SONOMA COUNTY WATER AGENCY

CF/42-0.19-9 SWRCB ORDER APPROVING TEMPORARY URGENCY CHANGE IN PERMITS 12947A, 12949, 12950 & 16596 FOR 2012

April 5, 2012

Barbara Evoy, Deputy Director of Water Rights
State Water Resources Control Board
Division of Water Rights
P.O. Box 2000
Sacramento, CA 95812-2000

RE: Petition for Temporary Urgency Change—Permits 12947A, 12949, 12950, and 16596

Dear Ms. Evoy:

Enclosed is a Petition for Temporary Urgency Change to modify the minimum instream flow requirements for the Russian River as established by Decision 1610 for Permits 12947A, 12949, 12950 and 16596. Accompanying the petition are the following:

1) A supporting analysis document: *Instream Flow Analysis for 2012 Temporary Urgency Change Petition.*
2) Notice of Exemption
3) California Department of Fish and Game (DFG) Review Fee Payment
4) State Water Resources Control Board (SWRCB) Petition Fee Payment

The petition is being submitted as required by the Russian River Biological Opinion issued by NOAA National Marine Fisheries in September 2008. The Sonoma County Water Agency requests that the Division of Water Rights act expeditiously to approve the requested changes to minimum instream flows as identified in the Russian River Biological Opinion.

I look forward to working with the State Water Resources Control Board and Division of Water Rights staff on this important conservation effort.

Sincerely,

Grant Davis
General Manager

c D. Butler, W. Hearn – National Marine Fisheries Service
E. Larson - CA Department of Fish & Game
P. Jeane, D. Seymour, T. Schram – Sonoma County Water Agency
S. Shupe, C. O'Donnell – Sonoma County Counsel
A. Lilly – Bartkiewicz, Kronick & Shanahan

RW\\fileserver\Data\CL\pinks\week 04-02-12\TUCP Transmittal Apr 2012.docx

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, Web: http://www.waterrights.ca.gov

PETITION FOR TEMPORARY URGENCY CHANGE

(Water Code 1435)

__X__ Change in Instream Flow Requirements

Applications # 12919A, 15736, 15737, 19351 Permits # 12947A, 12949, 12950, 16596

I (we) Sonoma County Water Agency hereby petition for a temporary urgency change(s) noted above
(Water Right Holders Name)
and described as follows:

The Sonoma County Water Agency requests that the State Water Resources Control Board make the following temporary changes to the Decision 1610 (D-1610) instream flow requirements for the period from May 1 through October 15: (a) reduce the D-1610 requirements in the Upper Russian River (from its confluence with the East Fork to its confluence with Dry Creek) to 125 cfs for Normal and Normal—Dry Spring 1 water supply conditions; (b) reduce the D-1610 requirements in the Lower Russian River (downstream of its confluence with Dry Creek) to 70 cfs for Normal and Dry water supply conditions.

These temporary changes are requested to comply with the National Marine Fisheries Service's *Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation District in the Russian River Watershed* (September 24, 2008).

The Water Agency also requests that the minimum instream flow requirement as it pertains to the Upper Russian River be specified as a 5-day running average of average daily streamflow measurements, with the stipulation that instantaneous flows will not be less than 110 cfs. This will allow the Water Agency to manage streamflows with a smaller operational buffer, thereby facilitating the attainment of flow conditions determined by NMFS and DFG to be conducive to the enhancement of salmonid habitat.

Point of Diversion or Rediversion (Give coordinate distances from section corner or California Coordinates, and the 40-acre subdivision in which the present and proposed points lie.)
Present see permits Proposed no change

Place of Use (If irrigation, then state number of acres to be irrigated within each 40-acre tract.)
Present see permits Proposed no change

Purpose of Use
Present see permits Proposed no change

Does the proposed use serve to preserve or enhance wetlands habitat, fish and wildlife resources, or recreation in or on the water (See WC 1707)? No (yes/no)

****This question was answered 'No' because this petition is not being filed under Water Code section 1707. However, the requested temporary changes will benefit fish resources, for the reasons stated in NMFS's Biological Opinion.*

The temporary urgency change(s) is to be effective from May 1, 2012 to October 15, 2012
(Cannot exceed 180 days)

Will this temporary urgency change be made without injury to any lawful user of water? Yes (yes/no)

Will this temporary urgency change be made without unreasonable effect upon fish, wildlife, and other instream beneficial uses? Yes (yes/no)

State the "Urgent Need" (Water Code 1435(c)) that is the basis of this temporary urgency change petition (attach additional information as necessary):
see attachment *Instream Flow Analysis for 2012 Temporary Urgency Change Petition*

If the point of diversion or rediversion is being changed, is any person(s) taking water from the stream between the old point of diversion or rediversion and the proposed point?
Not Applicable (yes/no)

Are there any persons taking water from the stream between the old point of return flow and the new point of return flow? Not Applicable (yes/no)
If yes, give name and address, as well as any other person(s) known to you who may be affected by the proposed change.

I (we) consulted the California Department of Fish and Game concerning this proposed temporary change. Yes (yes/no)
If yes, state the name and phone number of the person contacted and the opinion concerning the potential effects of your proposed temporary urgency change on fish and wildlife and state the measures required for mitigation.

The Agency has been coordinating activities related to the Biological Opinion and DFG's Consistency Determination with Richard Fitzgerald (707-944-5568) and Eric Larson (707-944-5528) of the California Department of Fish and Game (DFG).

Contacts at NOAA National Marine Fisheries Service for the Biological Opinion are Dr. William Hearn (707-575-6062) and Dick Butler (707-575-6058).

THIS TEMPORARY URGENCY CHANGE DOES NOT INVOLVE AN INCREASE IN THE AMOUNT OF THE APPROPRIATION OR SEASON OF USE. THIS TEMPORARY URGENCY CHANGE IS REQUESTED FOR A PERIOD OF ONE HUNDRED EIGHTY DAYS OR LESS.

I (we) declare under penalty of perjury that the above is true and correct to the best of my (our) knowledge and belief.

Dated April 4, 2012 at Santa Rosa, California

Signature(s) (707) 521-6210
Telephone No.

404 Aviation Boulevard, Santa Rosa, CA 95403-9019
(Address)

NOTE: All petitions must be accompanied by the **filing fee, (see fee schedule at www.waterrights.ca.gov)** made payable to the State Water Resources Control Board and an **$850 fee** made payable to the Department of Fish and Game must accompany this petition. Separate petitions are required for each water right.

April 2012

Sonoma County Water Agency

Instream Flow Analysis for 2012 Temporary Urgency Change Petition

1.0 BACKGROUND

The Sonoma County Water Agency (Water Agency) controls and coordinates water supply releases from the Coyote Valley Dam and Warm Springs Dam projects in accordance with the provisions of Decision 1610, which the State Water Resources Control Board (State Water Board) adopted on April 17, 1986. Decision 1610 specifies the minimum flow requirements for the Russian River and Dry Creek. These minimum flow requirements vary based on water supply conditions, which are also specified by Decision 1610.

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, which ever 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. <u>Normal-Dry Spring 2</u>: 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, which ever 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, 2011 to April 3, 2012, the cumulative inflow into Lake Pillsbury was 147,457 acre-feet. Consequently, the water supply condition starting April 1 was categorized as *Normal*. Based on the designation of a *Normal* water supply condition, 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) is 185 cfs and on the Lower Russian River (from the confluence with Dry Creek to the Pacific Ocean) is 125 cfs until at least the end of May. As discussed above, the water supply condition starting June 1, and in effect for the remainder of the year, will be determined based on cumulative inflow into Lake Pillsbury and the combined storage of Lake Pillsbury and Lake Mendocino on May 31. At this time, the projected cumulative inflow into Lake Pillsbury and the combined storage amount are difficult to predict because they are heavily dependent on late spring precipitation. However, based on the current hydrologic trends, the Water Agency anticipates *Normal* or *Normal-Dry Spring* 1 water supply conditions starting June 1. Consequently, the Decision 1610 required minimum instream flows in the Upper Russian River will likely be either 185 cfs or 150 cfs and on the Lower Russian River 125 cfs.

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 impacts 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 that ultimately led to this Biological Opinion led NMFS to conclude that the summer flows in the Upper Russian River and Dry Creek required by Decision 1610 are too high for optimal juvenile salmonid habitat. NMFS also concluded in the Biological Opinion that the historical practice of breaching the sandbar that builds up and frequently closes the mouth of the Russian River 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 and salmon if the estuary was managed as a seasonal freshwater lagoon. 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 preventing flooding of adjacent 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 (Petition filed 6/23/2009);
- 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 mainstem Russian River and its tributaries; and
- Continuing to participate in the Coho Broodstock 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 the National Environmental Polity Act (NEPA) and compliance with state and federal regulations. Consequently, the Biological Opinion requires that, starting 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 mainstem Russian River until the State Water Board has issued an order on the Water Agency's petition for permanent changes to the Decision 1610 minimum instream flow requirements. [1] The Biological Opinion requires the Water Agency to request that the mainstem minimum instream flow requirements be temporarily changed to the following value during *Dry* 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 2. (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 UNGENCY CHANGE TO PERMITS 12947A, 12949, 12950, 16596

As required by Water Code section 1435, subdivision (b), the 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.

---

[1] The Water Agency filed annual petitions on April 6, 2010 and April 18, 2011. The State Board issued temporary urgency change orders for the petitions on May 24, 2010 and June 1, 2011, respectively.

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).

Twenty-six years later, it appears that the flows set by Decision 1610 no longer benefit both fishery and recreation 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 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 Game (DFG) 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 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 DFG. 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

The Temporary Urgency Change Petitions (TUCP) that the Water Agency filed in 2004, 2007 and 2009 requested reductions in the Decision 1610 minimum instream flow requirements to address low storage levels in Lake Mendocino. In contrast, this petition, like the TUCPs filed in 2010 and 2011, is required by the Biological Opinion to provide improved conditions for threatened and endangered fish species. Water supply storage in Lake Mendocino as of April 3, 2012 was approximately 86,000 acre-feet, which is significantly higher than the April 3 levels observed in 2007 (71,019 acre-feet) and 2009 (53,650 acre-feet).

The proposed changes in the Decision 1610 Russian River minimum instream flows that are requested by this petition will not result in unusual circumstances. The proposed changes to minimum instream flows are within the range of those that already occur during the *Dry* and *Critical* water supply conditions specified by Decision 1610. Due to low rainfall and other hydrologic factors, flows in the Russian River from June through October for the three-year period from 2007 through 2009 have been similar to or lower than the minimum flows in the requested changes.

Because the requested changes are not driven by low storage levels in Lake Mendocino, reductions in summertime diversions by the Water Agency would not be beneficial. Under expected conditions, reducing the Water Agency's summertime diversions at Wohler-Mirabel would increase flows in the lower Russian River downstream of Wohler-Mirabel, which would exceed the minimum flows recommended in the Biological Opinion. In addition, since 2004 there has been a steady reduction in the amounts of wholesale water delivered by the Water Agency to its customers. In water year (WY) 2003/2004 the Water Agency's total water deliveries were 66,556 acre-feet. In WY 2010/2011, the Water Agency's total water deliveries were 47,045 acre-feet, a decrease of 39 percent. This is a result of a number of factors, including: (1) recent drought conditions; (2) the economic recession; and (3) significant long term conservation efforts by the Water Agency and its customers.

Historically, the Water Agency and its water contractors have implemented water use efficiency programs that align with the California Urban Water Conservation Council's Best Management Practices (BMPs). While these BMPs remain the baseline for the region, the adoption of the Sonoma Marin Saving Water Partnership in December 2010 memorialized the region's commitment to long-term, year-round water use efficiency. This partnership removes one of the most significant barriers to implementing conservation programs, funding. Each of the partners has committed to a minimum level of funding that is allocated specifically to conservation program implementation.

Furthermore, reductions in diversions by the Water Agency would likely result in increased groundwater pumping by the cities and special districts that purchase wholesale water from the Water Agency. This would have the unintended consequence of stressing local groundwater resources even though adequate surface water is available from the Russian River system.

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 last year's) that the minimum instream flow requirement as it pertains only to the Upper Russian River be implemented on a 5-day running average of average daily streamflow measurements with the condition that instantaneous flows be no less than 110 cfs. This adjustment will allow the Water Agency to manage streamflows 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 higher storage levels in the fall for increased releases for the outgoing migration of Chinook salmon and improving carry-over storage for the following year.

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 decade, 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.

State Water Resources Control Board
APR 25 2012

ORIGINAL DOCUMENT
SONOMA COUNTY WATER AGENCY

APR 30 2012

To: Davis, Jeane, Jasperse; cc: Schram ; cc: Martini-Lamb

CF/42-0.19-9 SWRCB Order Approving Temporary Urgency Change in Permits 12947A, 12949, 12950 & 16596 for 2012 (ID 4352)

Mr. Grant Davis
General Manager
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Dear Mr. Davis:

NOTICE OF SONOMA COUNTY WATER AGENCY'S PETITION FOR TEMPORARY URGENCY CHANGE OF PERMITS 12947A, 12949, 12950, AND 16596 (APPLICATIONS 12919A, 15736, 15737, 19351)

Enclosed is a public notice for Sonoma County Water Agency's (SCWA) petition for temporary urgency change in the subject permits.

California Water Code section 1438 requires that the petitioner provide public notice of its petition for temporary urgency change. Accordingly, enclosed is a copy of the public notice for SCWA to publish in the below-listed newspapers. The Division of Water Rights will post the notice on its website at http://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/transfers_tu_notices/index.shtml and distribute it through its electronic notification system.

As stated above, SCWA is directed to publish the notice, once only, in the following newspapers:

The Press Democrat
P. O. Box 569
Santa Rosa, CA 95402

Ukiah Daily Journal
P. O. Box 749
Ukiah, CA 95482-0749

The notice must be published in these newspapers as soon as practicable. The petitioner is responsible for all expenses associated with newspaper publication.

SCWA must file proof of publication with this office within 10 days of publication. Proof of publication shall consist of an affidavit of the publisher or foreman of the newspaper, attached to a copy of the notice, as published.

Parties filing objections to the petition shall furnish SCWA, as well as this office, a copy of their objections. We will then notify SCWA of the objections to which it must respond.

Should you have further questions in this matter, please contact Emily Wallace at (916) 341-5803 or ewallace@waterboards.ca.gov. Written correspondences or inquiries should be addressed as follows: Division of Water Rights, Attn: Emily Wallace, PO Box 2000, Sacramento, CA 95812-2000.

Sincerely,

Katy Lee, Chief
Russian River Watershed Unit

Enclosure

State Water Resources Control Board

NOTICE OF A TEMPORARY URGENCY CHANGE PETITION BY SONOMA COUNTY WATER AGENCY REGARDING PERMITS 12947A, 12949, 12950, AND 16596 (APPLICATIONS 12919A, 15736, 15737, 19351)

COUNTY: MENDOCINO, SONOMA

STREAM SYSTEM: RUSSIAN RIVER
PACIFIC OCEAN

The Sonoma County Water Agency (SCWA) filed a Temporary Urgency Change petition (TUCP) with the State Water Resources Control Board (State Water Board), Division of Water Rights (Division) on April 9, 2012, requesting reductions to the minimum instream flow requirements for the Russian River as follows:

(1) From May 1 through October 15, 2012, reduce the instream flow requirement 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, with the understanding that SCWA will measure this flow requirement as a 5-day running average of average daily streamflow measurements and that instantaneous flow will not be less than 110 cfs.

(2) From May 1 through October 15, 2012, reduce the instream flow requirement for the lower Russian River (downstream of its confluence with Dry Creek) from 125 cfs to 70 cfs.

No changes to the instream flow requirements for Dry Creek are requested. The TUCP was filed to comply with mandates in the Russian River Biological Opinion (Biological Opinion) issued by the National Marine Fisheries Service (NMFS) on September 24, 2008.

With the TUCP, SCWA submitted a document prepared by its staff and titled, "Sonoma County Water Agency, Instream Flow Analysis for 2012 Temporary Urgency Change Petition" (Analysis) dated April 2012. The Analysis provides: (1) a summary of minimum instream flows required under State Water Board Decision 1610 (Decision 1610); (2) an assessment of current water supply conditions of the Russian River System; (3) a summary of the Biological Opinion; and (4) a summary of the criteria for approving a TUCP. The Analysis indicates that, unlike the TUCPs filed by SCWA in 2004, 2007 and 2009, which requested reductions in minimum instream flow requirements in response to low storage levels in Lake Mendocino, the 2012 TUCP, like the TUCPs filed in 2010 and 2011, is required by the Biological Opinion in order to benefit threatened and endangered fish species.

Under the federal Endangered Species Act, steelhead, coho salmon and Chinook salmon in the Russian River watershed are listed as threatened or endangered species. The Biological Opinion is the culmination of more than a decade of consultation under Section 7 of the

Endangered Species Act among SCWA, U.S. Army Corps of Engineers (Corps), and NMFS regarding the impacts of SCWA's and the Corps' water supply and flood control operations in the Russian River watershed on the survival of these listed fish species.

The Biological Opinion includes a finding that summer flows in the Upper Russian River and Dry Creek required by Decision 1610 are too high for optimal juvenile salmon and steelhead habitat within the Russian River system. Two types of issues associated with high summer flows are discussed therein: 1) high summer flows create current velocities that limit the amount of freshwater rearing habitat available to salmon and steelhead, and 2) high summer 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 concludes that minimum instream flows lower than those required by Decision 1610 would result in improved salmon and steelhead rearing habitat in the mainstem Russian River. In addition, higher fall storage levels in Lake Mendocino would allow for enhanced management of Russian River flows in early fall for the benefit of fish migration.

Without approval of the requested modifications to the instream flow requirements, SCWA will continue to be required to operate under Decision 1610, which, according to the Biological Opinion, will jeopardize the recovery of salmon and steelhead in the Russian River and its tributaries.

This notice, SCWA's TUCP, and related project information can be viewed at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/transfers_tu_notices/index.shtml. The Biological Opinion and related information is available on SCWA's website at: http://www.scwa.ca.gov.

Pursuant to California Water Code section 1438(d), any interested person may file an objection to the TUCP. The procedure for addressing an objection is described in Water Code section 1438. Objections filed in response to this notice should be submitted to the persons listed below and must be received by 4:30 p.m. on May 24, 2012.

Send objections to both:

Emily Wallace	Grant Davis
Permitting Section	General Manager
Division of Water Rights	Sonoma County Water Agency
State Water Resources Control Board	404 Aviation Boulevard
P O Box 2000	Santa Rosa, CA 95403-9019
Sacramento, CA 95812	

For more information regarding this project, including procedures for filing objections, please contact Emily Wallace at (916) 341-5803 or EWallace@waterboards.ca.gov.

DATE OF NOTICE: April 25, 2012

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

MAY 02 2012

Mr. Grant Davis
General Manager
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Dear Mr. Davis:

ORDER APPROVING SONOMA COUNTY WATER AGENCY'S PETITION FOR TEMPORARY URGENCY CHANGE OF PERMITS 12947A, 12949, 12950, AND 16596 (APPLICATIONS 12919A, 15736, 15737, 19351)

The enclosed Order approves the petition for temporary urgency change in the subject permits. Please review the conditions of the Order and retain the Order with your permits.

If you have any questions, please contact Emily Wallace at (916) 341-5803 or by email at ewallace@waterboards.ca.gov. Written correspondence should be addressed as follows: State Water Resources Control Board, Division of Water Rights, Attn: Emily Wallace, P. O. Box 2000, Sacramento, CA 95812-2000.

Sincerely,

Phillip Crader, Manager
Permitting and Licensing Section
Division of Water Rights

Enclosure

cc: North Coast Regional Water Quality Control Board
5550 Skylane Blvd., Suite A
Santa Rosa, CA 95403

National Marine Fisheries Service
Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404

California Department of Fish and Game
Region 3: Bay Delta Region
P.O. Box 47
Yountville, CA 94599

United States Geological Survey
California Water Science Center
6000 J Street, Placer Hall
Sacramento, CA 95819

STATE OF CALIFORNIA
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

SOURCES: Dry Creek and Russian River

COUNTIES: Sonoma and Mendocino Counties

ORDER APPROVING TEMPORARY URGENCY CHANGE

BY THE DEPUTY DIRECTOR FOR WATER RIGHTS:

1.0 SUBSTANCE OF TEMPORARY URGENCY CHANGE PETITION

On April 9 2012, the Sonoma County Water Agency (SCWA) filed a Temporary Urgency Change Petition (TUCP) with the State Water Resources Control Board (State Water Board) requesting approval of a change to the subject permits pursuant to California Water Code section 1435. The TUCP requests the following temporary modifications to the Russian River instream flow requirements as required by the September 24, 2008 National Marine Fisheries Service (NMFS) Russian River Biological Opinion (Biological Opinion) for the improvement of juvenile salmonid habitat:

(1) From May 1 through October 15, 2012, 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) be reduced from 185 cubic feet per second (cfs) to 125 cfs. 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 will be no less than 110 cfs. This provision 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.

(2) From May 1 through October 15, 2012, instream flow requirements for the Lower Russian River (downstream of its confluence with Dry Creek) be reduced from 125 cfs to 70 cfs.

No changes to the instream flow requirements for Dry Creek are requested.

2.0 BACKGROUND

In 1986, State Water Board Decision 1610 (Decision 1610) set instream flows that the State Water Board concluded would benefit both fishery and recreation uses and which 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."

(Decision 1610 at p. 21.) The State Water Board also concluded in Decision 1610 that additional fishery studies should be done. (Decision 1610 at pp. 26-27.)

Under the federal Endangered Species Act, steelhead, coho salmon, and Chinook salmon 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 U.S. Army Corps of Engineers (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 2008 NMFS Biological Opinion includes summaries of the studies, analyses of the project impacts, and a determination that the flows set by Decision 1610 no longer benefit both fishery and recreation uses. More specifically, summer flows in the Upper Russian River and Dry Creek required by Decision 1610 are too high for optimal juvenile salmon and steelhead habitat within the Russian River system. According to the Biological Opinion, two types of issues are associated with the summer flows required by Decision 1610: 1) the flows create current velocities that limit the amount of freshwater rearing habitat available to salmon and steelhead; 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 these listed species. NMFS concluded in the Biological Opinion 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. Minimum instream flows required by Decision 1610 result in flows into the estuary that make it difficult to maintain a freshwater lagoon while preventing flooding of adjacent properties.

Without the requested modifications to the instream flow requirements, the summer time flows required by Decision 1610 will continue to jeopardize the recovery of coho salmon and steelhead in the Russian River and its tributaries. The Biological Opinion required SCWA to file a petition with the State Water Board to improve conditions for listed species by seeking long term reductions in the minimum Russian River instream flow requirements contained in SCWA'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 Branch [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.

One of the species listed under the federal Endangered Species Act (coho salmon) is also listed under the California Endangered Species Act (CESA). The California Department of Fish and Game (DFG) 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.

SCWA's TUCP involves the following permits:

- Permit 12947A is for year-round direct diversion of 92 cubic feet per second (cfs) from the Russian River and storage of 122,500 acre-feet per annum (afa) in Lake Mendocino.

- Permit 12949 is for year-round direct diversion of 20 cfs from the Russian River at the Wohler and Mirabel Park Intakes near Forestville.

- Permit 12950 is for 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.

- Permit 16596 is for year-round direct diversion of 180 cfs from the Russian River and storage of 245,000 afa in Lake Sonoma from October 1 of each year to May 1 of the succeeding year.

With the TUCP, SCWA submitted a document titled, "Sonoma County Water Agency, Instream Flow Analysis for 2012 Temporary Urgency Change Petition" (Analysis) dated April 2012. The Analysis provides: (1) a summary of minimum instream flows required under Decision 1610; (2) an assessment of current water supply conditions of the Russian River System; (3) a summary of the Biological Opinion; and (4) a summary of the criteria for approving a TUCP. The Analysis indicates that, unlike the TUCPs filed by SCWA in 2004, 2007 and 2009, which requested reductions in minimum instream flow requirements in response to low storage levels in Lake Mendocino, the TUCP filed in 2012, like the TUCPs filed in 2010 and 2011, is needed in order to benefit threatened and endangered fish species by allowing flows consistent with those specified in the Biological Opinion.

Following is the language contained in SCWA's permits regarding minimum instream flow requirements:

Term 20 of SCWA's Permit 12947A states:

For the protection of fish and wildlife, and for the maintenance of recreation in the Russian River, permittee shall pass through or release from storage at Lake Mendocino sufficient water to maintain:

(A) A continuous stream flow in the East Fork Russian River from Coyote Dam to its confluence with the Russian River of 25 cfs at all times.

(B) The following minimum flows in the Russian River between the East Fork Russian River and Dry Creek:

(1) During normal water supply conditions when the combined water in storage, including dead storage, in Lake Pillsbury and Lake Mendocino on May 31 of any year exceeds 150,000 af 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) During normal water supply conditions and when the combined water in storage, including dead storage, in Lake Pillsbury and Lake Mendocino on May 31 of any year is between 150,000 af or 90 percent of the estimated water supply storage capacity of the reservoirs, whichever is less, and 130,000 af or 80 percent of 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) During normal water supply conditions and when the combined water in storage, including dead storage, in Lake Pillsbury and Lake Mendocino on May 31 of any

year is less than 130,000 af 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

(4) During dry water supply conditions 75 cfs

(5) During critical water supply conditions 25 cfs

(C) The following minimum flows in the Russian River between its confluence with Dry Creek and the Pacific Ocean to the extent that such flows cannot be met by releases from storage at Lake Sonoma under Permit 16596 issued on Application 19351:

(1) During normal water supply conditions	125 cfs
(2) During dry water supply conditions	85 cfs
(3) During critical water supply conditions	35 cfs

For the purposes of the requirements in this term, the following definitions shall apply:

(1) Dry water supply conditions exist when cumulative inflow to Lake Pillsbury beginning on October 1 of each year 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
160,000 acre-feet as of June 1

(2) Critical water supply conditions exist when cumulative inflow to Lake Pillsbury beginning on October 1 of each year 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
75,000 acre-feet as of June 1

(3) Normal water supply conditions exist in the absence of defined dry or critical water supply conditions.

(4) The water supply condition designation for the months of July through December shall be the same as the designation for the previous June. Water supply conditions for January through June shall be predetermined monthly.

(5) Cumulative inflow to Lake Pillsbury is the calculated algebraic sum of releases from Lake Pillsbury, increases in storage in Lake Pillsbury, and evaporation from Lake Pillsbury.

(6) Estimated water supply storage space is the calculated reservoir volume below elevation 1,828.3 feet in Lake Pillsbury and below elevation 749.0 feet in Lake

Mendocino. Both elevations refer to the National Geodetic Vertical Datum of 1929. The calculation shall use the most recent two reservoir volume surveys made by the U. S. Geological Survey, U. S. Army Corps of Engineers, or other responsible agency to determine the rate of sedimentation to be assumed from the date of the most recent reservoir volume survey.

Term 17 of both Permit 12949 and Permit 12950 require SCWA to allow sufficient water to bypass the points of diversion at the Wohler and Mirabel Park Intakes on the Russian River to maintain the following minimum flows to the Pacific Ocean:

(1) During normal water supply conditions	125 cfs
(2) During dry water supply conditions	85 cfs
(3) During critical water supply conditions	35 cfs

Term 13 of Permit 16596 sets forth the following minimum flows for Dry Creek and the Russian River:

(A) The following minimum flows in Dry Creek between Warm Springs Dam and its confluence with the Russian River:

(1) During normal water supply conditions:

75 cfs from January 1 through April 30
80 cfs from May 1 through October 31
105 cfs from November 1 through December 30

(2) During dry or critical water supply conditions:

25 cfs from April 1 through October 31
75 cfs from November 1 through March 31

(B) The following minimum flows in the Russian River between its confluence with Dry Creek and the Pacific Ocean, 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 prohibited by the United States Government:

(1) During normal water supply conditions	125 cfs
(2) During dry water supply conditions	85 cfs
(3) During critical water supply conditions	35 cfs

Note: Permits 12949, 12950, and 16596 use the same water-year classification definitions as those listed in Permit 12947A. The water year classifications (Normal, Dry or Critical) were established in Decision 1610 and are based on cumulative inflow into Lake Pillsbury beginning October 1.

3.0 COMPLIANCE WITH CALIFORNIA ENVIRONMENTAL QUALITY ACT

SCWA has determined that the change is categorically exempt under the California Environmental Quality Act (CEQA). SCWA found that the change meets the Class 1, 6, 7, and 8 exemption criteria. The State Water Board has reviewed the information submitted by the SCWA and has made its own independent finding that the TUCP is categorically exempt under CEQA. 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." (Cal. Code Regs, tit. 14, § 15307.) The proposed action will assure the maintenance of a natural resource, i.e., the instream resources of the Russian River, by increasing the availability and improving the quality of steelhead and salmon rearing habitat in the Upper Russian River and more closely mimicking natural inflow to the estuary between late spring and early fall, thereby possibly enhancing the potential for maintaining a seasonal freshwater lagoon that could support increased production of juvenile steelhead. 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 assure the maintenance of the environment in the same way as stated for the Class 7 exemption. According to NMFS, the proposed action is necessary to avoid jeopardizing the continued existence of coho salmon, listed as an endangered species under the Endangered Species Act and CESA, and steelhead, listed as a threatened species under the Endangered Species Act. The proposed action also will conserve water in Lake Mendocino to benefit adult Chinook salmon migrating upstream in the fall.

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, which specifically includes maintenance of streamflows to protect fish and wildlife resources. (*Id.*, § 15301, subd. (i).) The proposed action will be within the existing operational parameters established by Decision 1610. The proposed action does not request and will not expand the water supply available to SCWA for consumptive purposes.

In addition, 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 Decision 1610 instream flow requirements required by the Biological Opinion, for which a separate petition is pending.

4.0 PUBLIC NOTICE OF THE TUCP

On April 25, 2012 the State Water Board issued and delivered to SCWA, a notice of the TUCP. Any interested person may file an objection to the temporary change with the State Water Board and the State Water Board shall give prompt consideration to any objection. Pursuant to Water Code section 1438, subdivision (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 lie. The State Water Board has posted the notice of the temporary urgency change and the TUCP (and accompanying materials) on its website. The State Water Board also distributed the notice through an electronic notification system. Pursuant to Water Code section 1438, the State Water Board may issue a temporary change order in advance of the required notice.

5.0 CRITERIA FOR APPROVING THE PROPOSED TEMPORARY URGENCY CHANGE

Water Code section 1435 provides that a permittee or licensee who has an urgent need to change the point of diversion, place of use, or purpose of use from that specified in the permit or license may petition for a conditional temporary change. 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 a TUCP for a permit or license other than a change 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 temporary urgency change, the State Water Board must make the following findings:

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.
(Wat. Code, § 1435, subd. (b)(1-4).)

5.1 Urgency of the Proposed Change

Under Water Code section 1435, subdivision (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 . . . ." However, the State Water Board shall not find the need urgent if it concludes that the petitioner has failed to exercise due diligence in petitioning for a change pursuant to other appropriate provisions of the Water Code.

In this case, an "urgent need" for the proposed changes exists within the meaning of section 1435, subdivision (c). The proposed temporary changes are "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" within the meaning of section 1435, subdivision (c). As described in the Biological Opinion, the changes will improve habitat for the listed species by reducing instream flow and 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 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, fishery experts agree that instream flows appear to be too high, and the change will not affect the ability of SCWA to deliver water for approved beneficial uses in its service area.

As stated above, beginning in 2010, SCWA will request temporary changes each year until long term changes to Decision 1610 are approved. This is expected to take 6 to 8 years, during which SCWA, DFG, Corps, NMFS, and the State Water Board will coordinate efforts to evaluate the impacts of flow regime changes on water supply, water quality, fisheries, recreation, and other uses and resources of the Russian River watershed. Potential water supply and stream flow regulation alternatives under consideration by these agencies cannot be fully analyzed based on the limited available information at this point in time; meaning a period of study and assessment is prudent to evaluate the effects of long term changes to Decision 1610.

5.2 No Injury to Any Other Lawful User of Water

Under this Order, SCWA will be required to maintain specific flows in the Russian River from its most upstream point of diversion to the river's confluence with the ocean. Therefore, it is anticipated that all SCWA water contractors and other legal users of water will receive the water to which they are entitled during the reduced flows specified in this Order. Pursuant to Water Code section 1439, the State Water Board shall supervise diversion and use of water under this temporary 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

This Order is based upon the analysis contained in the Biological Opinion, which has as its primary purpose improving conditions for the fishery resources. Improved conditions that result from this Order will be threefold. First minimum instream flows lower than those required by Decision 1610 would result in improved salmon and steelhead rearing habitat in the mainstem Russian River. Second, lowering 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. Third, the proposed reduced minimum flow requirements could encourage formation of a closed or perched lagoon at the mouth of the Russian River and therefore noticeably enhance the salmonid estuarine rearing habitat, while also conserving water and minimizing impacts to other river resources.

It is possible that reduced flows in the Russian River may impair some instream beneficial uses, principally recreation use. However, since 2004, Russian River flows have frequently been managed at decreased levels, both under Decision 1610 and under other temporary urgency change orders. Notwithstanding lower flows, Russian River recreation has continued. Accordingly, although recreation uses may be affected, given the analysis in the Biological Opinion and the potential impacts to fisheries that could occur if the TUCP were not approved, any impact on recreation for this summer is reasonable under the circumstances.

SCWA collects water quality and fishery information and data during the period that the flow reductions are in effect. These monitoring activities are summarized in annual reports intended to evaluate whether and to what extent the reduced flows caused any impacts to water quality and availability of aquatic habitat for salmonids. This information serves to inform the review and approval of the TUCP and the State Water Board's continuing supervision of the diversion and use of water under this temporary 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 the Decision 1610 instream flow requirements mandated by NMFS, for which a separate petition is pending.

SCWA also strives to make water available for reasonable beneficial use and to preserve instream values by continuing to work on water use efficiency. As part of this goal, SCWA continues to work with its Water Contractors to achieve SBx7-7's goal of reducing per capita water use 20 percent by the year 2020. Additionally, the majority of SCWA's Water Contractors require their dedicated irrigation customers be assigned a water budget designed to achieve a maximum applied water allowance of 60 percent ETo, which exceeds the State's Water Efficient Landscape Ordinance requirements.

Pursuant to Water Code section 1439, the State Water Board shall supervise diversion and use of water under this temporary change order for the protection of all other lawful users of water and instream beneficial uses.

5.4 The Proposed Change is in the Public Interest

As discussed above, the sole purpose of this Order is to improve conditions for listed Russian River salmonid species, as determined necessary by NMFS and DFG. Approval of SCWA's TUCP to reduce instream flows to benefit the fishery will also maintain storage levels in Lake Mendocino for a longer period of time so that the water is available in the fall for fishery purposes.

6.0 CONCLUSIONS

The State Water Board has adequate information in its files to make the evaluation required by Water Code section 1435.

I conclude that, based on the available evidence:

1. The permittee has an urgent need to make the proposed change;

2. The petitioned change will not operate to the injury of any other lawful user of water,

3. The petitioned change will not have an unreasonable effect upon fish, wildlife, or other instream beneficial uses; and

4. The petitioned change is in the public interest.

ORDER

NOW, THEREFORE, IT IS ORDERED THAT: the TUCP filed by Sonoma County Water Agency for Permits 12947A, 12949, 12950, and 16596 is approved, in part.

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

1. From the date of this Order until October 15, 2012, minimum flows 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:

   - Minimum instream flow in the Upper Russian River from its confluence with the East Fork of the Russian River to its confluence with Dry Creek shall be 125 cfs; and

   - Minimum instream flow in the Russian River from its confluence with Dry Creek to the Pacific Ocean shall be 70 cfs as measured at the U.S. Geological Survey gage located at Hacienda Bridge, with the understanding that SCWA will typically maintain approximately 85 cfs at the gage to provide an operational buffer.

   For purposes of compliance with this term, the minimum instream flow requirement that applies to the Upper Russian River will be implemented on a 5-day running average of average daily stream flow measurements, with the stipulation that instantaneous stream flows will be no less than 110 cfs. Minimum instream flow requirements in the Russian River from its confluence with Dry Creek to the Pacific Ocean shall be met on an instantaneous flow basis.

2. SCWA shall monitor and record daily numbers of adult Chinook salmon moving upstream past the Mirabel inflatable dam beginning no later than September 1, 2012, and continuing through at least November 15, 2012.

3. If adult Chinook salmon can enter the Russian River estuary, SCWA shall monitor numbers of adult Chinook salmon in representative deep pools in the Lower Russian River downstream of the Mirabel inflatable dam on a weekly basis beginning September 15, 2012, and ending when 200 fish have passed Mirabel Dam, when sustained flows in the Russian River at Hacienda Bridge are greater than 125 cfs, or on November 15, 2012, whichever is earliest.

4. SCWA shall monitor numbers of adult Chinook salmon at known spawning sites and in representative deep pools in the Upper Russian River (Lake Mendocino to Healdsburg) on a weekly basis after the number of adult Chinook salmon counted at Mirabel Dam exceeds 200 fish. Weekly surveys will continue until November 15, 2012, or when sustained flow at Healdsburg is above 185 cfs, whichever is earlier.

5. SCWA shall monitor juvenile salmonids and other native fishes by snorkel survey at six sites in the Upper main stem Russian River (upstream of Mirabel) between August 2012 and September 15, 2012, when suitable visibility conditions exist. Snorkel survey sites will correspond to those locations monitored by SCWA in 2010 and 2011.

6. Consistent with the requirements of the Biological Opinion, SCWA shall monitor downstream movement of juvenile salmonids in Dry Creek and the main stem Russian River at Mirabel Dam and monitor and record juvenile salmonid population and life history data at the Russian River Estuary (when river conditions permit safe monitoring).

7. SCWA shall report to NMFS and DFG every two weeks regarding the fisheries monitoring activities specified in Terms 2 through 6 of this Order. Consistent with the Biological Opinion, SCWA shall consult with NMFS and DFG regarding any necessary adaptations to the monitoring program including revisions to Terms 2 through 6. Upon consultation with NMFS and DFG, any

necessary revisions to Terms 2 through 6 shall be made upon approval by the State Water Board's Deputy Director for Water Rights (Deputy Director). Reporting of fisheries monitoring tasks described in Terms 2 through 6 shall be submitted to the Deputy Director by April 1, 2013 in accordance with NMFS and DFG annual reporting requirements as more fully described in the Biological Opinion.

8. SCWA shall prepare a Water Quality Monitoring Plan (Monitoring Plan) for the Russian River in consultation with: (1) the North Coast Regional Water Quality Control Board; (2) the United States Geological Survey; (3) NMFS; and (4) the Division of Water Rights. The objectives of the Monitoring Plan should be to provide information to evaluate potential changes primarily to water quality, but also to the availability of aquatic habitat for salmonids, resulting from the proposed long term reduction of Decision 1610 minimum instream flows required by the Biological Opinion. At a minimum, the following water quality parameters in the Monitoring Plan should be evaluated: water temperature, pH, dissolved oxygen, specific conductivity, bacteria, nutrients, and algae. Furthermore, the Monitoring Plan should build upon previous water quality studies that have been conducted in the Russian River and the estuary water quality monitoring required by the Biological Opinion, include a Quality Assurance Project Plan or description of an existing quality assurance protocol to be followed, and provide information to support the development of a CEQA document required for permanent changes to Decision 1610. Additionally, a completed Monitoring Plan that is adequate for use in future monitoring seasons will ensure collection of a continuous, comparable, and comprehensive data set. A Monitoring Plan developed in consultation with the North Coast Regional Water Quality Control Board, the United States Geological Survey, and NMFS shall be submitted to the Deputy Director for approval within 28 days of the date of this Order, and SCWA shall immediately implement the Monitoring Plan upon submittal.

9. SCWA shall summarize all data collected during the 2012 water quality monitoring program. 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 the availability of aquatic habitat for salmonids.and recreation. The report shall be submitted to the Deputy Director by March 31, 2013.

10. This Order does not authorize any act that results in the taking of a 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 to 2097) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "take" will result from any act authorized under this Order, the permittee shall obtain authorization for an incidental take permit prior to construction or operation. Permittee shall be responsible for meeting all requirements of the applicable Endangered Species Act for the temporary urgency change authorized under this Order.

11. The State Water Board reserves jurisdiction to supervise the temporary urgency change 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.

12. SCWA shall continue to work with agricultural Russian River water users to pursue opportunities that will result in improved management of the Russian River by better anticipating periods of high water demand. SCWA shall provide a written update to the Deputy Director regarding the progress of these efforts by March 31, 2013.

13. SCWA shall provide a written update to the Deputy Director by March 31, 2013 regarding activities and programs being implemented by SCWA and its Water Contractors to assess and reduce water loss and promote increasing water use efficiency.

14. SCWA shall provide a written update to the Deputy Director regarding the progress of the Santa Rosa Plain Groundwater Management Planning Program by March 31, 2013. The update shall include a discussion of: (1) progress being made towards implementation of groundwater recharge in the Santa Rosa basin; and (2) efforts by SCWA and its Water Contractors to conjunctively manage surface water and groundwater resources within SCWA's service area. Such management should emphasize the conservation and replenishment of groundwater resources and utilization of available surface water supplies to the extent feasible.

STATE WATER RESOURCES CONTROL BOARD

Barbara Evoy, Deputy Director
Division of Water Rights

Dated: MAY 02 2012

RESULTS OF THE FISHERIES MONITORING PLAN FOR THE SONOMA COUNTY WATER AGENCY 2012 TEMPORARY URGENCY CHANGE (TUC)

April 1, 2013

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

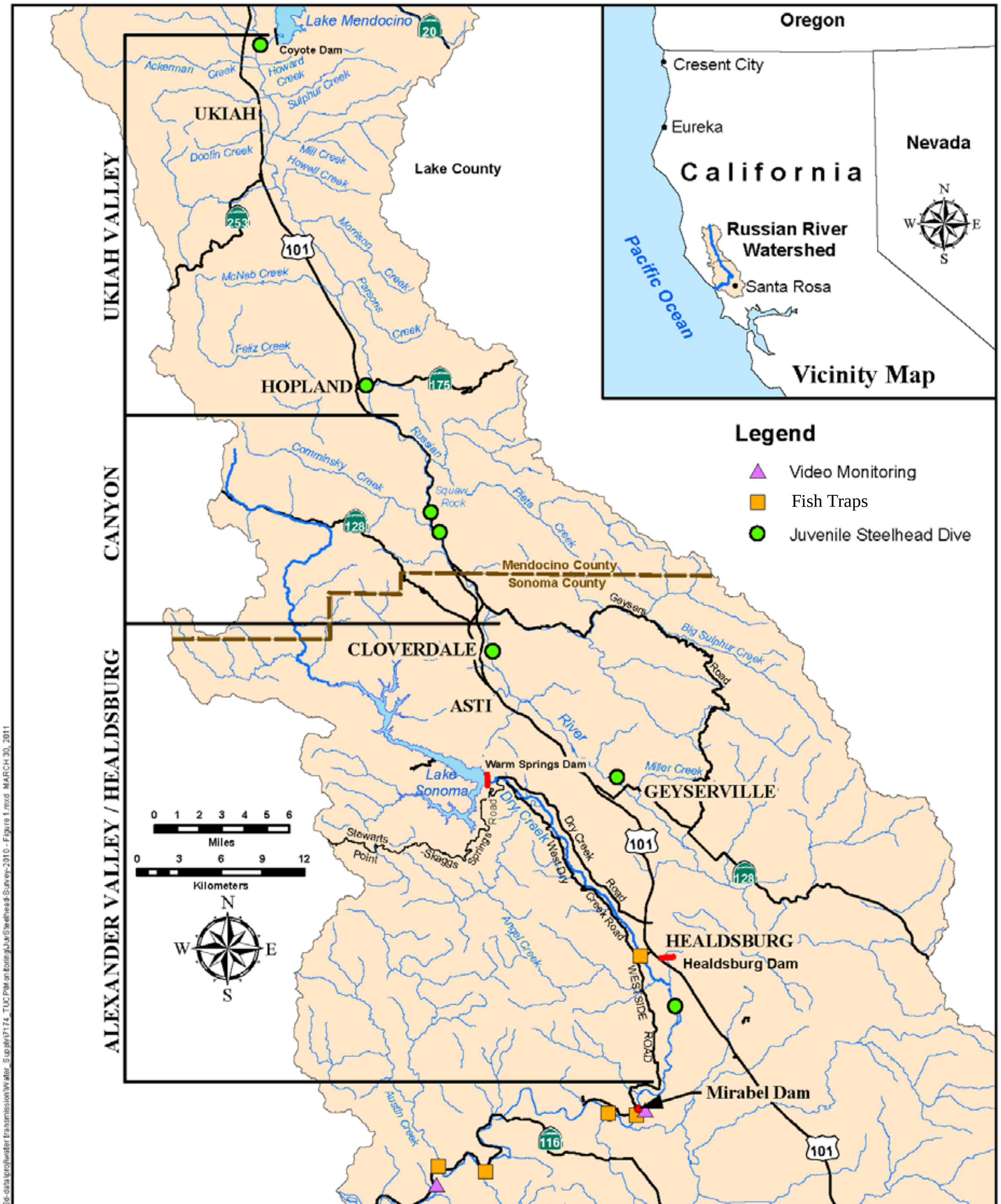
Introduction

On September 24, 2008 the National Marine Fisheries Service (NMFS) issued the Biological Opinion for Water Supply, Flood Control, and Channel Maintenance (Biological Opinion) to the U.S. Army Corps of Engineers, the Sonoma County Water Agency (Water Agency), and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed (NMFS 2008). The Biological Opinion found that high summer time flow in the Russian River under the current State Water Resources Control Board (State Water Board) Decision 1610 (D1610) degraded steelhead and coho salmon habitat.

In April of 2012, the Water Agency submitted a petition to the State Water Board requesting a temporary urgency change to D1610 to meet lower in-stream flows required by the Biological Opinion. On May 2, 2012, the State Water Board issued an "Order Approving Temporary Urgency Change" for the following temporary changes to D1610:

(1) From May 2 through October 15, 2012 in-stream flow requirements for the upper Russian River (from the confluence with the East Fork of the Russian River to its Confluence with Dry Creek) be reduced from 185 cubic feet per second (cfs) to 125 cfs.
(2) From May 2 through October 15, 2012 in-stream flow requirements for the lower Russian River (downstream of its confluence with Dry Creek) be reduced from 125 cfs to 70 cfs, with the understanding the Water Agency will typically maintain approximately 85 cfs at the Hacienda gauge as practicably feasible.

Provisions 2 through 7 of the State Water Board Order required the Water Agency to conduct and report on a number of fisheries monitoring projects. The Water Agency and State Water Board consulted with NMFS and the California Department of Fish and Game (DFG) regarding the fisheries monitoring objectives and methods. Projects included monitoring adult Chinook salmon returns at the Mirabel inflatable dam, dive surveys to monitor Chinook in the lower and upper Russian River, dive surveys to measure the relative abundance of juvenile steelhead and native freshwater fish in the upper Russian River, salmonid downstream migrant trapping operations in Dry Creek, the mainstem of the Russian River at Mirabel Dam and the Russian River estuary near Duncans Mills (Figure 1). Updates of fisheries monitoring data were sent to NMFS and DFG staff on a weekly basis per provision 7 of the State Water Board Order. While not a provision of the State Water Board Order, the Biological Opinion requires fish trap data collection in Austin Creek, Dutch Bill Creek, and Green Valley Creek (Figure 1). We present data collected at these sites in this report to supplement information required by the State Water Board Order. In spring of 2012, the results of all Water Agency Biological Opinion monitoring will be presented in a comprehensive report to NMFS and DFG.



