Appendix 3.1

Accessibility Statement

For accessibility assistance with this document, please contat Sonoma County Water Agency, Environmental Resources at (707) 526-5370, Fax to (707) 544-6123 or through California Relay Service by dialing 711.

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Please indicate County where your project is located here:

Sonoma / Mendo.

MAIL FORM AND ATTACHMENTS TO:
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Tel: (916) 341-5300 Fax: (916) 341-5400
http://www.waterboards.ca.gov/waterrights

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Separate petitions are required for each water right. Mark all areas that apply to your proposed change(s). Incomplete forms may not be accepted. Location and area information must be provided on maps in accordance with established requirements. (Cal. Code Regs., tit. 23, § 715 et seq.) Provide attachments if necessary.

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☐ **Place of Use** Wat. Code, § 1701
☐ **Purpose of Use** Wat. Code, § 1701

☐ **Distribution of Storage** Cal. Code Regs., tit. 23, § 791(e)
☒ **Temporary Urgency** Wat. Code, § 1435
☐ **Instream Flow Dedication** Wat. Code, § 1707
☐ **Waste Water** Wat. Code, § 1211

☐ **Split** Cal. Code Regs., tit. 23, § 836
☐ **Terms or Conditions** Cal. Code Regs., tit. 23, § 791(e)
☐ **Other**

Application 12919A Permit 12947A License _____ Statement _____

I (we) hereby petition for change(s) noted above and described as follows:

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Present:

Proposed:

Place of Use – Identify area using Public Land Survey System descriptions to ¼-¼ level; for irrigation, list number of acres irrigated.

Present:

Proposed:

Purpose of Use

Present:

Proposed:

Split

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Distribution of Storage

Present:

Proposed:

Rec'd
Ck#1614657
$24,414.80
Ck#1614818
$850.00
4-20-17 jh
A012947A
Etal,
KIL/LFG
PAL
Pet. Upg. Chg.

Temporary Urgency

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[redacted]

Right Holder or Authorized Agent Signature

Right Holder or Authorized Agent Signature

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☐ **Instream Flow Dedication** Wat. Code, § 1707
☐ **Waste Water** Wat. Code, § 1211

☐ **Split** Cal. Code Regs., tit. 23, § 836
☐ **Terms or Conditions** Cal. Code Regs., tit. 23, § 791(e)
☐ **Other**

Application 15736 Permit 12949 License Statement

I (we) hereby petition for change(s) noted above and described as follows:

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Present:

Proposed:

Place of Use – Identify area using Public Land Survey System descriptions to ¼-¼ level; for irrigation, list number of acres irrigated.

Present:

Proposed:

Purpose of Use

Present:

Proposed:

Split

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Distribution of Storage

Present:

Proposed:

Rec'd
ck#1614657
$24,414.80
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Upstream Location:

Downstream Location:

List the quantities dedicated to instream flow in either: ☐ cubic feet per second or ☐ gallons per day:

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Will the dedicated flow be diverted for consumptive use at a downstream location? ◯ Yes ◯ No

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Waste Water

If applicable, provide the reduction in amount of treated waste water discharged in cubic feet per second.

Will this change involve water provided by a water service contract which prohibits your exclusive right to this treated waste water? ◯ Yes ◯ No

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☐ **Waste Water** Wat. Code, § 1211

☐ **Split** Cal. Code Regs., tit. 23, § 836
☐ **Terms or Conditions** Cal. Code Regs., tit. 23, § 791(e)
☐ **Other**

Application 15737 Permit 12950 License _____ Statement _____

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Proposed:

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Present:

Proposed:

Purpose of Use

Present:

Proposed:

Split

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Present:

Proposed:

Rec'd
Ck#1614657
$24,414.80
Ck#1614818
$850.00
4-20-17 JA
A029947A,
Etal,
KIL/LFG
PAL
Pet. urg. chg.

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☐ **Split** Cal. Code Regs., tit. 23, § 836
☐ **Terms or Conditions** Cal. Code Regs., tit. 23, § 791(e)
☐ **Other**

Application 19351 Permit 16596 License _____ Statement _____

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Present:

Proposed:

Purpose of Use

Present:

Proposed:

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Proposed:

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Ck#1614657
$24,414.80
Ck#1614818
$850.00
4-20-17 $$
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April 2017

Sonoma County Water Agency

Supplement to the April 2017 Temporary Urgency Change Petition

1.0 BACKGROUND

The Sonoma County Water Agency (Water Agency) controls and coordinates water supply releases from Lake Mendocino and Lake Sonoma to implement the minimum instream flow requirements in water rights Decision 1610, which the State Water Resources Control Board (State Water Board) adopted on April 17, 1986. Decision 1610 specifies minimum flow requirements for the Upper Russian River, Dry Creek and the Lower Russian River. These minimum flow requirements vary based on water supply conditions, which are also specified in Decision 1610. The Decision 1610 requirements for the Upper Russian River and Lower Russian River are contained in term 20 of the Water Agency's water-right Permit 12947A (Application 12919A). The Decision 1610 requirements for the Lower Russian River are contained in term 17 of the Water Agency's water-right Permit 12949 (Application 15736) and term 17 of the Water Agency's water-right Permit 12950 (Application 15737). The Decision 1610 requirements for Dry Creek and the Lower Russian River are contained in term 13 of the Water Agency's water-right Permit 16596 (Application 19351).

The Water Agency's operations are also subject to the Russian River Biological Opinion issued by the National Marine Fisheries Service on September 24, 2008.

1.1 Minimum Flow Requirements

Decision 1610 requires a minimum flow of 25 cubic feet per second (cfs) in the East Fork of the Russian River from Coyote Valley Dam to the confluence with the West Fork of the Russian River under all water supply conditions. From this point to Dry Creek, the Decision 1610 required minimum Russian River flows are 185 cfs from April through August and 150 cfs from September through March during *Normal* water supply conditions, 75 cfs during *Dry* conditions and 25 cfs during *Critical* conditions. Decision 1610 further specifies two variations of the *Normal* water supply condition, commonly known as *Dry Spring 1* and *Dry Spring 2*. These conditions provide for lower required

minimum flows in the Upper Russian River during times when the combined storage in Lake Pillsbury (owned and operated by the Pacific Gas and Electric Company) and Lake Mendocino on May 31 is unusually low. *Dry Spring 1* conditions exist if the combined storage in Lake Pillsbury and Lake Mendocino is less than 150,000 acre-feet on May 31. Under *Dry Spring 1* conditions, the required minimum flow in the Upper Russian River between the confluence of the East Fork and West Fork and Healdsburg is 150 cfs from June through March, with a reduction to 75 cfs during October through December if Lake Mendocino storage is less than 30,000 acre-feet during those months. *Dry Spring 2* conditions exist if the combined storage in Lake Pillsbury and Lake Mendocino is less than 130,000 acre-feet on May 31. Under *Dry Spring 2* conditions, the required minimum flows in the Upper Russian River are 75 cfs from June through December and 150 cfs from January through March.

From Dry Creek to the Pacific Ocean, the required minimum flows in the Lower Russian River are 125 cfs during *Normal* water supply conditions, 85 cfs during *Dry* conditions and 35 cfs during *Critical* conditions.

In Dry Creek below Warm Springs Dam, the required minimum flows are 75 cfs from January through April, 80 cfs from May through October and 105 cfs in November and December during *Normal* water supply conditions. During *Dry* and *Critical* conditions, these required minimum flows are 25 cfs from April through October and 75 cfs from November through March.

Figure 1 shows all of the required minimum instream flows specified in Decision 1610 by river reach, the gauging stations used to monitor compliance, and the definitions of the various water supply conditions.

1.2 Water Supply Conditions

There are three main water supply conditions that are defined in Decision 1610, which set the minimum instream flow requirements based on the hydrologic conditions for the Russian River system. These water supply conditions are determined based on criteria for the calculated cumulative inflow into Lake Pillsbury from October 1 to the first day of each month from January to June. Decision 1610 defines cumulative inflow for Lake Pillsbury as the algebraic sum of releases from Lake Pillsbury, change in storage and lake evaporation.

Dry water supply conditions exist when cumulative inflow to Lake Pillsbury from October 1 to the date specified below is less than:

- 8,000 acre-feet as of January 1;

- 39,200 acre-feet as of February 1;
- 65,700 acre-feet as of March 1;
- 114,500 acre-feet as of April 1;
- 145,600 acre-feet as of May 1; and
- 160,000 acre-feet as of June 1.

Critical water supply conditions exist when cumulative inflow to Lake Pillsbury from October 1 to the date specified below is less than:

- 4,000 acre-feet as of January 1:
- 20,000 acre-feet as of February 1;
- 45,000 acre-feet as of March 1;
- 50,000 acre-feet as of April 1;
- 70,000 acre-feet as of May 1; and
- 75,000 acre-feet as of June 1.

Normal water supply conditions exist whenever a *Dry* or *Critical* water supply condition is not present. As indicated above, Decision 1610 further specifies three variations of the *Normal* water supply condition based on the combined storage in Lake Pillsbury and Lake Mendocino on May 31. These three variations of the *Normal* water supply condition determine the required minimum instream flows for the Upper Russian River from the confluence of the East Fork and the West Fork to the Russian River's confluence with Dry Creek. This provision of Decision 1610 does not provide for any changes in the required minimum instream flows in Dry Creek or the Lower Russian River (the Russian River between its confluence with Dry Creek and the Pacific Ocean). A summary of the required minimum flows in the Russian River for *Normal*, *Normal — Dry Spring 1* and *Normal — Dry Spring 2* water supply conditions is provided here:

1. Normal: When the combined water in storage in Lake Pillsbury and Lake Mendocino on May 31 of any year exceeds 150,000 acre-feet or 90 percent of the estimated water supply storage capacity of the reservoirs, whichever is less:

From June 1 through August 31	185 cfs

From September 1 through March 31	150 cfs
From April 1 through May 31	185 cfs

2. Normal-Dry Spring 1: When the combined water in storage in Lake Pillsbury and Lake Mendocino on May 31 of any year is between 150,000 acre-feet or 90 percent of the estimated water supply storage capacity of the reservoirs, whichever is less, and 130,000 acre-feet or 80 percent or the estimated water supply storage capacity of the reservoirs, whichever is less:

From June 1 through March 31	150 cfs
From April 1 through May 31	185 cfs
If from October 1 through December 31, storage in Lake Mendocino is less than 30,000 acre-feet	75 cfs

3. Normal-Dry Spring 2: When the combined water in storage in Lake Pillsbury and Lake Mendocino on May 31 of any year is less than 130,000 acre-feet or 80 percent of the estimated water supply storage capacity of the reservoirs, whichever is less:

From June 1 through December 31	75 cfs
From January 1 through March 31	150 cfs
From April 1 through May 31	185 cfs

2.0 PROJECTED WATER SUPPLY CONDITIONS

From October 1, 2016 to April 17, 2017, the cumulative inflow into Lake Pillsbury was 771,787 acre-feet. Consequently, the water supply condition will be categorized as *Normal* for the remainder of the year. Based on these criteria, the Decision 1610 required minimum instream flows in the Upper Russian River (from the East Fork Russian River to the Russian River's confluence of Dry Creek) will be 185 cfs between April 1 and May 31. The required minimum in-stream flows starting June 1 will be determined based on the combined storage of Lake Pillsbury and Lake Mendocino on May 31. At this time, the projected combined storage amount is difficult to predict

because it is heavily dependent on late spring precipitation. However, based on the current hydrologic trends, the Water Agency anticipates that the water supply condition starting June 1 will likely be *Normal*. Consequently, the Decision 1610 required minimum instream flows in the Upper Russian River will be 185 cfs until August 31 and then 150 cfs for the remainder of the year. In the Lower Russian River, the required minimum instream flow will be 125 cfs.

2.1 Lake Mendocino

As of April 17, 2017 the water supply storage level in Lake Mendocino was 92,532 acre-feet (AF) and still gaining. This storage level is 110 percent of the Target Water Supply Curve for this time of year. Figure 2 shows the storage level in Lake Mendocino compared to the 30-year average between 1987 and 2016. As shown in the figure, the storage level is well above the 30-year average for this time of year.

2.2 Lake Sonoma

As of April 17, 2017 the water supply storage level in Lake Sonoma was 252,828 AF and still gaining. This storage level is slightly greater than 103 percent of the available water conservation pool. Figure 3 shows the storage level in Lake Sonoma compared to the 30 year average between 1987 and 2016. As shown in the figure, the storage level is well above the 30-year average for this time of year.

3.0 RUSSIAN RIVER BIOLOGICAL OPINION

Under the federal Endangered Species Act (ESA), coho salmon in the Russian River watershed are listed as an endangered species, and steelhead and Chinook salmon are listed as threatened species. Additionally, coho salmon are listed as an endangered species under the California Endangered Species Act (CESA). In September 2008, the National Marine Fisheries Service (NMFS) issued the Russian River Biological Opinion (Biological Opinion). This Biological Opinion was the culmination of more than a decade of consultation under Section 7 of the ESA by the Water Agency and U.S. Army Corps of Engineers (Corps) with NMFS regarding the effects of the Water Agency's and Corps' water supply and flood control operations in the Russian River watershed on the survival of these listed fish species.

Studies conducted during the consultation period led NMFS to conclude in the Biological Opinion that the summer flows in the Upper Russian River and Dry Creek required by Decision 1610 create velocities that are too high for optimal juvenile salmonid habitat.

NMFS also concluded in the Biological Opinion that the historical practice of breaching the sandbar that closes the mouth of the Russian River to minimize flood risk during the summer and fall may adversely affect the listed species. NMFS concluded in the Biological Opinion that it might be better for juvenile steelhead if the estuary was managed as seasonal freshwater lagoon in the summer months. Minimum instream flows lower than those required by Decision 1610 may result in flows into the estuary that improve opportunities to maintain a freshwater lagoon while minimizing risk of flooding low-lying properties.

To address these issues, NMFS's Biological Opinion requires the Water Agency and Corps to implement a series of actions to modify existing water supply and flood control activities that, in concert with habitat enhancement measures, are intended to minimize impacts to listed salmon species and enhance their habitats in the Russian River and its tributaries. The Water Agency is responsible for the following actions under the Biological Opinion:

- Petitioning the State Water Board to modify permanently the requirements for minimum instream flows in the Russian River and Dry Creek (original Petition filed on September 23, 2009; revised petition filed on August 17, 2016);
- Enhancing salmonid habitat in Dry Creek and its tributaries;
- Developing a bypass pipeline around Dry Creek, if habitat enhancement measures are unsuccessful;
- Changing Russian River estuary management;
- Improving water diversion infrastructure at the Water Agency's Wohler and Mirabel facilities;
- Modifying flood control maintenance activities on the main stem Russian River and its tributaries; and
- Continuing to participate in the Coho Brood stock program.

The Biological Opinion acknowledges that implementing permanent changes to the minimum instream flow requirements for the Russian River and Dry Creek will take several years, including the time needed for review under the California Environmental Quality Act (CEQA) and compliance with state and federal regulations. Consequently, the Biological Opinion requires that, beginning in 2010, the Water Agency file annual petitions with the State Water Board for temporary changes to the Decision 1610 minimum instream flow requirements in the main stem Russian River until the State Water Board has issued an order on the Agency's petition for permanent changes to the Decision 1610 minimum instream flow requirements. The Biological Opinion requires the Water Agency to request that the main stem minimum instream flow requirements be

temporarily changed to the following values during *Normal* water supply conditions:

- 70 cfs between May 1 and October 15 at the U.S. Geological Survey (USGS) gage located at Hacienda Bridge (with the understanding that an operational buffer typically will result in flows of approximately 85 cfs)
- 125 cfs between May 1 and October 15 at the USGS gage located at Healdsburg

The temporary changes to Decision 1610 minimum instream flows specified in the Biological Opinion are summarized in Figure 4. (The Biological Opinion does not require the Water Agency to seek any temporary changes to the minimum instream flow requirements for Dry Creek.)

4.0 CRITERIA FOR APPROVING TEMPORARY URGENCY CHANGE TO PERMITS 12947A, 12949, 12950, 16596

As required by Water Code section 1435, subdivision (b), the State Water Board must make the following findings before issuing a temporary change order:

1. The permittee or licensee has an urgent need to make the proposed change;
2. The proposed change may be made without injury to any other lawful user of water;
3. The proposed change may be made without unreasonable effect upon fish, wildlife, or other instream beneficial uses; and
4. The proposed change is in the public interest.

4.1 Urgency of the Proposed Change

Decision 1610 set the minimum instream flow requirements that the State Water Board concluded, in 1986, would benefit both fishery and recreation uses, and would "preserve the fishery and recreation in the river and in Lake Mendocino to the greatest extent possible while serving the needs of the agricultural, municipal, domestic, and industrial uses which are dependent upon the water" (D 1610, § 13.2, page 21). The State Water Board also concluded in Decision 1610 that additional fishery studies should be done (D 1610, § 14.3.1, pages 26-27).

Thirty years later, it appears that the flows set by Decision 1610 no longer benefit fishery uses. To the contrary, the Biological Opinion concludes that summertime flows in the Russian River during Normal water supply conditions, at the levels required by Decision 1610, are higher than the optimal levels for the listed fish species. The Biological Opinion contains an extensive analysis of the impacts of these required minimum instream flows on listed fish species. The Biological Opinion requires the Water Agency to file a petition (original petition filed on September 23, 2009; revised petition filed on August 17, 2016) with the State Water Board to improve conditions for listed species by seeking permanent reductions in the minimum instream flow requirements contained in Water Agency's existing water rights permits. The Biological Opinion also contains the following requirement:

> "To help restore freshwater habitats for listed salmon and steelhead in the Russian River estuary, SCWA will pursue interim relief from D1610 minimum flow requirements by petitioning the SWRCB for changes to D1610 beginning in 2010 and for each year prior to the permanent change to D1610. These petitions will request that minimum bypass flows of 70 cfs be implemented at the USGS gage at the Hacienda Bridge between May 1 and October 15, with the understanding that for compliance purposes SCWA will typically maintain about 85 cfs at the Hacienda gage. For purposes of enhancing steelhead rearing habitats between the East Fork and Hopland, these petitions will request a minimum bypass flow of 125 cfs at the Healdsburg gage between May 1 and October 15. NMFS will support SCWA's petitions for these changes to D1610 in presentations before the SWRCB."
> (Biological Opinion, page 247.)

One of the species listed under the federal ESA (coho salmon) is also listed under the California Endangered Species Act (CESA). The California Department of Fish and Wildlife (DFW) has issued a consistency determination in which it determined that the incidental take statement issued to Water Agency by NMFS in connection with the Biological Opinion is consistent with the provisions and requirements of CESA.

In light of this background, an urgent need exists for the proposed change. As discussed in the Biological Opinion, the temporary changes that are requested in this petition will improve habitat for the listed species by reducing instream flows and by increasing storage for later fishery use, without unreasonably impairing other beneficial uses, thus maximizing the use of Russian River water resources. Moreover, given the listings of Chinook salmon, coho salmon, and steelhead under the federal ESA, there is a need for prompt action. As demonstrated by the Biological Opinion, there has been an extensive analysis of the needs of the fishery, and fishery experts agree that the

Decision 1610 minimum instream flows appear to be too high.

4.2 No Injury to Any Other Lawful User of Water

If this petition is granted, the Water Agency still will be required to maintain specified minimum flows in the Russian River. Because these minimum flows will be present, all other legal users of water still will be able to divert and use the amounts of water that they legally may divert and use. Accordingly, granting this petition will not result in any injury to any other lawful user of water.

4.3 No Unreasonable Effect upon Fish, Wildlife, or Other Instream Beneficial Uses

This petition is based upon the analysis contained in the 2008 Biological Opinion, which was issued primarily to improve conditions for fish resources in the Russian River system. Two types of improved conditions will result from an order approving this petition. First, the Biological Opinion concludes that stream flows that are required by Decision 1610 are too high for optimum fish habitat. If this petition is granted, then lower stream flows, which will result in better fish habitat, will occur. Second, lowering the required minimum instream flows will result in higher fall storage levels in Lake Mendocino. The resulting conservation of water in Lake Mendocino will allow enhanced management of Russian River flows in early fall for the benefit of fish migration.

It is possible that reduced flows in the Russian River may impair some instream beneficial uses, principally recreation uses. However, although some recreation uses may be affected by these reduced flows, any such impacts on recreation this summer will be reasonable in light of the impacts to fish that could occur if the petition were not approved.

4.4 The Proposed Change is in the Public Interest

As discussed above, the sole purpose of this petition is to improve conditions for listed Russian River salmonid species, as determined by NMFS and DFW. Approval of the Water Agency's petition to reduce instream flows to benefit the fishery will also result in higher fall storage levels in Lake Mendocino, which will make more water available in the fall for fishery purposes. Under these circumstances, it is in the public interest to temporarily change the Decision 1610 minimum required instream flows.

5.0 REQUESTED TEMPORARY URGENCY CHANGE TO PERMITS 12947A, 12949, 12950, 16596

To meet the terms and conditions of the Biological Opinion and to avoid excessively high flows that could result in violations to the Biological Opinion's Incidental Take Statement, the Water Agency is filing this TUCP. It requests that the State Water Board make the following changes to the Water Agency's permits for a period of 180 days from May 1, 2017 until October 15, 2017:

> (1) reduce the required minimum instream flow in the Russian River from the confluence of the East and West Forks to the river's confluence with Dry Creek from 185 cfs to 125 cfs; and
>
> (2) reduce required minimum instream flow in the Russian River from its confluence with Dry Creek to the Pacific Ocean from 125 cfs to 70 cfs.

The sole purpose of the requested changes is to meet the terms and conditions of the Biological Opinion, as there is adequate water supply available in Lake Mendocino and Lake Sonoma to meet this year's water supply demands by legal users and minimum in-stream flows required by Decision1610.

To improve its efforts at achieving the optimal habitat conditions in the Lower Russian River and to optimally manage flows in the entire river, the Water Agency has requested in this year's TUCP (as in previous ones) that the minimum instream flow requirement be implemented on a 5-day running average of average daily streamflow measurements with the condition that instantaneous flows on the Upper Russian River be no less than 110 cfs and on the Lower Russian River be no less than 60 cfs. This adjustment will allow the Water Agency to manage stream flows with a smaller operational buffer, thereby facilitating the attainment of the low flow conditions that the Biological Opinion identifies as being conducive to the enhancement of salmonid habitat. Reducing the operational buffer will also conserve water supply in Lake Mendocino, resulting in higher storage levels in the fall for increased releases for migrating Chinook salmon and improving carry over storage for the following year.

6.0 WATER CONSERVATION ACTIVITIES

The Water Agency's water contractors are committed to eliminating non-beneficial uses of potable water. The Water Agency and its water contractors continue to implement water use efficiency programs that align with the California Urban Water Conservation

Council's Best Management Practices (BMPs) and comply with SB 7x-7. While these BMPs remain the baseline for the region, the establishment of the Sonoma-Marin Water Saving Partnership (Partnership) in December 2010 memorialized the region's commitment to long-term, year-round water use efficiencies. The Partnership removes one of the most significant barriers to implementing conservation programs, funding. Each Partner has committed to a sustained level of funding that is allocated specifically to implementing conservation programs while continuously implementing water conservation programs to reduce overall regional water use.

The Partnership represents eleven North Bay water utilities in Sonoma and Marin counties that have joined together to provide regional solutions for water use efficiency. The utilities (Partners) are: the Cities of Santa Rosa, Rohnert Park, Petaluma, Sonoma, Cotati; North Marin Water, Valley of the Moon and Marin Municipal Water Districts; Cal American Water Company-Larkfield; the Town of Windsor and the Sonoma County Water Agency. The Partnership was formed to identify and recommend water use efficiency projects and to maximize the cost-effectiveness of water use efficiency programs in our region.

On April 7, 2017 Governor Edmund G. Brown Jr. issued Executive Order B-40-17 that removes the drought emergency for much of the State. Despite this Executive Order, the Partners are committed to maintain a conservation ethic in the region and will continue to implement conservation programs that minimize post drought water demand rebounds. Beyond the State's monthly reporting of water use, the Partners will continue to collect regional data to ensure our water customers remain engaged in making conservation a California way of life.

7.0 CONCLUSION

The potential need to make changes after 1986 to the minimum instream flow requirements specified in Decision 1610 was contemplated by Decision 1610. Decision 1610 states: "Our decision will be subject to a reservation of jurisdiction to amend the minimum flow requirements if future studies show that amendments might benefit the fisheries or if operating the project under the terms and conditions herein causes unforeseen adverse impacts to the fisheries." As discussed in this petition, fisheries studies conducted during the last two decades, which ultimately led to NMFS' Biological Opinion, now indicate the need to amend the Decision 1610 minimum flow requirements. The Water Agency therefore requests that the State Water Board approve this petition.

Appendix 3.2

STATE OF CALIFORNIA
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

In the Matter of Permits 12947A, 12949, 12950, and 16596
(Applications 12919A, 15736, 15737, 19351)

Sonoma County Water Agency

ORDER APPROVING PETITIONS FOR TEMPORARY URGENCY CHANGES TO PERMIT TERMS AND CONDITIONS

SOURCES: (1) East Fork Russian River tributary to Russian River
(2) Dry Creek tributary to Russian River
(3) Russian River thence the Pacific Ocean

COUNTIES: Sonoma and Mendocino

BY THE DEPUTY DIRECTOR FOR WATER RIGHTS:

1.0 SUBSTANCE OF TEMPORARY URGENCY CHANGES

On April 19, 2017, Sonoma County Water Agency (SCWA) filed Temporary Urgency Change Petitions (TUCPs) with the State Water Resources Control Board (State Water Board), Division of Water Rights (Division) requesting approval of changes to the subject permits pursuant to Water Code section 1435. The TUCPs request modification to State Water Board Decision 1610 (D1610) Russian River minimum instream flow requirements due to operational constraints placed on SCWA pursuant to the September 24, 2008, National Marine Fisheries Service (NMFS) Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers (Corps), SCWA, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed (Biological Opinion). The requested changes to D1610 minimum instream flows are as follows:[1]

- From May 1 through October 15, 2017, reduce instream flow requirements for the upper Russian River[2] from 185 cubic feet per second (cfs) to 125 cfs.
- From May 1 through October 15, 2017, reduce instream flow requirements for the lower Russian River[3] from 125 cfs to 70 cfs.

The changes also requested that the minimum instream flow requirement for the upper Russian River will be implemented as a 5-day running average of average daily stream flow measurements, with the stipulation that instantaneous stream flows on the upper Russian River will be no less than 110 cfs and on the lower Russian River no less than 60 cfs.

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[1] No changes to the instream flow requirements for Dry Creek are requested pursuant to the TUCPs.
[2] The upper Russian River refers to the river from the confluence with the East Fork of the Russian River to its confluence with Dry Creek.
[3] The lower Russian River refers to the river downstream of its confluence with Dry Creek to the Pacific Ocean.

This will allow SCWA to manage stream flows with a smaller operational buffer, thereby facilitating the attainment of the flow conditions that the Biological Opinion has concluded are conducive to the enhancement of salmonid habitat. The TUCPs also request changes to specific terms in SCWA's permits, which are described in the next section.

2.0 BACKGROUND

2.1 WATER RIGHT PERMITS

The TUCPs involve the following water right permits held by SCWA:

- Permit 12947A (Application 12919A), which authorizes direct diversion of 92 cfs from the East Fork Russian River and storage of 122,500 acre-feet (af) per year in Lake Mendocino from January 1 through December 31 of each year;
- Permit 12949 (Application 15736), which authorizes direct diversion of 20 cfs from the Russian River at the Wohler and Mirabel Park Intakes near Forestville from January 1 through December 31 of each year;
- Permit 12950 (Application 15737), which authorizes direct diversion of 60 cfs from the Russian River at the Wohler and Mirabel Park Intakes from April 1 through September 30 of each year; and
- Permit 16596 (Application 19351), which authorizes direct diversion of 180 cfs from the Russian River from January 1 to December 31 of each year and storage of 245,000 afa in Lake Sonoma from October 1 of each year to May 1 of the succeeding year.

2.2 REQUIREMENTS OF D1610

The State Water Board adopted D1610 in 1986. D1610 set minimum instream flows in the Russian River to "preserve the fishery and recreation in the river and in Lake Mendocino to the greatest extent possible while serving the needs of the agricultural, municipal, domestic, and industrial uses which are dependent upon the water." (Decision 1610 at p. 21.) The State Water Board also concluded in D1610 that additional fishery studies should be done. (D1610 at pp. 26-27.)

D1610 established water year classifications of *Normal*, *Dry*, and *Critically Dry*, which are based on cumulative inflow into Lake Pillsbury (in the Eel River Watershed) beginning October 1 of each year.[4] D1610 further specifies two variations of *Normal*, known as *Dry Spring 1* and *Dry Spring 2*, which provide lower minimum flows in the upper Russian River during times when combined storage in Lake Pillsbury and Lake Mendocino is unusually low. The Cumulative inflow into Lake Pillsbury from October 1, 2016 to April 17, 2017 was 771,787 af. Consequently, the water supply condition will be categorized as *Normal* for the remainder of the year. As such, the following conditions are required pursuant to D1610:

- Term 20 of Permit 12947A requires SCWA to pass through or release from storage at Lake Mendocino sufficient water to maintain specified instream flows for the protection of fish and wildlife, and for the maintenance of recreation in the Russian River. The flows vary depending on river reach and water supply conditions. For *Normal* water supply conditions, the minimum flow requirements are 185 cfs for the upper Russian River and 125 cfs for the lower Russian River.
- Term 17 of both Permits 12949 and 12950 requires SCWA to allow sufficient water to bypass the points of diversion at the Wohler and Mirabel Park Intakes on the Russian River to maintain 125 cfs to the Pacific Ocean during *Normal* water supply conditions.
- Similarly, Term 13 of Permit 16596 requires SCWA to maintain 125 cfs in the lower Russian River during *Normal* water supply conditions, unless the water level in Lake Sonoma is below elevation 292.0 feet with reference to the National Geodetic Vertical Datum of 1929, or unless federally prohibited.

[4] Permits 12947A, 12949, 12950, and 16596 use the same water-year classification definitions.

2.3 Biological Opinion

Under the federal Endangered Species Act, Central California Coast (CCC) steelhead *(Oncorhynchus mykiss)*, CCC coho salmon *(O. kisutch)*, and Central Coast (CC) Chinook salmon *(O. tshawytscha)* in the Russian River watershed are listed as threatened or endangered species. In accordance with the requirements of section 7 of the Endangered Species Act, NMFS, SCWA, and the Corps participated in a consultation process involving studies to determine whether the water supply and flood control operations of the Russian River (including the operations authorized under the subject permits) are likely to harm the survival and recovery of these listed fish species. The Biological Opinion includes summaries of the studies, analyses of the project impacts, and a determination that the flows set by D1610 no longer benefit both fishery and recreational uses. More specifically, the Biological Opinion indicated that summer flows in the upper Russian River and Dry Creek as required by D1610 are too high for optimal juvenile salmonid habitat within the Russian River system. According to the Biological Opinion, two types of issues are associated with the summer flows required by D1610: (1) the flows create current velocities that limit the amount of freshwater rearing habitat available to salmonids; and (2) the flow release requirements deplete the cold water pool in Lake Mendocino, contributing to relatively high water temperatures, which reduce the quality of available rearing habitat.

The Biological Opinion also concluded that the historical practice of breaching the sandbar at the mouth of the Russian River during the summer and fall adversely affects the estuarine rearing habitat for listed species. NMFS concluded that management of the estuary as a seasonal freshwater lagoon could improve conditions for juvenile salmon and steelhead and required SCWA to adopt adaptive management practices in the estuary. Additionally, the minimum instream flows required by D1610 were found to result in flows into the estuary that make it difficult to maintain a freshwater lagoon while preventing flooding of adjacent properties.

The Biological Opinion states that the D1610 minimum instream flow requirements in the Russian River will continue to jeopardize the recovery of CCC coho salmon and CCC steelhead unless the flows are modified. The Biological Opinion requires SCWA to file a petition for change with the State Water Board to improve conditions for listed species by seeking long-term, permanent reductions in the Russian River minimum instream flow requirements contained in SCWA's existing water rights permits.[5] The Biological Opinion also contains the following requirement:

> "To help restore freshwater habitats for listed salmon and steelhead in the Russian River estuary, SCWA will pursue interim relief from D1610 minimum flow requirements by petitioning the State Water Board for changes to D1610 beginning in 2010 and for each year prior to the permanent change to D1610. These petitions for change will request that minimum bypass flows of 70 cfs be implemented at the US Geological Survey (USGS) gage at the Hacienda Bridge between May 1 and October 15, with the understanding that for compliance purposes SCWA will typically maintain about 85 cfs at the Hacienda gage. For purposes of enhancing steelhead rearing habitats between the East Branch [Fork] and Hopland, these petitions for change will request a minimum bypass flow of 125 cfs at the Healdsburg gage between May 1 and October 15. NMFS will support SCWA's petitions for these changes to Decision 1610 in presentations before the State Water Board."

Coho salmon are also listed under the California Endangered Species Act (CESA). The California Department of Fish and Wildlife (CDFW) has issued a consistency determination, in which it determined that the incidental take statement issued to SCWA by NMFS in connection with the Biological Opinion was consistent with the provisions and requirements of CESA.

2.4 Long Term Water Rights Change Petitions

SCWA has also been progressing with petitioning for long term water right changes from the State Water Board as required in the Biological Opinion. SCWA submitted petitions for change and extensions of time filed under Permits 12947A, 12949, 12950, and 16596 (Applications 12919A, 15736, 15737, and 19351). The petitions, initially filed in 2009 and revised on August 17, 2016, request the following modifications to permit terms and conditions: (1) modification of the Russian River minimum instream flow requirements in Permits 12947A and

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[5] On September 23, 2009, SCWA filed a petition for change with the State Water Board and the petition for change is pending. A revised petition was filed on August 17, 2016.

16596; (2) modification of the required bypass flows in Permits 12949 and 12950, consistent with the requested minimum instream flows; (3) modification of the hydrologic index used to classify water supply conditions in Permits 12947A, 12949, 12950, and 16596; and (4) extension of the deadline for full application of water in Permits 12949, 12950 and 16596. The Draft Environmental Impact Report (DEIR) for the Fish Habitat Flows and Water Rights Project was also completed in 2016 and included a public review period from August 19, 2016 to October 17, 2016. The State Water Board and North Coast Regional Water Quality Control Board provided comments to the DEIR in a March 10, 2017 comment letter, which included significant requests for additional clarification and analysis of the project's impacts in the final EIR, which when considered with other agency and public comments, could result in modifications to the long term Fish Habitat Flows and Water Rights Project.

3.0 COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

The State Water Board must comply with any applicable requirements of the California Environmental Quality Act (CEQA) prior to issuance of any order approving a TUCP. (Cal. Code Regs., tit. 23, § 805.) SCWA determined that the requested change is categorically exempt under CEQA as the change meets the Class 1, 7, and 8 exemption criteria. SCWA filed a Notice of Exemption on April 19, 2017. The State Water Board has reviewed the information submitted by SCWA and has made its own independent finding that the requested changes are categorically exempt from CEQA.

The changes sought by the TUCPs are consistent with the following Categorical CEQA exemptions for the following reasons:

1) The proposed action consists of the operation of existing facilities involving negligible or no expansion of use beyond that existing, and accordingly is categorically exempt from CEQA under a Class 1 exemption. (Cal. Code Regs., tit. 14, § 15301.) The proposed action will be within the range of minimum instream flows established by D1610.

2) A Class 6 exemption "consists of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. These [activities] may be . . . part of a study leading to an action which a public agency has not yet approved, adopted or funded." (*Id.*, § 15306.) The water quality and fishery information and data collected during the period that the proposed action is in effect will assist with the study and development of future long-term changes to D1610 instream flow requirements, for which a separate petition for change is pending.

3) A Class 7 exemption "consists of actions taken by regulatory agencies as authorized by state law or local ordinance to assure the maintenance, restoration, or enhancement of a natural resource where the regulatory process involves procedures for protection of the environment." (*Id.*, § 15307.) The proposed action will ensure the maintenance of a natural resource (i.e., the instream resources of the Russian River) by increasing availability and improving the quality of salmonid rearing habitat in the upper Russian River and more closely mimicking natural inflow to the estuary, thereby enhancing the potential for maintaining a seasonal freshwater lagoon that could support increased production of juvenile steelhead. Accordingly, these changes are categorically exempt from CEQA pursuant to a Class 7 exemption.

4) A Class 8 exemption "consists of actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment." (*Id.*, § 15308.) The proposed action will ensure the maintenance of the environment (i.e., the instream environment of the Russian River) in the same way as stated for the Class 7 exemption.

4.0 PROCEDURAL REQUIREMENTS CONCERNING THE TUCPS

Pursuant to Water Code section 1438, the State Water Board may issue a temporary urgency change order in advance of the required notice. The State Water Board will issue and deliver to SCWA, as soon as practicable, a notice of the temporary urgency change order pursuant to Water Code section 1438(a). Pursuant to Water Code section 1438(b)(1), SCWA is required to publish the notice in a newspaper having a general circulation, and that is published within the counties where the points of diversion are located. In addition, the State Water Board will post

the notice of the temporary urgency change order on its website, along with the TUCPs and accompanying materials. The State Water Board will also distribute the notice through an electronic notification system. The State Water Board issued, and delivered to SCWA, public notice of the temporary urgency change on May 1, 2017. The public comment period ends on June 1, 2017.

Any interested person may file an objection to a temporary urgency change. (*Id.*, subd. (d).) State Water Board Resolution 2012-0029 delegates to the Deputy Director for Water Rights the authority to act on a TUCP if there are no objections. (Resolution 2012-0029, ¶ 4.4.1.) To date, one objection was received from the Russian River Watershed Protection Committee. This objection will be reviewed and addressed separately from the Order.

The State Water Board exercises continuing supervision over temporary urgency change orders and may modify or revoke temporary urgency change orders at any time. (Wat. Code, §§ 1439, 1440.) Temporary urgency change orders automatically expire 180 days from the date the authorization takes effect, unless revoked or an earlier expiration date is specified. (*Id.*, § 1440.) The State Water Board may renew temporary urgency change orders for a period not to exceed 180 days. (*Id.*, § 1441.)

5.0 Criteria for Approving the Proposed Temporary Urgency Changes

Water Code section 1435 provides that a right holder who has an urgent need to change the point of diversion, place of use, or purpose of use from that specified in the water right may petition for a conditional temporary change order. The State Water Board's regulations set forth the filing and other procedural requirements applicable to TUCPs. (Cal. Code Regs., tit. 23, §§ 805, 806.) The State Water Board's regulations also clarify that requests for changes to permits or licenses other than changes in point of diversion, place of use, or purpose of use may be filed, subject to the same filing and procedural requirements that apply to changes in point of diversion, place of use, or purpose of use. (*Id.*, § 791, subd. (e).)

Before approving a TUCP, the State Water Board must make the following findings (Wat. Code, § 1435, subd. (b)(1-4).): (1) the right holder has an urgent need to make the proposed change; (2) the proposed change may be made without injury to any other lawful user of water; (3) the proposed change may be made without unreasonable effect upon fish, wildlife, or other instream beneficial uses; and (4) the proposed change is in the public interest.

5.1 Urgency of the Proposed Changes

Under Water Code section 1435(c), an "urgent need" means "the existence of circumstances from which the board may in its judgment conclude that the proposed temporary change is necessary to further the constitutional policy that the water resources of the state be put to beneficial use to the fullest extent of which they are capable and that waste of water be prevented . . . ." The changes requested by SCWA for conformance with the Biological Opinion would improve habitat for listed salmonids by reducing flows and enabling increased storage for later fishery use, without unreasonable effects on other beneficial uses. Moreover, given the status of salmonids under the federal Endangered Species Act, there is a need for prompt action. In this case, there has been an extensive analysis of the needs of the fishery and experts have agreed that instream flows appear to be too high. The change will not affect the ability of SCWA to deliver water for approved beneficial uses in its service area.

5.2 No Injury to Any Other Lawful User of Water

SCWA will be required by this temporary urgency change order to maintain specified flows in the Russian River from its most upstream point of diversion to the river's confluence with the Pacific Ocean. Therefore, because minimum flows will be present, it is anticipated that all other lawful users of water will still be able to divert and use the amounts of water that they are legally entitled to during the period specified in this temporary urgency change order. As a general rule, appropriative water right holders below Lake Mendocino and Lake Sonoma are only entitled to divert natural and abandoned flows, and riparian water right holders are only entitled to divert natural flows; appropriative and riparian right holders are not entitled to divert water previously stored by SCWA that is released for use downstream, including stored water that is released for purposes of meeting instream flow requirements. (*State Water Resources Control Board Cases* (2006) 136 Cal.App.4th 674, 738-743.) Accordingly, SCWA is not obligated to supply water stored in Lake Mendocino to other users of water, except to the extent the users hold permits issued under the Sonoma County reservation established in Decision 1030 and Order WR 74-30. However, the reservation only applies to the use of water within the Russian River Valley, as defined by a map prepared by the Corps (Decision 1030, pp. 9, 46-47), and SCWA is not obligated to release stored water to satisfy

demand under the reservation (to the extent that retention of stored water is necessary to ensure satisfaction of the minimum instream flows required under Permit 12947A (Order WR 74-30, p. 13)). For these reasons, other legal users of water will not be injured to the extent that SCWA releases less previously stored water as a result of the changes.

Based on the information available, granting the TUCPs will not result in injury to any other lawful user of water. Pursuant to Water Code section 1439, the State Water Board will supervise diversion and use of water under this temporary urgency change order for the protection of all other lawful users of water and instream beneficial uses.

5.3 No Unreasonable Effect upon Fish, Wildlife, or Other Instream Beneficial Uses

The TUCPs are based upon the analysis contained in the Biological Opinion, which was issued primarily for improving conditions for fishery resources in the Russian River. Improved conditions that result from the temporary urgency changes are threefold. First, the reduction in minimum instream flows will result in improved salmonid rearing habitat in the Russian River. Secondly, reducing instream flows will result in conservation of a cold water pool in Lake Mendocino which would allow for cooler water temperatures in the upper Russian River, improved freshwater rearing habitat quality, and enhanced management of the flows in early fall for the benefit of fish migration. Thirdly, the reduction in minimum flow requirements may encourage formation of a closed or perched lagoon at the mouth of the Russian River and therefore enhance estuarine rearing habitat for salmonids.

SCWA will continue to be required to report on consultations with CDFW, NMFS, and the North Coast Regional Water Quality Control Board (Regional Water Board). In addition, to ensure beneficial use of water resources to the fullest extent possible and to prevent waste of water, SCWA will also be required to provide weekly updates to the State Water Board, CDFW, NMFS, and the Regional Water Board regarding the current hydrologic and environmental (water quality and fishery) conditions of the Russian River. This information will assist the State Water Board in determining whether additional actions are necessary.

Upper and Lower Russian River flows should be able to be maintained at or above the requested minimum flows during the requested TUCP's period due to this year's higher than average precipitation, and higher reservoir storage levels in Lake Mendocino. This has not always been the case, including in recent drought years. Therefore, due to the favorable hydrologic conditions, the TUCP's requested change to provide greater operational flexibility with a 5-day running average minimum flow and reduced minimum instantaneous flow of 60 cfs in the lower Russian River and 110 cfs in the upper Russian River is not necessary this year.

5.3.1 Recreation

It is possible that reduced flows in the Russian River could impair some instream beneficial uses, principally recreational uses. However, since 2004, Russian River flows have frequently been managed at decreased levels, both under D1610 and under other temporary urgency change orders. Despite changing operations, the average daily lower Russian River flows from 2010 to 2016 have been above 90 cfs in the months of July and August, except 2015, which was a dry year. Although recreational uses may be minimally affected by flow reductions, given the analysis in the Biological Opinion and the potential impacts to fisheries that could occur if the temporary changes are not approved, any impact on recreation for this summer would be reasonable under the circumstances and with the operational buffer flows made by SCWA.

5.3.2 Water Quality and Availability of Aquatic Habitat

During the period that the flow reductions will be in effect, SCWA will collect water quality and fishery information data. The monitoring activities will be summarized in annual reports intended to evaluate whether and to what extent the reduced flows may have caused any impacts to water quality and availability of aquatic habitat for salmonids. This information will serve to inform the State Water Board's continuing supervision of the diversion and use of water under this temporary urgency change order pursuant to Water Code section 1439. In addition, this information will assist with the study and development of future long-term changes in D1610 instream flow requirements for which a separate petition is pending.

5.3.3 Cyanobacteria

Cyanobacteria are present in most freshwater and marine aquatic environments. When conditions are favorable, including abundant light, elevated water temperature, elevated levels of nutrients, and lack of water turbulence and velocity, cyanobacteria can quickly multiply into a bloom. Not every bloom is toxic; however, harmful algal blooms (cyanoHABs) are a concern as some species of cyanobacteria produce toxins that have the potential to impact

drinking water, recreation, and fish and wildlife. Cyanotoxins were present in the Russian River in 2015 and 2016, which led to Sonoma County Department of Health Services posting warning signs. The warning signs were removed on October 11, 2016, due to the weather and water conditions on the Russian River no longer being favorable for cyanobacteria growth.

There are currently no federal water quality criteria, or regulations for cyanobacteria or cyanotoxins. However, some toxins (microcystins and clyindrospermopsin) have been added to the contaminant candidate list under the Safe Drinking Water Act, under the Regulatory Determination Process. In addition, the Clean Water Act sets ambient water quality standards and requires that the Environmental Protection Agency develop management strategies for assessing and managing algal toxins.

As of 2017, there is no regulation in the State of California regarding cyanobacteria or cyanotoxins. However, there has been an increase in cyanoHABs in California and a need for a statewide strategy. As a response, the Surface Water Ambient Monitoring Program (SWAMP) has developed a freshwater cyanoHAB assessment and a support strategy in coordination with other agencies to address assessment, response, and management of freshwater cyanoHABs.

The Regional Water Board, Sonoma County Department of Health Services, SCWA, and Sonoma County Department of Parks and Recreation formed a workgroup to coordinate a monitoring approach for assessing cyanobacteria in the Russian River during the summer of 2016 and ongoing as needed. SCWA has consulted with the Regional Water Board regarding monitoring activities related to the workgroup. As a result of the consultation, SCWA will make additional modifications to their existing Water Quality Monitoring Plan for the Russian River Estuary Management Project to include freshwater monitoring for the purpose of assisting in the evaluation of cyanoHAB conditions and the risk co-factors contributing to nuisance blooms (e.g., flow, temperature, nutrient, etc.).

5.3.4 Consultation

SCWA and the State Water Board consulted with CDFW, NMFS, and the Regional Water Board regarding the request to reduce minimum instream flow requirements in the Russian River. NMFS did not object to the proposed request and provided comments on the draft terms to the State Water Board which address fish monitoring sites and the ramping rate of release flows reductions from Lake Mendocino to protect against fish stranding. With the inclusion of the suggested comments, NMFS believes the terms and conditions included in this order are appropriate. CDFW and the Regional Board did not object to the proposed request and are in agreement with the terms and conditions.

5.4 The Proposed Change is in the Public Interest

As discussed above, the sole purpose of the TUCPs is to improve conditions for listed salmonids in the Russian River. Approval of the request to temporarily reduce minimum instream flows to benefit the fishery will also maintain storage levels in Lake Mendocino for a longer period of time so that water is available in the fall for fisheries purposes.

6.0 Conclusions

The State Water Board has adequate information in its files to make the findings required by Water Code section 1435(b).

I conclude that, based on the available evidence: (1) the right holder has an urgent need to make the proposed changes; (2) the proposed changes will not operate to the injury of any other lawful user of water; (3) the proposed changes will not have an unreasonable effect upon fish, wildlife, or other instream beneficial uses; and (4) the proposed changes are in the public interest.

ORDER

NOW, THEREFORE, IT IS ORDERED THAT: the TUCPs filed by SCWA for temporary urgency changes in Permits 12947A, 12949, 12950 and 16596 are approved and effective until October 15, 2017.

All existing terms and conditions of the subject permits remain in effect, except as temporarily amended by the following terms:

1. The minimum instream flow requirements in the Russian River, as specified in Term 20 of Permit 12947A, Term 17 of Permits 12949 and 12950, and Term 13 of Permit 16596, shall be modified as follows:

   a. Minimum instream flow in the upper Russian River shall remain at or above 125 cfs;

   b. Minimum instream flow in the lower Russian River shall remain at or above 70 cfs.

   For purposes of compliance with this term, the minimum instream flow requirements shall be based on instantaneous flow measurements.

2. SCWA shall conduct the following fisheries monitoring tasks and associated recording and reporting requirements. A summary report of the fisheries monitoring tasks described below shall be submitted to the Deputy Director for Water Rights by April 1, 2018, in accordance with the NMFS and CDFW annual reporting requirements as more fully described in the Biological Opinion.

   a. Beginning no later than September 1, 2017, and continuing through the duration of this Order, SCWA shall monitor and record daily numbers of adult salmon and steelhead moving upstream past the life cycle monitoring station in Dry Creek, at the Healdsburg fish ladder (when operable), and at Mirabel fish ladder. Mirabel fish ladder numbers shall be included in bi-weekly reports required in Term 7 (Dry Creek and Healdsburg numbers shall be reported as soon as they become available).

   b. Beginning October 1, 2017, if adult salmon and steelhead can enter the Russian River estuary and suitable water clarity allows snorkel surveys, SCWA shall monitor numbers of adult salmon and steelhead in representative deep pools in the lower Russian River downstream of the Mirabel inflatable dam. Monitoring shall occur on a weekly basis continuing through the duration of this Order or until sustained flows at the USGS gage at Hacienda (No.11467000) are above 135 cfs.

   c. Prior to October 15, 2017, or after a cumulative seasonal total of 100 adult salmon and steelhead move upstream past the counting station at the Mirabel fish ladder, whichever is earlier, SCWA shall consult with NMFS and CDFW regarding the possibility of increasing the instream flow at the gage at Hacienda to a level not to exceed 135 cfs. Consultations shall occur every two weeks and a summary report of consultation details and any increases to the minimum flows shall be submitted to the Deputy Director for Water Rights within one week of each consultation meeting.

   SCWA shall consult with NMFS and CDFW regarding any necessary revisions to this term. A summary report of consultation details shall be submitted to the Deputy Director for Water Rights within one week of any consultation meeting. Upon consultation with NMFS and CDFW, any necessary revisions to this term shall be made upon approval by the Deputy Director for Water Rights.

3. Monitoring shall be conducted to determine the effects on water quality and availability of aquatic habitat for salmonids. Monitoring in the Russian River shall include continuous monitoring of temperature, dissolved oxygen, pH, and specific conductivity at multiple stations from Ukiah to Jenner as described below for the duration of this Order.

   a. Monitoring on the East Fork Russian River shall occur at a seasonal water quality data sonde with real-time telemetry located approximately 1/3 mile (0.33 mi) downstream from Lake Mendocino, and SCWA shall record hourly measurements of water temperature, dissolved oxygen, specific conductivity, pH, and turbidity.

   b. Monitoring on the Russian River shall occur at three, multi-parameter "permanent" water quality data sondes at USGS stream gages located at Hopland, Diggers Bend near Healdsburg, and Hacienda Bridge. These three data sondes are referred to as "permanent" as they are maintained as part of SCWA's early warning detection system in coordination with USGS on its "Real-time

Data for California" website. The data sonde at SCWA's river diversion facility at Mirabel was removed in March 2014 due to construction of fish screen/fish ladder facilities. Construction of the fish screen/fish ladder facility is now complete and SCWA staff is currently evaluating options for installing a data sonde at the fish screen/fish ladder facility and anticipate having it operational by the end of summer 2017. If this data sonde is operational within the Order time period, data from this location will be included in the 2017 monitoring effort.

c. Monitoring on the Russian River shall occur at three seasonal data sondes with real-time telemetry in cooperation with USGS at USGS gages at Cloverdale station (north of Cloverdale at Commisky Station Road), Jimtown (at the Alexander Valley Road bridge), and at Johnson's Beach (Guerneville). The data sonde at the Cloverdale gage collects dissolved oxygen and temperature, the data sonde at the Jimtown gage collects pH, temperature, dissolved oxygen, specific conductivity and turbidity, and the data sonde at Johnson's Beach collects pH, temperature, dissolved oxygen, specific conductivity and turbidity. Data from these locations is available on the USGS "Real-time Data for California" website.

SCWA shall consult with the Regional Water Board regarding any necessary revisions to this term. A summary report of consultation details shall be submitted to the Deputy Director for Water Rights and the Executive Officer of the Regional Water Board within one week of any consultation. Any necessary revisions to the terms and conditions shall be made upon approval by the Deputy Director for Water Rights.

