Wild Winter Steelhead - Upper Calapooia Monitoring Monitoring Report

(OWEB# 218-3045-16036)

Prepared by
Calapooia Watershed Council
August 2022

Project Background:

The Calapooia Watershed Council (CWC) and its partners, including Weyerhaeuser Company, Oregon Department of Fish and Wildlife (ODFW), and numerous private residents worked together in 2019 and 2022 to complete fish and temperature monitoring to address knowledge gaps surrounding the steelhead population on the Upper Calapooia River (UCR) . The purpose of this effort was to collect data that may serve as a guide for additional resource monitoring and to identify potential restoration needs in the study area. While there has been research throughout the Calapooia watershed related to water quality, flows and biophysical impacts of small dam removal, very little fisheries monitoring has taken place on the Upper Calapooia River.

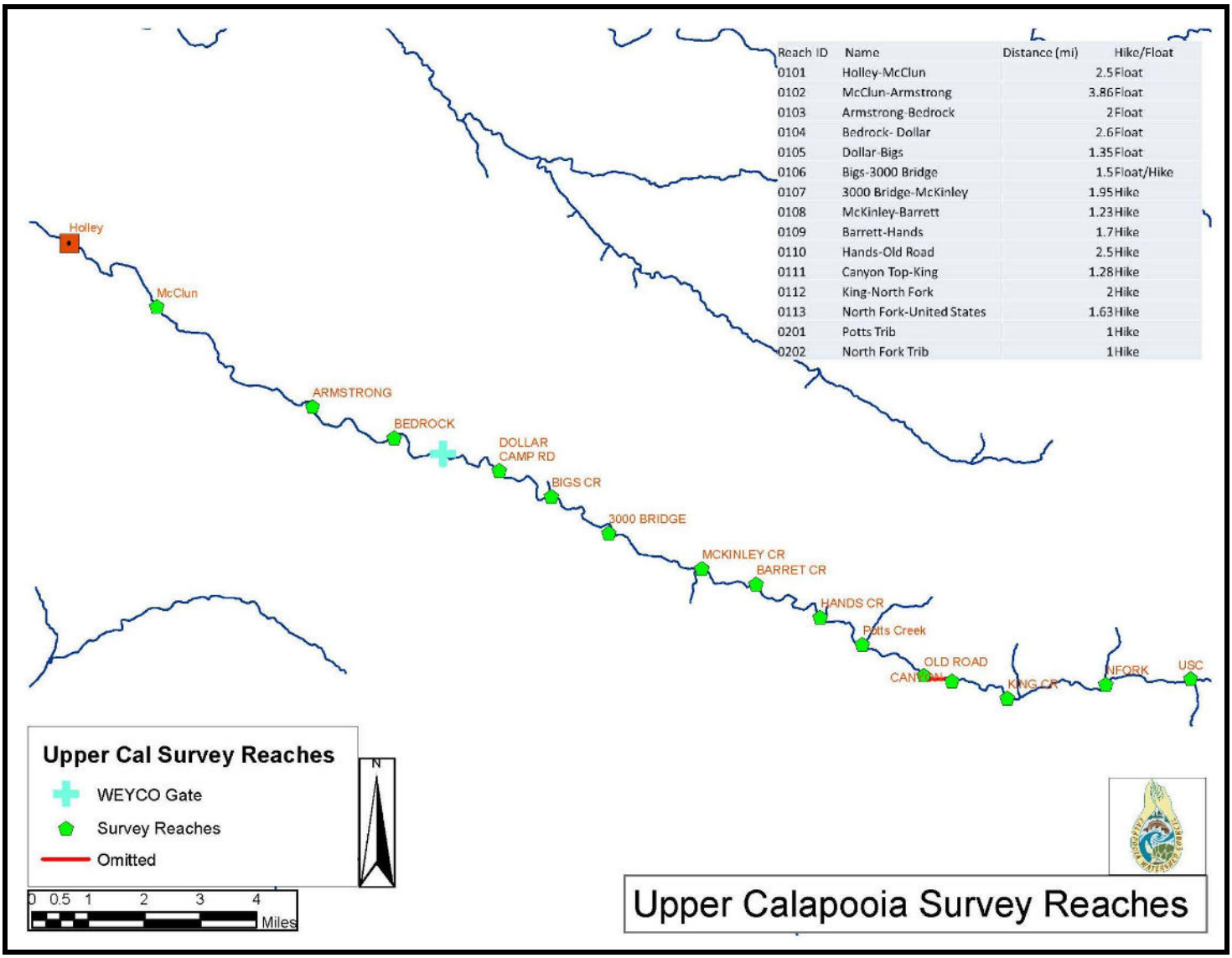
The majority of fisheries monitoring efforts in the Willamette Valley have been focused on the sub-basins with major dam projects that pose the greatest threats to the ESA- listed species, such as anadromous salmonids. Sub-basins, such as the Calapooia River, without major dams and existing hatchery programs do not typically receive as much attention. Therefore, to inform future local agencies and the CWC's restoration program funding was provided by Oregon Watershed Board to conduct winter steelhead spawning surveys, or redd counts, to better understand current production levels, spawn timing and distribution of winter steelhead in approximately 30 miles of the UCR in 2019 and 16.2 miles in 2020. In addition, water temperature monitoring was conducted in the same study area at 16 select points to gain a better understanding of thermal limitation for juvenile steelhead rearing.