SONOMA COUNTY WATER AGENCY

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.

Figure 1

Fisheries Monitoring Sites

Methods

Video Monitoring of Adult Salmon Migration :

The Water Agency has operated an underwater video camera system in fish ladders at the Mirabel inflatable dam to monitor the upstream migration of adult Chinook salmon for over a decade. As anadromous fish move upstream through the fish ladders on both sides of Mirabel Dam they are recorded by cameras (Figure 2). The cameras operate 24 hours a day, 7 days a week starting September 1, and ending when the dam is deflated due to high winter flows (typically in December). Video is reviewed by Water Agency biologists on a daily basis. Fish detected on the video are identified to species and enumerated. For detailed methods see Chase (2005).

Figure 2. An image of an adult coho (foreground) and an adult Chinook (background) taken from the Mirabel Dam underwater video monitoring system located on the mainstem Russian River near Forestville, CA.

Adult Chinook Salmon Dive Surveys:

The State Water Board Order requires dive surveys to be conducted in the lower mainstem provided 1.) adult Chinook are able to enter the Russian River (i.e. the river mouth was open), 2.) flows at the U.S. Geological Survey Hacienda Bridge Gage Station are below 125 cfs, and less than 200 Chinook have been observed on the Mirabel video system. Once 200 Chinook had been observed on the video system, the Water Agency is to conduct surveys at known spawning sites and relatively deep pools in the mainstem upstream of the Healdsburg memorial Dam when flows at Healdsburg are below 185 cfs.

Dive sites were selected to provide the best water velocity, river depth, and water clarity conditions to observe fish. Where feasible, sites sampled during previous years of monitoring were selected for surveys in 2010. In previous years, dive surveys were conducted at 8 sites in 2 reaches along the Russian River. The downstream reach extends from Brown's pool near Cassini's Ranch to the Mirabel Dam near the town of Forestville, CA. The Upstream reach extends from the Mirabel Dam to Diggers Bend near the Rio Linda Academy. In previous years surveys were conducted at Brown's pool near Cassini's Ranch, immediately downstream of the Vacation Beach Dam near Guerneville, immediately downstream of the Johnson Beach Dam near Guerneville, and at the pool immediately downstream of the Mirabel Dam. Upstream reach surveys were conducted at Redwood Hole approximately 3 km upstream of the Mirabel Dam, immediately downstream of the Healdsburg Memorial Dam, at the PG&E hole approximately 300 m upstream of the Healdsburg Memorial Dam, and at Diggers Bend near the Rio Linda Academy in Healdsburg. At each site, multiple divers entered the river and visually searched the dive site in an attempt to detect adult Chinook (Figure 3). General appearance and number of Chinook in each pool was noted.

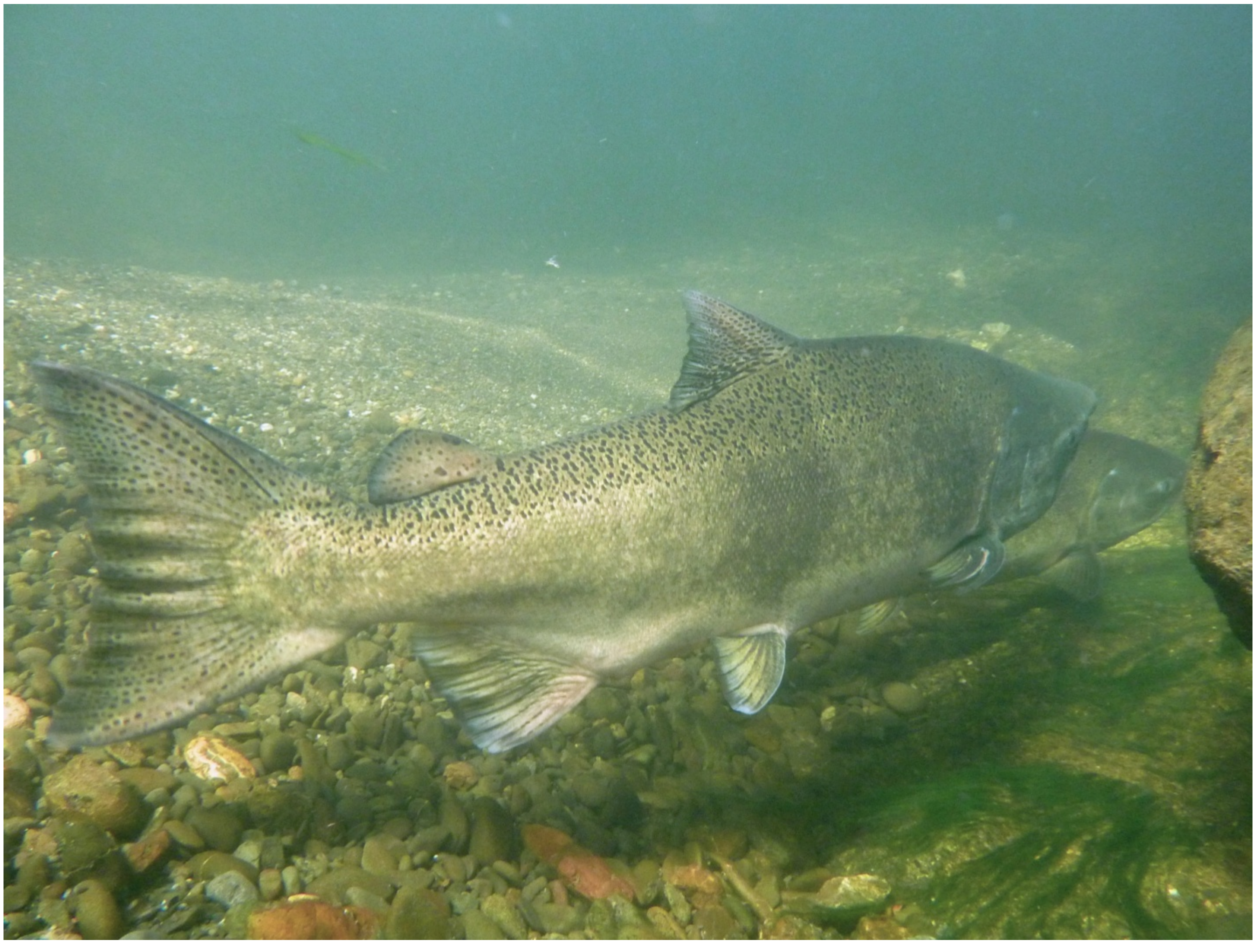


Figure 3. A photo of two adult Chinook in a pool near Healdsburg. The photo was taken during a dive survey conducted on October 11, 2012.

Juvenile Steelhead Dive Surveys:

From September 5 to September 11, 2011, the Water Agency conducted a dive survey for juvenile steelhead and native freshwater fish. A total of eight sites were sampled between Mirabel Dam and Lake Mendocino (Figure 1). Site photos are included in the Appendix. Each site was 500 m long and all but corresponded to sites sampled in 2011 (Smith 2011).

At each site, two divers entered the water at the downstream end of the sample site. The stream was divided into 2 lanes (left bank and right bank). Divers were assigned to a lane and moved upstream visually searching for fish occupying their lane. Divers would employ a serpentine swimming pattern if they could not see their entire section when swimming in a straight line. In cases when velocity was too high to swim upstream divers would start at the upstream end of the site and drift downstream attempting to remain motionless so as not to disturb fish. All fish were identified to species when possible. Fish that could not be identified to species were identified to family. Fish were grouped into 3 size classes (<100 mm total length (TL), 101-300 mm TL, and >300 mm TL). In general, steelhead <100 mm TL are young-of-the-year (YOY), steelhead 101-300 mm in length are age 1-2, and steelhead greater than 300 mm are age 3+ (Moyle 2002). At the end of a survey, fish data from all divers was recorded on a data form for each site. In addition, water temperature and water visibility was recorded.

Downstream Migrant Fish Trapping:

The Water Agency operates three types of downstream migrant traps in the Russian River basin; rotary screw traps, funnel traps, and pipe traps (Figure 4 and Figure 5). Water Agency rotary screw trap methods are detailed in Chase (2005) and Manning and Martini-Lamb (2011). Methods for funnel net and pipe trap operation in the Russian River can be found in Manning and Martini-Lamb (2011).

Fish traps located near the mouths of Mark West Creek (near Trenton Healdsburg Road) , Dutch Bill Creek, Austin Creek, near West Side Road on Dry Creek, and near Mirabel Dam on the mainstem Russian River were checked daily by Water Agency staff during the trapping season (typically from April through July). Captured fish were identified to species and enumerated. Fork length (to the nearest mm) and weight (to 0.1 g) were measured for a subset of individuals. Passive integrated transponder (PIT) tags were implanted into a subset of steelhead parr captured at the Mirabel, Dutch Bill Creek, Mark West Creek, and Austin Creek fish traps. The recapture of PIT tagged steelhead on PIT tag antennas operated by the Water Agency, at other fish traps, or during Russian River Estuary seining surveys conducted by the Water Agency provided information on steelhead movement and growth. These data are not presented here but are available in Biological Opinion annual monitoring reports.

Figure 4. A rotary screw trap on Austin Creek.

Figure 5. A pipe trap on Dutch Bill Creek.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

In addition to the aforementioned fish traps, the Water Agency also operates a video monitoring station that is comprised of a modified fyke net in the upper Estuary (Figure 6). The Estuary video system allows fish to freely move through a viewing chamber where they are detected by the underwater video camera and PIT tag reader as they exit the downstream end of the weir (Figure 7). The video system alleviates the need to handle fish and minimizes fish stress in the relatively warm water conditions of the lower Russian River.

Figure 6. The Estuary fyke net juvenile salmonid video monitoring system located near the town of Duncans Mills.

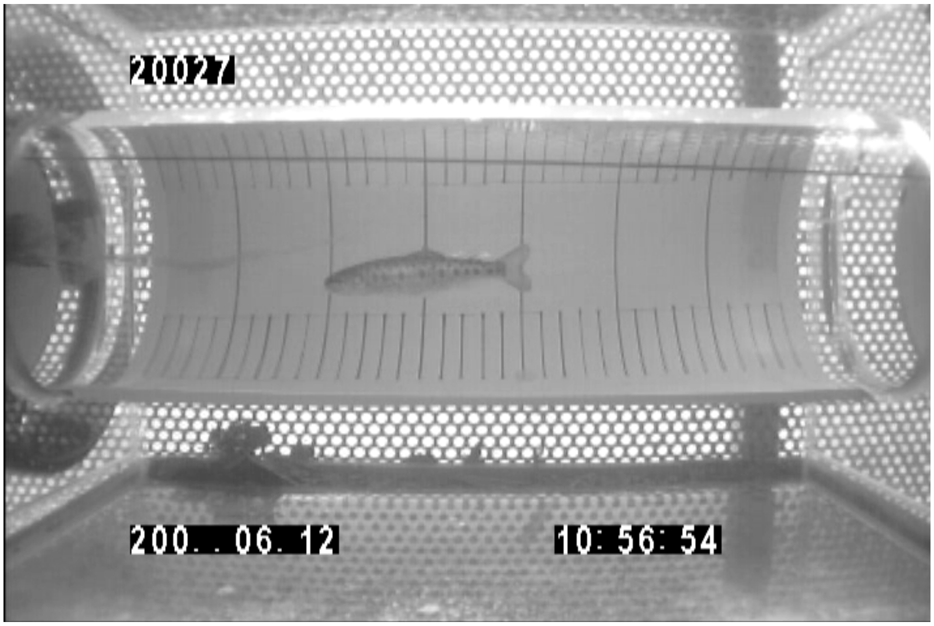


Figure 7. An image of a juvenile steelhead taken from video recoded on the Russian River Estuary fyke net juvenile salmonid video monitoring system.

Results:

Flows:

During the spring of 2012, Russian River flows were below the average stream flows for normal water years (2002, 2003, 2005, 2006). During the late summer flows in some reaches of the Russian River, such as near Hacienda and Healdsburg, were below D1610 minimum flows (Figure 8 and 9). When compared to the average daily flow at the Hacienda Bridge gaging station from 2000 to 2009 flow in 2012 was lower in the late spring and summer and slightly lower in the fall (Figure 9).

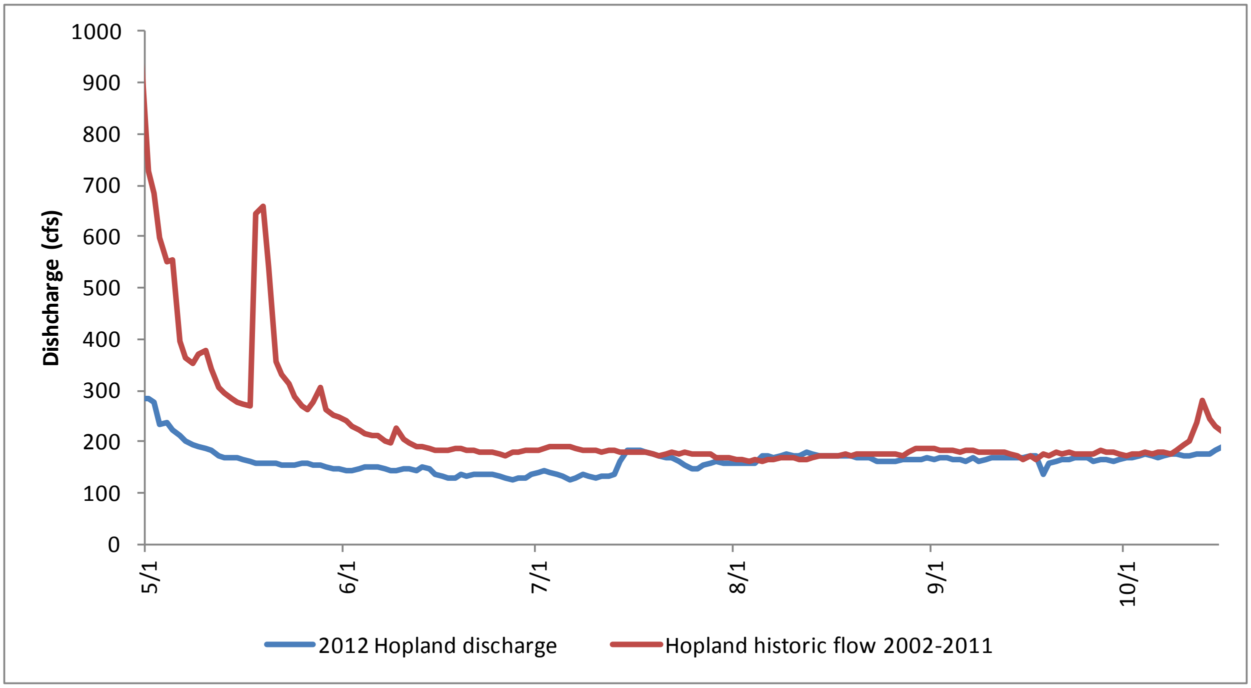


Figure 8. The average of flow of normal water years (2002, 2003, 2005, 2006) Hopland shown with weekly average flow in 2012.

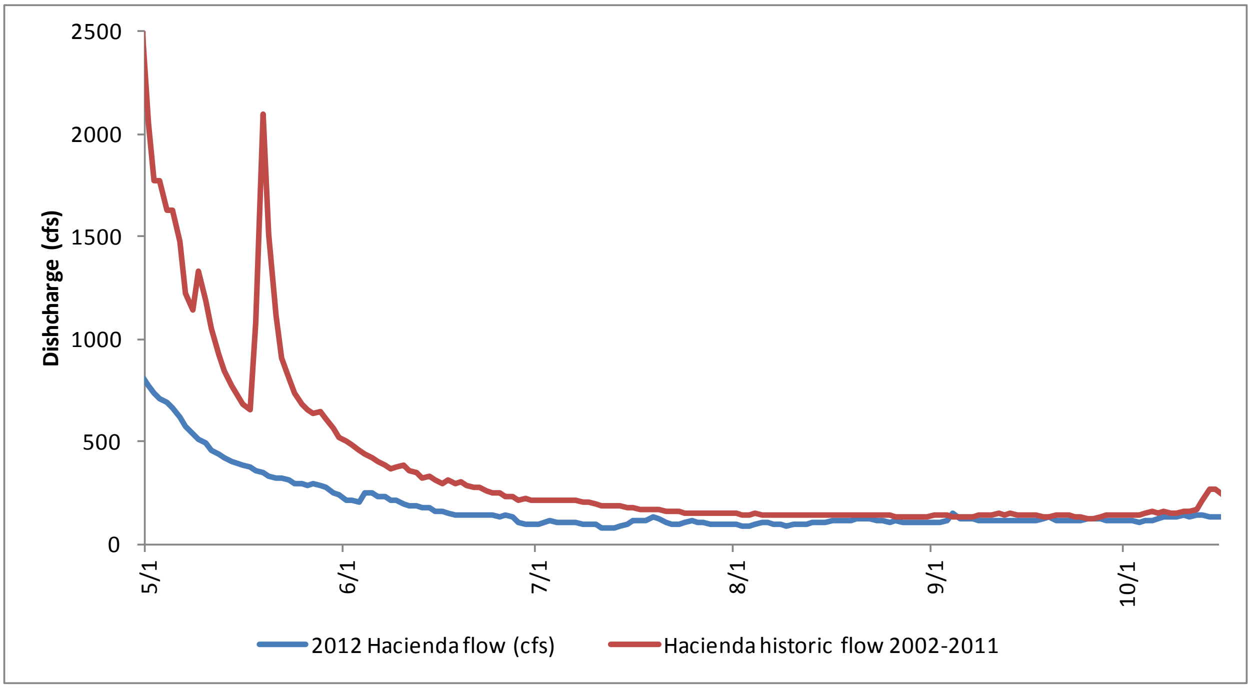


Figure 9. The average of flow of normal water years (2002, 2003, 2005, 2006) Hacienda Bridge shown with weekly average flow in 2012.

A relatively early winter storm forced the Water Agency to deflate the rubber dam at Mirabel in late November. The underwater camera system relies on counting fish as they move through fish ladders at the Mirabel inflatable dam. As a result the Water Agency was not able to monitor adult Chinook run as late into the year as is typically possible (Figure 10). Since the Mirabel dam was deflated in late November it is likely that some adult Chinook returned after the Water Agency was unable to monitor the Run. Therefore the numbers of Chinook reported here should be considered a minimum count and not the actual escapement of Chinook.

Video Monitoring of Adult Salmon Migration:

In 2012, video monitoring of adult Chinook migration past the Mirabel inflatable dam began on September 5 and continued until the dam was deflated for the season on November 21. The first Chinook of the season was observed on September 7 and the last Chinook was observed on November 21 for a total of 6,362 adult Chinook salmon. This number represents the highest count on record (Figure 11). In addition to Chinook, a total of 120 adult steelhead were also observed in 2012 (Table 1); however, because adult steelhead migration occurs relatively later than Chinook and the video system only functions when the dam is inflated, steelhead counts at Mirabel only represent minimum returns. Although coho salmon were also observed at Mirabel, their counts are preliminary at this time and are still undergoing review. Coho salmon populations in the Russian River are intensely monitored by the University of California Cooperative Extension Program/California Sea Grant.

Table 1. The number of adult Chinook salmon, and steelhead (wild and hatchery origin) observed on the Mirabel underwater camera system each week during the 2012 season. Note that the Chinook and steelhead counts may be adjusted slightly after some video is reviewed a second time by a panel of biologists.

Week start	**Chinook**	**steelhead**
1-Sep	1	0
8-Sep	1	1
15-Sep	0	1
22-Sep	14	3
29-Sep	69	3
6-Oct	61	7
13-Oct	1097	15
20-Oct	1946	5
27-Oct	1485	4
3-Nov	393	7
10-Nov	643	5
17-Nov	651	69
Total	**6362**	**120**

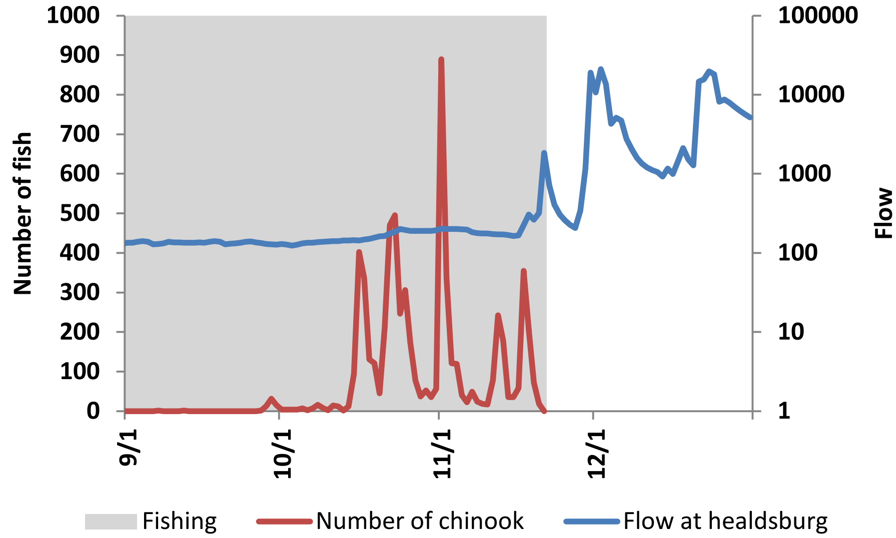


Figure 10. The number of Chinook salmon observed on the underwater camera system at Mirabel shown with the discharge at Hacienda. The days that the camera was operating is shown in grey.

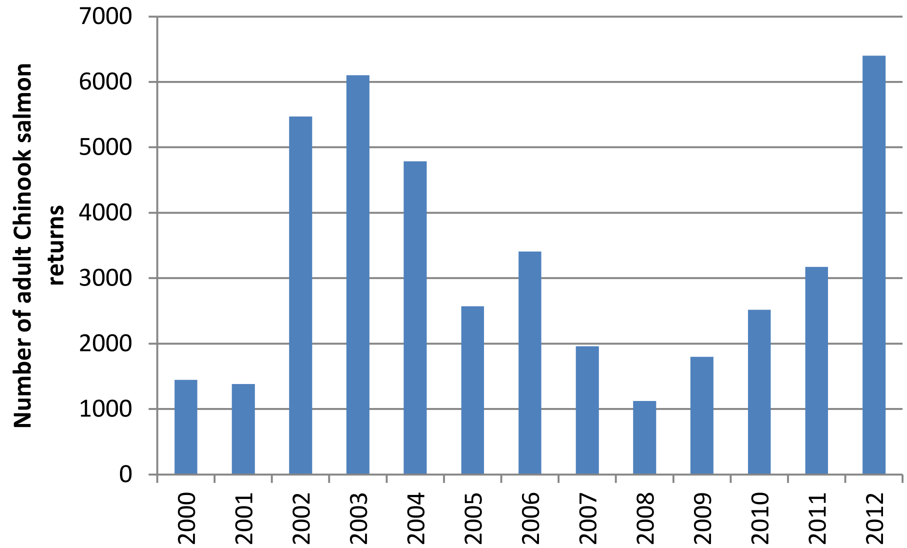


Figure 11. The number of adult Chinook observed on the underwater camera system at Mirabel from 2000 through 2012. Please note that sampling effort varied by year and direct comparisons should not be made.

Adult Chinook Salmon Dive Surveys:

Dive surveys to assess the general health and density of adult Chinook salmon were conducted by Water Agency staff in relatively deep holes in the lower Russian River in 2012. In 2012 over 200 Chinook were observed at the Mirabel fish counting station by October 15. Survey sites included pools near Duncans Mills, Vacation beach, Johnsons beach, Mirabel dam, immediately downstream from the Healdsburg Memorial Dam. In total approximately 70 large adult and 10 jack Chinook were observed during surveys that were conducted at these sites between October 11 and October 19, 2012. In addition to 1 adult coho, 3 adult, 5 juvenile, and 5 sub adult steelhead were also observed during these surveys.

Kayak based surveys to monitor adult salmon spawning activity by detecting salmon nests call redds were conducted in addition to dive surveys. In total 335 Chinook redds were observed during surveys conducted in the Russian River (Table 2). On November 14 and 15, 2012 a total of 236 chinook redds were observed in a 29 mile reach of the river between Crocker Road Bridge in Cloverdale and the Healdsburg Memorial Dam. On November 26, 2012 an additional 95 Chinook redds were observed between Lake Mendocino and Crocker Road Bridge. The section of river from the Healdsburg dam to the Wohler dam was surveyed on November 27, 2012 and 4 Chinook redds were observed. Four additional Surveys were conducted in Dry Creek from October 30, 2012 to November 27, 2012. In total 949 Chinook redds were observed in Dry Creek (Table 3). Since Dry Creek was surveyed multiple times there may be some double counting of redds between surveys. For detailed analysis of Chinook red surveys conducted in Dry Creek and the Russian River see Manning and Martini-Lamb (2013).

Table 2. The number of Chinook redds observed during kayak based redd surveys in the Russian River conducted in 2012.

	Date				
Reach	11/14	11/15	11/26	11/27	**Grand Total**
Forks of the Russian	-	-	3	-	**3**
Ukiah	-	-	90	-	**90**
Upper Alexander Valley	61	-	2	-	**63**
Middle Alexander Valley	94	-	-	-	**94**
Lower Alexander Valley	-	28	-	-	**28**
Upper Healdsburg	-	53	-	-	**53**
Lower Healdsburg	-	-	-	4	**4**
Total:	**155**	**81**	**95**	**4**	**335**

Table 3. The number of Chinook redds observed during kayak based redd surveys in Dry Creek conducted in 2012.

	Date				
Reach	10/30	11/6	11/13	11/27	**Grand Total**
Upper Dry Creek	67	178	200	298	**743**
Lower Dry Creek	24	44	74	64	**206**
Total:	**91**	**222**	**274**	**362**	**949**

Juvenile Steelhead Dive Surveys:

A total of 7,321 fish were detected during summer dive surveys consisting of 11 fish species however, only 15 juvenile steelhead were detected at the 8 survey sites (Table 4-6). Most fish consisted of native warm water species (99.7%). In 2011, 1 steelhead was found in a riffle located near a cold water seep upstream of the Highway 128 bridge crossing near Geyserville, 14 steelhead were found downstream of the confluence with Dry Creek. In comparison to the 4 sites (Ukiah below forks of the Russian River, Cloverdale above Comminski station, Cloverdale below Crocker road, and Geyserville, above hwy 128 bridge) sampled during 2002, 2009, 2010, 2011, and 2012 there were 604 steelhead detected in 2002, 2 steelhead detected during 2009, 2 steelhead during 2010, 0 in 2011, and 1 detected in 2012 (Table 4).

Water conditions during the 2012 survey were different then during 2002 and 2009 surveys, but similar to the 2010 and 2011 surveys. Water visibility was relatively poor in 2010, 2011 and 2012 when compared to 2002 and 2009. The visibility in 2012 ranged from less than 0.5 m to over 2 m. The visibility was the poorest near the confluence of the East and West Fork of the Russian River and gradually improved at downstream sample sites. During 2012 water visibility was greatest (greater than 2 m) downstream of the confluence with Dry Creek. Water temperatures in the upper sites were colder in 2012 than 2002 and 2009, but similar to 2010 and 2011. In 2012 water temperatures ranged from 12.7˚C in upper Ukiah Valley and gradually increased to 19 ˚C in the Healdsburg reach. Water temperatures at the Healdsburg dive site (downstream of the confluence of Dry Creek and the Russian River) was influenced by Dry Creek stream temperatures (12.8 ˚C at the mouth of Dry Creek and 16.8 ˚C at the downstream boundary of the survey site). The water temperature at River Front Park was 19 ˚C (Table 4).

Table 4. Steelhead observations during summer dive surveys from 2002, 2009, 2010, 2011 and 2012 in the upper Russian River. Each site consisted of a 0.5 km river section.

Reach	Location	2002						2009						2010						2011						2012					
		Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total
Ukiah Valley	Ukiah below Forks	1-2	20	21	33	1	55	0-1	16					0-1	12.5					0-1	12					0-1	12.7				
	Ukiah above Perkins Bridge	1-2	20.5	6	1		7	0-1	18					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ukiah Norgard Dam	1-2	20	51	109	1	161	0-1	16.7	3	2		5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hopland Feliz Creek confluence	-	-	-	-	-	-	1-2	17.2					0-1	15.5					0-1	15					0-1	13.8				
Canyon	Hopland above Squaw Rock	1-2	20	57	56		113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hopland below Squaw Rock	-	-	-	-	-	-	1-2	17.7					0-1	18					0-1	15		1		1	0-1	13.9				
	Cloverdale above Comminski	1-2	18.9	411	24		435	1-2	17.7	1	1		2	0-1	19					0-1	17.2					1-2	13.8				
Alexander Valley/ Healdsburg	Cloverdale below Crocker Bridge	1-2	22					1-2	21.1					0-1	21					0-1						1-2	15				
	Geyserville above Hwy 128	1-2	23	1			1	>2	22.2					1-2	21	1	1		2	0-1	20					>2	17.8	1			1
	Healdsburg Healdsburg Dam	>2	24	4	12		16	>2	23.3		1		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Healdsburg Diggers Bend	-	-	-	-	-	-	>2	21.7					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Healdsburg Dry Creek confluence	-	-	-	-	-	-	>2	15.5		10		10	>2	21	1	8		9	>2	13.8 - 18	6	9	2	17	>2	12.8 to 17.8		13	1	14
	Healdsburg above Riverfront Park	-	-	-	-	-	-	>2	16.7					-	-	-	-	-	-	>2	18.8		3		3	>2	19				
		Total:		**551**	**235**	**2**	**788**	**Total:**		**4**	**14**	**0**	**18**	**Total:**		**2**	**9**	**0**	**9**	**Total:**		**6**	**13**	**2**	**21**	**Total:**		**1**	**13**	**1**	**15**

Table 5. Observations of non-salmonids during summer dive surveys from 2002 and 2009. Each site consisted of a 0.5 km section of river. Coordinates and water conditions are shown in Table 1.

Location	Small Mouth Bass	Large Mouth Bass	Sac Sucker	Tule Perch	Hard-head	CA Roach	Sac Pike-minnow	Cyprinids	TS Stickle-back	Carp	Green Sunfish	Bluegill	Sculpin
2002													
Ukiah Valley, below Forks	0	0	83	0	0	0	0	66	10	0	0	0	0
Ukiah Valley, above Perkins Bridge	2	0	85	0	4	0	13	600	0	0	0	0	1
Ukiah Valley, Norgard Dam	1	0	511	61	1	0	0	578	300	0	0	0	2
Canyon, above Squaw Rock	0	0	298	119	10	1114	9	646	0	0	0	0	0
Canyon, above Comminski Station	2	0	1819	608	23	440	1	1297	0	0	0	0	0
Alexander Valley, below Crocker Bridge	37	0	1764	1212	40	4850	6	1454	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	5	0	239	353	18	0	14	1200	0	0	0	0	1
Healdsburg, Healdsburg Dam	370	0	196	79	91	0	6	605	0	1	27	0	1
TOTAL	**417**	**0**	**4995**	**2432**	**187**	**6404**	**49**	**6446**	**310**	**1**	**27**	**0**	**5**
2009													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, above Perkins Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Norgard Dam	0	0	0	0	0	0	0	0	0	0	0	0	0
Canyon, below Squaw Rock	4	0	115	19	36	0	23	2060	10	1	0	0	1
Canyon, above Comminski Station	5	0	449	281	201	0	29	2589	0	0	0	0	0
Alexander Valley, below Crocker Bridge	3	1	196	116	90	0	53	1775	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	14	0	222	40	102	0	33	1575	0	0	0	0	0
Healdsburg, Healdsburg Dam	309	0	160	53	1438	0	43	83	0	0	1	9	0
Ukiah Valley, Feliz Creek confluence	5	0	47	85	17	7	1	0	5	0	0	0	0
Healdsburg, Diggers Bend	470	2	450	2	219	0	45	86	0	0	4	1	0
Lower Healdsburg, Dry Creek confluence	1	0	377	13	245	0	4	415	101	0	0	0	0
Lower Healdsburg, above Riverfront Park	4	0	241	124	26	0	27	1185	0	0	0	0	0
TOTAL	**480**	**2**	**1115**	**224**	**507**	**7**	**77**	**1686**	**106**	**0**	**4**	**1**	**0**

Table 6 . Observations of non-salmonids during summer dive surveys from 2010, 2011 and 2012. Each site consisted of a 0.5 km section of river.

Location	Small Mouth Bass	Large Mouth Bass	Sac Sucker	Tule Perch	Hard-head	CA Roach	Sac Pike-minnow	Cyprinids	TS Stickle-back	Carp	Green Sunfish	Bluegill	Sculpin
2010													
Ukiah Valley, below Forks	0	0	3	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	2	0	0	0	0	20	0	0	0	0	0
Canyon, below Squaw Rock	0	0	17	1	0	0	0	800	0	0	0	0	1
Canyon, above Comminski Station	0	0	146	254	3	47	0	1561	4	0	0	0	1
Alexander Valley, below Crocker Bridge	2	0	1095	45	0	82	22	685	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	26	0	564	342	0	15	64	1985	1	0	0	0	0
Lower Healdsburg, Dry Creek confluence	6	0	48	82	220	718	53	705	0	0	3	0	0
TOTAL	**34**	**0**	**1875**	**724**	**223**	**862**	**139**	**5756**	**5**	**0**	**3**	**0**	**2**
2011													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	8	0	0	0	0	10	2	0	0	0	0
Canyon, below Squaw Rock	0	0	1	1	2	0	6	15	0	0	0	0	1
Canyon, above Comminski Station	0	0	167	231	0	49	12	630	18	0	0	0	0
Alexander Valley, below Crocker Bridge	0	0	6	0	7	18	0	34	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	15	0	215	324	138	8	76	444	400	0	0	0	5
Lower Healdsburg, Dry Creek confluence	0	0	55	24	0	0	48	95	0	0	0	0	0
Lower Healdsburg, above Riverfront Park	8	2	213	263	283	1115	167	90	0	0	0	0	1
TOTAL	**23**	**2**	**665**	**843**	**430**	**1190**	**309**	**1318**	**420**	**0**	**0**	**0**	**7**
2012													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	0	0	0	0	0	0	0	0	0	0	0
Canyon, below Squaw Rock	0	0	39	0	0	278	0	66	0	0	0	0	0
Canyon, above Comminski Station	0	0	76	151	0	180	0	430	0	0	0	0	1
Alexander Valley, below Crocker Bridge	0	4	12	20	0	150	1	0	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	13	0	865	435	88	0	64	480	0	0	0	0	0
Lower Healdsburg, Dry Creek confluence	0	0	79	23	45	18	105	1275	3	0	0	0	3
Lower Healdsburg, above Riverfront Park	1	0	380	162	115	20	84	1655	0	0	0	0	0
TOTAL	**14**	**4**	**1451**	**791**	**248**	**646**	**254**	**3906**	**3**	**0**	**0**	**0**	**4**

Downstream Migrant Fish Trapping:

Between April 6 and April 17, 2012, the Water Agency installed downstream migrant fish traps on 3 lower river tributaries (Dutch Bill Creek, Austin Creek, and Mark West Creek). The Water Agency installed rotary screw traps at Dry Creek and Mirabel April 5 and April 27, 2011, respectively. Traps were operated until out-migrant fish were no longer detected, or lower flow prevented efficient trap operation (Table 7).

Table 7. The installation and removal date and total number of days fished for the downstream migrant traps operated by the Water Agency.

Site	Installation date	Removal date	Days fished
Austin Creek	4/17	7/2	76
Dry Creek	4/5	7/31	117
Dutch Bill Creek	4/6	6/9	64
Mainstem	4/27	7/3	67
Mark West Creek	5/7	7/2	56

<u>Steelhead</u>:

In 2012, steelhead parr were frequently encountered in Austin Creek. Over the course of the 2012 trapping season, 3,666 steelhead parr were captured at the Austin Creek trap (Figure 12 and Table 8). The Water Agency applied 1,639 PIT tags to steelhead in Austin Creek. Dry Creek had a higher catch of steelhead during the 2012 trapping season. In total 4,705 wild steelhead parr and 57 wild steelhead smolts were caught at the Dry Creek trap (Figure 12 and Figure 13).

In 2012, relatively few steelhead were caught at Mirabel, Dutch Bill Creek, and Mark West Creek fish traps when compared to catches at Austin Creek and Dry Creek. In total, 983, 33, and 95 steelhead parr steelhead were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 9). While 79, 11, and 44 steelhead smolts were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 10). Please note that the above numbers reported for steelhead have not been adjusted for trap efficiencies and are not population estimates.

<u>Chinook</u>:

Chinook were most frequently encountered at the Dry Creek fish trap. In total 7,803 Chinook smolts were captured at the Dry Creek trap (Figure 14). A population estimate of 117,930 Chinook smolts (95% CI: ± 20,956) at the Dry Creek fish trap was calculated using the Dry Creek catch data and trap efficiencies.

In 2012, Mirabel had the second highest catch of Chinook (2,307 smolts, Figure 14). When adjusted for trap efficiencies Mirabel had a lower population estimate than Dry Creek. Based on trap efficacies a population estimate of 57,004 (95% CI: ± 20,560) was constructed for Mirabel in 2012 (Figure 15). In 2012 relatively few Chinook smolts were captured in Austin Creek, Dutch Bill Creek, and Mark West Creek (377, 13, and 376 respectively) (Figure 14).

Coho:

The Dutch Bill Creek trap detected the most coho salmon of the traps operated by the Water Agency to meet the requirements of the State Water Board's Order. In total 1,982 hatchery coho smolts, and 35 wild coho salmon smolts (coho with adipose fins are presumed to be wild), and 2 wild coho parr were captured at the Dutch Bill Creek fish trap. At Mirabel 270 hatchery coho smolts, 26 wild coho smolt, and 45 wild coho parr were captured (Figure 16 and 17). In Austin Creek 570 hatchery coho smolts, 37 wild coho smolt were detected at the trap (figure 16 and 17). In addition to coho smolts 584 hatchery coho parr and 372 wild coho parr were detected at the Austin Creek fish trap. At Mark West Creek 357 hatchery coho smolts, 28 wild coho smolt, and 7 wild coho parr were detected at the trap. The Dry Creek fish trap captured 127 hatchery coho smolts, 117 wild coho smolts, and 35 wild coho parr (Figure 16 and 17). Please note that the above numbers reported for coho smolts have not been adjusted for trap efficiencies and are not population estimates. For detailed analysis of downstream migrant trapping catches for coho smolts in the Russian River see Conrad (2005), Obedzinski *et al.* (2006), Obedzinski *et al.* (2007), Obedzinski *et al.* (2008) and the UCCE coho Salmon Monitoring Program results for 2011.

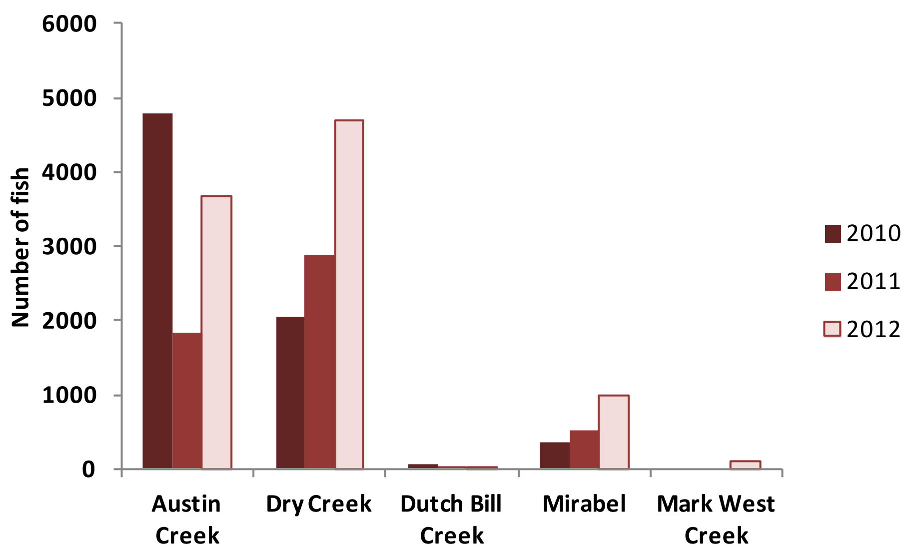


Figure 12. The number of wild steelhead parr captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

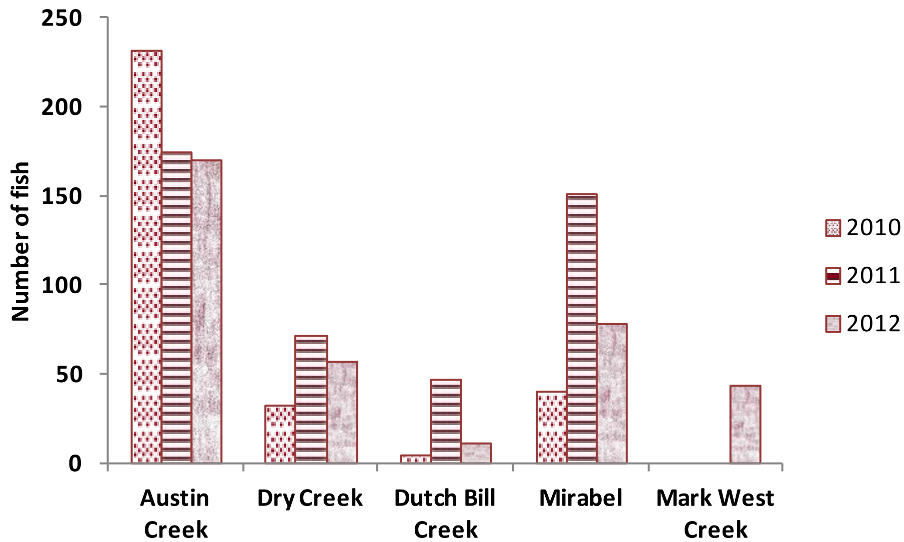


Figure 13. The number of wild steelhead smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Table 8. The annual catch of non-smolt steelhead caught during the 2000 to 2011 trapping seasons at downstream migrant traps operated by the Water Agency and UCCE. Note that dashes indicate a trap was not operated at that location during that particular year. The asterisk denotes that the Green Valley Creek trap was removed unusually early in 2011 due to trapping complications. The Mill Creek data for 2012 is not available (NA) at the time of this writing.

Tributary	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Austin Creek	-	-	-	-	-	-	-	-	-	-	4,774	1,829	3,666
DRY CREEK	-	-	-	-	-	-	-	-	-	5,207	2,049	2,879	4,704
Dutch Bill Creek	-	-	-	-	-	-	-	-	-	-	58	31	21
Estuary	-	-	-	-	-	-	-	-	-	51	-	-	-
Green Valley Creek	-	-	-	-	-	417	-	35	304	1	67	3	-
Mainstem	773	156	5,727	1,115	1,428	1,594	230	1,852	831	75	370	528	983
MARK WEST CREEK	-	-	-	-	-	-	-	-	-	-	-	-	95
Mill Creek	-	-	-	-	-	573	414	931	686	438	353	520	-
Sheephouse Creek	-	-	-	-	-	113	57	50	17	-	-	-	-
Ward Creek	-	-	-	-	-	498	351	707	-	-	-	-	-

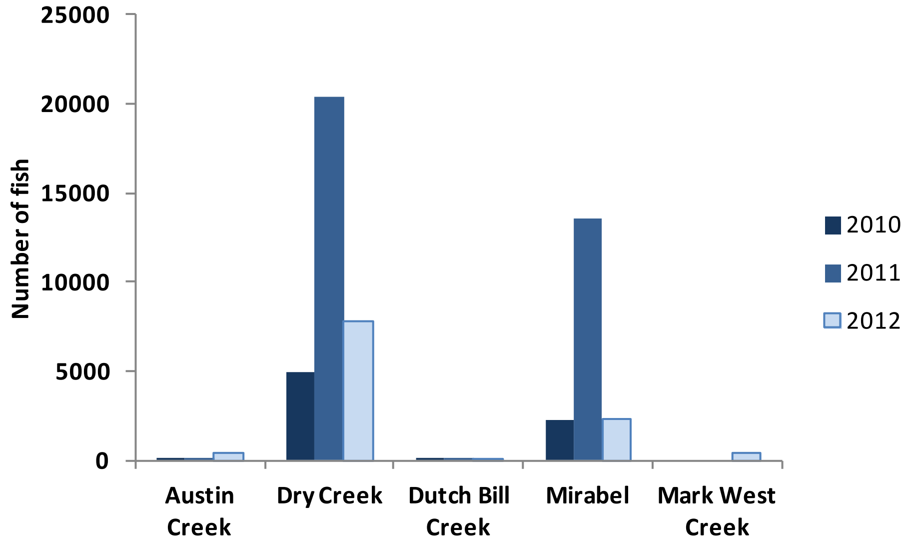


Figure 14. The number of wild Chinook smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

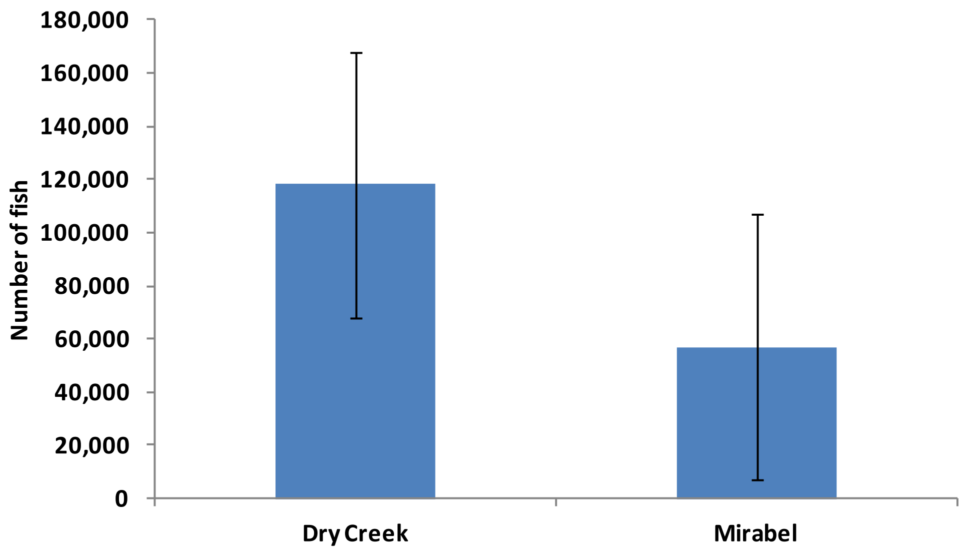


Figure 15. The population estimates for Chinook smolts at Mirabel and Dry Creek during the 2012 sampling season show with 95% confidence interval error bars.