4. Monitoring in the Russian River and its estuary shall include monitoring to contribute to the assessment of water quality indicators and water column conditions for the purpose of assisting in the evaluation of cyanoHAB conditions and the risk co-factors contributing to nuisance blooms (e.g., flow, temperature, nutrients, etc.). The monitoring shall be conducted in accordance with the "Water Quality Monitoring Plan for the Russian River Estuary Management Project" to be developed by June 30, 2017, in consultation with the Regional Water Board. Right holder shall submit a copy of the final plan to the Deputy Director for Water Rights and the Executive Officer of the Regional Water Board within two weeks of its completion.

   SCWA shall consult with the Regional Water Board regarding any necessary revisions to this term by June 15, 2017. A summary report of consultation details shall be submitted to the Deputy Director for Water Rights within one week of any consultation. Any necessary revisions to this term shall be made upon approval by the Deputy Director for Water Rights.

5. Before June 15, 2017, SCWA shall consult with the Regional Water Board to discuss possible water quality impacts of the reduced flows and water quality monitoring activities that will be required to document water quality conditions in the Russian River. SCWA shall submit a summary report of consultation details and a description of any modifications to the monitoring activities to the Deputy Director for Water Rights within one week of the consultation. Any necessary revisions to Terms 3 and 4 shall be made upon approval by the Deputy Director for Water Rights.

6. SCWA shall provide reports of the water quality monitoring tasks as detailed in Terms 3 through 5 as described below.

   a. Summary data from the permanent water quality data sondes required in Term 3 and the nutrient/bacterial/algal sampling data obtained in accordance with Term 4 (as data becomes available) shall be submitted to the Deputy Director for Water Rights and the Executive Officer of the Regional Water Board in the weekly hydrologic status report required in Term 7.

   b. All water quality data collected pursuant to Terms 3 and 4 during the term of this Order shall be summarized. The summary report shall include an evaluation of whether, and to what extent, the reduced flows authorized by the Order caused any impacts to water quality, including any water quality impacts affecting recreation or the availability of aquatic habitat for salmonids. The report shall be submitted to the Deputy Director for Water Rights and the Executive Officer of the Regional Water Board by April 1, 2018.

   c. If any water quality issues of concern are observed from the continuous monitoring or water sampling after June 15, 2017, SCWA or the Regional Water Board may initiate additional consultation. SCWA shall submit a summary report of consultation details to the Deputy Director for Water Rights within one week of each consultation meeting. If no additional consultation is

necessary; SCWA shall submit an explanation to the Deputy Director for Water Rights within one week after the conclusion of the effective period of this Order. Upon consultation with the Regional Water Board, any necessary revisions to Terms 3, 4, and 5 shall be made upon approval by the Deputy Director for Water Rights.

7. SCWA shall report to the Deputy Director for Water Rights, the Executive Officer of the Regional Water Board, the Environmental Program Manager of CDFW, and the Supervisory Fish Biologist of NMFS on a weekly basis regarding the current hydrologic condition of the Russian River system, including current Lake Mendocino reservoir level, the rate of decline for Lake Mendocino, a 16-day cumulative rainfall forecast, current inflow from the Potter Valley Project, and a summary of the available water quality data, including bacteria indicators. Fish counts shall be reported every two weeks.

8. This Order does not authorize any act that results in the taking of a candidate, threatened or endangered species, or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 et seq.) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 et seq.). If a "take" will result from any act authorized under this Order, SCWA shall obtain authorization for an incidental take permit prior to operation of the project. SCWA shall be responsible for meeting all requirements of the applicable Endangered Species Act for the temporary urgency changes authorized under this Order.

9. The State Water Board reserves jurisdiction to supervise the temporary urgency changes under this Order, and to coordinate or modify terms and conditions, for the protection of vested rights, fish, wildlife, instream beneficial uses and the public interest as future conditions may warrant.

10. SCWA shall immediately notify the Deputy Director for Water Rights if any significant change in storage conditions in Lake Mendocino occurs that warrants reconsideration of this Order.

11. By April 1, 2018, SCWA shall provide a written update to the Deputy Director for Water Rights regarding activities and programs being implemented by SCWA and its water contractors to assess and reduce water loss, promote increased water use efficiency and conservation, and improve regional water supply reliability.

12. Due to favorable hydrologic conditions in 2017 and to protect against stranding of fish when flow in the East Fork Russian River immediately below Coyote Dam is less than 250 cfs and releases from Lake Mendocino are reduced, flow in the East Fork Russian River immediately below Coyote Dam shall not be reduced by more than 12 cfs per hour, up to a maximum 24 cfs per day. Down ramping rates specified in this term may be revised upon consultation with NMFS and CDFW and approval of the Deputy Director for Water Rights. SCWA shall submit a summary report of consultation details to the Deputy Director within one week of each consultation meeting.

STATE WATER RESOURCES CONTROL BOARD

[redacted]

Leslie F. Grober, Deputy Director
Division of Water Rights

Dated: MAY 19 2017

Appendix 3.3

SONOMA COUNTY WATER AGENCY

CF/42-0.19-9.1 Correspondence Related to SWRCB Order Approving Temporary Urgency Change in Permits 12947A, 12949, 12950 & 16596 for 2018 (ID 6957)

April 2, 2018

SENT VIA EMAIL AND US MAIL

Attn: Mr. Erik Ekdahl
Deputy Director of Water Rights
State Water Resources Control Board
Division of Water Rights
P.O. Box 2000
Sacramento, CA 95812-2000

RE: Reporting Requirements for Terms 2, 6 and 11 of the State Water Resources Control Board Order Dated May 19, 2017

Dear Mr. Ekdahl:

Enclosed please find the following enclosed reports by the Sonoma County Water Agency to meet the final requirements of the State Water Resources Control Board order dated May 19, 2017 that approved the Temporary Urgency Change Petitions for water-right Permits 12947A, 12949, 12950, and 16596 (Applications 12919A, 15736, 15737, and 19351):

- Term 2 – Fisheries Monitoring
- Term 6 – Water Quality Monitoring
- Term 11 – Water Use Efficiency and Supply Reliability Projects

If you have any questions or comments about these reports, please do not hesitate to contact me at (707) 524-1173 or tschram@scwa.ca.gov .

Sincerely,

[redacted]

Todd J. Schram, P.E.
Water Agency Engineer IV

Enclosures

c: Sean Maguire, Patricia Fernandez - State Water Resources Control Board, Division of Water Rights
G. Davis, J. Jasperse, P. Jeane, D. Seymour - Sonoma County Water Agency
C. O'Donnell - Sonoma County Counsel
Alan Lilly - Bartkiewicz, Kronick & Shanahan

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State Water Resources Control Board
Order 5/19/2017

Term 2 – Fisheries Monitoring Tasks

April 1, 2018

Prepared by

Sonoma County Water Agency
404 Aviation Blvd
Santa Rosa, CA 95403

Introduction

On April 19, 2017, the Sonoma County Water Agency (Water Agency) filed a Temporary Urgency Change Petition (TUCP) with the State Water Resources Control Board (SWRCB) to temporarily reduce minimum instream flows in the upper Russian River to comply with operational constraints placed on the Water Agency pursuant to the September 24, 2008, National Marine Fisheries Service (NMFS) Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed (Biological Opinion).

In summary, the Water Agency requested that the SWRCB make the following temporary changes to the Decision 1610 (D1610) instream flow requirements:

(1) From May 1, 2017, through October 15, 2017, reduce instream flow requirements for the upper Russian River (from its confluence with the East Fork of the Russian River to its confluence with Dry Creek) from 185 cubic feet per second (cfs) to 125 cfs.

(2) From May 1, 2017, through October 15, 2017, reduce instream flow requirements for the lower Russian River (downstream of its confluence with Dry Creek) from 125 cfs to 70 cfs.

The SWRCB issued an Order (Order) approving the Water Agency's TUCP on May 19, 2017 (SWRCB 2017).

The State Water Board's Order included fisheries monitoring and reporting tasks which are summarized in term 2 of the Order. Term 2 required that the Water Agency monitor and record the daily number of adult salmonids moving upstream through the Russian River past the Dry Creek life cycle monitoring station and past the Healdsburg fish ladder. Beginning October 1, 2017 if the mouth of the river was open and adult salmon and steelhead could enter the Russian River the Water Agency was to monitor the number of adult salmon and steelhead in relatively deep pools in the lower Russian River (downstream of the Mirabel inflatable dam) on a weekly basis continuing through the duration of the order or until sustain flow at Hacienda (USGS gage 11467000) was above 135 cfs. Prior to October 15, 2017, or after a cumulative seasonal total of 100 adult salmon and steelhead move upstream past the Mirabel Dam fish counting station, whichever is earlier, the Water Agency was to consult with NMFS and CDFW regarding the possibility of increasing the instream flow at the Hacienda gage (USGS gage 11467000) to a level not to exceeding 135 cfs. Consultations were to occur every two weeks and a summary report of consultation details and any increases to the minimum flows was to be submitted to the Deputy Director for Water Rights within one week of each consultation meeting.

Methods

Adult fish counts

In 2017 the Water Agency experimented with operating an underwater video camera in the newly constructed Mirabel fish ladder on the west side of the Mirabel Inflatable Dam, as well as the "old" fish ladder on the east side of the dam, to count adult salmon returning to the Russian River. A camera was deployed in the west side counting station on September 13, and the east side fish ladder was deployed on September 29.

Snorkel surveys

Flows were sufficient to provide suitable conditions for adult upstream migration in 2017. As a result, snorkel surveys were not conducted.

Results

Flow

From May 1, 2017 to October 15, 2017 flow in the Russian River at Hacienda ranged from a high of over 1,350 cfs on May 1, to a low of 143 cfs on September 3. During the period of the Order, the Russian River was influenced by tributary in-flow until June, and was generally controlled by reservoir releases from July through early-October, and again by tributary inflow in late October. During the adult Chinook migration period flows were above 135 cfs (e.g., flows would not be limiting to adult salmonid upstream migration (Figure 1).

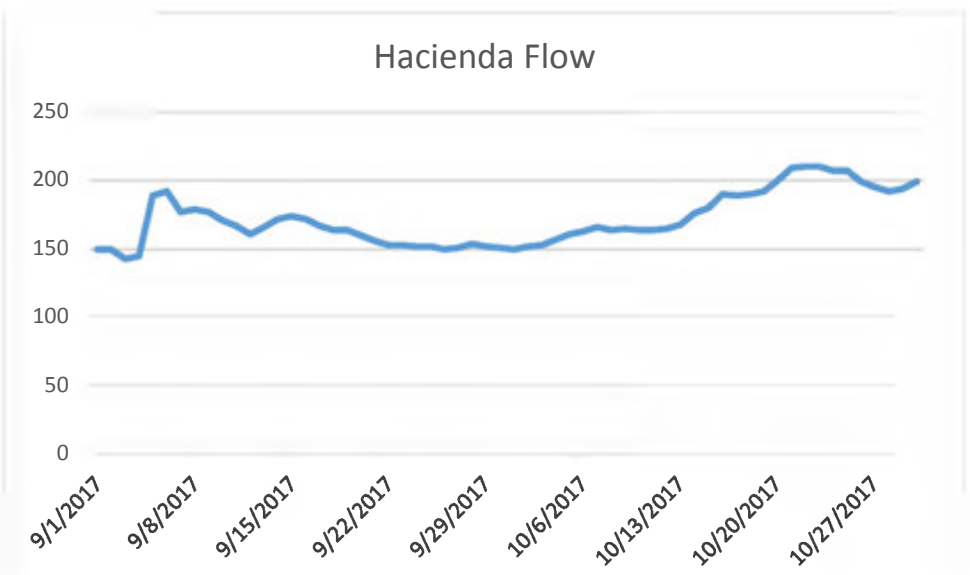

Figure 1. Flow at the USGS stream gages at Hacienda during the period of the Order that overlaps with the adult salmon migration (September 1 through October 15).

Adult counts

Video and DIDSON counts

The Water Agency operated two video camera at Mirabel from September 13 to after the Order expired. Typically 2 video cameras are operated at Mirabel, one in the east fish ladder and one in the west fish ladder. In 2017 we installed a video camera in the west ladder on September

13 and a camera in the east fish ladder on September 29. There were multiple periods of significant data loss at Mirabel due to technical problems mainly related to power loss. However, overall the system performed well (Figure 2).

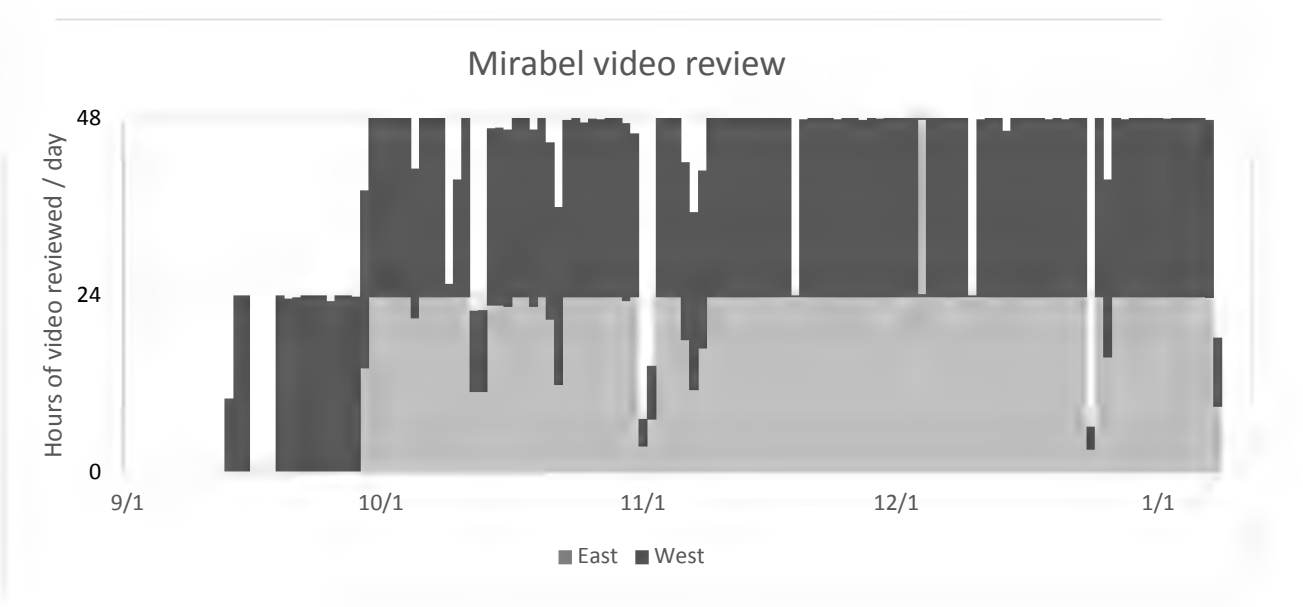

Figure 2. The number of hours of underwater video that has been reviewed per day at the Mirabel Fish ladder on the mainstem Russian River. Missing hours are due to corrupt data and technical difficulties.

At Mirabel 146 Chinook, 1 fish that had coho characteristics, 3 steelhead adults, and 2 unidentified adult salmonids were observed during the Order. The river mouth was closed for much of September (Figure 2). With the exception of 5 Chinook salmon, all salmonids were observed after October 1, 2017. The start date for the Chinook salmon run in 2017 is consistent with past years.

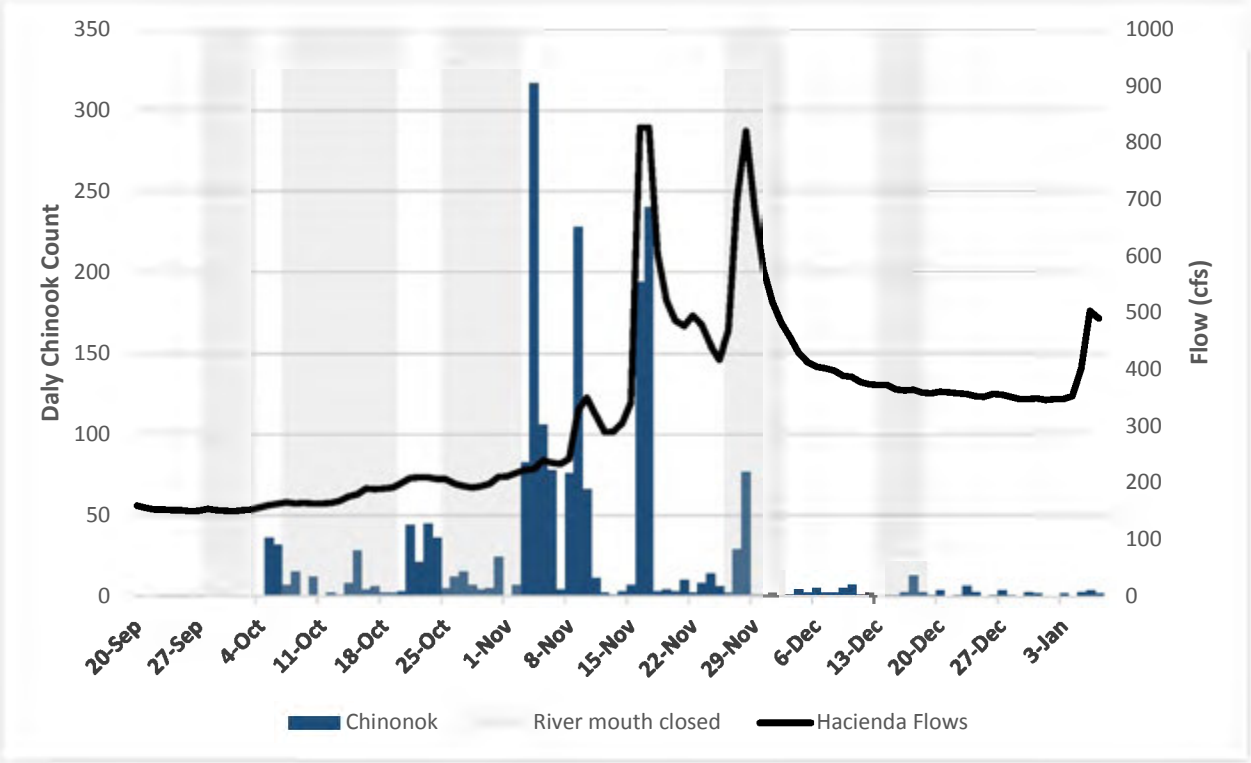

Figure 2. The period of time that the mouth of the Russian River was closed, the flow in the Russian River from the USGS Hacienda gage, and the number of adult salmonids observed at the Dry Creek DIDSON, Healdsburg underwater video, and Mirabel underwater video during the period of the Order.

Discussion

Flow

Flow in the Russian River was controlled by releases from project reservoirs through the end of the Order. The mouth of the river was closed periodically by sand bars from late September through mid-December. However, the mouth was open sufficiently to allow for upstream migration by adult salmonids. Flows in the lower river remained above 135 cfs throughout the 2017 upstream salmonid migration period, thus, project flows did not inhibit migration.

Adult Counts

Video counts

The bulk of the adult Chinook migration occurred after the end of the Order. This is consistent with past sampling efforts conducted by the Water Agency which has documented that approximately 85% of the Chinook salmon run occurs after mid-October. In 2017, approximately 95% of the run occurred after mid-October. Upstream migration is influenced by the sand bar condition at the mouth of the river (opened or closed) and streamflow in the river. Fall freshets reduce mainstem temperatures and increase flows and likely stimulate upstream migration by adult salmonids into the Russian River.

Snorkel Surveys

In 2017 we did not conduct dive surveys because flow was above 135 cfs which is the minimum flow required by the Order to conduct dive surveys. Years of video monitoring at Mirabel have shown that Chinook salmon can move upstream in the Russian River at a flow of approximately 135 cfs. During the Order flow was above 150 cfs during September 1, to October 15.

Consultations with NMFS and CDFW

Adjustments of flow

The Order required that the Water Agency consult with the NMFS and CDFW about the possibility of increasing flow to 135 cfs for adult passage once 100 adult salmonids have passed Mirabel. However, flow was above 135 cfs from September 1 to October 15.

References

State Water Board, In the matter of permits 12947A, 12949, 12950, and 16596 (applications 12919A, 15736, 15737, 19351) Sonoma County Water Agency order approving petitions for temporary urgency change permit terms and conditions. May 19, 2017. State Water Resource Control Board. Sacramento Ca.

Term 6 - Russian River Water Quality Summary for the 2017 Temporary Urgency Change (Order 5/19/2017)

April 2, 2018

Prepared by
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403

Contents

1.0 Introduction

On 19 April, 2017, the Sonoma County Water Agency (Water Agency) filed Temporary Urgency Change Petitions (TUCPs) with the State Water Resources Control Board (SWRCB) to temporarily reduce minimum instream flows in the Russian River to meet the terms and conditions of the Russian River Biological Opinion (NMFS 2008).

In summary, the SWRCB approved the following temporary changes to the Decision 1610 (D1610) instream flow requirements from 1 May 2017, until 15 October 2017 to the following:

(1) Minimum instream flow in the upper Russian River (from its confluence of the East and West Forks of the Russian River to its confluence with Dry Creek) shall remain at or above 125 cubic feet per second (cfs).

(2) Minimum instream flow requirements in the lower Russian River (from its confluence with Dry Creek to the Pacific Ocean) shall remain at or above 70 cfs.

For purposes of compliance with this term, the minimum instream flow requirements shall be based on instantaneous flow measurements. Approval of the request to temporarily reduce minimum instream flows to benefit the fishery would also maintain storage levels in Lake Mendocino for a longer period of time so that water would be available in the fall for fisheries purposes. The SWRCB issued the Order (Order) approving the Water Agency's TUCP on 19 May 2017.

2.0 2017 Russian River Flow Summary

In early January 2017, water storage in Lake Mendocino was similar to storage levels experienced in 2011 before the onset of drought conditions. Storage quickly increased through a series of storms between January and March, and by mid-April storage levels were above those observed in all prior years except 2010 (Figure 2-1). Storage in Lake Mendocino peaked in early May at over 97,400 acre-feet and remained above 80,000 acre-feet through early September. In addition, 2017 storage remained above conditions experienced during the drought in 2013 through 2015 for the remaining calendar year. However, late-season storms seen in prior years in November and December did not materialize, and storage continued to decrease through the remainder of the season. Storage declined from 80,000 acre-feet in early September to just over 59,000 acre-feet by 31 December 2017 (Figure 2-1).

The 2017 average daily flows at the Talmage, Hopland, Cloverdale, Jimtown, Digger Bend, and Hacienda USGS gaging stations are shown in Figure 2-2.

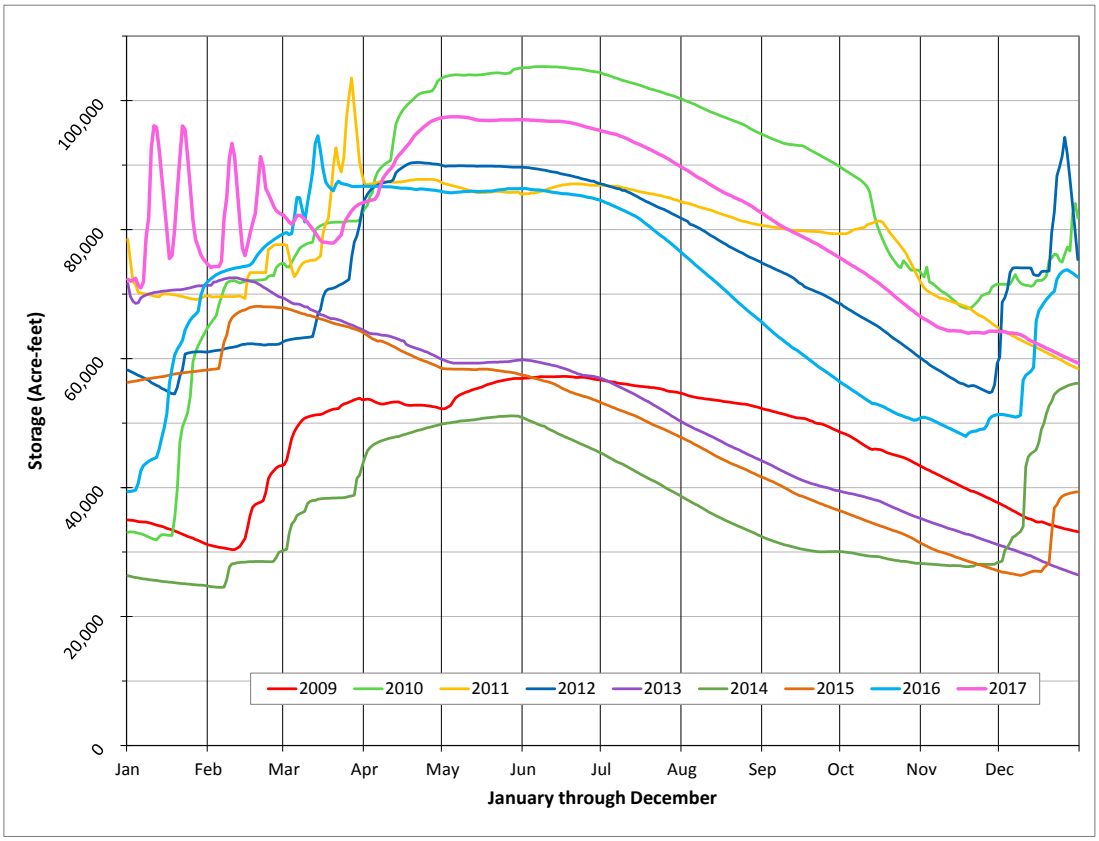

Figure 2-1. Lake Mendocino water storage levels, in acre-feet, from 2009 through 2017.

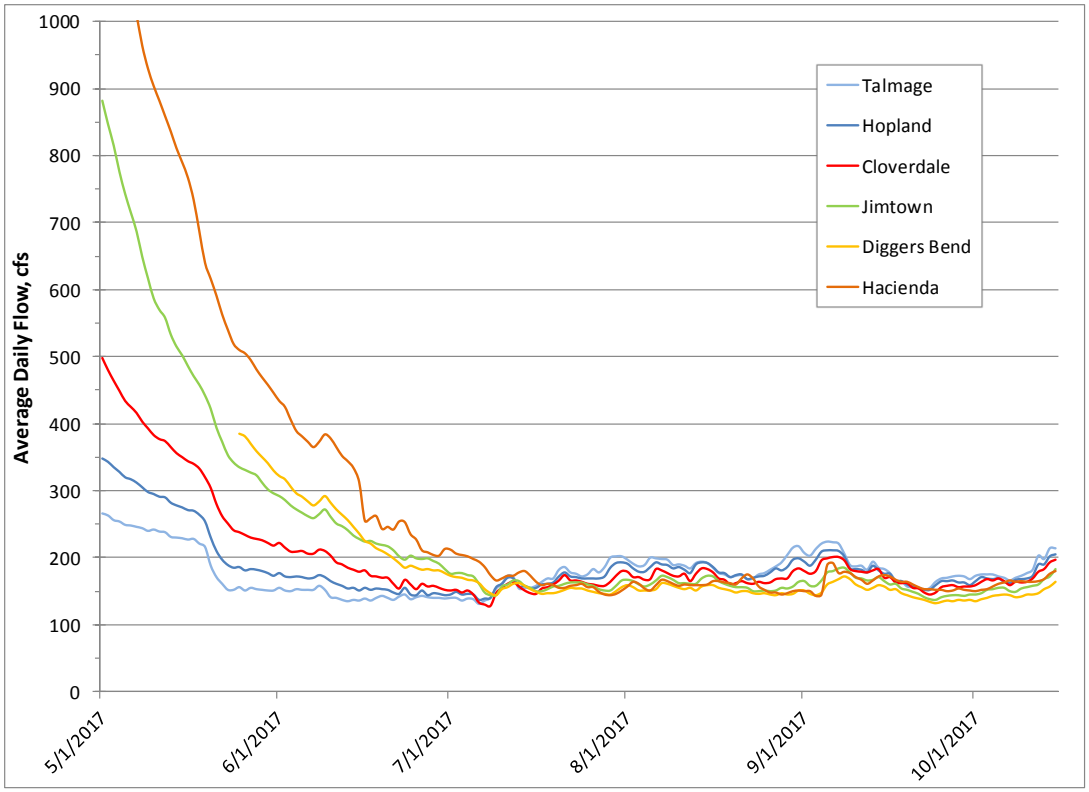

Figure 2-2. 2017 average daily flows in the Russian River as measured at U.S. Geological Survey (USGS) gages in cubic feet per second (cfs). Flow rates are preliminary and subject to final revision by USGS.

The changes in upper Russian River minimum instream flow requirements authorized by the Order allowed flows to decline below D1610 minimum instream flows of 185 cfs during the month of May at the Talmage and Hopland gages, and in mid- to late June at the Cloverdale, Jimtown, and Diggers Bend gages (Figure 2-3). However, upper Russian River flows did not decline below the instantaneous minimum flow of 125 cfs authorized by the Order (Figure 2-3).

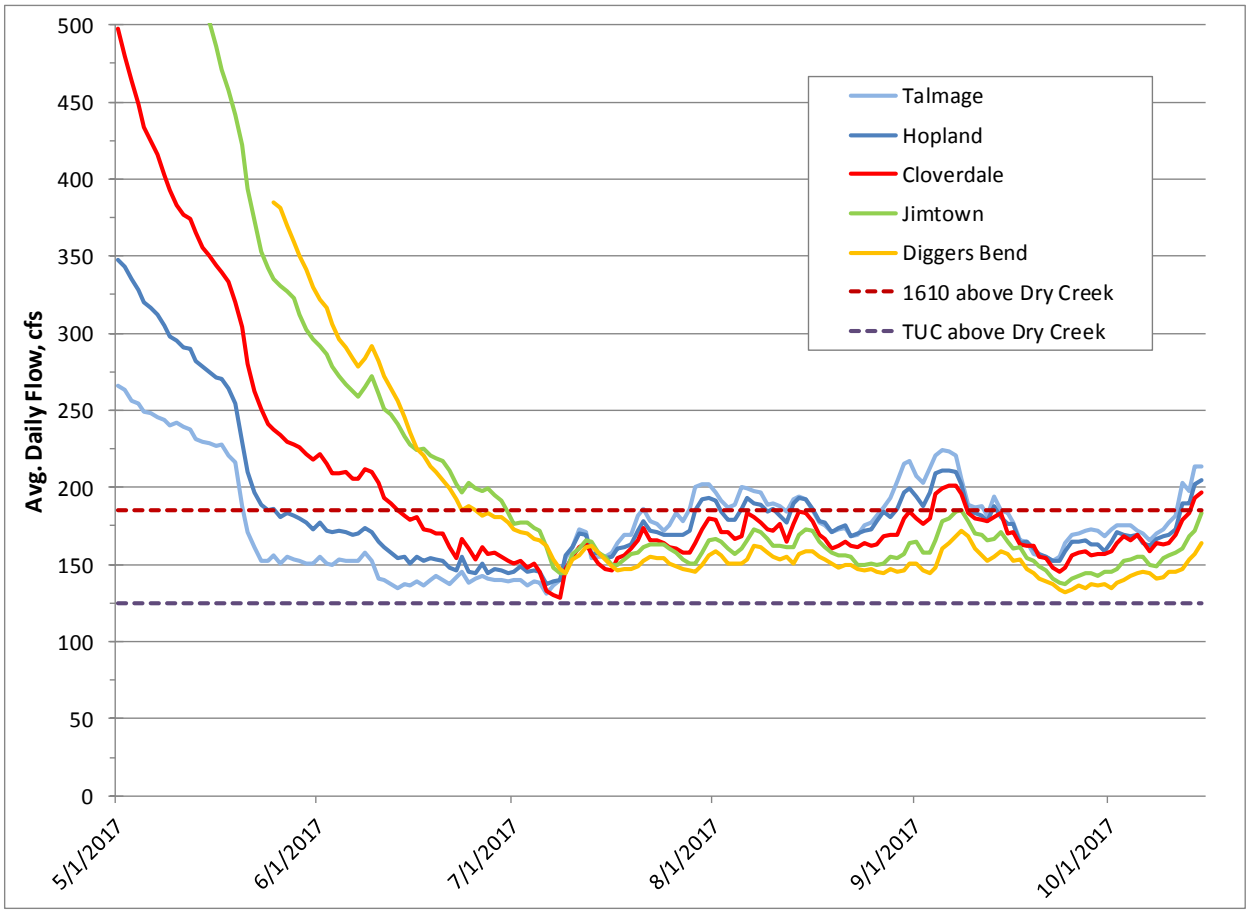

Figure 2-3. 2017 average daily flows in the Upper Russian River as measured at USGS gages above the Dry Creek confluence in cubic feet per second. Flow rates are preliminary and subject to final revision by USGS.

While the Order was in effect, lower Russian River flows at Hacienda (downstream of the confluence with Dry Creek) did not drop below the D1610 minimum flows of 125 cfs or the instantaneous minimum flow of 70 cfs authorized by the Order (Figure 2-4).

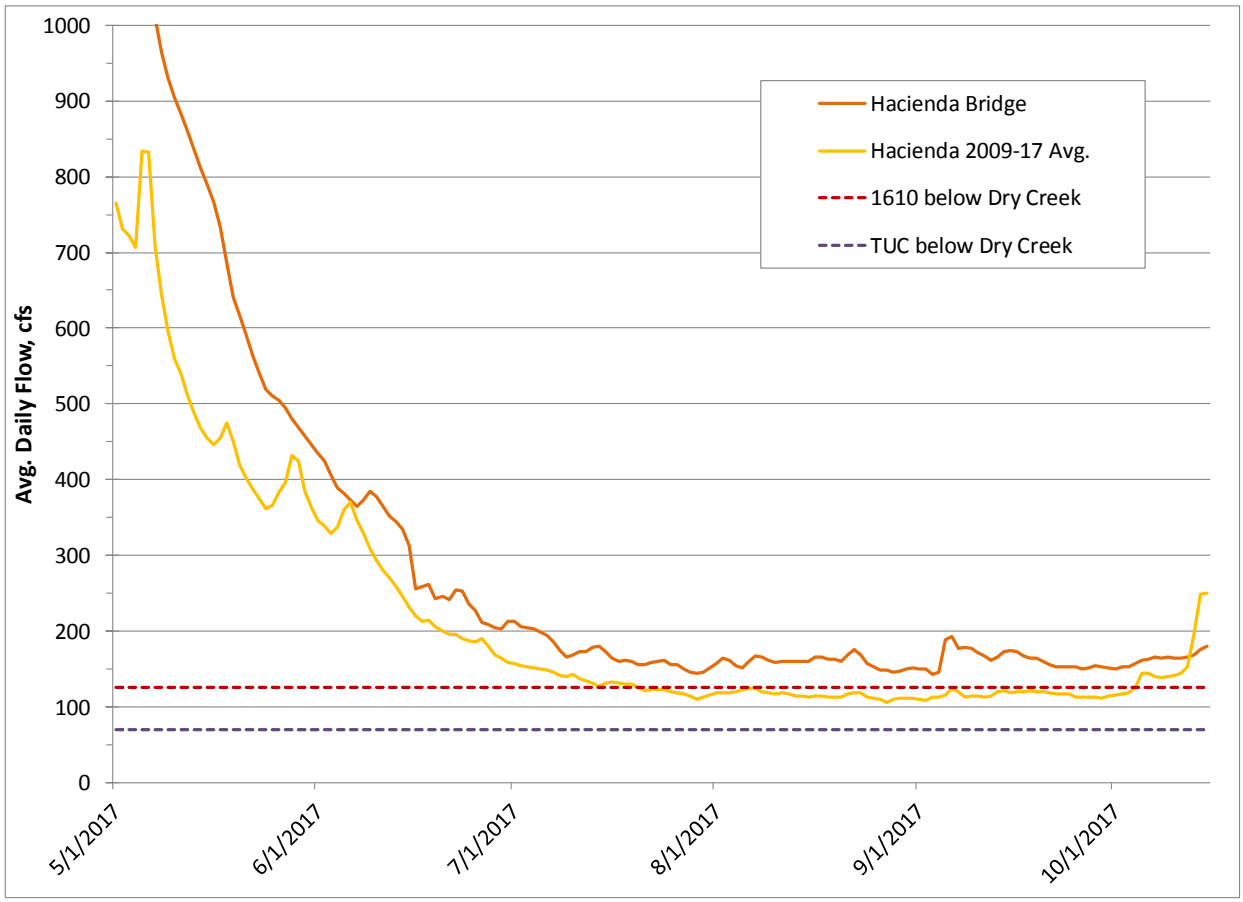

Figure 2-4. 2017 average daily flows in the Lower Russian River as measured at USGS gages below the Dry Creek confluence in cubic feet per second. Flow rates are preliminary and subject to final revision by USGS.

3.0 Water Quality Monitoring

Water quality data was collected to monitor TUC flows for potential effects to recreation and available aquatic habitat for salmonids. The data was used to supplement existing data to provide a more complete basis for analyzing spatial and temporal water quality trends due to Biological Opinion-stipulated changes in river flow and estuary management.

3.1 Mainstem Russian River Water Quality Monitoring

The North Coast Regional Water Quality Control Board (NCRWQCB), Sonoma County Department of Health Services (DHS), Water Agency, and Sonoma County Department of Parks and Recreation (Regional Parks) formed a workgroup to coordinate a monitoring approach for assessing cyanobacteria in the Russian River during the summer of 2016. Water Agency staff consulted with NCRWQCB staff regarding monitoring activities related to the workgroup. As a result of the consultation, the Water Agency made modifications to their existing Water Quality Monitoring Plan for the Russian River Estuary Management Project to modify the monitoring that is occurring in the estuary and to include freshwater monitoring for the purpose of assisting in the evaluation of cyanobacteria harmful algal bloom (cyanoHAB) conditions and the risk co-factors contributing to nuisance blooms (e.g., flow, temperature, nutrient, etc.).

In 2017, the Sonoma County DHS conducted weekly bacteriological and cyanotoxin sampling at ten (10) beaches with recreational activities involving the greatest body contact on the Russian River between Cloverdale and Patterson Point. The Water Agency conducted mainstem sampling for nutrients at six sites, and algae and cyanobacteria at four sites, along the Russian River between Talmage and Patterson Point to support NCRWQCB analysis and evaluation of water quality data relating to biostimulatory conditions and cyanotoxins. In addition, the Water Agency continued to conduct long-term water quality monitoring and weekly grab sampling for nutrients, bacteria, and algae in the middle and upper reaches of the Russian River Estuary and the upper extent of inundation and backwatering during lagoon formation, between Patty's Rock in Jenner and Vacation Beach, including in two tributaries.

The California Department of Public Health (CDPH) developed the "Draft Guidance for Fresh Water Beaches," which describes bacteria levels that, if exceeded, may require posted warning signs in order to protect public health (CDPH 2011). The CDPH draft guideline for single sample maximum concentrations is: 10,000 most probable numbers (MPN) per 100 milliliters (mL) for Total Coliform; 235 MPN per 100 mL for *E. coli*; and 61 MPN per 100 mL for *Enterococcus*. In 2012, the United States Environmental Protection Agency (EPA) issued Clean Water Act (CWA) §304(a) Recreational Water Quality Criteria (RWQC) for States (EPA 2012). The RWQC recommends using two criteria for assessing water quality relating to fecal indicator bacteria: the geometric mean (GM) of the dataset, and changing the single sample maximum (SSM) to a Statistical Threshold Value (STV) representing the 75th percentile of an acceptable water-quality distribution. However, the EPA recommends using STV values as SSM values for potential recreational beach posting and those values are provided in this report for comparative purposes. Exceedances of the STV values are highlighted in Table 3-1. It must be emphasized that these are draft guidelines and criteria, not adopted standards, and are therefore both subject to change (if it is determined that the guidelines and/or criteria are not accurate indicators) and are not currently enforceable.

Cyanobacteria are present in most freshwater and marine environments. When conditions are favorable, including abundant light, elevated water temperature, elevated levels of nutrients, and lack of water turbulence and velocity, cyanobacteria can quickly multiply into a bloom. Not every bloom is toxic; however, cyanoHABs are a concern as some species of cyanobacteria produce toxins that have the potential to impact drinking water, recreation, and fish and wildlife. Cyanotoxins were detected in the Russian River in 2015 and 2016, which led to Sonoma County DHS posting warning signs.

Currently, there are no federal or state standards for cyanotoxins in drinking water and recreational waters. Agencies participating in the California Water Quality Monitoring Council's (CWQMC) California Cyanobacteria and Harmful Algal Bloom (CCHAB) Network, including the SWRCB, California Office of Environmental Health Hazard Assessment (OEHHA), and CDPH, have developed and are further refining suggested guidelines for addressing health concerns for cyanotoxins in recreation waters (CWQMC 2017). The CDPH, county health departments, and water body managers are encouraged to use this guidance for posting of water bodies when cyanoHABs pose a health threat. Three primary trigger levels have been developed for posting and closing beaches for Total Microcystins, Anatoxin-a, and Cylindrospermopsin. Caution signs are recommended when Total Microcystins exceed 0.8 micrograms per liter (µg/L), any detection is made of Anatoxin-a, and when Cylindrospermopsin exceeds 1 µg/L. Warning signs (Tier I) are recommended when Total Microcystins exceed 6 µg/L, Anatoxin-a exceeds 20

µg/L, and cylindrospermopsin exceeds 4 µg/L. Danger signs (Tier II) are recommended when Total Microcystins exceed 20 µg/L, Anatoxin-a exceeds 90 µg/L, and cylindrospermopsin exceeds 17 µg/L. Secondary triggers have also been developed for the posting of caution signs when cell densities of toxin producers exceed 4,000 cells/mL or if there are site specific indicators of cyanobacteria including blooms, scums, and mats.

3.1.1 Sonoma County DHS Seasonal Mainstem Bacterial Sampling (Beach Sampling)

The Sonoma County DHS conducts seasonal bacteriological sampling to monitor levels of pathogens at ten (10) Russian River beaches with recreational activities involving the greatest body contact. Results are used by the Sonoma County DHS to determine whether or not bacteria levels fall within State guidelines. The 2017 Sonoma County DHS seasonal beach sampling locations consisted of: Cloverdale River Park; Del Rio Woods Beach; Camp Rose Beach; Healdsburg Veterans Memorial Beach; Steelhead Beach; Forestville Access Beach; Sunset Beach; Johnson's Beach; Monte Rio Beach; and Patterson Point. Bacteriological samples were collected weekly beginning 30 May and continued until 11 September. The samples were analyzed using the Colilert quantitray MPN method for Total Coliform and *E. coli*. Results from the sampling program were reported by the Sonoma County DHS at their website and on the Sonoma County DHS Beach Sampling Hotline. The 2017 seasonal results are shown in Table 3-1 and in Figures 3-1 and 3-2.

Table 3-1. Sonoma County DHS 2017 Seasonal Mainstem Bacteria Sampling Results (Sonoma County DHS, 2017a).

Date Sampled	Cloverdale River Park		Del Rio Woods Beach		Camp Rose Beach		Healdsburg Veterans		Steelhead Beach		Forestville Access Beach		Sunset Beach		Johnson's Beach		Monte Rio Beach		Patterson Point	
	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC
30-May-17	6,867	31	3,654	52	4,106	20	2,187	41	988	41	839	10	717	20	437	10	450	10	327	10
5-Jun-17	541	20	461	<10	548	20	477	30	354	52	465	20	372	10	448	<10	634	20	375	10
12-Jun-17	2,755	63	1,616	<10	1,989	20	1,374	20	1,017	20	1,467	20	1,421	20	857	41	3,076	30	960	10
19-Jun-17	6,488	41	3,076	10	2,481	30	2,247	52	1,723	63	1,935	31	1,725	<10	3,448	75	2,613	63	1,658	<10
26-Jun-17	2,909	31	2,603	20	2,755	10	2,755	122	1,553	41	2,481	20	1,722	74	1,935	31	1,401	10	932	10
3-Jul-17	1,989	52	2,359	10	2,755	20	1,607	41	1,467	10	2,755	41	1,918	30	2,613	20	10462*	41	8,164	41
5-Jul-17																	11,199**	833**		
6-Jul-17																	10,462**	110		
9-Jul-17																	11,199**	144		
10-Jul-17	5,172	20	2,909	20	2,359	10	2,755	63	1,172	10	3,255	20	1,872	10	2,755	31	7,772	13	13,520*	78
11-Jul-17																			5,646	13
17-Jul-17	2,755	52	2,613	<10	1,989	20	2,359	<10	2,247	10	2,046	10	2,359	10	2,755	10	10462*	275*	8,664	31
19-Jul-17																	6,867	63		
24-Jul-17	3,654	63	3,873	10	3,448	<10	2,909	10	2,098	20	2,909	20	2,481	10	2,481	10	4,352	120	6,131	41
31-Jul-17	2,495	63	2,282	20	3,448	31	2,613	31	1,296	10	1,354	10	1,500	10	1,450	<10	2,282	31	2,187	10
7-Aug-17	2,909	74	2,481	10	2,613	10	1,354	20	1,246	20	1,872	41	1,334	20	1,785	61	3,076	98	2,909	20
14-Aug-17	2,282	52	2,359	31	3,873	52	2,755	31	1,650	10	2,187	10	2,755	20	2,143	20	12,033*	3,255*	2,187	52
15-Aug-17																	2,489	97		
21-Aug-17	2,359	171	2,481	20	2,413	20	2,489	97	1,401	20	1,333	20	1,119	<10	1,106	20	>24,196*	530*	1,722	63
22-Aug-17																	2,481	63		
28-Aug-17	1,067	52	3,448	20	3,255	20	1,396	10	1,019	20	959	10	1,529	<10	1,414	31	3,448	20	1,789	10
5-Sep-17	3,255	22	3,076	<10	4,106	20	2,755	63	984	<10	1,789	10	1,723	<10	1,789	20	1,720	31	1,723	30
11-Sep-17	2,481	20	2,489	<10	3,873	41	2,755	20	2,282	31	1,281	<10	2,282	30	1,553	20	3,255	173	1,720	<10

*Resample conducted for confirmatory test.

** Beach closed.

GREEN indicates the beach is open - bacterial level results are within State guidelines.

YELLOW indicates the beach is open, but swimming is not advised - bacterial level results exceed State guidelines.

RED indicates the beach is closed - bacterial level results exceed State guidelines and are associated with a known or suspected human sewage release.

Recommended California Department of Public Health (CDPH) Draft Guidance and Environmental Protection Agency (EPA) Recreational Water Quality Criteria - Statistical Threshold Values (STV):

(Beach posting is recommended when indicator organisms exceed the STV) - Indicated by red text

Total Coliforms (STV): 10,000 per 100ml

E. coli (STV): 235 per 100 ml

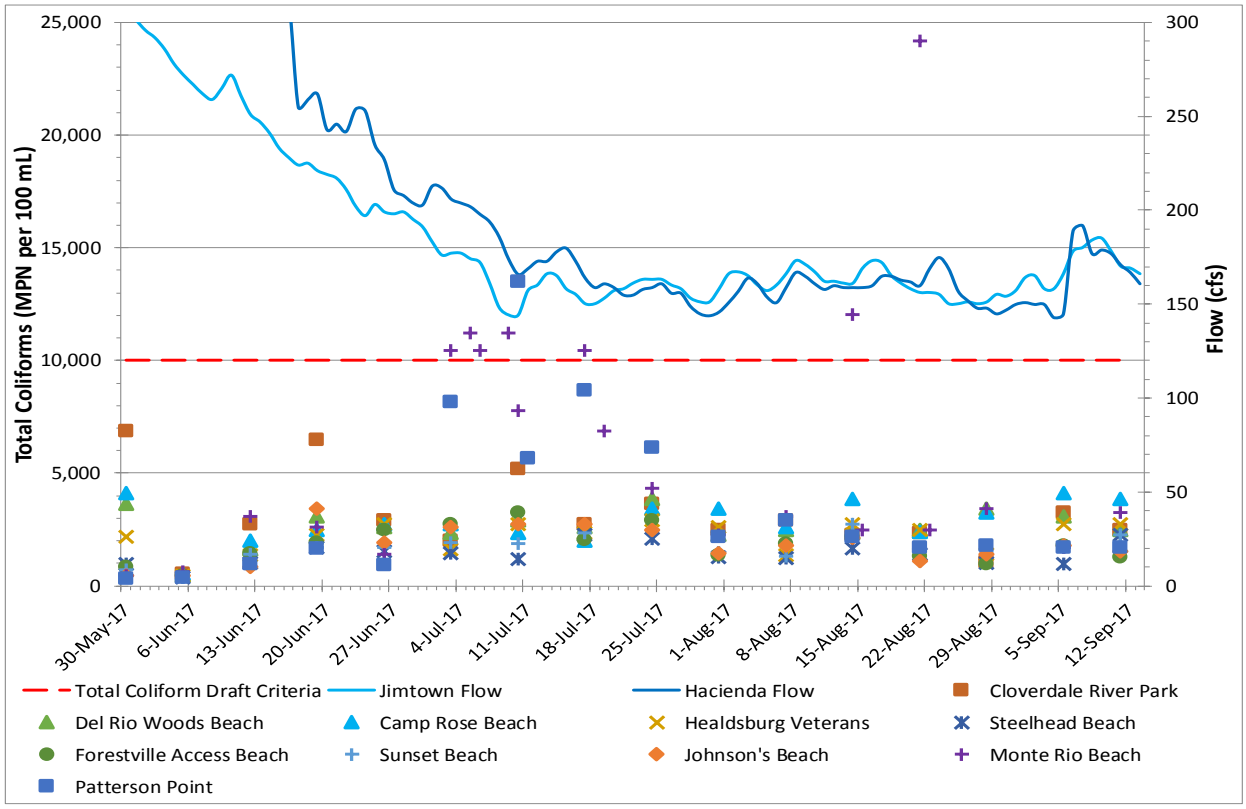

Figure 3-1. Sonoma County DHS 2017 Seasonal Mainstem Russian River Bacteria Sample Results for Total Coliform. Flow rates are preliminary and subject to final revision by USGS.

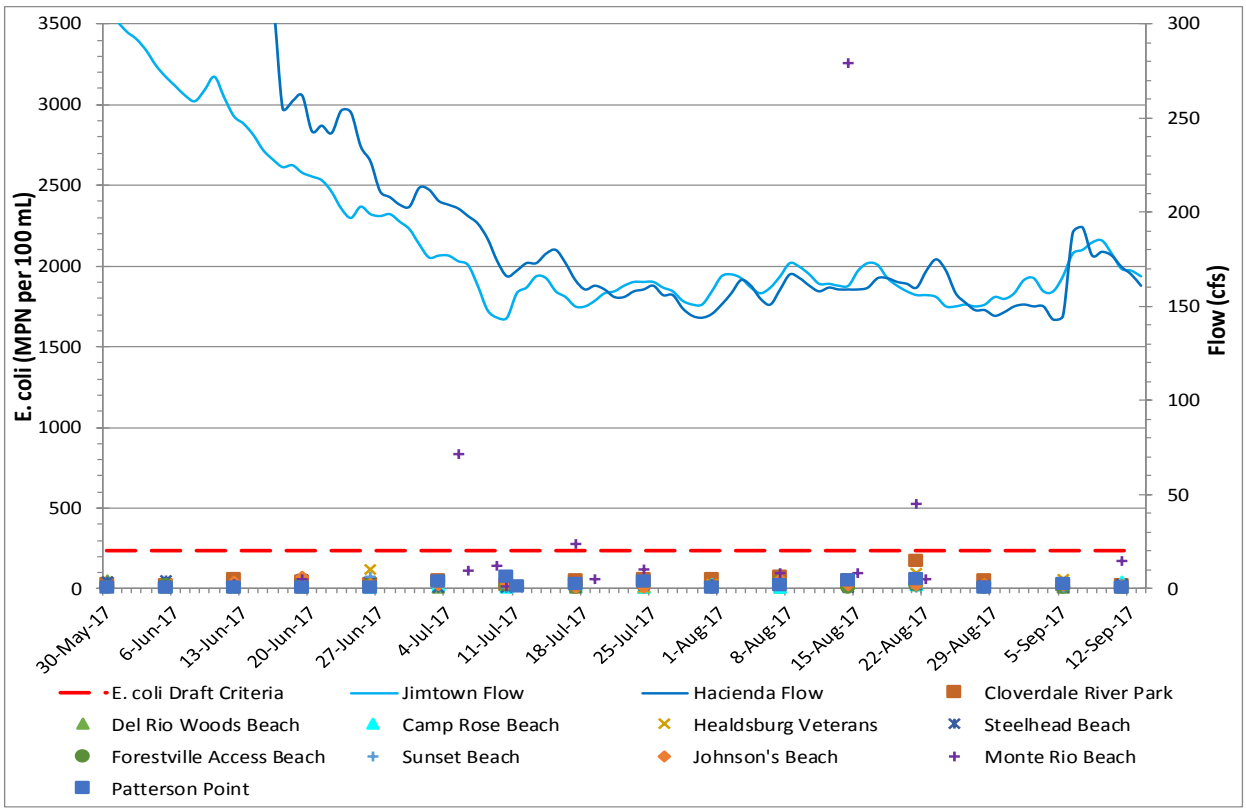

Figure 3-2. Sonoma County DHS 2017 Seasonal Mainstem Russian River Bacteria Sample Results for *E. coli*. Flow rates are preliminary and subject to final revision by USGS.