Spawning Survey Design:

A total of 30 miles of the Upper Calapooia River from the Holley Bridge upstream to the end of anadromy at the upper falls including two major tributaries, North Fork Calapooia and Potts Creek were surveyed for winter steelhead in 2019 and 2020. The survey area was divided into 16 survey segments averaging 1.9 miles in length (See Figure 1.0). These segments were established based on ODFW segments, logistical locations (bridge crossings) and tributary junctions.

Surveys were conducted by two fisheries monitoring technicians from February through May in both 2019 and 2020, with each segment re-surveyed in 10 day cycles. In addition to

surveys on the mainstem, two significant tributaries to the upper Calapooia, Potts Creek and North Fork Calapooia, were surveyed for redds. Spawning surveys followed established protocol for redd surveys (Gallagher et. al. in Salmonid Field Protocols Handbook 2008, pp. 197 – 234). ODFW provided the CWC's two fisheries monitoring technicians training in survey protocol and safe boating techniques. Surveys included enumeration of redds, live adults, water clarity and fish species. GPS waypoints of redd locations were documented to identify and map the spatial distribution of spawning activity that can be used for restoration planning.



Map 1.0 - UCR study area and spawning survey reaches.

Survey Results:

2019 Survey Season

Description:

The spawning surveys conducted from February through May 2019 documented a total of 99 steelhead redds in the 30 mile survey reach of the upper Calapooia River, or 3.3 redds per mile. To calculate adult escapement (amount of adult fish returning to spawn) from the redd number, the formula (1.7 X n redds) + 3.74 = adult fish. Therefore, the 99 documented steelhead redds would equal 172.04 or ~172 returning adult steelhead into the UCR study area.

Timing:

The first redd was detected on February 21st, 2019 and the last detected on May 16th, 2019. With spawning surveys conducted prior to after the first and last redd detections in February and June, respectively, it can be assumed that the CWC's monitoring effort encapsulated the entirety of the winter steelhead spawning period on the UCR. This spawning period is typical of late returning winter steelhead in the Upper Willamette system.

Distribution:

The majority of the steelhead redds were documented in the upper ~15 miles of the survey area from McKinley Creek upstream to United States Creek, with a total of 17 redds below McKinley Creek and the remaining 82 redds upstream of this point. The segment from Hands Creek to "Old Road" possessed the highest number of redds in a single segment, with a total of 17 redds documented during the survey period.

Image 1: Upper Falls within Willamette National Forest with CWC Fisheries Monitoring Technician. This barrier has been shown to be the end of anadromous fish distribution on the Calapooia River.

Map 2.0:

Steelhead Redd Locations 2019

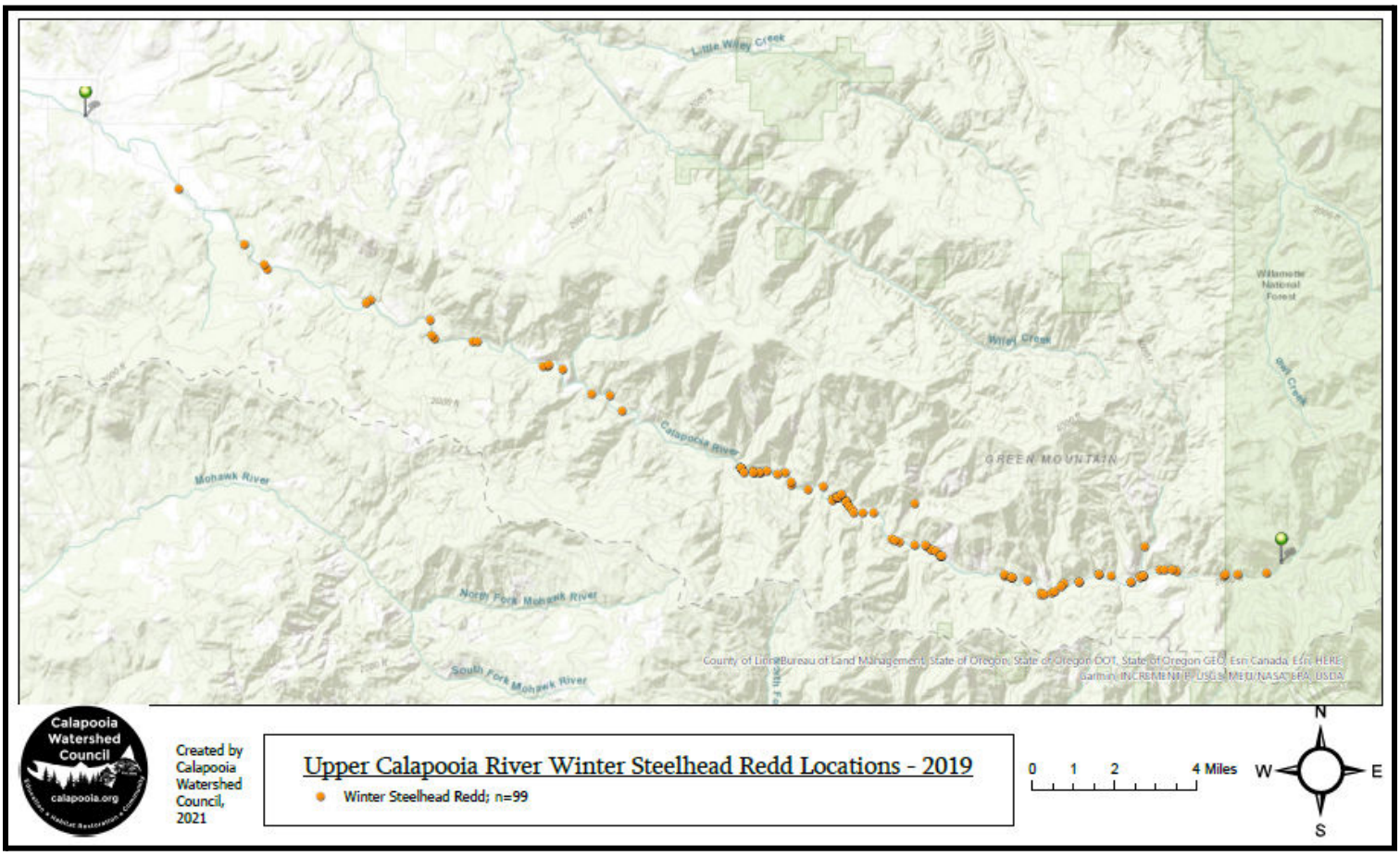


Figure 1:0

Table of Redd Survey Results by Reach (2019)