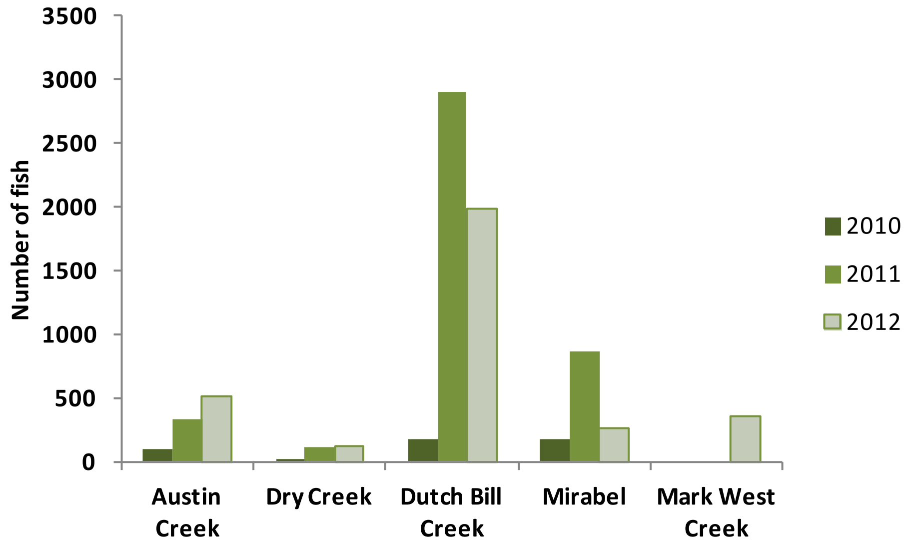


Figure 16. The number of RRCCBP coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

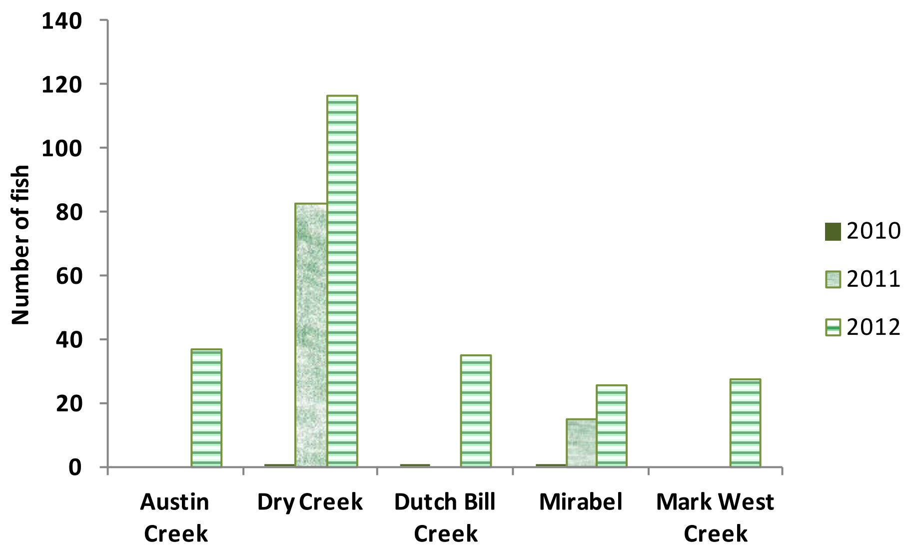


Figure 17. The number of wild coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

On June 13, 2012, the Water Agency began operating an underwater video camera near the upstream end of the Russian River estuary between Austin Creek and Moscow Road Bridge (10.5 km upstream of the mouth of the River) to monitor YOY steelhead as they made their way downstream into the Estuary. Attempts to install the camera were made as early as May 14, 2012, but the camera was damaged and was sent out for repair. Once installed the video camera recorded footage 24 hours per day through July 18. During this time 23 fish were identified as steelhead juveniles, 6 fish were identified as Chinook smolts, 3 fish were identified as coho smolts, 15 fish were identified to the family salmonidae, and 31 fish were unidentifiable (Table 9).

A PIT tag antenna array was operated at Duncans Mills during 2012 in order to detect PIT tagged steelhead as they entered the estuary. The first antenna in the array (a 4 foot by 4 foot swim through antenna) was installed on May 10, 2012. Five flat plate antennas were installed from June 7 through June 26, 2012. In total 346 steelhead parr that were PIT tagged at Austin Creek were detected at the Duncans Mills antenna. Steelhead PIT tagged at trap sites other than Austin Creek were not detected at the Duncans Mills antenna array. During the same time period that the camera was operated 78 steelhead were detected on the PIT tag antenna array. Travel time from the Austin Creek trap site to the Duncans Mills antenna array ranged from 0 to 155 days with the media travel time of 2 days. A total of 125 Chinook smolts tagged at the Dry Creek screw trap were detected at the Duncans Mills antenna array. During the period of time that the camera was operated 36 Chinook smolts were detected on the antenna array. The travel time from Dry Creek to ranged from 0 to 29 days with a median travel time of 2 days. In addition to juvenile salmonids 11 adult Chinook and 42 adult coho were detected on the antenna array.

Table 9. The number of Chinook, coho, steelhead, unknown salmonids, and unknown fish species that were observed per week on the fyke net video during the 2012 trapping season.

Week start	Chinook	Coho	Steelhead	Unknown salmonid	Unknown fish
6/13	2	0	2	2	6
6/20	2	1	4	0	1
6/27	0	2	12	4	12
7/4	0	0	0	2	5
7/11	1	0	1	0	4
7/18	1	0	4	7	3
Total	**6**	**3**	**23**	**15**	**31**

Conclusions:

Video Monitoring of Adult Salmon Migration:

Direct comparisons between years of Chinook counts at Mirabel cannot be made due to the difference in sampling periods. However relative differences in run size can be observed. The number of adult Chinook salmon observed in 2012 was the highest in the last 12 years. It is important to note that the 2012 sampling season was slightly truncated by relatively early rain storms and that more Chinook may have returned to the Russian River in 2012 than was observed on the camera system.

Adult Chinook Salmon Dive Surveys:

Adult Chinook observed during 2012 appeared healthy and not over crowded. Chinook redd surveys found Chinook redds throughout the upper Russian River and Dry Creek.

Juvenile Steelhead Dive Surveys:

Overall, steelhead abundance appeared to be lower during summer 2012 then 2002 and similar to 2009, 2010 and 2011. In the 4 sample sites that were repeatedly surveyed in 2002, 2009, 2010, 2011 and 2012, the Water Agency detected 604, 2, 2, 0, and 1 steelhead respectively. Water visibility likely played a role in the low detection rate of juvenile steelhead during the 2010 2011 and 2012 surveys. Water visibility was the poorest during the 2010, 2011, and 2012 surveys. Water visibility was greatest in 2002 (at least 1-2 meters of visibility all sites). In 2009, 2010, 2011, and 2012 the number of sites with 0-1 meters of visibility was 3, 5, 6, and 3 respectively (Table 4). However it is important to note that two of the remaining 5 sites sampled in 2012 had approximately 1.5 meters of visibility. Thurow 1994 suggests minimum water visibilities of between 1.5 and 4 meters depending on the target species and the nature of the habitat being sampled. He further suggests that surveyors should be able to see the stream bottom from the surface in the deepest portion of the sample site. These conditions were not met in many of the sample sites surveyed in 2009, 2010, 2011, and 2012. Therefore fish may have been present at these sites, but avoided detection. However, if large numbers of steelhead were present at these sites it is likely that some individuals would have been detected.

While visibility was likely a factor in the low number of steelhead detected in 2009, 2010, and 2011 the actual number of steelhead present may have been different between years. The discrepancy between juvenile steelhead counts from 2002 and steelhead counts from 2009-2012 could be explained by differences in adult steelhead returns and spawning from previous years. Some of the lowest steelhead adult hatchery returns at Warm Springs and Coyote Valley Hatcheries in the last 10 years occurred in 2008-2009, 2009-2010, 2010-2011, and 2011-2012. However the 2001-2002 adult returns were relatively strong (Figure 18). While these are not wild steelhead it is likely that both hatchery and wild steelhead smolts experienced similar ocean conditions and that the relative number of returning adults would be similar between the hatchery and wild populations. It is likely that there would be a larger population of juvenile steelhead following one or two years of strong adult returns and a smaller population of juvenile steelhead following weak adult returns. This may help explain why the survey conducted during 2002 detected more steelhead then the surveys conducted in 2009-2012.

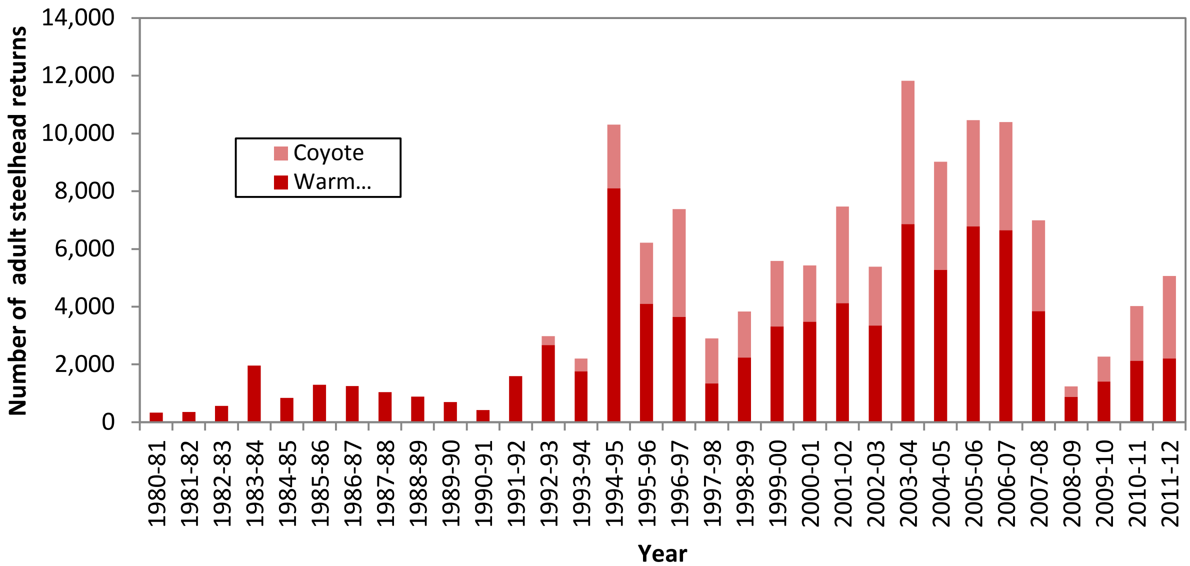


Figure 18. Hatchery returns of steelhead at Warm Springs and Coyote Hatcheries on the Russian River from 1980 to 2012.

Downstream Migrant Fish Trapping:

Steelhead:
Much of the 2012 steelhead smolt migration likely took place before the fish traps were installed. However, the traps were likely operating during the majority of time that juvenile steelhead could have moved out of Austin Creek and Dutch Bill Creek because low streamflow in these tributaries prevents fish from emigrating to the mainstem during summer.

Chinook:
Based on the population estimates of Chinook salmon passing the Dry Creek trap site in 2009, 2010, 2011, and 2012 as well as spawner survey data collected in the last 10 years (Manning and Martini-Lamb 2011), Dry Creek is an important resource for Chinook salmon in the Russian River basin. Chinook redd surveys conducted in the Russian River basin that found 22% to 44 % of Chinook redds, detected annually, in Dry Creek (Manning and Martini-Lamb 2011).

As concluded by Chase et al. (2007) and confirmed by our recent trapping data, Austin Creek and Dutch Bill Creek are less important resources for Chinook salmon.

coho:
Since all of the Water Agency's fish traps are downstream of streams stocked with hatchery coho it is not unusual to encounter hatchery coho smolts at these traps. However wild coho have become quite rare in the Russian River basin in the last 10 years. In 2012 wild coho were encountered at all of the Water Agency's traps which is likely due to the efforts of the Russian River Captive Broodstock Program. For a more detailed analysis of coho trapping data in the Russian River basin see the UCCE coho Salmon Monitoring Program results for the 2010 season.

Russian River Estuary fyke net video camera system:

When compared to the 2009 estuary fyke net trapping operations the Estuary fyke net video monitoring system operated in 2010 and 2011 improved our ability to monitor juvenile steelhead. However the number of salmonids observed in 2012 was similar to the number captured in the trap in 2009 (Manning and martini-Lamb 2011). Faulty equipment prevented us from installing the fyke net video system before Mid June. A change in environmental conditions (increase in drifting filamentous algae and a decrease in visibility) limited our ability to operate the fyke net effectively. Furthermore without the ability to measure trap efficiencies it is not possible to determine if the difference between the number of steelhead detected between years is related to a change in the number of steelhead entering the estuary, or to a change in detection rate due to modifications made to the trap or changing environmental conditions (flow, visibility, debris). Based on trap detections at Austin Creek and PIT tag detection at the fyke net it is likely that many steelhead passed the fyke net and were not detected. As a result the Water Agency in conjunction with NMFS and the California Department of Fish and Wildlife are exploring alternatives to detecting salmonids as they enter the estuary.

References

Chase, S. D., Benkert R., Manning D., White S., 2005. Sonoma County Water Agency's Mirabel rubber dam/Wohler pool fish sampling program: year 5 results, Santa Rosa, CA.

Chase, S. D., Manning, D., Cook, D., White S., 2007. Historical accounts, recent abundance, and current distribution of threatened Chinook salmon in the Russian River, California. California Fish and Game 93(3): 130-148.

Cook, D. 2003. Upper Russian River steelhead distribution study. Sonoma County Water Agency. Available at http://www.scwa.ca.gov/fisheries/.

Conrad, 2005 Annual Report for the Russian River coho Salmon Captive Broodstock Program: Hatchery Operations and Monitoring Activities. July 2004 – June 2005. http://groups.ucanr.org/RRCSCBP/files/38022.pdf

Manning D.J., Chase S., Cook, D. 2009. Results of the Fisheries Monitoring Plan to Meet State Water Resources Control Board Order WR 2009-0034 EXEC. Sonoma County Water Agency . 404 Aviation Blvd. Santa Rosa, CA 95406

Manning, D.J., and J. Martini-Lamb, editors. 2011. Russian River Biological Opinion status and data report year 2009-10. Sonoma County Water Agency, Santa Rosa, CA. 200 P.

Manning, D.J., and J. Martini-Lamb, editors. 2013. Russian River Biological Opinion status and data report year 20012-13. Sonoma County Water Agency, Santa Rosa, CA. In Press.

McGinnis, S. M., 1984. Freshwater Fishes of California. University of California Press. Berkeley and Los Angeles, California.

Moyle, P.B. 2002. Inland fishes of California. Berkeley: University of California Press.

NMFS. 2008. Biological Opinion for Water Supply, Flood Control, and Channel Maintenance to the U.S. Army Corps of Engineers, the Sonoma County Water Agency and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed. National Marine Fisheries Service, South West branch. 2008.

Obedzinski, M., J. Pecharich, G. Vogeazopoulos, D. Lewis, and P. Olin. 2006. Monitoring the Russian River coho Salmon Captive Broodstock Program: Annual Report July 2005 to June 2006. University of California Cooperative Extension and Sea Grant Program. Santa Rosa, California.

Obedzinski, M., J. Pecharich, J. Davis, D. Lewis, P. Olin. 2007. Russian River coho Salmon Captive Broodstock Program Monitoring Activities Annual Report; July 2006 to June 2007. University of California Cooperative Extension and Sea Grant Program. Santa Rosa, California.

Obedzinski, M., J. Pecharich, J. Davis, S. Nossaman, P. Olin, and D. Lewis. 2008. Russian River coho Salmon Captive Broodstock Program Monitoring Activities Annual Report: July 2007 to June 2008. University of California Cooperative Extension and Sea Grant Program. Santa Rosa, California.

Smith, J.P. 2011. Results of the Fisheries Monitoring Plan to Meet State Water Resources Control Board Order WR 2010-0018 DWR. Sonoma County Water Agency. 404 Aviation Blvd. Santa Rosa, CA 95406.

Appendix

Figure A Looking downstream at the confluence of the East and West fork of the Russian River. Note the high turbidity.

Figure C	Looking upstream at the Highway 175 Bridge above the Hopland survey site.

Figure D A diver near the bottom of the Squaw Rock survey site.

Figure E. A sculpin in the Canyon reach.

Figure F A photo of a divers hand taken in the canyon reach. Note the high turbidity.

Figure G A photo of a juvenile steelhead taken downstream of the Russian River and Dry Creek confluence.

Water Quality Monitoring Plan
for the Russian River
Sonoma County Water Agency
2012 Temporary Urgency Change

Russian River Chinook

Prepared by

Sonoma County Water Agency

May 2012

TABLE OF CONTENTS

1.0 INTRODUCTION

By letter dated April 5, 2012, the Sonoma County Water Agency (Water Agency) petitioned the State Water Resources Control Board (State Board) to temporarily reduce minimum instream flows in the Russian River as required by the National Marine Fisheries Service's (NMFS) *Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation District in the Russian River Watershed* (Russian River Biological Opinion, NMFS 2008). NMFS' Russian River Biological Opinion concluded that summer minimum instream flows required by Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile steelhead habitat. NMFS also determined that the conversion of the tidally-influenced Russian River estuary into a closed freshwater lagoon during the summer months would provide improved habitat for rearing juvenile steelhead. Given that, the Water Agency requested that the State Board make the following temporary changes to the Decision 1610 instream flow requirements:

(1) From May 1 through October 15, 2012, 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) be reduced from 185 cubic feet per second (cfs) to 125 cfs. 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 will be no less than 110 cfs. This will allow the Water Agency to manage stream flows with a smaller operational buffer, thereby facilitating the attainment of the flow conditions that the Biological Opinion concluded are conducive to the enhancement of salmonids habitat.

(2) From May 1 through October 15, 2012, instream flow requirements for the Lower Russian River (downstream of its confluence with Dry Creek) be reduced from 125 cfs to 70 cfs.

By Order dated May 2, 2012, the State Board approved the Water Agency petition. Provision 8 of the Order requires the Water Agency to submit a water quality monitoring plan to provide information to evaluate potential changes primarily to water quality, but also to the availability of aquatic habitat for salmonids, resulting from the proposed long term reduction of Decision 1610 minimum instream flows required by the Biological Opinion. The monitoring plan described hereinafter is submitted to meet the requirements of Provision 8 of the May 2, 2012 Order and in accordance with the California Environmental Quality Act (CEQA), to assess potential impacts that could occur as a result of changed flows.

2.0 BACKGROUND

Under the federal Endangered Species Act (ESA), steelhead, coho salmon and Chinook salmon in the Russian River watershed are listed as threatened or endangered species. Coho salmon is also listed as endangered under the California Endangered Species Act (CESA). In September 2008, NMFS issued the Russian River Biological Opinion, a culmination of more than a decade of consultation under Section 7 of the ESA among Water Agency, U.S. Army Corps of Engineers (Corps), and NMFS regarding the impacts of Water Agency's and Corps' water supply and flood control operations in the Russian River watershed on the survival of these listed fish species. The California Department of Fish and Game (CDFG) issued a consistency determination on November 9, 2009, finding that the Russian River Biological Opinion was consistent with the requirements of the CESA and adopting the measures identified in the Biological Opinion.

Studies conducted during the consultation period that ultimately led to this Biological Opinion indicate that summer flows required by Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile salmonid habitat. NMFS also concluded in the Biological Opinion that the historical practice of breaching the sandbar that builds up and frequently closes the mouth of the Russian River 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 and salmon if the sandbar is managed during these times, to allow for the formation of a seasonal freshwater lagoon in the Russian River estuary. Minimum instream flows required by Decision 1610 result in flows into the estuary that make it difficult to maintain a freshwater lagoon while preventing flooding of adjacent properties.

Without the requested modifications to the instream flow requirements, the high summer time flows required by Decision 1610 will continue to jeopardize the recovery of coho salmon and steelhead in the Russian River and its tributaries.

Changing minimum instream flows will assure the maintenance of a natural resource, i.e., the instream resources of the Russian River, by increasing available salmonid rearing habitat in the upper Russian River and Dry Creek, and providing a lower, closer to natural inflow to the estuary between late spring and early fall, thereby enhancing the potential for maintaining a seasonal freshwater lagoon that could support increased production of juvenile steelhead.

3.0 OBJECTIVES

Objective of this sampling and analysis plan: 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.

4.0 PURPOSE AND NEED

One of the conditions in the Order for the Temporary Urgency Change (TUC) petition states that Water Agency prepare this Water Quality Monitoring Plan (Monitoring Plan) for the Russian River. The objectives of the Monitoring Plan are to provide information to evaluate potential changes to water quality and availability of habitat for aquatic resources resulting from the proposed permanent changes to Decision 1610 minimum instream flows that are mandated by the Biological Opinion. Furthermore, the Monitoring Plan will build upon previous water quality studies that have been conducted in the Russian River and the estuary as required by the Biological Opinion, and provide information to support the development of a CEQA document required for permanent changes to Decision 1610.

Monitoring will be conducted to track potential changes to water quality associated with reduced flows in the mainstem Russian River and extended closure of the estuary during the dry season to form a summer lagoon at the mouth of the river. Mainstem and estuary monitoring will include continuous hourly monitoring of temperature, dissolved oxygen, pH, and specific conductance at several stations stretching from Ukiah to Jenner. In addition, the estuary will be monitored hourly to observe salinity concentration and stratification in the water column; as well as up and downstream migration of the salt water layer associated with tidal exchange, periods of lower instream flows, and extended sandbar closures. Water samples (grab) will also be collected by Water Agency staff and analyzed for several constituents by Alpha Labs in Ukiah and the Sonoma County Department of Health Services (DHS) Public Health Division Lab in Santa Rosa. .

Regarding water quality monitoring to support the Water Agency's CEQA compliance for changes to Decision 1610 minimum instream flow requirements, the following preliminary questions help explain the objective of the monitoring plan:

- What are the background levels of nutrients and pathogens under the current minimum instream flow levels? How do these background levels respond to changes in instream flow, considering other contributing factors?
- Does water temperature and dissolved oxygen respond to changes in minimum instream flows?
- Are there secondary biological effects related to changes in water quality related to instream flow changes (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?
- What are the background levels of nutrients and pathogens in the Estuary? How do the levels respond to managing the estuary as a closed summer lagoon, considering other contributing factors?
- Do water temperature, dissolved oxygen, and salinity respond to managing the estuary as a closed summer lagoon?
- Are there secondary biological effects related to changes in water quality as a result of managing the estuary as a closed summer lagoon (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?

5.0 SAMPLING AND ANALYSIS PLAN

5.1 Mainstem Russian River Study

5.1.1 Datasonde Deployment

In coordination with the United States Geological Survey (USGS) the Water Agency funds the maintenance and operation of five multi-parameter water quality sondes on the Russian River located at Hopland, Diggers Bend in Healdsburg, the Water Agency's river diversion facility (RDS) at Mirabel, Hacienda Bridge and Johnson's Beach (see Figure 1). These five sondes are referred to as "permanent" as the Water Agency maintains them as part of its early warning detection system. The sondes take real time readings of water pH, temperature, dissolved oxygen (DO), specific conductivity, and turbidity, every 15 minutes. The Hopland, Diggers Bend and Hacienda Beach data is provided in cooperation with the USGS on its "Real-time Data for California" website. The RDS and Johnson's Beach data is available via an "email subscription" available to the public via the Water Agency's website.

In addition to the permanent sondes, the Water Agency, in cooperation with the USGS, seasonally deploys sondes at various locations within the watershed. This year the Water Agency, in cooperation with the USGS will be installing seasonal sondes with real-time telemetry at a station north of Cloverdale at Commisky Station Road (USGS Cloverdale river gage) and at the Alexander Valley Road Bridge (USGS Jimtown river gage). The sonde at the Cloverdale gage collects DO and temperature and the sonde at the Jimtown gage collects pH, temperature, DO, specific conductivity and turbidity; both locations will transmit the data and be available on the USGS real-time website.

5.1.2 Nutrient/Bacterial/Algal Sampling

Water samples will be collected from six (6) surface-water sites in the mainstem of the Russian River (Figure 1). All samples will be analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (*e. coli* and enterococci), total and dissolved organic carbon, total dissolved solids, and turbidity (See Table 1). Sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols and procedures established by the contract laboratories (Alpha Labs and DHS Lab) and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency. As identified in Table 1, Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)". DHS will be conducting the analysis for enterococci and *e-coli.* and will be reporting the results at the LRL/PQL.

Beginning May 24, 2012, grab samples will be collected weekly (Thursdays). See Figure 1 for a map of surface-water sampling locations. Measurements of water temperature and pH will be collected using a YSI 6600 datasonde and YSI 650MDS datalogger during water sample collection; pH will be calibrated using 2 buffers prior to use each day. The temperature feature is checked against an NIST thermometer and recorded.

Russian River mainstem sites from upper to lower (Figure 1) include:

- Russian River NR Hopland (USGS gage 11462500)
- Russian River NR Cloverdale (USGS gage 11463000)
- Russian River @ Jimtown (USGS gage 11463682)
- Russian River @ Diggers Bend (USGS gage 11463980)
- Russian River @ Riverfront Park (aka NR Windsor – USGS gage 11465390)
- Russian River NR Guerneville (aka Hacienda Bridge – USGS gage 11467000)

The mainstem sampling sites have varied over the last several years based upon discussions with the coordinating agencies. This year, Upper River sample sites will be conducted at USGS gage stations and/or datasonde sites to better correlate, if possible, several water quality parameters. Duplicate field samples for non bacterial parameters are being collected at the Hacienda Bridge sample site and triplicate field samples for bacterial indicators will be collected at Jimtown and Hacienda Bridge.

These analyses will further the effort to establish a water-quality baseline for the mainstem of the Russian River. The baseline established with these analyses will help the Water Agency and other agencies to assess the influence of reduced flows in the mainstem of the Russian River during summer flow conditions.

5.1.3 Reporting

A report describing the results of the Water Agency 2012 mainstem Russian River water quality monitoring and sampling effort will be prepared as described in the TUC Order. The report will provide summaries of data observations recorded for each constituent sampled or monitored and an assessment of changes in aquatic habitat availability and impacts if any to recreational activities. The report may also provide recommendations for changes to monitoring and sampling efforts to be conducted in subsequent years. The information from this report will be used in a subsequent report being prepared by the Water Agency for the Biological Opinion that incorporates other studies and discusses trends and observations relating to the proposed permanent changes to minimum instream flows during the summer months. The report shall be submitted by March 31, 2013.

5.2 Russian River Estuary Study

5.2.1 Datasonde Deployment

Water quality monitoring will occur at ten (10) stations in the lower, middle, and upper reaches of the Russian River estuary, including tributaries and areas upstream from the estuary that become inundated during closed lagoon conditions (maximum backwater area). Eight stations will be located in the mainstem between the mouth of the river at Jenner and Monte Rio and two stations will be located in Willow and Austin Creeks, in areas that are subject to tidal and/or closed lagoon inundation. Refer to Figure 2 for a map of estuary water quality station locations.

Water Agency staff will use several Yellow Springs Incorporated (YSI) 6600 series multi-parameter datasondes (sondes) equipped with a YSI 6560 combination conductivity/temperature sensor, a YSI 6561 or YSI 6589Fr pH sensor, and either a YSI 6562 dissolved oxygen sensor or YSI 6150 optical dissolved oxygen sensor to collect water quality parameters at all sites. Sondes will be programmed to record hourly measurements of water temperature (Celsius), dissolved oxygen (milligrams per liter, mg/L), specific conductance (microsiemens), salinity (parts per thousand, ppt), and hydrogen ion (pH). Monitoring sites will be accessed by boat or by foot.

All sondes will be recalibrated following the manufacturer's 6-Series User Manual and data downloaded every two weeks by Water Agency staff. The YSI temperature sensor utilizes a thermistor that does not require calibration or maintenance. However, thermistor accuracy will be checked against a National Institute of Standards and Technology (NIST) thermometer during initial deployment to ensure the sensor is functioning properly. The YSI 6560 conductivity sensor will be calibrated using a 10,000 microsiemen (µS/cm) standard. The YSI 6561 pH sensor will be calibrated to two points using buffer solutions of pH 4, 7, and/or 10. The YSI 6562 dissolved oxygen sensor will be calibrated using the dissolved-oxygen-calibration chamber-in-air method where the calibration chamber is set-up with water and allowed to reach 100-percent saturation prior to calibration. The YSI 6150 optical dissolved oxygen sensor will be calibrated using a one-point dissolved-oxygen-calibration chamber-in-air method where the calibration chamber is set-up with water and allowed to reach 100-percent saturation prior to calibration.

Field calibration and data collection will be conducted using the YSI 650 Multiparameter Display System (MDS) datalogger designed to work with the 6-Series datasondes. Data will be downloaded onto the YSI 650 MDS and then transferred to a PC, where data will undergo analysis by Water Agency staff.

Monitoring sites (Figure 2) include:

- Russian River @ Mouth at Goat Rock State Beach (2 YSI 6600 Datasondes)
- Russian River @ Patty's Rock upstream from Penny Island (2 YSI 6600 Datasondes)
- Willow Creek at the 1st Bridge (1 YSI 6600 Datasonde)
- Russian River @ Sheephouse Creek downstream of Sheephouse Creek (1 or 2 YSI 6600 Datasondes)
- Russian River @ Heron Rookery halfway between Sheephouse and Freezeout creeks (2 YSI 6600 Datasondes)
- Russian River @ Freezeout Creek downstream of Freezeout Creek (2 YSI 6600 Datasondes)
- Russian River @ Brown's Pool downstream of Austin Creek (1 YSI 6600 Datasonde)
- Austin Creek downstream of first Steel Bridge (1 YSI 6600 Datasonde)
- Russian River @ Villa Grande (1 YSI 6600 Datasonde)
- Russian River @ Monte Rio downstream of Dutch Bill Creek (1 YSI 6600 Datasonde)

The five mainstem stations located in the lower, middle, and upper reaches of the estuary between the Mouth and Freezeout Creek will have a vertical array of two datasondes, with the exception of Sheephouse Creek which may only have one sonde in the mid-depth portion of the water column. Monitoring stations will be comprised of a concrete anchor attached to a steel cable suspended from the surface by a large buoy with sondes attached at varying depths along the cable. The rationale for choosing these sites was to locate the deepest pools at various points throughout the Estuary to obtain the fullest vertical profiles possible and to monitor anoxic events and temperature or salinity stratification. The three stations in the lower and middle estuary that are predominantly saline will have sondes placed at the surface (approximately 1-meter depth) and mid-depth portions of the water column. The two stations in the upper estuary, where water is predominantly fresh, will be located at the mid-depth and bottom of the water column.

Three additional mainstem stations will be established in the maximum backwater area, upstream from the estuary in freshwater habitat that becomes inundated during sandbar closure events. The stations at Brown's Pool and Villa Grande will have one datasonde each placed at the bottom of the pool or thalweg, which is the deepest part of the water column. They will be placed in this manner to track the potential migration of saline water upstream of Freezeout Creek during estuary closure. The Monte Rio station has not previously been observed to become saline and will have one sonde suspended at approximately mid-depth (during open conditions) in the thalweg, or deepest part of the water column. The two tributary stations in Willow and Austin creeks will each have one sonde that will be suspended at approximately mid-depth (during open conditions) in their respective thalwegs near the confluences with the Russian River.

Sondes will be located in this manner to track changes to water quality in the water column, vertically and longitudinally, within the estuary during reduced instream flows, tidal fluctuation and closure events. The placement of sondes in this manner will also allow Water Agency staff to track changes to water quality that may be associated with the migration and stratification of the salt water layer within the estuary, as well as the enhancement of habitat conditions for juvenile salmonids.

5.2.2 Nutrient/Bacterial/Algal Sampling

Water samples will be collected from 5 surface-water sites in the Russian River estuary (Figure 2). All samples will be analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (*e. coli* and enterococci), total and dissolved organic carbon, total dissolved solids, and turbidity (See Table 1). Sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A in conjunction with protocols and procedures established by the contract laboratories (Alpha Labs and DHS Lab) and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency. As identified in Table 1, Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)". DHS will be conducting the analysis for enterococci and *e-coli.* and will be reporting the results at the LRL/PQL.

Beginning May 22, 2012, grab samples will be collected every two weeks (Tuesdays) when flows are above Decision 1610 normal year levels (125 cfs – measured at USGS gauging station 11467000, near Hacienda), and will be collected weekly when flows drop below Decision 1610 normal year levels (125 cfs). See Figure 2 for a map of surface-water sampling locations. Measurements of water temperature and pH, will be collected using a YSI 6600 datasonde and YSI 650MDS datalogger during water sample collection.

Russian River Estuary sites (Figure 2) include:

- Russian River @ Jenner Boat Ramp
- Russian River @ Bridgehaven below Willow Creek
- Russian River @ Duncans Mills above Freezeout Creek
- Russian River @ Casini Ranch below Austin Creek
- Russian River @ Monte Rio below Dutch Bill Creek

Duplicate field samples for non bacterial parameters and triplicate field samples for bacterial indicators will be collected at the Monte Rio sampling site. Additional focused sampling will also occur under certain conditions and following specific river management and operational events, noted below, at the sites listed above.

- Removal of Johnson's Beach and/or Vacation Beach Dam – 3 samples within 10 days after dam removal
- Sandbar Closure – 3 samples within 10 days (or weekly)
- Sandbar Breach – 3 samples within 10 days after breach
- Lagoon Outlet Channel implementation – 3 samples within 10 days after implementation.

At the conclusion of any focused sampling event, regular sampling will resume following the schedule based on flows, as described above.

These analyses will continue the Water Agency effort to establish a water-quality baseline for the Russian River estuary (including the maximum backwater area) from Monte Rio to the river mouth at Jenner. The baseline established with these analyses will enable Water Agency to assess the influence of reduced flows on water quality, including aquatic habitat availability and public recreational opportunities in the lower mainstem, the Russian River estuary under open and closed conditions, and on the operation of a lagoon outlet channel across the river mouth sandbar, during summer flow.

5.2.3 Reporting

A report describing the results of the Water Agency 2012 Russian River estuary water quality monitoring and sampling effort will be prepared as described in the Russian River Biological Opinion. The report will provide summaries of data observations recorded for each constituent sampled or monitored and the inpacts if any to aquatic habitat availability and public recreational activities. The report may also provide recommendations for changes to monitoring and sampling efforts to be conducted in subsequent years. The information from this report will be used in a synthesis report being prepared by Water Agency for the Biological Opinion that incorporates other estuary studies and discusses trends and observations relating to the proposed permanent changes to minimum instream flows and estuary management during the summer months. The report shall be submitted by March 31, 2013.

5.3 Quality Assurance Program

As previously identified sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols and procedures established by Alpha Analytical Laboratories and the Sonoma County Department of Health Services Public Health Division Lab (the Water Agency's contract laboratories) and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency.

Table 1. List of bacterial indicators and nutrients to be analyzed in water samples collected from the Russian River Mainstem and Estuary.

Compound	Test Method	Method Detection Limit (MDL)	Laboratory Reporting Limit (LRL/PQL[1])	Units
Nitrogen, Total	SM4500-N	0.2	0.5	mg/L
Nitrogen, Total Organic	SM4500-N	0.2	0.2	mg/L
Nitrogen, ammonia as N	SM4500NH3C	0.1	0.2	mg/L
Ammonia Unionized	SFBRWQCP	0.00010	0.00050	mg/L
Nitrogen, nitrate as N	EPA300.0	0.050	0.20	mg/L
Nitrogen, nitrite as N	EPA300.0	0.010	0.20	mg/L
Organic carbon, dissolved	SM5310C	0.0400	0.300	mg/L
Organic carbon, total	SM5310C	0.0400	0.300	mg/L
Phosphorus, orthophosphate	SM4500-P E	0.020	0.020	mg/L
Phosphorus, total	SM4500-P E	0.020	0.10	mg/L
Total Dissolved Solids	SM2540C	4.2	5.0	mg/L
Chlorophyll (a)	SM10200H	0.000050	0.010	mg/L
Enterococci	SM9223 (entro)[4]	2.0	2.0	MPN[2]
e-coli	SM9223 (clert)[3]	2.0	2.0	MPN
Turbidity	EPA180.1	0.020	0.10	NTU

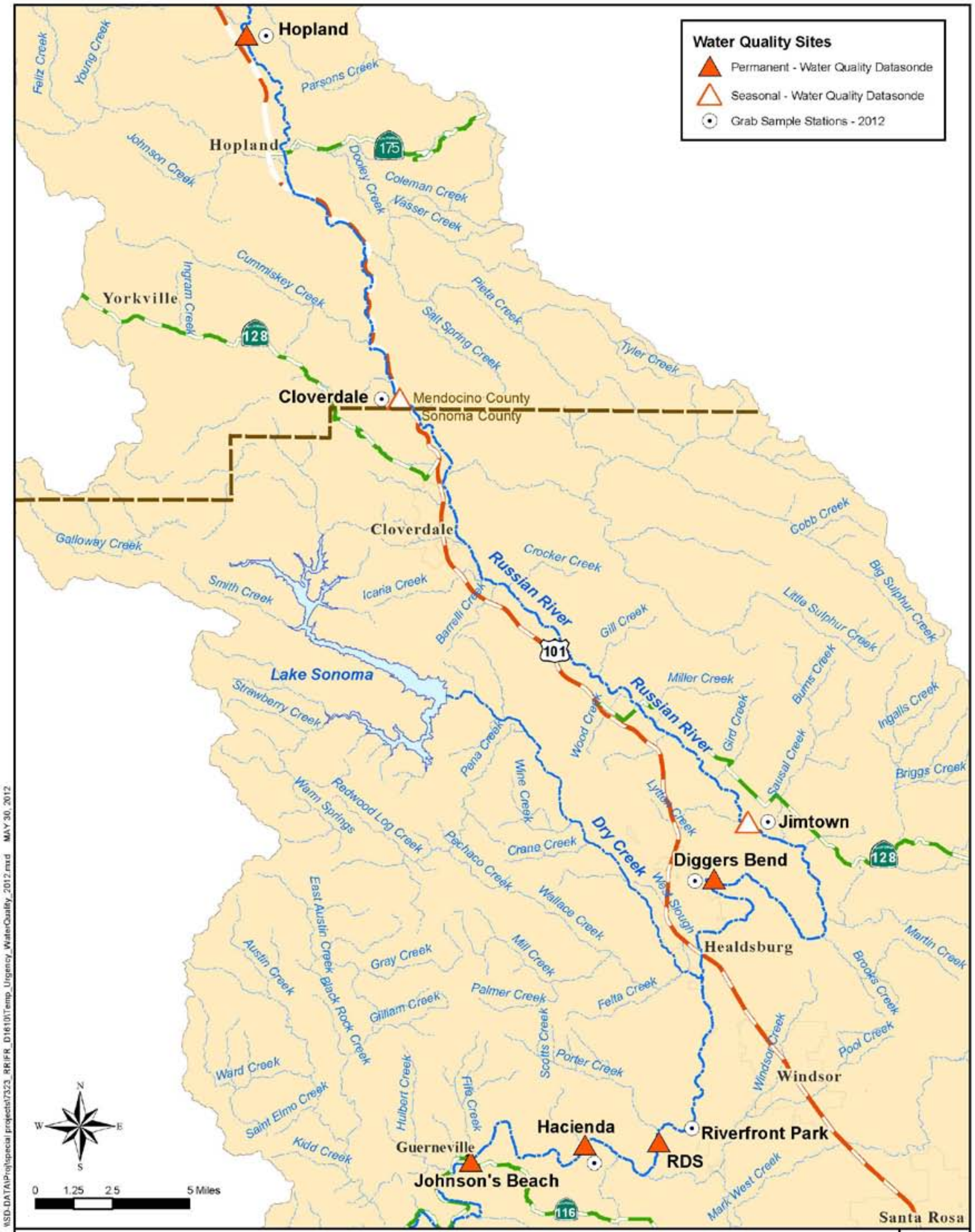
Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)". The Sonoma County Department of Health lab will be conducting the analysis for enterococci and *e-coli* and will be reporting the results at the LRL/PQL.

[1] PQL – Practical Quantitation Limit

[2] MPN – most probable number

[3] clert – Colilert Method

[4]entro – Enterolert Method

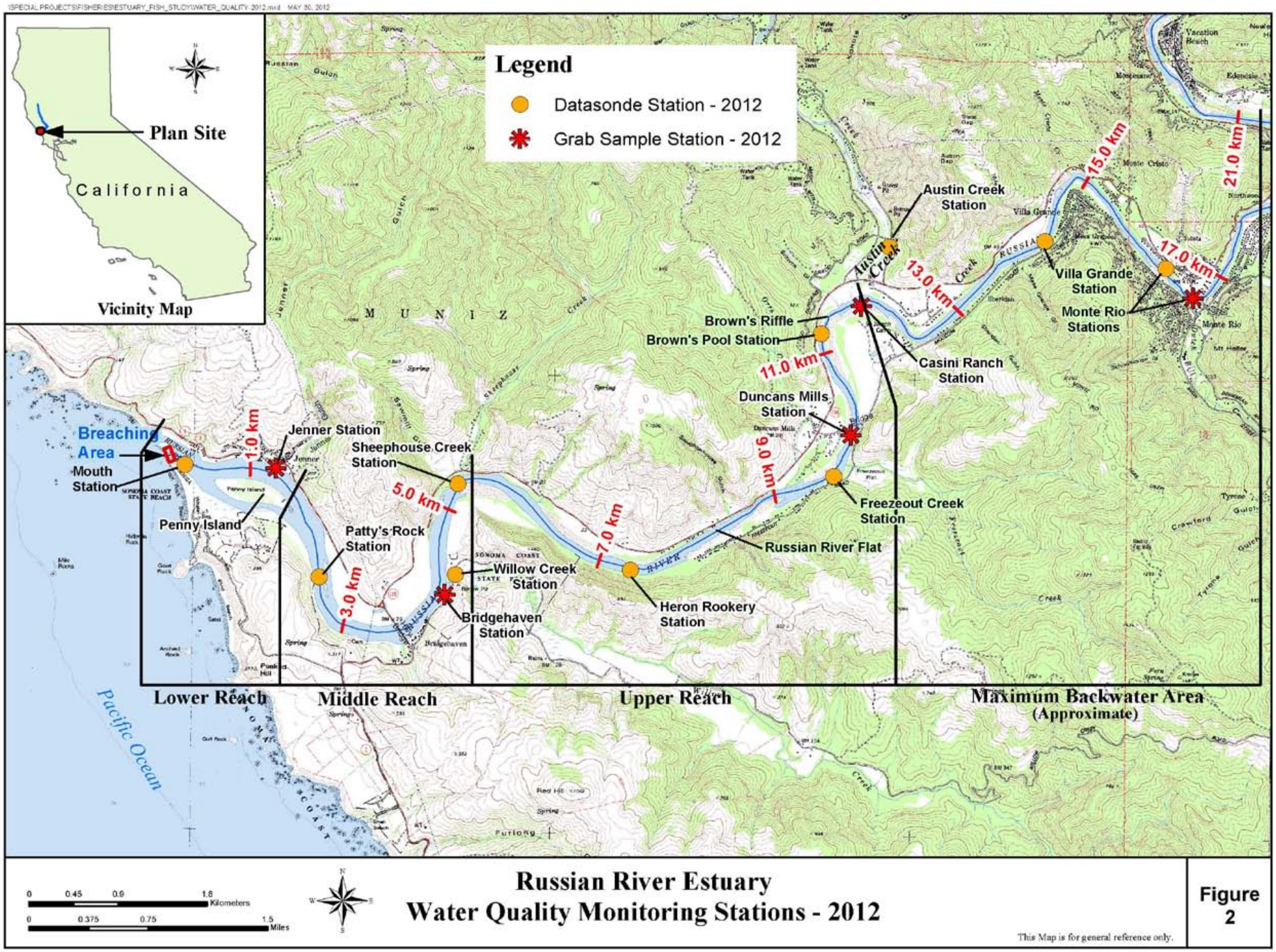


Russian River Mainstem

Water Quality Monitoring Stations - 2012

This Map is for general reference only.

Figure 1


Legend
Datasonde Station - 2012
Grab Sample Station - 2012
Plan Site
California
Vicinity Map
Breaching Area
Mouth Station
Penny Island
Jenner Station
Sheephouse Creek Station
Patty's Rock Station
Willow Creek Station
Bridgehaven Station
Heron Rookery Station
Russian River Flat
Freezeout Creek Station
Duncans Mills Station
Brown's Pool Station
Brown's Riffle
Casini Ranch Station
Austin Creek Station
Villa Grande Station
Monte Rio Stations
1.0 km
3.0 km
5.0 km
7.0 km
9.0 km
11.0 km
13.0 km
15.0 km
17.0 km
21.0 km
Lower Reach
Middle Reach
Upper Reach
Maximum Backwater Area
(Approximate)
Pacific Ocean
Kilometers
Miles
Russian River Estuary
Water Quality Monitoring Stations - 2012
This Map is for general reference only.
Figure
2

Russian River Water Quality Summary
For the
Sonoma County Water Agency
2012 Temporary Urgency Change

Prepared by

Sonoma County Water Agency

March 2013

TABLE OF CONTENTS

Section | Page Number

1.0 INTRODUCTION

On April 5, 2012, the Sonoma County Water Agency (Water Agency) petitioned the State Water Resources Control Board (SWRCB) to temporarily reduce minimum in-stream flows in the Russian River as required by the National Marine Fisheries Service's (NMFS) *Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation District in the Russian River Watershed* (Russian River Biological Opinion, NMFS 2008).

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

- From May 1 through October 15, 2012, 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) be reduced from 185 cubic feet per second (cfs) to 125 cfs. 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 will be no less than 110 cfs.

- From May 1 through October 15, 2012, in-stream flow requirements for the lower Russian River (downstream of its confluence with Dry Creek) be reduced from 125 cfs to 70 cfs with the understanding that the Water Agency will typically maintain approximately 85 cfs at the Hacienda gage as practicably feasible.

The SWRCB issued an Order (Order) approving the Water Agency's Temporary Urgency Change Petition (TUCP) on May 2, 2012. The Order included several terms and conditions, including requirements for the preparation of a water quality monitoring plan (Term 8). The Water Agency submitted a plan to meet the requirements of Term 8 on May 29, 2012. This report provides and summarizes all data collected during the 2012 water quality monitoring program as required by Term 9 of the Order.

2.0 2012 RUSSIAN RIVER FLOW SUMMARY

As described in the Order, the Water Agency requested temporary changes to D1610 in-stream flow requirements including reductions from 185 cfs to 125 cfs in the upper Russian River (from its confluence with the East Fork of the Russian River to its confluence with Dry Creek) and from 125 cfs to 70 cfs in the lower Russian River (downstream of its confluence with Dry Creek). The purpose of the 2012 Temporary Urgency Change (TUC) was to comply with the Biological Opinion which found that stream velocities under D1610 flows reduced the amount of available summer rearing habitat in the upper mainstem of the Russian River.

Late rains allowed sufficient inflow into Lake Pillsbury to classify 2012 as a Normal year under D1610. Storage in Lake Mendocino, while below conditions experienced in 2010 was well above 2009 conditions (Figure 2-1).

