | 2067 | 13 | 0 | 0 | | | |
| 718 | Fourmile Creek, N. Fork | 4.6 | 614 | 8 | 0 | 0 | | | |
| 764 | Mattole Canyon Creek | 26.8 | 490 | 4 | 0 | 0 | | | |
| 765 | Mattole Canyon Creek | 24.2 | 2868 | 31 | 0 | 0 | | | |
| 818 | Bear Creek | 55.4 | 3392 | 10 | 5 | 46 | 9.2 | natal | |
| 819 | Bear Creek | 45.3 | 2154 | 9 | 4 | 7 | 1.8 | natal | yes |
| 824 | Bear Creek, S. Fork | 11.9 | 2795 | 27 | 0 | 0 | | | |
| 825 | Bear Creek, S. Fork | 9.1 | 1323 | 17 | 0 | 0 | | | |
| 826 | Bear Creek, S. Fork | 6.7 | 2717 | 32 | 0 | 0 | | | |
| 848 | Jewett Creek | 6.1 | 2135 | 17 | 0 | 0 | | | |
| 885 | Big Finley Creek | 8.2 | 638 | 5 | 0 | 0 | | | |
| 892 | Eubanks Creek | 8.9 | 1500 | 30 | 0 | 0 | | | |
| 911 | Bridge Creek | 11.1 | 2400 | 18 | 1 | 1 | 1.0 | non-natal | |
| 924 | McKee Creek | 5.4 | 970 | 15 | 0 | 0 | | | |
| 925 | McKee Creek | 2.4 | 217 | 8 | 0 | 0 | | | |
| 937 | Anderson Creek | 1.8 | 732 | 20 | 0 | 0 | | | |
| 938 | Ravishoni (E. Anderson) | 1.8 | 290 | 4 | 0 | 0 | | | |
| 939 | Upper Mill Creek | 6 | 1598 | 30 | 1 | 1 | 1.0 | non-natal | |
| 947 | Harris Creek | 2.5 | 480 | 13 | 0 | 0 | | | |
| 951 | Baker Creek | 4 | 2359 | 73 | 27 | 228 | 8.4 | natal | |
| 958 | Yew Creek | 2.4 | 1565 | 35 | 4 | 10 | 2.5 | natal | |
| 963 | Lost River | 5.1 | 1300 | 28 | 0 | 0 | | | |
| 964 | Helen Barnum Creek | 1.6 | 557 | 17 | 0 | 0 | | | |
| 965 | Lost River, S. Fork | 1.8 | 502 | 17 | 0 | 0 | | | |
| Totals | | | | 749 | 95 | 655 | | | |

*Coho observed in reach #'s 310 and 311 were exclusively 1+ fish, as were 84 of the coho observed in reach #951.

**In double-dive pass units, the maximum count was used.

Appendix D – Drainage area, length surveyed, # of units surveyed, and coho occupancy and Chinook presence by reach, 2015