3.1.2 Sonoma County DHS Seasonal Mainstem Cyanotoxin Sampling (Beach Sampling)

In 2017, the Sonoma County DHS conducted seasonal cyanotoxin sampling at ten (10) Russian River beaches with recreational activities involving the greatest body contact including Cloverdale River Park; Del Rio Woods Beach; Camp Rose Beach; Healdsburg Veterans Memorial Beach; Steelhead Beach; Forestville Access Beach; Sunset Beach; Johnson's Beach; Monte Rio Beach; and Patterson Point. Cyanotoxin samples were collected weekly beginning 17 July and continued until 11 September. Results from the sampling program were reported by the Sonoma County DHS at their website and on the Sonoma County DHS Beach Sampling Hotline. The 2017 seasonal results are shown in Table 3-2.

Table 3-2. Sonoma County DHS 2017 Seasonal Mainstem Russian River Cyanotoxin Sampling Results (Sonoma County DHS, 2017b).

Anatoxin										
	Cloverdale River Park	Del Rio Woods Beach	Camp Rose Beach	Healdsburg Veterans	Steelhead Beach	Forestville Access Beach	Sunset Beach	Johnson's Beach	Monte Rio Beach	Patterson Point
17-Jul-17	0	0	0	0	0	0	0	0	0	0
24-Jul-17	0.16	0.15	0	0	0	0	0	0	0	0.14
31-Jul-17	0	0	0	0	0.16	0	0	0.25	0	0
7-Aug-17	0	0	0	0	0	0	0	0	0	0
14-Aug-17	0	0	0	0	0	0	0	0	0	0
21-Aug-17	0	0	0	0	0	0.12	0	0	0	0
28-Aug-17	0	0	0	0	0	0	0	0	0	0
5-Sep-17	0	0	0	0	0	0	0	0	0	0
11-Sep-17	0	0	0	0	0	0	0	0	0	0
Microcystin										
	Cloverdale River Park	Del Rio Woods Beach	Camp Rose Beach	Healdsburg Veterans	Steelhead Beach	Forestville Access Beach	Sunset Beach	Johnson's Beach	Monte Rio Beach	Patterson Point
17-Jul-17	0	0	0	0	0	0	0	0	0	0
24-Jul-17	0	0	0	0	0	0	0	0	0	0
31-Jul-17	0	0	0	0	0	0	0	0	0	0
7-Aug-17	0	0	0	0	0	0	0	0	0	0
14-Aug-17	0	0	0	0	0	0	0	0	0	0
21-Aug-17	0	0	0	0	0	0	0	0	0	0
28-Aug-17	0	0	0	0	0	0	0	0	0	0
5-Sep-17	0	0	0	0	0	0	0	0	0	0
11-Sep-17	0	0	0	0	0	0	0	0	0	0
Cylindrospermopsin										
	Cloverdale River Park	Del Rio Woods Beach	Camp Rose Beach	Healdsburg Veterans	Steelhead Beach	Forestville Access Beach	Sunset Beach	Johnson's Beach	Monte Rio Beach	Patterson Point
17-Jul-17	0.06	0.06	0	0	0	0.06	0	0	0	0.06
24-Jul-17	0	0	0	0	0	0	0	0	0	0
31-Jul-17	0	0	0	0	0	0	0	0	0	0
7-Aug-17	0	0	0	0	0	0	0	0	0	0
14-Aug-17	0	0	0	0	0	0	0	0	0	0
21-Aug-17	0	0	0	0	0	0	0	0	0	0
28-Aug-17	0	0	0	0	0	0	0	0	0	0
5-Sep-17	0	0	0	0	0	0	0	0	0	0
11-Sep-17	0	0	0	0	0	0	0	0	0	0

All results are in µg/L. A value of zero (0) indicates that no toxins were detected.

State Trigger Levels

	Caution	Warning (Tier I)	Danger (Tier II)
Microcystin	0.8 µg/L	6 µg/L	20 µg/L
Anatoxin	Any Detected	20 µg/L	90 µg/L
Cylindrospermopsin	1 µg/L	4 µg/L	17 µg/L

Source: State Water Resources Control Board.

3.1.3 Water Agency Seasonal Mainstem Russian River Ambient Algae and Nutrient Grab Sampling

In 2017, Ambient algae and cyanobacterial monitoring and sampling was conducted from 22 June through 31 October at four (4) stations including: the Hopland USGS gaging station north of Hopland, the Jimtown USGS gaging station in Alexander Valley, Syar Vineyards downstream of the confluence with Dry Creek, and Patterson Point in Villa Grande to support NCRWQCB and Sonoma County DHS cyanotoxin monitoring and assessment of the potential for cyanoHABs in the Russian River (Figure 3-3). This effort is also being conducted to identify algal and cyanobacterial genera and species in the Russian River, as well as to estimate algal cover, density, and seasonal growth patterns. Table 3-3 and Figure 3-4 provide a list and relative abundance of algal species observed in the mainstem Russian River during the 2017 monitoring season. Relative abundance is represented as the number of sample slides a given species was observed on out of a total of 460 sample slides.

Water Agency staff conducted biweekly nutrient grab sampling monitoring at six (6) stations in the mainstem Russian River including: the Talmage USGS gaging station in Ukiah, Hopland, Cloverdale River Park in Cloverdale, Jimtown, Syar, and Patterson Point. Grab sampling involves the collection of water from the water column for laboratory analysis. The grab sample sites are shown in Figure 3-3, and results are summarized in Tables 3-4 through 3-6 and Figures 3-5 through 3-10.

All grab samples were analyzed for nutrients, *chlorophyll a*, total dissolved solids, and turbidity. Grab samples were submitted to Alpha Analytical Labs in Ukiah for analysis. Grab sample data was collected during the Water Agency's ambient algae and cyanobacteria monitoring and sample collection effort.

Ambient algae, cyanobacteria, estuary response, and associated grab sampling data for 2017 is currently being compiled and will be discussed in greater detail in the Russian River Biological Opinion 2018 annual report, which will be posted to the Water Agency's website when available: http://www.scwa.ca.gov/bo-annual-report/.

Highlighted values indicate those values exceeding EPA recommended criteria for "Nutrients, *Chlorophyll a*, and Turbidity in Rivers and Streams in Aggregate Ecoregion III" (EPA 2000). However, it must be emphasized that the EPA criteria are not adopted standards and are therefore both subject to change (if it is determined that the guidelines or criteria are not accurate indicators) and are not currently enforceable.


Russian River Ambient Algae
Water Agency Algae and Nutrient Station
Willits
Van Arsdale Reservoir
Lake Pillsbury
Lake Mendocino
Talmage
Hopland
Hopland
Cloverdale River Park
Cloverdale
Lake Sonoma
Jimtown
Healdsburg
Syar
Russian River
Windsor
Guerneville
Forestville
Jenner
Patterson Point
Santa Rosa
Sebastopol
Rohnert Park
Cotati
Petaluma
Copyright:© 2014 Esri
T:\special projects\7339_RRIFR-EstuaryManagement\RR_WaterQual_Mon_July2017.mxd 7/12/2017
Figure 3.3. Russian River
Ambient Algae Monitoring
DISCLAIMER
This map document and associated data are distributed for informational purposes only "AS-IS" at the published scale and provided without warranty of any kind expressed or implied. The positional accuracy of the data is approximate and not intended to represent survey map accuracy. The Sonoma County Water Agency assumes no responsibility arising from use of this information.
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Miles
SONOMA COUNTY WATER AGENCY

Table 3-3. Genera observed during algae monitoring, June - October 2017.

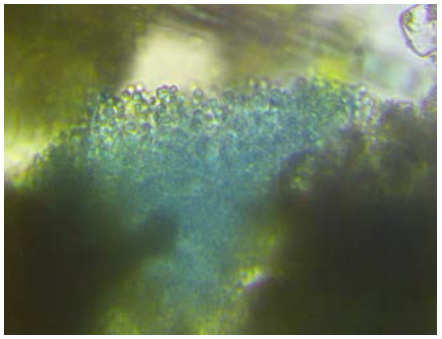
Algae Division	Genus/Genera	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Known Toxins (4)	Photograph
Cyanophyta	*Anabaena**	148 (All)	Alkilibiontic (1)	Microcystins, Anatoxin-a, Saxitoxins, BMAA	
Cyanophyta	*Aphanocapsa**	8 (P, S, J)	Open water in bogs (2)	Microcystins	
	Aphanothece	8 (P, S, J)	Hard and soft standing water (2) Oligotrophic (2) Range of Salinity (2)		
Cyanophyta	*Arthrospira/ Spirulina*	4 (P & S)	Heavy pollution (3) Mineral springs (3) Saline lakes (3)		

Table 3-3 cont.

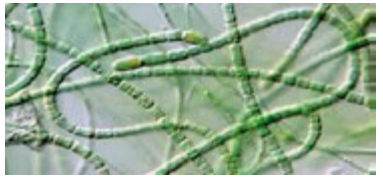
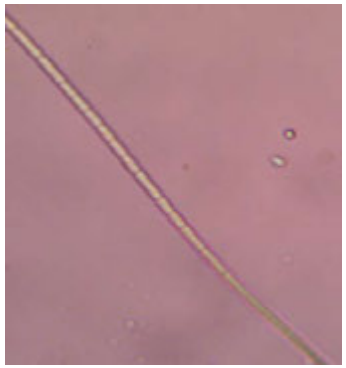
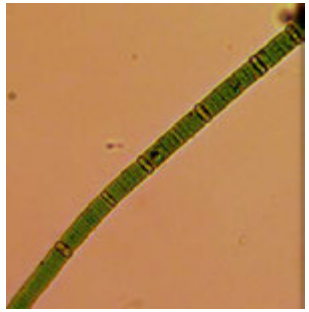
Algae Division	Genus/Genera	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Known Toxins (4)	Photograph
Cyanophyta	*Cylindrospermum**	35 (All)	Soft,acid lakes (2) Nitrogen fixer	Anatoxin-*a*	
Cyanophyta	*Geitlerinema*	171 (All)	Soft, clean freshwater biotopes(2) Some species are found in mineral waters and thermal springs(2) Inhabits periphyton of oligotrophic to mesotrophic waters(2)		
Cyanophyta	*Nodularia**	32 (P & S)	N-fixer	Nodularin N-fixer	

Table 3-3 cont.

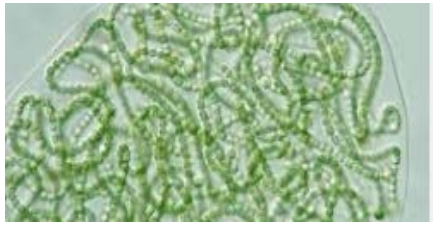
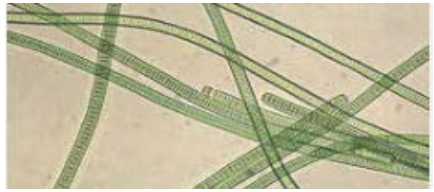
Algae Division	Genus/Genera	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Known Toxins (4)	Photograph
Cyanophyta	*Nostoc**	1 (P)	Nitrogen fixer Low N concentrations-2 High N:P ratio-2	Microcystins, Nodularin, BMAA	
Cyanophyta	*Oscillatoria**	88 (All)	Organic pollution (2)	Microcystins, Anatoxin-a, Aplysiatoxins	
Cyanophyta	*Phormidium*/ Lyngbya**	119 (All)	Low temp., low light (2)	Lyngbyatoxin-a, Aplysiatoxins, Saxitoxins, Anatoxins (Phormidium)	

Table 3-3 cont.

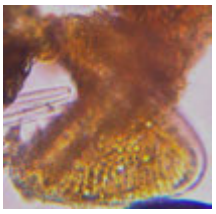
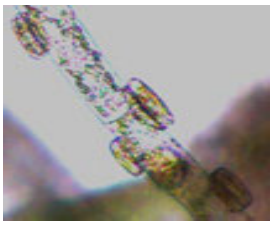
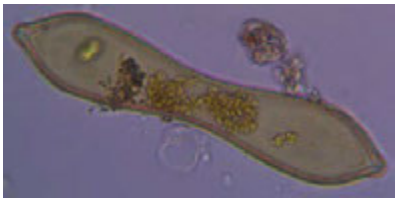
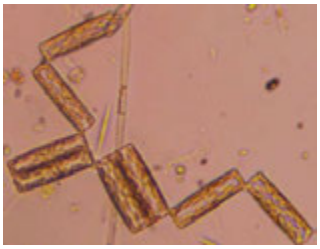
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Bacillariophyta	*Bacillaria*	220	Brackish (1) Low DO (1) Eutrophic (1)	
Bacillariophyta	*Campylodiscus*	39	Epipelic habitats in lentic ecosystems	
Bacillariophyta	*Cocconeis*	62	Alkiliphilous (1) Fresh-brackish (1) Moderate-high DO (1) Eutrophic (1)	
Bacillariophyta	*Cymatopleura*	53	Epipelic habitats in lakes, rivers and wetlands	
Bacillariophyta	*Cymbella*	76	Alkiliphilous (1) Fresh (1) Oligotrophic (1) High DO (1)	
Bacillariophyta	*Diatoma/ Tabellaria*	216	Alkiliphilous (1) Fresh-brackish(1) High to moderate DO (1) Meso-eutrophic (1)	

Table 3-3 cont.

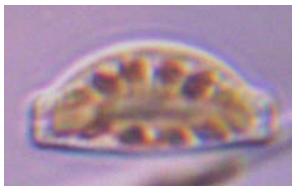
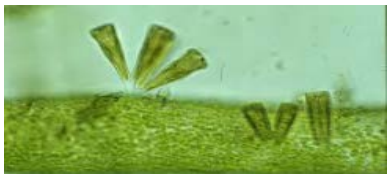
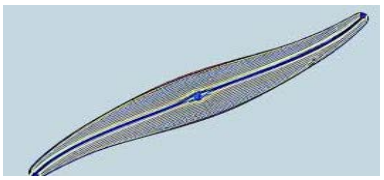
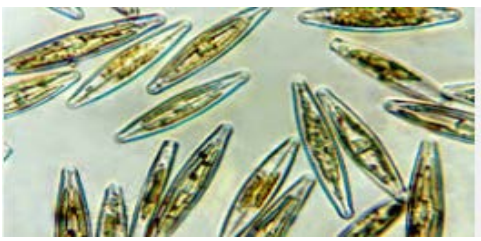
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Bacillariophyta	*Encyonema*	168	Alkiliphilous (1) Fresh (1) Oligotrophic (1) High DO (1)	
Bacillariophyta	*Fragilaria*	220	Alkiliphilous (1) Fresh (1) High to moderate DO (1) Eurytrophic (1)	
Bacillariophyta	*Gomphonema*	96	Alkiliphilous (1) Fresh (1) Organic pollution (2)	
Bacillariophyta	*Gyrosigma*	169	Alkiliphilous (1)	
Bacillariophyta	*Melosira*	318	Alkiliphilous (1) Fresh (1) Moderate DO (1) Eutrophic (1)	
Bacillariophyta	*Navicula*	256	Alkiliphilous (1) Fresh – brackish (1) Organic pollution (smaller species) (2) Soft substrate (2)	

Table 3-3 cont.

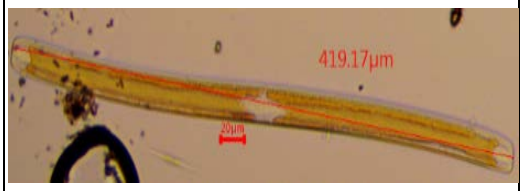
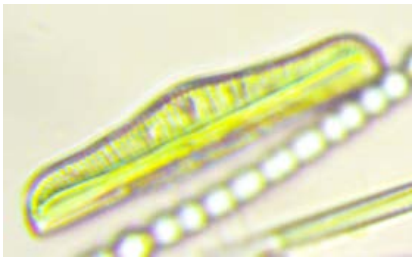
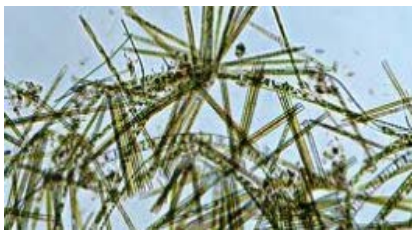
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Bacillariophyta	*Nitzschia*	106	Moderate DO (1) Eutrophic (1) Organic pollution (smaller species (2) Soft Substrate (2)	
Bacillariophyta	*Pinnularia*	124	Soft substrate (2)	
Bacillariophyta	*Rhopalodia*	93	Alkilibiontic (1) Fresh (1) Moderate DO (1) Eutrophic (1) Nitrogen fixer	
Bacillariophyta	*Surirella*	86	Alkiliphilous (1) Fresh (1) Moderate DO (1) Eutrophic (1)	
Bacillariophyta	*Synedra*	195	Fresh (1) Organic pollution (1 & 2)	

Table 3-3 cont.

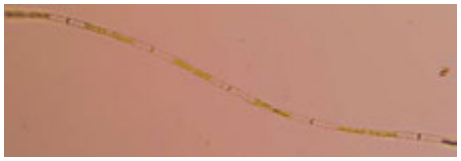
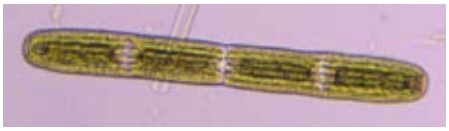
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Charophyta	*Closterium* sp.	207	Oligotrophic (2) Low pH bogs (2)	
Charophyta	*Cosmarium*	7	Oligotrophic (2) Low pH bogs (2)	
Charophyta	*Mougeotia*	183	High and Low pH (2) Low nutrients (2)	
Charophyta	*Mougeotiopsis*	42	Freshwater benthic	
Charophyta	*Penium*	2 (Patterson)	Oligotrophic (2) Low pH bogs (2)	
Charophyta	*Pleurotaenium*	1 (Patterson)	Oligotrophic (2) Low pH bogs (2)	

Table 3-3 cont.

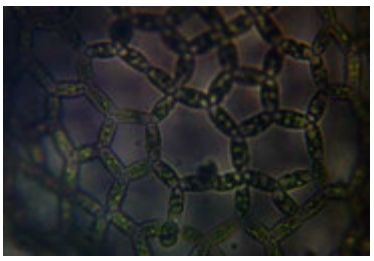
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Charophyta	*Spirogyra*	269	Standing and running waters (2) Low pH bogs (2)	
Charophyta	*Zygnema*	109	Shallow freshwater benthos	
Chlorophyta	*Ankistrodesmus*	23	Organic pollution (2)	
Chlorophyta	*Cladophora* sp. (few species)	229	Eutrophic to Hypertrophic (2)	
Chlorophyta	*Coelastrum*	2- S, J	Planktonic, abundant in eutrophic conditions(2) Freshwater habitats from arctic to tropical	No photo in archive.
Chlorophyta	*Hydrodictyon*	22	Hard water- high Ca concentration (2)	

Table 3-3 cont.

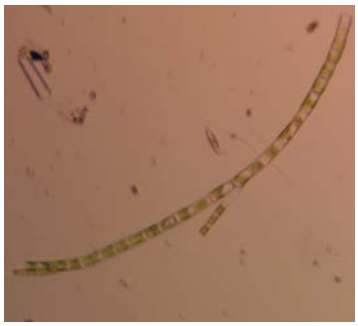
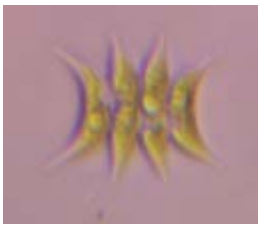
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Chlorophyta	*Microspora*	48	Cool water (3) Low pH (3)	
Chlorophyta	*Oedogonium*	138-	Standing water (2)	
Chlorophyta	*Pediastrum* sp.	35	Standing water (2) Eutrophic to Hypertrophic (1 & 2)	
Chlorophyta	*Scenedesmus* sp.	74	Standing and running waters (2) Eutrophic to Hypertrophic (2) Organic pollution (2)	
Chlorophyta	*Selenastrum* sp.	23	Standing waters-wetlands (2)	

Table 3-3 cont.

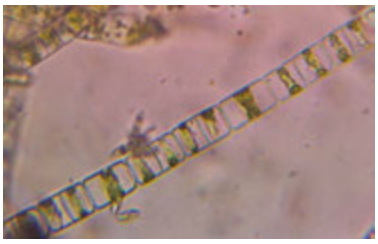
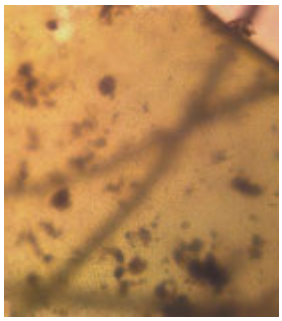
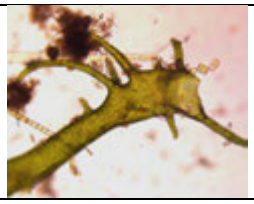
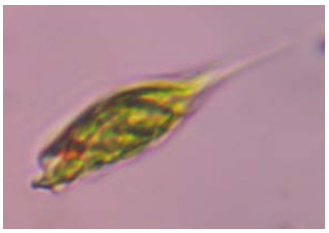
Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Chlorophyta	*Stigeoclonium* sp.	69	Organic pollution (2)	
Chlorophyta	*Ulothrix* sp.	101	Damp soil or stagnant water (3)	
Chlorophyta	*Ulva* sp.	17	Flowing water (3) Fresh to saline water (3)	
Chlorophyta	*Volvox* sp.	4	Cosmopolitan (3)	
Xanthophyta	*Tribonema*	8	Humic water (2)	
Xanthophyta	*Vaucheria*	35	Brackish water (2)	

Table 3-3 cont.

Algae Division	Genus	No. Slides Genera Present (out of 460)	Bioindicator Type(s)	Photograph
Chromista (taxonomy of *Ceratium* varies among sources)	*Ceratium*	11	Hard water – high Ca concentrations (2) High P concentrations in deeper water (2)	
Euglenozoa	*Euglena*		Very high nutrients, i.e. sewage (2) Organic pollution (2)	
Ochraphyta	*Dinobryon*	1 (H)	Slightly acidic to strongly acidic water (2) Oligotrophic (2)	
Rhodophyta	*Batrachospermum*	11	Polluted (3)	

1. Asarian, J.E. et al. 2014. *Spatial and Temporal Variation of Periphyton Assemblages in the Klamath River 2004-2012*. Prepared by Kier Associates, Portland State University, and Aquatic Ecosystem Sciences LLC. for the Klamath Basin Tribal Water Quality Work Group. 50p. + appendices.
2. Bellinger, E.G. and Sigee, D.C. 2015. *Freshwater Algae: Identification, Enumeration, and Use as Bioindicators*. 2nd edition. John Wiley and Sons, Ltd., Hoboken, New Jersey.
3. Wehr, J.D., Sheath, R.G., Kociolek, J.P. 2015. *Freshwater Algae of North America: Ecology and Classification*. 2nd edition. Elsevier, San Diego, CA.
4. www.cees.iupui.edu/research/algal-toxicology/cyanotoxins. January 23, 2017. "Cyanotoxin Fact Page." Center for Earth and Environmental Science, Indiana University-Purdue University, Indianapolis, IN.

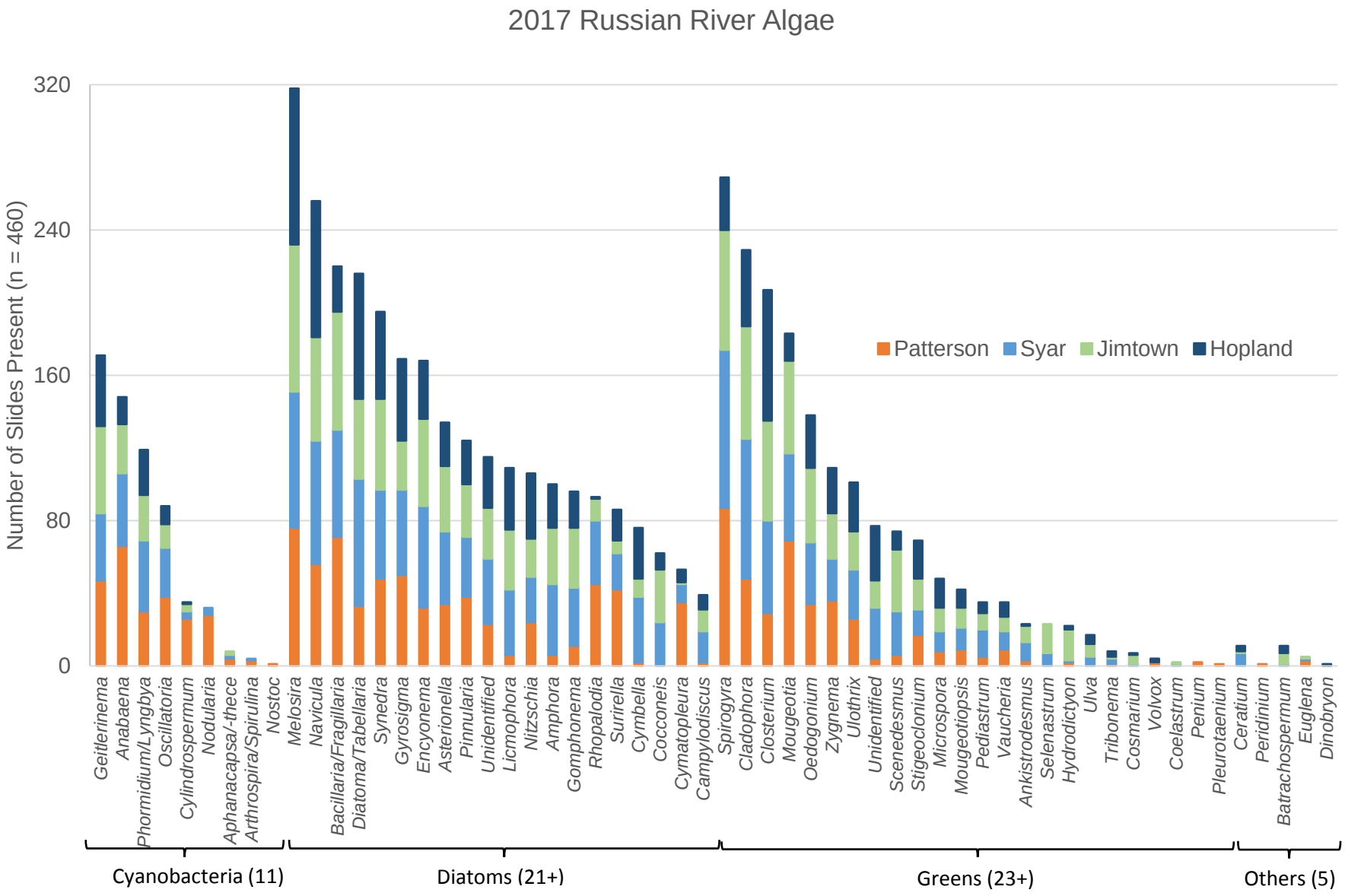


Figure 3-4. 2017 Russian River Algae Observed at Hopland, Jimtown, Syar, and Patterson Point Ambient Algae Sampling Stations.

The Talmage, Hopland, and Cloverdale River Park stations all had exceedances of the EPA criteria for Total Nitrogen during the ambient algae monitoring effort (Tables 3-4 and 3-5). Talmage and Cloverdale River Park had three exceedances, and Hopland had six exceedances that occurred at various times throughout the season with flows ranging from 104 cfs to 196 cfs at the Talmage, Hopland, and Cloverdale USGS gages. By contrast, the Jimtown and Syar stations did not have any exceedances of the EPA criteria (Tables 3-5 and 3-6). While the Patterson Point station had only one exceedance that occurred on 19 July during open estuary conditions and a flow of 159 cfs at the Hacienda USGS gage (Table 3-6 and Figure 3-10a).

Table 3-4. Water Agency 2017 Seasonal Mainstem Russian River Grab Sampling Results at Talmage and Hopland.

Talmage	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11462080 RR near Talmage****
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate*****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	14:40	15.6	7.6	0.24	ND	ND	0.097	ND	0.24	**0.38**	**0.049**	110		**0.0025**	142
7/6/2017	15:20	15.7	7.8	0.70	ND	ND	0.077	ND	0.70	**0.82**	**0.068**	100		**0.0030**	104
7/19/2017	14:50	14.9	7.3	ND	ND	ND	0.040	ND	ND	0.18	**0.059**	110	**14.8**	**0.0021**	165
8/2/2017	15:20	15.2	7.8	ND	ND	ND	0.047	ND	ND	0.15	**0.064**	97	**12.5**	**0.0026**	191
8/16/2017	15:00	15.0	7.6	ND	ND	ND	ND	ND	ND	0.16	**0.098**	95	**9.7**	0.0016	185
8/30/2017	15:10	15.1	7.5	0.24	ND	ND	ND	ND	0.24	0.27	**0.11**	120	**14.7**	**0.0035**	213
9/13/2017	15:00	15.7	7.6	ND	ND	ND	ND	ND	ND	0.19	**0.11**	100	**21.4**	**0.0028**	193
9/27/2017	14:30	15.8	7.4	0.24	ND	ND	0.058	ND	0.24	0.31	**0.13**	110	**22.2**	0.0013	169
10/18/2017	15:30	16.6	7.4	0.35	ND	ND	0.060	ND	0.35	**0.42**	**0.19**	110	**31.6**	0.0016	196
10/31/2017	16:10	17.8	7.6	0.21	ND	ND	ND	ND	0.21	0.25	**0.087**	120	**28.7**	**0.0029**	192

Hopland	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11462500 RR near Hopland****
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate*****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	14:00	17.9	7.5	0.28	ND	ND	0.25	ND	0.28	**0.57**	**0.058**	120		**0.0023**	146
7/6/2017	14:40	17.2	7.7	0.24	ND	ND	0.19	ND	0.24	**0.48**	**0.060**	110	**4.3**	0.0016	131
7/19/2017	13:50	15.3	7.2	ND	ND	ND	0.087	ND	ND	0.26	**0.055**	120	**12.0**	0.00081	159
8/2/2017	14:25	15.8	7.1	0.46	ND	ND	0.11	ND	0.46	**0.56**	**0.065**	100	**10.5**	0.0013	180
8/16/2017	14:20	15.3	7.8	ND	ND	ND	0.067	ND	ND	0.24	**0.075**	98	**6.2**	0.0016	186
8/30/2017	14:10	14.9	7.5	ND	ND	ND	0.066	ND	ND	0.24	**0.079**	110	**8.9**	**0.0023**	198
9/13/2017	14:00	15.7	7.3	ND	ND	ND	0.066	ND	0.21	0.28	**0.091**	110	**16.0**	**0.0023**	188
9/27/2017	13:30	14.8	7.4	0.24	ND	ND	0.13	ND	0.24	**0.38**	**0.11**	120	**17.4**	0.0011	166
10/18/2017	14:40	14.7	7.4	0.24	ND	ND	0.14	ND	0.24	**0.39**	**0.17**	110	**25.7**	0.00035	192
10/31/2017	15:10	15.7	7.5	0.21	ND	ND	0.21	ND	0.21	**0.44**	**0.10**	130	**21.2**	**0.0062**	185

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** Turbidity results after 6/16 were recorded using a YSI 6600 datasonde.

**** United States Geological Survey (USGS) Continuous-Record Gaging Station

***** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Total Nitrogen: 0.38 mg/L

Turbidity: 2.34 FTU/NTU

Table 3-5. Water Agency 2017 Seasonal Mainstem Russian River Grab Sampling Results at Cloverdale River Park and Jimtown.

Cloverdale River Park	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11463000 RR near Cloverdale****
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate*****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	13:10	23.6	8.2	0.28	ND	ND	0.18	ND	0.28	**0.49**	**0.042**	140		**0.0023**	154
7/6/2017	14:00	21.7	8.4	ND	ND	ND	0.076	ND	ND	0.22	**0.029**	140		0.0014	134
7/19/2017	13:10	20.2	8.2	ND	ND	ND	ND	ND	ND	0.21	**0.037**	130	**6.2**	**0.0028**	160
8/2/2017	13:40	20.6	8.2	0.38	ND	ND	0.055	ND	0.38	**0.44**	**0.042**	130	**4.9**	**0.0025**	173
8/16/2017	13:30	19.1	8.1	ND	ND	ND	ND	ND	ND	0.14	**0.057**	100	**4.6**	**0.0042**	176
8/30/2017	13:20	19.1	8.0	ND	ND	ND	0.041	ND	ND	0.22	**0.055**	120	**4.6**	**0.0021**	180
9/13/2017	13:20	18.4	8.1	ND	ND	ND	0.051	ND	ND	0.23	**0.058**	140	**8.9**	**0.0025**	180
9/27/2017	12:50	16.5	8.0	ND	ND	ND	0.10	ND	ND	0.24	ND	120	**9.6**	0.0015	162
10/18/2017	13:50	14.1	7.7	ND	ND	ND	0.12	ND	ND	0.30	**0.10**	100	**15.3**	**0.0018**	187
10/31/2017	14:30	15.3	8.0	ND	ND	ND	0.28	ND	ND	**0.46**	**0.074**	140	**9.8**	**0.0028**	180

Jimtown	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11463682 RR at Jimtown****
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate*****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	12:30	24.4	7.6	0.21	ND	ND	0.16	ND	0.21	0.37	0.019	170		0.0016	208
7/6/2017	13:10	22.9	7.7	ND	ND	ND	0.069	ND	ND	0.21	0.018	160	0.9	0.0011	155
7/19/2017	12:00	22.2	7.7	ND	ND	ND	ND	ND	ND	0.20	0.012	160	1.2	0.0016	161
8/2/2017	12:40	22.9	7.9	ND	ND	ND	0.054	ND	ND	0.19	0.020	150	0.4	**0.0028**	165
8/16/2017	12:30	21.4	7.9	ND	ND	ND	0.046	ND	ND	0.15	**0.030**	140	2.3	0.0016	175
8/30/2017	12:20	22.1	7.7	ND	ND	ND	0.048	ND	ND	0.19	**0.028**	140	0.7	**0.0033**	158
9/13/2017	12:10	20.4	7.5	ND	ND	ND	ND	ND	ND	0.14	**0.034**	150	**4.8**	**0.0022**	167
9/27/2017	11:50	18.9	7.6	ND	ND	ND	0.075	ND	ND	0.26	**0.030**	140	**5.2**	**0.0029**	145
10/18/2017	12:40	14.9	7.6	ND	ND	ND	0.070	ND	ND	0.25	**0.048**	130	**6.1**	**0.0025**	182
10/31/2017	13:10	16.5	7.7	0.24	ND	ND	0.13	ND	0.24	0.37	**0.043**	150	**4.5**	**0.0023**	178

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** Turbidity results after 6/16 were recorded using a YSI 6600 datasonde.

**** United States Geological Survey (USGS) Continuous-Record Gaging Station

***** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Total Nitrogen: 0.38 mg/L

Turbidity: 2.34 FTU/NTU

All six monitoring stations were observed to have exceedances of the EPA criteria for Total Phosphorous during the monitoring season (Tables 3-4 through 3-6). The station at Talmage was observed to have the highest concentrations of the six stations, including a maximum value of 0.19 mg/L on 18 October, and exceeded the EPA criteria during the entire term of the Order under flows that ranged from 104 cfs to 213 cfs (Table 3-4 and Figure 3-5b). Maximum concentrations also occurred on 18 October at the Hopland, Cloverdale River Park, and Jimtown stations (Tables 3-4 and 3-5). Hopland had a concentration of 0.17 mg/L with a flow of 192 cfs, Cloverdale River Park had a concentration of 0.10 mg/L with a flow of 187 cfs, and Jimtown had a concentration of 0.048 mg/L with a flow of 182 cfs (Figures 3-6b through

3-8b). The Jimtown station had exceedances during the latter half of the season; however, concentrations were significantly lower than those at Talmage, Hopland, and Cloverdale River Park (Tables 3-4 and 3-5). Syar Vineyards had eight exceedances during the season, including a maximum value of 0.029 mg/L, with flows ranging from 186 cfs to 338 cfs (Table 3-6 and Figure 3-9b). Patterson Point exceeded the criteria throughout the season during open and closed conditions, including a maximum value of 0.045 mg/L, with flows ranging from 138 cfs to 252 cfs (Table 3-6 and Figure 3-10b). While concentrations generally increased through the season at Talmage, Hopland, Cloverdale River Park, and Jimtown, they remained relatively level at Syar Vineyards and Patterson Point.

Table 3-6. Water Agency 2017 Seasonal Mainstem Russian River Grab Sampling Results at Syar and Patterson Point.

Syar	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11465390 RR near Windsor***
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	11:20	21.5	7.9	ND	ND	ND	0.093	ND	ND	0.27	**0.029**	150	**4.0**	**0.0028**	338
7/6/2017	12:00	21.2	8.2	ND	ND	ND	0.042	ND	ND	0.22	**0.022**	140	**3.6**	0.0014	261
7/19/2017	10:50	20.7	8.0	ND	ND	ND	ND	ND	ND	0.12	0.018	150	**2.9**	0.0011	229
8/2/2017	11:25	21.4	8.0	0.21	ND	ND	ND	ND	0.21	0.24	**0.024**	150	1.8	0.0013	233
8/16/2017	11:25	20.3	8.0	0.21	ND	ND	ND	ND	0.21	0.24	**0.025**	130	2.3	**0.0018**	233
8/30/2017	10:40	19.7	8.0	ND	ND	ND	ND	ND	ND	0.21	0.020	140	**2.8**	**0.0023**	207
9/13/2017	10:50	19.6	7.8	ND	ND	ND	ND	ND	ND	0.091	**0.025**	140	**6.3**	0.0017	223
9/27/2017	10:10	17.0	7.7	ND	ND	ND	0.062	ND	ND	0.085	**0.028**	130	**6.3**	0.00049	186
10/18/2017	11:20	13.8	7.7	ND	ND	ND	0.046	ND	ND	0.12	**0.028**	130	**6.5**	**0.0018**	253
10/31/2017	11:20	14.4	7.8	ND	ND	ND	0.043	ND	ND	0.18	**0.029**	88	**6.2**	0.0013	282

Patterson Point	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Dissolved Solids	Turbidity***	Chlorophyll-a	USGS 11467000 RR near Guerneville (Hacienda)****
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	4.2	0.020	0.000050	Flow Rate*****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
6/22/2017	9:50	25.0	8.2	0.32	ND	ND	ND	ND	0.32	0.33	**0.038**	170	0.9	**0.11**	252
7/6/2017	10:20	22.6	8.0	0.21	ND	ND	ND	ND	0.21	0.23	**0.039**	160	1.8	**0.0044**	184
7/19/2017	9:20	23.7	7.6	0.38	ND	ND	ND	ND	0.38	**0.38**	**0.045**	160	**2.8**	**0.0018**	159
8/2/2017	9:30	23.0	7.8	0.32	ND	ND	ND	ND	0.32	0.33	**0.030**	150	1.6	0.0016	159
8/16/2017	10:00	23.0	7.7	ND	ND	ND	ND	ND	ND	0.16	**0.029**	130	**5.5**	0.00074	156
8/30/2017	9:00	22.1	7.6	0.24	ND	ND	ND	ND	0.24	0.27	**0.028**	140	1.2	0.0016	138
9/13/2017	9:10	22.8	7.7	ND	ND	ND	ND	ND	ND	0.10	**0.029**	120	**5.5**	**0.0020**	152
9/27/2017	9:10	18.6	7.5	ND	ND	ND	0.044	ND	ND	0.085	**0.028**	130	**5.1**	0.00049	140
10/31/2017	9:30	15.5	7.7	ND	ND	ND	ND	ND	ND	0.18	**0.037**	130	**5.1**	ND	211

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** Turbidity results after 6/16 were recorded using a YSI 6600 datasonde.

**** United States Geological Survey (USGS) Continuous-Record Gaging Station

***** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

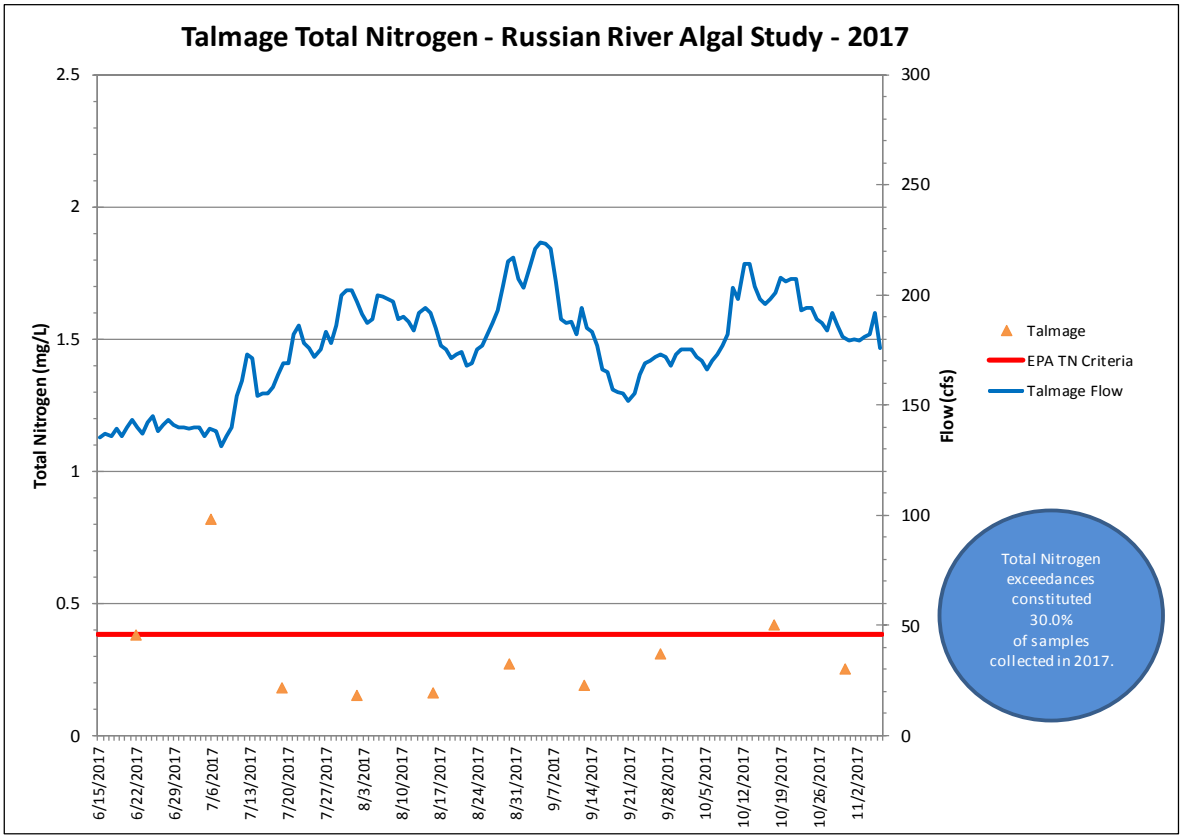
Total Nitrogen: 0.38 mg/L

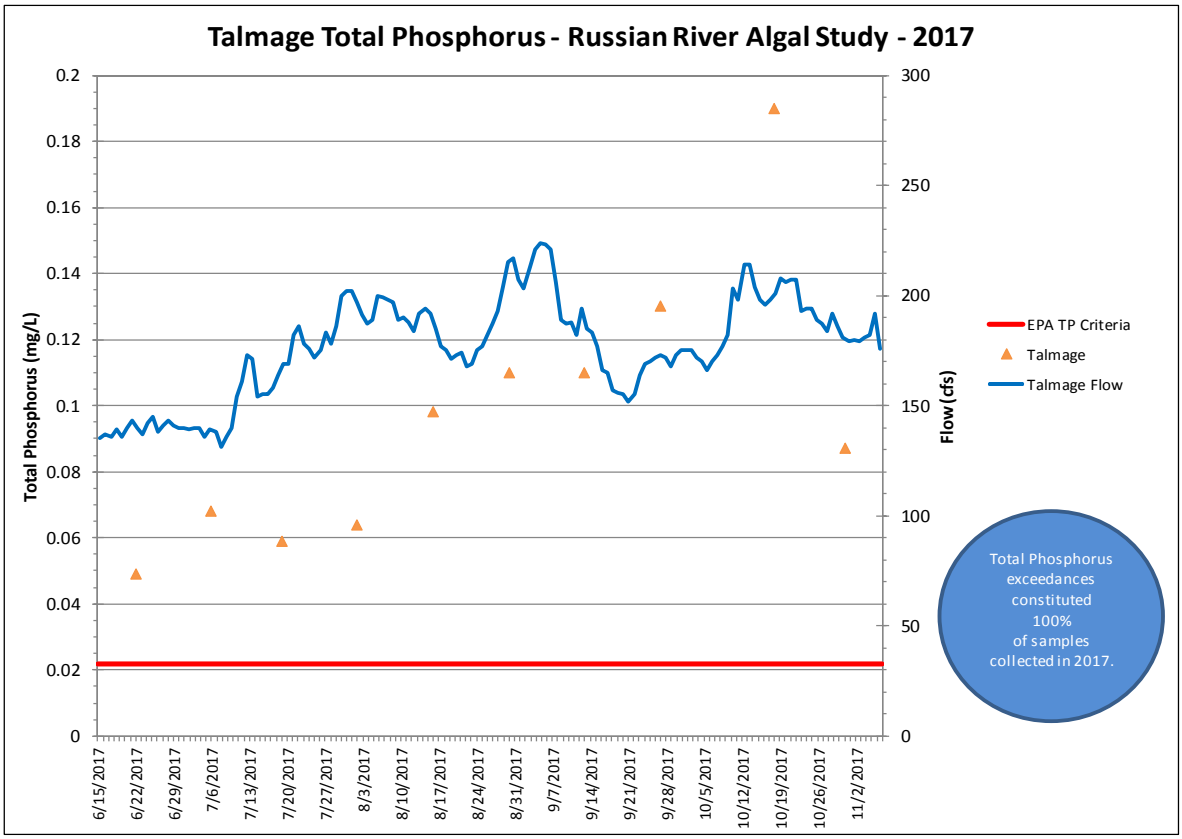
Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Turbidity: 2.34 FTU/NTU

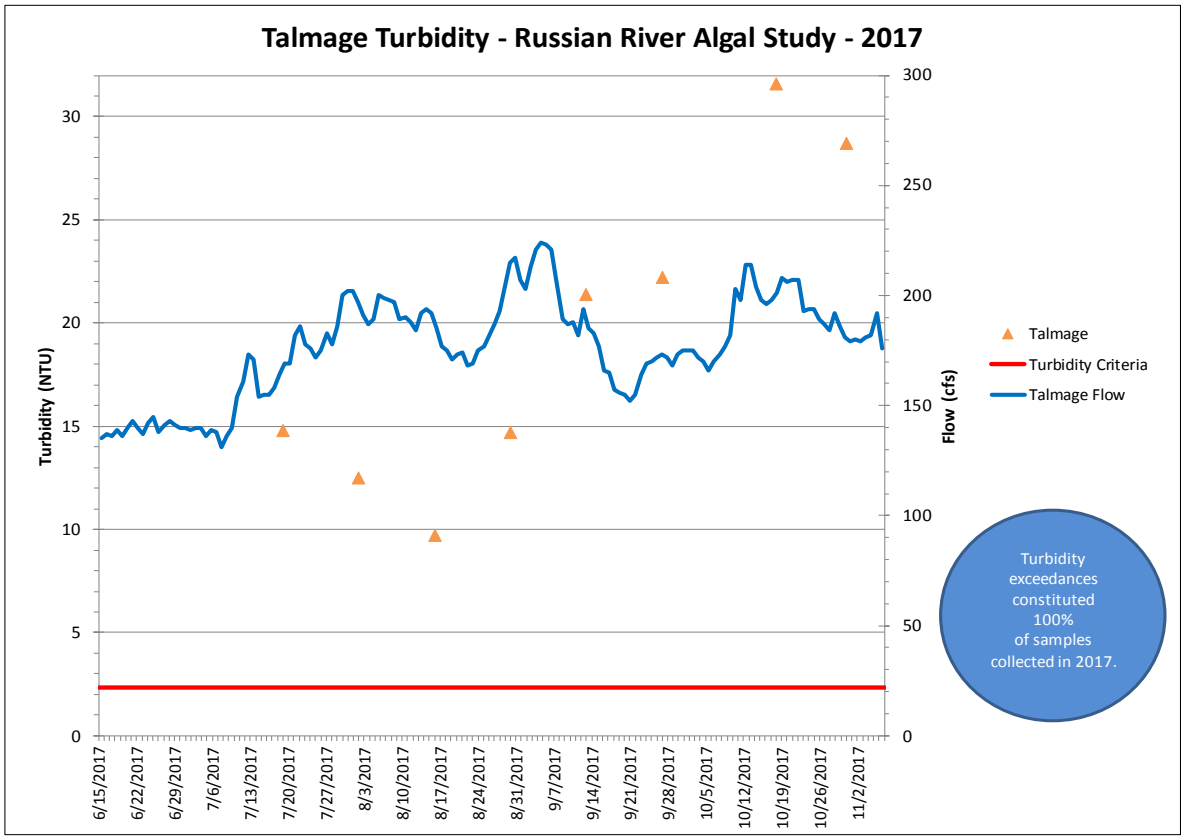
Turbidity levels exceeded the Turbidity EPA criteria during the entire monitoring season at the Talmage, Hopland, and Cloverdale River Park stations (Tables 3-4 and 3-5). Values were observed to generally increase through the season at these stations, similar to the pattern observed for Total Phosphorus (Figures 3-5b through 3-7 b and 3-5c through 3-7c). The maximum values observed occurred on 18 October with values of 31.6 NTU, 25.7 NTU, and 15.3 NTU, at Talmage, Hopland, and Cloverdale River Park, respectively (Tables 3-4 and 3-5). Tubidity values were also observed to increase through the season at Jimtown (Table 3-5). However, values only exceeded the EPA criteria during the latter half of the season with a maximum value of 6.1 NTU that occurred on 18 October with a flow of 182 cfs (Table 3-5 and Figure 3-8c). It is possible that the increasing turbidity values may be associated with the increasing Total Phosphorus values Talmage, Hopland, Coverdale River Park, and possibly Jimtown (Figures 3-5c through 3-8c). However, additional data would need to be collected to confirm if there is a positive correlation. The Syar Vineyards station exceeded the EPA criteria a majority of the time with flows ranging from 186 to 338 cfs (Table 3-6). A maximum value of 6.5 NTU was observed at Syar Vineyards on 18 October with a flow of 253 cfs (Table 3-6 and Figure 3-9c). The Patterson Point station exceeded the turbidity criteria five times throughout the season, during open and closed estuary conditions and summer dam removal, with flows ranging from 140 to 211 cfs (Table 3-6 and Figure 3-10c).