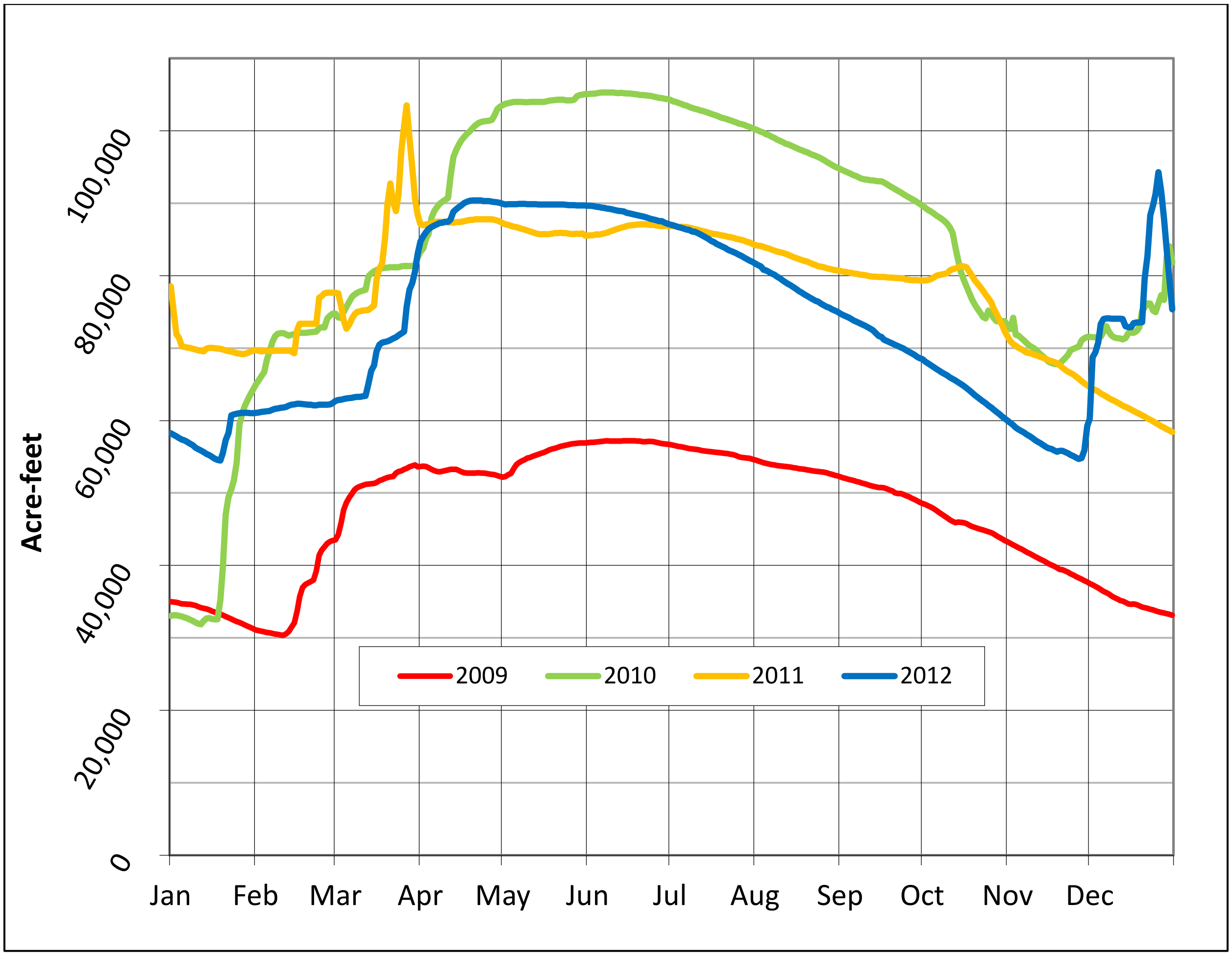


Figure 2-1. 2009 – 2012 Lake Mendocino Storage Levels

Despite the reduced Coyote Valley Dam releases authorized by the Order, flows were above D1610 minimum flows in some sections of the Russian River from tributary inflow due to a relatively wet spring. A moderate demand season allowed stable releases from Lake Mendocino. 2012 flows are shown in Figure 2-2.

In the section of the Russian River from Ukiah to the mouth of Dry Creek (upper Russian River) flows dropped below D1610 minimum flow requirements and the five-day running average flow of 125 cfs, but did not drop below the instantaneous flow of 110 cfs authorized by the TUC Order. Flows in the upper Russian River above the Dry Creek confluence were below 185 cfs from May 11 to October 15 at Hopland, including one day with flows below 125 cfs. Flows did not drop below 185 cfs at Digger's Bend until early June, but stayed under through the remainder of the Order. Flows at Digger's Bend were also observed to drop below the five-day running average of 125 cfs for several days throughout the Order, but did not drop below the instantaneous flow of 110 cfs (Figure 2-3).

Flows in the lower Russian River at Hacienda (downstream of the confluence with Dry Creek) dropped below D1610 minimum flow requirements from late June through early October, but remained higher than TUC minimum flows during the entire period of the Order (Figure 2-4).

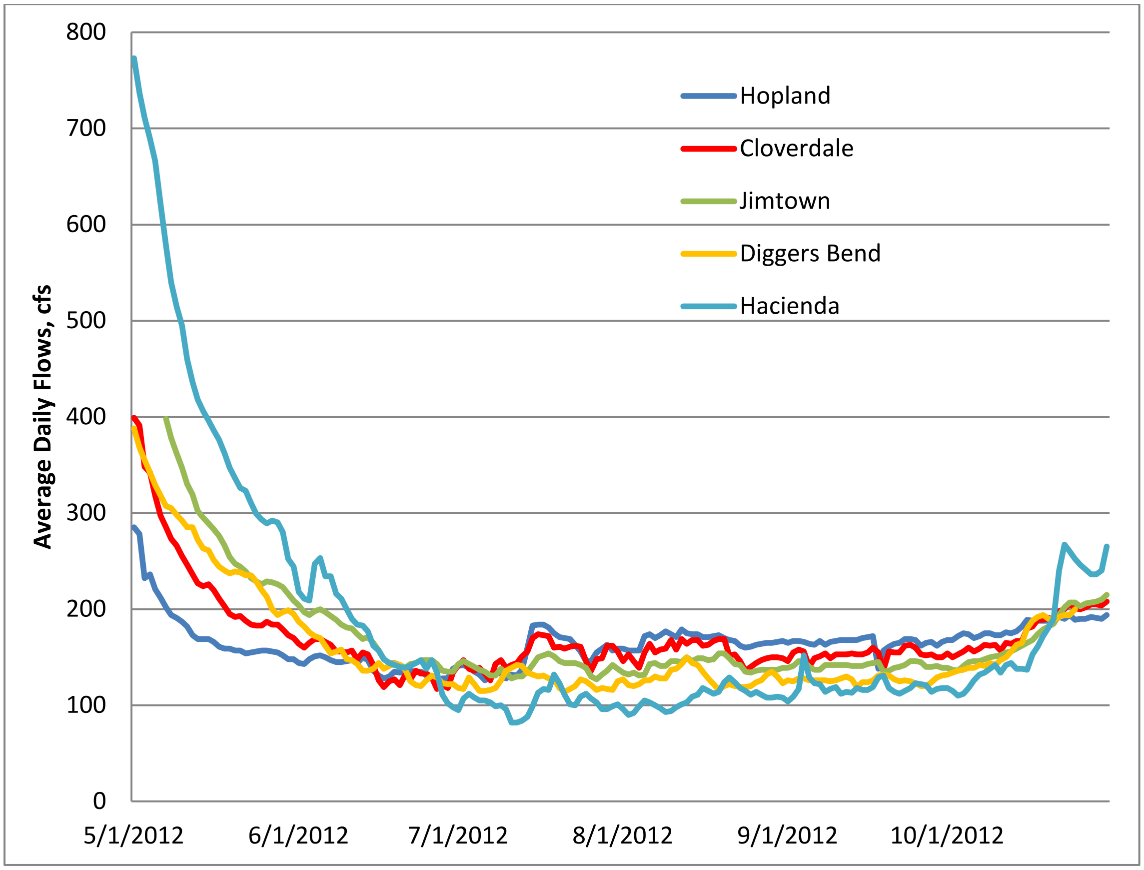


Figure 2-2. 2012 Average Daily Flows USGS Russian River gages, cubic feet per second (cfs)

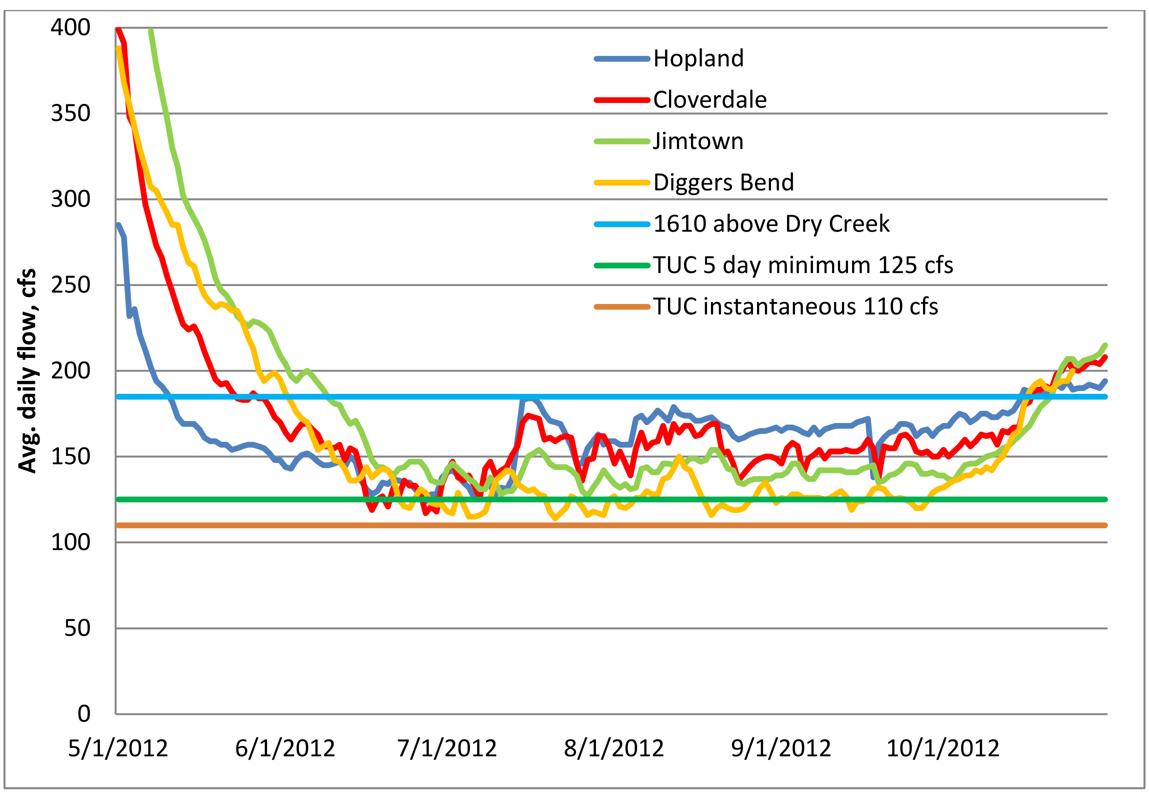


Figure 2-3. 2012 Average Daily Flows USGS Russian River gages above Dry Creek confluence, cfs

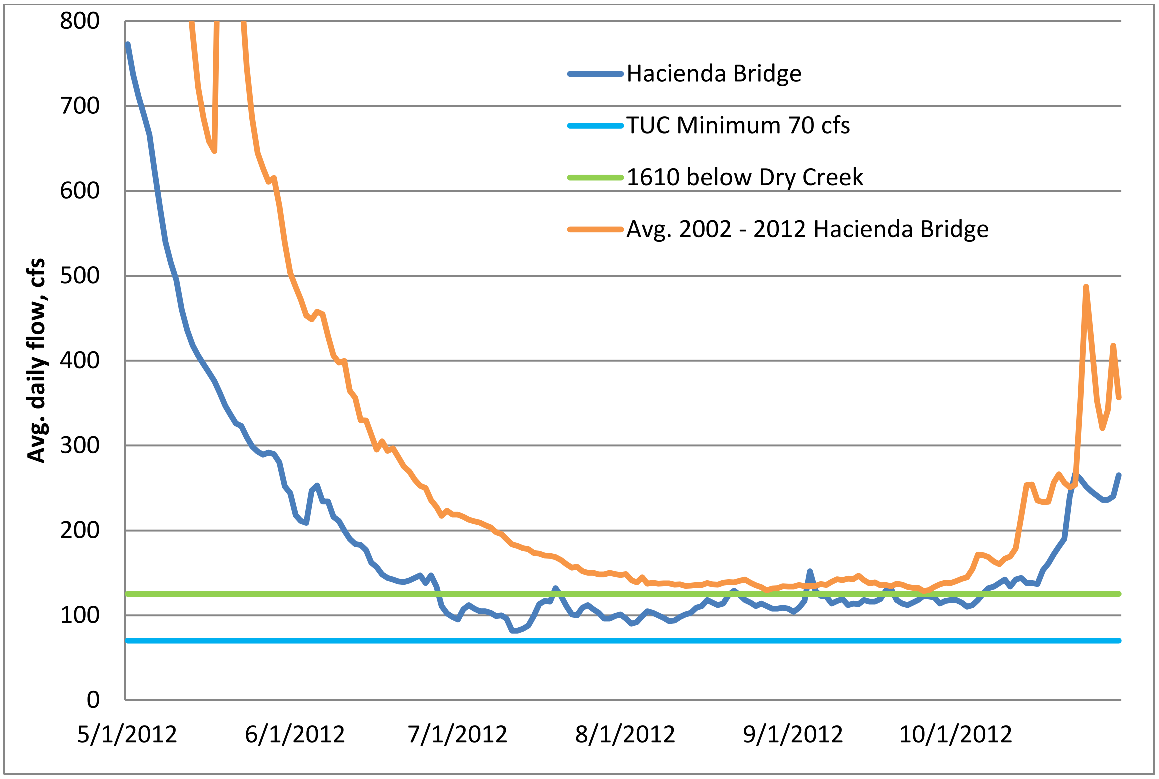


Figure 2-4. 2012 Average Daily Flows USGS Russian River gages below Dry Creek confluence, cfs

3.0 WATER QUALITY MONITORING

The collection of water quality data was conducted 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. The resulting 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 in-stream flows that are mandated by the Biological Opinion. A complete analysis and evaluation of the water quality data is being conducted as part of the CEQA requirements associated with establishing permanent changes to D1610 and management of the estuary.

3.1 Mainstem Russian River Water Quality Monitoring

Several agencies conducted water quality monitoring in the mainstem of the Russian River during the term of the Order. From May 21 through August 29, the NCRWQCB conducted weekly bacteriological sampling in cooperation with the Sonoma County Department of Health Services (DHS) at beaches that experience recreational activities involving the greatest body contact. To support the analysis and evaluation of water quality data needed for the CEQA requirements as noted above, the Water Agency conducted weekly bacteriological, nutrient and algal mainstem sampling from May 24 through October 11.

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. The CDPH draft guideline for single sample; total coliform is 10,000 most probable numbers (MPN) per 100 milliliters (ml), 235 MPN per 100 ml for *e coli* and the MPN for Enterococcus is 61 per 100 ml. Exceedances of the draft guidance are highlighted in Table 3-1. However, it must be emphasized that these are draft guidelines, not adopted standards, and are therefore both subject to change (if it is determined that the guidelines are not accurate indicators) and are not currently enforceable. In addition, these draft guidelines were established for and are only applicable to fresh water beaches. Currently, there are no numeric guidelines that have been developed for estuarine areas. However, the EPA recommended freshwater criteria for Nutrients, Chlorophyll a, and Turbidity in Rivers and Streams in Aggregate Ecoregion III are used throughout for comparative purposes, with exceedances highlighted in Tables 3-2 to 3-8.

3.1.1 2012 Water Agency Mainstem Water Quality Sampling

Water samples were collected from the following six (6) surface-water sites in the mainstem of the Russian River and as shown on Figure 3-1: Hopland; Comminsky Station; Jimtown Bridge; Diggers Bend; Riverfront Park; and Hacienda.

All samples were analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (total coliforms, *E. coli* and enterococci), total and dissolved organic carbon, turbidity, and total dissolved solids. Samples were not analyzed specifically for total coliforms, but concentrations are determined as part of the analytical process for determining *E. coli* concentrations and the results are included in the lab report. As such, it should be noted that the dilution rates that are utilized to accurately quantify *E. coli* concentrations for comparison to the draft guidelines do not allow for the quantification of total coliform concentrations at a high enough level to compare with the draft guidelines and are instead reported as greater than 2419.6 MPN (>2419.6). The decision to focus on *E. coli* and enterococcus for the analysis of potential water quality impacts and not total coliform concentrations was done in coordination and consultation with Regional Board staff. Duplicate samples of all constituents were taken at Hacienda, and triplicate samples were taken for bacteria at Hacienda and Jimtown Bridge.

Bacteria analysis for the Water Agency was conducted by the Sonoma County DHS Public Health Division Lab in Santa Rosa. *E. coli* and total coliform were analyzed using the Colilert method and enterococcus was analyzed using the Enterolert method. Table 3-1 and Figures 3-2 and 3-3 summarize the bacteria data collected during the term of the Order. Rather than plot the duplicate and triplicate results, the most conservative set of results was plotted for samples collected at Jimtown and Hacienda.

Based upon the CDPH guidance for fresh water beaches, Enterococcus exceedances varied throughout the term of the Order with several exceedances being observed at Hopland and Digger's Bend beginning in July and recurring throughout the rest of the order. A few exceedances were also observed late in the season at Jimtown Bridge. There were no exceedances of the CDPH guidelines for *E. coli* at any of the mainstem sites throughout the term of the Order. Nutrient results at Hopland and Comminsky Station predominantly exceeded the EPA criteria for Total Phosphorous and Total Nitrogen. Turbidity results at these two stations also exceeded recommended EPA criteria throughout the duration of the Order. Algal results were also frequently exceeded at these two stations, though not as often as turbidity or Total Phosphorus. Jimtown Bridge experienced exceedances of the nutrient and algal criteria, but to a lesser degree than the two upstream stations and did not have any exceedances of the turbidity criteria. Digger's Bend and Riverfront Park had a few exceedances of the nutrient criteria, but did not exceed the turbidity or algal criteria at all during the monitoring period. Finally, Hacienda had several exceedances of the Total Phosphorus criteria early in the season, but then had non-detect results from early July until early October and remained under the recommended criteria for the rest of the Order. Hacienda also did not have any exceedances of the turbidity or algal criteria. See Tables 3-2 through 3-8.

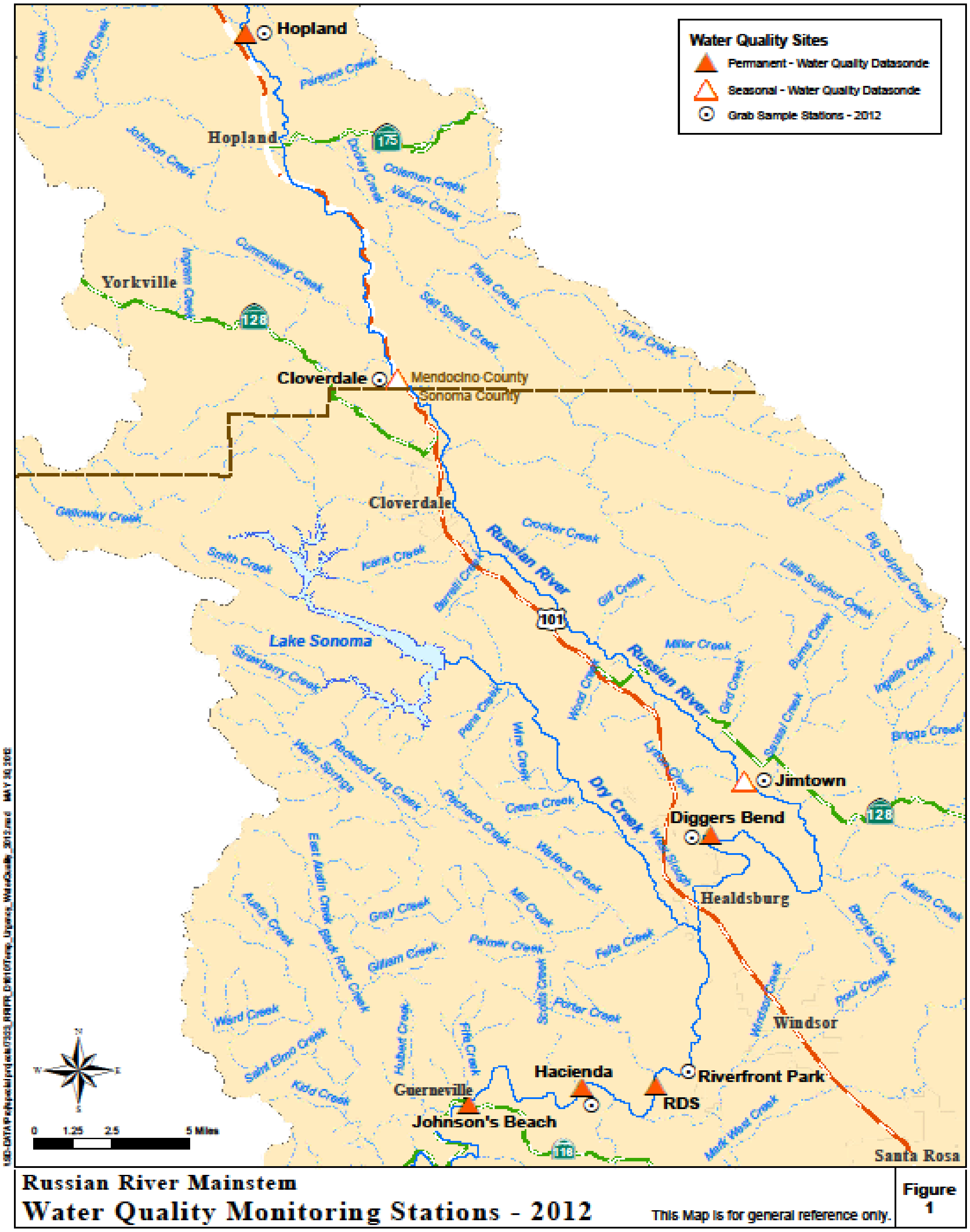


Figure 3-1. 2012 Water Agency Sample Site Locations

Table 3-1. Bacteria concentrations for samples collected by the Water Agency. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

Hopland	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11462500 RR Near Hopland***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	14.4	7.5	>2419.8	69.1	24.6	156
5/31/2012	15.3	7.5	>2419.6	61.3	33.6	148
6/7/2012	14.1	7.6	1413.6	75.9	32.7	147
6/14/2012	15.2	7.4	2419.6	52.9	45.0	147
6/21/2012	15.3	7.7	>2419.6	47.1	47.4	137
6/28/2012	14.6	7.5	2419.6	48.0	30.1	128
7/5/2012	15	7.6	>2419.6	54.8	**67**	132
7/12/2012	15.3	7.5	>2419.6	50.4	**105.4**	131
7/19/2012	14.5	7.8	1119.9	44.3	59.4	175
7/26/2012	15.0	7.8	1553.1	83.9	**121.1**	146
8/2/2012	14.7	7.8	920.8	71.2	**83.9**	157
8/9/2012	13.9	7.8	1203.3	64.4	**75.4**	177
8/16/2012	14.4	7.8	1553.1	25.9	43.7	171
8/23/2012	14.7	7.8	2419.6	42.2	**64.4**	162
8/30/2012	13.9	7.8	1553.1	52.0	60.2	166
9/6/2012	14.0	7.9	1046.2	39.3	--	163
9/13/2012	14.5	7.8	727	71.7	51.2	168
9/20/2012	13.7	8.0	920.8	61.3	57.3	161
9/27/2012	15.0	7.9	1203.3	55.6	40	165
10/4/2012	15.7	7.7	727	77.1	**74.9**	175
10/11/2012	15.0	7.8	1203.3	60.5	41.1	173
Comminsky Station	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11463000 RR Near Cloverdale (Comminsky)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	16.1	7.9	1986.3	22.8	8.4	183
5/31/2012	17.3	7.8	770.1	48.0	21.6	170
6/7/2012	15.7	7.9	1553.1	32.3	12.0	163
6/14/2012	17.6	7.8	>2419.6	54.6	31.5	153
6/21/2012	17.7	8.0	2419.6	93.3	44.4	132
6/28/2012	16.7	7.9	1203.3	25.0	22.6	121
7/5/2012	17.9	7.8	1986.3	42	31.3	139
7/12/2012	18.4	7.9	>2419.6	32.7	31.5	144
7/19/2012	16.6	7.9	770.1	16.1	32.3	160
7/26/2012	17.3	8.0	>2419.6	68.9	26.2	136
8/2/2012	17.3	7.9	920.8	59.8	49.6	153
8/9/2012	16.1	7.9	>2419.6	38.4	53.7	159
8/16/2012	16.7	7.9	>2419.6	39.3	31.8	162
8/23/2012	16.6	7.9	1299.7	42.8	37.9	146
8/30/2012	15.9	7.9	866.4	79.4	55.4	150
9/6/2012	15.2	8.0	1413.6	49.6	--	149
9/13/2012	16.3	8.0	648.8	77.6	29.2	154
9/20/2012	14.7	8.2	152.3	49.5	25.6	156
9/27/2012	15.7	8.0	172.0	31.7	53.6	152
10/4/2012	16.2	7.9	613.1	55.6	52.1	156
10/11/2012	14.9	7.9	686.7	25.9	23.1	157

* 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-1 cont. Bacteria concentrations for samples collected by the Water Agency. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

Jimtown Bridge	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11463682 RR at Jimtown***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	17.9	7.8	>2419.6	7.5	1.0	229
5/31/2012	19.6	7.7	>2419.6	8.6	2.0	209
6/7/2012	18.1	7.8	1119.9	13.5	8.5	193
6/14/2012	20.2	7.6	1413.6	17.3	8.6	171
6/21/2012	19.8	7.7	1413.6	21.3	34.3	139
6/28/2012	19.7	7.5	727.0	28.8	9.8	136
7/5/2012	21.2	7.6	980.4	8.5	13.2	137
7/12/2012	22.1	7.7	1732.9	7.5	12	130
7/19/2012	19.0	7.7	1299.7	6.3	27.9	151
7/26/2012	19.5	7.7	770.1	17.5	50.4	130
8/2/2012	20.9	7.9	866.4	6.3	43.5	132
8/9/2012	20.8	7.9	980.4	5.2	53.6	141
8/16/2012	20.7	8.1	1203.3	9.6	35.0	149
8/23/2012	20.3	8.4	1732.9	8.6	43.7	142
8/30/2012	20.0	8.3	1986.3	9.7	49.5	137
9/6/2012	18.2	8.0	1553.1	5.2	--	137
9/13/2012	19.6	8.4	1046.2	17.3	14.8	141
9/20/2012	17.9	8.5	1299.7	8.5	**65.0**	136
9/27/2012	17.0	7.8	920.8	13.4	**73.8**	140
10/4/2012	18.1	7.8	410.6	13.5	**195.5**	141
10/11/2012	16.4	8.0	38.7	12.1	57.8	152

Jimtown Bridge (Duplicate)	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11463682 RR at Jimtown***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	17.9	7.8	>2419.6	13.5	3.1	229
5/31/2012	19.6	7.7	>2419.6	8.6	3.0	209
6/7/2012	18.1	7.8	686.7	18.3	7.3	193
6/14/2012	20.2	7.6	1046.2	14.6	19.9	171
6/21/2012	19.8	7.7	1119.9	15.8	29.9	139
6/28/2012	19.7	7.5	517.2	18.5	9.7	136
7/5/2012	21.2	7.6	1203.3	7.4	19.7	137
7/12/2012	22.1	7.7	1299.7	4.1	9.7	130
7/19/2012	19.0	7.7	816.4	9.4	22.3	151
7/26/2012	19.5	7.7	816.4	14.8	39.9	130
8/2/2012	20.9	7.9	866.4	13.4	57.1	132
8/9/2012	20.8	7.9	1553.1	6.2	**70.3**	141
8/16/2012	20.7	8.1	2419.6	5.2	33.7	149
8/23/2012	20.3	8.4	>2419.6	18.5	42.0	142
8/30/2012	20.0	8.3	1986.3	10.9	39.9	137
9/6/2012	18.2	8.0	1553.1	5.2	--	137
9/13/2012	19.6	8.4	1732.9	23.8	32.8	141
9/20/2012	17.9	8.5	1413.6	15.6	28.2	136
9/27/2012	17.0	7.8	866.4	14.5	**75.4**	140
10/4/2012	18.1	7.8	686.7	21.1	**135.4**	141
10/11/2012	16.4	8.0	461.1	8.6	**131.4**	152

* 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-1 cont. Bacteria concentrations for samples collected by the Water Agency. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

Jimtown Bridge (Triplicate)	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11463682 RR at Jimtown***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	17.9	7.8	>2419.6	10.9	4.1	229
5/31/2012	19.6	7.7	>2419.6	6.1	3.1	209
6/7/2012	18.1	7.8	1203.3	8.6	9.8	193
6/14/2012	20.2	7.6	920.8	14.6	18.7	171
6/21/2012	19.8	7.7	1299.7	6.0	18.1	139
6/28/2012	19.7	7.5	461.1	46.4	21.1	136
7/5/2012	21.2	7.6	1732.9	6.3	11	137
7/12/2012	22.1	7.7	--	--	13.4	130
7/19/2012	19.0	7.7	648.8	7.4	30.9	151
7/26/2012	19.5	7.7	980.4	14.6	40.4	130
8/2/2012	20.9	7.9	1203.3	5.2	53.7	132
8/9/2012	20.8	7.9	1732.9	4.1	**79.8**	141
8/16/2012	20.7	8.1	1413.6	7.2	30.5	149
8/23/2012	20.3	8.4	>2419.6	7.5	35.9	142
8/30/2012	20.0	8.3	1986.3	7.5	48.0	137
9/6/2012	18.2	8.0	2419.6	6.3	--	137
9/13/2012	19.6	8.4	920.8	16.1	24.6	141
9/20/2012	17.9	8.5	1413.6	9.8	46.4	136
9/27/2012	17.0	7.8	1119.9	12.1	**118.7**	140
10/4/2012	18.1	7.8	866.4	21.3	**148.3**	141
10/11/2012	16.4	8.0	488.4	12.0	**98.8**	152

Digger's Bend	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11463980 RR at Digger's Bend***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	18.3	8.0	1413.6	4.1	<1.0	240
5/31/2012	--	--	--	--	--	220
6/7/2012	19.3	8.1	920.8	23.3	6.3	187
6/14/2012	21.5	7.9	2419.6	4.1	8.5	156
6/21/2012	20.9	8.0	>2419.6	11.6	18.9	138
6/28/2012	20.9	8.0	1732.9	5.2	7.3	125
7/5/2012	22.0	8.0	>2419.6	12.2	18.3	122
7/12/2012	22.9	8.0	1732.9	13.2	56.3	115
7/19/2012	20.0	8.0	1553.1	8.5	--	141
7/26/2012	20.7	8.1	1732.9	4.1	**85.7**	118
8/2/2012	21.8	8.1	1732.7	8.4	**90.6**	116
8/9/2012	22.2	8.0	2419.6	5.2	**88.4**	120
8/16/2012	21.6	8.1	1986.3	3.1	50.4	137
8/23/2012	20.6	8.1	1553.1	14.5	**61.3**	128
8/30/2012	20.5	8.1	1732.9	8.5	40.2	119
9/6/2012	18.8	8.1	1732.9	7.5	--	123
9/13/2012	20.2	8.2	547.5	5.2	14.4	126
9/20/2012	17.8	8.4	1119.9	13.4	**110.6**	119
9/27/2012	17.6	8.1	1119.9	7.4	47.3	127
10/4/2012	18.8	8.0	770.1	30.9	**102.2**	124
10/11/2012	16.7	8.0	547.5	13.5	**101.1**	139

* 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-1 cont. Bacteria concentrations for samples collected by the Water Agency. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

Riverfront Park	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11465390 RR near Windsor (Riverfront Park)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	17.6	7.8	920.8	9.8	4.1	308
5/31/2012	19.0	7.8	1299.7	2.0	9.8	282
6/7/2012	18.1	7.9	920.8	23.3	7.5	--
6/14/2012	19.8	7.8	1203.3	13.4	5.2	222
6/21/2012	18.7	7.8	290.9	10.9	14.3	193
6/28/2012	19.3	7.8	1413.6	14.8	6.3	178
7/5/2012	20.0	7.9	1553.1	22.8	2.0	187
7/12/2012	20.2	7.9	1986.3	29.5	8.3	201
7/19/2012	18.9	7.9	727.0	14.8	19.7	243
7/26/2012	19.0	7.9	1203.3	26.2	18.7	222
8/2/2012	19.4	7.4	816.4	15.6	10.9	211
8/9/2012	19.8	7.8	727.0	14.8	21.8	213
8/16/2012	19.3	8.0	980.4	19.9	9.8	231
8/23/2012	18.5	7.9	866.4	17.3	8.4	230
8/30/2012	18.5	7.9	866.4	27.5	17.5	218
9/6/2012	17.0	7.9	1046.2	47.1	--	230
9/13/2012	18.1	8.0	816.4	18.7	14.1	--
9/20/2012	16.0	8.1	866.4	35.9	14.6	223
9/27/2012	16.0	8.1	1119.9	35.5	15.6	225
10/4/2012	17.1	7.8	686.7	33.6	36.4	221
10/11/2012	15.4	7.8	325.5	24.6	22.8	243
Hacienda	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	19.0	8.0	686.7	12.2	4.1	299
5/31/2012	20.5	7.9	1413.6	4.1	6.3	244
6/7/2012	20.0	8.0	579.4	9.7	3.1	234
6/14/2012	22.2	7.9	1732.9	8.6	10.7	177
6/21/2012	21.1	8.0	2419.6	21.1	22.6	139
6/28/2012	21.5	8.0	816.4	17.1	8.5	111
7/5/2012	22.3	7.9	1553.1	28.1	6.3	105
7/12/2012	22.3	7.8	1553.1	12.1	4.1	82
7/19/2012	19.9	8.0	158.5	35	53.8	132
7/26/2012	20.9	8.1	1299.7	7.4	8.6	107
8/2/2012	21.7	8.0	866.4	10.9	7.4	90
8/9/2012	21.9	8.0	613.1	11.9	5.2	93
8/16/2012	21.5	8.1	579.4	4.1	14.6	118
8/23/2012	20.8	8.0	648.8	4.1	5.2	118
8/30/2012	20.3	7.9	517.2	3.1	4.1	109
9/6/2012	18.9	8.0	648.8	47.1	--	123
9/13/2012	19.8	8.1	365.4	<1.0	<1.0	113
9/20/2012	17.4	8.1	547.5	13.4	5.2	118
9/27/2012	16.9	7.9	365.4	7.5	5.2	121
10/4/2012	18.2	7.8	461.1	20.4	13.5	112
10/11/2012	15.9	7.9	488.4	9.8	13.4	134

* 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-1 cont. Bacteria concentrations for samples collected by the Water Agency. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

Hacienda (Duplicate)	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	19.0	8.0	770.1	13.4	3.1	299
5/31/2012	20.5	7.9	1986.3	10.8	3.1	244
6/7/2012	20.0	8.0	686.7	10.9	3.0	234
6/14/2012	22.2	7.9	1203.3	10.9	12.1	177
6/21/2012	21.1	8.0	1553.1	18.7	18.7	139
6/28/2012	21.5	8.0	727	13.2	8.4	111
7/5/2012	22.3	7.9	488.4	23.8	6.3	105
7/12/2012	22.3	7.8	1203.3	12.1	5.2	82
7/19/2012	19.9	8.0	1203.3	62.7	**88.8**	132
7/26/2012	20.9	8.1	1413.6	9.8	7.4	107
8/2/2012	21.7	8.0	770.1	7.5	5.2	90
8/9/2012	21.9	8.0	727.0	42	5.2	93
8/16/2012	21.5	8.1	613.1	2.0	14.5	118
8/23/2012	20.8	8.0	648.8	5.2	4.2	118
8/30/2012	20.3	7.9	461.1	3.1	3.1	109
9/6/2012	18.9	8.0	770.1	9.7	--	123
9/13/2012	19.8	8.1	517.2	5.2	4.1	113
9/20/2012	17.4	8.1	648.8	9.7	7.5	118
9/27/2012	16.9	7.9	488.4	20.1	11	121
10/4/2012	18.2	7.8	>2419.6	13.4	13.5	112
10/11/2012	15.9	7.9	488.4	9.8	10.8	134

Hacienda (Triplicate)	Temperature	pH	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100mL	MPN/100mL	MPN/100mL	(cfs)
5/24/2012	19.0	8.0	1119.9	9.8	3.0	299
5/31/2012	20.5	7.9	1732.9	11.0	3.1	244
6/7/2012	20.0	8.0	547.5	12.2	3.1	234
6/14/2012	22.2	7.9	1119.9	9.8	9.8	177
6/21/2012	21.1	8.0	1299.7	22.6	19.9	139
6/28/2012	21.5	8.0	770.1	10.9	13.1	111
7/5/2012	22.3	7.9	2419.6	16.9	8.6	105
7/12/2012	22.3	7.8	1413.6	9.7	8.5	82
7/19/2012	19.9	8.0	920.8	35.5	**66.3**	132
7/26/2012	20.9	8.1	1203.3	7.3	5.2	107
8/2/2012	21.7	8.0	1119.9	7.5	3.0	90
8/9/2012	21.9	8.0	686.7	30.7	2.0	93
8/16/2012	21.5	8.1	648.8	5.2	6.3	118
8/23/2012	20.8	8.0	727.0	3.1	1.0	118
8/30/2012	20.3	7.9	435.2	5.2	1.0	109
9/6/2012	18.9	8.0	1046.2	10.9	--	123
9/13/2012	19.8	8.1	387.3	5.1	<1.0	113
9/20/2012	17.4	8.1	307.6	16.1	13.4	118
9/27/2012	16.9	7.9	517.2	12.1	4.1	121
10/4/2012	18.2	7.8	547.5	22.8	12.2	112
10/11/2012	15.9	7.9	410.6	19.7	15.8	134

* 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

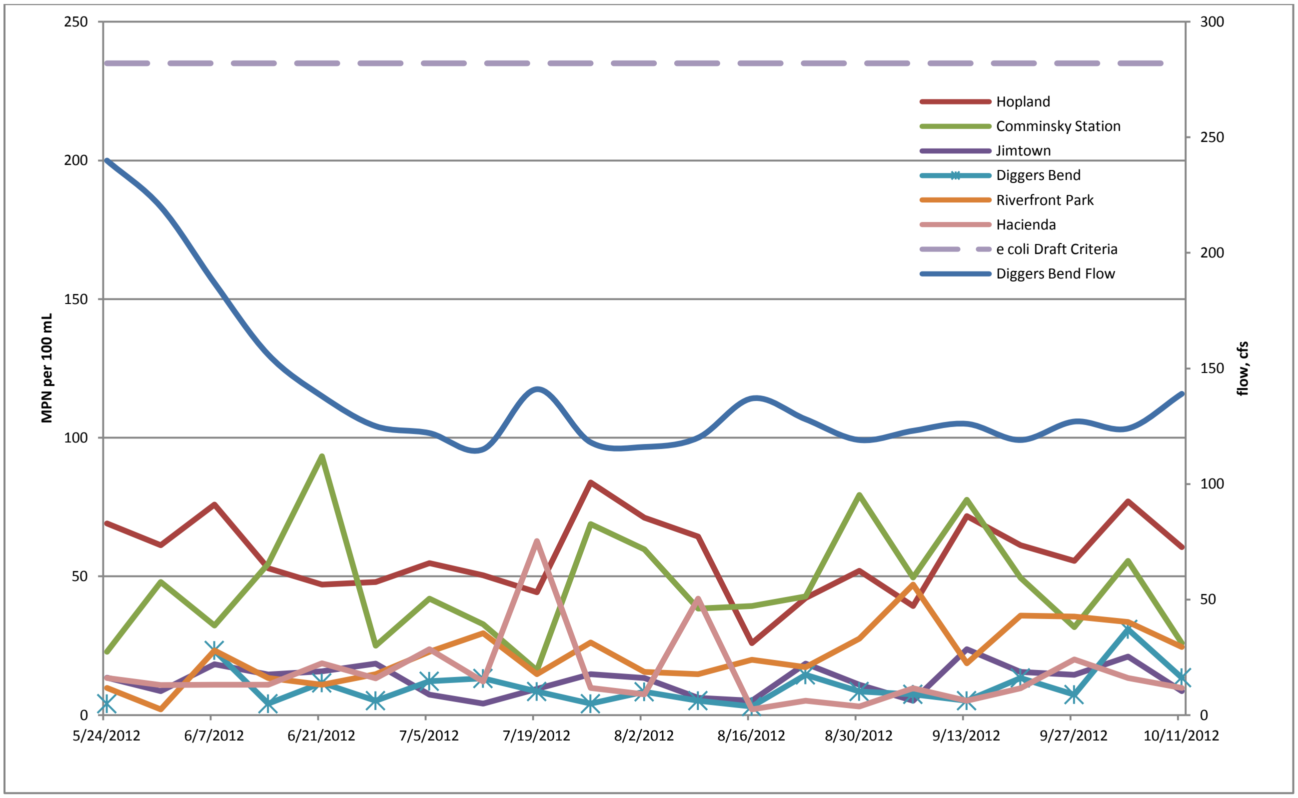


Figure 3-2. Water Agency *E. coli* Sample Results for the Russian River, Hopland to Hacienda Bridge

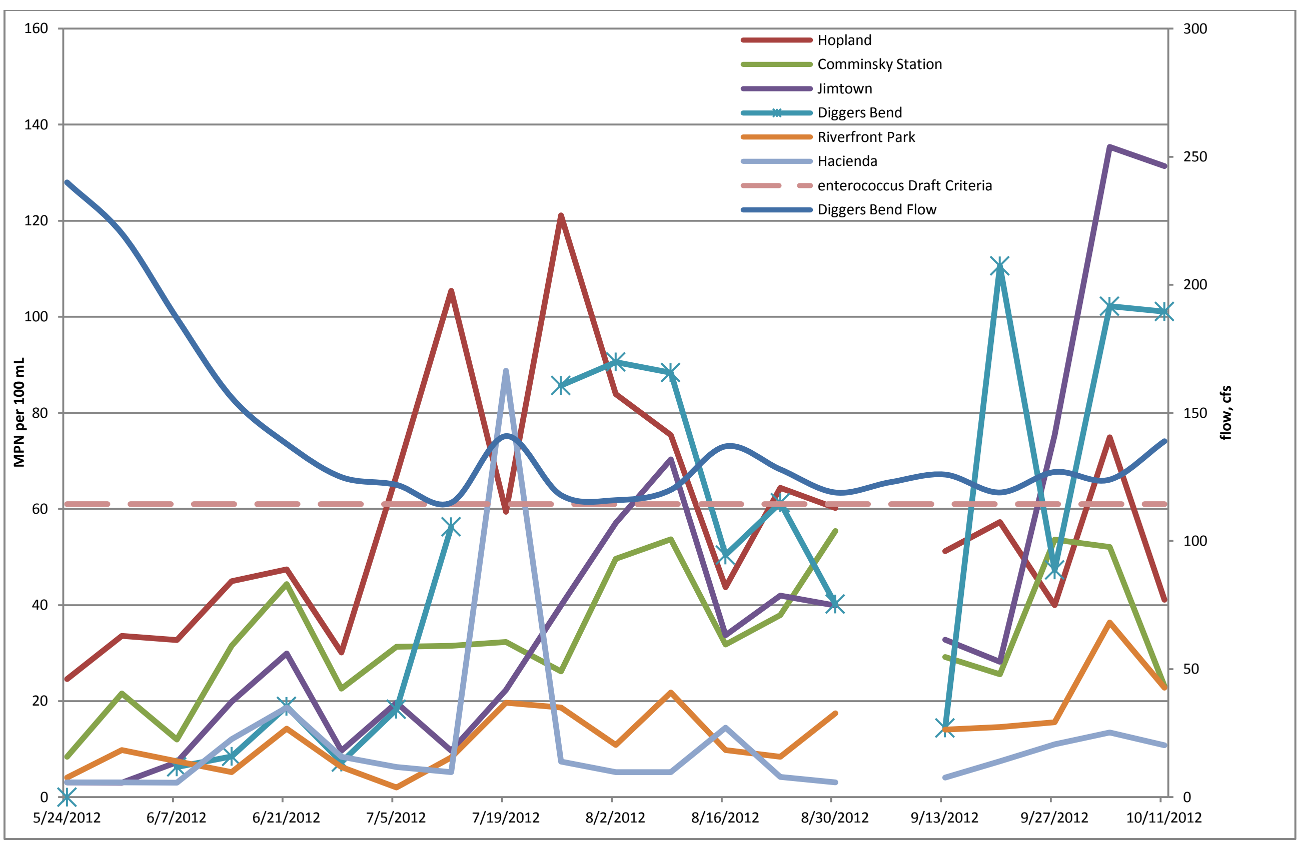


Figure 3-3. Water Agency Enterococcus Sample Results for the Russian River, Hopland to Hacienda Bridge

Table 3-2. 2012 Water Agency Nutrient Sample Results for Hopland. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Hopland	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 11462500 RR Near Hopland***
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)
5/24/2012	14.4	7.5	0.210	ND	0.0003	0.29	ND	0.24	0.53	0.043	0.066	1.75	2.4	120	4.8	0.00019	156
5/31/2012	15.3	7.5	0.210	ND	0.0006	0.28	ND	0.28	0.56	0.042	0.083	1.59	2.38	120	5.0	0.0025	148
6/7/2012	14.1	7.6	0.245	0.1	0.001	ND	0.058	0.35	0.41	0.054	0.13	1.67	2.55	120	6.2	0.0022	147
6/14/2012	15.2	7.4	ND	0.14	0.0009	0.26	ND	0.28	0.54	0.054	0.12	1.78	2.66	120	7.1	0.0022	147
6/21/2012	15.3	7.7	ND	0.14	0.0018	0.25	0.046	0.24	0.54	0.070	0.14	1.72	2.63	120	7.0	ND	137
6/28/2012	14.6	7.5	ND	ND	ND	0.30	ND	0.21	0.51	0.060	0.13	1.71	2.49	460	7.6	0.00063	128
7/5/2012	15	7.6	ND	0.14	0.0014	0.28	ND	0.24	0.53	0.058	0.099	1.74	2.49	120	8.6	0.00084	132
7/12/2012	15.3	7.5	ND	0.14	0.0011	0.23	ND	0.28	0.51	0.054	0.13	2.57	2.57	120	11	0.00035	131
7/19/2012	14.5	7.8	ND	ND	ND	0.19	ND	0.21	0.40	0.053	0.12	1.84	2.69	120	8.8	0.00081	175
7/26/2012	15.0	7.8	0.21	ND	ND	0.20	ND	0.24	0.44	0.048	0.089	1.84	2.67	120	7.8	0.00092	146
8/2/2012	14.7	7.8	0.49	0.10	0.0016	0.20	ND	0.60	0.80	0.048	0.075	1.79	2.70	120	7.8	0.0015	157
8/9/2012	13.9	7.8	0.24	ND	ND	0.20	ND	0.32	0.51	0.049	0.080	1.72	2.54	120	9.0	0.0027	177
8/16/2012	14.4	7.8	0.21	ND	ND	0.18	ND	0.28	0.46	0.039	0.088	2.06	2.78	120	6.6	0.0020	171
8/23/2012	14.7	7.8	0.67	ND	ND	0.19	ND	0.70	0.89	0.054	0.13	2.06	2.75	120	7.5	0.00087	162
8/30/2012	13.9	7.8	ND	0.14	0.0021	0.17	ND	0.21	0.38	0.044	0.095	2.00	2.84	120	7.3	0.0030	166
9/6/2012	14.0	7.9	ND	ND	ND	0.17	ND	0.24	0.41	0.053	0.10	1.93	2.69	120	5.4	0.0020	163
9/13/2012	14.5	7.8	ND	0.14	0.0023	0.16	ND	0.24	0.40	0.071	0.17	1.95	2.90	120	4.4	0.0013	168
9/20/2012	13.7	8.0	ND	ND	ND	0.17	ND	0.21	0.38	0.11	0.24	1.92	2.67	120	4.8	0.0011	161
9/27/2012	15.0	7.9	0.24	ND	ND	0.20	ND	0.32	0.52	0.11	0.23	2.00	2.91	120	6.7	0.0016	165
10/4/2012	15.7	7.7	ND	ND	ND	0.35	0.037	0.32	0.57	0.15	0.36	1.93	2.69	110	5.0	0.0021	175
10/11/2012	15.0	7.8	0.21	0.14	0.0023	0.37	0.043	0.35	0.59	0.16	0.44	1.97	2.66	120	5.1	0.0017	173