Table 5

| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|----------|-----------------------------------|-------------------------------|---------------------|---------------------|-----------------------------|-------------------------|--------------------------|-----------------------------|------------------|
| 273 | Mattole River | 762.5 | 3990 | 25 | 0 | | | | X |
| 275 | Mattole River | 748 | 5237 | 8 | 0 | | | | x |
| 277 | Mattole River | 633.8 | 4699 | 10 | 0 | | | | x |
| 279 | Mattole River | 616.6 | 8288 | 9 | 0 | | | | |
| 284 | Mattole River | 522.4 | 11580 | 10 | 0 | | | | |
| 288 | Mattole River | 490.4 | 11251 | 13 | 0 | | | | x |
| 291 | Mattole River | 357.11 | 6883 | 0 | 0 | | | | |
| 297 | Mattole River | 277.7 | 6384 | 2 | 0 | | | | |
| 299 | Mattole River | 254.9 | 7290 | 4 | 0 | | | | x |
| 304 | Mattole River | 126.1 | 2504 | 20 | 0 | | | | x |
| 307 | Mattole River | 79.4 | 5091 | 24 | 4 | 6 | 1.5 | non-natal | x |
| 308 | Mattole River | 52.3 | 6731 | 42 | 25 | 175 | 7.0 | natal | x |
| 309 | Mattole River | 30.3 | 3513 | 32 | 29 | 925 | 31.9 | natal | x |
| 311 | Mattole River | 5.8 | 1594 | 44 | 37 | 367 | 9.9 | natal | x |
| 328 | Lower Mill Creek | 5.4 | 912 | 22 | 0 | | | | |
| 340 | Lower N. Fork Mattole | 97.6 | 1900 | 5 | 0 | | | | |
| 425 | East Mill Creek | 7.4 | 456 | 4 | 0 | | | | |
| 440 | Conklin Creek | 14.4 | 757 | 3 | 0 | | | | |
| 483 | Squaw Creek | 18.9 | 2618 | 20 | 0 | | | | |
| 544 | Granny Creek | 2.4 | 889 | 2 | 0 | | | | x |
| 557 | Woods Creek | 5.1 | 180 | 1 | 0 | | | | |
| 631 | Honeydew Creek | 44.3 | 946 | 6 | 0 | | | | |
| 632 | Honeydew Creek | 33.8 | 2540 | 8 | 0 | | | | |
| 633 | Honeydew Creek | 17.9 | 1465 | 8 | 0 | | | | |
| 641 | Honeydew Creek, Lower E. Fork | 13.5 | 579 | 6 | 0 | | | | |
| 646 | West Fork Honeydew Creek | 5.9 | 115 | 2 | 0 | | | | |
| 678 | Dry Creek | 14.8 | 1385 | 12 | 0 | | | | |
| 715 | Fourmile Creek | 14.1 | 2072 | 17 | 0 | | | | |
| 718 | Fourmile Creek, N. Fork | 4.6 | 560 | 7 | 0 | | | | |
| 733 | Sholes Creek | 10.5 | 2268 | 26 | 0 | | | | x |
| 765 | Mattole Canyon Creek | 24.2 | 3218 | 22 | 0 | | | | |
| 770 | Panther Creek | 6.7 | 996 | 7 | 0 | | | | |
| 792 | Blue Slide Creek | 25.8 | 1934 | 15 | 0 | | | | |
| 796 | Crooked Prairie (Bick's) Creek | 2.4 | 245 | 1 | 0 | | | | |
| 818 | Bear Creek | 55.4 | 3114 | 16 | 0 | | | | x |
| 819 | Bear Creek | 45.3 | 2177 | 11 | 0 | | | | |
| 825 | Bear Creek, S. | 9.1 | 1981 | 17 | 0 | | | | |

Appendix D – Drainage area, length surveyed, # of units surveyed, and coho occupancy and Chinook presence by reach, 2015