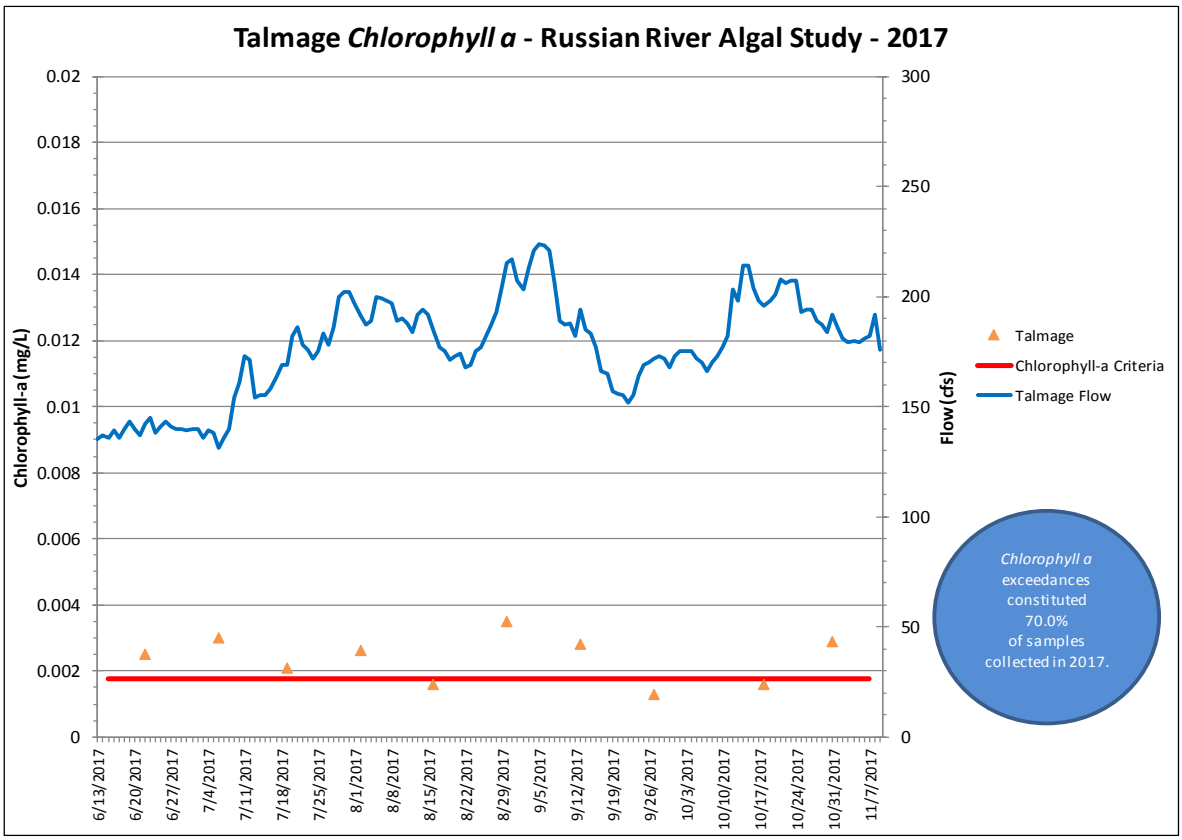
Chlorophyll a (used as an indicator for algae) results were observed to periodically exceed the EPA criteria at all six stations during the season, with flows that ranged from 104 cfs to 338 cfs (Tables 3-4 through 3-6). Talmage had seven exceedances, including a maximum value of 0.0035 mg/L that occurred on 30 August with a flow of 213 cfs (Table 3-4 and Figure 3-5d). Hopland had four exceedances, including a maximum value of 0.0062 mg/L that occurred on 31 October with a flow of 185 cfs (Table 3-4 and Figure 3-6d). Cloverdale River Park had eight exceedances, including a maximum value of 0.0042 mg/L that occurred on 16 October with a flow of 176 cfs (Table 3-5 and Figure 3-7d). Jimtown had six exceedances, including a maximum value of 0.0033 mg/L that occurred on 30 August with a flow of 158 cfs (Table 3-5 and Figure 3-8d). Syar vineyards had four *chlorophyll a* exceedances, including a maximum value of 0.0028 mg/L that occurred on 22 June with a flow of 338 cfs (Table 3-6 and Figure 3-9d). Patterson Point had four *chlorophyll a* exceedances, including a maximum value of 0.11 mg/L that occurred during closed estuary conditions on 22 June with a flow of 252 cfs at Hacienda (Table 3-6 and Figure 3-10d).



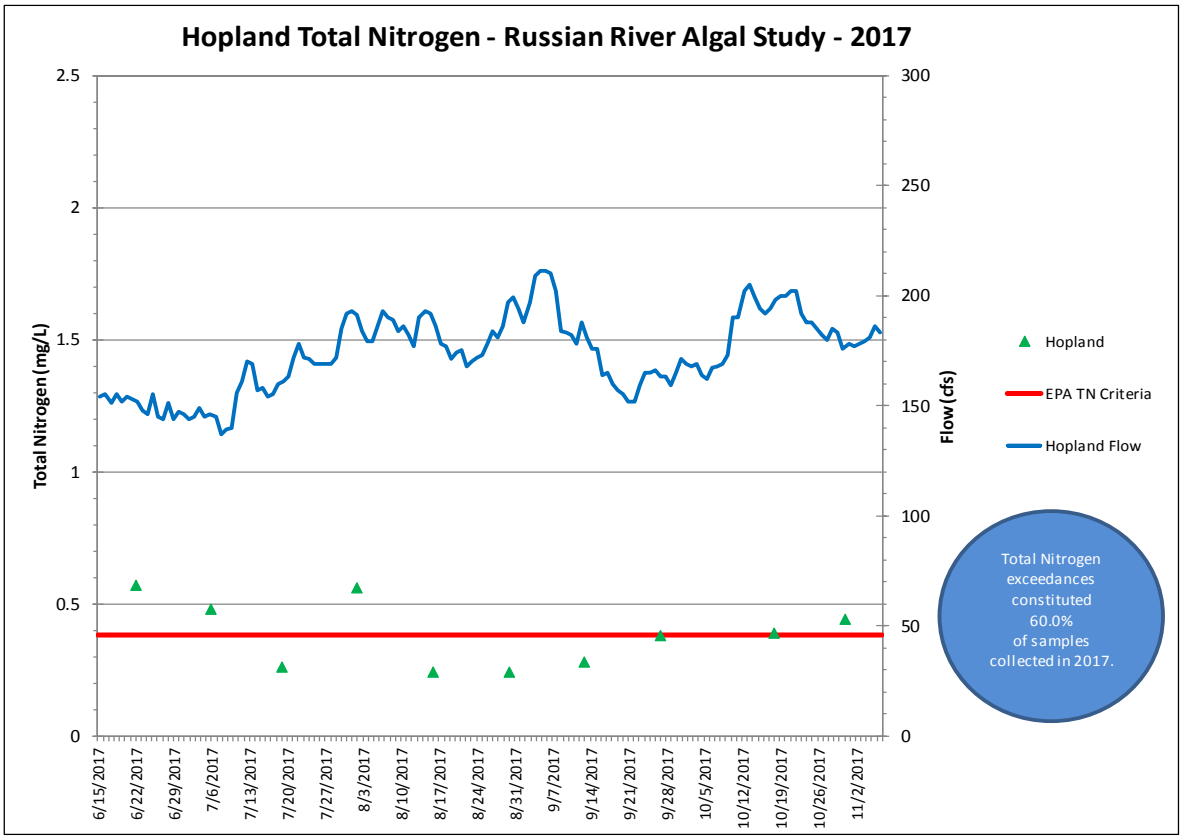


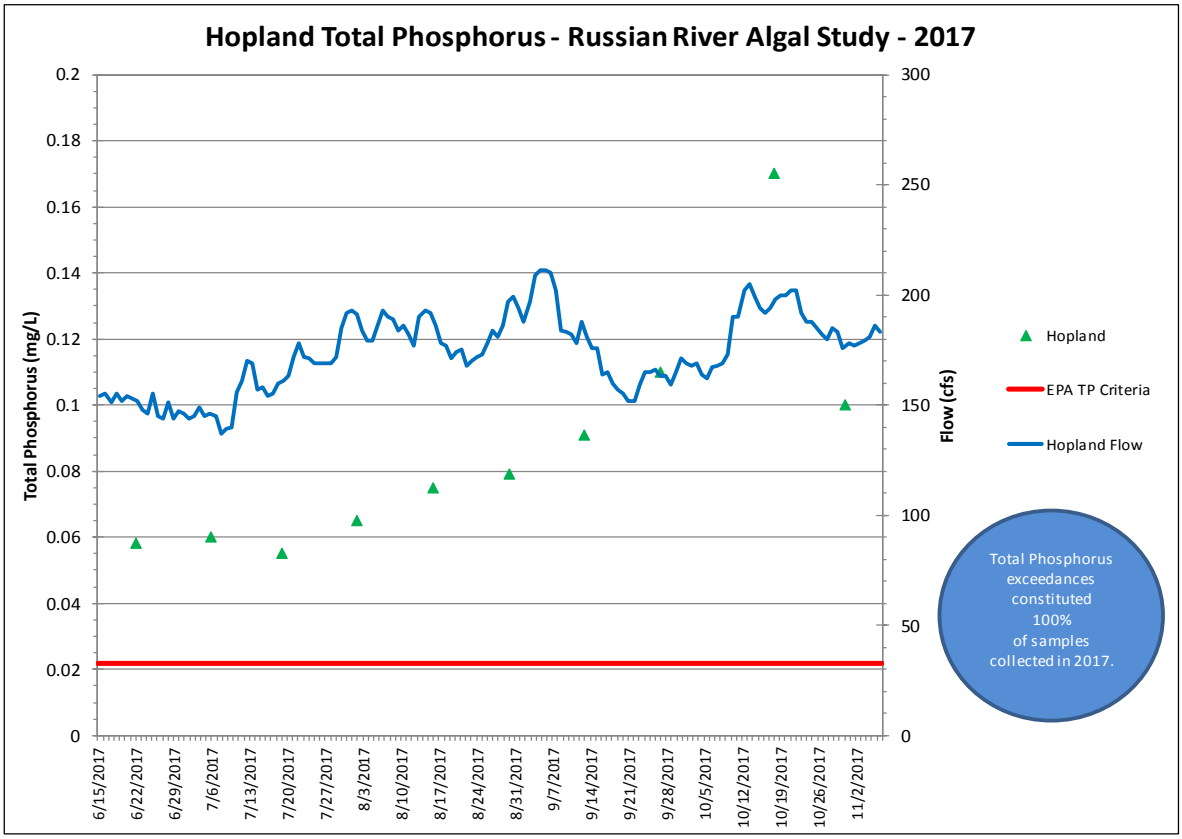
Figures 3-5 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Talmage in 2017.



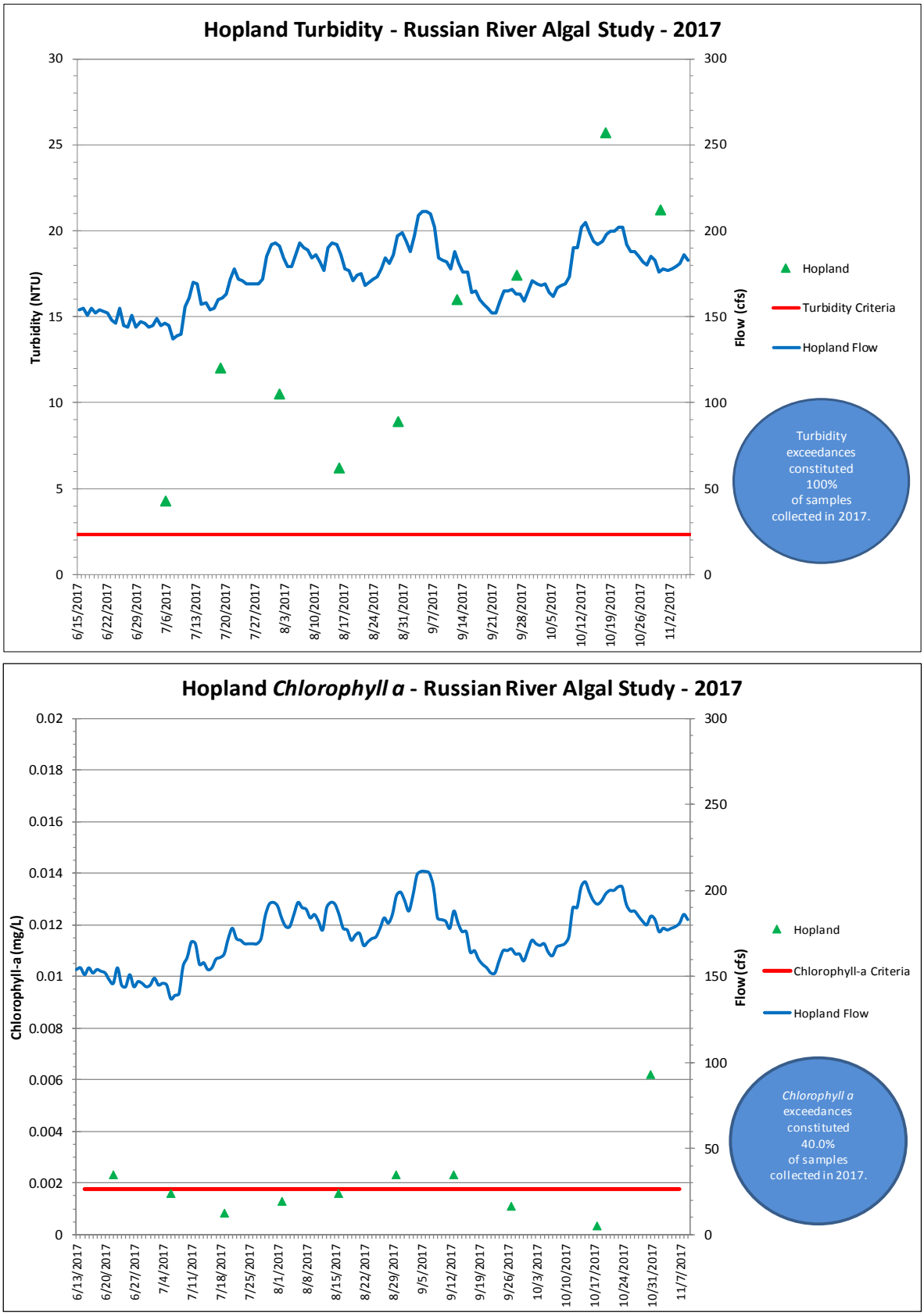


Figures 3-5 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll a* Results from Talmage in 2017.

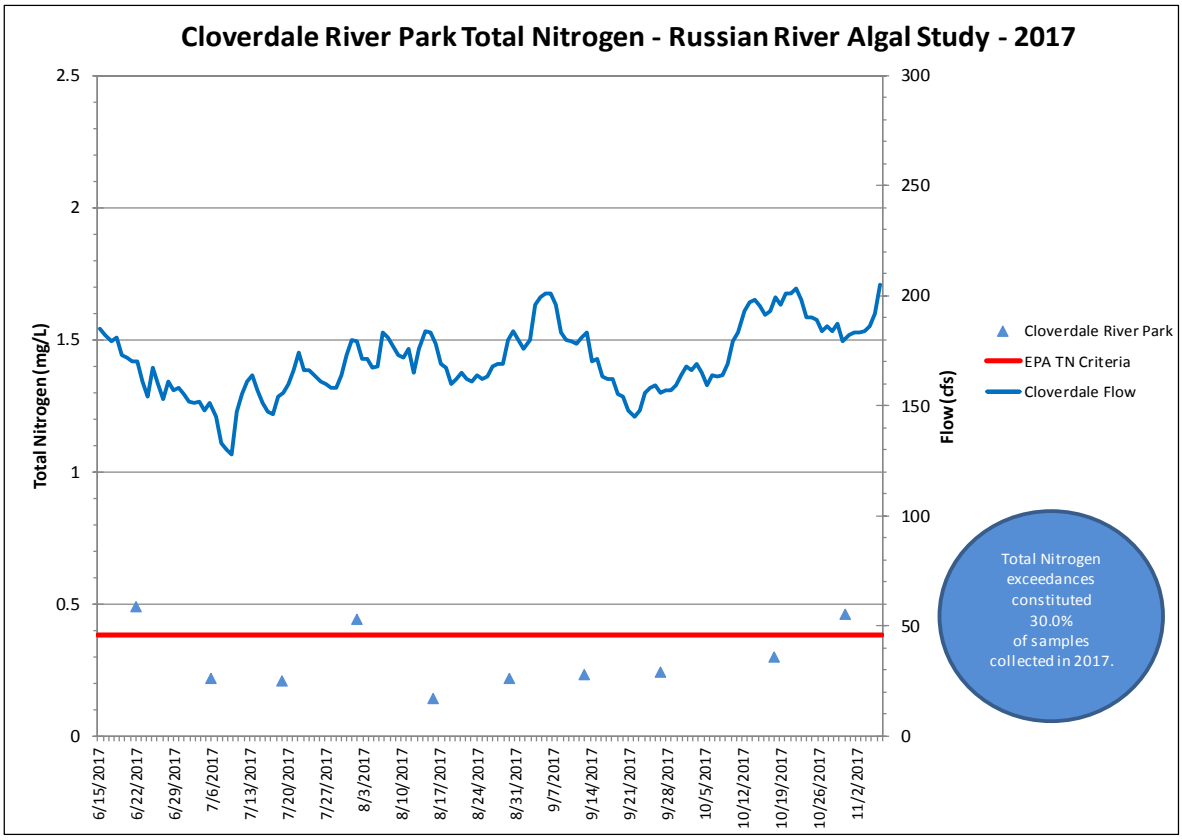


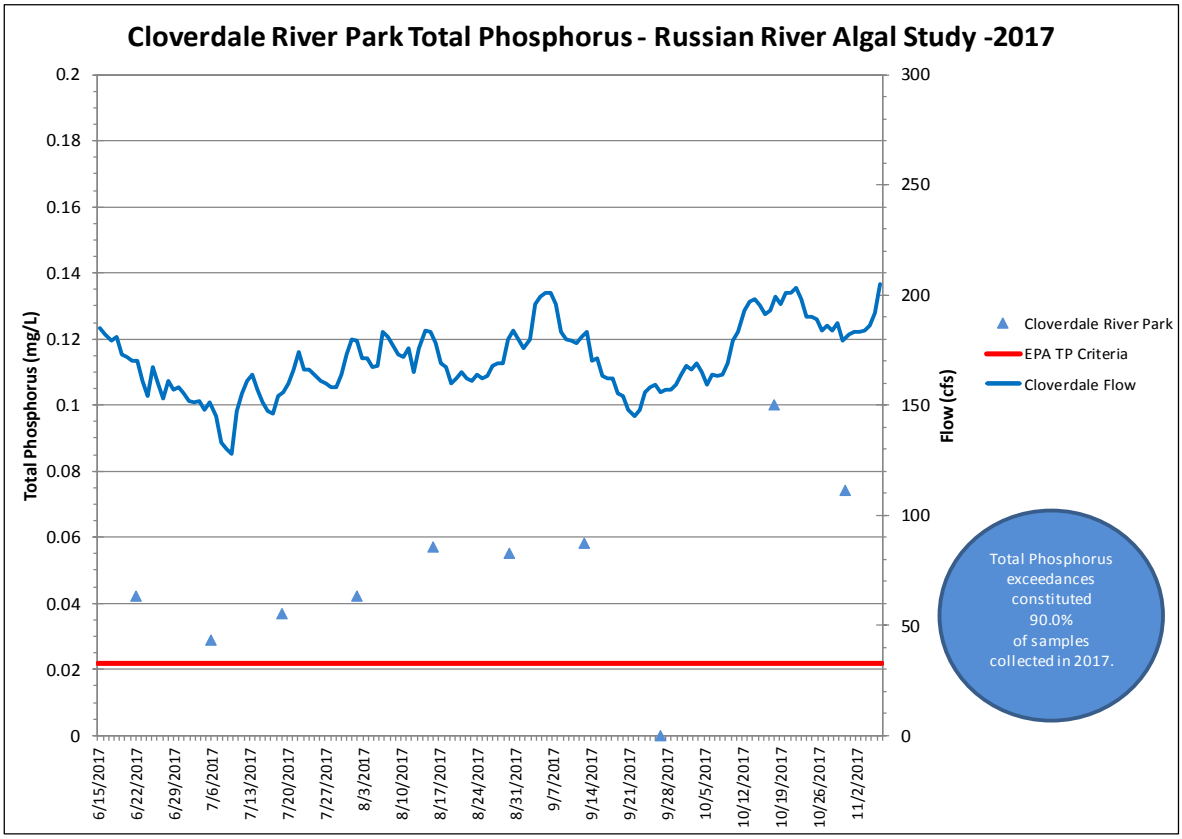


Figures 3-6 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Hopland in 2017.

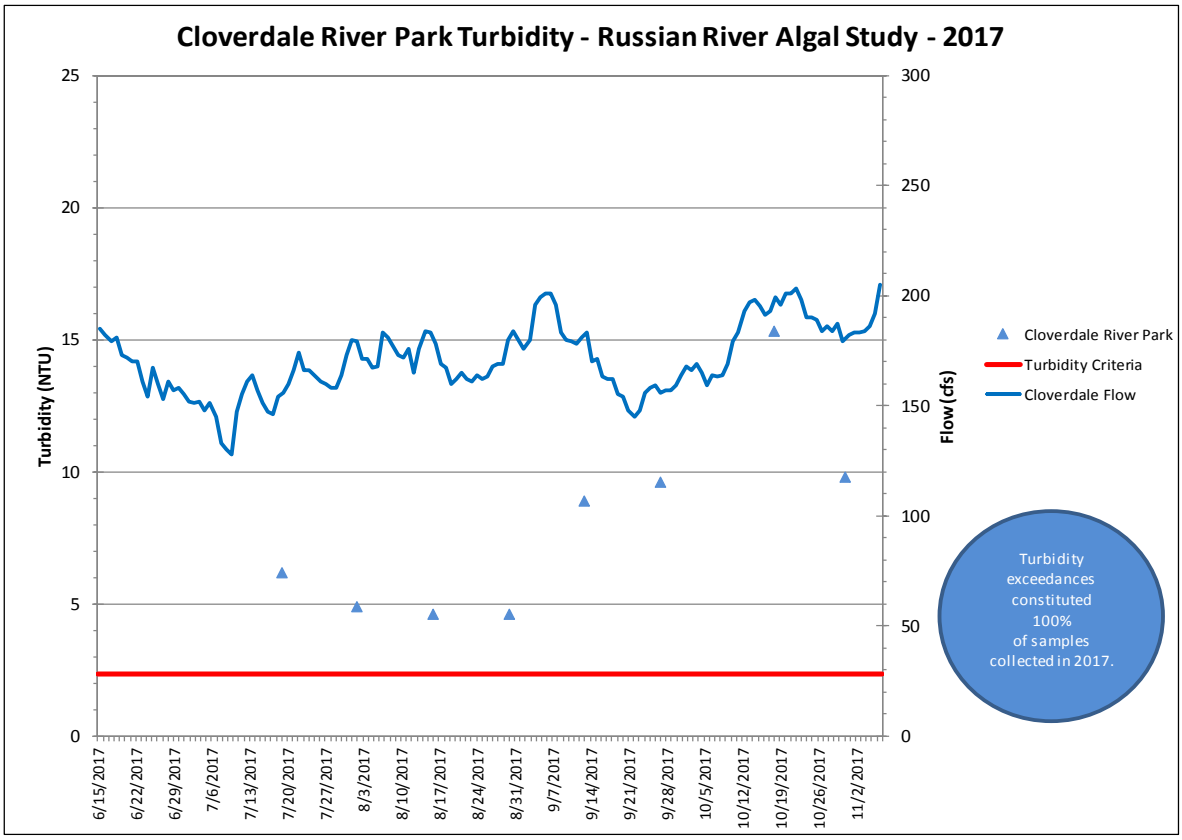


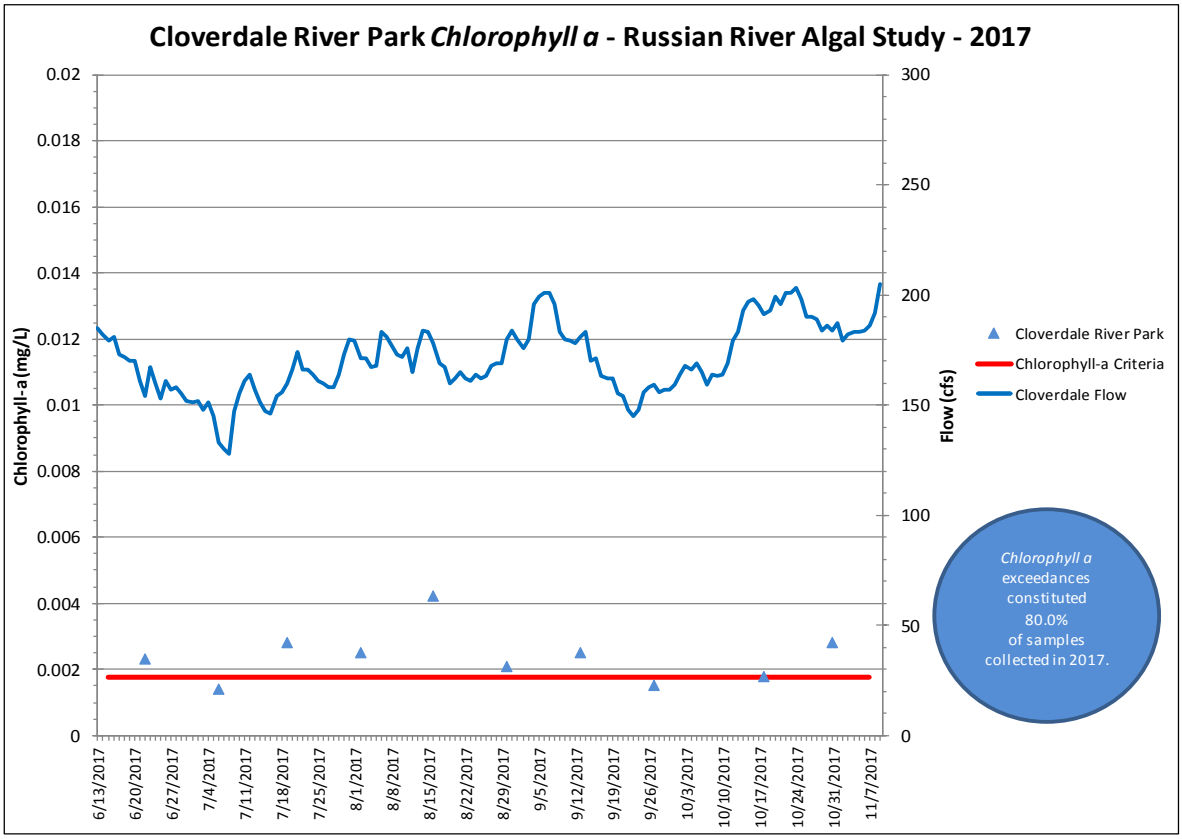
Figures 3-6 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll a* Results from Hopland in 2017.



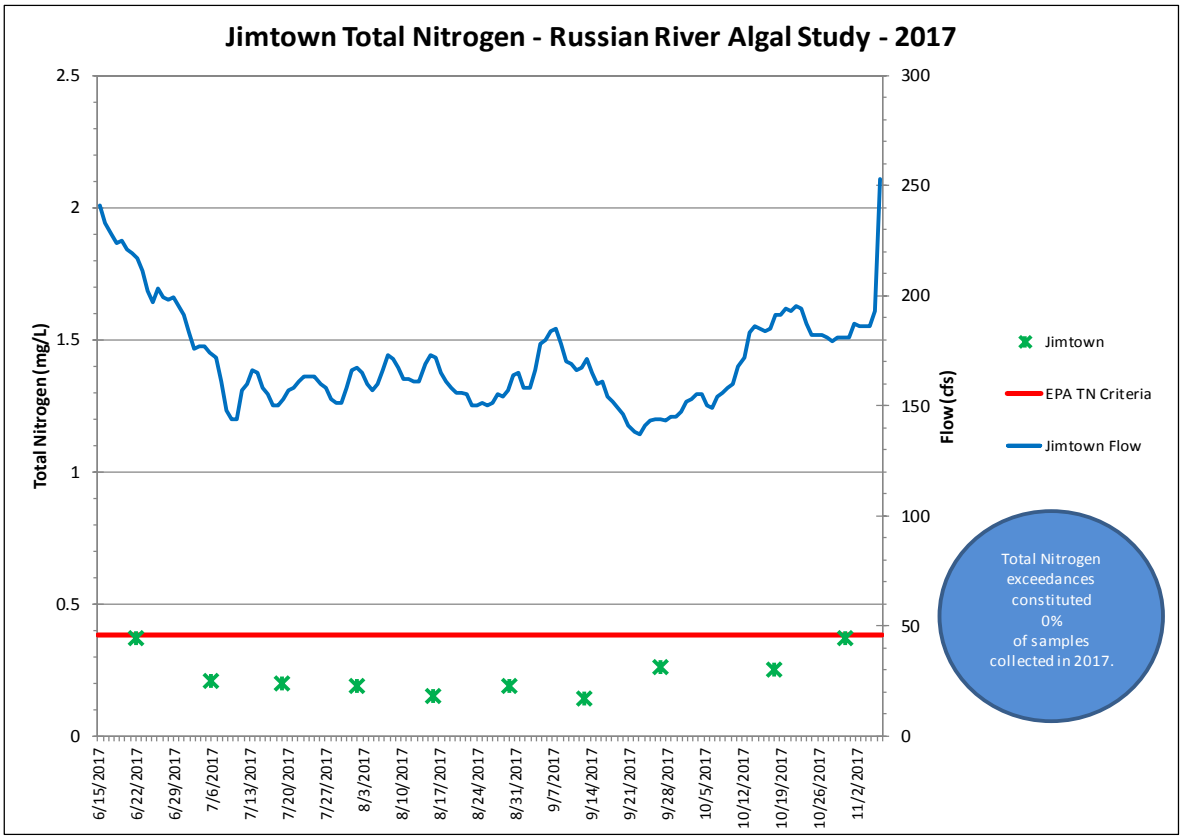


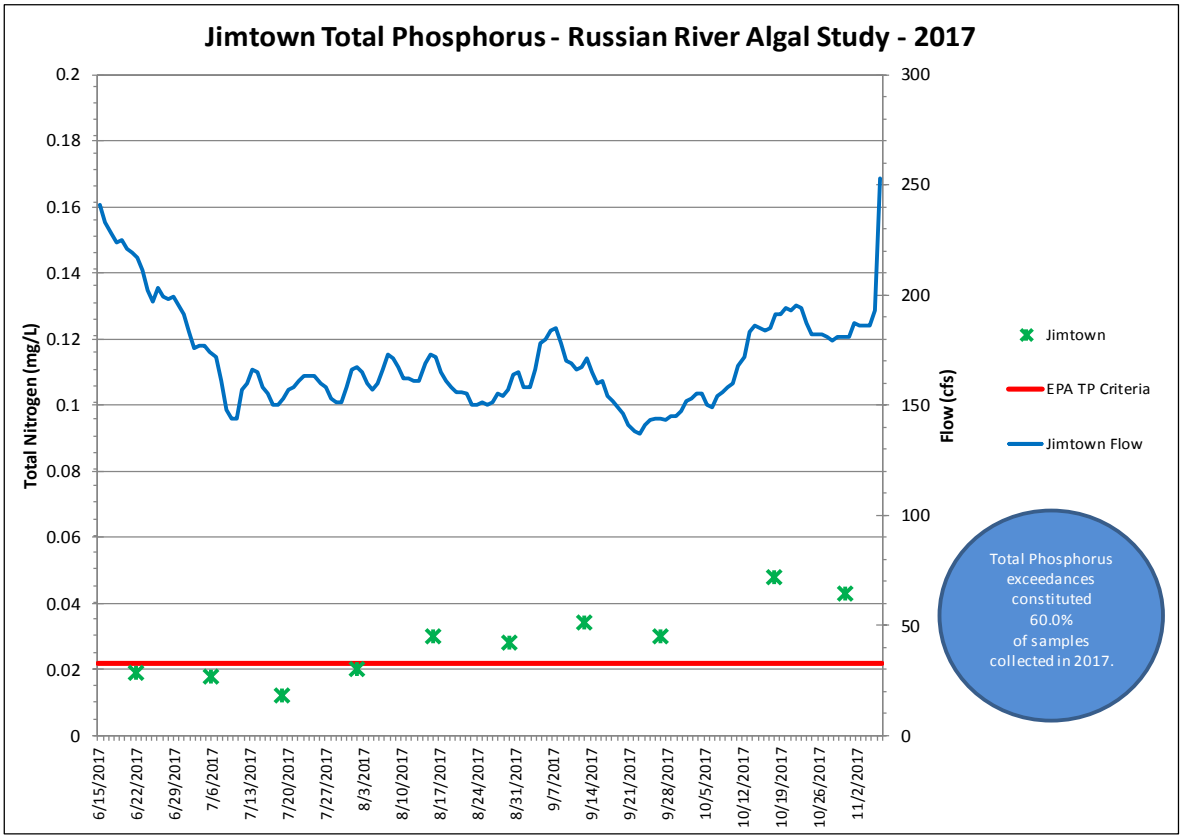
Figures 3-7 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Cloverdale River Park in 2017.



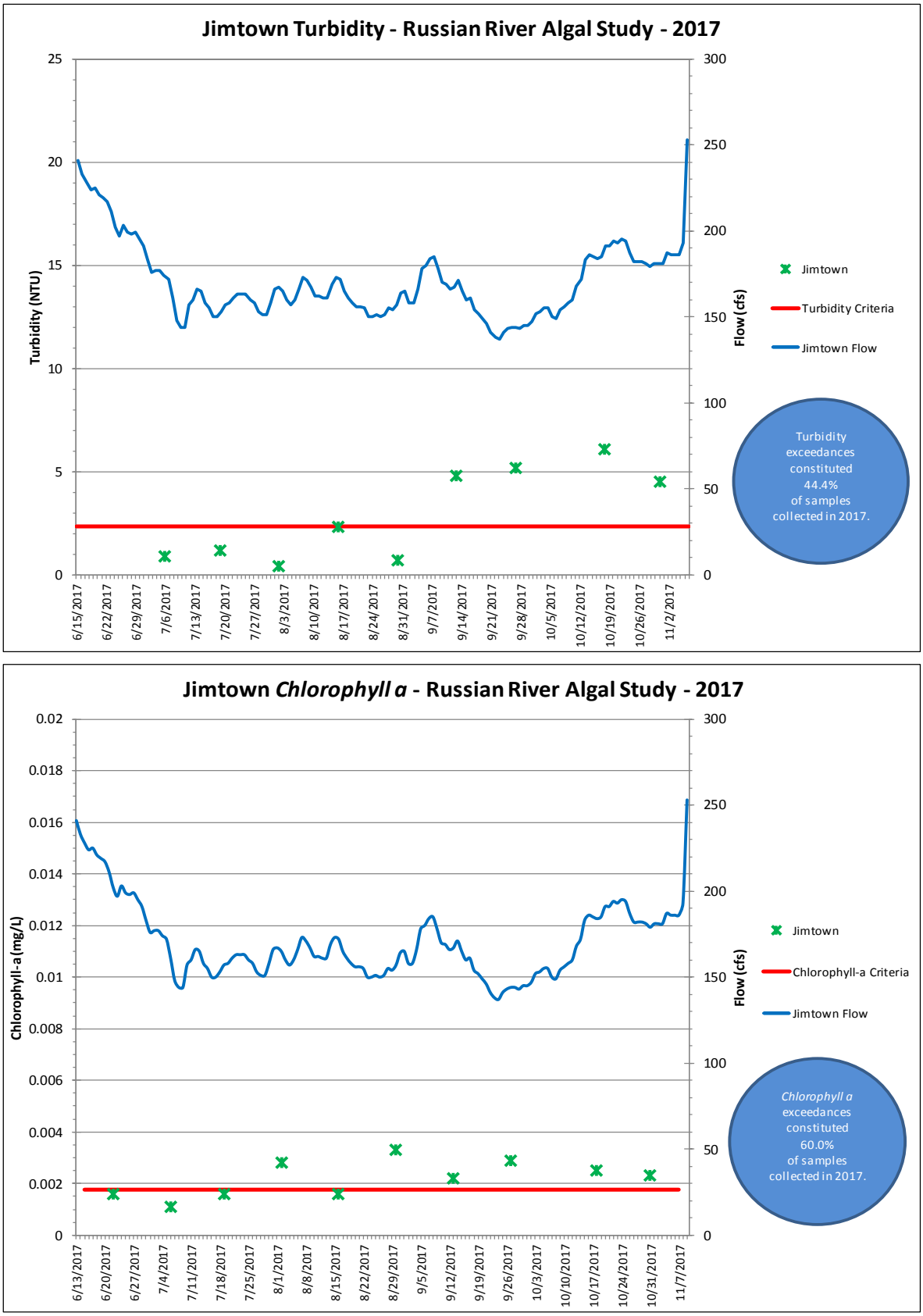


Figures 3-7 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll-a* Results from Cloverdale River Park in 2017.

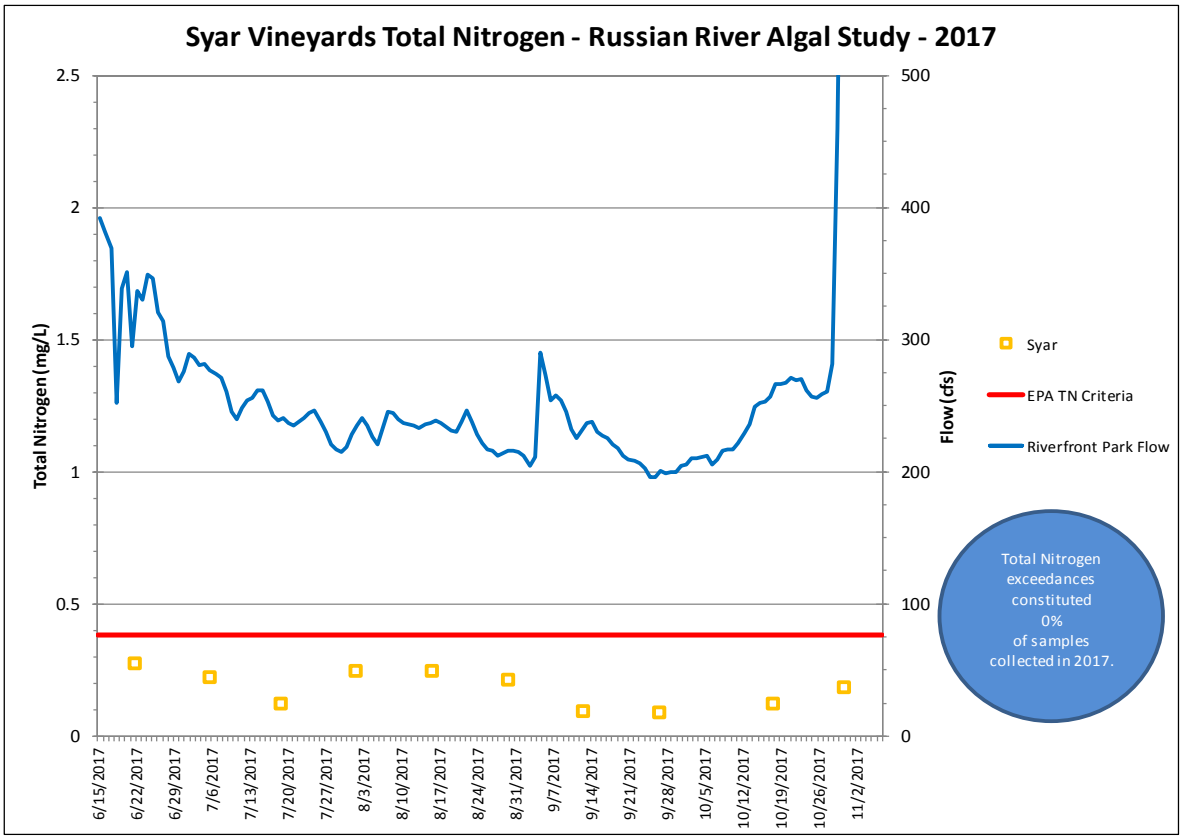


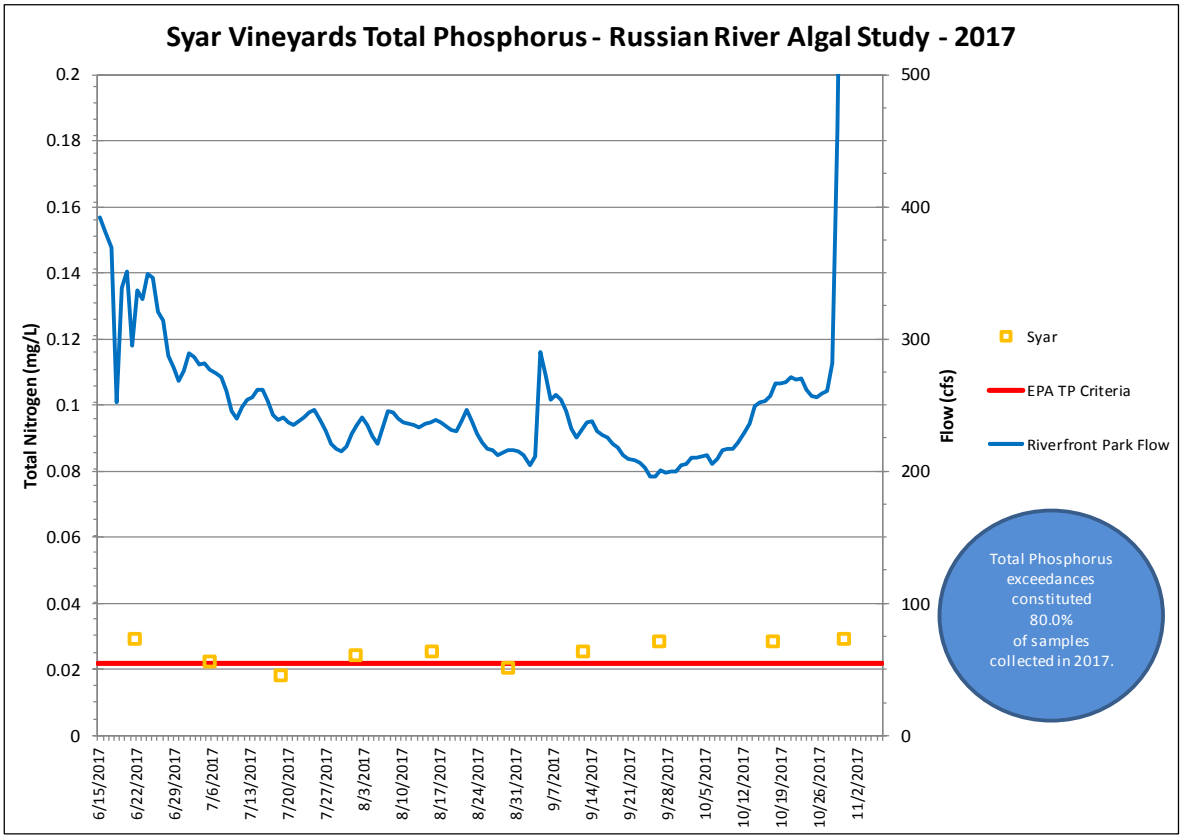


Figures 3-8 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Jimtown in 2017.

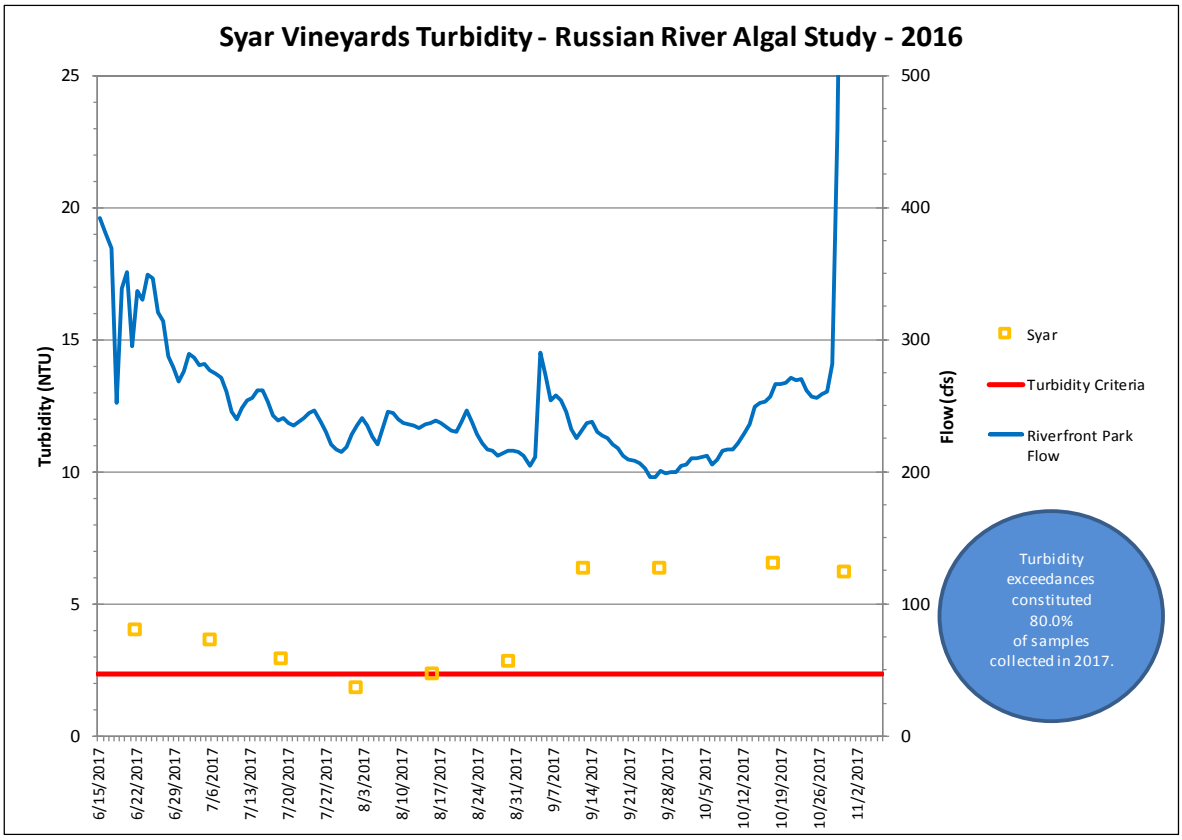


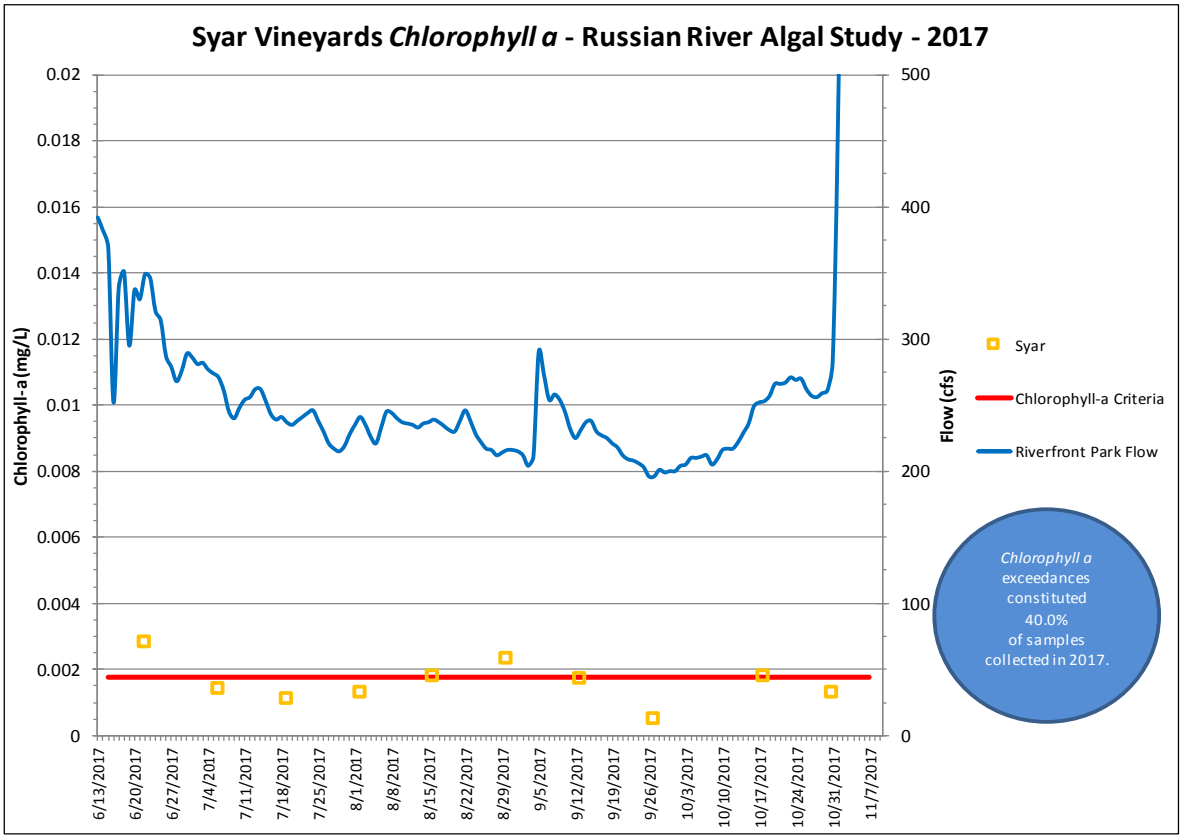
Figures 3-8 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll-a* Results from Jimtown in 2017.



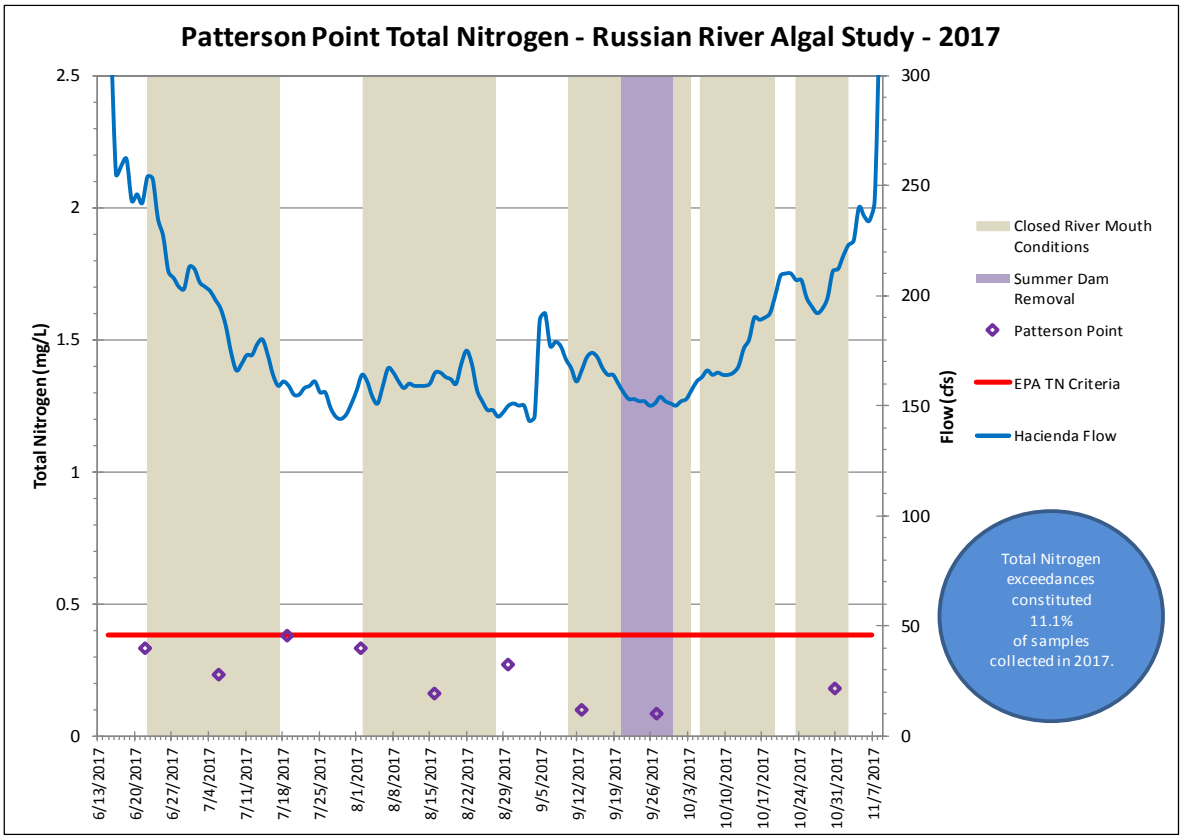


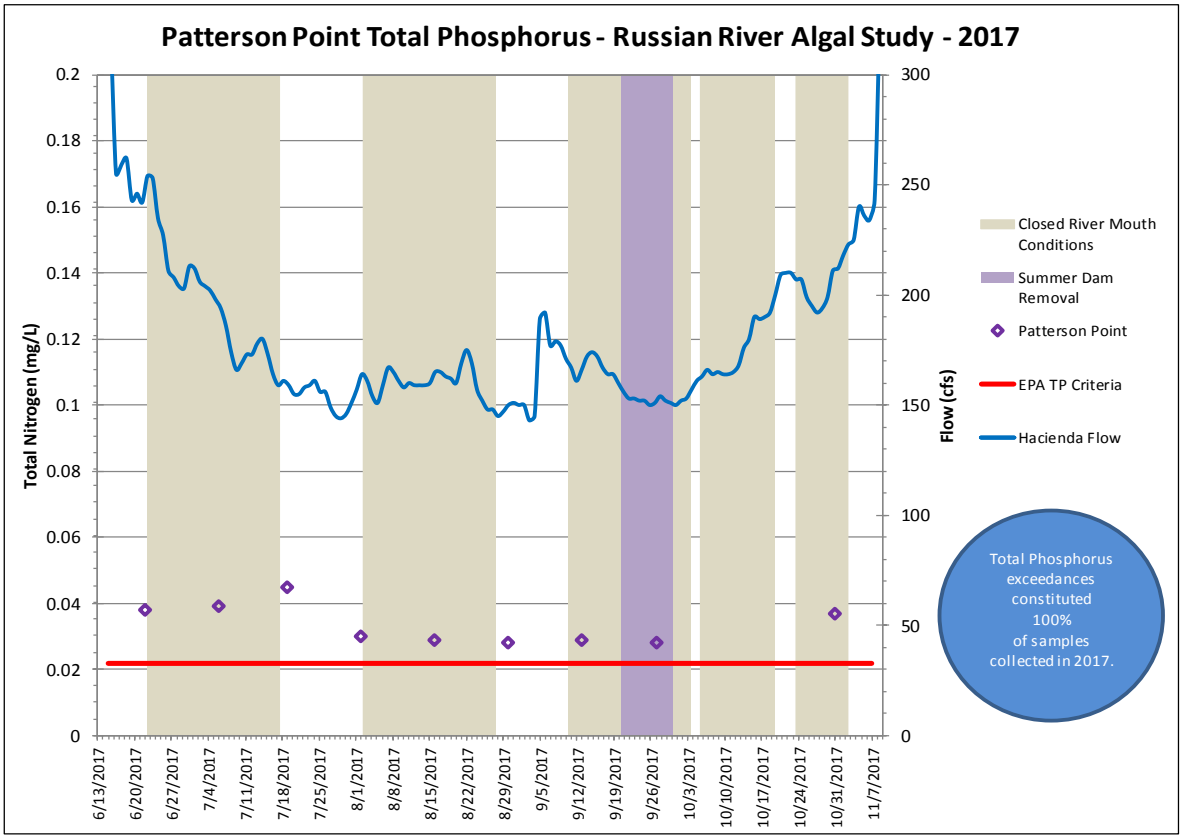
Figures 3-9 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Syar Vineyards in 2017.