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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
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

Table 3-3. 2012 Water Agency Nutrient Sample Results for Comminsky Station. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Comminsky Station	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 11463000 RR Near Cloverdale (Comminsky)***
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)
5/24/2012	16.1	7.9	0.210	ND	0.0008	0.24	ND	0.24	0.48	0.03	0.031	1.65	1.99	130	2.4	0.0025	183
5/31/2012	17.3	7.8	ND	ND	0.0007	0.24	ND	0.18	0.42	0.036	0.064	1.68	2.00	130	3.2	0.0026	170
6/7/2012	15.7	7.9	0.280	ND	0.0015	ND	0.054	0.35	0.52	0.14	0.086	1.43	2.15	140	5.8	0.0020	163
6/14/2012	17.6	7.8	0.210	ND	0.0007	0.26	ND	0.24	0.51	0.052	0.11	1.58	2.34	120	5.4	0.0023	153
6/21/2012	17.7	8.0	ND	0.18	0.0057	0.26	ND	0.28	0.54	0.063	0.10	1.82	2.15	140	4.8	ND	132
6/28/2012	16.7	7.9	ND	ND	ND	0.30	ND	0.18	0.48	0.049	0.093	1.47	2.09	130	5.2	0.0014	121
7/5/2012	17.9	7.8	ND	ND	ND	0.25	ND	0.21	0.46	0.043	0.053	1.6	2.27	120	5.2	0.0021	139
7/12/2012	18.4	7.9	ND	ND	ND	0.18	ND	0.18	0.35	0.063	0.06	1.64	2.34	120	5.4	ND	144
7/19/2012	16.6	7.9	0.245	ND	ND	0.15	ND	0.32	0.46	0.034	0.048	1.71	2.43	120	5.7	0.0031	160
7/26/2012	17.3	8.0	ND	0.10	0.0031	0.14	ND	0.21	0.35	0.022	0.046	1.69	2.44	130	4.5	0.0027	136
8/2/2012	17.3	7.9	0.91	0.10	0.0025	0.16	ND	1.0	1.2	0.041	0.083	1.69	2.52	120	6.6	0.0024	153
8/9/2012	16.1	7.9	ND	ND	ND	0.16	ND	0.21	0.37	0.037	0.058	1.59	2.32	130	7.6	0.0020	159
8/16/2012	16.7	7.9	ND	0.10	0.0025	0.16	ND	0.21	0.37	0.033	0.065	1.91	2.64	130	6.6	0.0014	162
8/23/2012	16.6	7.9	ND	0.14	0.0033	0.16	ND	0.21	0.37	0.035	0.066	2.35	2.60	120	5.2	0.0010	146
8/30/2012	15.9	7.9	ND	0.10	0.0023	0.15	ND	0.18	0.33	0.035	0.056	1.87	2.62	110	5.4	0.0019	150
9/6/2012	15.2	8.0	0.21	ND	ND	0.15	ND	0.21	0.36	0.044	0.074	1.81	2.41	120	4.2	0.0017	149
9/13/2012	16.3	8.0	ND	0.10	0.0029	0.14	ND	0.24	0.38	0.048	0.11	1.81	2.64	130	3.4	0.0011	154
9/20/2012	14.7	8.2	0.21	0.10	0.0042	0.16	ND	0.32	0.48	0.064	0.13	1.79	2.45	110	3.3	0.00024	156
9/27/2012	15.7	8.0	ND	ND	ND	0.20	ND	0.21	0.41	0.069	0.18	1.92	2.69	120	3.7	0.00091	152
10/4/2012	16.2	7.9	ND	ND	ND	0.29	ND	0.18	0.50	0.096	0.23	1.88	2.53	140	3.2	0.0016	156
10/11/2012	14.9	7.9	ND	0.14	0.0028	0.32	ND	0.24	0.56	0.097	0.27	1.79	2.39	120	2.1	0.0012	157

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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
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

Table 3-4. 2012 Water Agency Nutrient Sample Results for Jimtown. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Jimtown Bridge	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 11463682 RR at Jimtown***
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)
5/24/2012	17.9	7.8	ND	ND	ND	0.23	ND	0.14	0.37	ND	0.020	1.04	1.41	160	0.73	0.0011	229
5/31/2012	19.6	7.7	0.210	ND	ND	0.23	ND	0.21	**0.44**	ND	0.022	0.971	1.35	170	1.2	0.00085	209
6/7/2012	18.1	7.8	0.210	ND	0.0010	ND	0.047	0.24	**0.47**	**0.022**	0.059	0.983	1.44	160	1.8	0.00072	193
6/14/2012	20.2	7.6	ND	ND	0.0009	0.21	ND	0.21	**0.42**	**0.022**	0.038	1.02	1.48	160	1.2	0.00072	171
6/21/2012	19.8	7.7	ND	ND	ND	0.18	ND	0.18	0.36	ND	0.026	0.890	1.23	170	0.78	ND	139
6/28/2012	19.7	7.5	ND	ND	ND	ND	ND	0.18	0.18	ND	0.044	0.985	1.29	160	0.62	0.00042	136
7/5/2012	21.2	7.6	ND	ND	ND	0.16	ND	0.21	0.37	ND	ND	0.978	1.46	150	0.53	0.00032	137
7/12/2012	22.1	7.7	ND	ND	ND	0.14	ND	0.14	0.28	ND	ND	1.05	1.45	130	0.62	0.00012	130
7/19/2012	19.0	7.7	ND	0.10	0.0018	0.12	ND	0.14	0.26	**0.022**	ND	1.22	1.77	150	0.94	0.0012	151
7/26/2012	19.5	7.7	ND	ND	ND	0.13	ND	0.18	0.31	ND	ND	1.09	1.63	160	0.89	0.00092	130
8/2/2012	20.9	7.9	0.91	ND	ND	0.14	ND	0.98	**1.1**	ND	ND	1.18	1.74	160	0.69	0.00059	132
8/9/2012	20.8	7.9	0.24	ND	ND	0.13	ND	0.32	**0.44**	0.020	ND	1.11	1.72	150	1.1	0.0016	141
8/16/2012	20.7	8.1	ND	ND	ND	0.12	ND	0.21	0.33	ND	0.042	1.73	2.01	150	0.97	0.0016	149
8/23/2012	20.3	8.4	ND	0.10	0.0092	0.12	ND	0.14	0.26	0.021	0.031	1.35	1.92	150	0.83	0.00012	142
8/30/2012	20.0	8.3	ND	ND	ND	0.12	ND	0.10	0.22	ND	ND	1.37	1.98	140	0.77	**0.0023**	137
9/6/2012	18.2	8.0	ND	ND	ND	0.13	ND	0.21	0.34	ND	0.028	1.26	1.90	150	0.74	0.0011	137
9/13/2012	19.6	8.4	ND	0.18	0.016	0.12	ND	0.21	0.33	ND	ND	1.41	2.05	150	0.70	0.00098	141
9/20/2012	17.9	8.5	ND	ND	ND	0.14	ND	0.24	**0.38**	**0.025**	0.042	1.26	1.81	150	0.73	0.00012	136
9/27/2012	17.0	7.8	ND	ND	ND	0.15	ND	0.18	0.32	**0.034**	0.072	1.94	2.01	140	0.85	0.0013	140
10/4/2012	18.1	7.8	ND	ND	ND	0.15	ND	0.21	**0.90**	**0.027**	0.053	1.23	1.74	150	0.69	**0.0038**	141
10/11/2012	16.4	8.0	0.28	ND	ND	0.15	ND	0.35	**0.50**	**0.041**	0.070	1.26	1.96	140	0.47	**0.0024**	152

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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
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

Table 3-5. 2012 Water Agency Nutrient Sample Results for Digger's Bend. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Digger's Bend	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 11463980 RR at Digger's Bend***
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)
5/24/2012	18.3	8.0	ND	ND	0.0011	ND	ND	0.18	0.36	ND	0.028	0.99	1.33	170	0.68	0.0011	240
5/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	220
6/7/2012	19.3	8.1	0.280	ND	ND	ND	ND	0.28	**0.46**	**0.024**	0.056	1.13	1.33	160	2.1	0.00063	187
6/14/2012	21.5	7.9	ND	0.10	0.034	ND	ND	0.18	0.35	ND	0.038	1.17	1.38	170	1.1	0.0014	156
6/21/2012	20.9	8.0	0.240	ND	ND	0.14	ND	0.24	**0.39**	ND	0.041	0.899	1.21	170	0.66	ND	138
6/28/2012	20.9	8.0	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.09	1.27	160	0.76	ND	125
7/5/2012	22.0	8.0	ND	0.10	0.0044	ND	ND	0.21	0.21	ND	ND	1.19	1.42	150	0.63	0.00032	122
7/12/2012	22.9	8.0	ND	ND	ND	ND	ND	0.21	0.21	ND	ND	1.05	1.53	160	0.80	0.00023	115
7/19/2012	20.0	8.0	ND	ND	ND	ND	ND	0.21	0.21	ND	ND	1.45	1.75	160	1.2	ND	141
7/26/2012	20.7	8.1	ND	ND	ND	ND	ND	0.18	0.18	ND	0.042	1.21	1.74	160	1.3	0.00034	118
8/2/2012	21.8	8.1	0.28	ND	ND	ND	ND	0.35	0.35	ND	ND	1.25	1.86	160	0.87	0.00012	116
8/9/2012	22.2	8.0	ND	ND	ND	ND	ND	0.18	0.18	**0.024**	0.035	1.14	1.80	160	1.1	ND	120
8/16/2012	21.6	8.1	ND	ND	ND	ND	ND	0.14	0.14	ND	ND	1.45	1.98	150	1.1	0.00046	137
8/23/2012	20.6	8.1	ND	0.10	0.0052	ND	ND	0.14	0.14	ND	ND	1.40	2.03	150	0.82	ND	128
8/30/2012	20.5	8.1	ND	ND	ND	ND	ND	0.21	0.21	ND	ND	1.69	1.96	150	0.85	0.00014	119
9/6/2012	18.8	8.1	ND	0.18	0.0077	ND	ND	0.14	0.14	ND	ND	1.27	1.90	150	0.72	0.00056	123
9/13/2012	20.2	8.2	ND	0.10	0.0060	0.12	ND	0.18	0.30	ND	ND	1.38	2.07	150	0.94	ND	126
9/20/2012	17.8	8.4	ND	ND	ND	ND	ND	0.18	0.18	ND	0.026	1.22	1.84	150	0.67	ND	119
9/27/2012	17.6	8.1	ND	0.10	0.0042	ND	ND	0.18	0.18	**0.033**	0.036	1.41	2.00	140	0.80	0.00013	127
10/4/2012	18.8	8.0	ND	0.10	0.0036	ND	ND	0.18	0.24	ND	0.030	1.19	1.79	140	0.52	0.00063	124
10/11/2012	16.7	8.0	ND	ND	ND	ND	ND	0.18	0.18	**0.029**	0.054	1.30	1.78	150	0.46	0.00061	139

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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
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

Table 3-6. 2012 Water Agency Nutrient Sample Results for Riverfront Park. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Riverfront Park	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 11465390 RR near Windsor (Riverfront Park)***
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)
5/24/2012	17.6	7.8	ND	ND	0.0014	ND	ND	0.14	0.29	ND	0.028	0.956	1.39	150	0.98	0.00094	308
5/31/2012	19.0	7.8	ND	0.10	0.0023	ND	ND	0.24	**0.41**	ND	0.026	0.910	1.29	140	1.4	0.00085	282
6/7/2012	18.1	7.9	ND	ND	0.0009	ND	ND	0.21	0.37	**0.022**	0.044	0.927	1.35	150	1.6	0.00054	--
6/14/2012	19.8	7.8	ND	ND	0.0016	ND	ND	0.18	0.32	ND	0.022	1.02	1.43	160	1.4	0.0014	222
6/21/2012	18.7	7.8	0.210	ND	ND	0.13	ND	0.21	0.34	ND	0.022	0.938	1.32	150	0.96	ND	193
6/28/2012	19.3	7.8	ND	ND	ND	ND	ND	0.14	0.14	ND	0.048	1.01	1.37	140	1.0	0.00053	178
7/5/2012	20.0	7.9	ND	ND	ND	0.13	ND	0.18	0.31	ND	ND	1.02	1.41	140	1.2	0.00011	187
7/12/2012	20.2	7.9	0.245	ND	ND	0.13	ND	0.28	**0.41**	ND	0.022	1.00	1.39	140	1.2	ND	201
7/19/2012	18.9	7.9	ND	0.10	0.0029	ND	ND	0.21	0.21	ND	ND	1.03	1.57	140	1.4	0.00012	243
7/26/2012	19.0	7.9	ND	ND	ND	ND	ND	0.14	0.14	ND	ND	1.11	1.53	140	1.4	0.00034	222
8/2/2012	19.4	7.4	ND	ND	ND	0.12	ND	0.24	0.37	ND	ND	1.07	1.56	130	0.93	0.00035	211
8/9/2012	19.8	7.8	ND	ND	ND	0.12	ND	0.14	0.26	ND	ND	0.870	1.35	140	1.9	0.00012	213
8/16/2012	19.3	8.0	ND	0.10	0.0036	ND	ND	0.14	0.14	**0.022**	ND	1.23	1.66	130	0.94	0.00023	231
8/23/2012	18.5	7.9	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.21	1.68	140	1.3	ND	230
8/30/2012	18.5	7.9	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.23	1.71	140	1.1	ND	218
9/6/2012	17.0	7.9	ND	0.10	0.0025	ND	ND	0.18	0.18	ND	0.039	1.19	1.66	130	1.0	0.00085	230
9/13/2012	18.1	8.0	ND	0.10	0.0033	ND	ND	0.24	0.24	ND	ND	1.14	1.77	140	1..1	0.00056	--
9/20/2012	16.0	8.1	0.35	ND	ND	ND	ND	0.38	**0.38**	ND	ND	1.14	1.69	140	1.2	ND	223
9/27/2012	16.0	8.1	ND	0.10	0.0036	ND	ND	0.18	0.18	**0.032**	0.040	1.26	1.98	140	1.7	ND	225
10/4/2012	17.1	7.8	ND	ND	ND	ND	ND	0.24	0.24	0.020	0.022	1.15	1.62	140	0.94	0.00076	221
10/11/2012	15.4	7.8	ND	0.14	0.0023	0.14	ND	0.18	0.31	**0.023**	0.023	1.15	1.57	140	0.75	0.00037	243

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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 3-7. 2012 Water Agency Nutrient Sample Results for Hacienda. Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Hacienda	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)
5/24/2012	19.0	8.0	ND	ND	0.0024	ND	ND	0.18	0.31	**0.030**	0.069	1.33	1.74	150	1.1	0.0012	299
5/31/2012	20.5	7.9	ND	0.18	0.0057	ND	ND	0.24	**0.40**	**0.036**	0.067	1.17	1.58	160	2.3	0.00066	244
6/7/2012	20.0	8.0	ND	0.1	0.0038	ND	ND	0.21	0.21	**0.032**	0.089	1.14	1.58	160	1.8	0.00072	234
6/14/2012	22.2	7.9	ND	0.1	0.0036	ND	ND	0.18	0.30	**0.031**	0.072	1.19	1.63	150	1.2	0.0015	177
6/21/2012	21.1	8.0	ND	0.14	0.0055	0.12	ND	0.18	0.29	**0.036**	0.086	1.19	1.54	160	1.1	ND	139
6/28/2012	21.5	8.0	ND	ND	ND	ND	ND	0.18	0.18	**0.043**	0.085	1.28	1.65	150	1.2	0.00084	111
7/5/2012	22.3	7.9	ND	ND	ND	0.12	ND	0.18	0.30	**0.038**	0.053	1.18	1.56	150	1.9	0.00084	105
7/12/2012	22.3	7.8	ND	ND	ND	ND	ND	0.21	0.21	ND	0.052	1.05	1.41	150	1.5	ND	82
7/19/2012	19.9	8.0	ND	ND	ND	ND	ND	0.21	0.21	ND	0.029	1.09	1.52	150	1.7	ND	132
7/26/2012	20.9	8.1	ND	ND	ND	ND	ND	0.21	0.21	ND	0.038	1.11	1.55	150	1.9	0.00023	107
8/2/2012	21.7	8.0	ND	0.10	0.0044	ND	ND	0.18	0.18	ND	0.021	1.14	1.54	140	1.4	ND	90
8/9/2012	21.9	8.0	ND	ND	ND	0.11	ND	0.14	0.25	ND	ND	0.947	1.31	140	1.4	ND	93
8/16/2012	21.5	8.1	ND	ND	ND	ND	ND	0.18	0.18	ND	0.030	1.31	1.68	140	1.2	0.00023	118
8/23/2012	20.8	8.0	ND	0.14	0.0055	ND	ND	0.18	0.18	ND	0.024	1.25	1.70	130	1.4	ND	118
8/30/2012	20.3	7.9	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.23	1.71	140	1.4	ND	109
9/6/2012	18.9	8.0	ND	ND	ND	ND	ND	0.18	0.18	ND	0.020	1.15	1.59	130	1.2	ND	123
9/13/2012	19.8	8.1	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.17	1.77	130	1.2	0.00014	113
9/20/2012	17.4	8.1	0.21	ND	ND	ND	ND	0.21	0.21	ND	0.023	1.13	1.64	130	0.98	ND	118
9/27/2012	16.9	7.9	ND	ND	ND	ND	ND	0.21	0.21	ND	ND	1.26	1.82	100	1.5	ND	121
10/4/2012	18.2	7.8	ND	0.14	ND	ND	ND	0.18	0.18	**0.023**	0.022	1.15	1.63	130	1.7	0.00025	112
10/11/2012	15.9	7.9	ND	ND	ND	ND	ND	0.18	0.18	0.021	0.023	1.17	1.54	140	0.91	0.00012	134

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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 3-8. 2012 Water Agency Nutrient Sample Results for Hacienda (Duplicate). Highlighted values indicate those values exceeding the recommended EPA criteria based on Aggregate Ecoregion III.

Hacienda (Duplicate)	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)
5/24/2012	19.0	8.0	ND	ND	0.0012	ND	ND	0.18	0.30	**0.028**	0.085	1.32	1.75	160	1.4	0.0010	299
5/31/2012	20.5	7.9	ND	0.18	0.0057	ND	ND	0.21	0.36	**0.033**	0.094	1.15	1.56	170	2.2	0.00085	244
6/7/2012	20.0	8.0	0.245	ND	0.0026	ND	ND	0.32	**0.43**	**0.032**	0.086	1.18	1.61	150	1.7	0.00063	234
6/14/2012	22.2	7.9	ND	ND	0.0024	ND	ND	0.21	0.34	**0.032**	0.072	1.22	1.62	160	1.1	0.0013	177
6/21/2012	21.1	8.0	ND	ND	ND	0.12	ND	0.18	0.30	**0.038**	0.082	1.16	1.54	180	1.1	ND	139
6/28/2012	21.5	8.0	ND	ND	ND	ND	ND	0.18	0.18	**0.040**	0.089	1.27	1.65	150	1.2	0.0011	111
7/5/2012	22.3	7.9	ND	ND	ND	0.12	ND	0.18	0.30	**0.037**	0.053	1.19	1.56	140	1.8	0.00063	105
7/12/2012	22.3	7.8	ND	ND	ND	ND	ND	0.21	0.21	ND	0.052	1.03	1.41	140	1.4	0.00012	82
7/19/2012	19.9	8.0	ND	ND	ND	ND	ND	0.14	0.14	0.021	0.022	1.09	1.52	150	1.7	0.00012	132
7/26/2012	20.9	8.1	ND	0.18	0.0088	ND	ND	0.14	0.14	ND	ND	1.14	1.54	150	1.9	ND	107
8/2/2012	21.7	8.0	ND	0.10	0.0044	ND	ND	0.18	0.18	ND	0.029	1.11	1.54	140	1.4	ND	90
8/9/2012	21.9	8.0	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	0.902	1.27	150	1.3	ND	93
8/16/2012	21.5	8.1	ND	ND	ND	0.11	ND	0.14	0.25	ND	0.030	1.30	1.67	130	1.2	0.00080	118
8/23/2012	20.8	8.0	ND	0.14	0.0055	ND	ND	0.18	0.18	ND	ND	1.27	1.72	130	1.4	ND	118
8/30/2012	20.3	7.9	ND	ND	ND	ND	ND	0.10	0.10	ND	0.050	1.24	1.70	140	1.3	0.00014	109
9/6/2012	18.9	8.0	ND	0.14	0.0048	ND	ND	0.18	0.18	ND	ND	1.16	1.59	140	1.2	0.00014	123
9/13/2012	19.8	8.1	ND	ND	ND	ND	ND	ND	0.070	ND	0.039	1.21	1.74	140	0.94	ND	113
9/20/2012	17.4	8.1	ND	ND	ND	ND	ND	0.21	0.21	0.020	ND	1.16	1.60	140	0.93	ND	118
9/27/2012	16.9	7.9	ND	ND	ND	ND	ND	0.18	0.18	ND	ND	1.25	1.79	140	1.4	0.00013	121
10/4/2012	18.2	7.8	ND	0.10	0.0021	ND	ND	0.14	0.14	**0.023**	ND	1.12	1.65	130	1.5	0.00025	112
10/11/2012	15.9	7.9	ND	0.10	0.0023	ND	ND	0.18	0.18	ND	0.031	1.17	1.53	130	0.93	0.00024	134

* Method Detection Limit can vary for individual samples depending on matrix interference and dilution factors, 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

3.1.2 2012 Seasonal Bacterial Sampling (Beach Sampling)

The NCRWQCB, in cooperation with the Sonoma County DHS conducts seasonal bacteriological sampling at Russian River beaches which experience the greatest body contact recreation.

The NCRWQCB 2012 seasonal sampling locations consist of: Cloverdale River Park; Crocker Road (downstream end of Cloverdale River Park below Big Sulphur Creek confluence); Alexander Valley; Camp Rose Beach; Healdsburg Veterans Memorial Beach; Steelhead Beach; Forestville Access Beach; Johnson's Beach; and Monte Rio Beach. Bacteriological samples were collected twice a week beginning in late May and continuing through August. The samples were analyzed using the Colilert quantitray MPN method for total coliform and *E. coli* and the Enterolert quantitray method for Enterococcus. Results from the sampling program are reported by the NCRWQCB and the DHS at their respective websites and on the DHS Beach Sampling Hotline. The 2012 seasonal results are shown in Table 3-9 and Figures 3-4 through Figure 3-6.

The NCRWQCB ran either single samples or triplicate samples depending on the timing of the year: Monday results (5/21 - 6/29) are from a single sample, (7/2 – 8/29) are the median values from triplicate samples and Wednesday results are the median values from triplicate samples. The analysis resulting from the 2012 beach sampling program and prior years are being evaluated as part of the CEQA requirements associated with establishing permanent changes to D1610.

Table 3-9. Sonoma County Seasonal Beach Results collected by the NCRWQCB. Highlighted values indicate those values exceeding the California Department of Public Health Draft Guidance for Fresh Water Beaches.

	Cloverdale River Park			Crocker Rd*			Alexander Valley			Camp Rose			Healdsburg			Steelhead Beach			Forestville			Johnson's Beach			Monte Rio Beach		
	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT	TC	EC	ENT
5/21/2012	12033	20	10				11199	10	10	2500	10	10	1515	10	10	1067	10	10	1616	10	10	1191	10	10	1918	31	10
5/23/2012	14136	10	10				7701	10	10	2178	10	10	1669	40	10	1540	10	10	3075	31	10	1334	10	10	1616	10	10
5/28/2012	4106	41	74				4884	10	10	4352	10	10	1354	20	10	1336	31	10	1246	52	10	1174	10	10	749	10	10
5/30/2012	2851	41	31				5794	10	10	2224	10	10	1565	30	10	1565	10	10	1071	10	10	857	10	10	1178	132	20
6/4/2012	4884	10	20				2909	20	10	2035	10	10	1860	30	20	1789	10	10	1396	31	10	2098	20	10	2014	10	10
6/6/2012	1565	61	10				1334	41	10	1291	10	10	882	10	20	1106	20	10	1274	10	10	960	10	10	1396	10	10
6/11/2012				2014	20	10	1624	10	10	1529	10	10	1162	10	10	1046	41	10	880	10	10	987	10	10	1789	10	10
6/13/2012				2014	41	41	1467	10	10	2481	20	10	1935	10	10	1723	20	10	1470	10	10	1565	10	10	1467	10	10
6/18/2012				2851	41	31	1785	20	10	2481	20	10	1782	20	10	2909	10	10	2014	20	10	2489	63	52	2613	20	10
6/20/2012				2851	74	31	1296	31	10	4352	20	10	1670	20	10	1860	30	10	1989	31	10	4106	63	96	2481	20	52
6/25/2012				2723	41	10	1071	10	10	1529	10	10	2613	63	63	1576	20	10	959	30	10	2489	10	20	1515	31	10
6/27/2012				1259	41	31	908	20	41	2046	10	10	3076	52	63	839	10	10	789	20	10	1529	41	52	1274	10	10
7/2/2012				2382	41	10	1086	31	10	3255	41	10	3130	20	41	1354	10	10	1259	10	10	1989	31	52	1539	10	10
7/3/2012				2613	41	20	1455	10	30	4884	31	10	1483	41	20	1259	20	10	1785	10	10	2359	20	10	2046	20	20
7/4/2012				2187	31	20	1860	10	26	2603	10	21	1835	31	38	1291	20	22	2382	20	31	2359	20	43	2603	10	10
7/5/2012				2489	10	88	1723	31	30	4352	10	36	2987	41	54	1789	10	39	1723	10	14	2359	20	71	2481	20	48
7/9/2012				3255	20	38	2382	20	52	3654	10	68	1317	20	16	1500	10	16	1450	20	15	1872	10	18	1153	20	4
7/11/2012				3654	10	81	2613	10	43	3448	10	66	1354	20	13	1274	10	14	1670	10	12	2382	10	16	2382	10	5
7/16/2012				4106	135	109	2359	10	93	4106	31	138	1576	10	24	1670	30	21	1658	10	29	2359	20	33	860	10	10
7/18/2012				2187	20	68	1354	20	32	2143	10	31	1376	31	20	1106	10	12	960	20	9	2187	10	14	1017	20	5
7/23/2012				4106	30	260	1850	10	88	3076	10	91	789	31	11	1670	10	11	1553	10	9	1354	10	10	813	10	10
7/25/2012				2987	20	68	1658	10	76	2613	10	104	1076	31	12	1334	20	19	1664	10	19	1860	10	8	1296	10	5
7/30/2012				3784	20	112	1723	10	108	2382	10	91	1246	41	9	1046	10	10	1106	10	9	1935	20	9	1607	10	1
8/1/2012				4884	20	76	1723	10	99	2755	10	84	1354	10	4	1267	20	8	1211	10	6	2014	10	7	1935	10	1
8/6/2012				2755	63	91	1396	10	142	1842	10	166	1483	31	10	839	10	53	789	10	7	1296	31	3	1674	41	26
8/8/2012				3255	41	43	1850	10	140	3448	10	130	1333	31	7	836	10	9	677	10	3	1236	52	36	1450	10	20
8/13/2012				2359	31	116	2187	10	93	2310	10	82	1274	10	4	709	10	8	1396	20	11	1467	10	8	1500	10	2
8/15/2012	2909	41	19	10462	52	66	2481	10	131	2143	10	79	1723	20	6	1014	10	10	839	10	13	1918	10	13	1246	10	4
8/20/2012				1935	10	36	3255	20	52	2359	10	46	2098	31	21	759	10	9	651	20	11	1076	20	16	1789	20	10
8/22/2012	1250	41	37	1553	63	31	2610	10	84	2909	10	78	1515	10	10	749	10	9	789	30	9	1178	10	33	1789	30	15
8/29/2012	1789	31	72	1314	41	72	1989	10	166	3448	10	12	932	10	3	313	10	3	512	10	2	1467	31	8	1144	10	2

Single Sample Values

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliform: 10,000 per 100 mL

e coli: 235 per 100 mL

Enterococcus: 61 per 100 mL

* Crocker Road site is located at south end of Cloverdale River Park

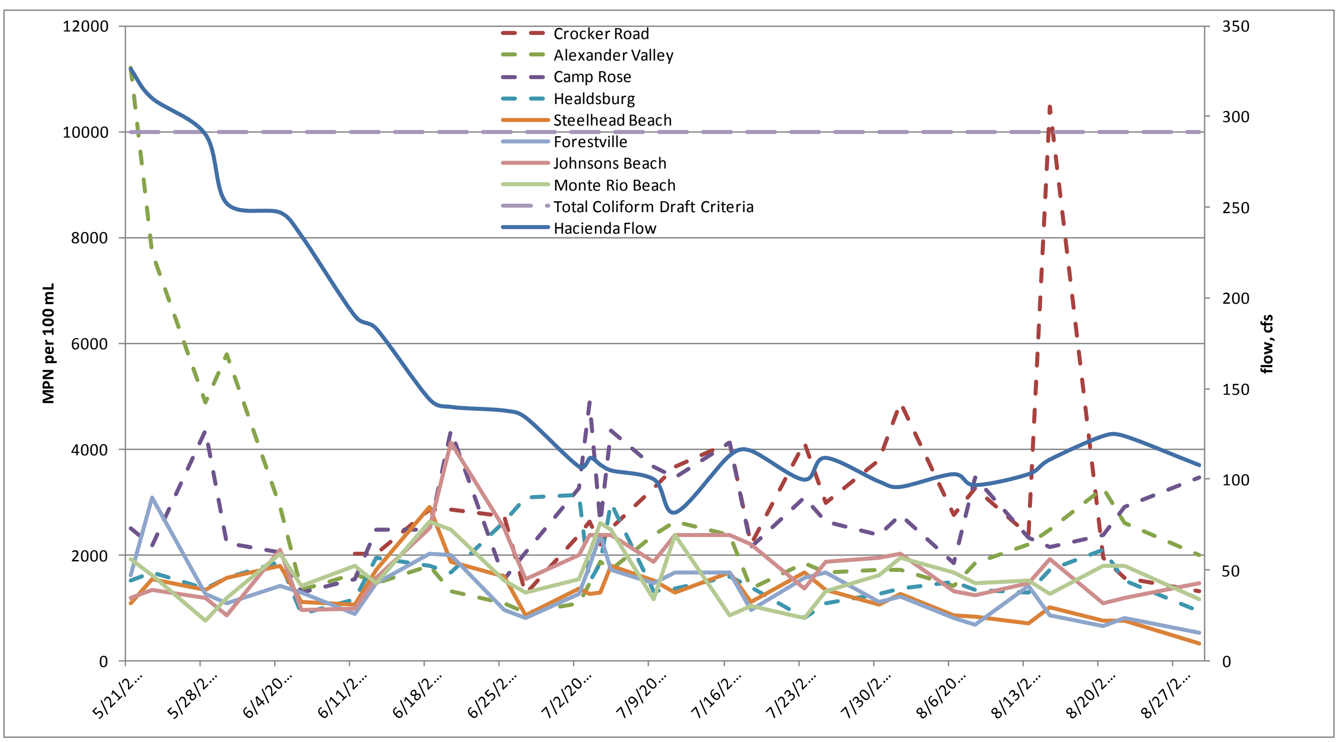


Figure 3-4. Sonoma County Beach Bacteria Sample Results for Total Coliform

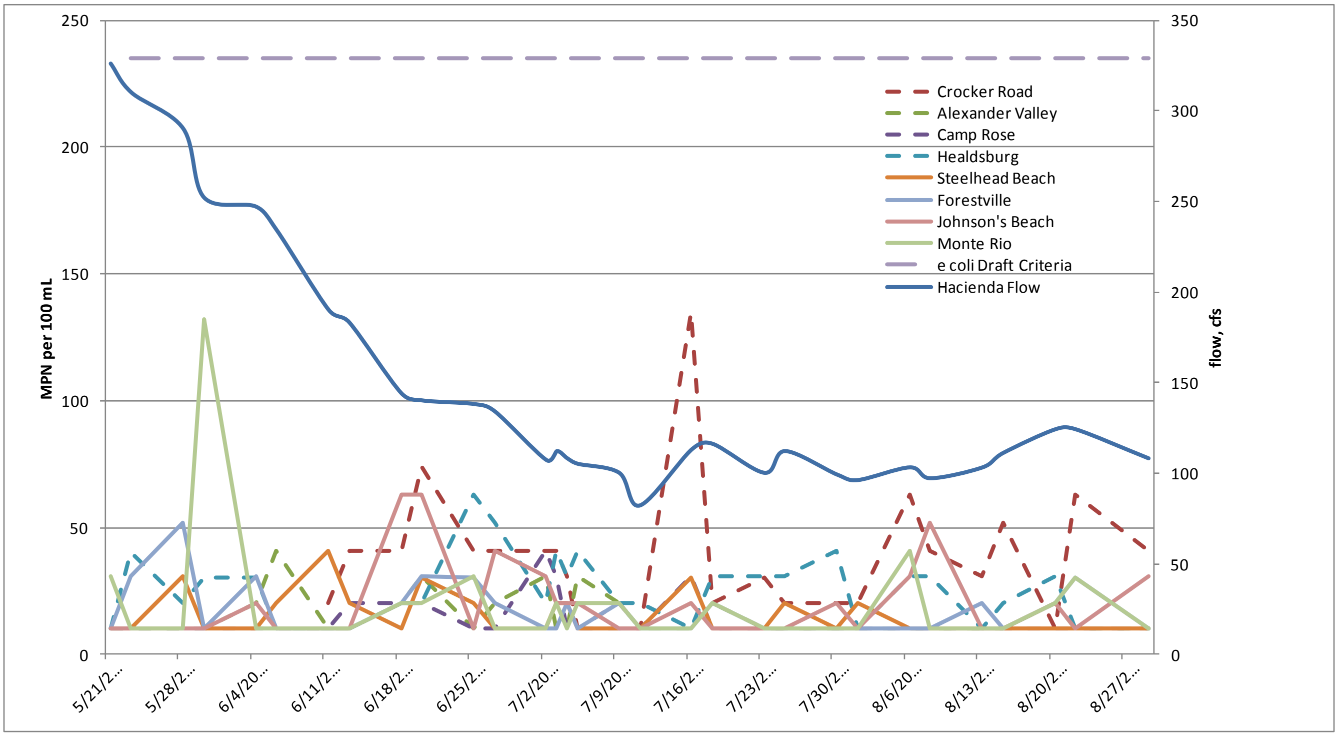


Figure 3-5. Sonoma County Beach Pathogen Sample Results for *E. coli*

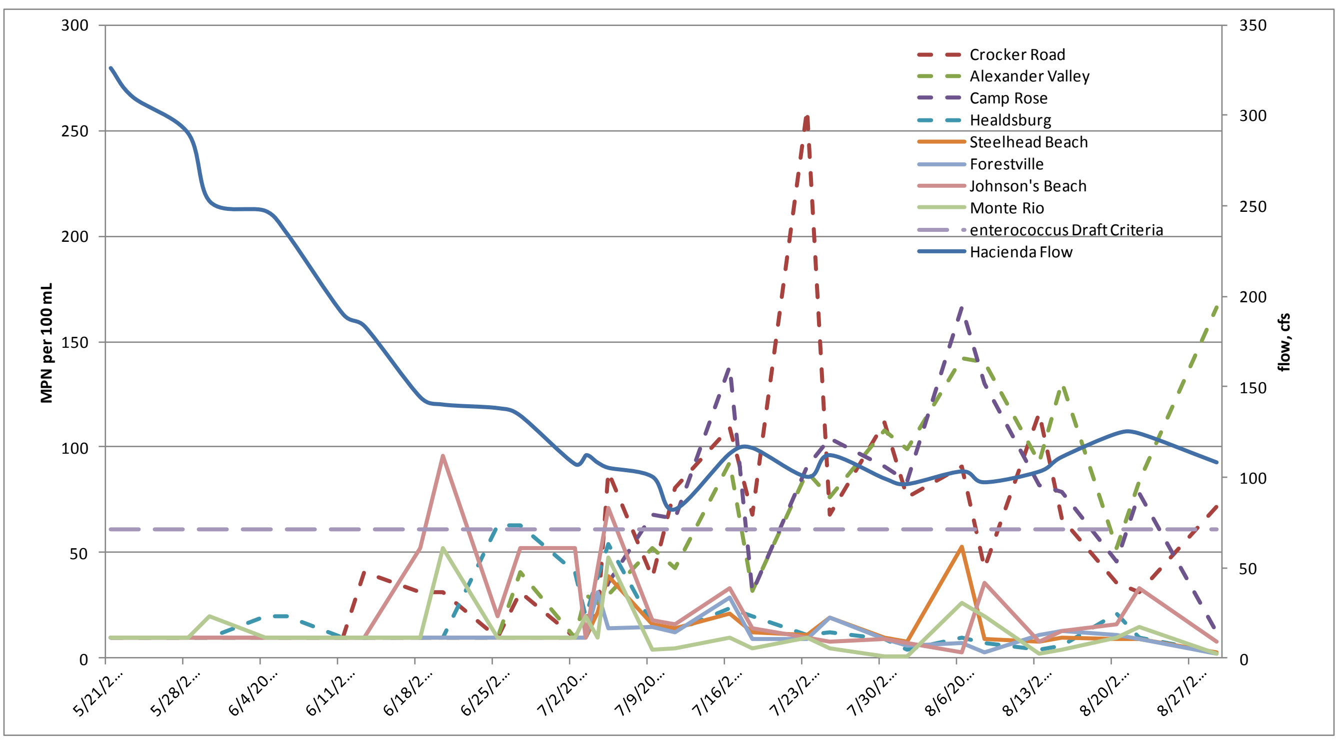


Figure 3-6. Sonoma County Beach Pathogen Sample Results for Enterococcus

3.2 Russian River Estuary Water Quality Monitoring

Flows in the lower Russian River at Hacienda (downstream of the confluence with Dry Creek) dropped below D1610 minimum flow requirements from late June through early October, but remained higher than TUC minimum flows during the entire period of the Order. Long-term water quality monitoring and grab sampling was conducted in the lower, middle, and upper reaches of the Russian River Estuary and the upper extent of inundation and backwatering during lagoon formation, between the mouth of the river at Jenner and Monte Rio, including in two tributaries. Grab sampling was conducted bi-monthly until mid-July when flows dropped below D1610 minimum requirements and then grab sampling was conducted weekly for the rest of the Order. Water Agency staff also 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, and reopening.

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 (May 15 to October 15), 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 summer low flow conditions and barrier beach closure. Additionally, river flows, tides, topography, and wind action affect the amount of mixing of the water column at various longitudinal and vertical positions within the Estuary.

The Water Agency submits an annual report to the National Marine Fisheries Service and California Department of Fish and Game, documenting the status updates of the Water Agency's efforts in implementing the Biological Opinion. The water quality monitoring data for 2012 is currently being compiled and will be discussed in the "Russian River Biological Opinion Status and Data Report Year 2012-13" due to be released in June, 2013. The annual report will be available on the Water Agency's website: http://www.scwa.ca.gov/bo-annual-report/. As with the other datasets, the estuary data will be evaluated as part of the CEQA requirements associated with revised minimum flows in the mainstem. The grab sample sites are shown in Figure 3-7, the results are summarized in Figures 3-8 and 3-9 and Tables 3-10 through 3-16 and the entire dataset can be found as noted, in the 2012-2013 Russian River Biological Opinion Status and Data Report. Rather than plot the duplicate and triplicate results, the most conservative set of results was plotted for samples collected at Monte Rio.

Highlighted values indicate those values exceeding California Department of Public Health Draft Guidance for Fresh Water Beaches for Indicator Bacteria and EPA recommended criteria for Nutrients, Chlorophyll a, and Turbidity in Rivers and Streams in Aggregate Ecoregion III. 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. In addition, these draft guidelines and criteria were established for and are only applicable to fresh water beaches and freshwater portions of the estuary. Currently, there are no numeric guidelines or criteria that have been established specifically for estuaries.

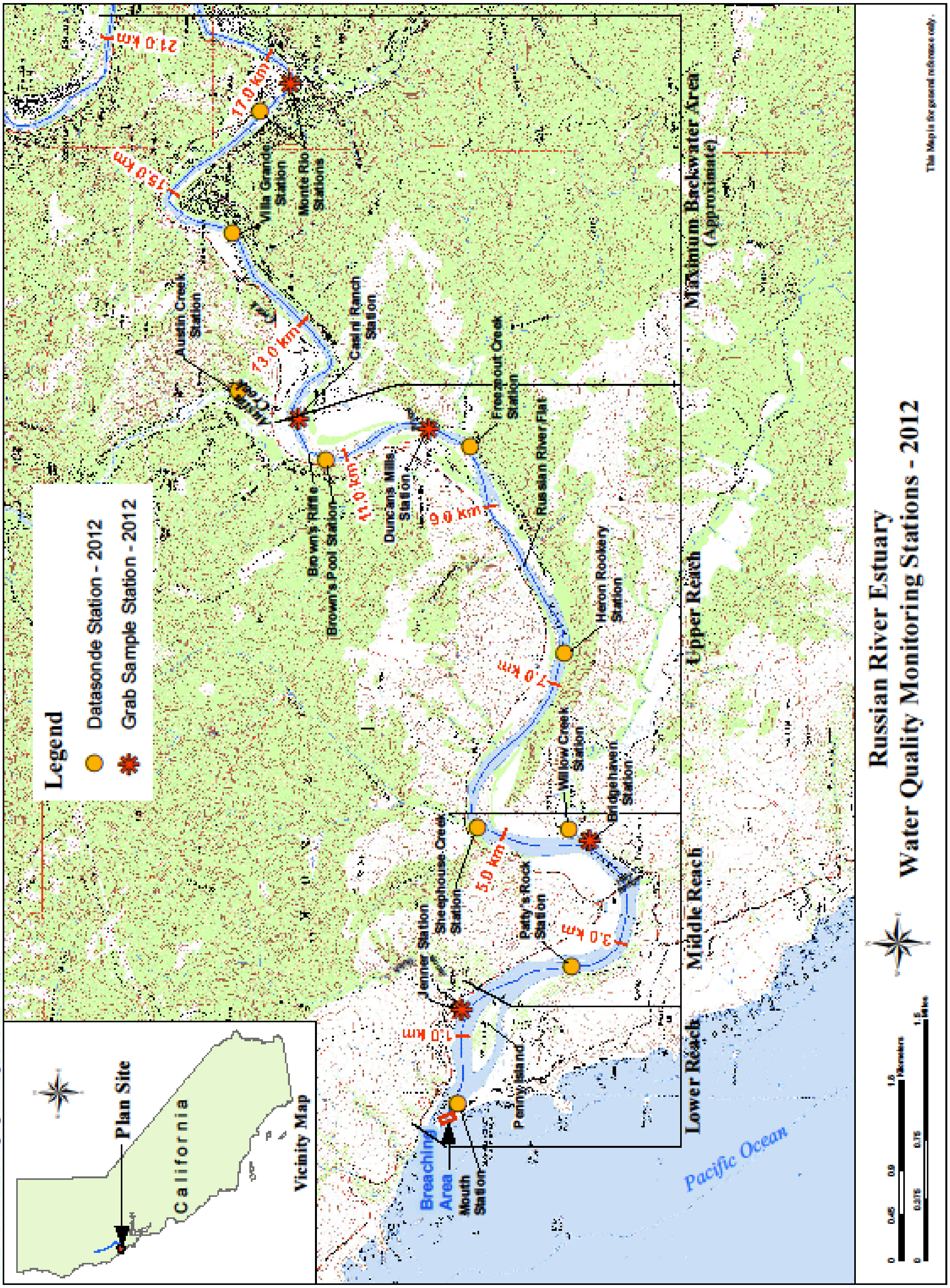


Figure 3-7. 2012 Estuary Sample Sites.

Table 3-10. 2012 Monte Rio Station Grab Sample Results.

Monte Rio	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	Turbidity	Chlorophyll-a	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100m	MPN/100m	MPN/100m	(cfs)
5/22/2012	20.3	7.9	ND	ND	0.0016	ND	ND	0.24	0.24	**0.030**	0.054	1.3	**0.0090**	>2419.6	7.0	--	323
6/5/2012	20.1	8.0	ND	ND	0.0026	ND	ND	0.24	0.36	**0.033**	0.053	1.5	0.0015	1732.9	37.9	22.8	253
6/19/2012	23.0	7.8	0.21	ND	ND	ND	ND	0.28	0.28	**0.035**	0.072	1.4	**0.0023**	1986.3	55.6	8.4	142
7/3/2012	24.2	7.8	ND	ND	ND	ND	ND	0.18	0.18	**0.027**	0.10	1.5	0.00084	1986.3	18.5	**164.8**	112
7/17/2012	22.3	7.9	0.701	ND	ND	ND	ND	0.77	**0.77**	**0.029**	0.061	1.3	0.00012	866.4	13.4	14.6	117
7/24/2012	23.2	8	ND	0.10	0.0047	ND	ND	0.18	0.18	**0.023**	0.044	1.5	0.00080	1203.3	8.3	**77.2**	109
7/31/2012	23.6	8.0	ND	0.18	0.0052	0.24	ND	0.21	0.33	**0.026**	0.039	0.91	ND	1986.3	6.3	1.0	101
8/7/2012	22.6	8.0	ND	ND	ND	ND	ND	0.14	0.14	0.021	0.067	0.85	0.00082	1203.3	6.3	2.0	100
8/14/2012	22.6	7.8	ND	ND	ND	ND	ND	ND	ND	ND	0.049	1.0	0.00074	1553.1	10.9	9.6	109
8/21/2012	22.3	7.9	ND	ND	ND	ND	ND	0.14	0.14	**0.024**	ND	0.88	0.00080	1203.3	9.7	29.5	129
8/28/2012	21.8	7.9	ND	ND	ND	ND	ND	0.18	0.18	**0.023**	0.031	0.74	ND	1553.1	7.3	7.3	108
9/4/2012	21.0	8.0	0.21	0.10	0.0041	ND	ND	0.32	0.32	**0.026**	0.040	1.2	0.00042	1732.9	6.3	2.0	152
9/11/2012	20.2	8.0	ND	0.14	0.0051	ND	ND	0.18	0.18	**0.023**	0.028	0.70	0.00014	1299.7	2.0	7.5	112
9/18/2012	19.1	8.0	ND	0.10	0.0036	ND	ND	0.14	0.14	ND	0.027	0.63	ND	727	3.1	8.5	129
9/25/2012	18.0	7.8	ND	ND	ND	ND	ND	0.18	0.18	ND	0.027	0.8	ND	410.6	9.7	14.6	123
10/2/2012	18.7	7.8	ND	ND	ND	0.14	ND	0.18	0.31	**0.036**	0.053	0.93	0.00039	727.0	6.3	12.2	115
10/4/2012	19.0	7.8	ND	ND	ND	ND	ND	0.18	0.18	**0.027**	ND	0.98	ND	365.4	5.2	12.1	112
10/9/2012	16.9	7.8	ND	ND	ND	ND	ND	0.14	0.14	**0.024**	ND	0.85	ND	275.5	20.1	4.1	138

* 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

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

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-11. 2012 Monte Rio Duplicate Station Grab Sample Results.