Survey Reach	Start Latitude	Start Longitude	End Latitude	End Latitude	Reach Length (Miles)	Number of Redd Detected
Holley to McClun	44.35019	-122.78734	44.33431	-122.75439	2.5	0
McClun to Armstrong	44.33431	-122.75439	44.307921	-122.6991	3.86	4
Armstrong to Bedrock	44.307921	-122.6991	44.29972	-122.66987	2	2
Bedrock to Dollar	44.29972	-122.66987	44.28965	-122.63049	2.6	5
Dollar Camp to Bigs Creek	44.35019	-122.78734	44.33431	-122.75439	1.35	4

Biggs Creek to 3000 Bridge	44.284	-122.61342	44.27488	-122.59278	1.5	4
3000 Bridge to McKinley Creek	44.27488	-122.59278	44.26591	-122.55939	1.95	0
McKinley Creek to Barrett Creek	44.26591	-122.55939	44.26155	-122.53982	1.23	13
Barret Creek to Hands Creek	44.26155	-122.53982	44.25289	-122.51676	1.7	15
Hands Creek to Old Road	44.25289	-122.51676	44.23721	-122.47889	2.5	17
Canyon Top to King Creek	44.236663	-122.46549	44.23175	-122.44984	1.28	7
King Creek to North Fork Calapooia	44.23175	-122.44984	44.236	-122.41465	2	12
North Fork Calapooia to United States Creek	44.236	-122.41465	44.23640	-122.38388	1.63	10
United States Creek to Upper Falls	44.23640	-122.38388	44.23913	-122.36195	1.3	2
Potts Creek Tributary; Upstream 1 mile	44.24612	-122.50226	44.25592	-122.49017	1	2
North Fork Calapooia Tributary; Upstream 1 mile	44.236	-122.41465	44.24538	-122.40916	1	2

2020 Survey Season

Description:

Due to the outbreak of COVID-19 shortly after the onset of the 2020 survey season the spawning surveys had to be adjusted to limit close contact between Fisheries Monitoring Technicians. To limit close person-to-person contact, the lower most survey reaches were omitted from the survey list starting on March 18th, 2020. This limited the total survey area by approximately 13.8 miles to a total of 16.2 miles.

The spawning surveys conducted from February through May 2020 documented a total of 221 steelhead redds in the adjusted 16.2 mile survey reach of the upper Calapooia River, or 13.64 redds per mile To calculate adult escapement (amount of adult fish returning to spawn) from the redd number, the formula (1.7 X n redds) + 3.74 = adult fish. Therefore, the 221

documented steelhead redds would equal 379.44 or ~379 returning adult steelhead into the UCR study area.

Timing:

The first redd was detected on February 25st, 2020 and the last detected on May 12th, 2020. With spawning surveys conducted prior to after the first and last redd detections in February and June, respectively, it can be assumed that the CWC's monitoring effort encapsulated the entirety of the winter steelhead spawning period on the UCR. This spawning period is typical of late returning winter steelhead in the Upper Willamette system.

Distribution:

Similar to 2019 results, the majority of the steelhead redds were documented in the upper ~15 miles of the survey area from McKinley Creek upstream to United States Creek, with a total of 23 redds below McKinley Creek and the remaining 98 redds upstream of this point. The segment from Hands Creek to "Old Road" again possessed the highest number of redds in a single segment, with a total of 60 redds documented during the survey period.

Map 3.0:

Steelhead Redd Locations 2020

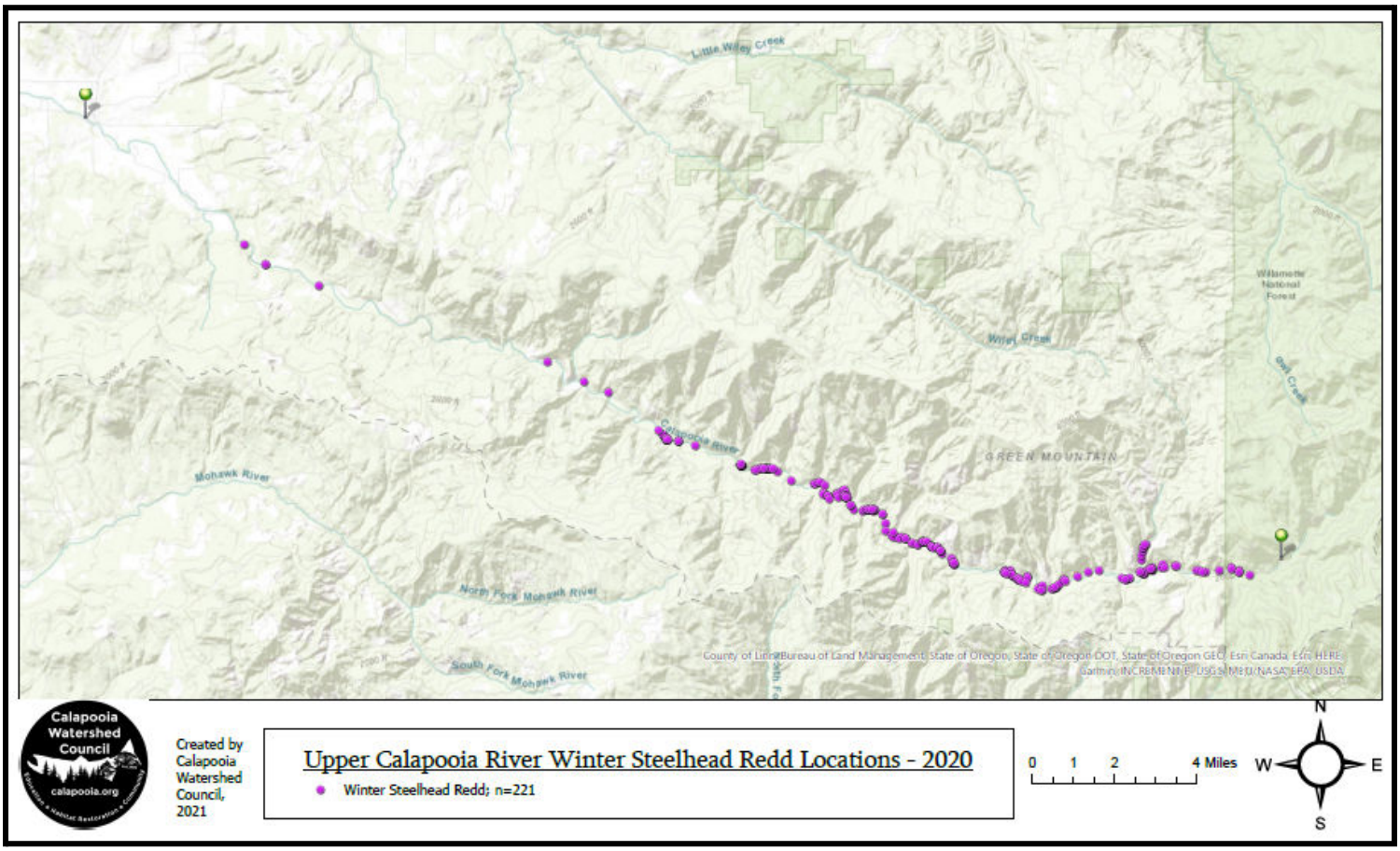


Figure 2:0

Table of Redd Survey Results by Reach (2020)

Survey Reach	Start Latitude	Start Longitude	End Latitude	End Latitude	Reach Length (Miles)	Number of Redd Detected
Holley to McClun	44.35019	-122.78734	44.33431	-122.75439	2.5	0
McClun to Armstrong	44.33431	-122.75439	44.307921	-122.6991	3.86	4
Armstrong to Bedrock	44.307921	-122.6991	44.29972	-122.66987	2	0
Bedrock to Dollar	44.29972	-122.66987	44.28965	-122.63049	2.6	0
Dollar Camp to Bigs Creek	44.35019	-122.78734	44.33431	-122.75439	1.35	1
Biggs Creek to 3000 Bridge	44.284	-122.61342	44.27488	-122.59278	1.5	2
3000 Bridge to McKinley Creek	44.27488	-122.59278	44.26591	-122.55939	1.95	17
McKinley Creek to Barrett Creek	44.26591	-122.55939	44.26155	-122.53982	1.23	23
Barret Creek to Hands Creek	44.26155	-122.53982	44.25289	-122.51676	1.7	30
Hands Creek to Old Road	44.25289	-122.51676	44.23721	-122.47889	2.5	60
Canyon Top to King Creek	44.236663	-122.46549	44.23175	-122.44984	1.28	26
King Creek to North Fork Calapooia	44.23175	-122.44984	44.236	-122.41465	2	19
North Fork Calapooia to United States Creek	44.236	-122.41465	44.23640	-122.38388	1.63	22
United States Creek to Upper Falls	44.23640	-122.38388	44.23913	-122.36195	1.3	6
Potts Creek Tributary; Upstream 1 mile	44.24612	-122.50226	44.25592	-122.49017	1	9
North Fork Calapooia Tributary; Upstream 1 mile	44.236	-122.41465	44.24538	-122.40916	1	1

Spawning Results Discussion:

Abundance

The Upper Willamette River population of winter steelhead are among two historic populations of anadromous salmonids able to traverse Willamette Falls, near Oregon City. Willamette Falls created a natural barrier to other salmonid migrations into the upper portion of the basin until the construction of a fish ladder, and other modifications of the falls, allowed for additional fish migration to move above the falls. This bottleneck in the movement of fishes in the Willamette River offered an opportunity to track fish migration into the upper basin and has been operating as a monitoring station since 1961.

In 2019, the Winter steelhead upstream migration at Willamette Falls was estimated at 3,202 returning adults. With the CWC's 2019 redd surveys detecting 99 redds resulting in an estimate of 172 returning adults to the UCR, that would mean the UCR receives ~3% of the total Upper Willamette River Winter Steelhead returning adults in 2019.

In 2020, the Winter steelhead upstream migration at Willamette Falls was estimated at 5,510 returning adults. With the CWC's 2020 redd surveys detecting 221 redds resulting in an estimate of 379 returning adults to the UCR, that would mean the UCR receives ~4% of the total Upper Willamette River Winter Steelhead returning adults in 2020. This 4% return estimate is also likely lower than the actual return to the UCR survey area due to the COVID-19 pandemic and resulting reduction in surveys miles during the 2020 monitoring period.