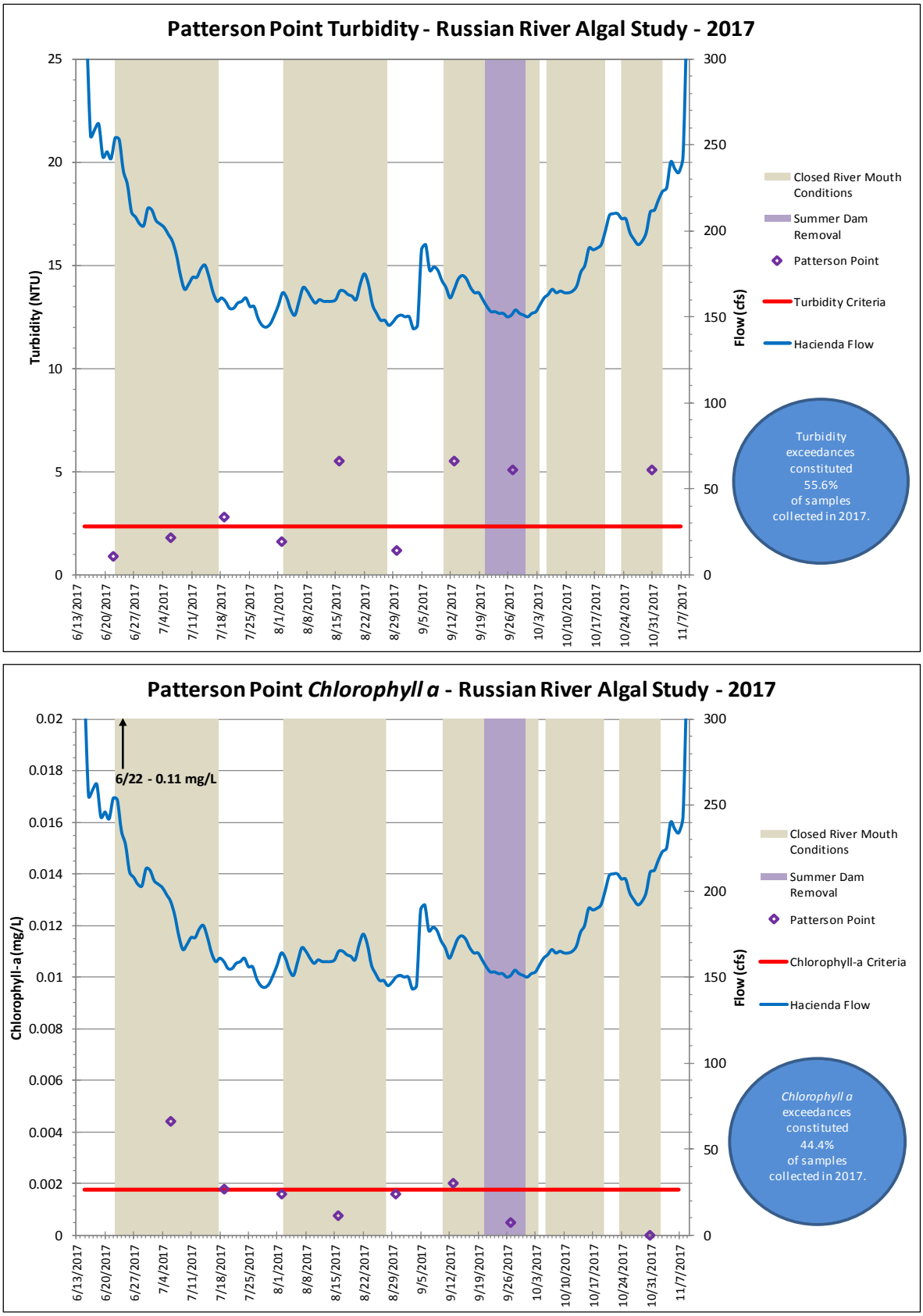


Figures 3-9 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll- a* Results from Syar Vineyards in 2017.





Figures 3-10 a and b. Water Agency Seasonal Mainstem Russian River Grab Sampling Total Nitrogen and Total Phosphorus Results from Patterson Point in 2017.



Figures 3-10 c and d. Water Agency Seasonal Mainstem Russian River Grab Sampling Turbidity and *Chlorophyll-a* Results from Patterson Point in 2017.

3.2 Water Agency Russian River Estuary Water Quality Monitoring

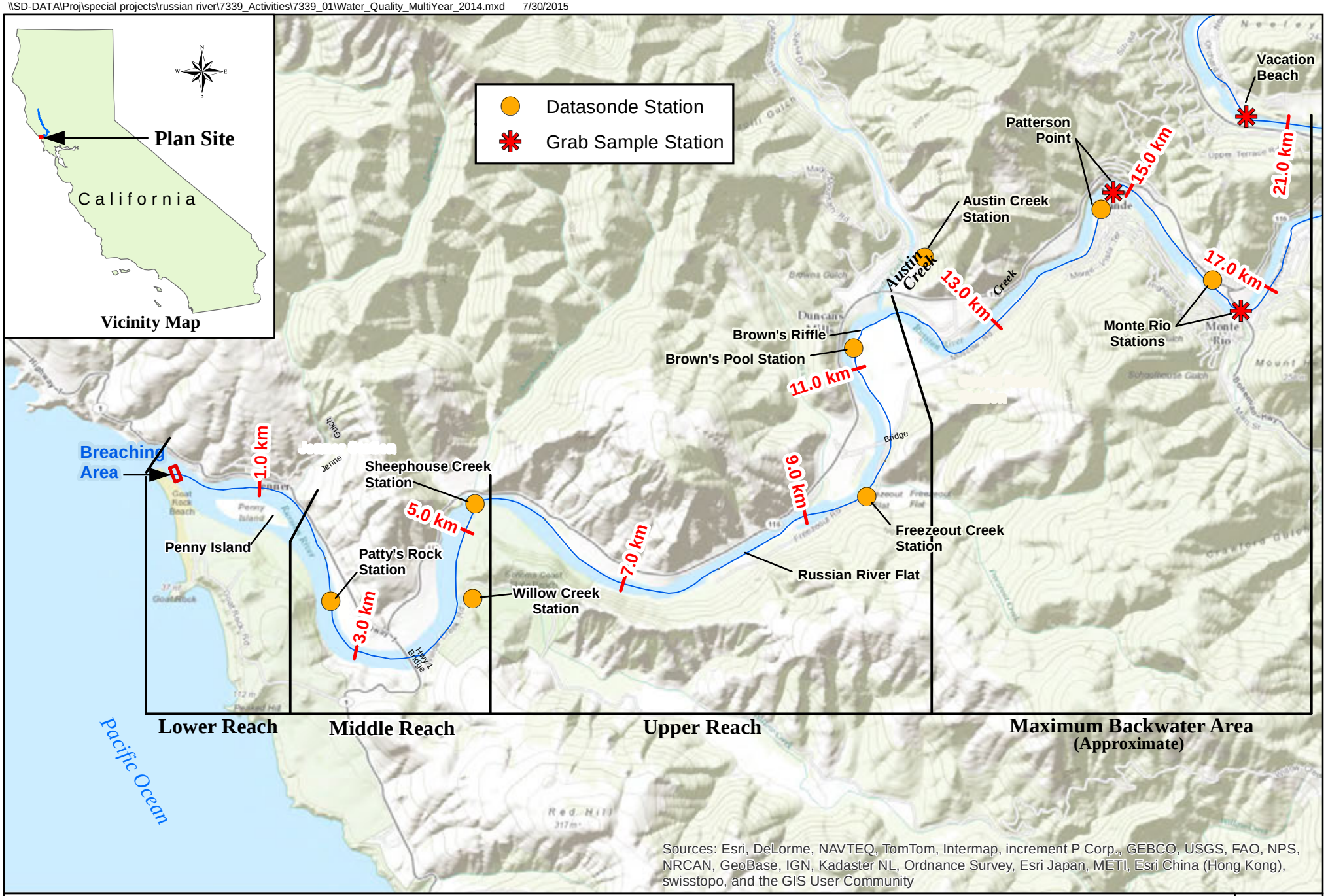
Flows in the lower Russian River at Hacienda (downstream of the confluence with Dry Creek) did not drop below the D1610 minimum flow of 125 cfs while the Order was in effect from 1 May through 15 October (Figure 2-4). Long-term water quality monitoring and weekly grab sampling was conducted in the middle and upper reaches of the Russian River Estuary and the upper extent of inundation and backwatering during lagoon formation, referred to as the maximum backwater area (MBA), between Patty's Rock at Jenner and Vacation Beach, including in two tributaries.

Saline water is denser than freshwater and a salinity "wedge" forms as freshwater outflow passes over the denser tidal inflow. During the lagoon management period (15 May to 15 October), the lower and middle reaches of the Estuary up to Sheephouse Creek are predominantly saline environments with a thin freshwater layer that flows over the denser saltwater. The upper reach of the Estuary transitions to a predominantly freshwater environment, which is periodically underlain by a denser, saltwater layer that migrates upstream to Duncans Mills during low flow conditions and barrier beach closure.

Water Agency staff continued to collect long-term monitoring data to: establish baseline information on water quality in the Estuary and assess the availability of aquatic habitat in the Estuary; gain a better understanding of the longitudinal and vertical water quality profile during the ebb and flow of the tide; and track changes to the water quality profile that may occur during periods of low flow conditions, barrier beach closure, lagoon outlet channel implementation, and reopening. Long-term monitoring datasondes were deployed at seven stations in the Russian River estuary, including two tributary stations during the 2017 monitoring season (Figure 3-11). Data was not collected at the Sheephouse Creek station in 2017 due to malfunctioning equipment. The Water Agency submits an annual report to the National Marine Fisheries Service and California Department of Fish and Wildlife documenting the status updates of the Water Agency's efforts in implementing the Biological Opinion. The water quality monitoring data for 2017 is currently being compiled and will be discussed in the Russian River Biological Opinion 2018 annual report, which will be posted to the Water Agency's website when available: http://www.scwa.ca.gov/bo-annual-report/.

Water Agency staff conducted weekly grab sampling from 16 May to 17 October at three stations in the lower mainstem Russian River, including: Vacation Beach, Monte Rio, and Patterson Point (Figure 3-11). All samples were analyzed for nutrients, *chlorophyll a*, standard bacterial indicators (Total Coliform, *E. coli*, and *Enterococcus*), total and dissolved organic carbon, total dissolved solids, and turbidity. Samples were collected during the monitoring season for diluted and undiluted analysis of Total Coliform and *E. coli* for comparative purposes and the results are included in Tables 3-7 through 3-9 and Figures 3-12 and 3-13. Samples collected for *Enterococcus* were undiluted only and results are included in Tables 3-7 through 3-9 and Figure 3-14. The Water Agency submitted samples to the Sonoma County DHS Public Health Division Lab in Santa Rosa for bacteria analysis. Total Coliform and *E. coli* were analyzed using the Colilert method and *Enterococcus* was analyzed using the Enterolert method. Samples for all other constituents were submitted to Alpha Analytical Labs in Ukiah for analysis. Total Coliform and *E. coli* data presented in Figures 3-12 and 3-13 utilize undiluted sample results unless the reporting limit has been exceeded, at which point the diluted results are utilized.

\\SD-DATA\Proj\special projects\russian river\7339_Activities\7339_01\Water_Quality_MultiYear_2014.mxd 7/30/2015



0 0.45 0.9 1.8 Kilometers

0 0.375 0.75 1.5 Miles

Russian River Estuary
Water Quality Monitoring Stations

This Map is for general reference only.

Figure 3-11

NCRWQCB staff has indicated, based on guidance from Sonoma County DHS, that *Enterococcus* is not currently being utilized as a fecal indicator bacteria in freshwater conditions due to uncertainty in the validity of the lab analysis to produce accurate results, as well as evidence that *Enterococcus* colonies can be persistent in the water column and therefore its presence at a given site may not always be associated with a fecal source. Water Agency staff will continue to collect *Enterococcus* samples and record and report the data, however, *Enterococcus* results will not be relied upon when coordinating with the NCRWQCB and Sonoma County DHS about potentially posting warning signs at freshwater beach sites or to discuss potential adaptive management actions including mechanical breaching of the barrier beach to address potential threats to public health.

Sampling for human-host *Bacteroides* bacteria was conducted at public freshwater beaches when other bacteria samples were collected. Samples were submitted to the DHS lab where they were filtered, frozen and archived for possible future analyses of human-host *Bacteroides* bacteria by staff at the NCRWQCB. Lab analysis of *Bacteroides* bacteria will be conducted only for those sample dates and locations when operational standards for *E. coli* bacteria are exceeded. The analysis of human-host *Bacteroides* bacteria will help determine if the source of the high level of *E. coli* bacteria is from human or other sources.

The grab sample sites are shown in Figure 3-11, and the results are summarized in Tables 3-7 through 3-12 and Figures 3-12 through 3-18. Highlighted values indicate those values exceeding California Department of Public Health Draft Guidance for Fresh Water Beaches for Indicator Bacteria (CDPH 2011), EPA Recreational Water Quality Criteria (EPA 2012), and EPA recommended criteria for Nutrients, *Chlorophyll a*, and Turbidity in Rivers and Streams in Aggregate Ecoregion III (EPA 2000). However, it must be emphasized that the draft CDPH guidelines and EPA criteria are not adopted standards, and are therefore both subject to change (if it is determined that the guidelines or criteria are not accurate indicators) and are not currently enforceable.

There were two exceedances of the recommended EPA Recreational Water Quality Criteria (RWQC) for Total Coliform at the Monte Rio station and one exceedance at the Patterson Point station during open and closed estuary conditions with Hacienda flows that ranged from 136 to 175 cfs (Figure 3-12). Total Coliform concentrations were observed to increase through the early part of the season before peaking in July and generally declining through the remainder of the monitoring season (Figure 3-12). The Monte Rio station was also observed to have one exceedance of the RWQC for *E. coli* during closed estuary conditions on 22 August with flows at 149 cfs (Table 3-8 and Figure 3-13). Exceedances of the *Enterococcus* RWQC were observed periodically through the season at all three monitoring stations during open and closed estuary conditions, with Hacienda flows ranging from 138 to 179 cfs (Tables 3-7 through 3-9). During the latter half of the season, all three stations were observed to have *Enterococcus* exceedances during estuary closure and summer dam removal (Figure 3-14). External factors including contact recreation, estuary closure, and the late-September removal of summer dams in Guerneville likely had an effect on elevated bacterial concentrations observed in the Vacation Beach to Patterson Point area during the 2017 monitoring season (Figures 3-12 through 3-14).

Table 3-7. 2017 Vacation Beach bacteria concentrations for samples collected by the Water Agency. This site experiences freshwater conditions.

Vacation Beach	Time	Temperature	pH	Total Coliforms (Colilert)	Total Coliforms Diluted 1:10 (Colilert)	E. coli (Colilert)	E. coli Diluted 1:10 (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				20		20		2	Flow Rate****
Date		°C		MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/16/2017	10:10	16.5	7.9	727.0	435	8.6	<10	3.0	777
5/23/2017	10:30	20.3	7.9	547.5	776	12.2	10	2.0	561
5/30/2017	11:00	19.4	7.9	344.1	448	16.7	20	1.0	483
6/6/2017	14:30	22.4	8.0	980.4	1126	8.6	20	3.1	400
6/13/2017	11:00	19.2	7.9	770.1	697	5.2	<10	9.7	364
6/20/2017	11:30	25.5	8.1	1553.1	3255	37.9	52	39.0	243
6/27/2017	11:10	23.3	8.1	>2419.6	2909	22.6	31	10.9	207
7/5/2017	11:00	23.0	8.1	1986.3	1553	13.5	10	9.6	197
7/11/2017	10:50	24.6	8.0	>2419.6	5794	3.0	31	15.5	175
7/13/2017	13:00	24.2	8.1	>2419.6	4352	8.6	<10	10.9	179
7/18/2017	11:50	24.6	8.0	>2419.6	5475	8.4	<10	10.9	164
7/25/2017	10:20	23.6	8.0	1986.3	3076	10.9	<10	7.5	141
8/1/2017	11:15	23.5	8.0	387.3	2282	5.2	10	4.1	139
8/8/2017	9:30	22.7	7.9	2419.6	1935	11	20	30.5	144
8/10/2017	10:40			1986.3	2613	3.1	<10		136
8/15/2017	10:30	23.3	7.9	1986.3	2098	18.9	<10	34.1	136
8/22/2017	9:50	20.7	7.8	1553.1	2014	6.3	10	20.1	149
8/29/2017	10:30	22.7	7.8	1732.9	2359	5.2	20	21.1	135
9/5/2017	11:40	23.5	7.8	1986.3	1374	15.8	<10	13.2	177
9/12/2017	10:30	23.0	7.8	1553.1	1054	20.9	52	25.9	148
9/19/2017	10:10	19.9	7.7	1203.3	1664	14.5	63	17.5	151
9/21/2017	8:40	18.9	7.6	1533.1	1314	21.6	10	**61.3**	143
9/26/2017	10:10	18.1	7.6	1299.7	958	23.1	41	**73.8**	138
9/28/2017	10:20	18.4	7.6	1553.1	624	14.8	52	57.3	142
10/3/2017	10:30	17.5	7.7	980.4	677	23.1	52	**85.7**	140

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** United States Geological Survey (USGS) Continuous-Record Gaging Station

*** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Recreational Water Quality Criteria - Statistical Threshold Value (STV) and Geomteric Mean (GM)

(Beach posting is recommended when indicator organisms exceed the STV) - Indicated by red text

E. coli (STV): 235 per 100 ml	Enterococcus (STV): 61 per 100 ml
E. coli (GM): 126 per 100mL	Enterococcus (GM): 33 per 100 mL

Table 3-8. 2017 Monte Rio bacteria concentrations for samples collected by the Water Agency. This site experiences freshwater conditions.

Monte Rio	Time	Temperature	pH	Total Coliforms (Colilert)	Total Coliforms Diluted 1:10 (Colilert)	E. coli (Colilert)	E. coli Diluted 1:10 (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				20		20		2	Flow Rate****
Date		°C		MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/16/2017	9:50	16.3	7.7	866.4	523	9.7	10	4.1	777
5/23/2017	10:10	19.9	7.8	727.0	613	7.3	<10	8.5	561
5/30/2017	10:35	19.3	7.8	501.2	546	12.0	<10	1.0	483
6/6/2017	14:00	22.0	7.9	1413.6	1401	8.6	10	1.0	400
6/13/2017	10:40	19.5	7.9	816.4	1050	11.0	<10	1.0	364
6/20/2017	11:10	25.3	8.0	>2419.6	2143	24.6	10	15.8	243
6/27/2017	10:50	22.7	7.9	920.8	1723	7.5	20	3.1	207
7/5/2017	10:40	22.7	8.0	>2419.6	7270	19.7	10	5.2	197
7/11/2017	10:20	24.6	8.0	>2419.6	**17329**	52.0	63	59.8	175
7/13/2017	12:40	24.5	8.0	>2419.6	5172	26.2	10	**62.6**	179
7/18/2017	11:30	23.9	7.7	>2419.6	**12033**	18.5	85	19.5	164
7/25/2017	10:00	23.6	7.8	>2419.6	3255	31.7	52	**152.9**	141
8/1/2017	10:50	23.1	7.8	325.5	3076	10.9	10	4.1	139
8/8/2017	9:00	22.6	7.7	2419.6	2014	14.5	20	5.2	144
8/10/2017	10:20			>2419.6	3448	113.7	123		136
8/15/2017	10:10	23.5	7.9	2419.6	3448	38.4	74	20.9	136
8/22/2017	9:30	21.1	7.8	>2419.6	4611	**270.0**	**275**	**135.4**	149
8/29/2017	10:00	22.5	7.6	1119.9	1421	7.2	10	1.0	135
9/5/2017	11:20	23.5	7.7	2419.6	1850	6.3	31	17.1	177
9/12/2017	10:00	22.9	7.7	1732.9	1483	9.7	20	6.2	148
9/19/2017	9:40	20.2	7.8	1986.3	1553	47.3	74	**69.7**	151
9/21/2017	8:20	19.6	7.8	1203.3	2603	73.8	85	**69.7**	143
9/26/2017	9:50	18.4	7.6	1119.9	1130	37.3	20	60.9	138
9/28/2017	10:00	18.9	7.6	1203.3	1566	77.1	63	**83.6**	142
10/3/2017	10:00	18.2	7.8	1203.3	801	48.7	30	**88.0**	140

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** United States Geological Survey (USGS) Continuous-Record Gaging Station

*** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Recreational Water Quality Criteria - Statistical Threshold Value (STV) and Geomteric Mean (GM)

(Beach posting is recommended when indicator organisms exceed the STV) - Indicated by red text

E. coli (STV): 235 per 100 ml — Enterococcus (STV): 61 per 100 ml

E. coli (GM): 126 per 100mL — Enterococcus (GM): 33 per 100 mL

Table 3-9. 2017 Patterson Point bacteria concentrations for samples collected by the Water Agency. This site experiences freshwater conditions.

Patterson Point	Time	Temperature	pH	Total Coliforms (Colilert)	Total Coliforms Diluted 1:10 (Colilert)	E. coli (Colilert)	E. coli Diluted 1:10 (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				20		20		2	Flow Rate****
Date		°C		MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/16/2017	9:20	16.1	7.6	686.7	383	12.0	10	3.0	777
5/23/2017	9:40	19.6	7.8	1119.9	706	11.0	20	<1.0	561
5/30/2017	10:10	19.2	7.8	344.1	457	110.0	**310**	3.0	483
6/6/2017	13:30	22.1	7.9	727.0	987	14.6	<10	1.0	400
6/13/2017	10:00	19.4	8.0	770.1	857	12.1	<10	3.1	364
6/20/2017	10:40	25.1	8.1	1732.9	2481	11.0	<10	13.4	243
6/27/2017	10:20	23.2	8.0	1413.6	1246	11.0	10	6.1	207
7/5/2017	10:10	22.7	8.0	>2419.6	8664	18.7	20	6.2	197
7/11/2017	9:50	24.1	8.0	>2419.6	7701	12.1	20	35.0	175
7/13/2017	12:20	23.7	7.9	>2419.6	7270	23.3	20	13.1	179
7/18/2017	10:50	23.9	7.8	>2419.6	9804	27.9	10	20.9	164
7/25/2017	8:30	23.4	7.8	>2419.6	3255	12.1	10	31.2	141
8/1/2017	10:20	22.9	7.8	325.5	2224	6.3	<10	4.1	139
8/8/2017	8:30	22.6	7.7	>2419.6	2489	29.8	52	**64.4**	144
8/10/2017	9:40			>2419.6	2613	42.6	31		136
8/15/2017	9:30	23.4	7.9	>2419.6	**14136**	35.9	52	**>2419.6**	136
8/22/2017	9:10	21.2	7.8	1986.3	1722	8.4	20	52.0	149
8/29/2017	9:30	22.2	7.6	1203.3	1019	10.7	<10	14.5	135
9/5/2017	10:30	23.2	7.7	>2419.6	2909	14.8	<10	25.9	177
9/12/2017	9:30	22.9	7.8	1986.3	1989	5.2	<10	7.4	148
9/19/2017	9:20	20.1	7.9	>2419.6	4106	25	20	**129.6**	151
9/21/2017	8:00	19.8	7.9	2419.6	2909	71.2	75	**920.8**	143
9/26/2017	9:20	18.5	7.5	1119.9	1291	33.6	31	**62.4**	138
9/28/2017	9:40	18.7	7.7	1553.1	1137	46.4	30	44.1	142
10/3/2017	9:40	18.4	7.6	1299.7	1274	20.9	20	36.4	140

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** United States Geological Survey (USGS) Continuous-Record Gaging Station

*** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Recreational Water Quality Criteria - Statistical Threshold Value (STV) and Geomteric Mean (GM)

(Beach posting is recommended when indicator organisms exceed the STV) - Indicated by red text

E. coli (STV): 235 per 100 ml	Enterococcus (STV): 61 per 100 ml
E. coli (GM): 126 per 100mL	Enterococcus (GM): 33 per 100 mL

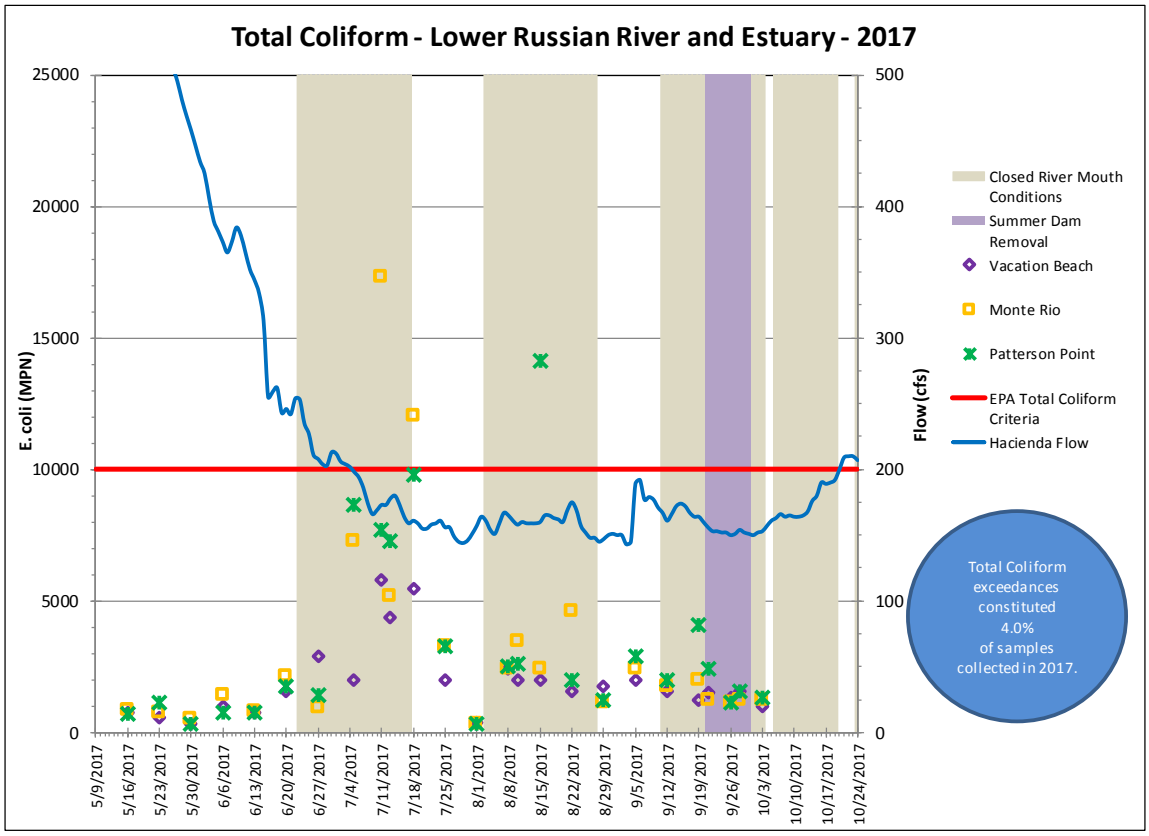


Figure 3-12. Total Coliform results for the Russian River from Vacation Beach to Patterson Point in 2017.

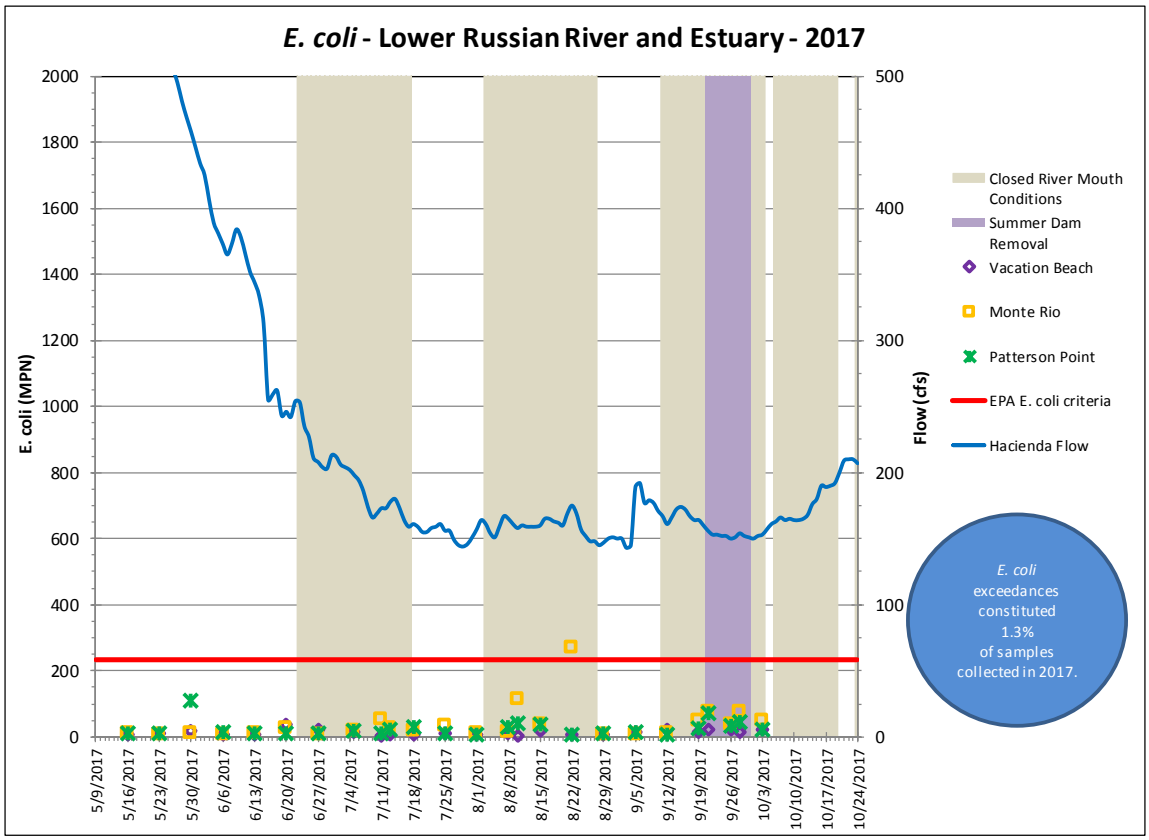


Figure 3-13. *E. coli* results for the Russian River from Vacation Beach to Patterson Point in 2017.

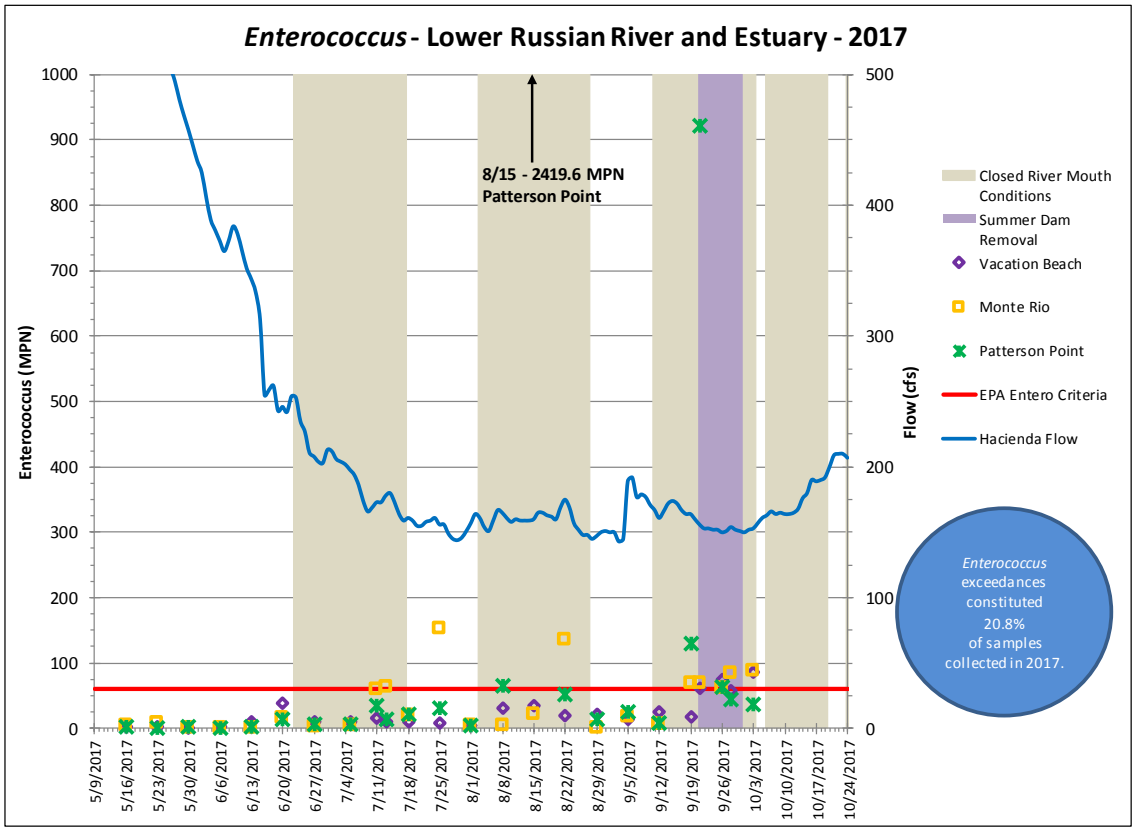


Figure 3-14. *Enterococcus* results for the Russian River from Vacation Beach to Patterson Point in 2017.

The EPA criteria for Total Nitrogen was exceeded three times at Vacation Beach and twice at Monte Rio and Patterson Point with Hacienda flows ranging from 243 cfs to 561 cfs (Tables 3-10 through 3-12). All exceedances were observed to occur during open estuary conditions at the beginning of the season, with all three stations exceeding the criteria on 13 June and 20 June (Figure 3-15). In contrast, all three stations predominantly exceeded the EPA criteria for Total Phosphorous during the term of the Order and with flows that ranged from 135 cfs to 777 cfs, continuing a trend of consistent exceedances observed in previous years (Tables 3-10 through 3-12). Interestingly, the Monte Rio station had two concentrations below the Total Phosphorus criteria during estuary closure, removal of the summer dams, and flows of 143 cfs on 21 September and 140 cfs on 3 October (Table 3-11 and Figure 3-16).

The EPA criteria for Turbidity was exceeded periodically at Monte Rio and Patterson Point and predominantly at Vacation Beach throughout the season (Tables 3-10 through 3-12). Exceedances were observed to occur during open and closed estuary conditions with Hacienda flows ranging from 135 cfs to 777 cfs (Figure 3-17). Streamflow over the Vacation Beach summer dam and through the fish ladder is likely contributing to the elevated turbidity values at the Vacation Beach station.

Algal (*chlorophyll a*) results exceeded the EPA criteria at all three stations periodically throughout the season, under open and closed conditions and Hacienda flows that ranged from 136 cfs to 777 cfs (Tables 3-10 through 3-12 and Figure 3-18). However, algal concentrations and exceedances were observed to be more pronounced during the first half of the season when flows were still declining from spring storm events (Figure 3-18).

Table 3-10. 2017 Vacation Beach nutrient grab sample results. This site experiences freshwater conditions.

Vacation Beach	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Orthophosphate	Dissolved Organic Carbon	Total Organic Carbon	Total Dissolved Solids	Turbidity	Chlorophyll-a	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.0400	0.0400	4.2	0.020	0.000050	Flow Rate****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
5/16/2017	10:10	16.5	7.9	0.21	ND	ND	0.066	ND	0.21	0.28	**0.034**	0.084	1.46	1.68	160	**4.5**	**0.0049**	777
5/23/2017	10:30	20.3	7.9	0.24	ND	ND	0.060	ND	0.24	**0.88**	**0.035**	0.075	1.59	1.72	150	**3.0**	**0.0023**	561
5/30/2017	11:00	19.4	7.9	0.28	ND	ND	0.047	ND	0.28	0.33	**0.038**	0.076	1.37	1.52	170	**3.1**	**0.0022**	483
6/6/2017	14:30	22.4	8.0	ND	ND	ND	0.068	ND	ND	0.24	**0.036**	0.087	0.958	1.11	170	**2.5**	**0.0099**	400
6/13/2017	11:00	19.2	7.9	0.42	ND	ND	0.059	ND	0.42	**0.52**	**0.038**	0.087	1.64	1.59	170	**3.2**	**0.0035**	364
6/20/2017	11:30	25.5	8.1	0.46	ND	ND	0.046	ND	0.46	**0.50**	**0.037**	0.081	1.73	1.84	160	2.2	**0.0035**	243
6/27/2017	11:10	23.3	8.1	ND	ND	ND	ND	ND	ND	0.18	**0.039**	0.10	1.31	1.43	160	1.9	**0.0069**	207
7/5/2017	11:00	23.0	8.1	ND	ND	ND	ND	ND	ND	0.18	**0.041**	0.065	1.65	2.10	150	**2.9**	**0.0050**	197
7/11/2017	10:50	24.6	8.0	ND	ND	ND	ND	ND	ND	0.18	**0.036**	0.073	1.12	1.49	150	1.8	**0.0034**	175
7/13/2017	13:00	24.2	8.1	ND	ND	ND	ND	ND	ND	0.10	**0.035**	0.083	1.68	1.84	160	1.9	**0.0026**	179
7/18/2017	11:50	24.6	8.0	ND	ND	ND	ND	ND	ND	0.18	**0.033**	0.057	1.74	1.75	150	1.8	**0.0020**	164
7/25/2017	10:20	23.6	8.0	ND	ND	ND	ND	ND	ND	0.070	**0.032**	0.066	1.68	1.91	140	2.2	**0.0030**	141
8/1/2017	11:15	23.5	8.0	ND	ND	ND	ND	ND	ND	0.16	**0.030**	0.069	1.63	1.95	150	**2.4**	**0.0018**	139
8/8/2017	9:30	22.7	7.9	ND	ND	ND	ND	ND	ND	0.19	**0.032**	0.055	1.75	1.87	150	**2.7**	0.0013	144
8/15/2017	10:30	23.3	7.9	ND	ND	ND	ND	ND	ND	0.19	**0.025**	0.061	1.81	1.99	130	2.2	0.0012	136
8/22/2017	9:50	20.7	7.8	ND	ND	ND	ND	ND	ND	0.070	**0.023**	0.038	1.53	1.88	130	2.1	0.0011	149
8/29/2017	10:30	22.7	7.8	ND	ND	ND	ND	ND	ND	0.10	**0.12**	0.05	1.45	1.69	140	**2.6**	0.0015	135
9/5/2017	11:40	23.5	7.8	ND	ND	ND	ND	ND	ND	0.14	**0.025**	0.047	1.64	1.68	140	1.8	0.0016	177
9/12/2017	10:30	23.0	7.8	ND	ND	ND	ND	ND	ND	0.10	**0.027**	0.064	1.51	1.84	120	**2.5**	0.0014	148
9/19/2017	10:10	19.9	7.7	ND	ND	ND	ND	ND	ND	0.19	**0.11**	0.078	1.37	1.46	110	**2.4**	**0.13**	151
9/21/2017	8:40	18.9	7.6	ND	ND	ND	ND	ND	ND	0.16	**0.029**	0.055	1.21	1.36	140	**3.3**	0.00097	143
9/26/2017	10:10	18.1	7.6	ND	ND	ND	0.10	ND	ND	0.24	**0.031**	0.053	1.35	1.37	130	**4.8**	0.00065	138
9/28/2017	10:20	18.4	7.6	ND	ND	ND	0.042	ND	ND	0.15	**0.030**	0.056	1.33	1.56	120	**3.3**	0.0010	142
10/3/2017	10:30	17.5	7.7	ND	ND	ND	ND	ND	ND	0.14	**0.026**	0.044	1.51	1.56	130	**3.4**	0.0016	140
10/17/2017	9:40	14.2	7.8	ND	ND	ND	ND	ND	ND	0.14	**0.030**	0.061	1.39	1.67	130	**4.4**	0.00018	189

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** United States Geological Survey (USGS) Continuous-Record Gaging Station

**** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Total Nitrogen: 0.38 mg/L

Turbidity: 2.34 FTU/NTU

Table 3-11. 2017 Monte Rio nutrient grab sample results. This site experiences freshwater conditions.

Monte Rio	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Orthophosphate	Dissolved Organic Carbon	Total Organic Carbon	Total Dissolved Solids	Turbidity	Chlorophyll-a	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.0400	0.0400	4.2	0.020	0.000050	Flow Rate****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
5/16/2017	9:50	16.3	7.7	0.24	ND	ND	0.061	ND	0.24	0.31	**0.034**	0.072	1.50	1.72	160	**4.9**	**0.0080**	777
5/23/2017	10:10	19.9	7.8	0.28	ND	ND	0.050	ND	0.28	0.37	**0.030**	0.063	1.66	1.79	170	**2.7**	**0.0048**	561
5/30/2017	10:35	19.3	7.8	0.24	ND	ND	ND	ND	0.24	0.28	**0.033**	0.065	1.40	1.53	170	**3.4**	**0.0075**	483
6/6/2017	14:00	22.0	7.9	0.21	ND	ND	0.064	ND	0.21	0.27	**0.040**	0.083	1.41	1.67	170	2.0	**0.0072**	400
6/13/2017	10:40	19.5	7.9	0.35	ND	ND	ND	ND	0.35	**0.39**	**0.038**	0.079	0.916	1.09	180	2.3	**0.0026**	364
6/20/2017	11:10	25.3	8.0	0.46	ND	ND	ND	ND	0.46	**0.48**	**0.037**	0.073	1.78	1.81	160	1.8	**0.012**	243
6/27/2017	10:50	22.7	7.9	0.21	ND	ND	ND	ND	0.21	0.21	**0.035**	0.066	1.47	1.58	150	1.4	**0.0049**	207
7/5/2017	10:40	22.7	8.0	0.21	ND	ND	ND	ND	0.21	0.21	**0.044**	0.081	1.72	2.08	160	**2.8**	**0.0038**	197
7/11/2017	10:20	24.6	8.0	0.24	ND	ND	ND	ND	0.24	0.24	**0.042**	0.081	1.10	1.52	160	1.6	**0.0026**	175
7/13/2017	12:40	24.5	8.0	ND	ND	ND	ND	ND	ND	0.14	**0.036**	0.083	1.28	1.78	160	1.6	**0.0018**	179
7/18/2017	11:30	23.9	7.7	ND	ND	ND	ND	ND	ND	0.035	**0.039**	0.073	1.84	1.75	150	1.7	**0.0020**	164
7/25/2017	10:00	23.6	7.8	0.21	ND	ND	ND	ND	0.21	0.21	**0.038**	0.070	1.60	2.04	140	**2.6**	**0.0021**	141
8/1/2017	10:50	23.1	7.8	ND	ND	ND	ND	ND	ND	0.10	**0.035**	0.077	1.51	1.89	150	**3.2**	**0.0020**	139
8/8/2017	9:00	22.6	7.7	ND	ND	ND	ND	ND	ND	0.086	**0.030**	0.074	1.62	1.89	130	**3.4**	**0.0019**	144
8/15/2017	10:10	23.5	7.9	ND	ND	ND	ND	ND	ND	0.16	**0.029**	0.065	1.97	1.98	140	1.7	0.0013	136
8/22/2017	9:30	21.1	7.8	ND	ND	ND	ND	ND	ND	0.090	**0.027**	0.050	1.73	1.94	140	1.3	0.00093	149
8/29/2017	10:00	22.5	7.6	ND	ND	ND	ND	ND	ND	0.18	**0.030**	0.070	1.56	1.69	140	1.6	0.0011	135
9/5/2017	11:20	23.5	7.7	ND	ND	ND	ND	ND	ND	0.14	**0.029**	0.047	1.62	1.73	140	1.7	**0.0021**	177
9/12/2017	10:00	22.9	7.7	ND	ND	ND	ND	ND	ND	0.10	**0.031**	0.064	1.48	1.72	130	2.2	0.00078	148
9/19/2017	9:40	20.2	7.8	ND	ND	ND	ND	ND	ND	0.12	**0.030**	0.066	1.41	1.47	120	1.6	0.00057	151
9/21/2017	8:20	19.6	7.8	ND	ND	ND	ND	ND	ND	0.12	0.019	0.051	1.19	1.44	130	1.9	0.00097	143
9/26/2017	9:50	18.4	7.6	ND	ND	ND	0.086	ND	ND	0.19	**0.026**	0.05	1.45	1.42	130	1.4	0.00032	138
9/28/2017	10:00	18.9	7.6	ND	ND	ND	ND	ND	ND	0.14	**0.024**	0.048	1.41	1.58	130	1.0	0.00033	142
10/3/2017	10:00	18.2	7.8	ND	ND	ND	ND	ND	ND	0.18	0.021	0.048	1.62	1.64	140	0.93	0.0013	140
10/17/2017	9:10	14.0	7.9	ND	ND	ND	ND	ND	ND	0.10	**0.022**	0.069	1.50	1.62	120	1.4	0.00018	189

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** United States Geological Survey (USGS) Continuous-Record Gaging Station

**** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Total Nitrogen: 0.38 mg/L

Turbidity: 2.34 FTU/NTU

Table 3-12. 2017 Patterson Point nutrient grab sample results. This site experiences freshwater conditions.

Patterson Point	Time	Temperature	pH	Total Organic Nitrogen	Ammonia as N	Ammonia as N Unionized	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen	Total Nitrogen**	Phosphorus, Total	Total Orthophosphate	Dissolved Organic Carbon	Total Organic Carbon	Total Dissolved Solids	Turbidity	Chlorophyll-a	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*				0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.0400	0.0400	4.2	0.020	0.000050	Flow Rate****
Date		°C		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	(cfs)
5/16/2017	9:20	16.1	7.6	ND	ND	ND	0.063	ND	ND	0.24	**0.034**	0.076	1.49	1.82	150	**4.4**	**0.0035**	777
5/23/2017	9:40	19.6	7.8	0.28	ND	ND	0.053	ND	0.28	0.37	**0.030**	0.071	1.70	1.69	160	**2.4**	**0.0038**	561
5/30/2017	10:10	19.2	7.8	0.28	ND	ND	0.041	ND	0.28	0.32	**0.032**	0.065	1.44	1.5	160	**2.5**	**0.0038**	483
6/6/2017	13:30	22.1	7.9	0.21	ND	ND	0.075	ND	0.21	0.32	**0.032**	0.075	0.754	0.896	170	1.7	**0.0029**	400
6/13/2017	10:00	19.4	8.0	0.42	ND	ND	0.046	ND	0.42	**0.47**	**0.034**	0.083	1.58	1.78	170	2.2	**0.0023**	364
6/20/2017	10:40	25.1	8.1	0.49	ND	ND	ND	ND	0.49	**0.51**	**0.037**	0.073	1.57	2.15	160	1.7	**0.0061**	243
6/27/2017	10:20	23.2	8.0	0.21	ND	ND	ND	ND	0.21	0.23	**0.035**	0.070	1.42	1.50	150	1.4	**0.0044**	207
7/5/2017	10:10	22.7	8.0	0.24	ND	ND	ND	ND	0.24	0.26	**0.044**	0.069	1.64	2.13	160	2.0	**0.0047**	197
7/11/2017	9:50	24.1	8.0	ND	ND	ND	ND	ND	ND	0.18	**0.038**	0.092	1.24	1.60	160	1.4	0.0014	175
7/13/2017	12:20	23.7	7.9	ND	ND	ND	ND	ND	ND	0.18	**0.039**	0.083	1.24	1.75	160	1.3	**0.0018**	179
7/18/2017	10:50	23.9	7.8	ND	ND	ND	ND	ND	ND	0.10	**0.040**	0.077	1.75	1.74	160	1.6	0.0016	164
7/25/2017	8:30	23.4	7.8	ND	ND	ND	ND	ND	ND	0.035	**0.042**	0.070	1.67	2.01	140	2.1	**0.0030**	141
8/1/2017	10:20	22.9	7.8	ND	ND	ND	ND	ND	ND	0.12	**0.031**	0.073	1.52	1.88	160	2.2	**0.0023**	139
8/8/2017	8:30	22.6	7.7	ND	ND	ND	ND	ND	ND	0.12	**0.029**	0.059	1.42	1.90	140	**2.9**	0.0015	144
8/15/2017	9:30	23.4	7.9	ND	ND	ND	ND	ND	ND	0.19	**0.027**	0.061	1.84	1.96	110	1.7	**0.0018**	136
8/22/2017	9:10	21.2	7.8	ND	ND	ND	ND	ND	ND	0.053	**0.027**	0.054	1.86	2.00	140	1.1	0.0017	149
8/29/2017	9:30	22.2	7.6	ND	ND	ND	ND	ND	ND	0.16	**0.031**	0.070	1.44	1.67	140	2.1	0.0013	135
9/5/2017	10:30	23.2	7.7	ND	ND	ND	ND	ND	ND	0.10	**0.028**	0.059	1.51	1.64	140	1.4	0.0014	177
9/12/2017	9:30	22.9	7.8	ND	ND	ND	ND	ND	ND	0.28	**0.032**	0.068	1.57	1.75	120	2.2	0.0012	148
9/19/2017	9:20	20.1	7.9	ND	ND	ND	ND	ND	ND	0.20	**0.033**	0.078	1.35	1.51	140	**2.5**	0.00095	151
9/21/2017	8:00	19.8	7.9	0.21	ND	ND	ND	ND	0.21	0.24	**0.031**	0.071	1.26	1.48	140	**5.2**	0.0013	143
9/26/2017	9:20	18.5	7.5	ND	ND	ND	0.10	ND	ND	0.21	**0.023**	0.046	1.49	1.41	130	1.6	0.0007	138
9/28/2017	9:40	18.7	7.7	ND	ND	ND	0.040	ND	ND	0.15	**0.025**	0.044	1.33	1.64	120	2.1	0.00099	142
10/3/2017	9:40	18.4	7.6	ND	ND	ND	0.046	ND	ND	0.22	**0.022**	0.048	1.38	1.68	140	1.4	0.00082	140
10/17/2017	8:50	14.1	7.8	ND	ND	ND	0.046	ND	ND	0.22	**0.024**	0.040	1.36	1.67	130	1.4	ND	189

* Method Detection Limit - limits can vary for individual samples depending on matrix interference and dilution factors, all results are preliminary and subject to final revision.