Monte Rio (Duplicate)	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	Turbidity	Chlorophyll-a	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100m	MPN/100m	MPN/100m	(cfs)
5/22/2012	20.3	7.9	ND	ND	0.0016	ND	ND	0.21	0.21	**0.028**	0.023	1.3	**0.0090**	2419.6	4.0	--	323
6/5/2012	20.1	8.0	ND	ND	0.0026	ND	ND	0.21	0.33	**0.031**	0.060	1.3	0.0014	1732.9	22.8	20.1	253
6/19/2012	23.0	7.8	0.210	0.10	0.0030	ND	ND	0.32	0.32	**0.034**	0.072	1.4	**0.0020**	2419.6	60.5	16.9	142
7/3/2012	24.2	7.8	ND	ND	ND	ND	ND	0.21	0.21	**0.027**	0.10	1.4	0.0017	1413.6	24.3	**79.0**	112
7/17/2012	22.3	7.9	ND	ND	ND	ND	ND	0.14	0.14	**0.031**	0.053	1.3	0.00023	727	13.4	13.4	117
7/24/2012	23.2	8	0.18	ND	ND	0.11	ND	ND	0.18	**0.027**	0.052	1.4	0.00069	1299.7	8.6	56.8	109
7/31/2012	23.6	8.0	ND	0.14	0.0068	ND	ND	0.21	0.21	**0.024**	0.043	0.84	ND	2419.6	4.1	1.0	101
8/7/2012	22.6	8.0	ND	ND	ND	ND	ND	0.18	0.18	0.021	0.060	0.84	0.00094	1299.7	6.3	2.0	100
8/14/2012	22.6	7.8	ND	0.10	0.0030	0.12	ND	0.14	0.26	**0.021**	0.049	1.0	0.00025	1413.6	7.4	7.3	109
8/21/2012	22.3	7.9	ND	0.14	0.0047	ND	ND	0.10	0.10	0.021	0.020	0.86	0.00046	1986.3	11	22.6	129
8/28/2012	21.8	7.9	ND	ND	ND	ND	ND	0.14	0.14	ND	0.035	0.73	0.00095	1203.3	7.5	7.3	108
9/4/2012	21.0	8.0	ND	ND	ND	ND	ND	ND	ND	0.021	0.033	1.3	0.00056	1533.1	3.1	2.0	152
9/11/2012	20.2	8.0	ND	0.14	0.0051	ND	ND	0.18	0.18	**0.022**	0.036	0.76	0.00014	1413.6	4.1	4.1	112
9/18/2012	19.1	8.0	ND	0.10	0.0036	0.11	ND	0.14	0.25	ND	0.023	0.69	ND	1203.3	5.2	10.9	129
9/25/2012	18.0	7.8	ND	ND	ND	ND	ND	0.18	0.18	ND	0.031	0.83	ND	579.4	7.5	12.1	123
10/2/2012	18.7	7.8	ND	0.10	0.0023	0.14	ND	0.18	0.32	**0.034**	0.057	0.96	0.00013	613.1	6.3	8.6	115
10/4/2012	19.0	7.8	ND	ND	ND	ND	ND	0.14	0.14	**0.029**	ND	0.77	ND	517.2	5.2	4.1	112
10/9/2012	16.9	7.8	ND	ND	ND	ND	ND	0.18	0.10	**0.026**	0.026	0.72	0.00025	365.4	19.7	2.0	138

* 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

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

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-12. 2012 Monte Rio Triplicate Station Grab Sample Results (bacteria only).

Monte Rio (Triplicate)	Temperature	pH	Total Coliforms (Collilert)	E. coli (Collilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			20	20	2	Flow Rate****
Date	°C		MPN/100m	MPN/100m	MPN/100ml	(cfs)
5/22/2012	20.3	7.9	1732.9	15.2	--	323
6/5/2012	20.1	8.0	1986.3	44.1	25.9	253
6/19/2012	23.0	7.8	>2419.6	48.1	14.4	142
7/3/2012	24.2	7.8	1986.3	9.8	59.3	112
7/17/2012	22.3	7.9	866.4	16.1	28.3	117
7/24/2012	23.2	8	1413.6	10.8	**87.1**	109
7/31/2012	23.6	8.0	1986.3	8.4	2.0	101
8/7/2012	22.6	8.0	307.6	4.1	1.0	100
8/14/2012	22.6	7.8	1553.1	13.5	8.4	109
8/21/2012	22.3	7.9	1413.6	3.1	42.2	129
8/28/2012	21.8	7.9	1299.7	6.3	3.1	108
9/4/2012	21.0	8.0	1203.3	12.2	7.4	152
9/11/2012	20.2	8.0	1732.9	2.0	7.5	112
9/18/2012	19.1	8.0	980.4	7.5	17.3	129
9/25/2012	18.0	7.8	613.1	16.0	15.6	123
10/2/2012	18.7	7.8	488.4	5.2	9.8	115
10/4/2012	19.0	7.8	488.4	9.7	5.2	112
10/9/2012	16.9	7.8	461.1	7.3	6.3	138

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

** 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.

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-13. 2012 Casini Ranch Station Grab Sample Results. This site may experience estuarine conditions.

Casini Ranch	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	Turbidity	Chlorophyll-a	Total Coliforms (Collilert)	E. coli (Collilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100m	MPN/100m	MPN/100m	(cfs)
5/22/2012	21.2	8.1	ND	0.10	0.0052	ND	ND	0.21	0.21	ND	0.038	0.81	**0.0065**	1553.1	6.0	--	323
6/5/2012	21.0	8.1	ND	ND	0.0034	ND	ND	0.18	0.18	**0.026**	0.060	1.0	**0.0020**	980.4	26.2	11.9	253
6/19/2012	22.4	8.0	ND	0.10	0.0044	ND	ND	0.21	0.21	**0.040**	0.072	1.2	0.0014	1299.7	49.5	**248.9**	142
7/3/2012	23.2	8.1	ND	ND	ND	ND	ND	0.21	0.33	**0.027**	0.10	1.2	0.00074	980.4	12.1	38	112
7/17/2012	21.7	8.2	0.245	ND	ND	ND	ND	0.28	0.28	**0.032**	0.049	0.95	0.00012	1046.2	6.3	8.5	117
7/24/2012	22.1	8.2	ND	0.10	0.0069	0.11	ND	0.18	0.29	**0.030**	ND	1.1	0.00023	1046.2	<1.0	3.0	109
7/31/2012	22.8	8.2	0.28	0.10	0.0073	0.15	ND	0.38	**0.54**	**0.026**	0.035	1.1	ND	920.8	5.2	4.1	101
8/7/2012	22.3	8.2	ND	ND	ND	ND	ND	0.18	0.18	**0.035**	0.044	**2.4**	0.0011	>2419.6	5.2	6.2	100
8/14/2012	21.5	8	ND	ND	ND	ND	ND	0.18	0.18	**0.029**	0.031	1.2	0.0014	1553.1	7.5	7.4	109
8/21/2012	22.3	8.0	ND	ND	ND	ND	ND	0.18	0.18	**0.025**	0.020	1.0	0.0011	1986.3	<1.0	5.1	129
8/28/2012	21.8	7.9	ND	ND	ND	ND	ND	0.18	0.18	**0.027**	0.046	0.70	0.00054	1046.2	5.2	6.3	108
9/4/2012	20.6	8.2	ND	0.10	0.0064	ND	ND	0.14	0.14	**0.026**	ND	1.4	0.00099	1203.3	4.1	4.1	152
9/11/2012	20.5	8.4	ND	0.14	0.013	ND	ND	0.18	0.18	ND	0.025	0.74	ND	1046.2	8.6	5.1	112
9/18/2012	19.3	8.8	ND	0.14	0.026	0.11	ND	0.24	0.36	**0.025**	0.062	0.62	ND	980.4	7.5	6.3	129
9/25/2012	18.3	8.5	ND	ND	ND	ND	ND	0.18	0.18	ND	0.047	1.0	ND	866.4	17.3	26.2	123
10/2/2012	19.1	8.1	ND	ND	ND	ND	ND	0.14	0.14	**0.022**	0.057	1.0	ND	866.4	20.1	44.8	115
10/4/2012	19.1	8.1	ND	0.10	0.0045	ND	ND	0.24	0.24	**0.037**	ND	1.4	0.00025	613.1	15.5	21.3	112
10/9/2012	18.1	8.2	ND	ND	ND	ND	ND	0.18	0.18	ND	0.026	0.90	0.00013	648.8	6.3	11.0	138

* 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

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

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-14. 2012 Duncans Mills Station Grab Sample Results. This site may experience estuarine conditions.

Duncans Mills	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	Turbidity	Chlorophyll-a	Total Coliforms (Collilert)	E. coli (Collilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100ml	MPN/100ml	MPN/100ml	(cfs)
5/22/2012	20.3	8.1	ND	ND	0.0032	ND	ND	0.21	0.21	0.020	0.062	0.62	0.0010	1046.2	13.2	--	323
6/5/2012	20.8	8.4	ND	ND	0.0065	ND	ND	0.21	0.31	**0.029**	0.064	0.86	0.0013	2419.6	29.2	14.5	253
6/19/2012	22.1	8.2	0.28	ND	ND	ND	ND	0.32	0.32	**0.034**	0.052	0.91	0.00062	461.1	60.5	10.8	142
7/3/2012	23.6	8.4	0.245	ND	ND	ND	ND	0.32	0.32	**0.035**	0.093	1.0	0.00053	980.4	27.2	5.2	112
7/17/2012	21.3	8.5	3.26	ND	ND	0.12	ND	3.3	**3.4**	**0.037**	0.068	1.1	0.00035	1986.3	30.1	12.1	117
7/24/2012	22.4	8.3	0.28	ND	ND	0.12	ND	0.35	**0.47**	**0.027**	0.025	1.2	0.00046	1986.3	4.1	10.7	109
7/31/2012	22.7	8.5	ND	0.14	0.018	0.12	ND	0.21	0.33	**0.069**	0.062	1.1	ND	1203.3	8.5	9.5	101
8/7/2012	21.6	8.3	ND	ND	ND	0.17	ND	0.21	**0.38**	**0.031**	0.075	**2.7**	0.0012	>2419.6	12.0	18.9	100
8/14/2012	21.1	8.1	ND	ND	ND	0.12	ND	0.18	0.30	**0.029**	0.034	1.1	0.00086	>2419.6	15.8	24.3	109
8/21/2012	21.4	8.4	ND	ND	ND	ND	ND	0.24	0.24	**0.024**	0.028	0.86	0.00092	1553.3	3.1	2.0	129
8/28/2012	21.1	8.1	ND	ND	ND	0.12	ND	0.21	0.33	0.020	0.027	0.61	0.0011	1299.7	6.3	6.3	108
9/4/2012	20.1	8.3	ND	ND	ND	ND	ND	0.21	0.21	**0.029**	ND	1.6	0.00085	2419.6	8.5	7.3	152
9/11/2012	19.3	8.2	ND	ND	ND	0.12	ND	0.14	0.14	0.021	0.025	0.73	0.00014	1986.3	10.8	13.7	112
9/18/2012	19.2	8.6	ND	0.10	0.014	ND	ND	0.18	0.18	0.021	0.027	0.59	ND	1732.9	10.8	13.4	129
9/25/2012	17.9	8.1	ND	ND	ND	ND	ND	0.18	0.18	ND	0.035	1.3	ND	461.1	14.6	22.8	123
10/2/2012	18.6	8.0	ND	ND	ND	0.14	ND	0.14	0.28	**0.027**	0.057	0.90	ND	1732.9	45.7	28.2	115
10/4/2012	19.1	8.1	0.21	ND	ND	ND	ND	0.24	0.24	**0.029**	ND	1.0	0.00013	866.4	12.2	26.6	112
10/9/2012	17.2	8.1	ND	ND	ND	0.14	ND	0.18	0.31	ND	0.033	0.79	0.00013	770.1	8.5	7.5	138

* 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

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

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-15. 2012 Bridgehaven Station Grab Sample Results. Estuarine conditions exist at this site.

Bridgehaven	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	Turbidity	Chlorophyll-a	Total Coliforms (Collilert)	E. coli (Collilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100ml	MPN/100ml	MPN/100ml	(cfs)
5/22/2012	18.8	8.0	ND	0.1	0.0030	ND	ND	0.28	0.28	**0.038**	0.065	2.2	0.001	>2419.6	10.1	--	323
6/5/2012	18.5	8.4	ND	ND	0.0053	ND	ND	0.24	0.34	0.020	0.026	0.89	0.00027	980.4	75.4	**121.1**	253
6/19/2012	20.6	8.5	0.28	ND	ND	ND	ND	0.28	0.28	**0.036**	0.080	1.1	0.00041	1119.9	22.6	19.7	142
7/3/2012	19.9	8.3	0.315	ND	ND	ND	ND	0.35	0.35	**0.046**	0.089	2.1	0.00032	>2419.8	20.1	2.0	112
7/17/2012	18.8	8.8	0.315	ND	ND	0.12	ND	0.38	**0.51**	**0.077**	0.030	1.1	0.0015	>2419.6	14.1	17.5	117
7/24/2012	20.0	8.7	ND	0.14	0.020	ND	ND	0.21	0.21	0.020	ND	1.8	0.00057	>2419.6	8.6	24.1	109
7/31/2012	19.9	8.7	ND	0.25	0.034	0.13	ND	0.28	**0.41**	**0.026**	0.051	1.2	ND	>2419.6	24.1	53.7	101
8/7/2012	21.0	8.5	ND	0.1	0.01	ND	ND	0.28	0.28	**0.029**	0.036	**2.6**	0.0012	>2419.6	<1.0	13.2	100
8/14/2012	19.2	8.3	ND	ND	ND	0.60	ND	0.18	**0.78**	ND	0.026	0.84	0.00012	>2419.6	2.0	**146.4**	109
8/21/2012	19.5	8.4	ND	0.18	0.012	0.59	ND	0.21	**0.80**	ND	ND	0.79	0.0010	>2419.6	21.2	58.3	129
8/28/2012	19.4	8.2	ND	0.18	0.0078	ND	ND	0.21	0.21	**0.040**	ND	0.64	**0.0018**	2419.6	10.2	23.5	108
9/4/2012	17.0	7.8	ND	0.21	0.0032	ND	ND	0.21	0.21	ND	ND	0.71	0.0017	2419.6	3.1	26.2	152
9/11/2012	17.8	8.3	ND	ND	ND	ND	ND	0.21	0.21	**0.025**	0.025	0.69	**0.0025**	>2419.6	1.0	19.9	112
9/18/2012	17.2	8.3	0.42	ND	ND	ND	ND	0.35	0.35	**0.028**	0.023	0.64	**0.0022**	>2419.8	6.3	5.2	129
9/25/2012	16.1	8.1	ND	ND	ND	ND	ND	0.24	0.24	ND	0.027	1.2	0.0017	2419.6	3.0	16.1	123
10/2/2012	16.8	8.2	ND	ND	ND	ND	ND	0.24	0.24	**0.023**	0.038	0.90	**0.0019**	365.4	16.0	5.2	115
10/4/2012	17.8	8.0	ND	0.18	0.0051	0.30	ND	0.28	**0.58**	**0.035**	ND	1.1	**0.0039**	>2419.6	186	**201.4**	112
10/9/2012	15.7	8.1	ND	ND	ND	ND	ND	0.18	0.18	**0.025**	0.030	0.94	**0.0019**	1046.2	**461.1**	**365.4**	138

* 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

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

CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:

Beach posting is recommended when indicator organisms exceed any of the following levels:

Total coliforms: 10,000 per 100 ml

E. coli: 235 per 100 ml

Enterococcus: 61 per 100 ml

Table 3-16. 2012 Jenner Boat Ramp Station Grab Sample Results. Estuarine conditions exist at this site.

Jenner Boat Ramp	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	Turbidity	Chlorophyll-a	Total Coliforms (Colilert)	E. coli (Colilert)	Enterococcus (Enterolert)	USGS 11467000 RR near Guerneville (Hacienda)***
MDL*			0.200	0.10	0.00010	0.030	0.030	0.10		0.020	0.020	0.020	0.000050	20	20	2	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	MPN/100ml	MPN/100ml	MPN/100ml	(cfs)
5/22/2012	17.9	7.9	0.35	ND	0.0015	ND	ND	0.42	**0.90**	**0.053**	0.069	**6.5**	**0.0019**	--	--	--	323
6/5/2012	18.3	8.5	ND	0.21	0.018	ND	ND	0.28	0.28	**0.022**	0.030	1.6	0.0013	1732.9	127.4	**547.5**	253
6/19/2012	20.5	8.5	0.35	ND	ND	ND	ND	0.35	0.35	**0.034**	0.087	1.4	**0.0023**	>2419.6	137.6	**157.6**	142
7/3/2012	20.4	8.5	0.245	ND	ND	ND	ND	0.28	0.28	0.020	0.055	1.2	0.00021	2419.8	143.9	51.2	112
7/17/2012	18.5	8.7	0.420	0.10	0.013	0.12	ND	0.52	**0.65**	**0.024**	0.026	1.7	0.0014	>2419.6	30.5	**648.8**	117
7/24/2012	19.6	8.4	ND	0.10	0.0083	0.26	ND	0.24	**0.50**	**0.026**	0.021	1.9	0.00069	>2419.6	3.0	23.8	109
7/31/2012	19.2	8.4	ND	0.21	0.014	0.16	ND	0.32	**0.47**	**0.026**	0.043	1.2	ND	>2419.6	59.1	**613.1**	101
8/7/2012	18.2	8.2	0.32	ND	ND	0.63	ND	0.35	**0.48**	**0.027**	0.048	1.4	**0.0027**	>2419.6	<1.0	54.6	100
8/14/2012	18.0	8.1	0.21	ND	ND	1.2	ND	0.24	**1.4**	**0.030**	0.023	1.4	0.0014	>2419.6	3.0	**275.5**	109
8/21/2012	17.7	8.1	ND	0.21	0.0065	1.2	ND	0.21	**1.4**	**0.022**	ND	0.76	0.0015	>2419.6	54.1	**62**	129
8/28/2012	17.3	8.3	ND	ND	ND	1.3	ND	0.21	**1.5**	**0.025**	ND	0.92	**0.0030**	>2419.6	34.2	21.8	108
9/4/2012	16.5	8.3	ND	ND	ND	0.64	ND	0.24	**0.88**	**0.025**	ND	1.1	0.0013	165.0	3.1	43.2	152
9/11/2012	16.8	8.2	ND	0.18	0.0065	ND	ND	0.21	0.21	**0.026**	0.025	0.72	0.0011	>2419.6	3.1	11	112
9/18/2012	15.5	8.1	ND	ND	ND	ND	ND	0.21	0.21	**0.026**	0.043	0.65	0.00098	2419.6	2.0	10.9	129
9/25/2012	14.8	8.0	0.28	ND	ND	1.4	ND	0.35	**0.49**	ND	0.031	0.73	0.00073	>2419.6	1.0	15.8	123
10/2/2012	15.7	8.2	0.28	ND	ND	ND	ND	0.32	0.32	**0.022**	0.038	0.83	0.00078	980.4	33.6	21.8	115
10/4/2012	17.9	8.1	ND	0.14	0.0049	0.70	ND	0.32	**1.0**	**0.027**	ND	1.3	**0.0020**	816	9.8	12.1	112
10/9/2012	15.3	8.1	ND	ND	ND	0.74	ND	0.24	**0.39**	0.021	0.037	1.3	0.0013	360.9	45.5	**71.2**	138

* 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	CDPH Draft Guidance for Fresh Water Beaches - Single Sample Values:
Total Phosporus: 0.02188 mg/L (21.88 ug/L) ≈ 0.022 mg/L	Beach posting is recommended when indicator organisms exceed any of the following levels:
Total Nitrogen: 0.38 mg/L	Total coliforms: 10,000 per 100 ml
Chlorophyll *a*: 0.00178 mg/L (1.78 ug/L) ≈ 0.0018 mg/L	*E. coli:* 235 per 100 ml
Turbidity: 2.34 FTU/NTU	Enterococcus: 61 per 100 ml

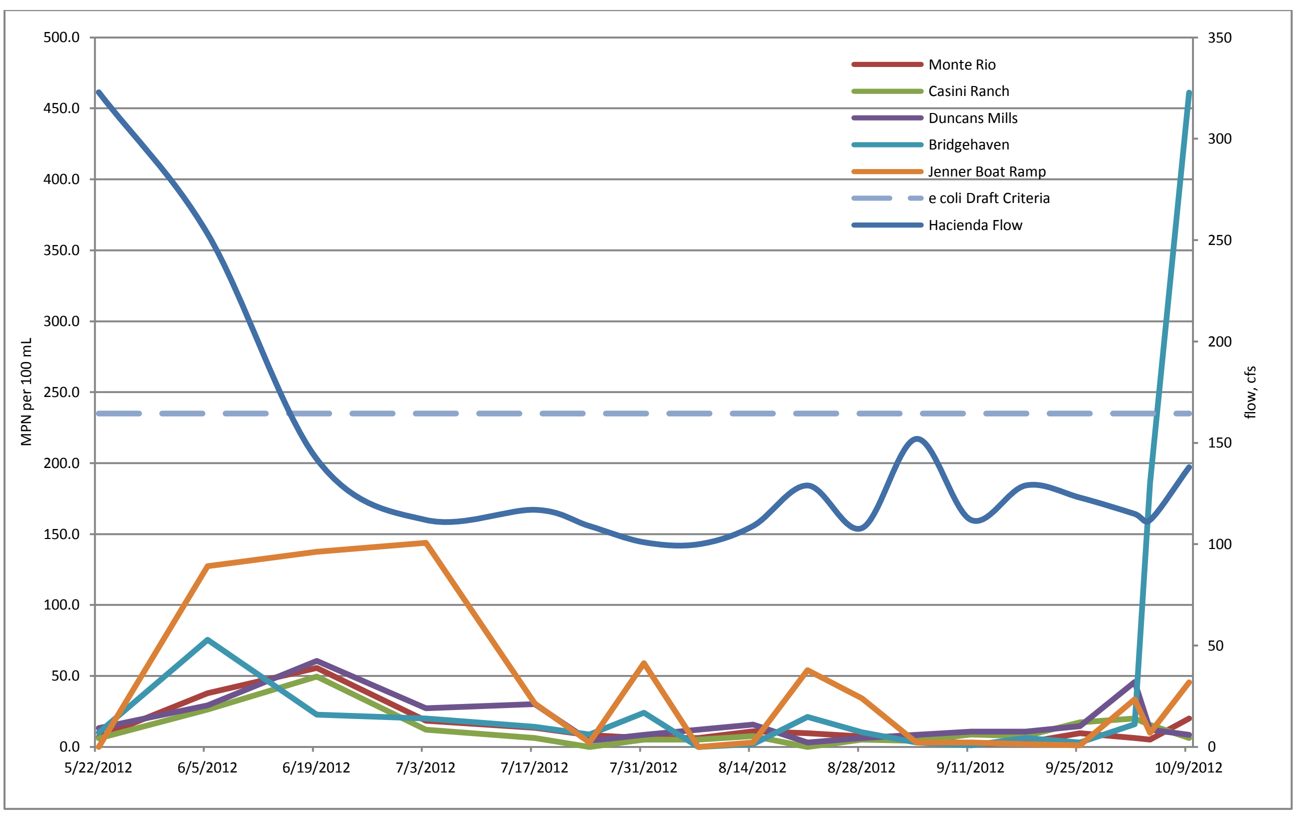


Figure 3-8. Water Agency *E. coli* Sample Results for the Russian River, Monte Rio to Jenner

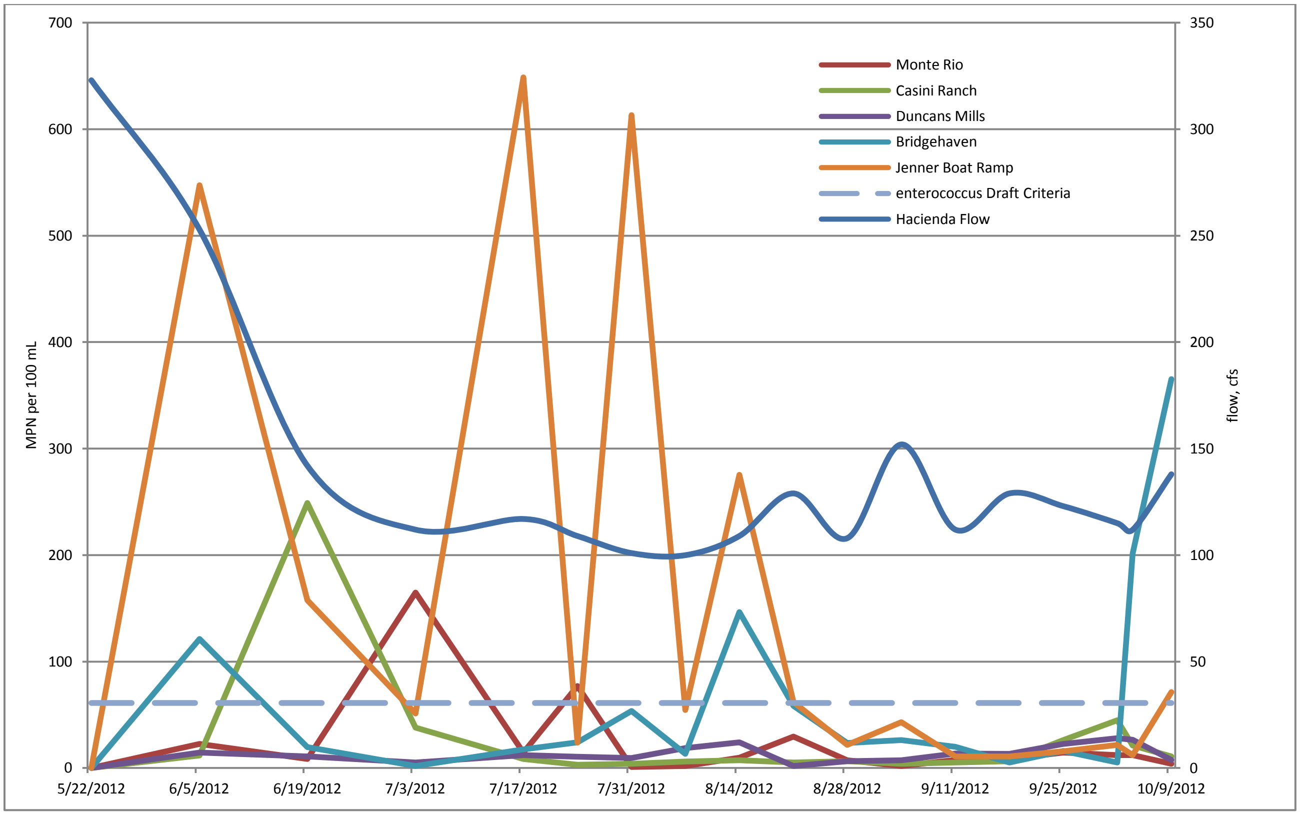


Figure 3-9. Water Agency Enterococcus Sample Results for the Russian River, Monte Rio to Jenner

4.0 ADDITIONAL MONITORING

4.1 Permanent Datasondes

In coordination with the USGS the Water Agency maintains five multi-parameter water quality sondes on the Russian River located at Russian River near Hopland, Russian River at Diggers Bend near Healdsburg and Russian River near Guerneville (aka Hacienda Bridge), the Water Agency's water supply facility at Mirabel (RDS), and Johnson's Beach. These five sondes are referred to as "permanent" because the Water Agency maintains them as part of its early warning detection system for use year-round. The sondes take real time readings of water pH, temperature, dissolved oxygen content (DO), specific conductivity, turbidity, and depth, every 15 minutes.

In addition to the permanent sondes, the Water Agency in cooperation with the USGS installed seasonal sondes with real-time telemetry at the USGS river gage station at Russian River near Cloverdale (north of Cloverdale at Commisky Station Road) and at the gage station at Russian River at Jimtown (Alexander Valley Road Bridge). These two additional sondes are included by the USGS on its "Real-time Data for California" website.

The data collected by the sondes described above are evaluated in Section 4.2 in response to the SWRCB request 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 2012 dataset and historical sonde data will be evaluated to support the Water Agency's future CEQA compliance documents.

4.2 Aquatic Habitat for Salmonids

4.2.1 Introduction

Altered flow regimes in rivers have the potential to change the environmental conditions experienced by salmonids occupying mainstem habitats. NMFS (2008) found that high summer time flows related to reservoir releases can increase velocities to the point that there is a reduction in the amount of optimal habitat available to summer rearing salmonids. However summer flows could be reduced to the point that water temperature could increase and dissolved oxygen (DO) could decrease, thereby degrading summer salmonid rearing habitat. In April of 2012 the Water Agency requested a Temporary Urgency Change Petition (TUCP) to meet the requirements in the Biological Opinion. The 2012 TUCP requested a change in minimum instream flow requirements under Decision 1610 (D1610) in order to improve salmonid rearing habitat in the Russian River as outlined in the Biological Opinion. These flow changes are also intended to provide a lower, closer-to-natural inflow to the estuary between late spring and early fall, thereby enhancing the potential for maintaining a seasonal freshwater lagoon that would likely support increased production of juvenile steelhead and salmon (NMFS 2008). In the State Water Resource Control Board's (SWRCB) Order the Water Agency was tasked with evaluating impacts to water quality and the availability of aquatic habitat for salmonids in the Russian River associated with reductions in minimum instream flows in the Order. The period covered by the Order is May 2 through October 15, 2012 (Crader 2012). This report summarizes Russian River flow, temperature, DO, and salmonid monitoring data in order to evaluate the potential effect of reducing minimum instream flows on salmonid habitat.

4.2.2 Life stages

Salmonids in the Russian River can be affected by flow, temperature, and DO changes at multiple life stages. The Russian River supports three species of salmonids, coho salmon, steelhead, and Chinook salmon (Martini-Lamb and Manning 2011). These species follow a similar life history where 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 on riffles and pool tail crests. As eggs are deposited into the nest as they are fertilized by males. The eggs are covered with gravel by the female and the eggs remain in the nest for 8-10 weeks before hatching. After hatching the larval fish, identified as alevins, remain in the gravel for another 4-10 weeks before emerging. After emerging 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, and 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 1 to 4 years at sea before returning to the river to spawn as adults (Moyle 2002). Because all life stages of all three species of Russian River salmonids spend a period of time in the Russian River watershed, they must cope with the freshwater conditions they encounter including flow, temperature, and DO levels. While broadly 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; consequently, these subtle but important differences may expose each species to a different set of freshwater conditions.

Coho timing

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 and 2012 indicate that the adult coho salmon run may start in late October and continue through at least January (SCWA unpublished data). 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). For coho, only the temperature and DO data relating to the adult and smolt life stages will be summarized for this report. Spawning and rearing take place in the tributaries which are outside of the spatial boundaries governed by the Order (Table 4-1).

Steelhead timing

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 although very few adult steelhead may return as early September in some years, the vast majority of returns occur between January and April. Additionally, during coho spawner surveys conducted by the University of California Cooperative Extension (UCCE), steelhead have been observed spawning in tributaries of the Russian River in January, but more often in February and March (Obedzinski 2012).

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 main stem 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 (Ukiah Reach), but at a lower density than in the Canyon Reach. 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 have cooler water temperatures when compared to other mainstem reaches. The cool water found in the Canyon and Ukiah reaches is a direct result of releases made at the Coyote Valley Dam. Therefore, for steelhead parr, water temperature data will only be summarized at Hopland and Cloverdale because they are the only sites where water temperature data was collected that are within the section of the upper Russian River known to support summer rearing steelhead parr.

The steelhead smolt migration in the Russian River begins at least as early as March and continues through June, peaking between mid-March and mid-May (Martini-Lamb and Manning 2011). For Russian River steelhead, adult migratory, parr (rearing), and smolt life stages are present in the mainstem during the time period covered by the Order and only these life stages will be analyzed for the potential effect of altered temperature and DO levels related to the Order (Table 4-1).

Chinook timing

Based on video monitoring at the Water Agency's inflatable dam in Mirabel, adult Chinook are typically observed in the Russian River before coho and steelhead. Chinook enter the Russian River as early as September, but are typically not present in high numbers until mid-October. Generally the Chinook run peaks between mid-October and mid-November and is over in late December (Chase et al. 2005 and 2007, SCWA unpublished data). 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. Based on downstream migrant trapping data the majority of the Chinook smolt out-migration appears to be complete by mid to late June (Chase et al. 2005 and 2007, Martini-Lamb and Manning 2011). The adult migratory 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 levels during the time period related to the Order will be analyzed for these Chinook life stages in this report (Table 4-1).

Table 4-1. The species and life stage of salmonids found in the Russian River watershed that will be analyzed for this report during the period covered by the Order (May 2, 2012 to October 15, 2012) and the justification for excluding certain life stages from the analysis. The Order only applies to the Mainstem Russian River and not its tributaries.

Species	Life stage	Summarized in report	Comments
Chinook	adult	x	September to late December
	spawning		Fall/winter
	egg		Winter/early spring
	alevin		Winter/early spring
	fry		Winter/early spring
	smolt	x	Spring/early summer
steelhead	adult	x	Fall/winter
	spawning		Winter/early spring
	egg		Winter/early spring
	alevin		Winter/early spring
	fry		Spring/early summer
	parr	x	spring/summer/fall/possibly winter
	smolt	x	Winter/early spring
coho	adult		Fall/winter
	spawning		spawns in tributaries
	egg		eggs deposited tributaries
	alevin		Alvin emerge in tributaries
	fry		freshwater rearing takes place in tributaries
	parr		freshwater rearing takes place in tributaries
	smolt	x	Spring/early summer

4.2.3 Methods

The Water Agency operated a downstream migrant trap and later an underwater camera system at the Mirabel inflatable dam approximately 4.8 river kilometers (rkm) upstream of Hacienda. Data from this monitoring site was used to determine what species and life stages were present in the Russian River during the Order. Physical habitat conditions (flow, water temperature, and DO) were collected at multiple sites (Hopland, Cloverdale, Diggers Bend and Hacienda) in the Russian River during the Order. These conditions were compared to findings in the literature that were used to construct temperature and DO criteria for Russian River salmonids during different life history phases. These criteria were used to assess potential impacts to salmonids related to temperature, and DO.

Temperature

Daily minimum and daily maximum water temperature were collected at 4 sites (Hopland, Cloverdale, Diggers bend and Hacienda) on the Russian River and compared to temperature zones and limits that were constructed from a compilation of temperature data found in the literature. Salmonids have different temperature requirements depending on the species or life stage, therefore the temperature zones and upper limit used in this report differ by species and life stage.

Stream temperatures that restrict salmonids vary with species and possibly by geographical region. Critical temperatures that limit production and survival of salmonids vary widely in the literature. As a result, establishing a single set of criteria that describes the suitability of a particular stream's thermal regime to support salmonids is difficult. For example, Bell (1986) states that the upper lethal temperature of steelhead is 23.8 ˚C, while Nielsen et al. (1994) reported steelhead in the Eel River feeding at water temperatures of 24 ˚C. Further, growth of Chinook has been reported to be maximized at a temperature of 14.8 ˚C when food rations are maintained at 60 percent of satiation, but at 18.9 to 20.5˚C when fish were fed to satiation. Much of the literature analyzing the effects of temperature on fish is focused on determining "optimal" or lethal levels. However, even in natural environments, fish often spend the majority of their time exposed to "suboptimal" conditions. Depending on the elevated temperature, fish are able to survive, grow, and reproduce at temperatures above their theoretical "optimum." Brett (1956) developed a generalized concept of the effects of temperature on salmonids. He used four categories (zones) with five responses to relate the effects of temperature on growth and survival; the upper lethal limit where death occurs rapidly, zone of resistance where death can occur depending on the length of exposure, zone of tolerance where there is no mortality but no growth as well, and the zone of preference where growth occurs proportional to food availability, and optimal zone where growth occurs at all but starvation rations. Below the Zone of Preference growth is reduced by excessively cold temperatures. Sullivan et al. (2000) illustrated this concept graphically (Figure 4- 1). It is within the Zone of Preference that fish spend the majority of their lives.

Chinook salmon and steelhead have similar temperature tolerances. In addition, they both spawn in the mainstem Russian River. Coho salmon generally have a lower tolerance for temperature and do not spawn in the mainstem Russian River. Therefore, criteria evaluating the effects of temperature on Chinook salmon and steelhead will be combined, while a separate set of criteria will be developed for Coho salmon. However, the time of year that they are present in the river differ.

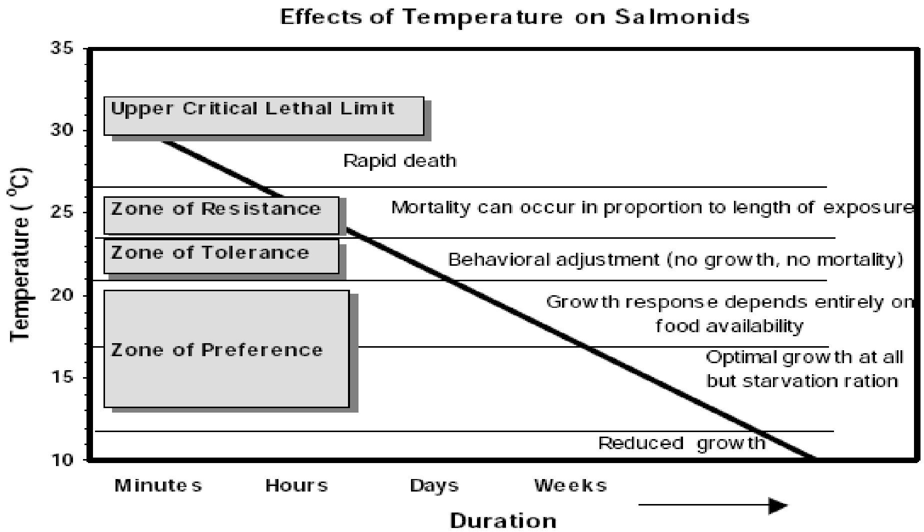


Figure 4-1. General environmental effects of temperature on salmonids in relation to duration and magnitude of temperature (from Sullivan et al. 2000, page 2-2).

Coho salmon

Bell (1986) gives the preferred range of temperatures for emigrating juvenile coho salmon as 7.2 to 16.7 ˚C. The Environmental Protection Agency (EPA 1977) developed the concept of the "Maximum Weekly Average Temperature" (MWAT). A MWAT is the highest temperature that an organism can survive over the long term and maintain a healthy population (the MWAT is based on a 7-day moving average, and is the warmest seven consecutive days recorded annually). The EPA determined that the MWAT for coho salmon was 17.7 ˚C. Welsh *et al.* (2001) compared the distribution of juvenile coho salmon in 21 tributaries in the Mattole River Basin with the maximum weekly maximum temperature (MWMT), defined as the highest average maximum temperature over a seven day period, and the MWAT. The warmest tributaries supporting coho salmon had a MWMT of 18 ˚C, and a MWAT of 16.7 ˚C. All tributaries that had a MWMT of less than 16.3 ˚C and a MWAT of less than 14.5 ˚C supported juvenile coho salmon.

The maximum sustained cruising (swimming) speed of under yearling coho salmon occurred at 20 ˚C; above this temperature, swimming speed decreased significantly (Griffiths and Alderice (1972) and Brett *et al.* (1958), cited by Bell (1986)). Growth of coho salmon fry was reported as high between 8.9 and 12.8 ˚C, but decreased (from 55 mg/day to 35 mg/day) when temperature was increased to 18.1˚C (Stein *et al.* 1972). Coho salmon growth apparently stops at temperatures above 20 ˚C (Bell 1973, cited by McMahon 1983). However, in a field study conducted in Washington, no differences in coho salmon growth rates were found between streams where the daily maximum water temperature exceeded 20 ˚C during July and August and other nearby streams of similar size (Bisson *et al.* 1988). Sullivan *et al.* (2000) concluded that setting an upper threshold for the 7-day maximum temperature at 16.5 ˚C would minimize growth loss for coho salmon. Thomas *et al.* (1986) examined the effects of fluctuating temperature on mortality, stress and energy reserves of juvenile coho salmon. Coho salmon held in a fluctuating environment of 6.5 to 20 ˚C had higher levels of plasma cortisol (which may indicate that the fish were under stress); however, the fish did not exhibit common signs o`f stress, such as flashing, gasping at the surface, or disorientation. Thomas *et al.* (1986) also reported that all test fish survived when daily temperature fluctuation ranged from 5.0 to 23 ˚C.

Holt *et al.* (1975) found that the percentage of coho salmon and steelhead dying after exposure to a bacterial infection increased with temperature from no mortality at a temperature of 9.4 ˚C to 100 percent mortality at a temperature of 20.6 ˚C. All control fish survived the maximum temperatures tested (23.3 ˚C).

Steelhead

The upper lethal water temperature for steelhead has been reported to be 23.8 ˚C (Bell 1986). Myrick and Cech (2000) reported that various strains of rainbow trout/steelhead can withstand temperatures near 26 ˚C for short periods of time. In the Eel River, juvenile steelhead were observed feeding in surface waters with ambient temperatures up to 24 ˚C (Nielsen *et al.* 1994). Optimal water temperatures for rearing steelhead have been reported to be 10 to 12.7 ˚C (Bell 1984) and 14.2 ˚C (Bovee 1978). Steelhead streams should have summer water temperatures between 10 and 15 ˚C, with maximum water temperatures below 20 ˚C (Barnhart 1986). Myrick and Cech (2000) reported a preferred temperature for wild Feather River steelhead of approximately 17 ˚C under both fed and food deprived conditions, even though the fish were collected from water with temperatures below 15 ˚C. Myrick and Cech (2005) tested steelhead growth rates at three temperatures (11, 15 and 19 ˚C). Food consumption rates were the same at each temperature, however growth rate was higher at 19 ˚C suggesting improved food conversion efficiency at the higher temperature. Reese and Harvey (2002) found that the growth of and the size of the territory defended by dominant steelhead was reduced in the presence of juvenile pikeminnow at temperatures between 20.0-23 ˚C, but growth was not reduced when the two species were held in treatment water ranging between 15 and 18 ˚C. Werner et al. (2005) detected significant increases in the heat shock protein (hsp) 72 in wild steelhead parr collected in the Navarro River Watershed when the short- and long term daily average temperatures were 18 to 19 ˚C, and daily maximum temperatures were 20 to 22.5 ˚C. Although this study did not report on the ecological consequences of juvenile steelhead rearing at temperatures above 18 ˚C (e.g., reduced growth, survival, etc.), the presence of hsp indicate that the fish were undergoing a response to an outside stressor (temperature in this case), implying a physiological cost to the fish. Nielsen *et al.* (1994) reported an increase in agonistic behavior and a decrease in foraging as stream temperatures increased above 22 ˚C. Harvey et al. (2002) found steelhead in relatively high densities in some tributaries to the Eel River where MWATs ranged between 20-22 ˚C. Steelhead were not observed to move into thermally stratified pools at temperatures below 22 ˚C. Wurtsbaugh and Davis (1977) reported that for fish fed to satiation, an increase in temperature led to an increase in the maximum consumption rates. The high feeding rates decreased the negative effects of increased water temperatures, up to 22.5 ˚C for rainbow trout. Above 22.5 ˚C, feeding rates decreased, possibly due to temperature related stress.

Sullivan *et al.* (2000) concluded that setting an upper threshold for the 7-day maximum temperature at 20.9 ˚C would minimize growth loss for steelhead. Roelofs *et al.* (1993) classified water temperatures in the Eel River as: extremely stressful for steelhead above 26 ˚C, causing chronic physiological stress that jeopardizes survival at temperatures between 23 and 26 ˚C, and as having chronic effects at temperatures between 20 and 23 ˚C. A MWAT has not been calculated for steelhead.

Chinook salmon

The upper critical lethal limit for Chinook salmon has been variously reported to be 26 ˚C (Hansen 1999, cited in Myrick and Cech 2000), 25 ˚C (Brett 1952 and Bell 1986), and 23 ˚C (±1˚C) (Baker *et al.* 1995). Chinook salmon can tolerate brief exposure to temperatures of 28.8˚C when acclimated to a temperature 19 ˚C (Myrick and Cech 1999). The upper chronic thermal limit (temperature survived for at least 7 days) is similar to the upper lethal temperatures (24 to 25.1˚C) (Myrick and Cech 2000).

The preferred temperature range for Chinook salmon has been reported to range from 12 to 14 ˚C (Brett 1952) and 13.0 to 14.4 ˚C (Bell 1986). However, Myrick and Cech (2000) reviewed several studies analyzing the effects of temperature on growth of Chinook salmon, and found that growth was maximized at temperatures ranging between 15.3 and 20.5 ˚C, when food was not limiting. Brett et al. 1982 reported growth was maximized between 18.9 and 20.5 ˚C (when fed to satiation), depending on the stock used. Stauffer (1973) (modified by McLean 1979) developed a model for Chinook and coho salmon in a Washington State fish hatchery that predicts growth rate based on ration levels and water temperature. When ration levels were cut to 60 percent of satiation, maximum growth occurred at 14.8 ˚C, and theoretically, zero growth would occur at 21.4 ˚C. Rich (1987) reported maximum growth occurred at 15.3 ˚C, but water quality may have been a factor in the reducing growth in this study. Marine and Cech (2004) reported that Chinook smolts reared at fluctuating temperatures between 17 and 20.0 ˚C grew at rates similar to Chinook smolts reared at 13 to 16 ˚C, and that Chinook smolts survived and grew at temperatures up to 24 ˚C at ration levels found in the wild. However, the rate of growth decreased for fish reared at temperatures above 22 ˚C (Brett et al. 1982).