Although the overall percentage of Upper Willamette River winter steelhead returning to the upper Calapooia River is relatively low at 3-4%, the genetic contribution of the UCR population segment provides a lineage of Oncorhynchus mykiss that is devoid of hatchery genetics. This genetic contribution therefore increases the resilience of the UWR winter steelhead population as a whole

Timing

The delayed arrival of adult fish experienced in 2019 and 2020 are typical of returns for "late winter" steelhead populations in the Willamette River. This is due to Willamette Falls, which created a nearly impassable barrier to upstream fish migration. This limited migratory fish from moving upstream of the falls except when late winter or early spring flows caused the river to rise, enabling fish to complete their spawning migrations. The salmonid populations in the Willamette and its tributaries, therefore, adapted to this temporal "bottleneck" on the lower Willamette River by postponing their freshwater arrival and upstream migration until later in the spawning season than many other steelhead populations in the Pacific Northwest.

Image 2.0: Above Left; juvenile steelhead rearing in UCR (2019).
Image 3.0: Above Right; Adult steelhead holding in shallow riffle (2020).

Stream Temperature Monitoring (2019)

Image 4.0: Example of HOBO temperature sensor being downloaded (2019)

Temperature Monitoring Design:

To gain a better understanding of the summer temperature regimes in the UCR, the council deployed 13 temperature monitoring devices, or loggers in the mainstem Calapooia and select tributaries in 2019 and 2020. These loggers collected temperature data at 1-hour

intervals from early June through late September. The goal of this monitoring was to determine where summer temperatures were suitable for steelhead rearing and which exceed certain thermal thresholds. The council consulted multiple sources when determining these thresholds but relied on Richter and Kolmes, 2005 (Maximum Temperature Limits for Chinook, Coho, and Chum Salmon, and Steelhead Trout in the Pacific Northwest) for the parameters described in this report. These parameters were used to designate habitat quality in each study reach.

Figure 2.0:

Thermal Thresholds for Juvenile Steelhead:

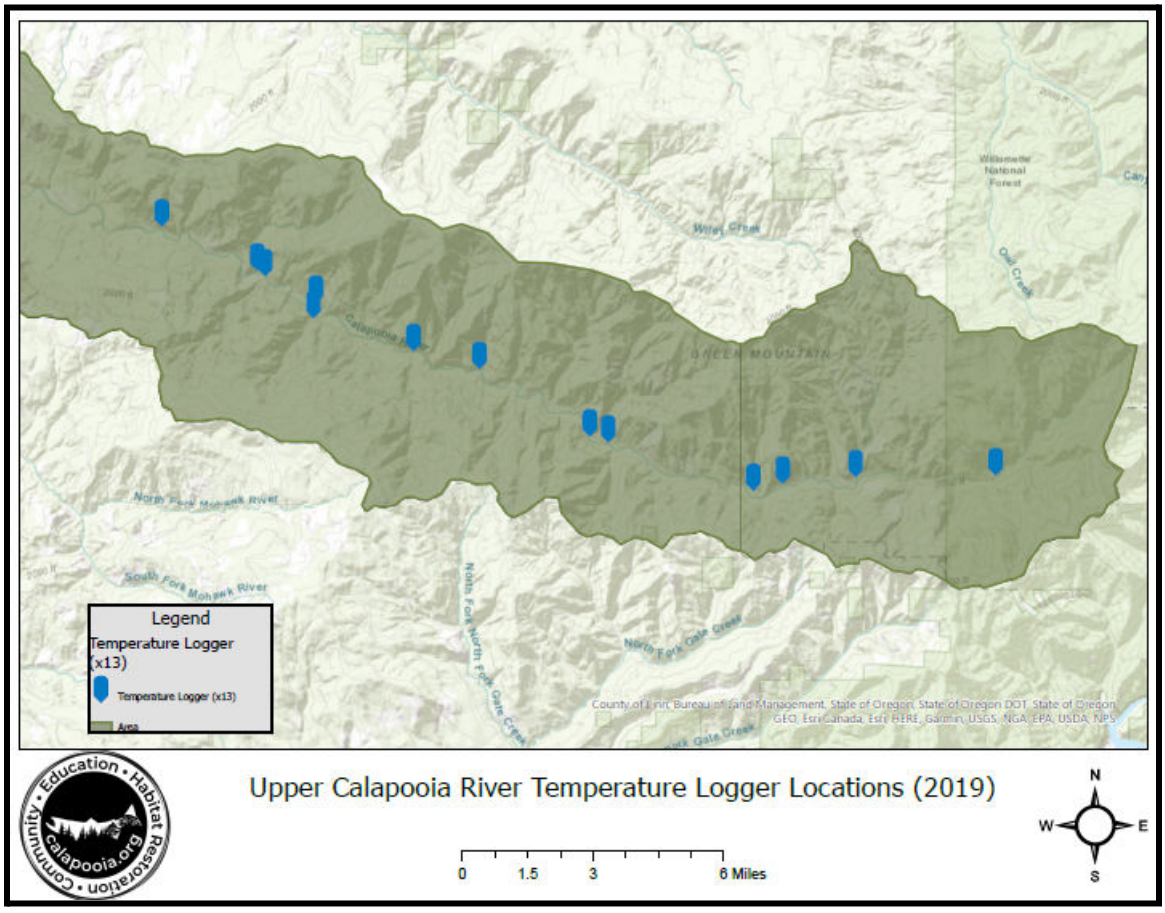
Optimal Juvenile Rearing	14°C to 17°C
Lethal Conditions	<20°C