** Total nitrogen is calculated through the summation of the different components of total nitrogen: organic and ammoniacal nitrogen (together referred to as Total Kjeldahl Nitrogen or TKN) and nitrate/nitrite nitrogen.

*** United States Geological Survey (USGS) Continuous-Record Gaging Station

**** Flow rates are preliminary and subject to final revision by USGS.

Recommended EPA Criteria based on Aggregate Ecoregion III

Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L

Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L

Total Nitrogen: 0.38 mg/L

Turbidity: 2.34 FTU/NTU

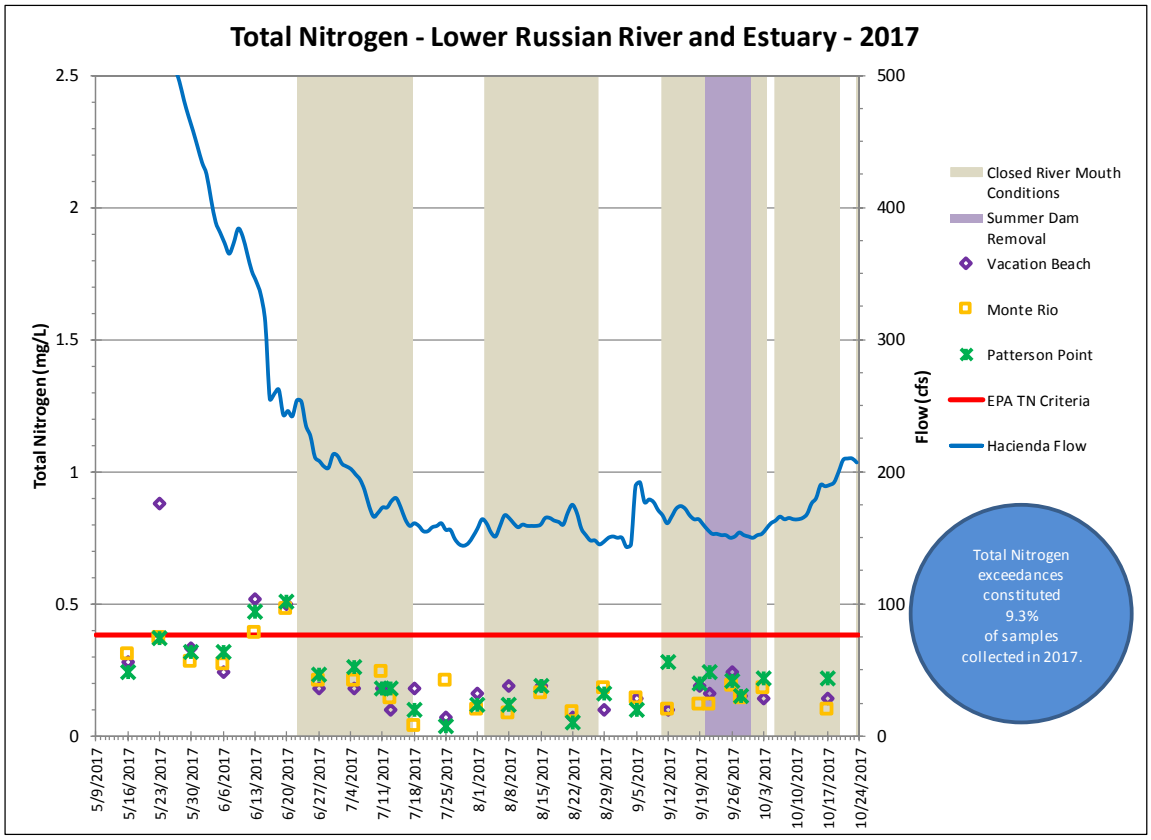


Figure 3-15. Total Nitrogen results for the Russian River from Vacation Beach to Patterson Point in 2017.

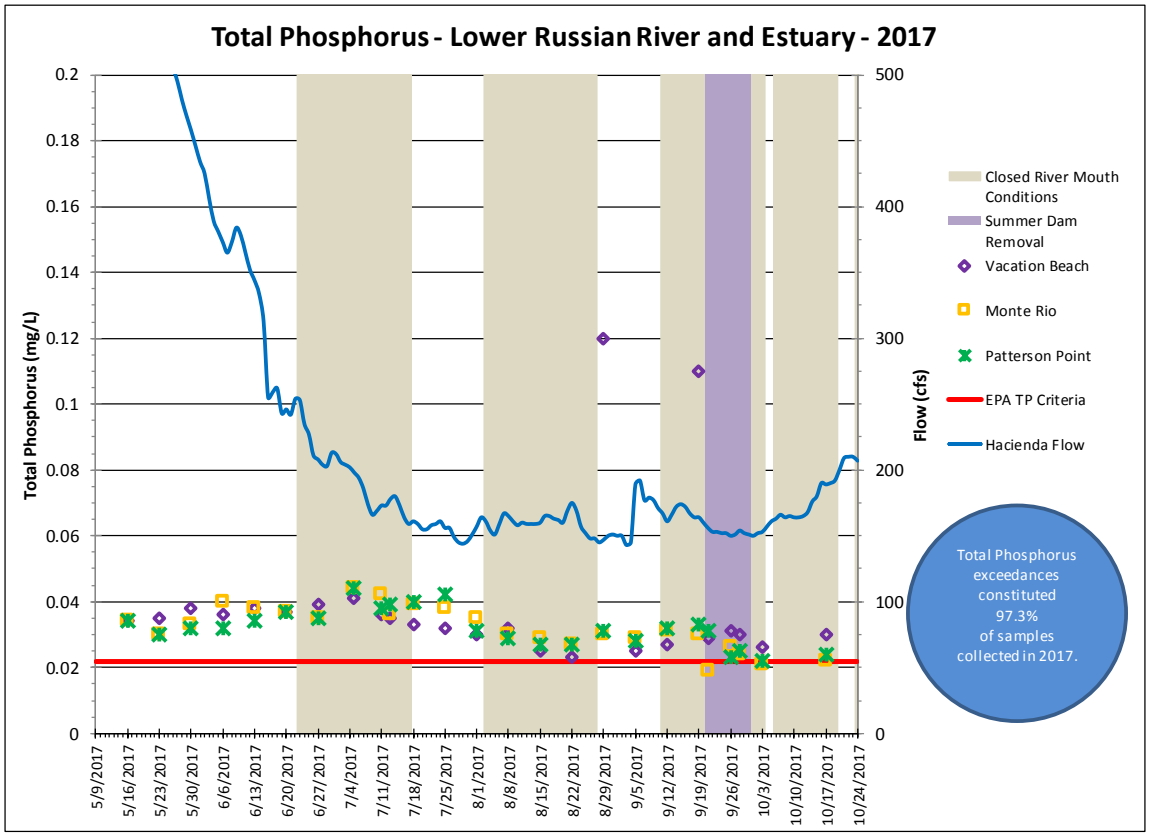


Figure 3-16. Total Phosphorus results for the Russian River from Vacation Beach to Patterson Point in 2017.

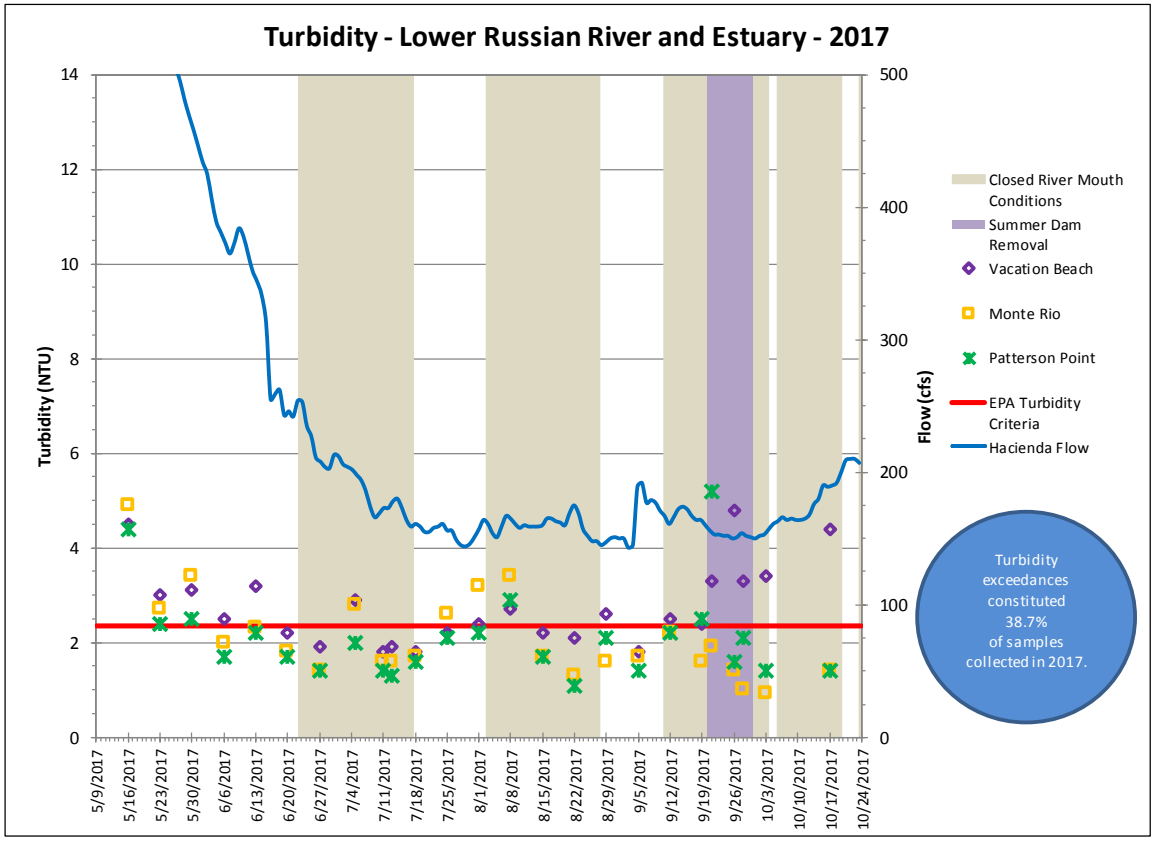


Figure 3-17. Turbidity results for the Russian River from Vacation Beach to Patterson Point in 2017.

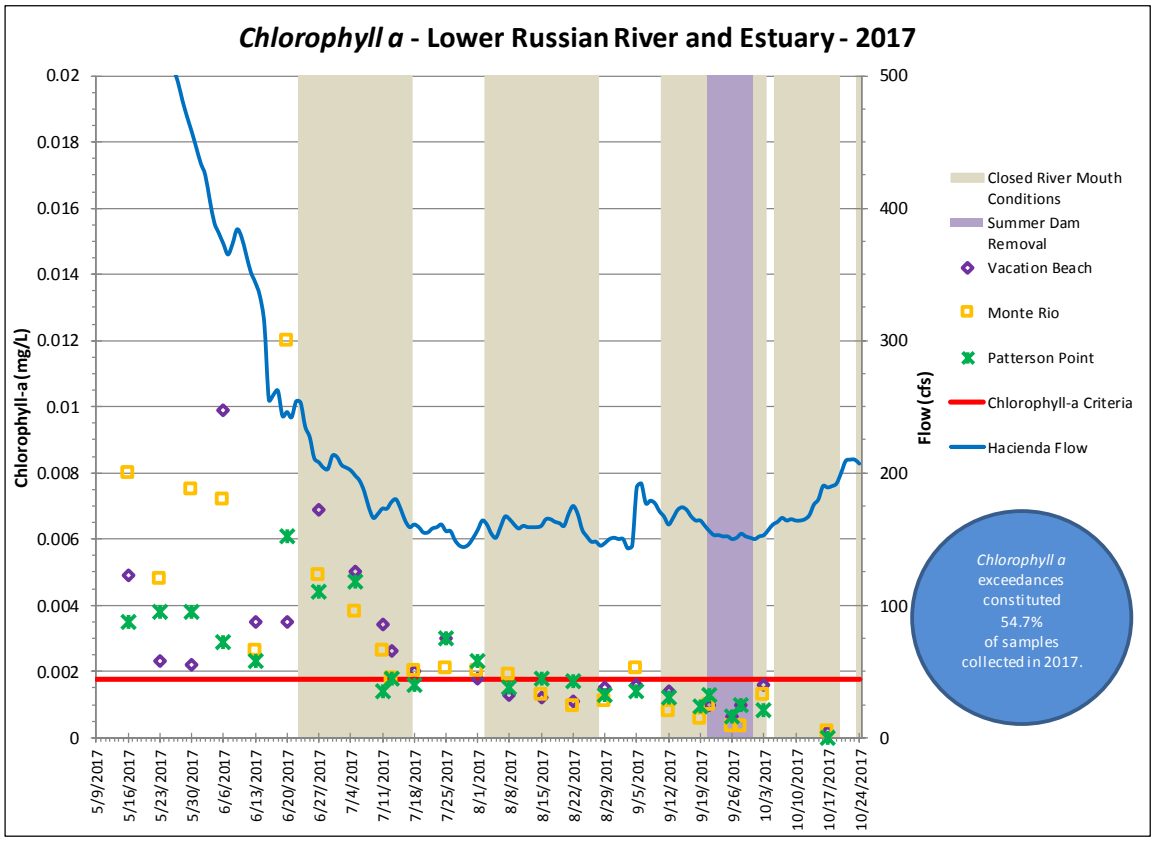


Figure 3-18. *Chlorophyll a* results for the Russian River from Vacation Beach to Patterson Point in 2017.

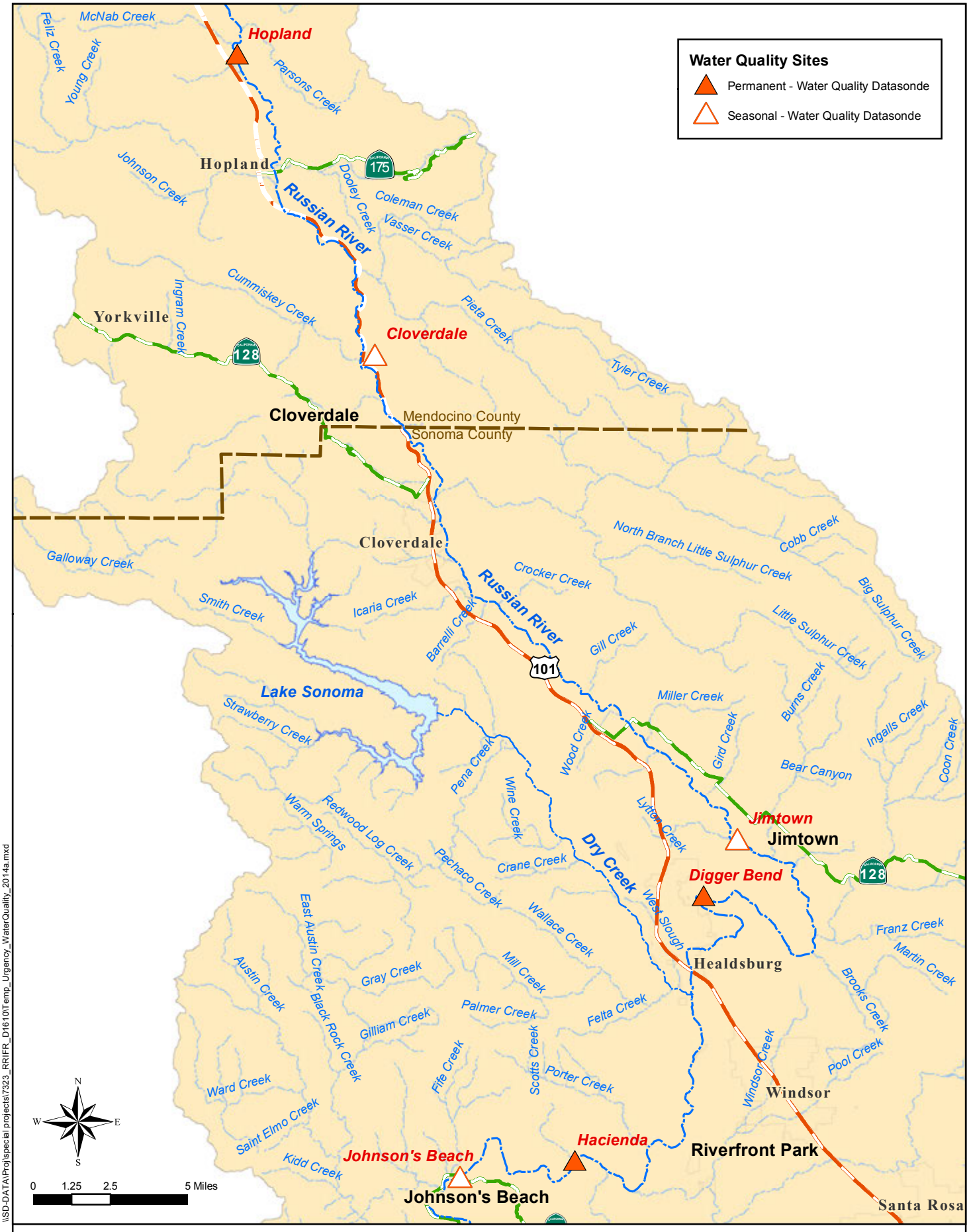
4.0 Additional Monitoring

4.1 Water Agency and USGS Permanent and Seasonal Datasondes

In coordination with the USGS the Water Agency maintains three, multi-parameter water quality sondes on the Russian River located at Russian River near Hopland, Russian River at Digger Bend near Healdsburg, and Russian River near Guerneville (aka Hacienda). These three sondes are referred to as "permanent" because the Water Agency maintains them as part of its early warning detection system for use year-round (Figure 4.1). The sondes take real time readings of water temperature, pH, dissolved oxygen content (DO), specific conductivity, turbidity, and depth, every 15 minutes. In addition, the Water Agency maintains a permanent sonde on the East Fork of the Russian River approximately one-third of a mile (1/3 mi.) downstream of Lake Mendocino. However, this station is not a real-time station or part of the early warning detection system.

In addition to the permanent sondes, the Water Agency, in cooperation with the USGS, installed three seasonal sondes with real-time telemetry at the USGS river gage station at Russian River near Cloverdale (north of Cloverdale at Comminsky Station Road), at the gage station at Russian River at Jimtown (Alexander Valley Road Bridge), and at Johnson's Beach in Guerneville (Figure 4.1). The two seasonal sondes at Cloverdale and Jimtown are included by the USGS on its "Real-time Data for California" website: https://waterdata.usgs.gov/ca/nwis/rt.

The data collected by the sondes described above are evaluated in Section 4.2 in response to the terms of the SWRCB TUC Order to evaluate whether and to what extent the reduced flows authorized by the Order caused any impacts to water quality or availability of aquatic habitat for salmonids. In addition, the 2017 data will help provide information to evaluate potential changes to water quality and availability of habitat for aquatic resources resulting from the proposed permanent changes to D1610 minimum instream flows that are mandated by the Biological Opinion and will be included in the Biological Opinion Annual Monitoring Report. The annual report will be available on the Water Agency's website: http://www.scwa.ca.gov/bo-annual-report/.



\\SD-DATA\Proj\special projects\7323_RRIFR_D1610\Temp_Urgency_WaterQuality_2014a.mxd

Water Agency and USGS Russian River Mainstem
Permanent and Seasonal Datasonde Monitoring Stations

This Map is for general reference only.

Figure 4-1

4.2 Aquatic Habitat for Salmonids

4.2.1 Introduction

In Term 6(b) of the Temporary Urgency Change Order (Order), the State Water Resource Control Board (SWRCB) tasked the Water Agency with evaluating the effects of reductions in minimum instream flows authorized by the Order on water quality and the availability of aquatic habitat for Russian River salmonids. This section of the report summarizes temperature and dissolved oxygen conditions in the Russian River during the Order and relates these conditions to fisheries monitoring data collected by the Water Agency.

4.2.2 Russian River Salmonid Life Stages

Salmonids in the Russian River can be affected by flow, temperature, and dissolved oxygen (DO) changes at multiple life stages. The Russian River supports three species of salmonids, coho salmon, steelhead, and Chinook salmon. These species follow similar life history patterns. Adults migrate from the ocean to the river and move upstream to spawn in the fall and winter. Females dig nests called redds in the stream substrate and deposit eggs which remain in the redd for several weeks before hatching. After hatching, the larval fish remain in the gravel for another several more weeks before emerging. After emerging from the gravel these young salmonids are identified first as fry and then later as parr once they have undergone some freshwater growth. Parr rear for a few months (Chinook) to 2 years (steelhead) in freshwater before undergoing a physiological change identified as smoltification. At this stage, fish are identified as smolts, are physiologically able to adapt to living in saltwater, and are ready for ocean entry (Quinn 2005). In the Russian River smolts move downstream to the ocean in the spring (Chase et al. 2005 and 2007, Obedzinski et al. 2006). Salmonids spend several months to a few years at sea before returning to the river to spawn as adults (Moyle 2002). Because all three species of Russian River salmonids spend a period of time in the Russian River, they must cope with the freshwater conditions they encounter including flow, temperature, and DO. While all three species follow a similar life history, each species tends to spawn and rear in different locations and are present in the Russian River watershed at slightly different times. These subtle but important differences may expose each species to a different set of freshwater conditions.

Coho Timing and Distribution

Wild coho have become scarce in the Russian River and monitoring data relies mainly on fish released from the hatchery as part of the Russian River Coho Salmon Captive Broodstock Program (RRCSCBP). Data collected on the Water Agency's Mirabel inflatable dam video camera system in 2011 through 2013 indicate that the adult coho salmon run may start in late October and continue through at least January. The bulk of the adult coho migrate through the river from November through February. In 2013 97% of coho were observed after November 20 (Martini-Lamb and Manning 2014). Spawning and rearing occurs in the tributaries to the Russian River (NMFS 2008). Downstream migrant trapping in tributaries of the Russian River indicate that the coho smolt out-migration starts before April and continues through mid-June (Obedzinski et al. 2006). Coho salmon have been detected as late as mid-July in the mainstem Russian River downstream migrant traps operated by the Water Agency (Martini-Lamb and Manning 2011). Most coho smolts emigrate from the Russian River from March through May. For coho, the temperature and DO data relating to juvenile rearing and smolt life stages will be analyzed for this

report as these are the life stages likely to be present in the Russian River during the time period governed by the Order (May 19, 2017 through October 15, 2017).

Steelhead Timing and Distribution

Based on video monitoring at the Water Agency's Mirabel inflatable dam and returns to the Warm Springs Hatchery, adult steelhead return to the Russian River later than Chinook. Deflation of the inflatable dam and removal of the underwater video camera system preclude a precise measure of adult return timing or numbers. However, continuous video monitoring at the inflatable dam during late fall through spring in 2006-2007, timing of returns to the hatchery, and data gathered from steelhead angler report cards (SCWA unpublished data, Jackson 2007) suggests that steelhead return to the Russian River from December through March with the majority returning in January and February.

Many steelhead spawn and rear in the tributaries of the Russian River while some steelhead rear in the upper mainstem Russian River (NMFS 2008, Cook 2003). Cook (2003) found that summer rearing steelhead in the mainstem of the Russian River were distributed in the highest concentrations between Hopland and Cloverdale (Canyon Reach). Steelhead were also found in relatively high numbers (when compared to habitats downstream of Cloverdale) in the section of river between the Coyote Valley Dam and Hopland. The Canyon Reach is the highest gradient section of the mainstem Russian River and contains fast water habitats that include riffles and cascades (Cook 2003). Both the Canyon and Ukiah reaches generally have cooler water temperatures when compared to other mainstem reaches due to releases made from Lake Mendocino.

The steelhead smolt migration in the Russian River begins at least as early as March and continues through June, peaking between March and May (Martini-Lamb and Manning 2011). For Russian River steelhead, parr (rearing) and smolt life stages are present in the mainstem during the time period covered by the Order. Therefore only the temperature and DO data relating to the juvenile rearing and smolt life stages will be analyzed for this report.

Chinook Timing and Distribution

Based on video monitoring at the Water Agency's Mirabel inflatable dam, adult Chinook are typically observed in the Russian River before coho and steelhead. Chinook enter the Russian River as early as September and the migration is complete by early February. Generally the bulk of Chinook pass the Mirabel dam from October through December. Chinook are mainstem spawners and deposit their eggs into the stream bed of the mainstem Russian River and in Dry Creek during the fall (Chase et al. 2005 and 2007, Cook 2003, Martini-Lamb and Manning 2011). Chinook offspring rear for approximately two to four months before out-migrating to sea in the spring. The bulk of Chinook smolt out-migration occurs from April through mid-July. The adult and smolt life stages are present in the mainstem of the Russian River during the time period covered by the Order. Therefore, temperature and DO data relating to the adult and smolt life stage will be analyzed for this report.

4.2.3 Methods

The Water Agency uses underwater video, dual frequency identification sonar (DIDSON), downstream migrant traps, and water quality data collected in the Russian River and Dry Creek to summarize Russian River water quality conditions when salmonids were present. The Water Agency operates underwater video cameras and DIDSON to enumerate adult salmonids, and downstream migrant traps to enumerate

salmonid smolts. USGS stream gages and a Water Agency operated data sonde were used to provide water quality data in the mainstem Russian River.

To estimate the number of adult Chinook that return to the Russian River the Water Agency typically operates underwater video cameras in two fish ladders located on the east and west sides of the Mirabel Inflatable Dam. However, a large construction project to improve fish passage at Mirabel Dam in 2014 through 2016 created new challenges in operating video camera at this site. In 2017 we experimented with a camera in the newly constructed fish ladder as well as in the existing fish ladder on the east side. In addition to the Mirabel camera system, the Water Agency collected adult counts from a DIDSON at Dry Creek (a tributary to the Russian River near Healdsburg). The DIDSON collects sonar images of fish as they pass the sample site. This allows us to count fish across a larger area of the stream channel than can be captured by video images and collect images of fish during periods of high turbidity when an underwater camera would be ineffective. The resolution of DIDSON precludes the accurate identification of species. In years past, the Water Agency experimented with operating an underwater video camera alongside the DIDSON in order to collect species information and prorate DIDSON images. Unfortunately the underwater video camera did not capture enough images to prove useful. Data from these monitoring sites were used to determine when adult salmonids were present in the Russian River during 2017.

Physical habitat conditions (flow, water temperature, and DO) were collected at multiple sites in the Russian River. USGS stream gages located on the Russian River at Hacienda, Digger Bend, Jimtown, and at Hopland provided flow, water temperature, and DO data. A data sonde in the east fork of the Russian River downstream of Lake Mendocino provided water temperature, and DO data. These water quality conditions were compared to findings in the literature and were used to construct temperature and DO criteria for Russian River salmonids (Table 4-1 through Table 4-4).

Table 4-1. Adult salmonid water temperature (°C) thresholds used for migration when describing water quality conditions during the term of the May 2017 temporary urgency change order. Criteria is from SCWA (2016).

Description	Chinook	Coho	Steelhead
optimal upper limit	15.6	11.1	11.1
suitable upper limit	17.8	15.0	15.0
stressful upper limit	19.4	21.1	21.1
acutely stressful upper limit	23.8	23.8	23.8
lethal	23.9	23.9	23.9

Table 4-2. Juvenile salmonid rearing temperature (°C) thresholds used for describing water quality conditions during the term of the May 2017 temporary urgency change order. Citations used to develop these criteria are found in SCWA (2016).

Description	Chinook	Coho	Steelhead
optimal upper limit	16.9	13.9	16.9
suitable upper limit	17.8	16.9	18.9
stressful upper limit	20.0	17.8	21.9
acutely stressful upper limit	23.8	23.8	23.8
lethal	23.9	23.9	23.9

Table 4-3. Salmonid smolting temperature (°C) thresholds used for describing water quality conditions during the term of the May 2017 temporary urgency change order. Citations used to develop these criteria are found in SCWA (2016).

Description	Chinook	Coho	Steelhead
optimal upper limit	16.9	10.0	11.1
suitable upper limit	17.8	13.9	12.8
stressful upper limit	20.0	16.9	15.0
acutely stressful upper limit	23.8	23.8	23.8
lethal	23.9	23.9	23.9

Table 4-4. Dissolved oxygen (mg/L) thresholds for all salmonid life stages used for describing water quality conditions during the term of the May 2017 temporary urgency change order. Citations used to develop these criteria are found in SCWA (2016).

Description	Dissolved Oxygen (mg/L)
optimal upper limit	>12
suitable upper limit	8.0-11.9
stressful upper limit	5.0-7.9
acutely stressful upper limit	3.0-4.9
lethal	<3

Adult salmonid counts are used to relate water quality conditions to the timing and magnitude of the adult salmonid run. We compared adult counts from counting stations with water quality information only where fish would either pass through a water quality station before being detected at a particular counting station. For instance since Hacienda is downstream of Dry Creek, all adult salmonids observed at these sites must first pass through the Hacienda water quality station. Therefore displaying Dry Creek adult salmonid counts with Hacienda water quality conditions allows us to relate the timing and magnitude of the adult salmonid run to water quality conditions they likely experienced at Hacienda. Because the majority of steelhead rearing habitat in the mainstem Russian River occurs upstream of Hopland this report presents the water quality data from the USGS Hopland gaging station when discussing juvenile steelhead. Smolts moving downstream out of Dry Creek first pass our Dry Creek downstream migrant trap then pass the Hacienda USGS stream gage before entering the ocean. Therefore we have paired Dry Creek salmonid smolt data with Dry Creek and Hacienda water quality data to describe the conditions these fish likely experienced as they moved downstream out of Dry creek and the lower Russian River.

4.2.4 Results

Flow

From May 19, 2017, to October 15, 2017, flow in the Russian River at Hacienda ranged from a high of 640 cfs on May 19 to a low of 143 cfs in early September. Flow during the Order was typically between 160 cfs and 230 cfs (25th and 75th percentiles of the daily average flow). During the period of the Order, the Russian River was influenced by tributary in-flow until July, and was generally controlled by reservoir releases from July through October.

Temperature

Adult Salmonid Migration

The Dry Creek DIDSON was installed on September 1, the camera in the west fish ladder at Mirabel was installed on September 13, and the camera in the east ladder was installed on September 29. During the period of the Order, 422 adult salmonids were observed when combining the Mirabel and Dry Creek counts. However, this includes double counting since fish passing Dry Creek would have first passed and been counted at Mirabel. At Mirabel 146 Chinook, 3 steelhead adults, and 2 unidentified adult salmonids were observed during the Order. At the Dry Creek DIDSON 271 adult salmonids were observed during the Order. The river mouth was closed for much of September (Figure 4-2) which likely limited the number of salmonids that entered the Russian River in September, 2017.

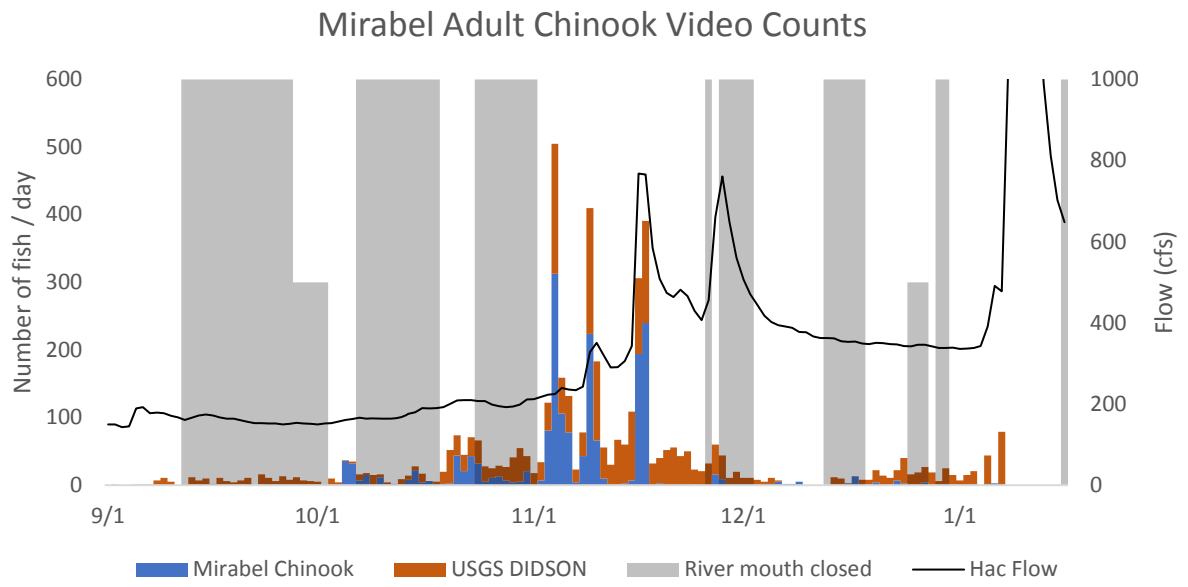


Figure 4-2. Flow in the Russian River at the USGS Hacienda stream gage (11467000). Times when the mouth of the Russian River was closed due to the formation of a sand bar are shown as shaded areas. Also shown are the adult salmonid counts from video collected at Mirabel and DIDSON collected on Dry Creek.

Table 4-5. The number of days of the adult salmonid run that occurred in each time period, the percentage of those days the river mouth was closed and blocked adult salmonids from entering the Russian River, the number of adult salmonids that could not be identified to species, and the number of Chinook observed on the underwater video cameras. The time periods are separated into the period of the Order that overlaps with the adult salmonid run (September 1, 2017 through October 15, 2017) and the period of time from when the order expired (October 15, 2017) to December 31, 2017. Additional adult salmonids were observed after December 31, 2017, and are not included in this table.

Time period	# of days	% of time river mouth closed	Observed Chinook	Unidentified salmonids
During order	44	68 %	146	271
After order expired	77	38 %	1,914	2,741

Water temperatures for Chinook salmon were favorable during the portion of the Order that overlaps with the Chinook adult migration (October). At the Hacienda gage the temperature ranged from optimal to acutely stressful for adult salmonids based on our criteria (Table 4-1 and Figure 4-3). Moving upstream from Hacienda, Chinook would experience water temperatures similar to Hacienda at Digger Bend and Jimtown, but significantly cooler at Hopland and in the East Fork Russian River near Coyote Valley Dam (Figures 4-4 through 4-7).

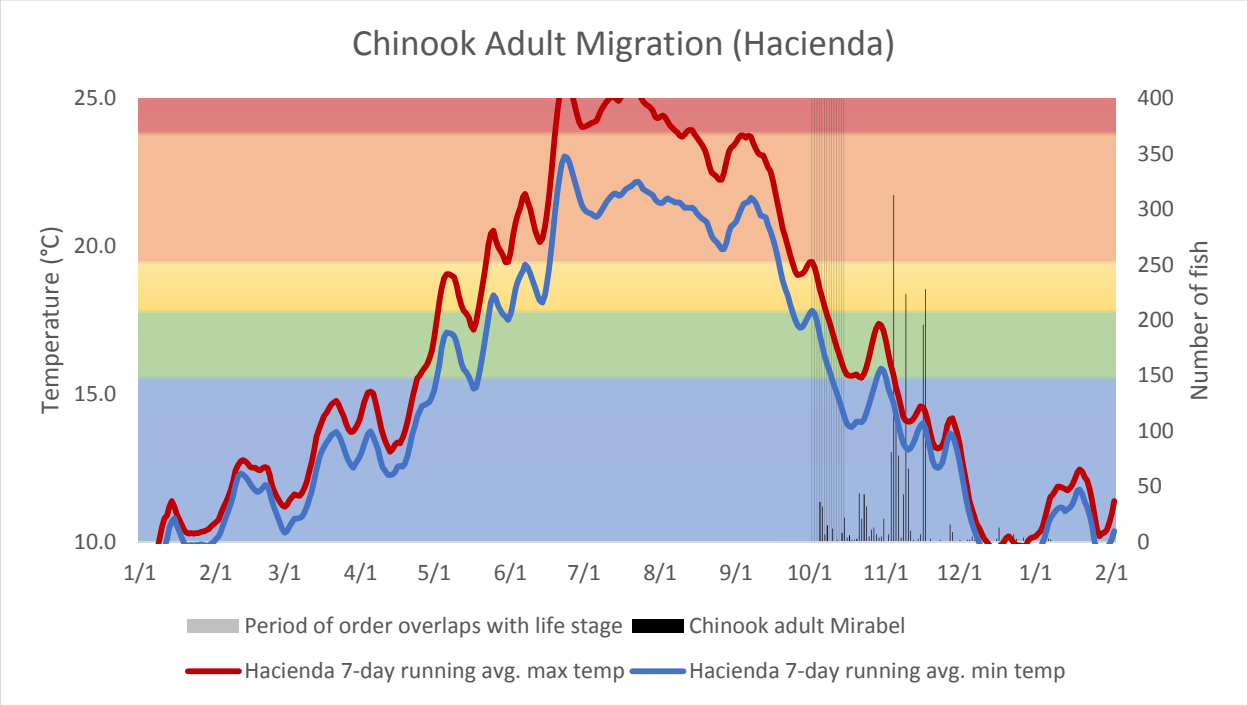


Figure 4-3. The 7-day running average of the minimum and maximum water temperatures collected at Hacienda (USGS gage number 11467000) shown with the Chinook counts from the mainstem Russian River at Mirabel. Also show are optimal, suitable, stressful, acutely stressful, and lethal water temperature thresholds for adult Chinook salmon based on Table 4-1.

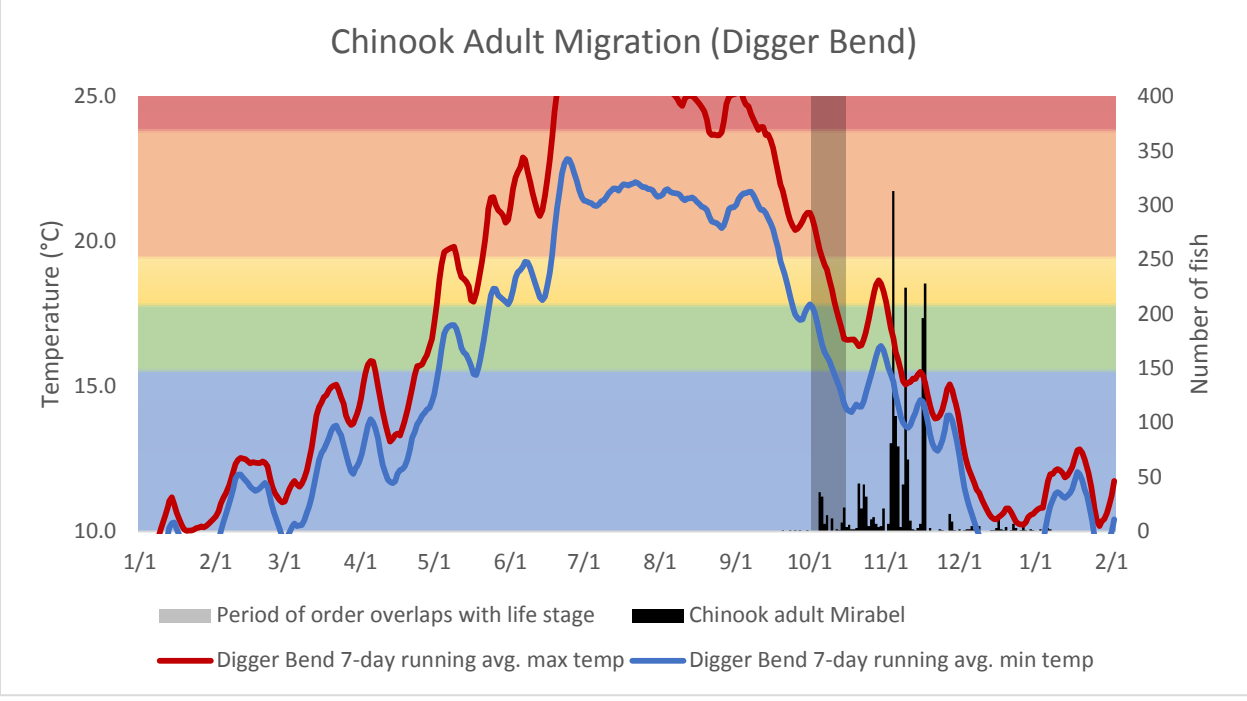


Figure 4-4. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Digger Bend (11463980) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook adult migration based on Table 4-1.

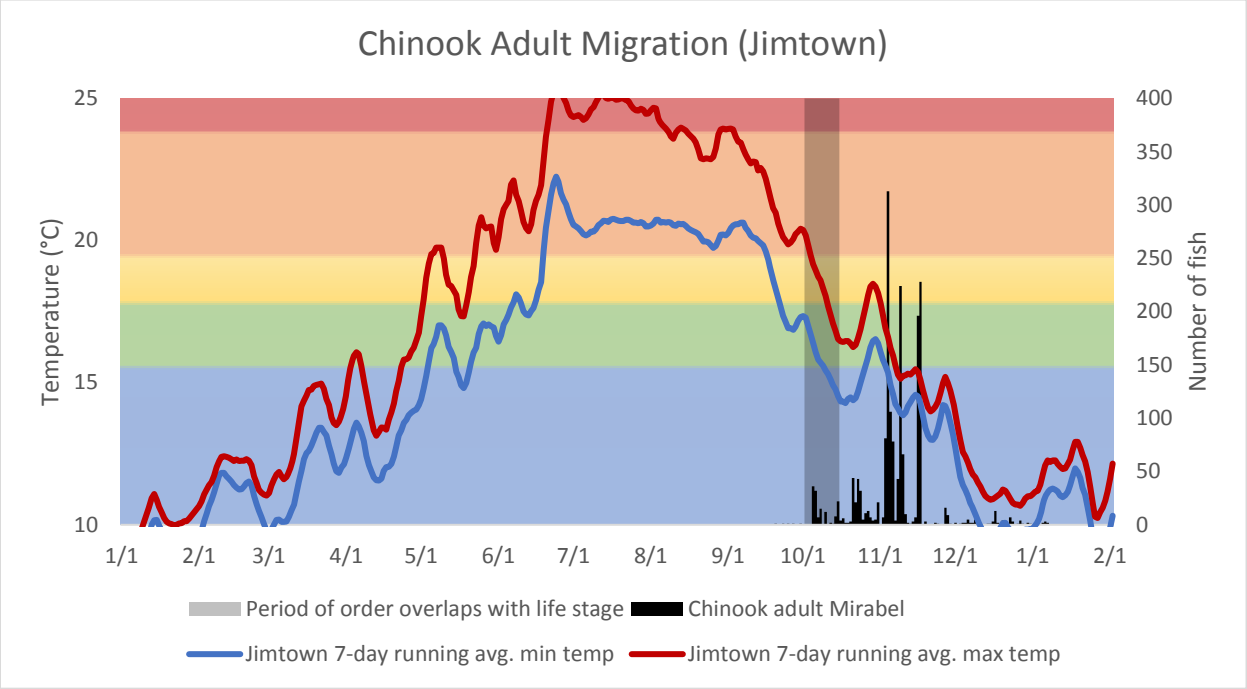


Figure 4-5. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Jimtown (USGS gage number 11463682) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook adult migration based on Table 4-1.

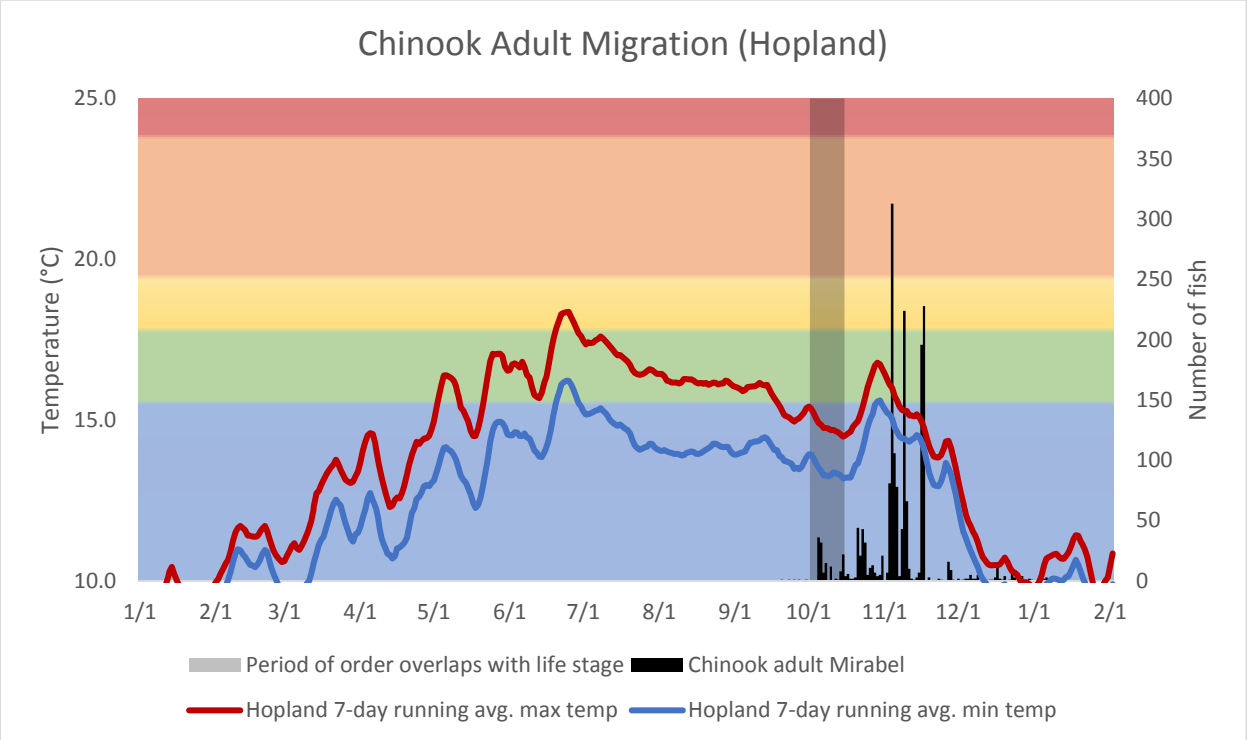


Figure 4-6. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Hopland (11462500) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook adult migration based on Table 4-1.

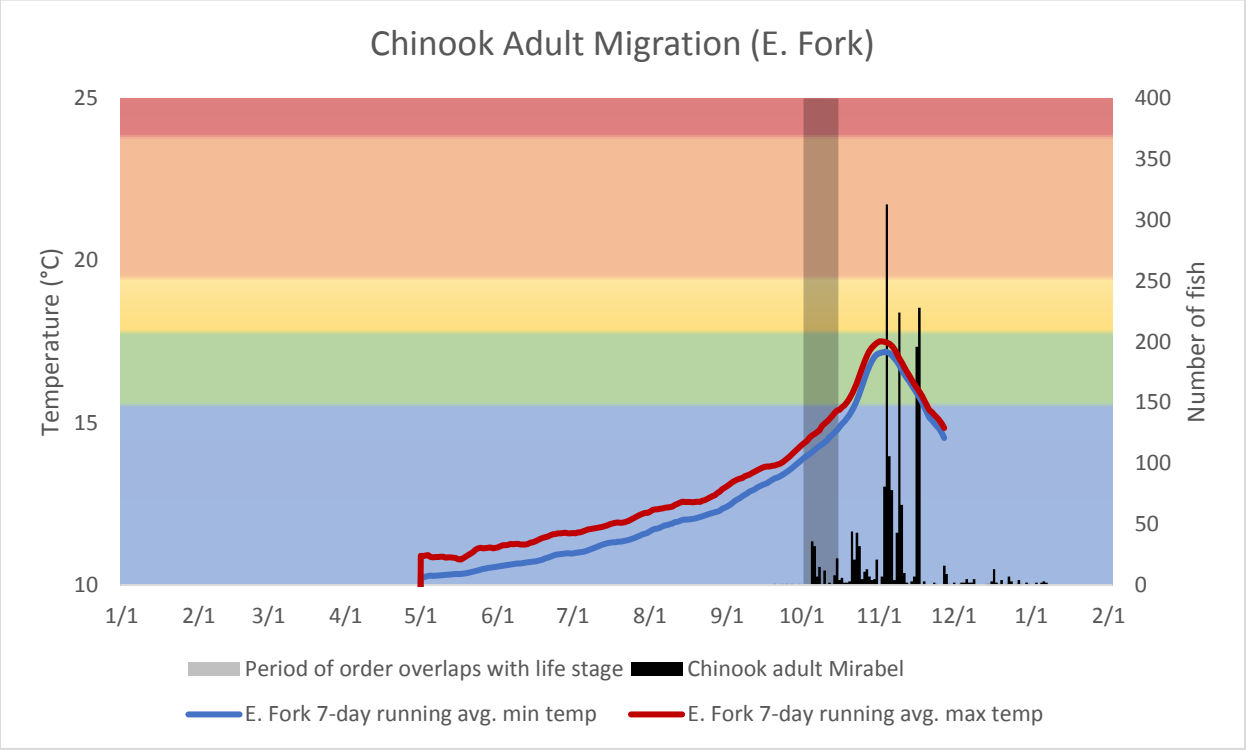


Figure 4-7. The 7-day running average of the minimum and maximum water temperatures collected in the East Fork Russian River approximately 1/3 of a mile downstream of the Coyote Valley Dam shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook adult migration based on Table 4-1.

Salmonid Rearing

Salmonids must cope with water temperatures found at their rearing sites. In the Russian River basin much of the salmonid rearing sites are located in tributaries to the Russian River including Dry Creek. Water temperatures from Dry Creek are shown with the temperature criteria for Chinook, coho, and steelhead as this is an important rearing area for these species. Chinook and steelhead rear in the mainstem Russian River as well. Chinook emerge from redds constructed in the upper Russian River in the early spring and begin rearing in the shallow portions of the stream margins. In the mainstem Russian River Chinook finish rearing in the spring when water temperatures are still relatively cool throughout the River. As a result Chinook rear at more locations in the Russian River, but for a shorter season than steelhead. We relate water temperature at a number of mainstem Russian River sites to Chinook water temperature criteria. Steelhead rear for over one year and are restricted to the portion of Russian River where water released from the cold water pool (the bottom portion of the lake) in Lake Mendocino. We relate steelhead water temperature criteria to water temperature collected in the East Fork Russian River and at Hopland as these sites are within the section of the Russian River that can provide year round rearing opportunities for juvenile steelhead.

Chinook

During 2017 water temperatures for rearing Chinook were favorable in the early spring at all sites and became less favorable in May and June in the mainstem Russian River at Jimtown, Digger Bend, and Hacienda. Water temperatures were generally in the optimal or suitable range for Chinook salmon rearing in the East Fork Russian River and at the USGS stream gage at Hopland (gauge number 11462500, Figure 4-8 and Figure 4-9). At Jimtown, Digger Bend, and Hacienda water temperatures were

generally favorable for Chinook rearing until May, then temperatures became stressful and eventually acutely stressful or even potentially lethal by June (Figures 4-10 through 4-12). It is important to note that Chinook have evolved to migrate downstream and out to sea in the spring to avoid rearing at high temperatures.

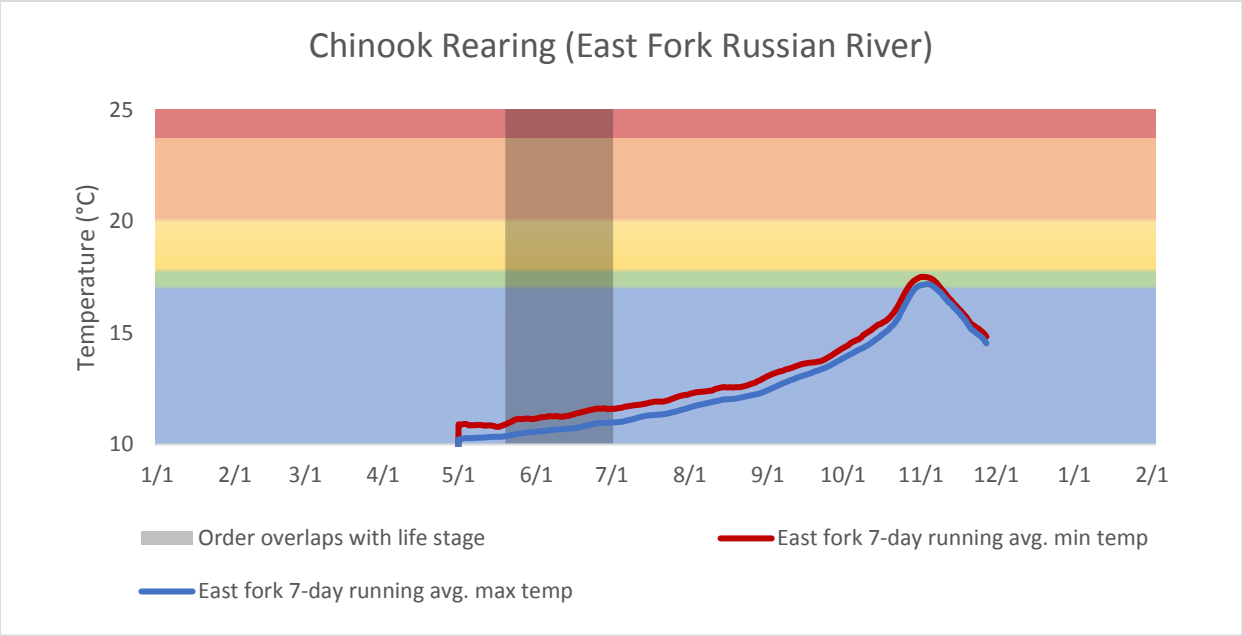


Figure 4-8. The 7-day running average of the minimum and maximum water temperatures collected in the East Fork Russian River approximately 1/3 of a mile downstream of the Coyote Valley Dam shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook rearing based on Table 4-2.