Water temperatures above 21.1 ˚C have been reported to stop downstream migration of Chinook salmon smolts (Department of Water Resources (DWR) 1988 cited by NCRWQCB 2000). However, in the Russian River, Chinook salmon have been captured in downstream migrant traps (presumed migrating) at temperatures in excess of 21.9 ˚C (Chase et al. 2004). Chinook reared at temperatures greater than 17 ˚C had impaired hypoosmoregulatory capability (ability to adapt to seawater) compared to fish reared between 13 and 16 ˚C (Marine and Cech 2004). However, smolts reared at temperatures between 17 and 20 ˚C did not experience a statistically significant decrease in survival during acute seawater test compared to fish reared at 13 to 16 ˚C. Compared to smolts reared at cooler temperatures, smolts reared at warmer temperatures were more vulnerable to predation during test held at cooler temperatures ranging between 15.0 and 17 ˚C, but were not more vulnerable to predation when the test were held at temperatures ranging from 18 to 21 ˚C. Marine (1997) demonstrated that Chinook salmon can successfully smolt at temperatures up to 20.0 ˚C, however, they did exhibit some impaired patterns compared to fish reared at lower temperatures. Clarke and Shelbourn (1985) and Clarke et al. (1981) reported that optimal temperatures for smolting Chinook salmon range between 10.0 and 17.5 ˚C.

Fall Adult Chinook salmon reportedly migrate at temperatures ranging from 10.6 to 19.4 ˚C, with an optimal temperature of 12.2 ˚C (Bell 1991). Upstream migration by adult Chinook salmon in the San Joaquin River was halted when temperatures exceeded 21.1 ˚C, but resumed when temperatures declined below 17.8 ˚C (Hallock 1970, cited by Entrix (in DW Kelly and Associates and 1992)). However, Dunham (1968, cited by SWRCB 1988) reported that adult salmon migrated through the Klamath River at water temperatures as high as 24.4 ˚C. In the Russian River, adult Chinook salmon have been observed migrating past the Inflatable Dam at temperatures up to 21.8 ˚C, but relatively large numbers of adults are rarely observed at temperatures above 17 ˚C.

Assessing the potential impacts of temperature on adult salmonids is complicated by the fact that temperatures that have little or no impact on the adults may result in reduced survival of their subsequent embryos. Eggs from salmon held for a prolonged time period at 15.6 to 16.7 ˚C had a lower survival rate to hatching (70 percent) compared to eggs from salmon held at 12.8 to 15 ˚C (80 percent survival). Eggs incubated at temperatures above 16.7 ˚C experienced 100 percent mortality (Hinze 1959, cited by DW Kelly and Associates and 1992). Since spawning success involves impacts to both adults and egg development, upstream migration and spawning are considered to be one life stage, and the temperature criteria will be based on the developing eggs, as opposed to impacts to adults which have a higher temperature tolerance.

Adult Chinook salmon begin to migrate upstream through the Russian River in earnest in October through November (low numbers of Chinook salmon have been counted at the Inflatable Dam in late August (≤ 9 annually) and September (0 to 176 annually). Entry into freshwater is based on a number of variables, including time of year, ocean conditions, streamflow, whether the river mouth is opened or closed, and possibly water temperature. Although Chinook salmon have been observed migrating past the Inflatable dam at temperatures ranging to 22.6 °C, approximately 91 percent of the adult Chinook salmon have been observed at the fish counting station after the average daily temperature declined below 17.1 °C (SCWA unpublished data). Annually, between approximately 73 and 97 percent of the fish counted at the Inflatable dam pass after the average daily temperature declines below 15.6 °C.

Using information gathered from the literature water temperature criteria were constructed for coho, Steelhead, and Chinook. These criteria for each spe cies were subdivided by the following life stages; downstream migrants (smolts), upstream migration and spawning (adults), and juvenile rearing (parr) (Table 4-2 through 4-4).

Table 4-2. Water Temperature Criteria and Life History Phase used to Assess Potential Impacts Related to coho salmon in the Russian River (upstream and downstream migrations).

Downstream migrants (March through June)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	< 15
Zone of Preference – Suitable	15 – 17.8
Zone of Tolerance	17.8– 20
Zone of Resistance	20 – 23.8
Upper Critical Lethal Limit	> 23.9
Upstream migration and spawning (November through January)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	<12.2
Zone of Preference – Suitable	12.2 – 15.6
Zone of Tolerance	15.6 – 16.9
Zone of Resistance	16.9 – 21.1
Upper Critical Lethal Limit	> 23.9
Juvenile Rearing (June through September)	
Zone	**Temperature (˚C) criteria**
Zone of Preference –Optimal	< 15
Zone of Preference – Suitable	15– 17.8
Zone of Tolerance	17.8 – 20
Zone of Resistance	20 – 23.8
Upper Critical Lethal Limit	> 23.9

Table 4-3. Water Temperature Criteria and Life History Phase used to Assess Potential Impacts Related to steelhead in the Russian River.

Downstream migrants (March through May)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	< 17.5
Zone of Preference – Suitable	17.5 – 18.9
Zone of Tolerance	18.9 – 21.1
Zone of Resistance	21.1 – 23.8
Upper Critical Lethal Limit	> 23.9
Upstream migration and spawning (December through March)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	<12.2
Zone of Preference – Suitable	12.2 – 15.5

Zone of Tolerance	15.5 – 16.9
Zone of Resistance	16.9 – 21.1
Upper Critical Lethal Limit (adults)	> 23.9
Juvenile Rearing (June through September)	
Zone	**Temperature (˚C) criteria**
Zone of Preference –Optimal	< 15.5
Zone of Preference – Suitable	15.5 – 20
Zone of Tolerance	20 – 21.9
Zone of Resistance	21.9 – 23.8
Upper Critical Lethal Limit	> 23.9

Table 4-4. Water Temperature Criteria and Life History Phase used to Assess Potential Impacts Related to Chinook salmon in the Russian River.

Downstream migrants (March through June)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	< 17.5
Zone of Preference – Suitable	17.5 – 18.9
Zone of Tolerance	18.9 – 21.1
Zone of Resistance	21.1 – 23.8
Upper Critical Lethal Limit	> 23.9
Upstream migration and spawning (October through December)	
Zone	**Temperature (˚C) criteria**
Zone of Preference – Optimal	<12.2
Zone of Preference – Suitable	12.2 – 15.5
Zone of Tolerance	15.5 – 16.9
Zone of Resistance	16.9 – 21.1
Upper Critical Lethal Limit (adults)	> 23.9

Dissolved Oxygen

Defining DO criteria for fish is complicated by the interaction between temperature and DO. Temperature strongly influences an organism's metabolism which in turn increases or decreases the DO demand placed on that organism. For example, Raleigh et al. (1986) summarized several studies on DO-requirements for salmonids and concluded that DO levels of 8 mg/l were optimal at temperatures between 7 and 10 ˚C, but at temperatures above 10 ˚C optimal DO levels were >12.0 mg/l. Bjornn and Reiser (1991) summarized several studies and concluded that food conversion was impaired at DO concentrations less than 5.0 mg/L and that salmonids were not impaired when DO concentrations exceeded 8 mg/L. Depending on temperature, the lower lethal limit for DO is around 3.0 mg/l (Raleigh et al. 1984).

Table 4-5. Dissolved oxygen criteria used to assess conditions for salmonids in Dry Creek and the Russian River.

DO range (mg/L)	Descriptive rating
≤3.0	Lower Lethal Limit
3.1 to <5.0	Zone Resistance
5.0 to < 8.0	Zone Tolerance
8.0 to <12.0	Zone of Preference – Suitable
≥12.0	Zone of Preference – Optimal

4.2.4 Results

Flow

Late rains allowed sufficient inflow into Lake Pillsbury to classify 2012 as a Normal year under D1610, but flows in the Russian River were effectively reduced in some sections by implementing the flow regimes outlined in the Order. In portions of the upper Russian River near Hopland flows were generally below the historic flows (the average of normal water years 2002, 2003, 2005, 2006) and D1610 minimum flows (185 cfs), but above the minimum flows authorized by the 2012 Order (Figure 4-2). At Healdsburg flows were generally lower than the historic flows and were lower than D1610 minimums for 129 days of the 167 day long Order. Flows within 10 cfs of the 125 cfs minimum flows were implemented for 75 days of the order. Flows in the lower Russian River (downstream of the confluence with Dry Creek) were below the D1610 minimum flow (125 cfs) for 94 days during the Order but did not drop below 80 cfs (Figure 4-3). Flows during the spring were above D1610 minimums due to rainfall and tributary input.

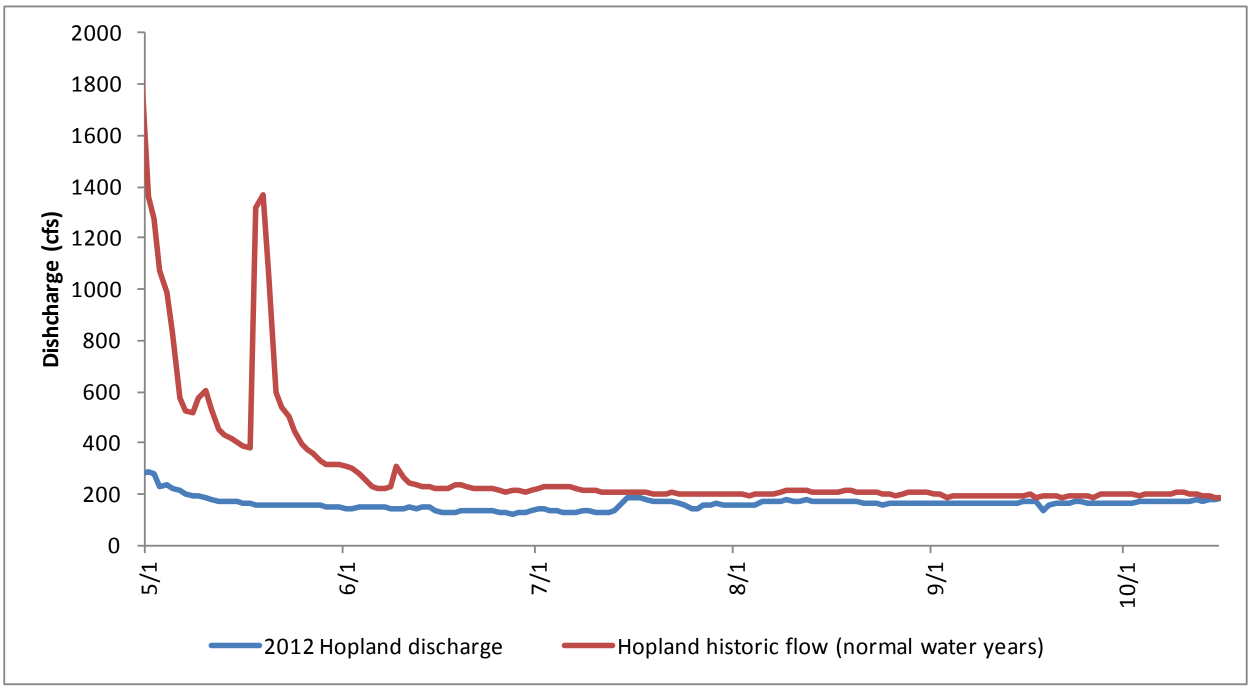


Figure 4-2. The 2012 Hopland average daily flow shown with the Historic flow at Hopland for normal water years (2002, 2003, 2005, 2006)

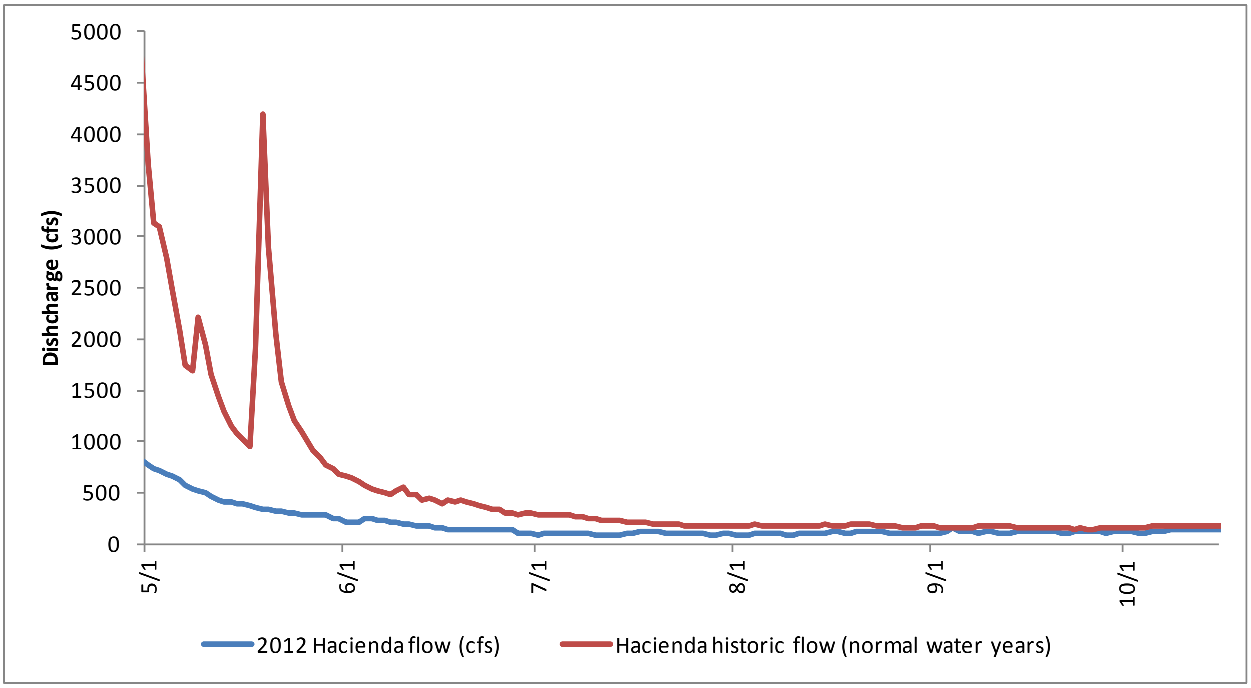


Figure 4-3. The 2012 Hacienda average daily flow shown with the Hacienda flow at Hopland for normal water years (the average flow for years (2002, 2003, 2005, 2006)

Temperature

In the upper Russian River near Hopland, water temperatures remained cooler in the fall than during many other years. During August the daily maximum water temperatures in the upper Russian River diverged from the historic water temperatures from normal water years (2002, 2003, 2005, 2006). On September 21, 2012, this difference became the most apparent and the maximum daily water temperature at Hopland was 4.5 °C cooler than the historic water temperature for normal water years (the average of the 2002, 2003, 2005, 2006 maximum daily water temperatures for that day, Figure 4-4). It is important to note that both the ambient air temperature was similar in 2012 than in normal water years and that flows were less in 2012 than in normal water years (Figure 4-5). The divergence in water temperature from normal water years at Hopland during the fall is likely due to the cold water pool (the portion of the lake below the thermocline) in Lake Mendocino being depleted under D1610 releases, but being preserved under the flow regime outlined in the Order. The preservation of the coldwater pool may also rely on carry over storage from the previous year as well as the degree of lake mixing which is likely wind driven. Flow is not the only factor in determining water temperature. Ambient air temperature is likely an important factor in determining mainstem Russian River water temperatures. However, preserving the cold water pool into the fall likely provides adult Chinook, as well as summer rearing steelhead, with cooler temperatures in the upper reaches of the mainstem Russian River.

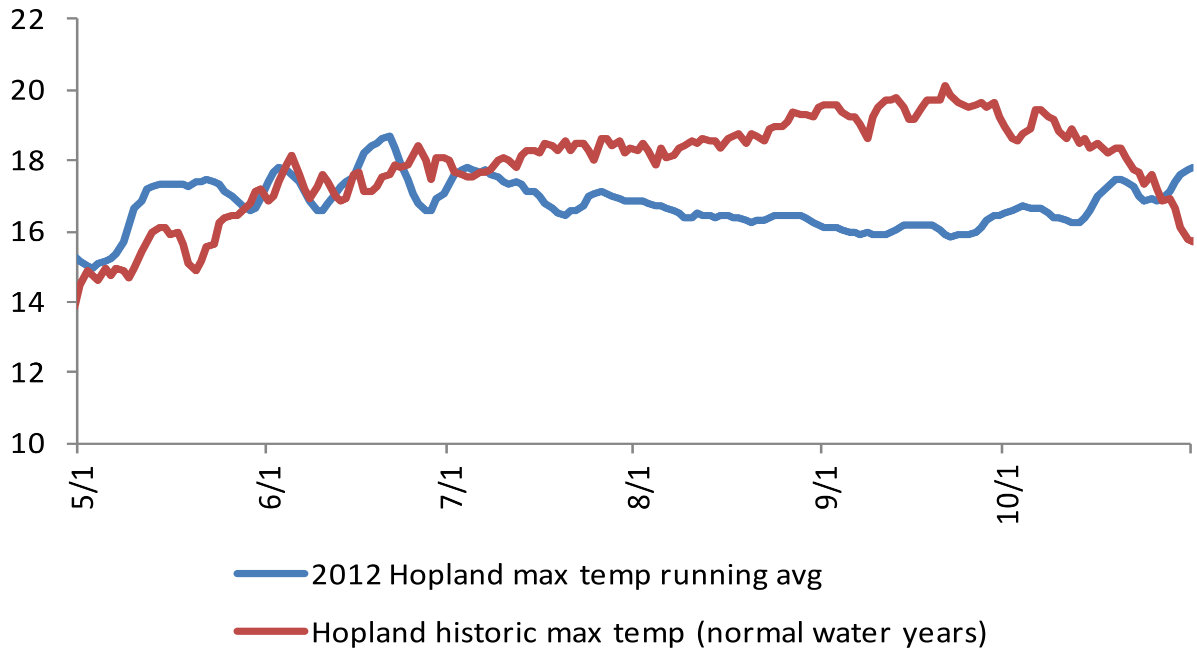


Figure 4-4. The 7-day running average of the daily maximum water temperature in 2012 at Hopland and the historic daily maximum water temperature (the average of the daily maximum water temperature from Decision 1610 normal water years (2002, 2003, 2005, 2006)

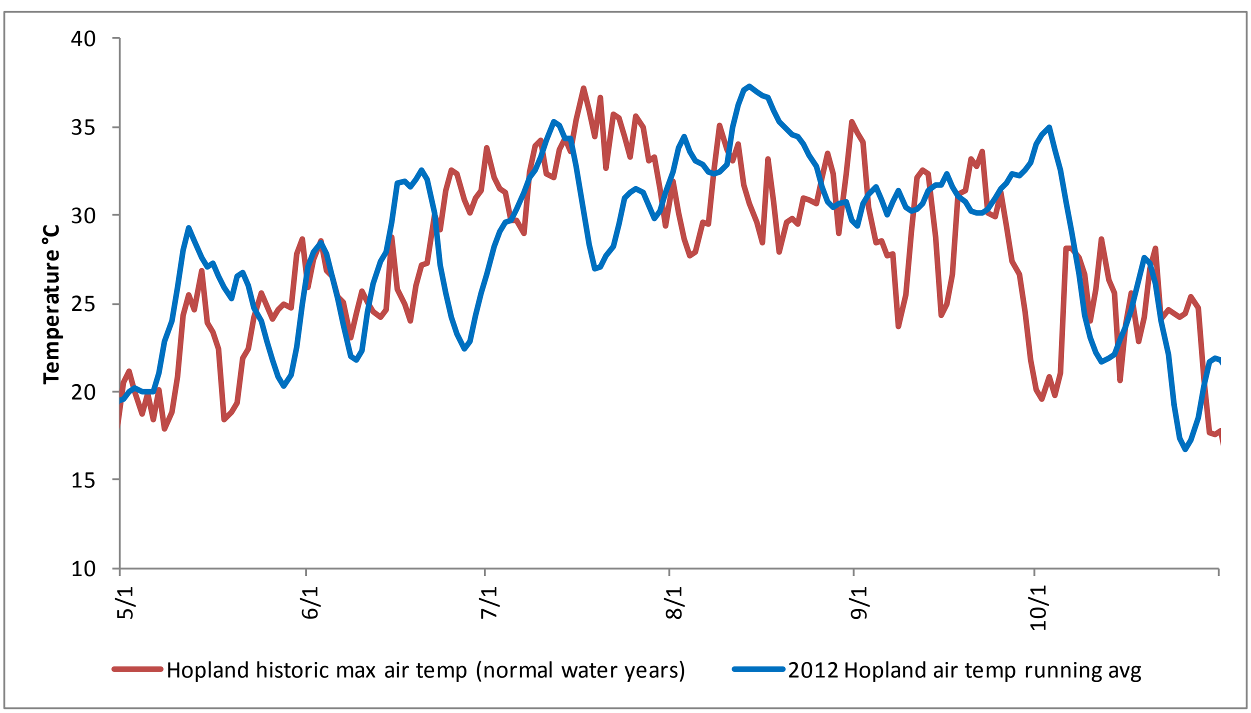


Figure 4-5. The 7-day running average of the daily maximum air temperature in 2012 at Hopland and the historic daily maximum air temperature (the average of the daily maximum air temperature from Decision 1610 normal water years (2002, 2003, 2005, 2006).

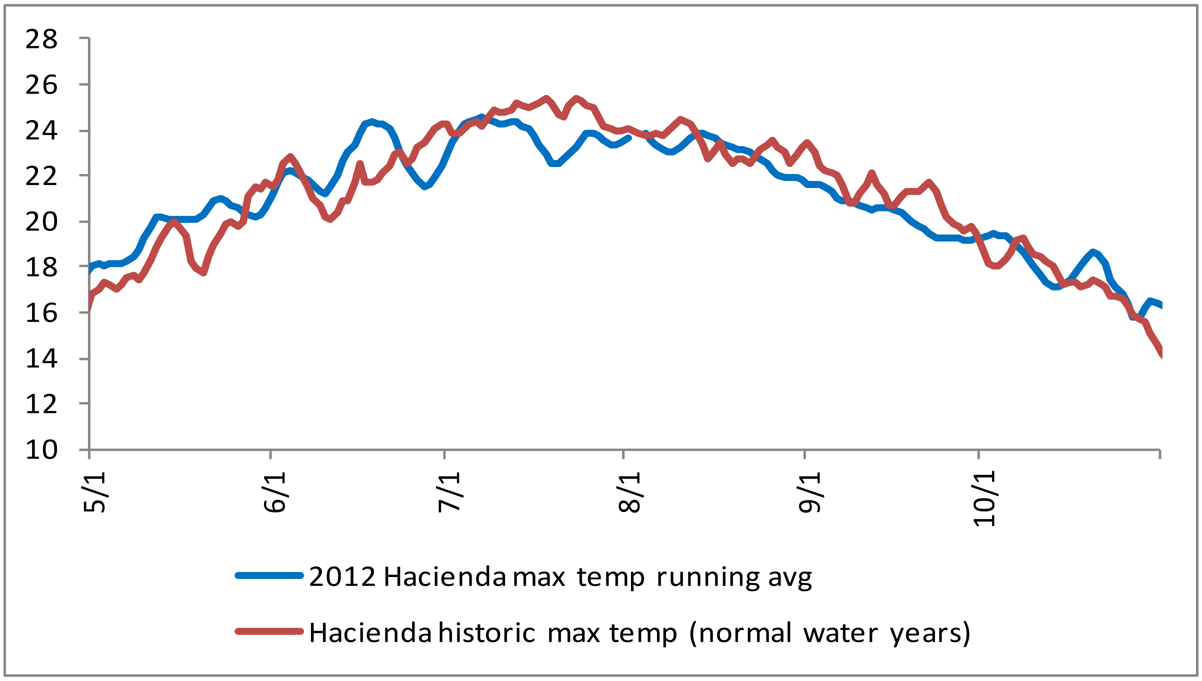


Figure 4-6. The 7 day running average of the daily maximum water temperature in 2012 at Hacienda and the historic daily maximum water temperature (the average of the daily maximum water temperature from Decision 1610 normal water years (2002, 2003, 2005, 2006).

In the lower river, 2012 water temperatures were generally similar to normal water years and showed less divergence from normal water years than did Hopland (Figure 4-6). It is important to note that while flow was lower in 2012 than in normal water years, water temperatures were similar between these two groups. Daily maximum water temperatures at Hacienda tracked ambient air temperature closely during the spring, but there was some divergence in the fall (Figure 4-7). Daily maximum water temperatures at Hacienda are typically warmer than at Hopland (Figure 4-8). This is likely due to the amount of time that cold water releases from Lake Mendocino were exposed to ambient air temperatures. Daily maximum air temperatures in Santa Rosa were similar in 2012 as in normal water years (Figure 4-9).

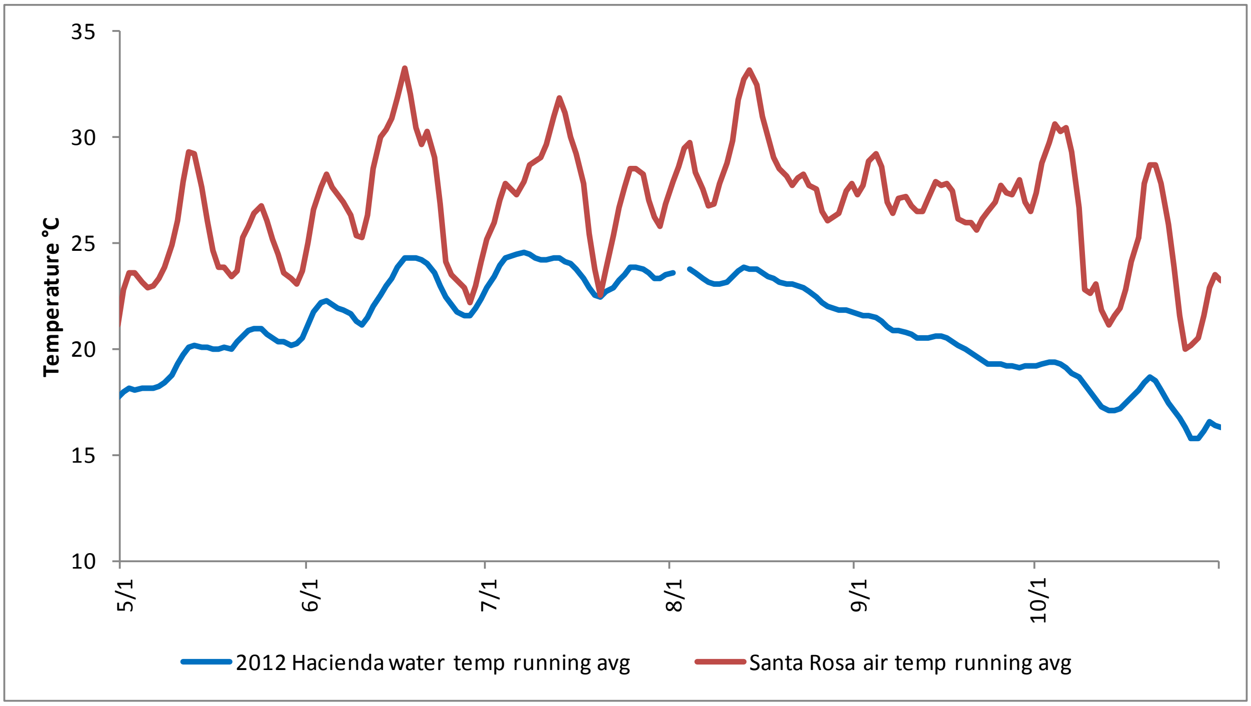


Figure 4-7. The 7-day running average of the daily maximum water temperature in 2012 at Hacienda and the 7-day running average of the daily maximum air temperature in 2012 measured at Santa Rosa.

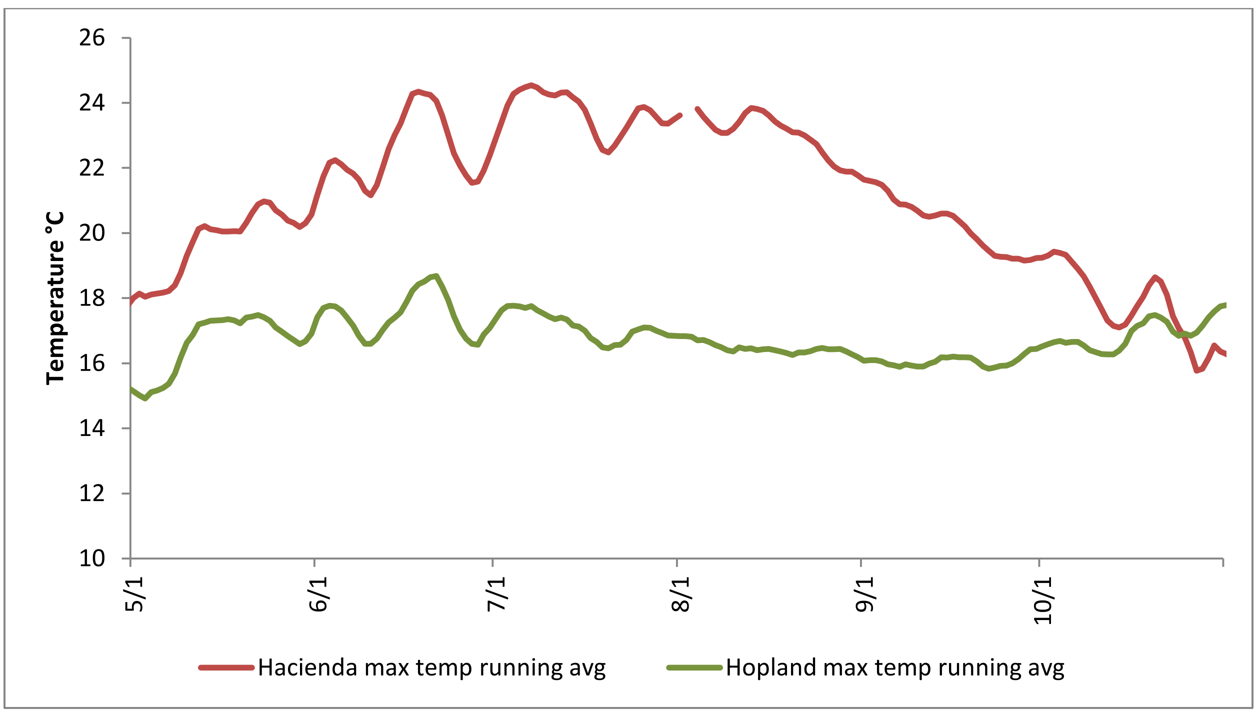


Figure 4-8. The 7-day running average of the daily maximum water temperature in 2012 at Hacienda and at Hopland.

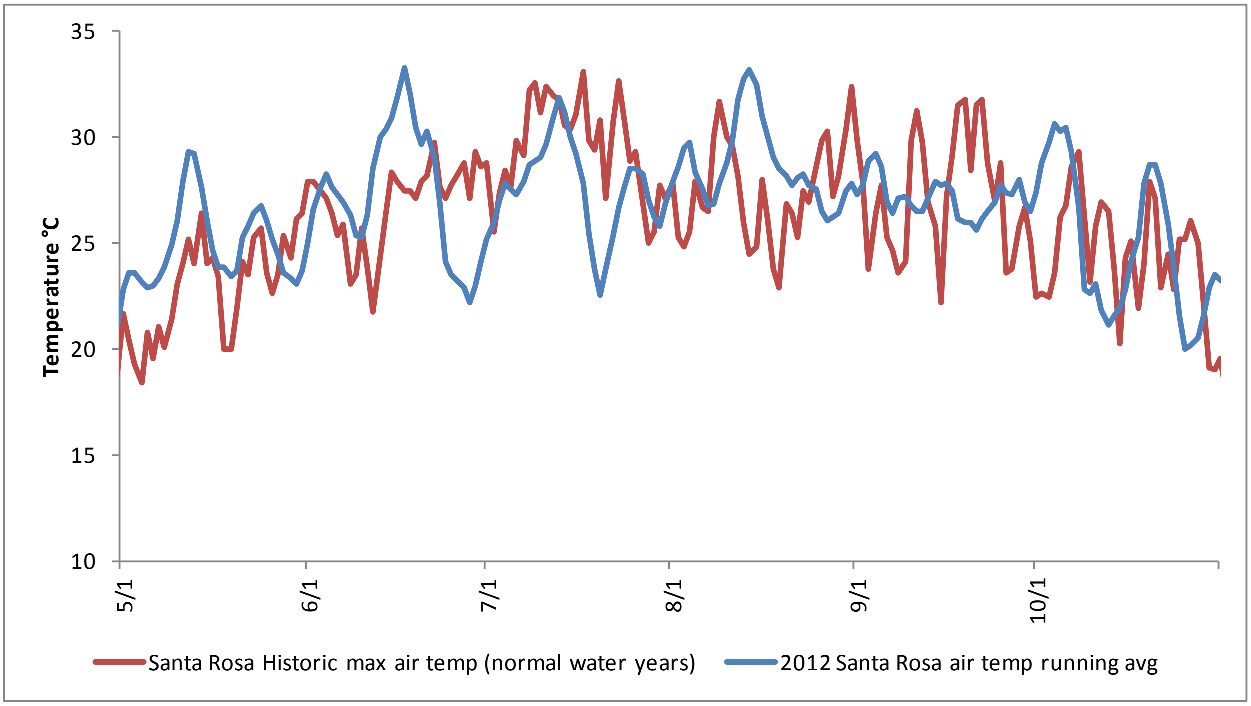


Figure 4-9. The running average of the daily maximum air temperature in 2012 at Santa Rosa and the daily air temperatures.

Coho

Fish observed on the underwater video camera system at Mirabel that have coho characteristics are sent to a panel of biologists for a verification of species identification. At the time of this writing the panel has not reviewed all the video that was sent to them. Therefore the adult coho numbers reported here are preliminary and subject to change. During the Order 4 coho adults were observed on the underwater video camera system at Mirabel. These 4 individuals were observed on the last 5 days of the Order where water temperature at Hacienda ranged from 15.6 to 18.4 °C. At this time water temperatures at Hacienda for coho adults were in the zones of tolerance and resistance (Figure 4-10). However it is important to note that coho adults voluntarily leave the ocean and enter the Russian River, and that the bulk of the adult coho migration occurs in the winter when water temperatures are much cooler.

Coho smolts were migrating through the mainstem Russian River during the beginning portion of the Order. Based on downstream migrant trapping at Mirabel in 2012, coho smolts were present in the mainstem Russian River until at least July 3. At Mirabel, 201 coho smolts, representing 67 % of the season total catch were captured after the Order went into effect on May 2, 2012.

In the section of river that coho smolts would be encountered (downstream of Maacama Creek) water temperatures were collected at Diggers Bend and Hacienda during the coho smolt migration. From May 2 to July 3, 2012, daily water temperatures ranged from a low of 15 °C to a high of 26.2 °C at Diggers Bend. At Hacienda water temperatures ranged from 14.6°C to 25.1 °C. During the period of the Order where coho smolts were detected at Hacienda water temperatures at Hacienda were generally in the suitable temperature zone; however, water temperatures did enter the zones of tolerance and resistance near the end of the coho outmigration season (Figure 4-11). It is important to note that nearly all coho spawning habitat in the Russian River is in tributaries in the lower river (downstream of Healdsburg) and in Dry Creek. The only upper river tributary that is known to presently support coho is Redwood Creek a tributary to Maacama Creek. Therefore most of the coho produced in the Russian River basin do not encounter the water temperatures at Diggers Bend.

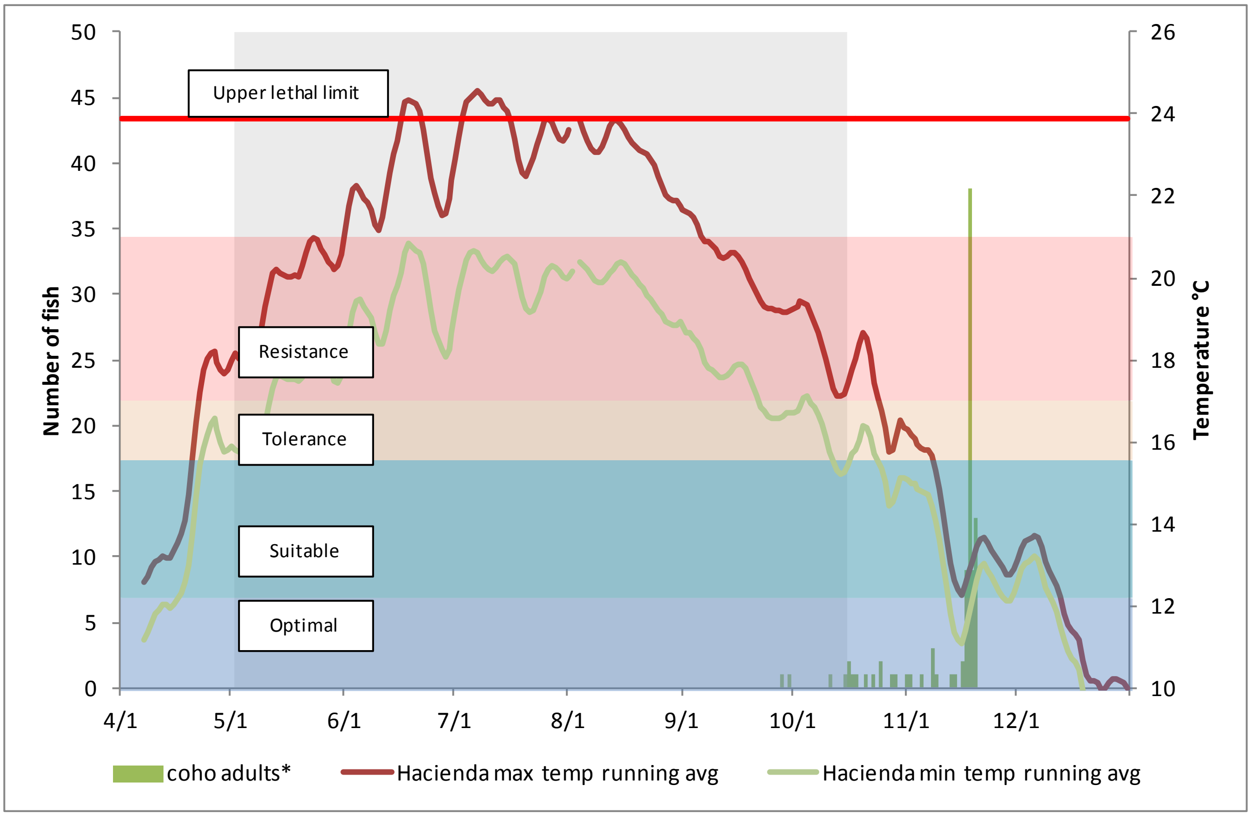


Figure 4-10. The number of coho adults observed on the Mirabel camera system (*preliminary data and subject to change) shown with the daily maximum and minimum water temperature 7-day running averages collected at Hacienda. Also shown are the temperature zones of optimal (<12.2 °C), suitable (12.2-15.6 °C), tolerance (15.6-16.9 °C), resistance (16.9-21.1 °C), and the upper critical lethal limit (>23.9 °C) for coho adults. The period of the Order is shaded in grey.

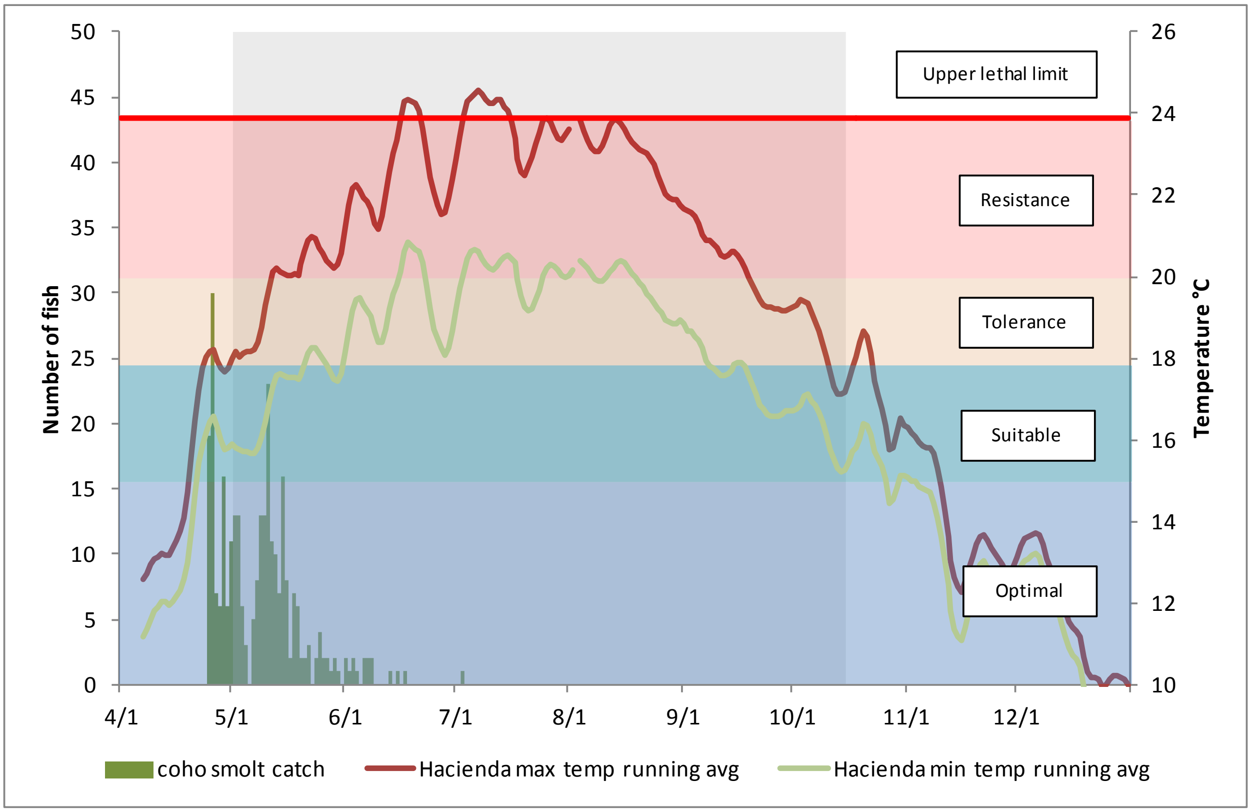


Figure 4-11. The number of coho smolts captured at Mirabel shown with the maximum and minimum daily water temperature 7-day running averages collected at Hacienda. Also shown are the temperature zones of optimal (<15 °C), suitable (15-17.8 °C), tolerance 17.8-20 °C), resistance (20-23.8 °C), and the upper critical lethal limit (>23.9 °C) for coho smolts. The period of the Order is shaded in grey.

Steelhead

Few adult steelhead were found in the Russian River during the time period that the Order was in effect. The first adult steelhead of the 2012 video monitoring season was observed on September 13. A total of 26 adult steelhead were estimated to have passed the Inflatable dam during the 2012 Order (SCWA unpublished data). Water temperatures at Hacienda, ranged from 14.3 °C to 20.6 °C during the period of the Order when adult steelhead were observed at the inflatable dam. During this time, water temperatures at Hacienda were in the zones of tolerance and resistance for adult steelhead (Figure 4-12). However it is important to note that steelhead adults voluntarily leave the ocean and enter the Russian River, and that the bulk of the adult steelhead migration occurs from December through April when water temperatures are much cooler (Chase 2005, Jackson 2007, SCWA unpublished data)

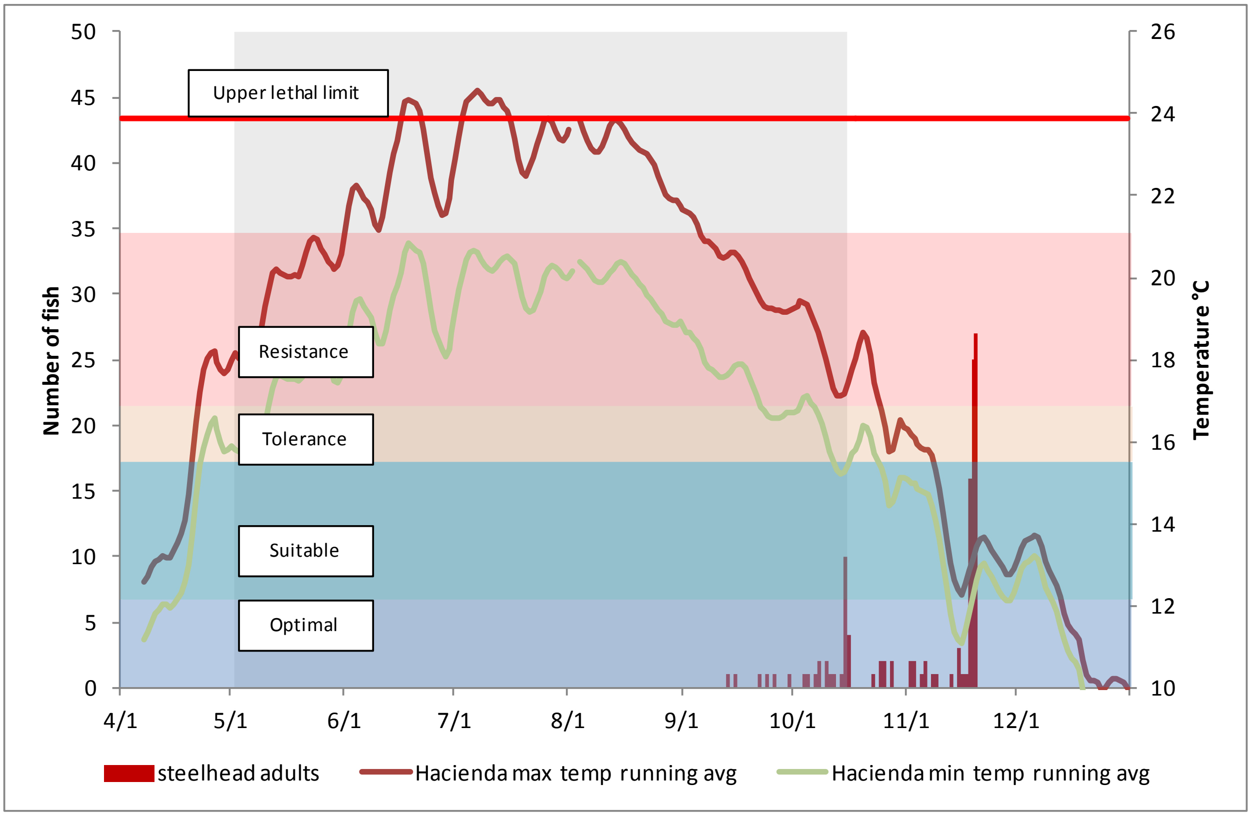


Figure 4-12. The number of steelhead adults observed on the Mirabel camera system shown with the daily maximum and minimum water temperature 7-day running averages collected at Hacienda. Also shown are the temperature zones of optimal (<12.2 °C), suitable (12.2-15.5 °C), tolerance (15.5-16.9 °C), resistance (16.9-21.1 °C), and the upper critical lethal limit (>23.9 °C) for steelhead adults . The period of the Order is shaded in grey.