| Reach ID | Stream Name | Drainage area km ² | Length surveyed (m) | # of units in reach | # of units occupied by coho | Total # coho observed** | Mean coho count per pool | Suspected coho rearing type | Chinook presence |
|----------------------------------------------|----------------------------|-------------------------------|---------------------|---------------------|-----------------------------|-------------------------|--------------------------|-----------------------------|------------------|
| | Fork | | | | | | | | |
| 826 | Bear Creek, S. Fork | 6.7 | 2911 | 40 | 0 | | | | |
| 827 | S. Fork Bear Creek | 4 | 3477 | 90 | 0 | | | | |
| 848 | Jewett Creek | 6.1 | 2177 | 20 | 0 | | | | x |
| 858 | N. Fork Bear Creek | 13.4 | 3040 | 23 | 0 | | | | |
| 892 | Eubanks Creek | 8.9 | 1500 | 18 | 0 | | | | |
| 924 | McKee Creek | 5.4 | 1405 | 28 | 0 | | | | |
| 928 | Van Arken Creek | 5.2 | 1967 | 41 | 0 | | | | |
| 930 | South Fork Van Arken Creek | 1.5 | 289 | 6 | 0 | | | | |
| 937 | Anderson Creek | 1.8 | 755 | 12 | 0 | | | | |
| 939 | Upper Mill Creek | 6 | 731 | 15 | 2 | 2 | 1.0 | non-natal | |
| 947 | Harris Creek | 2.5 | 667 | 20 | 0 | | | | |
| 957 | Thompson Creek | 2.3 | 1159 | 49 | 0 | | | | |
| 963 | Lost River | 5.1 | 1367 | 34 | 12 | 93 | 7.8 | natal | x |
| 964 | Helen Barnum Creek | 1.6 | 583 | 16 | 0 | | | | |
| 972 | Ancestor Creek | 2.6 | 778 | 22 | 12 | 37 | 3.1 | natal | x |
| Totals | | | | 915 | 121 | 1605 | | | |
| Incidental Surveys – non-GRTS Reaches | | | | | | | | | |
| 293 | Mattole River | 345.2 | 5619 | 1 | 0 | | | | x |
| 310 | Mattole River | 9.3 | 2721 | 43 | 16 | 72 | 4.5 | natal | x |
| 951 | Baker Creek | 4.0 | 1200 | 25 | 9 | 30 | 3.3 | non-natal | x |
| 956 | Thompson Creek | 9.5 | 2845 | 35 | 1 | 5 | 5.0 | non-natal | x |
| 966 | Lost River, N. Fork | 1.6 | 580 | 16 | 0 | | | | |

Appendix E. Presence of coho salmon juveniles by survey reach, 1980-2015. Data from 1980-2011 from Garwood (2012a and 2012b). Data encompasses multiple survey techniques and varying levels of survey effort.

| Reach ID# | Stream | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 273* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 275* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | 2 | 2 | | | | | | | | 3 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 277* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 279* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 282* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 284* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 288* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 291* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 293* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 295* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 297* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 299* | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 302 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | 1 | | 0 | 0 | 1 | | | | | | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 304 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | |
| 307 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 1 | 1 | 1 | 1 | 3 | 0 | 1 | 1 | 0 | 0 | 1 | 3 | | | | | | | | | | | |
| 308 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 2 | 3 | 2 | | | | | | | | |
| 309 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 2 | |
| 310 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 2 |
| 311 | Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | | | |

Appendix E. Presence of coho salmon juveniles by survey reach, 1980-2015. Data from 1980-2011 from Garwood (2012a and 2012b). Data encompasses multiple survey techniques and varying levels of survey effort.

| Reach ID # | Stream | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | | | | | | | | |
|------------|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|--|--|
| | River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 328 | Lower Mill Creek | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| 337 | Jeffrey Gulch | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 340 | North Fork Mattole | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | |
| 341 | North Fork Mattole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | |
| 342 | North Fork Mattole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 343 | North Fork Mattole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 353 | Grizzly Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | |
| | East Branch North Fork Mattole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 364 | River | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 425 | East Mill Creek | | 0 | | | | | 0 | | | | | | | | | | | | | | 0 | 1 | 0 | 1 | 0 | 1 | 3 | | | | | | | | | | | | | | | | | | |
| | South Branch, East Mill Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 428 | Mill Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | |
| 440 | Conklin Creek | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | McGinnis Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 453 | Indian Creek | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | | | | | |
| 470 | Squaw Creek | | 1 | 1 | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 479 | Squaw Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 480 | Squaw Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 481 | Squaw Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | |
| 482 | Squaw Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 483 | Squaw Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | | |
| 528 | Pritchard Creek | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| 544 | Granny Creek | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | | | | | | | | | | | | | 0 | 0 | 0 | 0 | | | |
| 548 | Saunders Creek | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | 0 | | | | |

Appendix E. Presence of coho salmon juveniles by survey reach, 1980-2015. Data from 1980-2011 from Garwood (2012a and 2012b). Data encompasses multiple survey techniques and varying levels of survey effort.