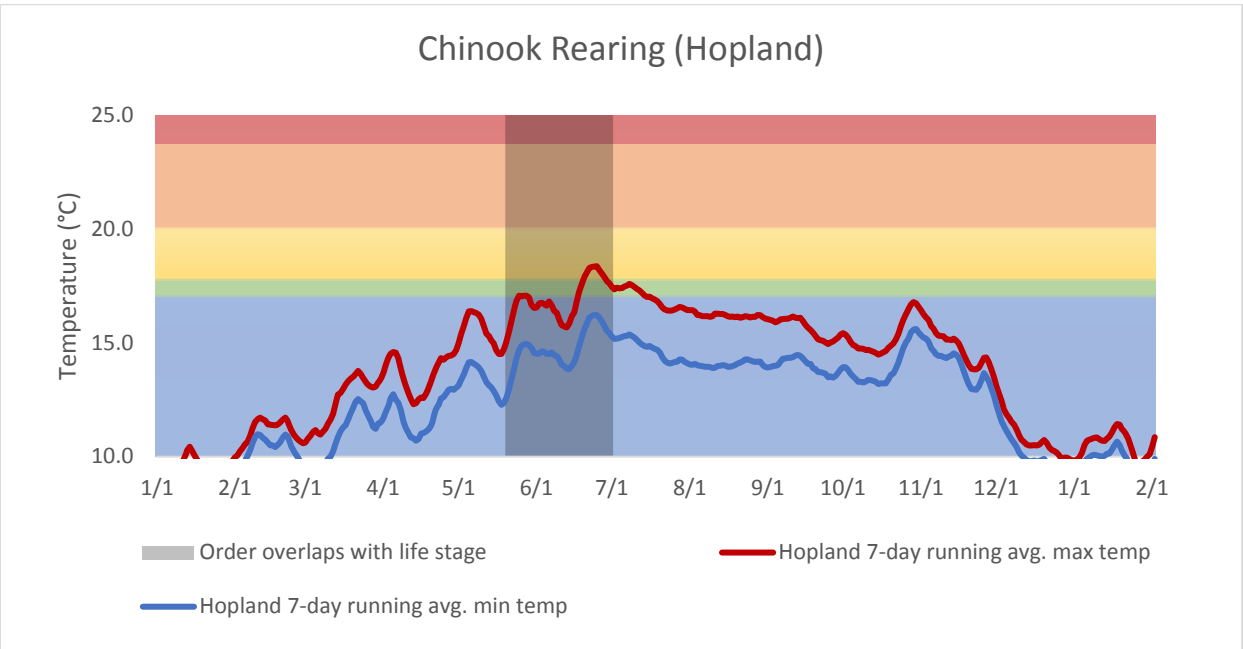


Figure 4-9. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Hopland (11462500) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook rearing based on Table 4-2.

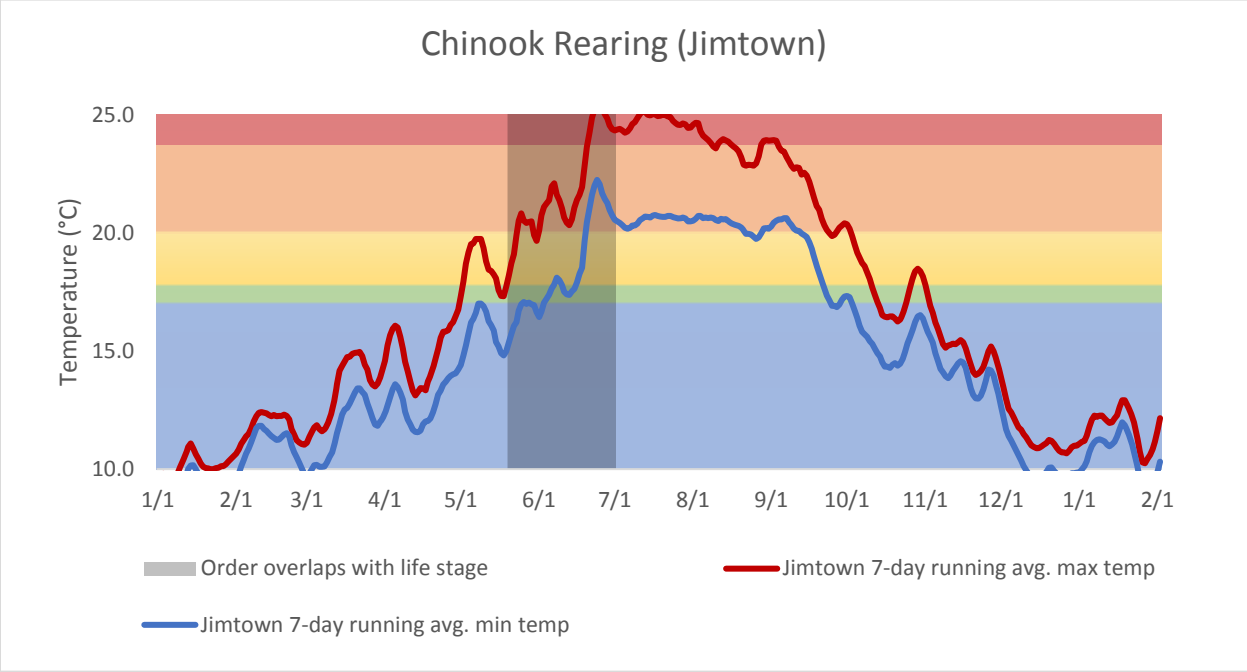


Figure 4-10. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Jimtown (USGS gage number 11463682) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook rearing based on Table 4-2.

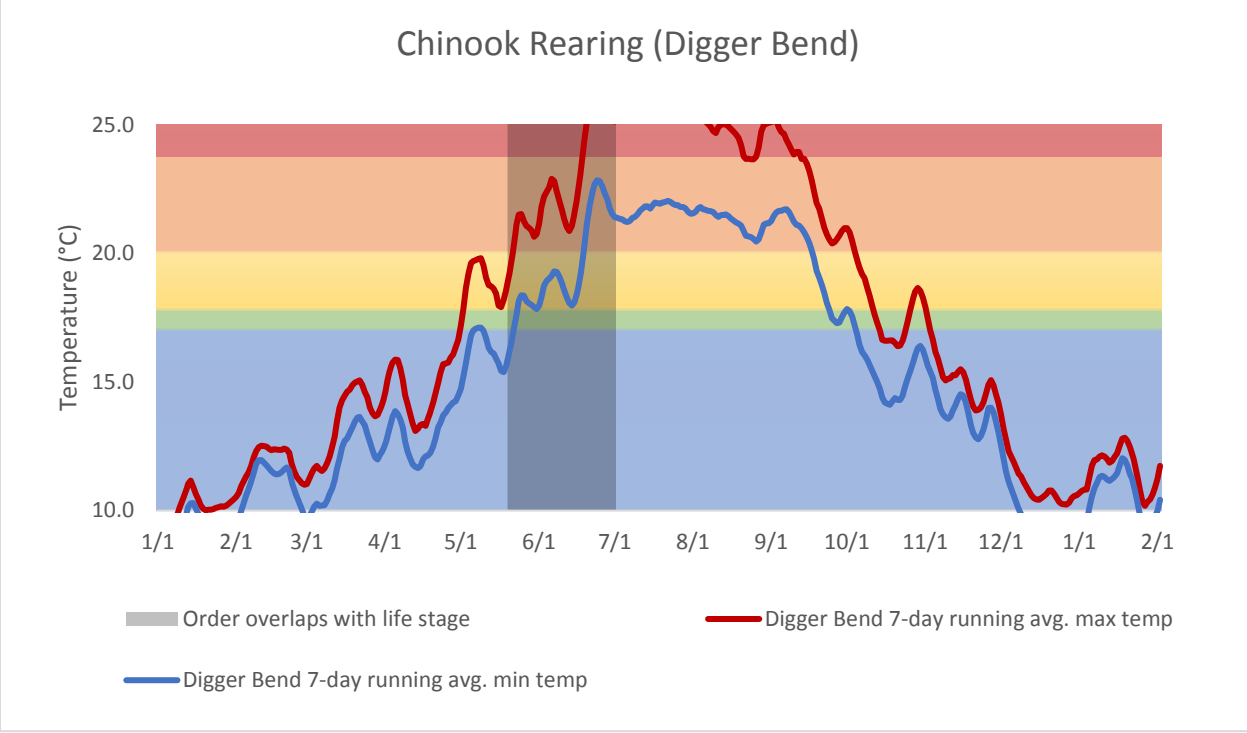


Figure 4-11. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Digger Bend (11463980) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook rearing based on Table 4-2.

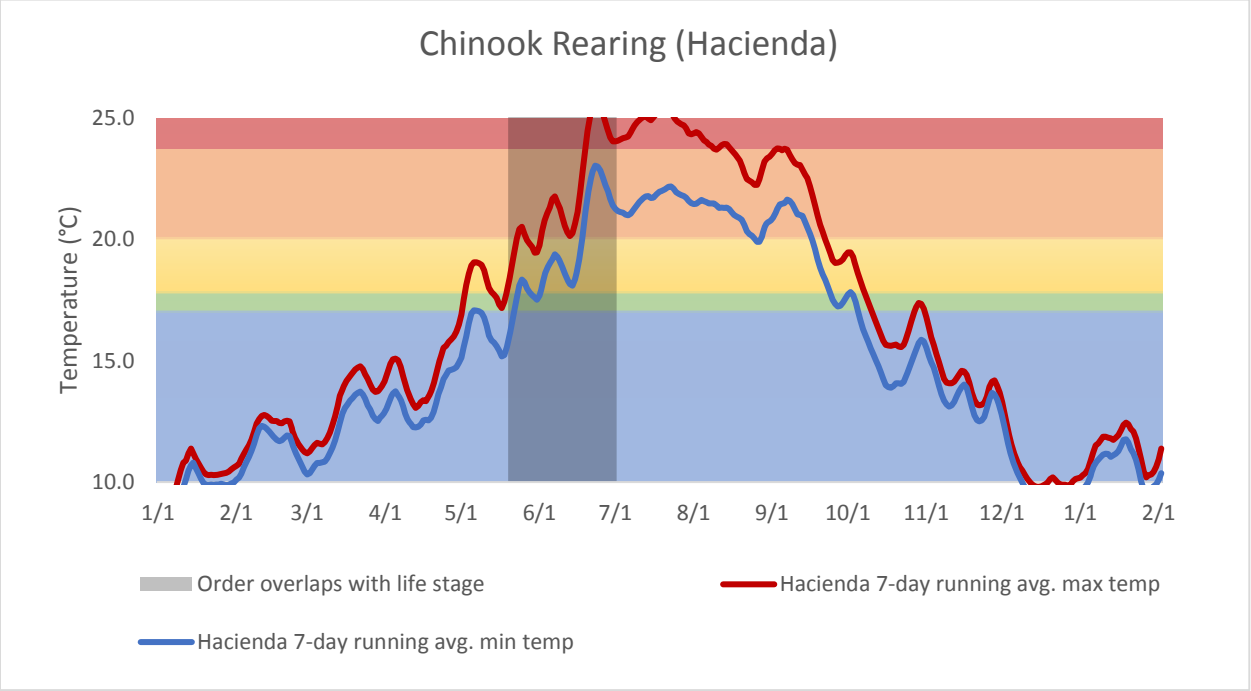


Figure 4-12. The 7-day running average of the minimum and maximum water temperatures collected at the USGS stream gage at Hacienda (gage number 11467000) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook rearing based on Table 4-2.

Steelhead

Steelhead parr rear year round in the upper Russian River. Water temperature was optimal for most of the order in the East Fork Russian River (Figure 4-13). During the Order water temperature at the USGS stream gage at Hopland mainly fell in the optimal to suitable range for steelhead parr (Figure 4-14).

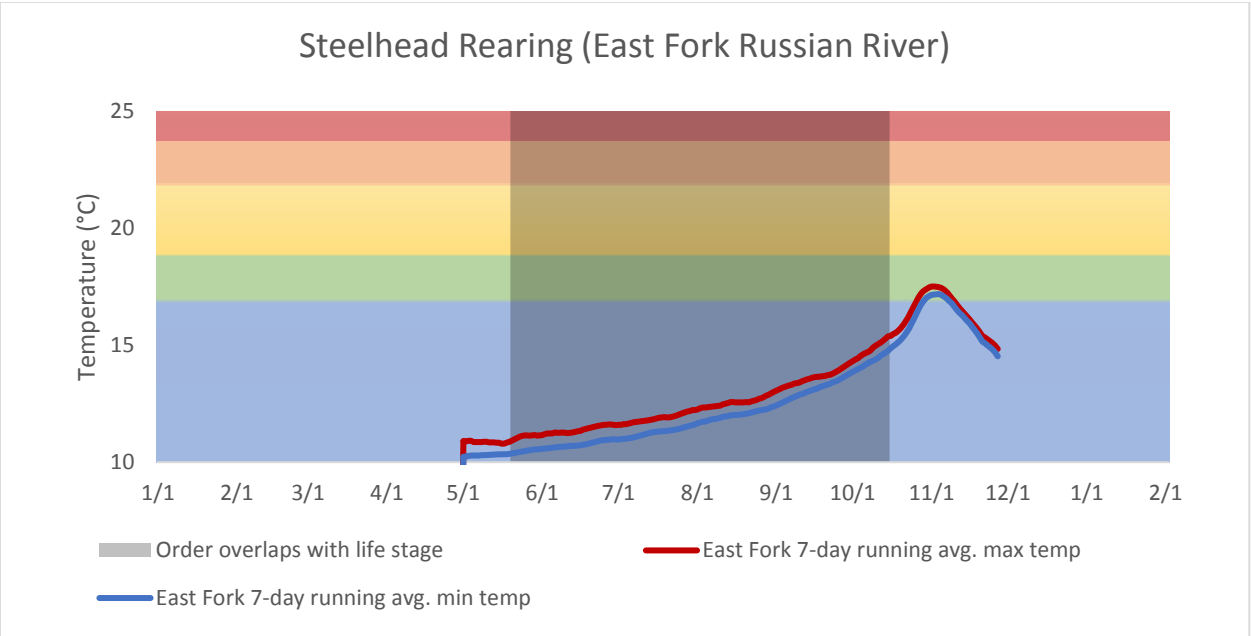


Figure 4-13. The 7-day running average of the minimum and maximum water temperatures collected in the East Fork Russian River. The optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead parr based on Table 4-2 are also shown.

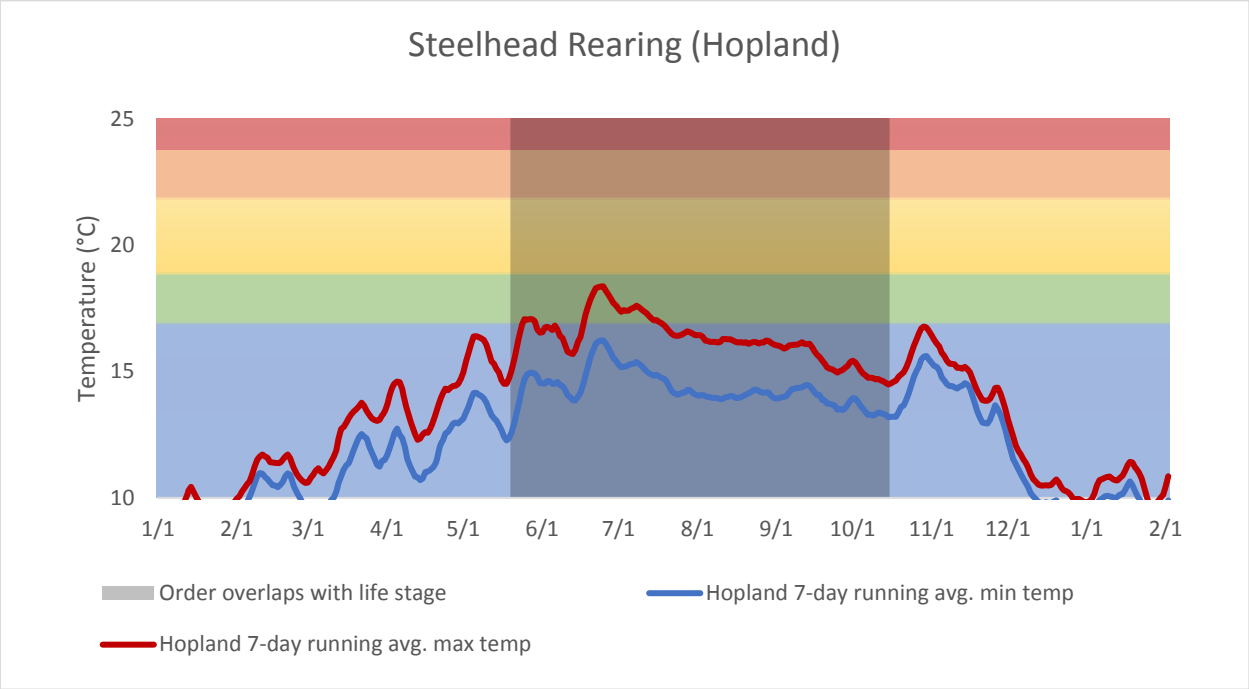


Figure 4-14. The 7-day running average of the minimum and maximum water temperatures collected at Hopland (USGS stream gage number 11462500). The optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead parr based on Table 4-2 are also shown.

Salmonid Smolt Outmigration

As salmonid smolts immigrate to the ocean they experience river temperatures that are often warmer than their natal tributary or mainstem river habitat. We summarize water temperatures for the East Fork Russian River, Hopland, Jimtown, and Digger Bend gages and show these temperatures with water temperature criteria for Chinook and steelhead. We operated a downstream migrant trap at Dry Creek from April 21, 2017, until July 30, 2017. During the Order (May 19, 2017 to July 31, 2017) we captured 2,552 Chinook salmon smolts, 118 coho salmon smolts and 40 wild and steelhead smolts at this trapping site. We relate these catch data to temperature collected at Dry Creek and at Hacienda. Hacienda is located approximately 20 km downstream of the trap site and represents temperatures experienced by smolts as they emigrate through the lower river. It is worth noting that temperatures at the trap site are significantly cooler than temperatures at Hacienda.

Chinook

Water temperature in the Russian River near the Coyote Valley Dam was favorable for Chinook smolts during the period of time that Chinook are expected to emigrate from that potion of the Russian River (April through June, Figure 4-15 and Figure 4-16). However, water temperature became less favorable in the later part of the migration at sites located downstream of Hopland (Figure 4-17 through Figure 4-19). It is important to note that Chinook have evolved to emigrate during the spring before water temperatures become lethal.

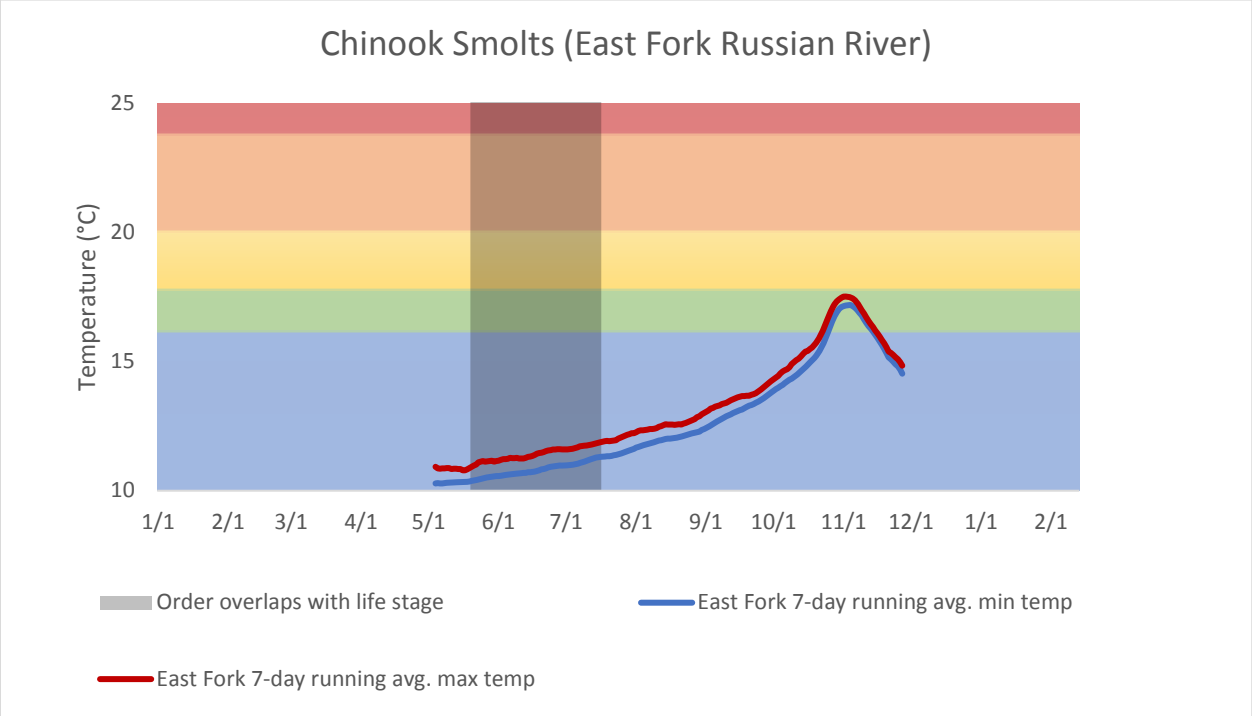


Figure 4-15. The 7-day running average of the minimum and maximum water temperatures collected in the East Fork Russian River shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook smolts based on Table 4-3.

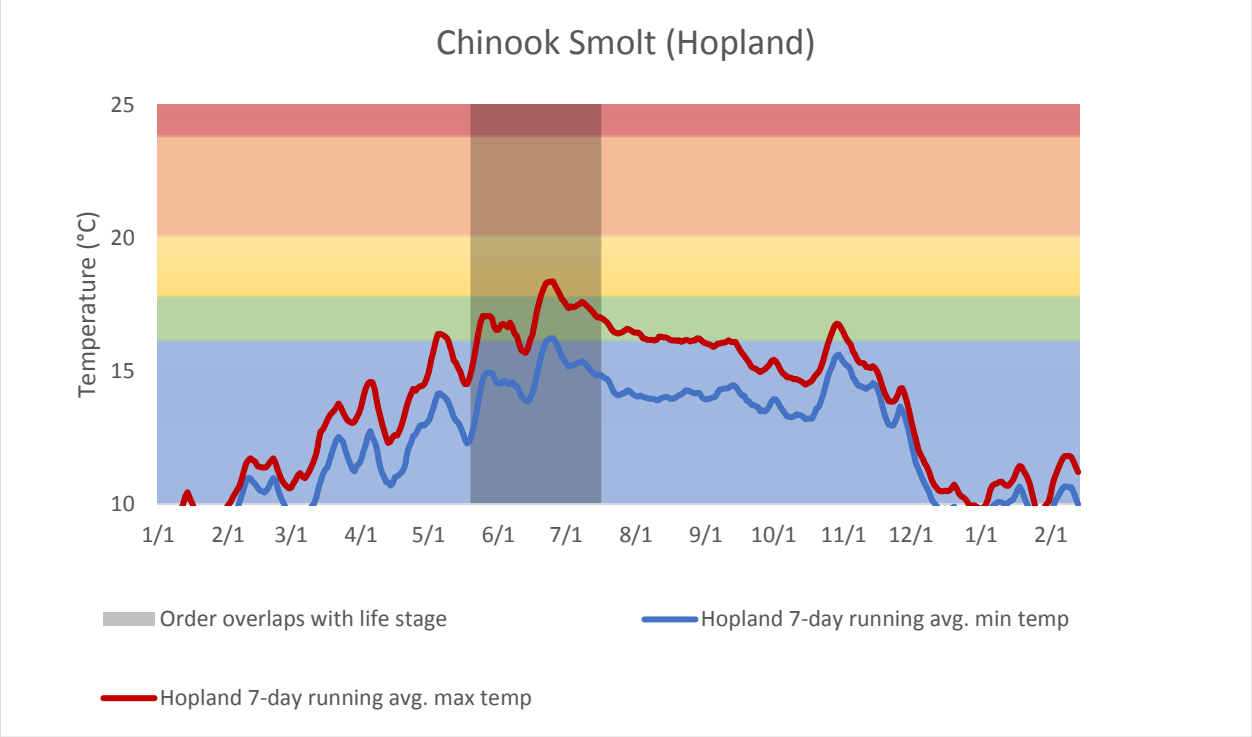


Figure 4-16. The 7-day running average of the minimum and maximum water temperatures collected at Hopland (USGS stream gage number 11462500). Shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook smolts based on Table 4-3.

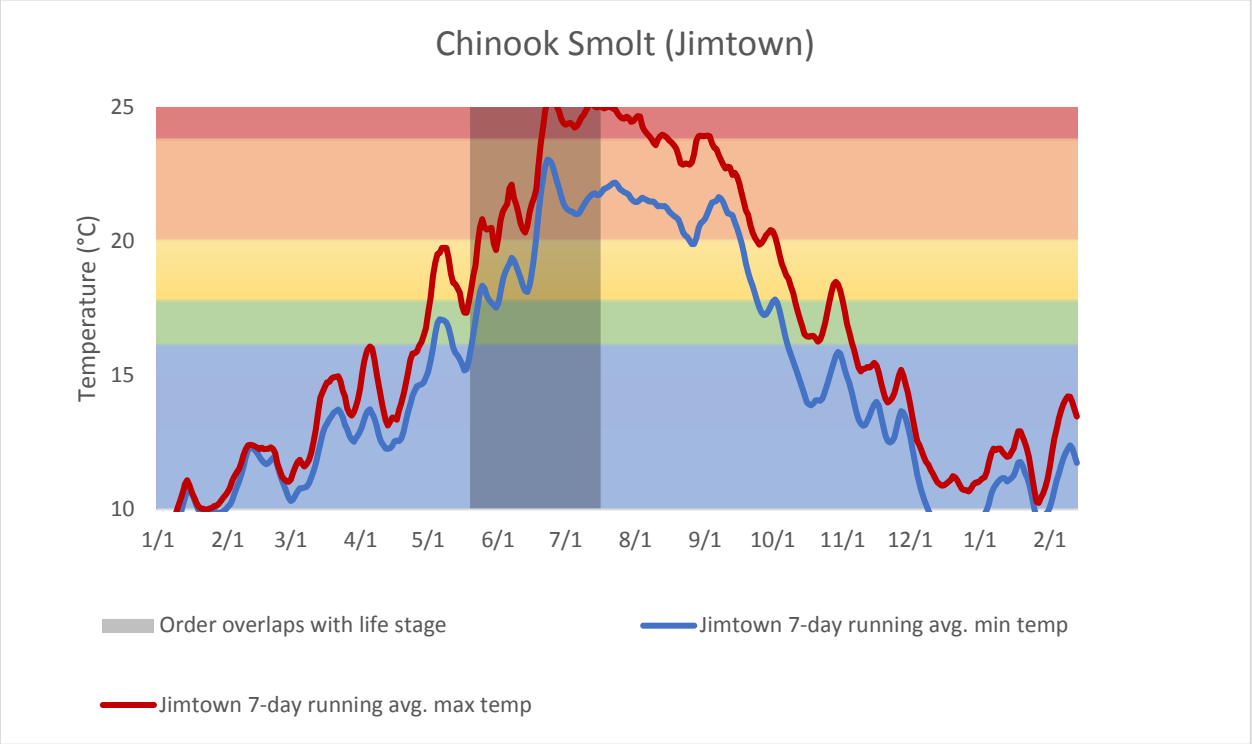


Figure 4-17. The 7-day running average of the minimum and maximum water temperatures collected at the Jimtown USGS stream Gage (1146382) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook smolts based on Table 4-3.

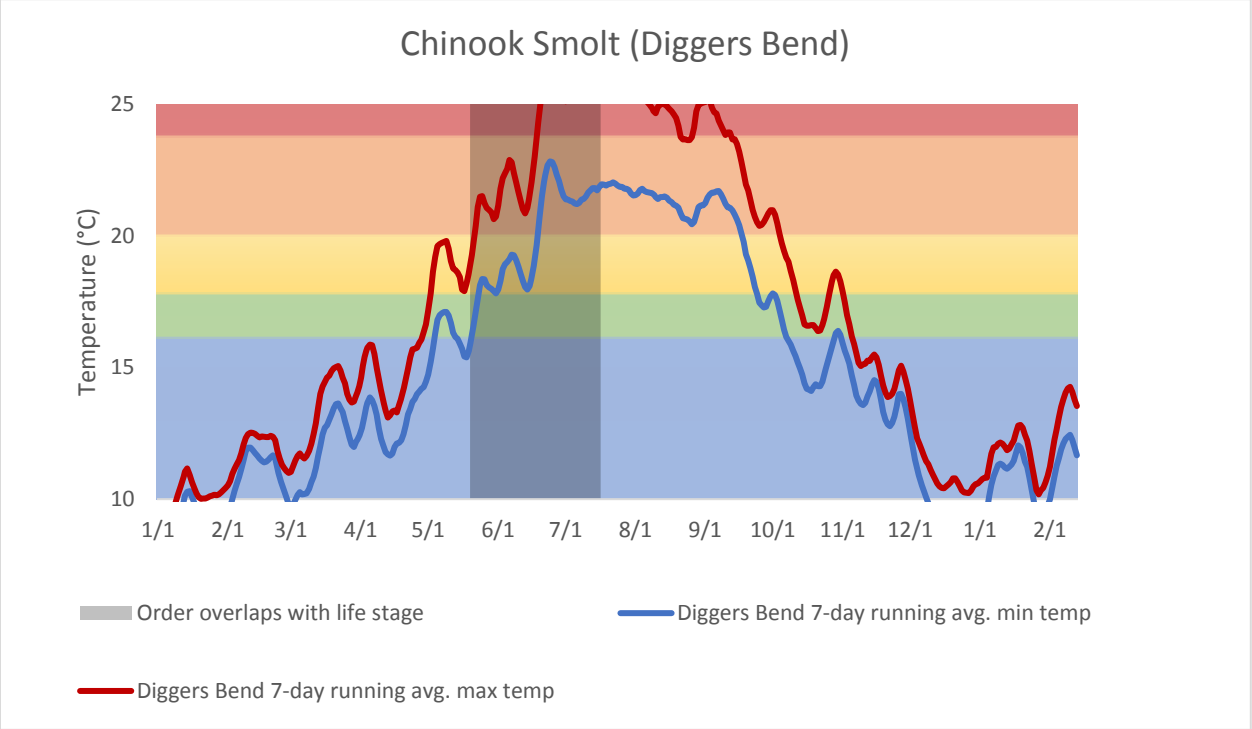


Figure 4-18. The 7-day running average of the minimum and maximum water temperatures collected at the Digger Bend USGS stream gage (11463980) shown with the daily Chinook smolt catch from a fish trap located at Chalk Hill approximately 5 miles upstream of Digger Bend. Also show are the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook smolts based on Table 4-3.

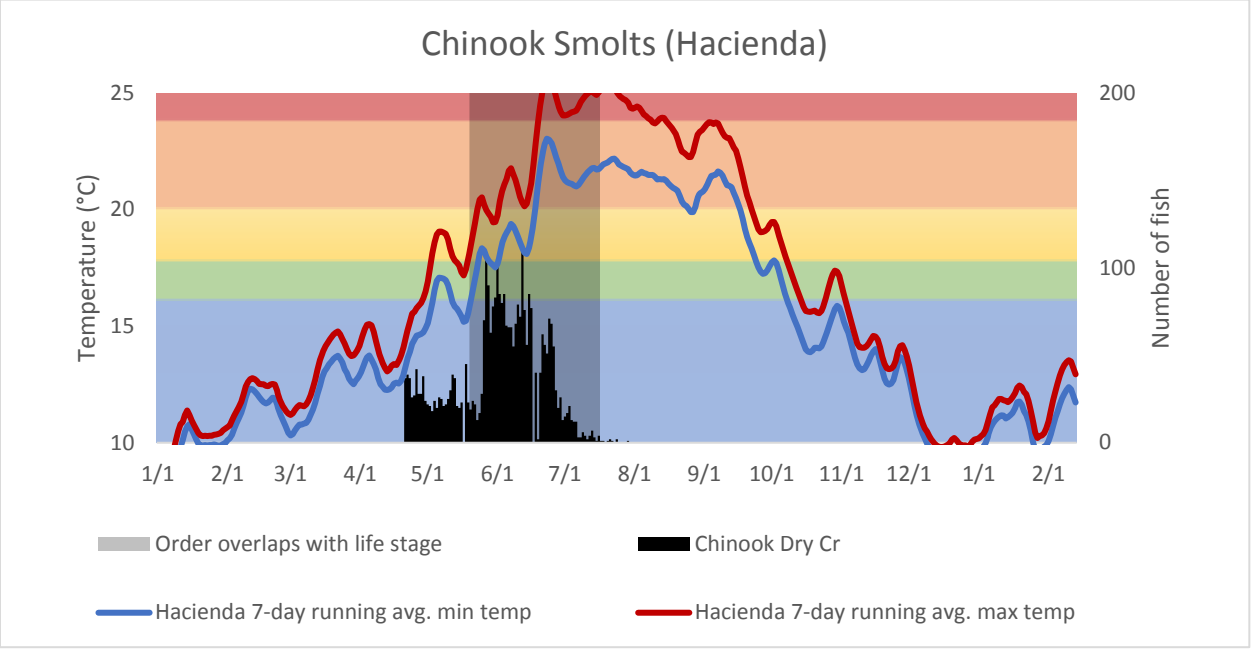


Figure 4-19. The 7-day running average of the minimum and maximum water temperatures collected at Hacienda (USGS gage number 11467000) shown with the Chinook smolt catch from Dry Creek. Also show are the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for Chinook smolts based on Table 4-3.

Coho

A total of 118 Coho smolts were captured at the downstream migrant trap from May 19, 2017 until July 2, 2017. The water temperature at Hacienda ranged from 16.2 °C to 26.3 °C during the time we captured coho smolts. For the days that we captured coho smolts the maximum and minimum daily water temperature were generally in the stressful to acutely stressful range (Figure 4-20).

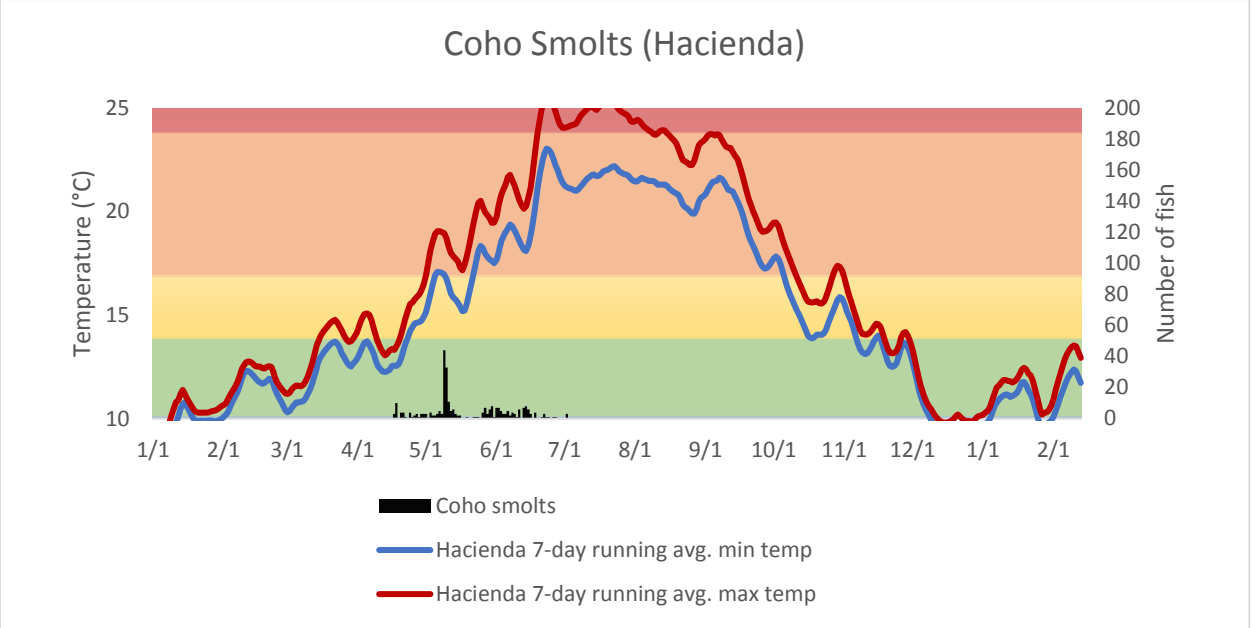


Figure 4-20. The 7-day running average of the minimum and maximum water temperatures collected at Hacienda (USGS gage number 11467000) shown with the coho smolt catch from Dry Creek. Also shown are the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for coho smolts based on Table 4-3.

Steelhead

Water temperature for steelhead smolting ranged from suitable to lethal during the time period that steelhead smolts are expected to be in the Russian River (March 1, to May 31). Water temperatures in the East Fork Russian River were suitable for steelhead smolting (Figure 4-21). At Hopland water temperatures for smolting steelhead were stressful to acutely stressful (Figure 4-22). At Jimtown water temperatures were acutely stressful (Figure 4-23). At Digger Bend water temperatures were acutely stressful to lethal (Figure 4-24). We did not captured steelhead smolts in the downstream migrant trap at Wohler in 2017. We did capture steelhead smolts in Dry Creek from April 21, 2017, until May 31, 2017. The water temperature at Hacienda ranged from 15.1 °C to 24.9 °C during the time we captured steelhead smolts. For days that fish were captured during the order the minimum and maximum daily water temperature was generally acutely stressful at Hacienda (Figure 4-25).

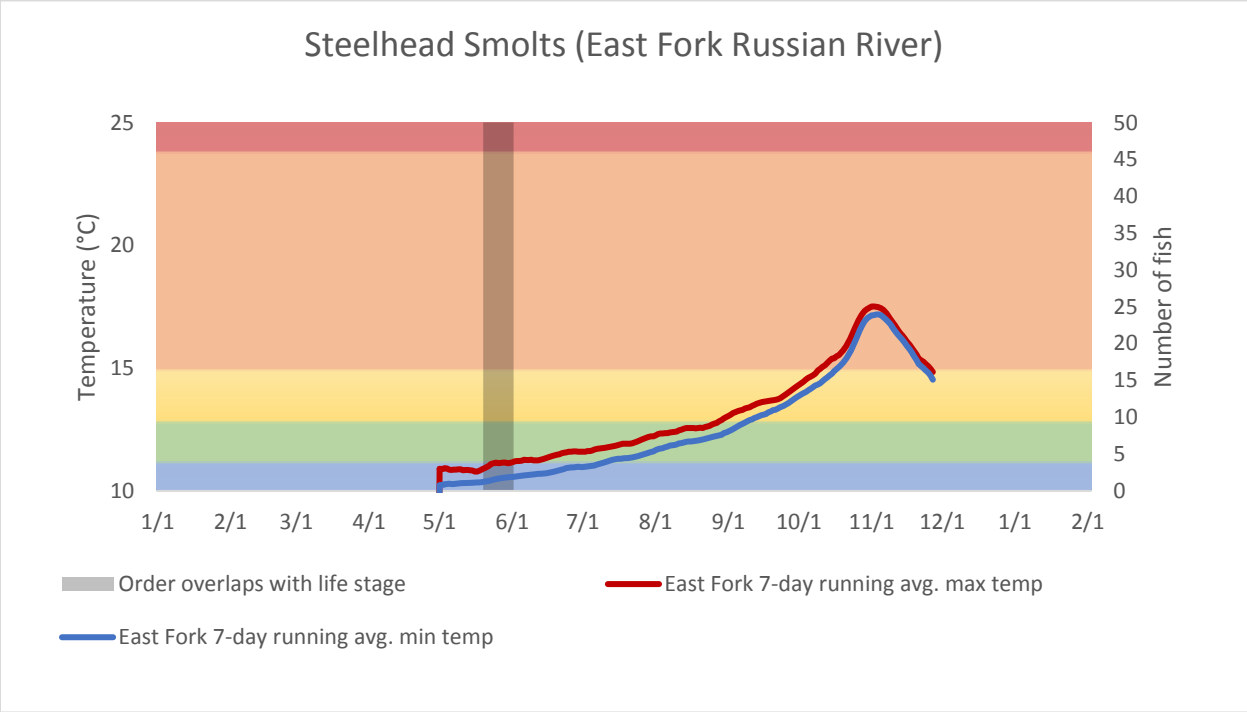


Figure 4-21. The 7-day running average of the minimum and maximum water temperatures collected in the East Fork Russian River shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead smolts based on Table 4-3.

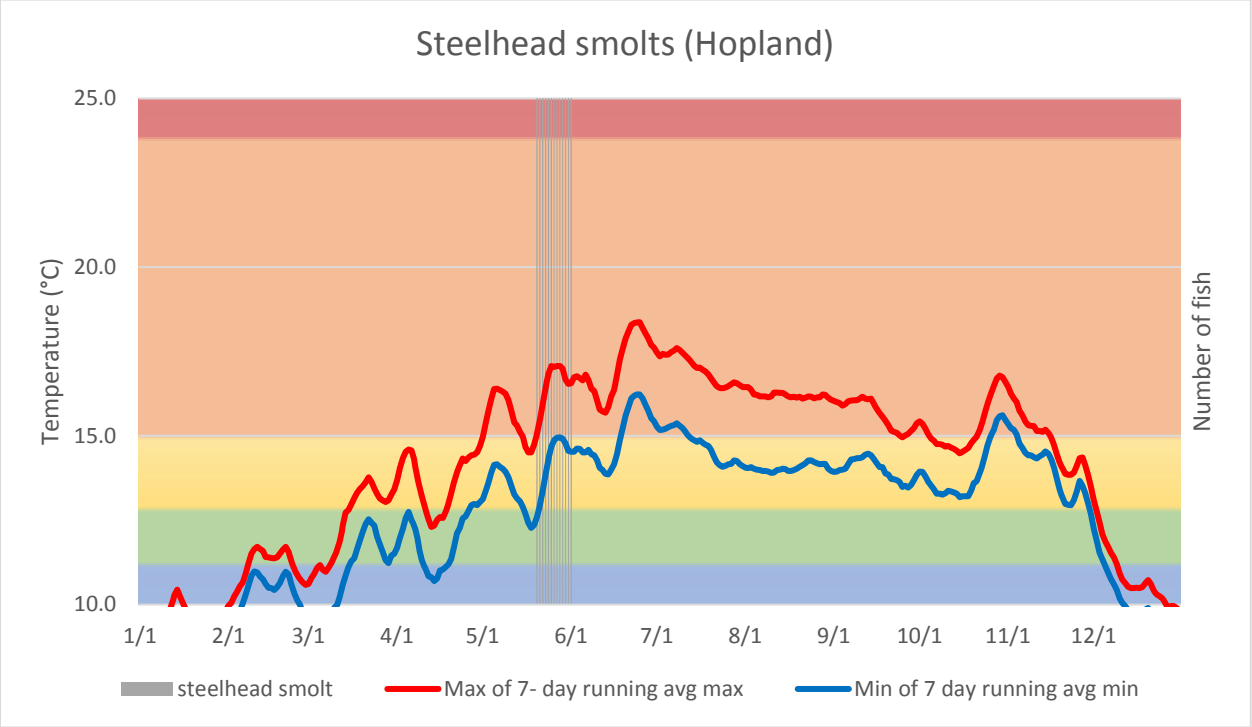


Figure 4-22. The 7-day running average of the minimum and maximum water temperatures collected at the USGS gage at Hopland (gage number 11462500) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead smolts based on Table 4-3.

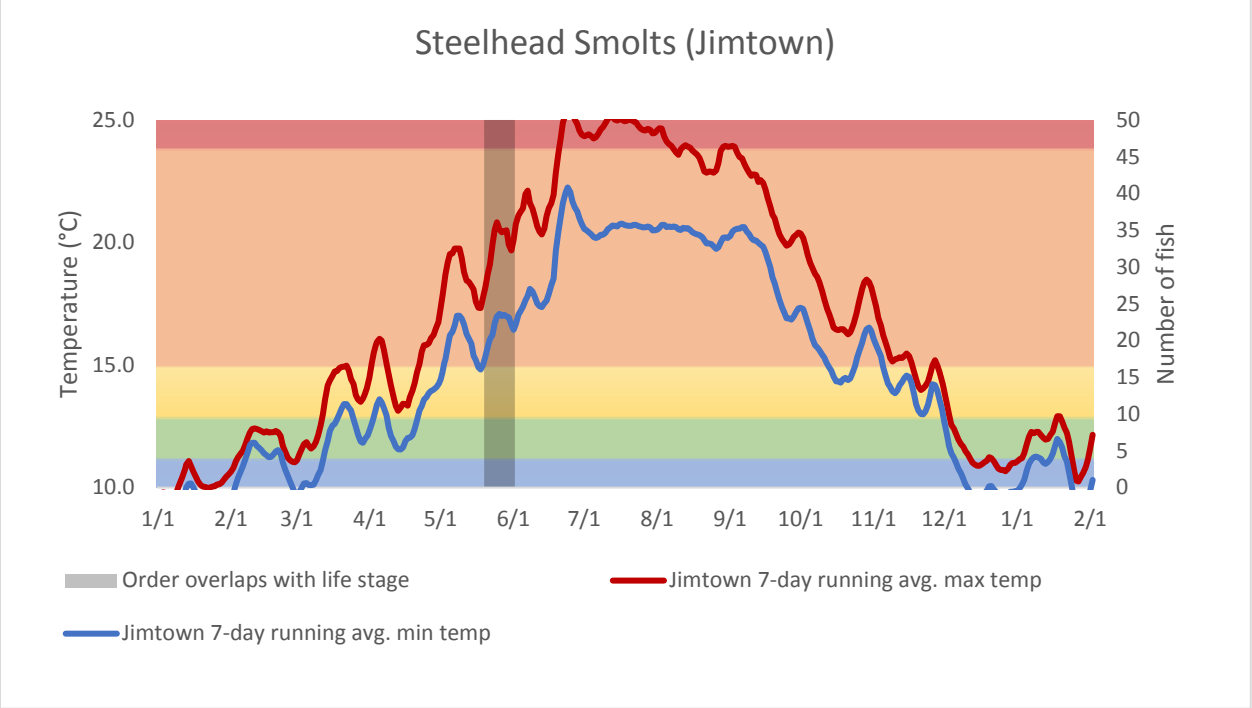


Figure 4-23. The 7-day running average of the minimum and maximum water temperatures collected at the USGS gage at Jimtown (USGS gage number 11463682) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead smolts based on Table 4-3.

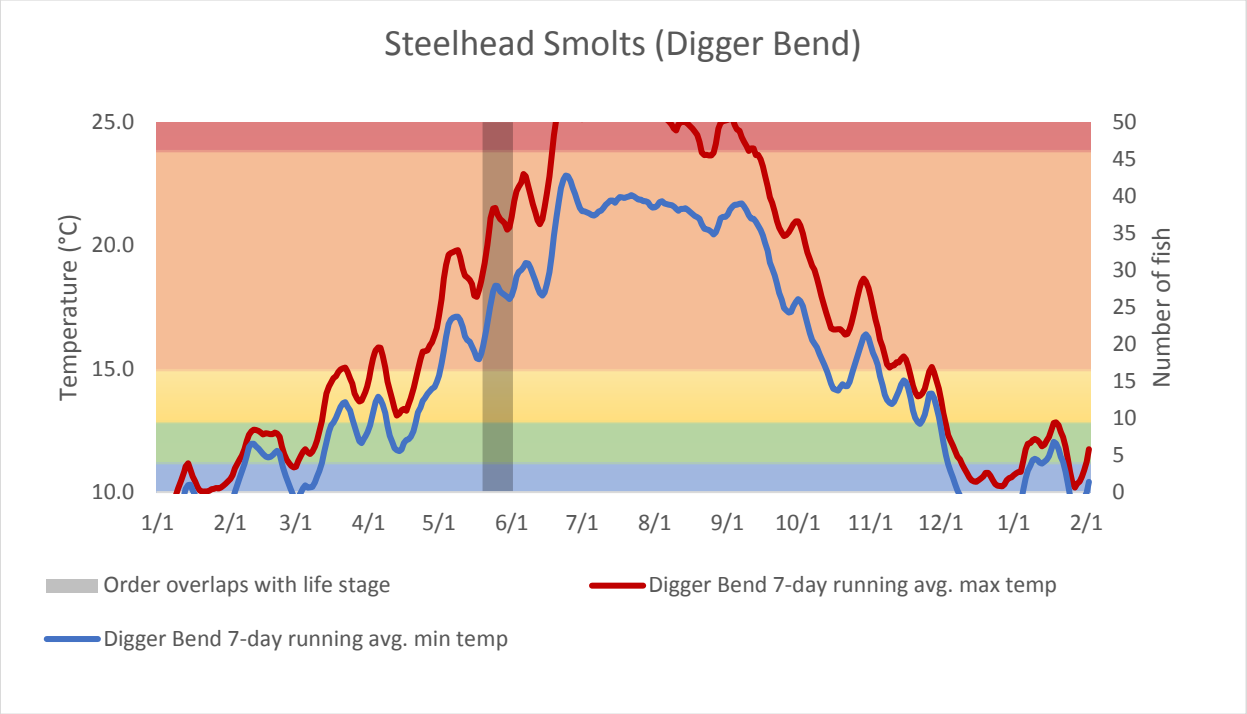


Figure 4-24. The 7-day running average of the minimum and maximum water temperatures collected at the USGS gage at Digger Bend (11463980) shown with the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead smolts based on Table 4-3.

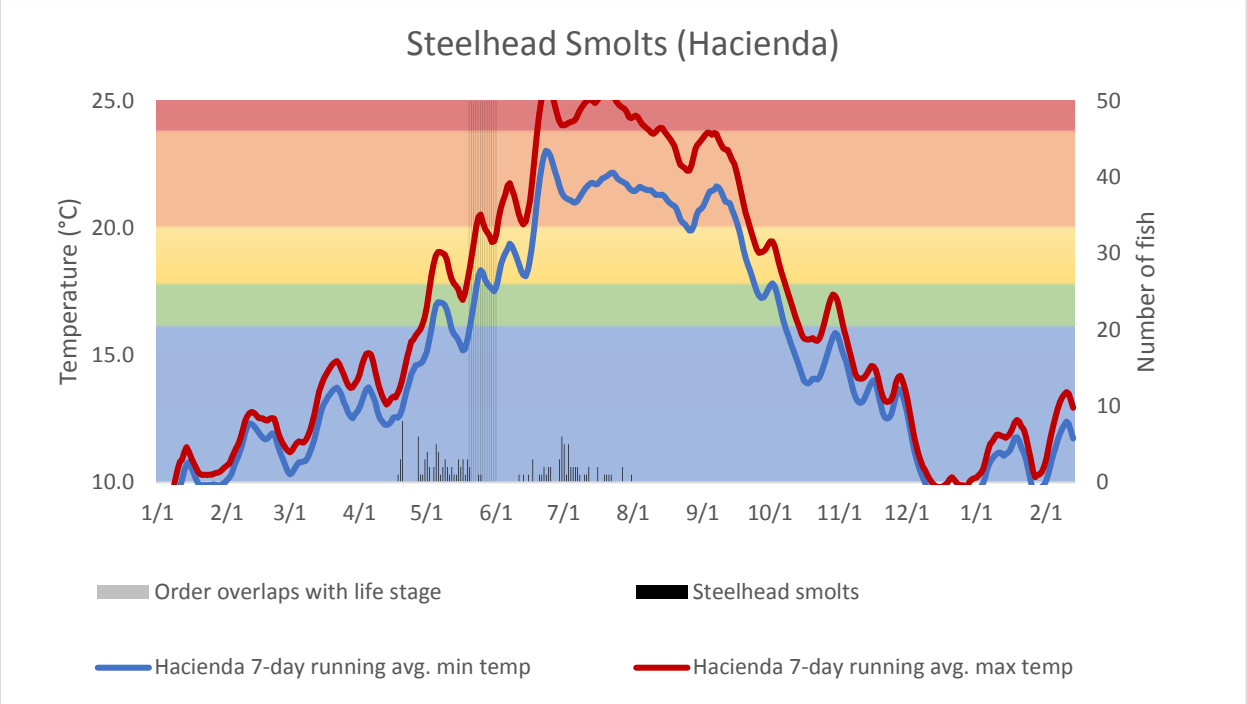


Figure 4-25. The 7-day running average of the minimum and maximum water temperatures collected at Hacienda (USGS gage number 11467000) shown with the steelhead smolt catch from Dry Creek. Also show are the optimal, suitable, stressful, acutely stressful and lethal water temperature thresholds for steelhead smolts based on Table 4-3.