Figure 3.0:

Habitat Quality Categories Based on Temperature Profiles:

Excellent Quality Habitat	10°C to 17°C
Moderate Quality Habitat	17°C to 20°C
Poor Quality Habitat	<20°C

Map 4.0: UCR Temperature monitoring sensor locations



Temperature Monitoring Results (2019):

UCR Mainstem Results:

The mainstem Calapooia River displayed a broad range of thermal conditions throughout the 2019 monitoring period (June 6th - Sept 29th). This included temperatures optimal for juvenile steelhead rearing and those considered lethal. There was a clear increase in stream temperatures in a downstream progression with the highest quality rearing habitat highest in the system. Out of the nine monitoring reaches in the study, five were designated poor rearing habitat, one designated moderate rearing habitat and three designated excellent rearing habitat.

Figure 4.0:

Upper Calapooia Mainstem Temperature Readings (2019)

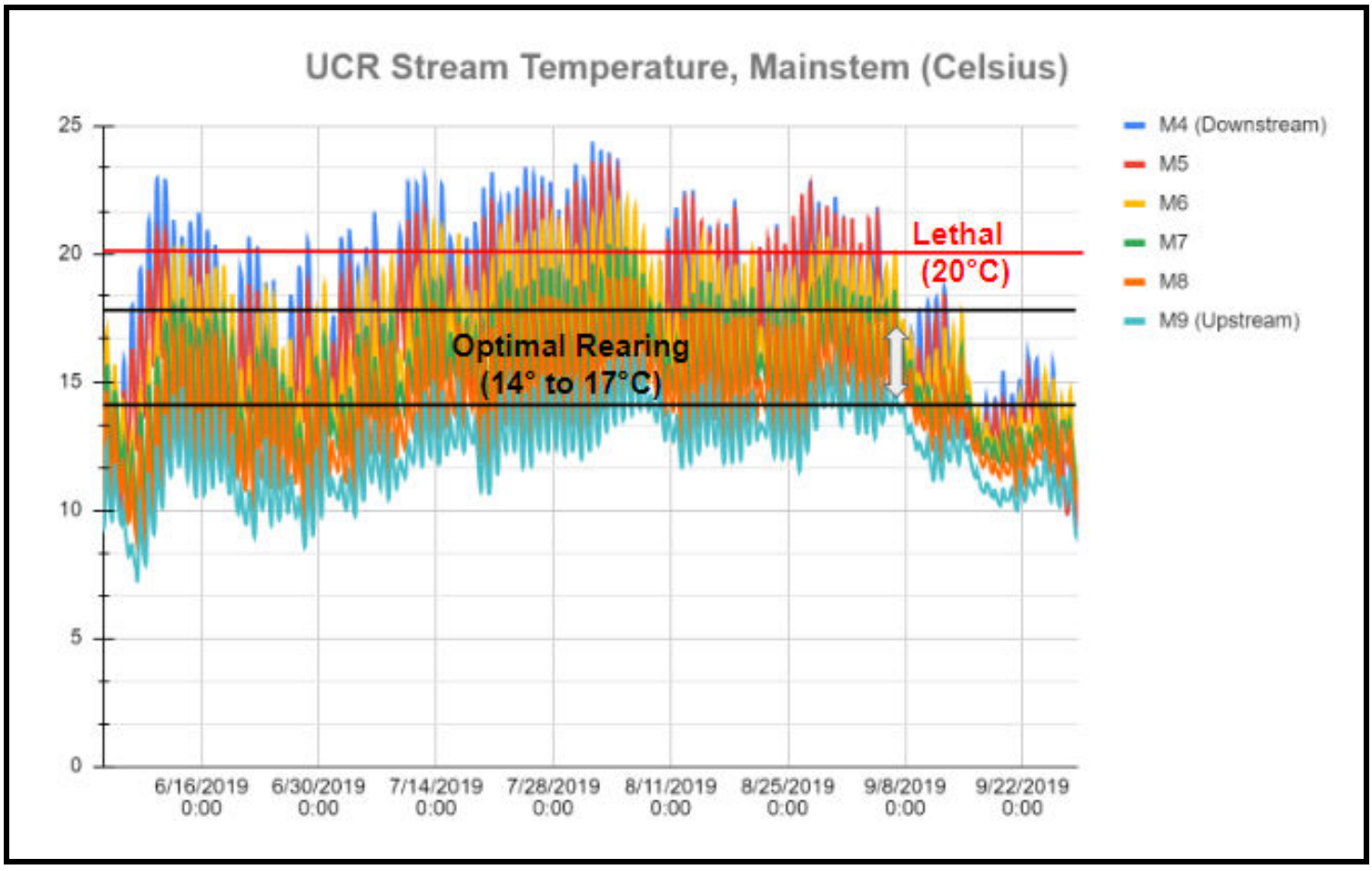


Figure 5.0:

Upper Calapooia Mainstem Reach Habitat Quality Designations

Reach	ID	Latitude	Longitude	Habitat Quality
Lonely Rock to 3000 Bridge	M4	44.295172	-122.645092	Poor
3000 Bridge to Barret Creek	M5	44.277175	-122.593847	Poor
Barret Creek to Potts Creek	M6	44.261429	-122.539484	Poor
Potts Creek to King Creek	M7	44.244026	-122.496699	Moderate
King Creek to United States Creek	M8	44.234312	-122.438728	Excellent
United States Creek to Upper Falls	M9	44.236283	-122.367994	Excellent

UCR Tributary Results:

The seven tributaries monitored in this study displayed a more narrow range of temperatures than the mainstem. The majority of the monitoring period showed optimal rearing conditions for juvenile steelhead. All seven tributaries monitored in 2019 displayed suitable or optimal rearing temperatures for juvenile steelhead.