| Reach ID # | Stream | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | | | | | | | | | | | | | | | | | |
|------------|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 550 | Lindley Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 557 | Woods Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 568 | Upper North Fork Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 569 | Upper North Fork Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 570 | Upper North Fork Mattole River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 593 | Oil Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 631 | Honeydew Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 632 | Honeydew Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 633 | Honeydew Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 641 | East Fork Honeydew Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 646 | W. Fork Honeydew Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 678 | Dry Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 695 | Westlund Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 715 | Fourmile Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 718 | N. Fork Fourmile Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 733 | Sholes Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 749 | Grindstone Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 764 | Mattole Canyon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 765 | Mattole Canyon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Reach ID # | Stream | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | | |
|------------|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|---|
| 766 | Mattole Canyon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 770 | Panther Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 792 | Blue Slide Creek | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | | | | | | | | 0 | | |
| 793 | Blue Slide Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 794 | Blue Slide Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 796 | Crooked Prairie | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 818 | Bear Creek | | 0 | | | | | | | | | | | | | | | | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | | | | | | | 2 | 0 | |
| 819 | Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | 0 |
| 822 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 823 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 824 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 825 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 826 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 827 | South Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 848 | Jewett Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 858 | North Fork Bear Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 877 | Deer Lick | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 885 | Big Finley Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 892 | Eubank Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 893 | Eubank Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 911 | Bridge Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | |
| 912 | W. Fork Bridge Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |

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|-----------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 915 | Bridge Creek | | | | | | | | | | | | | | | | | | | | | | 2 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 916 | Bridge Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 924 | McKee Creek | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 926 | Painter Creek | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 928 | Van Arken Creek | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 930 | S. Fork Van Arken Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 937 | Anderson Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 938 | E. Anderson Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 939 | Mill Creek | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 947 | Harris Creek | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 948 | Gibson Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Stanley Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 951 | Baker Creek | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 956 | Thompson Creek | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 957 | Thompson Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 958 | Yew Creek | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 960 | Danny's Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 963 | Lost River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 964 | Helen Barnum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 966 | N Fork Lost Ancestor Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 972 | 972 | 1 | 10 | 17 | 0 | 1 | 4 | 4 | 5 | 7 | 8 | 10 | 10 | 10 | 14 | 14 | 15 | 22 | 21 | 26 | 31 | 28 | 36 | 45 | 43 | 16 | 5 | 14 | 36 | 33 | 32 | 26 | 23 | 6 | 32 | 40 | 52 | | | | | | | | | | | | | | | | |
| | # Reaches Surveyed | 1 | 10 | 17 | 0 | 1 | 4 | 4 | 5 | 7 | 8 | 10 | 10 | 10 | 14 | 14 | 15 | 22 | 21 | 26 | 31 | 28 | 36 | 45 | 43 | 16 | 5 | 14 | 36 | 33 | 32 | 26 | 23 | 6 | 32 | 40 | 52 | | | | | | | | | | | | | | | | |
| | # Reaches Coho Present | 0 | 3 | 7 | 0 | 1 | 2 | 3 | 4 | 7 | 6 | 5 | 5 | 4 | 4 | 6 | 6 | 7 | 10 | 13 | 12 | 18 | 23 | 24 | 16 | 5 | 7 | 14 | 14 | 8 | 9 | 12 | 6 | 12 | 15 | 10 | | | | | | | | | | | | | | | | | |

Appendix E. Presence of coho salmon juveniles by survey reach, 1980-2015. Data from 1980-2011 from Garwood (2012a and 2012b). Data encompasses multiple survey techniques and varying levels of survey effort.

| Reach ID # | Stream | Proportion reach occupancy | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | |
|------------|--------|----------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|
| | | | 0.000.300.41 | 1.000.500.750.801.000.750.500.400.290.430.400.320.330.380.420.430.500.510.561.001.000.500.390.420.250.350.521.000.380.380.19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0=coho not detected, 1=coho present, unclear if natal or non-natal; 2=present, suspected natal; 3=present, suspected non-natal

*Did not display non-detections prior to 2013, due to differing methodology. Most pre-2013 surveys of these large mainstem reaches have targeted other species, such as summer steelhead, and divers were not necessarily seeking out likely coho habitat.