Dissolved Oxygen

Dissolved oxygen was generally favorable for salmonids in the Russian River throughout the Order at most sites. However, dissolved oxygen declined throughout the year in the East Fork of the Russian River to a level that was very poor for salmonids (Figure 4-26). At Hopland, Jimtown, Digger Bend, and at Hacienda, dissolved oxygen levels were generally in the optimal and suitable range although the minimum daily dissolved oxygen levels became stressful at some sites (Figures 4-27 through 4-30).

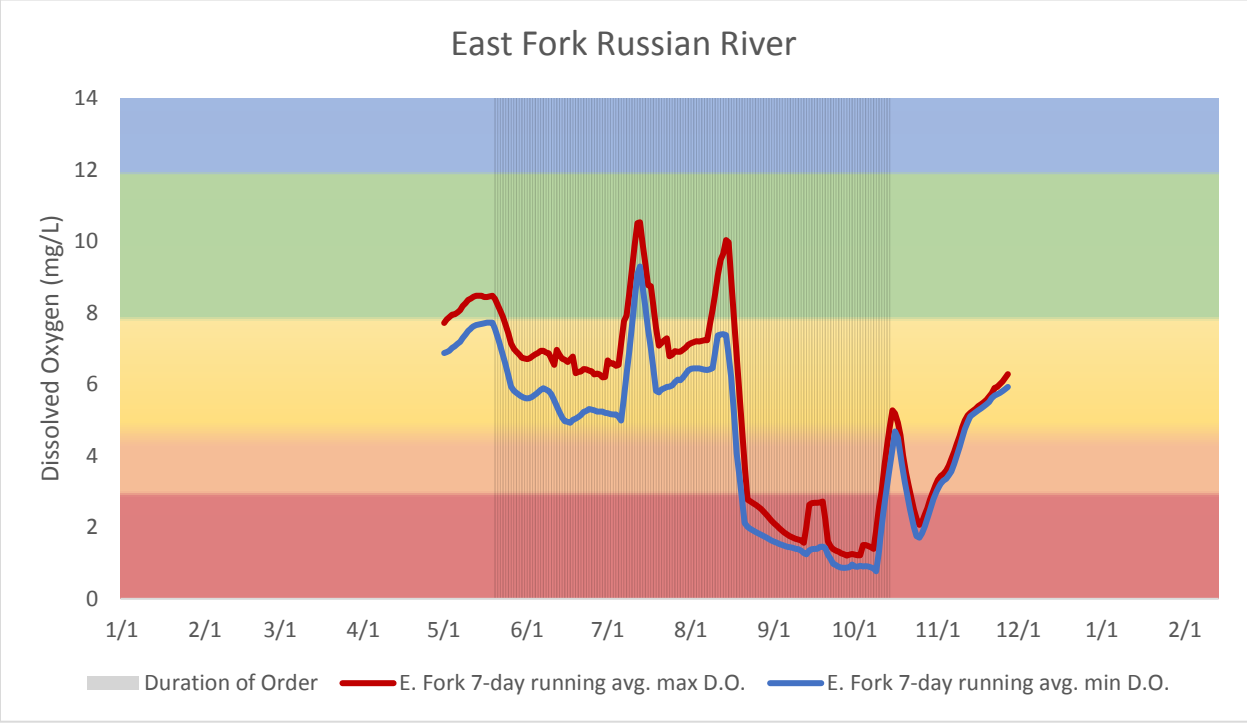


Figure 4-26. The 7-day running average of the minimum and maximum dissolved oxygen collected in the East Fork Russian River approximately 1/3 mile downstream of the Coyote Valley Dam. Shown with the optimal, suitable, stressful, acutely stressful, lethal dissolved oxygen zones based on our criteria. See Table 4-3 for a description of water quality zones.

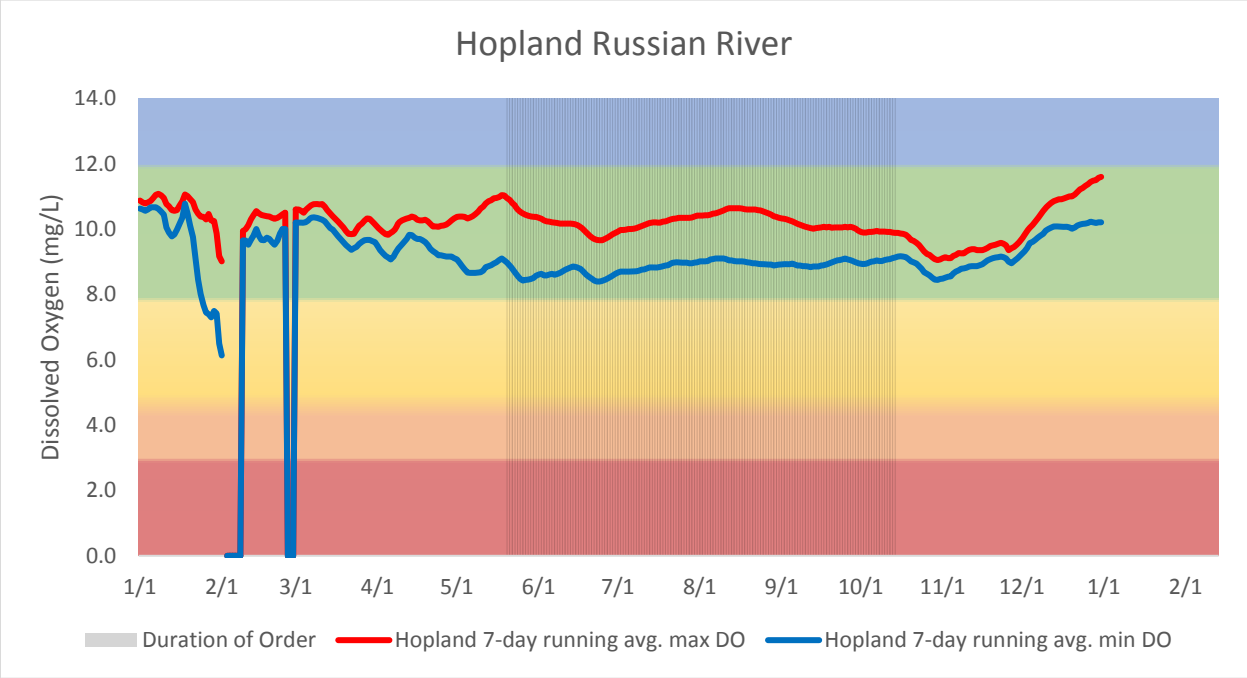


Figure 4-27. The 7-day running average of the minimum and maximum dissolved oxygen collected at Hopland (USGS stream gage number 11462500). Also shown are the optimal, suitable, stressful, acutely stressful, lethal dissolved oxygen zones based on our criteria. See Table 4-4 for a description of water quality zones.

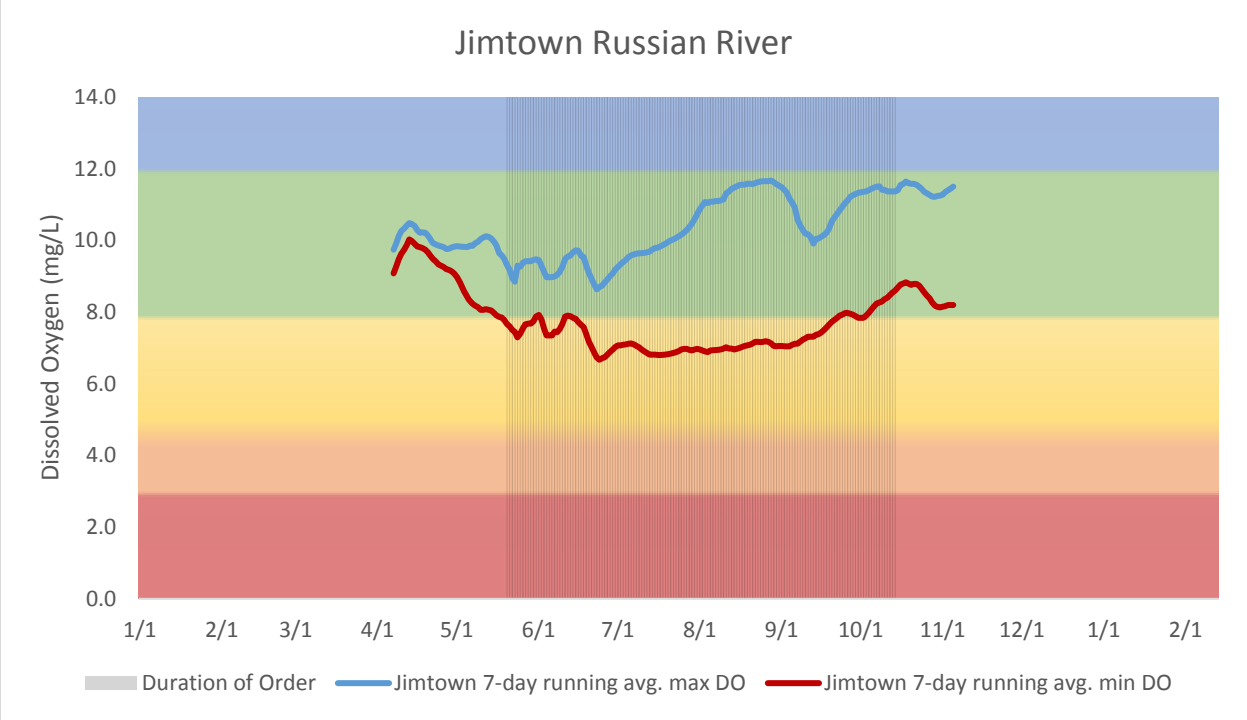


Figure 4-28. The 7-day running average of the minimum and maximum dissolved oxygen collected at the Jimtown USGS stream Gage (1146382). Also shown are the optimal, suitable, stressful, acutely stressful, lethal dissolved oxygen zones based on our criteria. See Table 4-4 for a description of water quality zones.

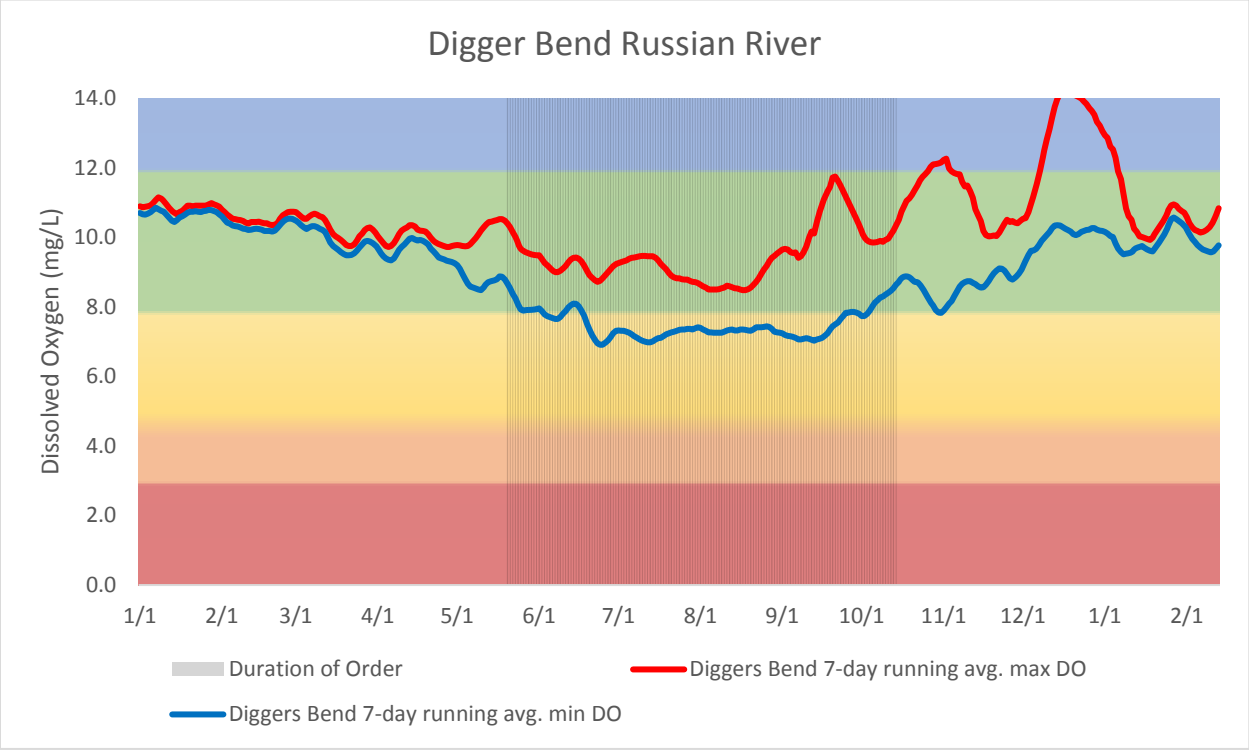


Figure 4-29. The 7-day running average of the minimum and maximum dissolved oxygen collected at the Digger Bend USGS stream gage (11463980). Also shown are the optimal, suitable, stressful, acutely stressful, lethal dissolved oxygen zones based on our criteria. See Table 4-4 for a description of water quality zones.

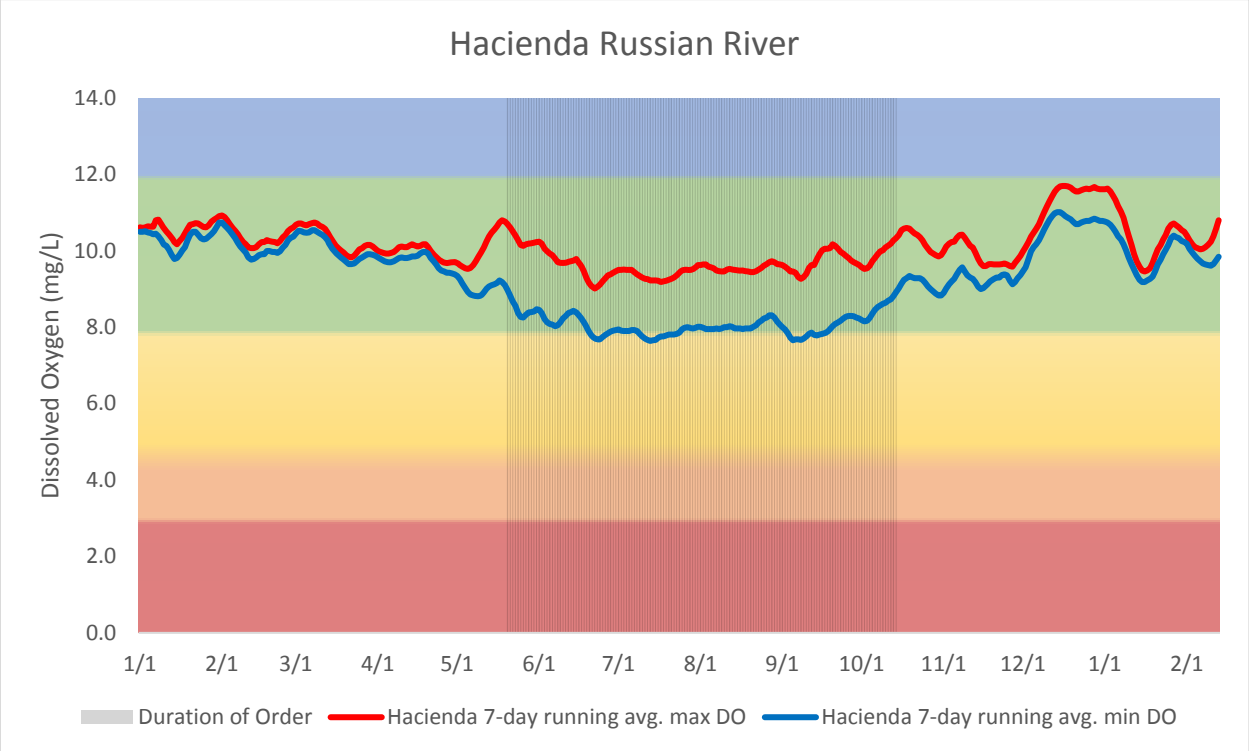


Figure 4-30. The 7-day running average of the minimum and maximum dissolved oxygen collected at the Hacienda USGS stream gage (1146700). Also shown are the optimal, suitable, stressful, acutely stressful, lethal dissolved oxygen zones based on our criteria. See Table 4-4 for a description of water quality zones.

4.2.5 Summary

Compared to the last few years of significant drought, flows in 2017 were higher in the Russian River during the spring, summer, and fall. Adult fish moved past Mirabel during the Order. However, like in previous years, a sand bar formed at the mouth of the river, limiting fish from entering the river during the beginning of the adult migration season. Significant rain events and higher streamflows in October likely scoured the sand bar and motivated adult Chinook salmon to migrate upstream. When Chinook first began migrating upstream in 2017, water temperature at Hacienda was stressful to acutely stressful, but quickly decline to suitable to optimal temperatures. Water temperatures at sites upstream of Hacienda followed a similar trend where temperatures were acutely stressful to stressful then declined as air temperatures declined with the onset of fall. By mid-October water temperatures were suitable to optimal for adult Chinook at all sites with the exception of the East Fork Russian River. Water temperature in the East Fork Russian River increased to stressful levels in mid-October as the cold water pool in Lake Mendocino was exhausted. However, atmospheric temperatures cooled water released from Lake Mendocino and by no farther than Hopland water temperatures were suitable to optimal for adult Chinook. While temperatures were occasionally unfavorable for adult Chinook it is important to remember that Chinook have evolved to cope with seasonally warm water temperatures by returning to the river in the fall when water temperatures are cooler and that the vast majority of adult Chinook return to the Russian River after mid-October when water temperatures in the river are becoming favorable.

For Chinook smolts, water temperatures were favorable for rearing in the early spring and at most sites, but became unfavorable by the end of the rearing season. Water temperatures remained suitable to optimal in the East Fork Russian River and in Dry Creek throughout the rearing season. Fish that remained at these sites to rear and emigrated as smolts late in the rearing season encountered unfavorable water temperatures as they moved downstream and out to sea. It is important to note that Chinook have likely adapted to warm temperatures in the Russian River and have adjusted their run timing to further cope with seasonally warmer water temperatures by emigrating earlier in the year.

Water temperatures were favorable for coho salmon rearing in Dry Creek in 2017. It is because of these favorable water temperatures that the NMFS recommended 6-miles of habitat enchantments be constructed in Dry Creek (NMFS 2008). The Water Agency has begun implementing these habitat enhancements (SCWA 2016). In the future there will be even more habitat available for coho rearing in Dry Creek.

Water temperatures near Hopland and in Dry Creek were favorable for steelhead rearing throughout the order. In the East Fork Russian River water temperature began to warm from August to the end of the order as the cold water pool in Lake Mendocino was depleted. However, water temperature in the East Fork Russian River remained below stressful levels for rearing steelhead.

Chinook salmon had favorable water temperatures for smolting at the East Fork Russian River and Hopland. Water temperatures became acutely stressful after June 1, when most of the smolts had migrated past Chalk Hill based on trap catches. Many Chinook smolts were captured in the Dry Creek downstream migrant trap after June 1, when water temperatures became stressful and acutely stressful at Hacienda. Cold water released from Lake Sonoma may keep Chinook smolts from receiving migration cues they might otherwise receive as the water warmed from changing seasons. This may delay some

Chinook from emigrating from Dry Creek. Once these late emigrating fish leave Dry Creek they would experience stressful and acutely stressful temperatures in the lower Russian River.

According to our criteria water temperatures for coho and steelhead smolts in Dry Creek was suitable to acutely stressful, but this criteria may not represent fish that have adapted to local conditions. Recent studies suggest that salmonids may adapt to local conditions and that salmonids may tolerate a much wider range of temperatures than reported in the literature (Verhille et al. 2015). Returning adults are evidence that steelhead and coho successfully smolt in the Russian River basin (SCWA 2016). Russian River steelhead and coho that successfully smolt may either undergo the smoltification process earlier in the year when water is cooler, or they may be able to tolerate warmer water temperatures than reported in the literature. Furthermore, water temperatures in Dry Creek are significantly cooler in May and June than they would be under natural hydrology (unregulated).

Dissolved oxygen was favorable for salmonids at all sites and for the duration of the Order, with the exception of the East Fork Russian River. In the East Fork Russian River dissolved oxygen decreased throughout the season eventually reaching lethal levels. This would primarily affect summer rearing steelhead that are restricted by temperature to the upper Russian River. In the summer of 2017, water released from the cold water pool was hypoxic. However, oxygen levels typically recover by the time the released water reaches the confluence with the West Fork (Jeff Church personal communication). Low dissolved oxygen in this section of river probably has a relatively small impact on the steelhead population since the section of river from Coyote Valley Dam to the confluence with the West Fork Russian River is short. Furthermore summer rearing steelhead may have left this section of stream when dissolved oxygen became depressed and sought out more favorable habitat downstream. Adult Chinook migrating upstream in the fall could avoid this section of river if dissolved oxygen levels were unfavorable. Therefore adult Chinook salmon are likely not affected by low dissolved oxygen in the East Fork Russian River.

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State Water Resources Control Board
Order 5/19/2017

Term 11 –Water Use Efficiency and Supply Reliability Projects

April 2, 2018

Prepared by

Sonoma County Water Agency
404 Aviation Blvd
Santa Rosa, CA 95403

1 Introduction

This report has been prepared by the Sonoma County Water Agency (Water Agency) to fulfill the requirements of Term 11 of the State Water Resources Control Board (State Board) Order dated May 19, 2017 (Order).

Term 11 of the Order directs the Water Agency to take the following actions:

> By April 1, 2018, SCWA shall provide a written update to the Deputy Director for Water Rights regarding activities and programs being implemented by SCWA and its water contractors to assess and reduce water loss, promote increased water use efficiency and conservation, and improve regional water supply reliability.

2 Sonoma-Marin Saving Water Partnership

The Cities of Santa Rosa, Rohnert Park, Sonoma, Cotati, Petaluma, Town of Windsor and North Marin, Marin Municipal and Valley of the Moon Water Districts and the Water Agency formed the Sonoma-Marin Saving Water Partnership (Partnership) in 2010. The purpose of the Partnership is to establish the financial obligation for the nine local water retailers, Marin Municipal Water District and Sonoma County Water Agency, identify and recommend implementation of water conservation projects and to maximize implementation of cost-effective projects for the Partnership. The Partnership coordinates all water use efficiency focused media buys in the region and provides support to members that need additional assistance meeting conservation targets.

Since 2013, annual conservation campaigns focused on ongoing drought conditions were launched by the Partnership and the Water Agency. In 2014 “There’s a Drought On. Turn the Water Off.” was the regions first ever winter advertising reminding customers to conserve water. In 2015 the Partnership wanted to keep the similar, humorous, engaging campaign that resonated with the general public so we shifted into the “There’s Never Enough to Waste. Turn the Water Off.” campaign. The new campaign had the same look and feel as the prior year with a slight shift. Our focus became providing resources on how to make specific behavioral and hardware changes with the ads focusing on a call to action. As water supply conditions improved, the 2016 campaign focused on acknowledging the success achieved by the community. In 2017, the campaign focused on outdoor water use and increased water efficiency in order to keep the community engaged and to maintain the water use reductions gained during the drought. A few sample ads are below from the 2017 SMSWP outreach campaign.

2.1 Sonoma-Marin Saving Water Partnership Annual Report

The Partners committed to implement or use best efforts to secure the implementation of any water conservation requirements and will publish an Annual Report to track progress. The Annual Report tracks program implementation, highlight program milestones, and reinforce the importance of protecting and preserving water resources for future generations. The 2016/2017 Annual Report for the Partnership is attached in Appendix A.

3 Conservation Tracking

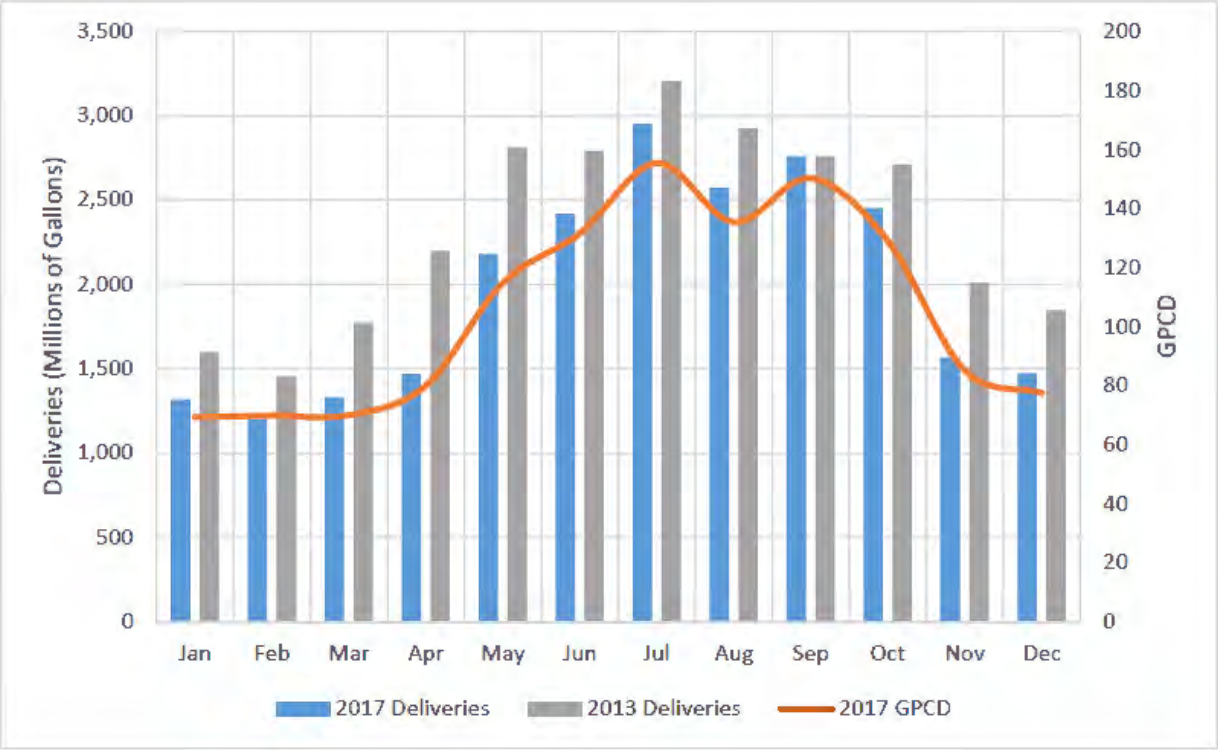
The Water Agency actively engaged all the Partners to track and report water use data in 2017 despite the region not having a mandated conservation goal. The Partners continue to see water demand reductions as compared to the 2013 Benchmark established by Executive Order B-40-17, which continues the reporting requirements established in Executive Order B-29-15. Table 1 below shows the

regions cumulative reduction in demand for 2017 exceeds 16% and each individual Partner served by the Agency. As displayed, the Partnership continued to experience significant demand reductions in the region. Chart 1 demonstrates a regional winter low of 69 gallons per capita per day (GPCD) and 155 GPCD in the summer, with fluctuations following local weather patterns.

Table 1: 2017 Total Deliveries Compared to 2013 Benchmark Water Use

Water Retailer	Total Deliveries (Gallons)	2013 Benchmark (Gallons)	Relative to 2013 Benchmark
Cal Am	284,932,699	309,018,000	-8%
Cotati	264,610,558	327,969,032	-19%
Marin Municipal	8,001,401,645	9,131,679,941	-12%
North Marin	2,507,719,800	3,254,000,000	-23%
Petaluma	2,679,831,209	3,191,983,293	-16%
Rohnert Park	1,486,190,118	1,668,000,000	-11%
Santa Rosa	5,830,924,012	7,111,187,431	-18%
Sonoma	650,452,296	747,787,642	-13%
Valley of the Moon	875,957,207	1,044,331,014	-16%
Windsor	1,108,813,603	1,273,975,459	-13%
SMSWP Total	**23,690,833,149**	**28,080,775,550**	**-16%**

Chart 1: SMSWP Monthly Deliveries and GPCD



4 Regional Water Supply Reliability Projects

The Water Agency currently has several long-term studies to investigate ways to improve the reliability of the Russian River watershed to supply water for human and environmental needs. At Lake Mendocino, the Water Agency has partnered on a project that has conducted a preliminary viability assessment for implementing Forecast Informed Reservoir Operations (FIRO). The Water Agency is also collaborating with NOAA and other partners to improve the regional monitoring and forecasting of precipitation on two projects: the Advanced Quantitative Precipitation Information System (AQPI) Project and the Hydrometeorological Testbed Project. These projects may provide ancillary support to the development of FIRO for Lake Mendocino. In Sonoma Valley, the Water Agency is evaluating the potential for groundwater banking with an aquifer storage and recovery pilot test program commencing in April 2018.

4.1 Forecast-Informed Reservoir Operations

Forecast-Informed Reservoir Operations (FIRO) is a reservoir management strategy that uses meteorological and hydrological forecasts to support more efficient operation of reservoirs and has been adopted at Lake Mendocino as a pilot study. Lake Mendocino with a total storage capacity of 116,500 acre-feet is operated jointly by the Water Agency, controlling releases when levels are in the water supply pool, and the U.S. Army Corps of Engineers (USACE), who owns the project and coordinates flood control releases. The Water Control Manual (issued 1959; revised August 1986) dictates release flows and contains a rule curve that specifies the top of the water conservation pool throughout the year. In general, the operation is designed to release stored water above the conservation pool as quickly as possible, retaining flood control space to capture future large inflow events. The rule curve is predicated on typical historical weather patterns– wet during the winter, dry otherwise. The rule curve does not account for variability in weather patterns and recent reductions to inflows into Lake Mendocino from Pacific Gas and Electric's (PG&E's) Potter Valley Project (which diverts water from the Eel River to the Russian River) that began in 2006.

The Water Control Manual lacks flexibility to adapt to the highly variable conditions of droughts and floods experienced in the Russian River watershed, as well the over 50% reduction of inflow into Lake Mendocino from the Potter Valley Project. As a result, the water supply reliability of Lake Mendocino is impaired with significant consequences to downstream water supply reliability and ecological resources. A Preliminary Viability Assessment (PVA) was completed in August 2017. The analytical results demonstrated that FIRO could improve reliability of meeting water management objectives without adversely affecting flood risk management. The Water Agency analysis with FIRO alternatives showed significant additional storage that resulted in improved reliability of meeting water management objectives. Compared with existing operation, additional water was stored and available for delivery for nearly all years simulated. Additionally, the analysis showed no significant loss of ability of the system

to manage flood risk for the Russian River basin. The report assessed risk in terms of average annual damage (AAD) based on data from 1951 to 2010.

Additional information on the project PVA is provided in 'Forecast-Informed Reservoir Operations: Preliminary Viability Assessment for Lake Mendocino' found in Appendix B.

4.2 Sonoma Valley Aquifer Storage and Recovery

The Water Agency has long considered groundwater banking of winter-time Russian River water into one of the regional groundwater basins as a potentially effective water supply reliability strategy. The Water Agency, City of Sonoma, and other local partners, including the cities of Rohnert Park and Cotati, Valley of the Moon Water District, and the Town of Windsor (study participants) have conducted a feasibility study for a regional groundwater banking program (Groundwater Banking Feasibility Study) to investigate the viability of enhancing the conjunctive management of surface water and groundwater resources (GEI, 2013). Conceptually, the groundwater banking program would involve the diversion and transmission of surplus Russian River water produced at existing drinking water production facilities during wet weather conditions (i.e., the winter and spring seasons) for storage in aquifers beneath the Santa Rosa Plain and/or Sonoma Valley. The stored water would then be available for subsequent recovery and use during dry weather conditions (i.e., the summer and fall seasons) or emergency situations. The Groundwater Banking Feasibility Study provided an evaluation of the regional needs and benefits, source water availability and quality, regional hydrogeologic conditions, and alternatives for groundwater banking. Based on the findings from the study, pilot studies to further assess the technical feasibility of Aquifer Storage and Recovery (ASR) as a method for groundwater banking were recommended and currently are being pursued in Sonoma Valley, as described below.

In December 2017, a technical report was prepared and submitted to the San Francisco Bay Regional Water Quality Control Board that documented the proposed design and approach to conduct an aquifer storage and recovery pilot test in Sonoma Valley. The overall objective of the pilot test is to verify and empirically determine specific hydrogeologic and water-quality factors to support a technical and economic viability assessment of ASR techniques in the region. The Regional Board issued a Notice of Applicability under State Water Resources Control Board's (Water Board's) Water Quality Order 2012-0010, General Waste Discharge Requirements for Aquifer Storage and Recovery Projects that Inject Drinking Water into Groundwater for the pilot study on March 1, 2018. The pilot study was initiated on March 19, 2018 and will consist of several cycles of recharge, storage, and recovery of approximately 11 acre-feet of drinking water through a confined aquifer system within the Sonoma Volcanics beneath the City of Sonoma over an approximate four month period. If ASR technology is deemed feasible, the pilot project results could be used to complete environmental documentation and design for a full scale or permanent ASR project in the region. Results from the pilot project will also provide information on the technical feasibility for ASR to other local agencies, including the Water Agency's other Water Contractors and the newly formed Groundwater Sustainability Agencies in Sonoma County.

Appendix A

2016/2017 Annual Report for the Sonoma-Marin Saving Water Partnership

ANNUAL REPORT 2016-2017

City of Santa Rosa

City of Rohnert Park

City of Petaluma

City of Sonoma

City of Cotati

North Marin Water District

Valley of the Moon Water District

Marin Municipal Water District

Town of Windsor

Sonoma County Water Agency

ABOUT THE PARTNERSHIP

The Sonoma-Marin Saving Water Partnership (Partnership) represents 10 water utilities in Sonoma and Marin counties that have joined together to provide regional solutions for water use efficiency.

The utilities include the Cities of Santa Rosa, Rohnert Park, Petaluma, Sonoma, Cotati; North Marin, Valley of the Moon and Marin Municipal Water Districts; Town of Windsor, and Sonoma County Water Agency (Partners). Each of the Partners have water conservation programs that can assist customers in reducing their water use.

The Partnership was formed to identify and recommend implementation of water use efficiency projects, and maximize the cost-effectiveness of water use efficiency programs in our region.

The Partners are committed to remain members in good standing of the California Urban Water Conservation Council and support its transition to the California Water Efficiency Partnership.

OUR SERVICE AREA

More than 600,000 residents in Sonoma and Marin counties rely on the water delivered from the Russian River by the Sonoma County Water Agency (Water Agency) to the nine cities and districts in the Partnership. Supplementing the water provided by the Water Agency are local supplies including recycled water, groundwater from underground aquifers and surface water reservoirs.

Recreation, agriculture and wildlife, including threatened and endangered steelhead, coho and Chinook salmon also rely on these same natural resources in order to thrive.

Realizing the importance of protecting and preserving water resources for future generations, the members of the Partnership have taken a proactive role in helping fund, maintain and implement an array of water supply, water use efficiency and fishery recovery programs.

THERE'S NEVER ENOUGH TO WASTE!

The 2016-2017 winter season resulted in above average rain and snowfall throughout most of the state ending California's five-year drought. Consequently, on April 7, 2017 Governor Jerry Brown ended the drought state of emergency and directed state agencies to implement a framework for long-term efficient water use. Even though our region experienced above average rainfall, the Sonoma Marin Water Saving Partnership cumulatively reduced water production by 21% compared to the State's 2013 benchmark year.

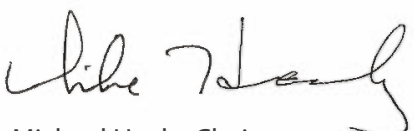
The Partnership's collaborative water conservation public outreach effort continued with a simple message: "There's Never Enough to Waste!" Radio, television, print and online media encouraged water users to remain diligent in using water efficiently. The area retail water providers continued their water conservation efforts as well as encouraged customers to make conservation a way of life.

For the fifth year in a row the Partnership received awards from the U.S. Environmental Protection Agency (EPA). In 2017 the EPA awarded the Partnership its first "Sustained Excellence Award" for its expanded irrigation-professional training opportunities to community college students and working with other partners on outdoor water efficiency education through the Qualified Water Efficient Landscaper (QWEL) program. The Partnership also received a 2017 "Excellence Award" for its education and outreach efforts. The Partnership was awarded two of 20 awards issued by the EPA nationally.

The Partnership was formed in late 2010 and recognizes that establishing common regional water conservation projects may cost effectively conserve more water than would otherwise be conserved by individual agencies. This regional approach is based on meeting water conservation regulatory requirements by offering financial incentives to conserve and by educating water users about where drinking water comes from and how to use it most efficiently. The Partnership, through its many water efficiency programs, educational seminars and outreach campaigns, is working every day of the year to educate our communities about the importance of conserving water resources and curbing water-wasting behaviors.

Regional water use during Fiscal Year 2016-2017 remains down significantly from prior years as a result of continued water conservation efforts by all Partnership agencies. The Partnership offers educational resources, programs and incentives to aid our communities in meeting water use efficiency requirements in the future as we work together in response to variable water year conditions and maintain supplies for beneficial use and instream needs.

Sincerely,



Michael Healy, Chair
Water Advisory Committee

Shirlee Zane, Chair
Sonoma County Water Agency

PARTNERSHIP ACHIEVEMENTS BY THE NUMBERS

RESIDENTIAL PROGRAMS

52 HOT WATER RECIRCULATION SYSTEM REBATES

11 LAUNDRY TO LANDSCAPE GRAYWATER SYSTEMS

4,301 RESIDENTIAL TOILET REPLACEMENTS

3,193 WATER SMART HOME EVALUATIONS

712 HIGH-EFFICIENCY CLOTHES WASHER REBATES

11,223 GALLONS OF RAINWATER HARVESTING CAPACITY ADDED

LANDSCAPE PROGRAMS

411,701 SQUARE FEET OF LAWN REMOVED VIA CASH FOR GRASS/ MULCH MADNESS

ECO FRIENDLY GARDEN TOUR

1,635 ATTENDEES

24 SITES

123 GARDEN SENSE CONSULTATIONS

38 POOL COVER REBATES

47 LANDSCAPE UPGRADE REBATES

87 IRRIGATION STATIONS RETROFITTED WITH SMART CONTROLLERS

48 QWEL & SQWEL GRADS

4 SHEET MULCHING CLASSES

6 RAINWATER HARVESTING WORKSHOPS

365 WATER WASTE ENFORCEMENTS

140 LANDSCAPE PLANS REVIEWED

10 BIOSWALES, DRIP IRRIGATION & LOW WATER USE GARDEN DESIGN CLASSES HELD

346 REBATES GIVEN FOR LAWN REMOVAL VIA CASH FOR GRASS/ MULCH MADNESS

FISCAL YEAR 2016-2017

COMMERCIAL PROGRAMS

115
INDOOR SURVEYS COMPLETED

45
COMMERCIAL HIGH EFFICIENCY TOILETS AND URINALS RETROFITTED

656,976 GALLONS SAVED THROUGH SUSTAINED REDUCTION

K-12 EDUCATION PROGRAMS

90
HIGH SCHOOL VIDEO CONTEST PARTICIPANTS

CURRICULUM MATERIALS DISTRIBUTED TO
27,370
STUDENTS

10,264
STUDENTS RECEIVED DIRECT INSTRUCTION

871
ENTRIES IN THE WATER AWARENESS POSTER CONTEST

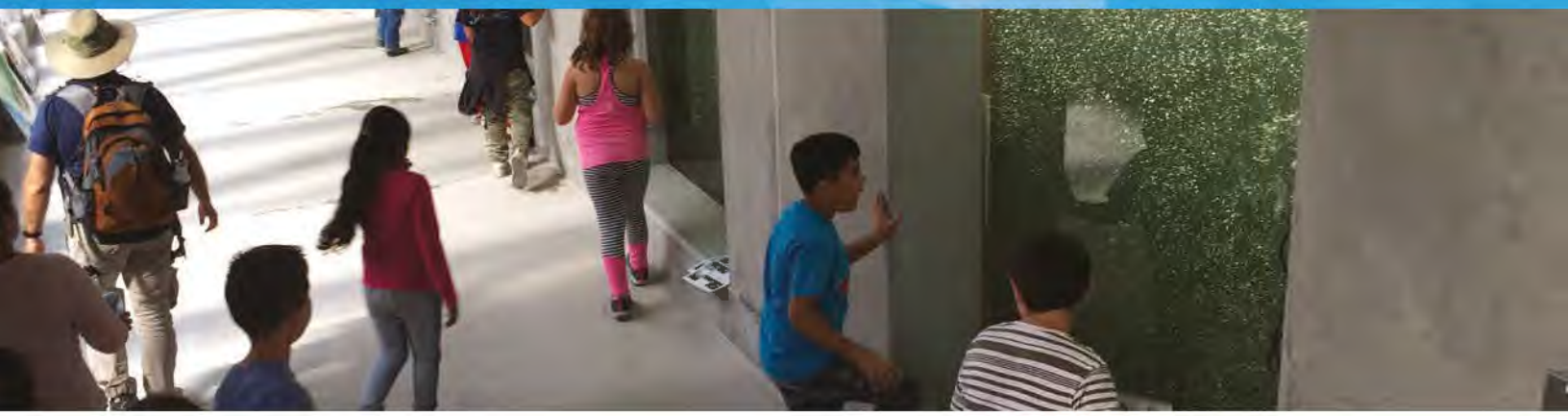
17,084
ASSEMBLY PROGRAM ATTENDEES

9,041
STUDENTS REACHED AT COMMUNITY OUTREACH EVENTS

375
PARENT CHAPERONES ATTENDED FIELD TRIPS

58
TEACHERS ATTENDED WORKSHOPS

PARTNERSHIP HIGHLIGHTS



FISH LADDER VIEWING GALLERY OPENS

The Water Agency operates an inflatable dam located on the Russian River near Forestville to increases water production capacity during peak demand months. In September 2016, the construction of a new, modern fish ladder to bypass the dam was completed, allowing fish and other aquatic animals to safely swim past the inflatable dam. The new fish ladder also offered an opportunity to develop a viewing gallery. The viewing gallery serves as a window into the Russian River, allowing Water Agency fish biologists to count endangered salmon and creating a unique opportunity for the public on guided tours to catch a glimpse of aquatic wildlife. During the 2016-17 school year, 2,300 students visited the gallery as part of the Water Agency's award-winning water education program. During this field program, students learn about the Russian River and how it provides habitat for endangered salmon as well as drinking water for our community.

WATER SMART PLANT CARDS

The Partnership's popular plant cards were revised with new plants and the new "Water Smart Plant" labeling campaign for identifying climate appropriate plants at local nurseries. Each deck of cards feature 50 different low water use plants organized into six categories: trees, shrubs, perennials, grasses, groundcovers and vines. The cards are a component of the Partnerships outreach initiative to educate the public on outdoor water use and are available through the Partners and at outreach events.

PROGRAM EXPENDITURES

(In thousands of dollars)

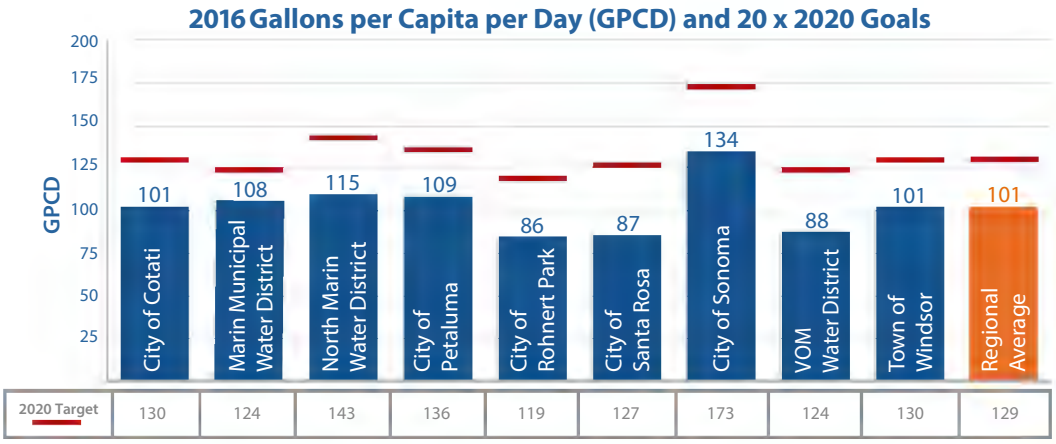
	FY 16-17	Minimum
City of Cotati	$55	$18
Marin Municipal Water District	$1858	$206
North Marin Water District	$540	$217
City of Petaluma	$657	$260
City of Rohnert Park	$16	$102
City of Santa Rosa	$3421	$555
City of Sonoma	$129	$59
Valley of the Moon Water District	$85	$70
Town of Windsor	$199	$13
Sonoma County Water Agency	$2085	NA
Regional Total	**$9045**	**$1500**

Minimum is established in the MOU regarding the Sonoma-Marin Saving Water Partnership.

20 X 2020 GOALS

In 2009, SBx7-7 established a statewide goal, known as 20 x 2020, to reduce per capita water use 20% by the year 2020. The chart below displays 2016 per capita water use in each Partner service area and the region as a whole. The 2020 goals are indicated by the red lines.

While the chart shows that all Partners are currently meeting the 2020 targets, we recognize that water use efficiency must continue. Many factors can affect water use patterns as has been seen in recent years. It is important to continue the work on water use efficiency to maintain the savings already achieved and make sure the region captures all the benefits of future water savings.



ANNUAL MULTI-MEDIA PUBLIC EDUCATION CAMPAIGN

Building on the success of past public outreach campaigns, the Partnership continued in 2018 with the message, "Water efficiency is…There's never enough to waste." The campaign was disseminated throughout the region via radio and print in English and Spanish.

Additionally, the Partnership had a large presence at the Sonoma County Fair, displaying its "Water Efficient House" in the Grace Pavilion. The interactive house provides tips for saving water inside and outside the home as well as rebate information for each of the Partners' service areas. About 223,000 people visited the County Fair this year.

EPA WaterSense 2017 SUSTAINED EXCELLENCE

AWARD STREAK CONTINUES

The Partnership was award two 2017 U.S. EPA WaterSense Awards continuing an award streak that began in 2013. Each year, 20 WaterSense Awards are given nationally to industry leaders who support WaterSense in its mission to promote water use efficiency. The Partnership received its first ever 2017 Sustained Excellence award for its Qualified Water Efficient Landscape Program and received the 2017 Excellence Award for Outreach and Education.

For more about WaterSense, visit www.epa.gov/watersense.

EPA WaterSense 2017 EXCELLENCE AWARD

SONOMA - MARIN SAVING WATER PARTNERSHIP

City of Cotati
(707) 665-3631
www.ci.cotati.ca.us

Marin Municipal Water District
(415) 945-1520
www.marinwater.org

City of Petaluma
(707) 778-4507
cityofpetaluma.net/wrcd

North Marin Water District
(415) 761-8933
www.nmwd.com

City of Rohnert Park
(707) 588-3300
www.rpcity.org

Sonoma County Water Agency
(707) 547-1933
sonomacountywater.org

City of Santa Rosa
(707) 543-3985
srcity.org/water

Town of Windsor
(707) 838-1004
townofwindsor.com

City of Sonoma
(707) 933-2237
www.sonomacity.org

Valley of the Moon
Water District
(707) 996-1037
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Appendix B

Forecast-Informed Reservoir Operations:

Preliminary Viability Assessment for Lake Mendocino (Summer 2017)

FORECAST INFORMED RESERVOIR OPERATIONS: PRELMINARY VIABILITY ASSESSMENT FOR LAKE MENDOCINO

PREPARED BY SONOMA COUNTY WATER AGENCY · SUMMER 2017

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BACKGROUND

Lake Mendocino, located on the East Fork of the Russian River in California, has a total storage capacity of 122,500 acre-feet. Lake Mendocino is created by Coyote Valley Dam, which was constructed in 1958 for flood control, and provides water supply, recreation and stream flow.

The US Army Corps of Engineers (Corps) owns the project and makes flood control releases in accordance with the Water Control Manual (WCM). Sonoma County Water Agency (SCWA) is the local partner and controls releases when water levels are in the water supply pool.

The WCM, issued in 1959 and with minor revisions in 1986, was developed without the benefit of modern forecasting methods. The WCM specifies reservoir operation according to a rule curve, which dictates water storage during a flood event and water releases soon thereafter to create storage space for the next potential flood. The rule curve is predicated on historical weather patterns – wet during the winter, dry otherwise.

THE PROBLEM The rule curve does not account for increased variation in weather patterns and reductions to inflows into Lake Mendocino resulting from a 56% reduction of diversions from the Eel River due to changed hydroelectric facility operations. This region experiences some of the most variable weather in California, with frequent droughts and floods. As a result, the water supply reliability of Lake Mendocino is impaired with significant consequences to downstream municipal and agricultural water users as well as endangered coho salmon, threatened steelhead trout and Chinook salmon.

A VIABLE SOLUTION Applying scientific advances in weather and stream flow prediction can lessen the impacts of weather extremes without the need for expensive infrastructure expansion. This cost-effective approach, called Forecast

(over)

Informed Reservoir Operations (FIRO), is being assessed for its viability to optimize water management and improve resilience of Lake Mendocino.

A Steering Committee is working collaboratively on this project, which has transferability potential to other reservoirs. The preliminary viability assessment (PVA), which will be released in August 2017, finds that FIRO is a viable approach to improving management of Lake Mendocino in anticipation of upcoming conditions. Specifically, the PVA (available at link) finds that:

- Integrating forecasts of inflows into the reservoir and downstream flows into the river into decisions about reservoir releases would permit operators to more reliably meet water management objectives and environmental flows in the Russian River basin.
- Based on data from 1985-2010, median end of year reservoir storage attributable to FIRO was modeled and found to range from 8,633 AF to 27,780 AF, or up to a 49% increase.
- Making decisions about reservoir releases based on forecasts of reservoir inflows and local flows does not adversely affect flood risk management.
- Atmospheric River-type storms are the key drivers of both drought and flood risk in this region, as these events produce heavy and sometimes prolonged precipitation. The high-impact storms of 2017, following a years-long drought, illustrate the type of extremes that the watershed can experience in relatively short time periods.
- Current forecasting skill, especially during extended dry periods, provides an opportunity to implement some elements of FIRO. However, significant uncertainty remains in the strength, timing, duration, and orientation of land-falling Atmospheric Rivers.

PROJECT STATUS AND APPLICATION TO OTHER AREAS

Based on the results of the PVA, the Steering Committee is developing a FIRO Final Viability Assessment. The Final Viability Assessment will consider and recommend FIRO strategies that could be implemented in the near-term using current technology and scientific understanding, and identify and develop new science and technologies that can ensure FIRO implementation is safe and successful in the long term.

The Steering Committee is developing a plan for using FIRO to support requests to the Corps for deviations to the WCM over the next few years. Deviation requests will be designed to explore the viability of implementing FIRO strategies using current forecast skill and technology with the appropriate limitations that meet Corps conditions for deviations.

Finally, additional research will be conducted by the contributing agencies and centers, including CW3E, SCWA and Corps ERDC. The results of these studies will be included in the Final Viability Assessment to answer key questions identified in the PVA. Transferability of this project to other reservoirs and to flood reduction potential of FIRO will also be assessed.

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