Figure 7.0:

Upper Calapooia River Tributary Temperature Readings (2019)

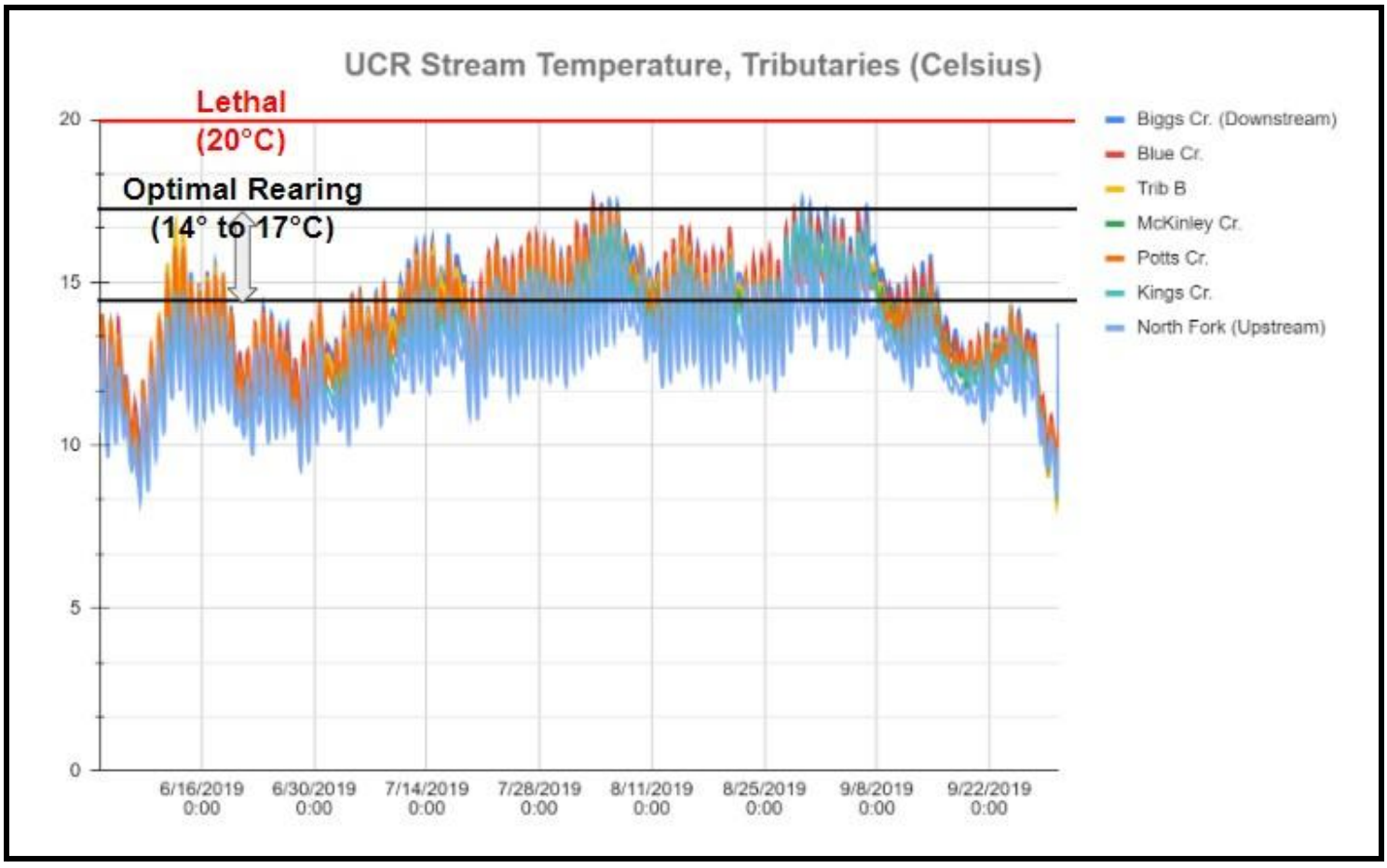


Figure 6.0:

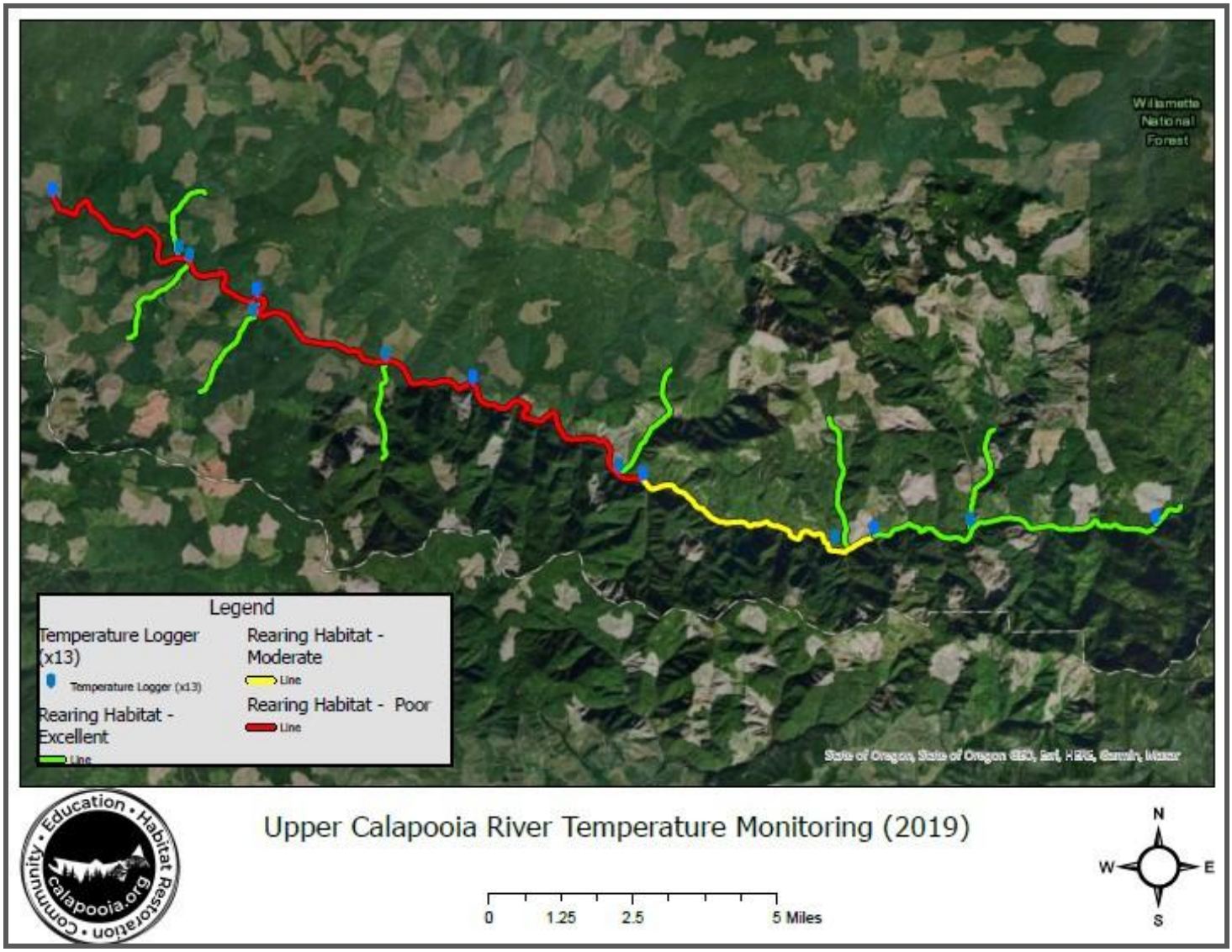
Upper Calapooia Tributary Habitat Quality Designations

Tributary	ID	Latitude	Longitude	Habitat Quality
Biggs Creek	T1	44.284778	-122.613321	Excellent
Blue Creek	T2	44.283383	-122.61066	Excellent
Trib B	T3	44.273487	-122.594662	Excellent
McKinley Creek	T4	44.265693	-122.561388	Excellent
Potts Creek	T5	44.245493	-122.502811	Excellent
Kings Creek	T6	44.232604	-122.448512	Excellent
North Fork Calapooia	T7	44.235802	-122.414521	Excellent

Map 5.0:

UCR /Map with Habitat Quality Designations (2019)

Green = Excellent, Yellow = Moderate, Red = Poor



Temperature Monitoring Results Discussion:

Although lethal conditions were documented in the mainstem Calapooia River, it is highly likely that juvenile steelhead, and many other cold water fishes, were able to evade the lethal effects of these conditions by relocating to more suitable habitat or by positioning themselves near coldwater refuges (e.g. coldwater seeps, hyporheic flows, etc). Due to the broad scale of the monitoring effort and limited number of sensors it is likely that many localized coldwater refuges went undetected by the council. However, these results confirm that reaches of the UCR are unsuitable for juvenile steelhead rearing and may benefit from habitat restoration.

The results of the temperature monitoring in seven of the largest UCR tributaries confirm the importance of cool water inputs from these tributaries into the mainstem Calapooia River. These tributaries may also offer thermal refuge during the warmer summer months, however many are inaccessible during the summer months due to high gradients at their confluences and low stream flows.

Habitat Restoration Potential and Conservation Identified

The goal of the Wild Winter Steelhead and Upper Calapooia Monitoring project is to gain additional information to guide the restoration of the Upper Calapooia River and aid in the recovery of the Calapooia population of ESA-listed Upper Willamette Steelhead. The following recommendations are based on the results of both the spawning surveys and stream temperature monitoring conducted in 2019 and 2020.

1. Conduct large wood and/or boulder placements in reaches with low/no redd counts and limited spawning substrate (i.e. downstream of McKinley Creek to Holley Bridge). The additional instream complexity may drive natural processes that properly hold and sort suitable spawning substrate and provide winter/summer rearing habitat.

2. Increase quality riparian cover in reaches designated with “poor” juvenile steelhead rearing habitat (i.e. Lonely Rock to Potts Creek confluence) to buffer summer stream temperatures and provide future large wood recruitment.

3. Enhance tributary systems in the UCR that provide critical cool water inputs to the UCR through the addition of wood placements.

4. Enhance and restore riparian vegetation lost during the 2020 Holiday Farm fire in tributary systems, specifically the North Fork Calapooia River which lost a significant amount of its riparian cover.
5. Enhance and conserve reaches of the mainstem Calapooia River that are currently providing the highest quality rearing habitats (i.e. from Potts Creek confluence upstream to the Upper Falls).

6. Develop projects that produce additional side channel habitat within the mainstem Calapooia River. These habitats are limited and may offer important rearing and spawning opportunities for winter steelhead.

7. Work with private timber companies to preserve important tributary systems during timber harvesting.