In reaches that are considered steelhead rearing habitat, Ukiah to Cloverdale, water temperatures were often favorable for juvenile steelhead. During the time period that the Order was in effect, daily water temperatures measured at the USGS gauge (11462500) near Hopland ranged from 12 °C to 19.7 °C. At Hopland, the daily maximum and minimum water temperatures were generally in the optimal and suitable temperature zones (Figure 4-13). At Cloverdale, daily maximum water temperatures were generally in the zone of tolerance or suitability. There were no days in the Cloverdale record where water temperature entered the zone of resistance. However there was a 15 day period in June with missing data. It is important to note that the Cloverdale gage is at the downstream limit of the reaches considered to be steelhead habitat and that water temperatures are gradually cooler as one moves upstream from Cloverdale towards Hopland. Water temperatures remained below the upper critical lethal limit at Hopland and Cloverdale (Figures 4-13 and 4-14).

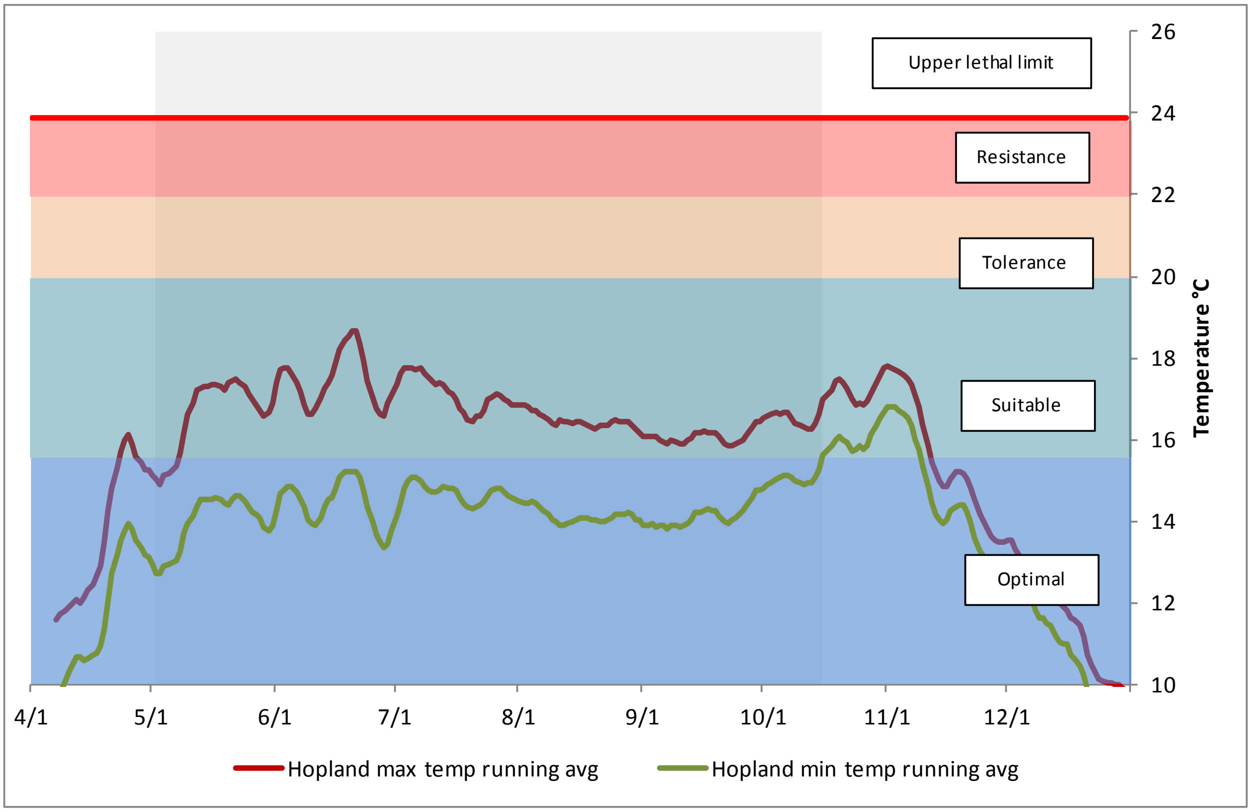


Figure 4-13. The maximum daily water temperature 7-day running average collected at Hopland shown with the temperature zones of optimal (>15.5 °C), suitable (15.5-20 °C), tolerance (20-21.1 °C), resistance (21.9-23.8 °C), and the upper critical lethal limit (>23.9 °C) for steelhead parr. The period of the Order is shaded in grey.

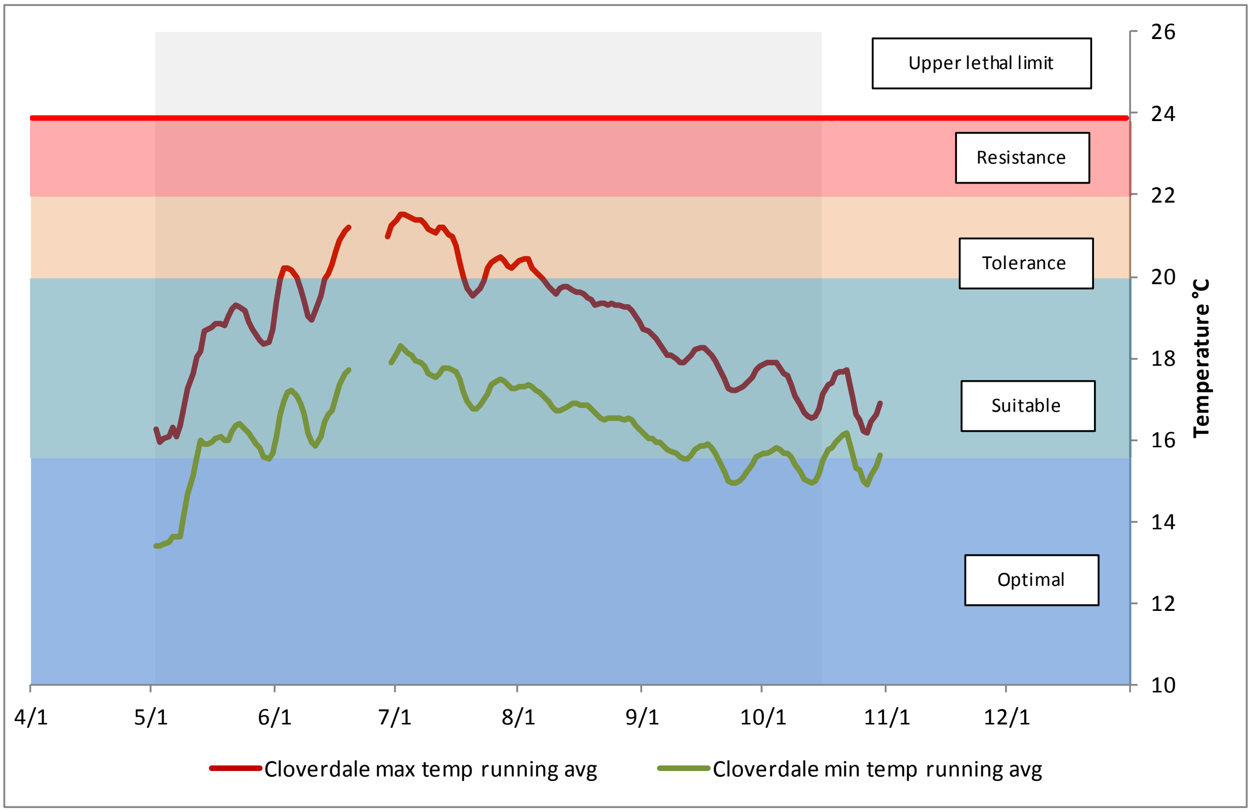


Figure 4-14. The maximum daily water temperature 7-day running average collected at Cloverdale shown with the temperature zones of optimal (>15.5 °C), suitable (15.5-20 °C), tolerance (20-21.1 °C), resistance (21.9-23.8 °C), and the upper critical lethal limit (>23.9 °C) for steelhead parr. The period of the Order is shaded in grey.

Steelhead smolts were present in the Russian River during the time period that the Order was in effect, although probably in low numbers. During 2012, 66 wild steelhead smolts were captured between May 2 and June 27 at Mirabel. The water temperatures at Hacienda ranged from 14.6 °C to 25.1 °C. During the portion of the Order where steelhead smolts were captured at Mirabel water temperatures at Hacienda were generally in the suitable and tolerable zones (Figure 4-15). Hopland, Cloverdale, and Diggers Bend are several miles upstream of the Water Agency's Mirabel trap site. Based on water temperatures it is likely that steelhead would emigrate from these sites earlier in the year. It is likely that many of the steelhead smolts detected in the Water Agency's trap at Mirabel had emigrated from Dry Creek where the water temperatures are much cooler. It is important to note that the Water Agency installs their downstream migrant traps as early as possible to monitor salmonid smolt outmigration, however because of high spring flows which limit trap installation and the early run timing of steelhead smolts it is likely that the majority of steelhead smolts emigrate from the Russian River before the Water Agency can install their fish traps.

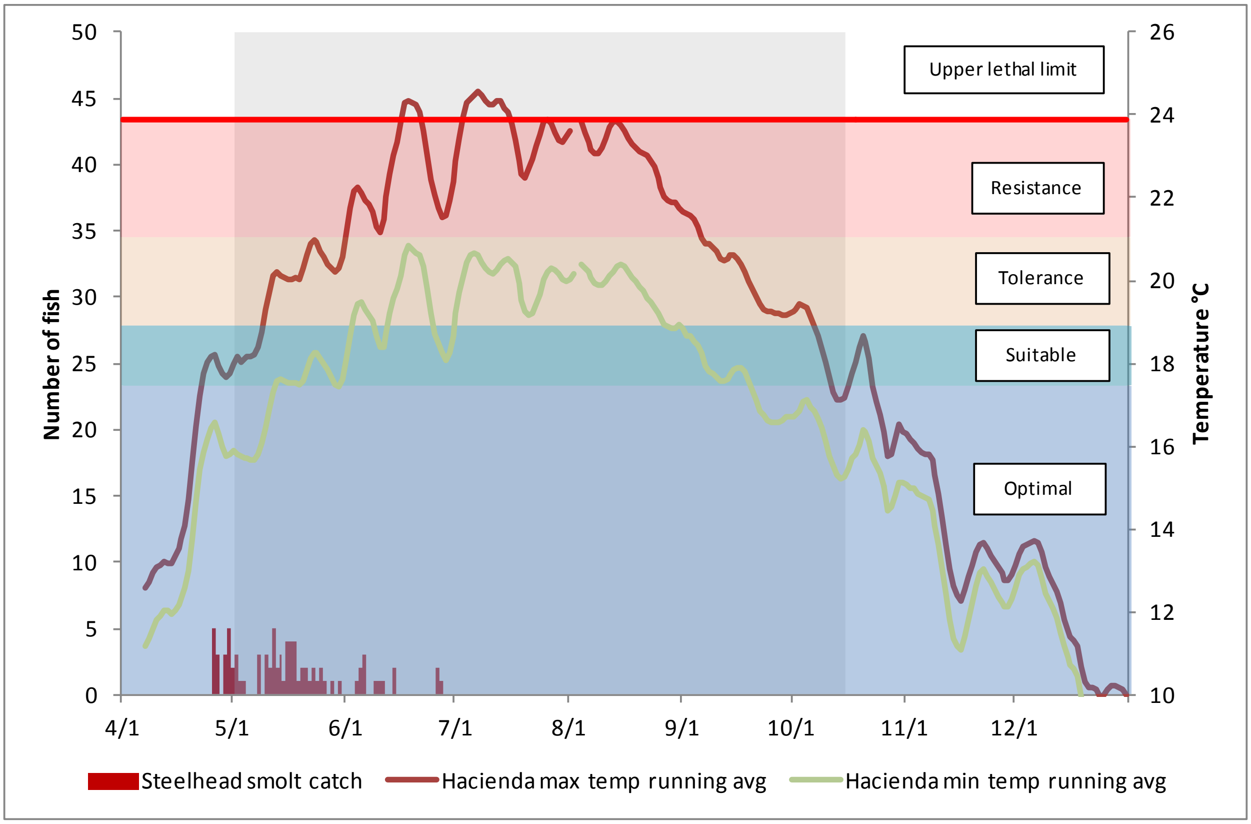


Figure 4-15. The number of steelhead smolts captured at Mirabel shown with the maximum and minimum daily water temperature 7-day running averages collected at Hacienda. Also shown are the temperature zones of optimal (<17 °C), suitable (17.5-18.9 °C), tolerance 18.9-21.1 °C), resistance (21.1-23.8 °C), and the upper critical lethal limit (>23.9 °C) for steelhead smolts. The period of the Order is shaded in grey.

Chinook

Chinook adults were present in the Russian River during the latter portion of the time span regulated by the Order. The first Chinook adult of 2012 was observed on September 7. By October 15, a total of 253 Chinook were estimated to have passed the dam, or 3.8 % of the Chinook adults detected at the inflatable dam. During this time period daily water temperatures at Hacienda were generally in the zone of resistance for the portion of the Chinook run that took place during the Order (Figure 4-16). Dry Creek is an important spawning area and many Chinook salmon migrating upstream during this time period may have been destined for by Dry Creek and the colder water the creek offers.

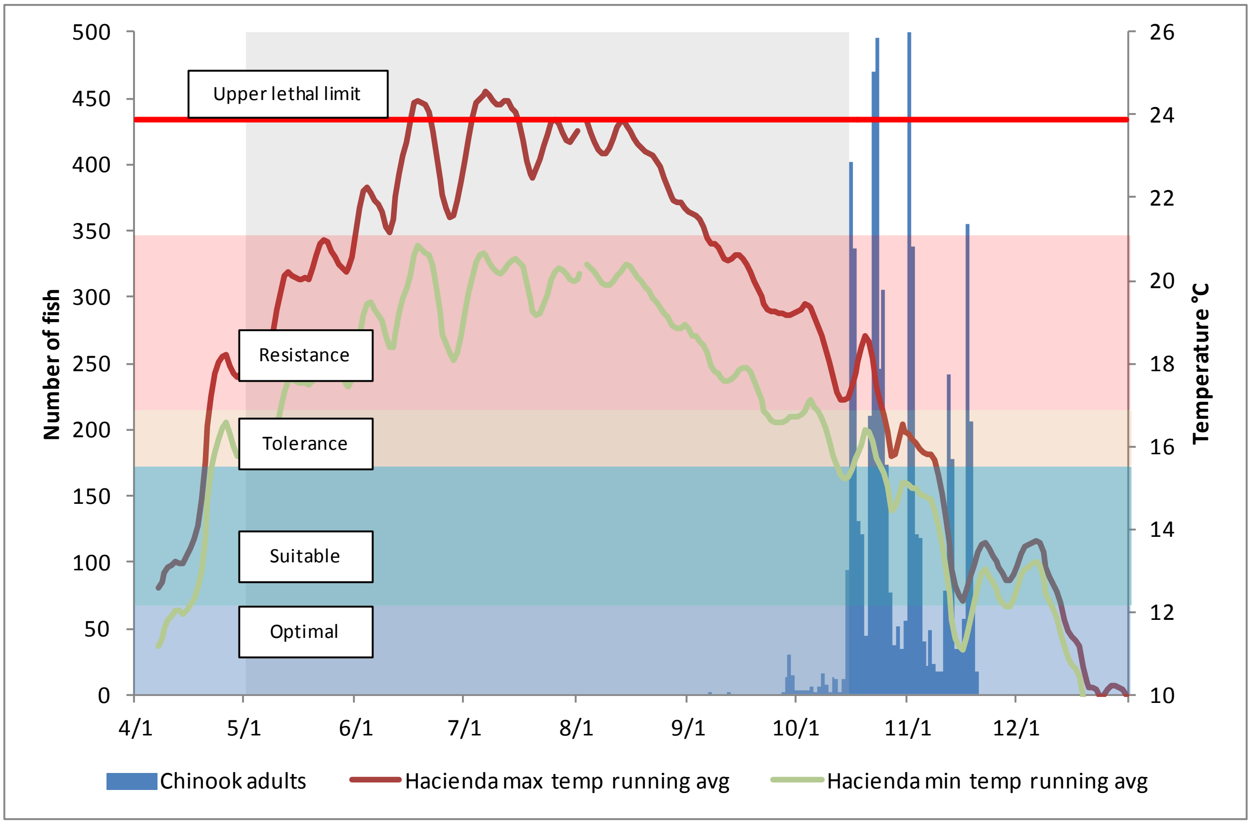


Figure 4-16. The number of Chinook adults detected at Mirabel shown with the maximum daily water temperature 7-day running average collected at Hacienda. Also shown are the temperature zones of optimal (<12.2 °C), suitable (12.2-15.5 °C), tolerance (15. 5-16.9 °C), resistance (16.9-21.1 °C), and the upper critical lethal limit (>23.9) for Chinook adults. The period of the Order is shaded in grey.

Between May 2, 2012 and when the traps were removed on July 3, 2012, a total of 2,082 Chinook smolts were captured at Mirabel. During the period of the Order daily maximum water temperatures at Hacienda were in the zones of optimal, suitable, tolerance, and resistance temperature conditions, with the tolerance, and resistance temperature conditions occurring during the tail of the Chinook smolt run (Figure 4-17). While water temperatures entered the zones of tolerance and resistance Russian River Chinook adapted under historic conditions that were likely naturally warm. Smolts from the Russian River Chinook population may be able to cope with warmer water than the populations of Chinook used in the literature to construct these temperature zones.

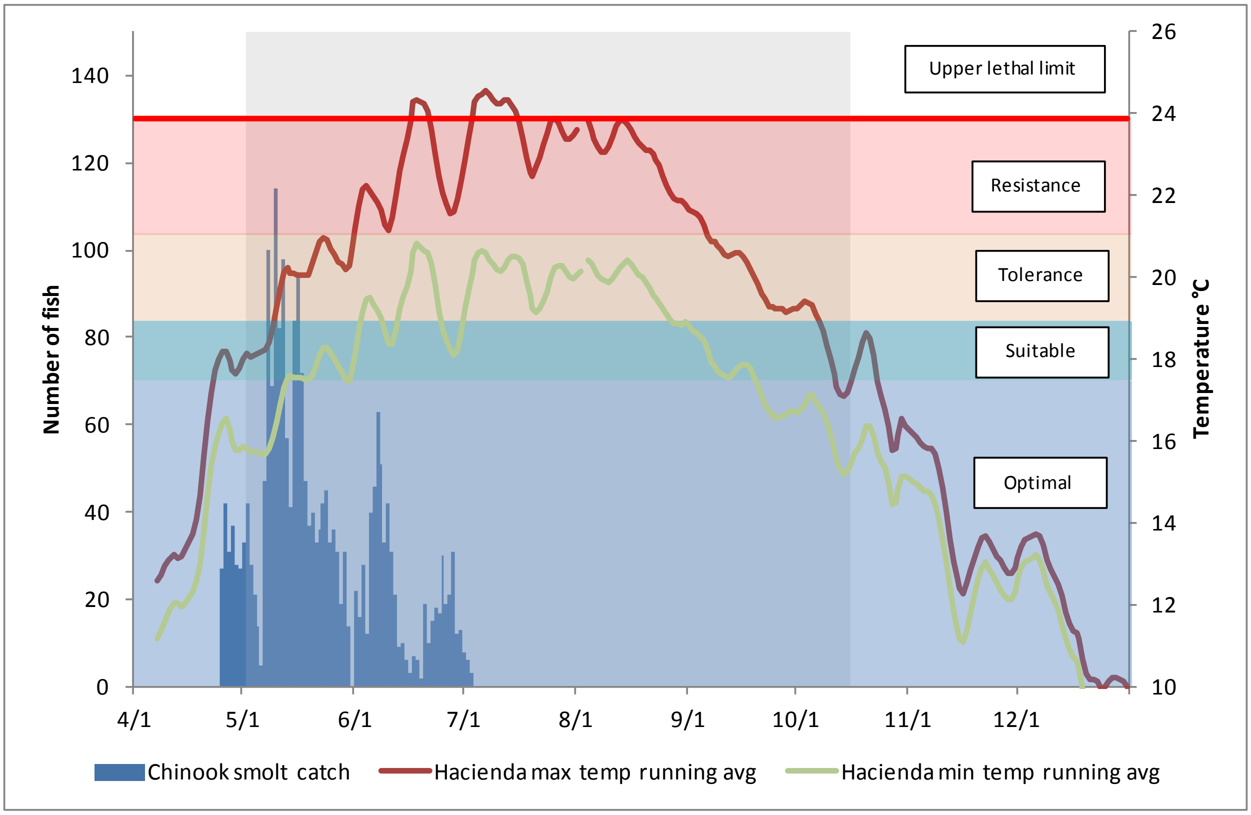


Figure 4-17. The number of Chinook smolts detected at Mirabel shown with the maximum daily water temperature 7-day running average collected at Hacienda. Also shown are the zones of optimal (<17 °C), suitable (17.5-18.9 °C), tolerance 18.9-21.1 °C), resistance (21.1-23.8 °C), and the upper critical lethal limit (>23.9 °C) for Chinook smolts. The period of the Order is shaded in grey.

Dissolved Oxygen

The data for the DO section of this report has been summarized for the time period when the Order overlaps the presence of each salmonid life stage found in the upper mainstem of the Russian River. Unlike temperature Dissolved oxygen requirements are fairly similar between species.

Adult Salmonids

Adult steelhead and Chinook were present in the Russian River during a portion of the Order. The first adult salmonid observed in 2012 at the Inflatable dam was a Chinook on September 7. A total of 253 adult Chinook were observed passing the Inflatable dam before October 15, 2012. The first steelhead was observed on the camera system was on September 13 and by October 15, 2012 a total of 26 steelhead were counted as they passed the Inflatable dam (SCWA unpublished data). The first adult coho was observed on September 28, 2012. During the Order 4 adult coho were observed on the Mirabel camera system. From September 7 to October 15, 2012, the lowest minimum DO readings at Hopland, Cloverdale, and Hacienda were 8.9, 8.2, and 8.2, mg/L, respectively. Both daily minimum and maximum levels of DO were typically within the suitable zone for adult salmonids at Hacienda (Figure 4-18).

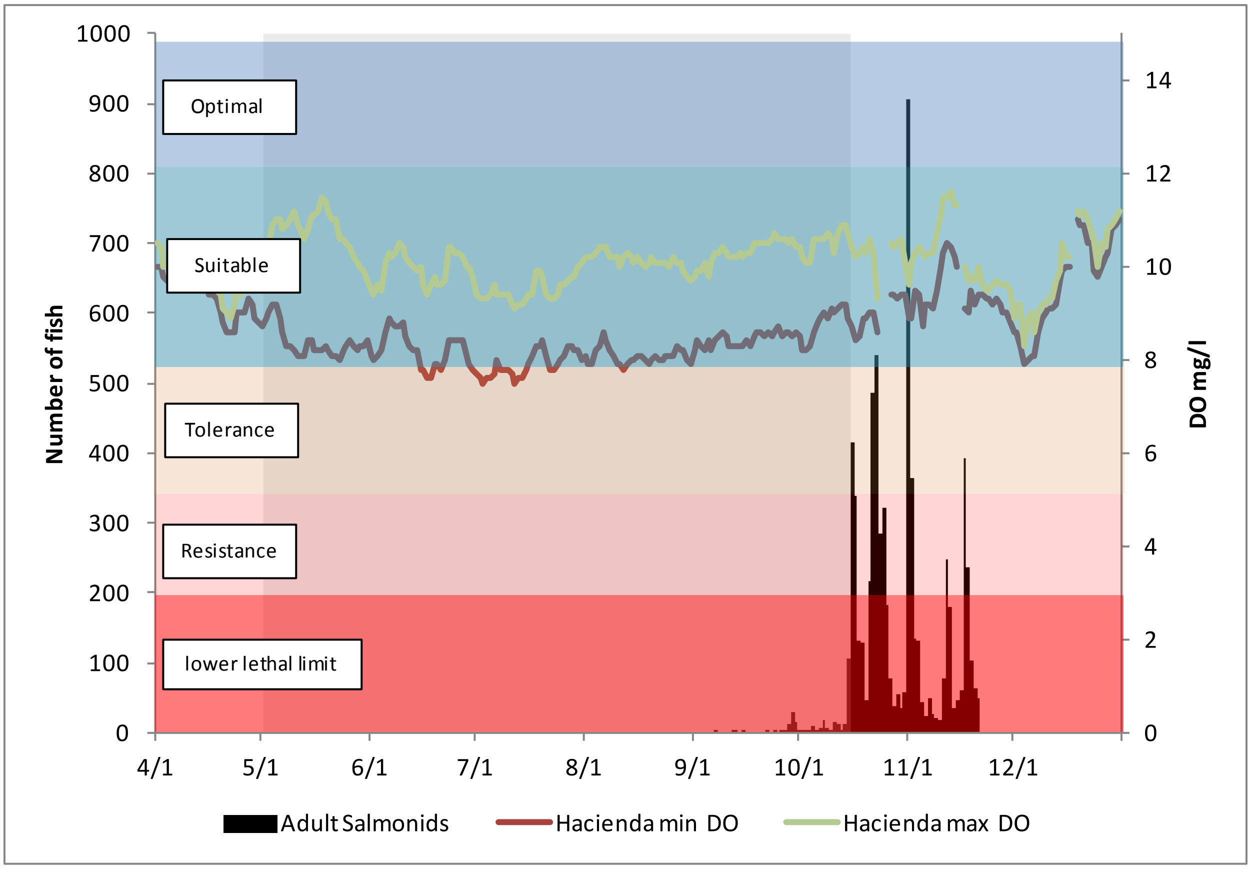


Figure 4-18. The number of adult salmonids observed at Mirabel shown with the daily minimum and daily maximum levels of DO at Hacienda. Also show are the DO zones of optimal (≥ 12 mg/L), suitable (8 to <12 mg/l), tolerance (5 to <8 mg/L), resistance (3.1 to <5 mg/L), and the lower lethal limit (≤3 mg/L) of DO for adult salmonids.

Juvenile freshwater rearing

Steelhead parr rear in the upper mainstem of the Russian River above Cloverdale year around (NMFS 2008). During the order the lowest daily minimum DO readings at Hopland and Cloverdale was 6.9 mg/L. Dissolved oxygen levels remained in the suitable zone for steelhead parr rearing at Hopland throughout the duration of the Order (Figure 4-19). At Cloverdale daily minimum DO levels occasionally entered the zone of tolerance, but were typically in the suitable zone (Figure 4-20). Daily maximum DO levels at Cloverdale remained in the suitable zone throughout the duration of the Order.

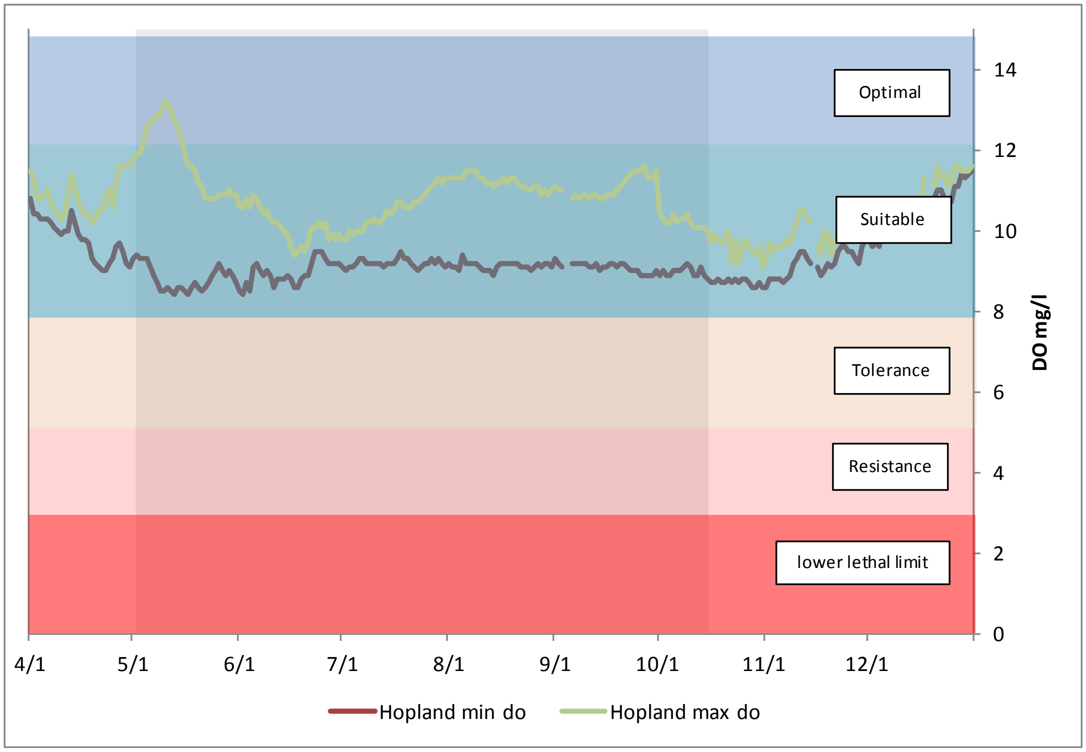


Figure 4-19. The daily minimum and daily maximum levels of DO at Hopland. Also show are the DO zones of optimal (≥ 12 mg/L), suitable (8 to <12 mg/l), tolerance (5 to <8 mg/L), resistance (3.1 to <5 mg/L), and the lower lethal limit (≤3 mg/L) of DO for salmonids.

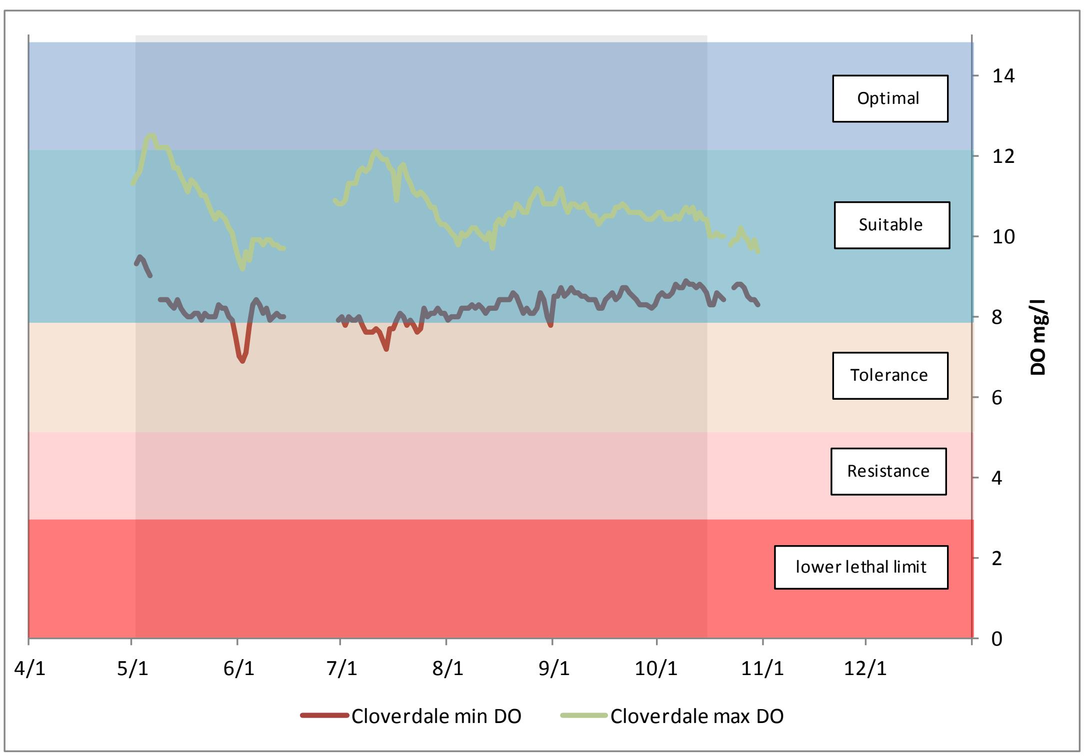


Figure 4-20. The daily minimum and daily maximum levels of DO at Cloverdale. Also show are the DO zones of optimal (≥ 12 mg/L), suitable (8 to <12 mg/l), tolerance (5 to <8 mg/L), resistance (3.1 to <5 mg/L), and the lower lethal limit (≤3 mg/L) of DO for salmonids.

Smolts

Salmonid smolts were observed in the mainstem Russian River during the June and July portion of the Order. Downstream migrant traps were installed at the Inflatable dam in 2012 before the Order went into effect and were operated until July 3, 2012. The traps were ultimately removed because the daily catch of salmonids was diminishing. In total 2,082 Chinook smolts, 201 hatchery and wild coho smolts, and 64 wild steelhead smolts were captured in the downstream migrant traps from May 2 to July 3, 2012. During the time period that salmonid smolts were captured at the inflatable dam daily minimum and maximum DO readings Hacienda were 7.5 mg/L and 11.5 mg/L, respectively. During this time the daily minimum DO at Hacienda was typically in the suitable DO zone and occasionally in the zone of tolerance while the daily maximum DO remained in the suitable DO zone (Figure 4-21).

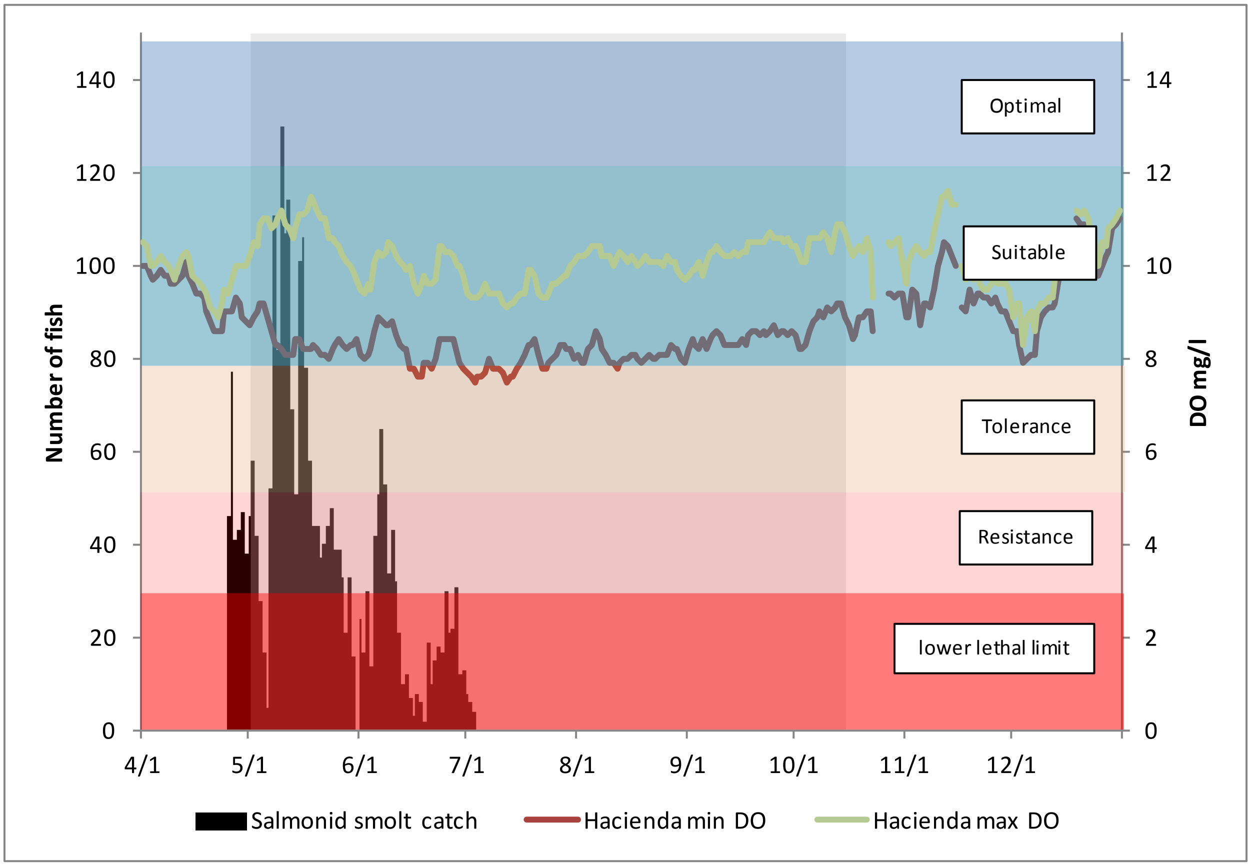


Figure 4-21. The number of salmonid smolts observed at Mirabel shown with the daily minimum and daily maximum levels of DO at Hacienda. Also show are the DO zones of optimal (≥ 12 mg/L), suitable (8 to <12 mg/l), tolerance (5 to <8 mg/L), resistance (3.1 to <5 mg/L), and the lower lethal limit (≤3 mg/L) of DO for salmonids.

4.2.5 Summary

The Water Agency was tasked with evaluating impacts to water quality and the availability of aquatic habitat for salmonids in the Russian River associated with flow reductions outlined in the Order. However due to a relatively small temperature and DO data set coupled with climate variability it is difficult to determine, in most cases, if changes in temperature or DO were due to flow changes related to the Order. Therefore the Water Agency summarized the environmental conditions experienced by salmonids during the Order and compared these conditions to standards outlined in the literature.

Flow
Flows were effectively reduced in summer steelhead rearing habitat in the upper Russian River during a portion of the time period covered by the Order. For much of the duration of the 2012 Order, flows in the upper Russian River were lower than D1610 flows and closer to the flows that are outlined in the Biological Opinion to improve salmonid habitat. For a 94 day period in 2012 flows in the lower Russian River were below D1610 minimum instream flows and closer to the flows outlined in the Biological Opinion (Figures 4-2 and 4-6).

Temperature
At Hopland water temperatures were cooler in 2012 when compared to historic normal water years where flows were above D1610 minimums (Figure 4-4). This is likely due to preserving the cold water pool (the cooler portion of the lake below the thermocline) in Lake Mendocino during the 2012 flow regime, but depleting the cold water pool during D1610 flows. This trend is not present at downstream gauge stations most likely because stream temperatures at downstream gauge sites are more dependent on air temperatures as there is a longer period of time for the water to warm once released from the dam (Figure 4-8). Water temperature at Hacienda seemed to track local air temperatures fairly closely during the smolt season (Figure 4-7).

Coho
Few adult coho where observed in the Russian River during the order, however coho smolts were regularly encountered at the fish trap during the early portion of the order. A total of 4 adult coho were observed on the Mirabel underwater video camera during the Order. Based on counts at the Mirabel inflatable dam most of the adult coho run took place well after the Order expired (SCWA unpublished data). Coho smolts migrate through the mainstem Russian River and were in the river during the beginning portion of the Order. During the Order, daily maximum water temperatures for coho at Hacienda were in the zone of suitability and the zone of tolerance with a few individuals emigrating during the tail of the run in the zone of tolerance. The elevated water temperatures during the coho smolt migration were likely related to rising air temperatures in June (Figure 4-7).

Steelhead
Adult steelhead were observed in the Russian River during the time period that the Order was in effect. However, it is important to note that only a few individual adult steelhead were detected during the Order and that the bulk of the adult steelhead migration occurs later in the year from December through April when water temperatures are cooler. The water temperatures during the portion of the order that steelhead adults were observed in the Russian River were in the zones of tolerance and resistance. While water temperatures at Hacienda were in the zone of tolerance and resistance water temperatures at Hacienda in 2012 were similar to water temperatures during normal water years (2002, 2003, 2005, 2006) when flows were above D1610 minimum flows (Figure 4-6). It is important to note that adult steelhead voluntarily leave the ocean and enter the Russian River.

Steelhead parr rear throughout the summer in a section of the upper Russian River near Ukiah and Hopland. During the Order the maximum water temperature at Hopland remained in the suitable temperature zone. The daily minimum water temperature remained in the optimal temperature zone for the duration of the order. Water temperatures in this section of the river are influenced by the temperature of water released from Coyote Valley Dam. The flow regime outlined by the Order may have preserved the cold water pool in Lake Mendocino later into the year than under D1610 releases (Figure 4-22). Juvenile steelhead that reared between Ukiah and Hopland may have benefited from the releases remaining cooler later into the year.

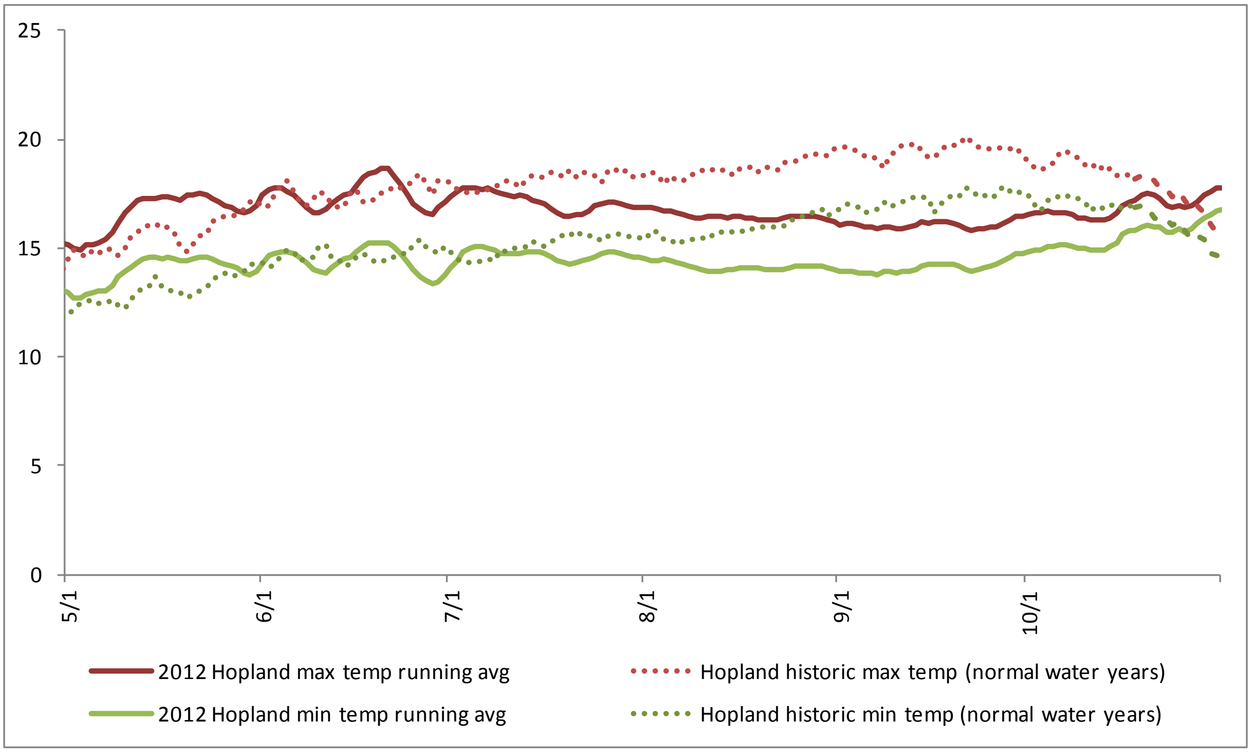


Figure 4-22. The daily maximum and minimum water temperature 7-day running average collected at Hopland shown with the daily maximum and minimum water temperature for normal water years (2002, 2003, 2005, 2006).

Steelhead smolts were in the mainstem Russian River during the beginning portion of the Order. During the Order daily maximum water temperatures for steelhead smolts at Hacienda were in the optimum zone, the zone of suitability, and the zone of tolerance with only a few individuals emigrating during the tail of the run in the zone of tolerance. The maximum daily water temperature reached the upper critical lethal limit at the tail end of the steelhead smolt emigration. The elevated water temperatures during the steelhead smolt migration were likely related to rising air temperatures in June (Figure 4-7).

Chinook

Chinook adult upstream migration in the Russian River begins during the latter portion of the time span regulated by the Order. At Hacienda, daily maximum water temperatures where generally in the zone of resistance for adult Chinook during the Order. The daily minimum water temperatures were in the zone of tolerance and zone of resistance during the period of the order that adult Chinook were observed at Hacienda. It is important to note that while water temperatures at Hacienda were in the zone of resistance water temperatures at Hacienda in 2012 were similar to water temperatures during normal water years (2002, 2003, 2005, 2006) when flows were above D1610 minimum flows (Figure 4-6).

Chinook smolts were captured in mainstem Russian River traps during portions of the Order when water temperatures were in the zones of suitability, tolerance, and resistance. However despite lower flow in

2012 the water temperatures were similar to water temperatures during normal water years (2002, 2003, 2005, 2006) when flows were above D1610 minimum flows. The water temperatures observed during the smolt migration were likely a result of the ambient air temperatures.

DO

Dissolved oxygen levels were generally favorable for salmonids in the Russian River. For the adult life stage, Hacienda daily minimum and maximum DO remained in the zone of suitability. For the parr life stage at Hopland, both the daily minimum and daily maximum DO remained in the zone of suitability for the duration of the order. At Cloverdale the daily minimum DO occasionally dipped into the zone of tolerance, but was generally in the zone of suitability while the daily maximum DO remained in the zone of suitability for the duration of the order. For the smolt life stage the daily minimum DO occasionally dipped into the zone of tolerance, but was generally in the zone of suitability while the daily maximum DO remained in the zone of suitability for the duration of the order. During the order DO levels were typically favorable for all salmonid species and life stages at the locations where water quality data was summarized.

References

Bell, M. C. 1986. Fisheries handbook of engineering requirements and biological criteria. Fisheries Engineering and Research Program, U.S. Army Corps of Engineers Division, Portland, Oregon.

Baker, P. F., T. P. Speed, and F. K. Ligon (1995). Estimating the influence of temperature on the survival of Chinook salmon smolts (Oncorhynchus tshawytscha) migrating through the Sacramento-San Joaquin River Delta of California. Journal of Fisheries and Aquatic Sciences 52: 855-863.

Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) -- steelhead. U.S. Fish and Wildlife Service report 82(11.60). U.S. Army Corps of Engineers, TR EL-82-4. 21 pp.

Bell, M. C. 1991. Fisheries handbook of engineering requirements and biological criteria. Fisheries Engineering and Research Program, U.S. Army Corps of Engineers Division, Portland, Oregon.

Bisson, P. A. and J. L. Nielsen, and J. W. Ward. 1988. Summer production of coho salmon stocked in Mount St. Helens streams 3-6 years after the 1980 eruption. Transactions of the American Fisheries Society 117: 322-335.

Bovee, K. D. 1978. Probability of Use Criteria for the Family Salmonidae. U.S. Fish and Wildlife Service.(FWS/OBS-78/07.): 53.

Brett, J. R. 1952. Temperature tolerance in young Pacific salmon, genus Oncorhynchus. Journal of the Fisheries Research Board of Canada 9(6): 265-309.

Brett, J. R., M Hollands, and D. F. Alderdice. 1958. The effects of temperature on the cruising speed of young sockeye and coho salmon. Journal of the Fisheries Research Board of Canada. 15(4):587-605.

Brett, J. R., W. C. Clar, and J. E. Shelbourn. 1982. Experiments on the thermal requirements for growth and food conversion efficiency of juvenile Chinook salmon. Canadian Technical Report of Fisheries and Agricultural Science. 1127. Pacific Biological Station, Nanaimo, BC. 29 pp.

Carter, K. 2005. The Effects of Temperature on Steelhead Trout, Coho Salmon, and Chinook Salmon Biology and Function by Life Stage: Implication for the Klamath Basin TMDLs. Regional Water Quality Control Board North Coast Region.

Chase, S. D., R. C. Benkert, D. J. Manning, and S. K. White. 2004 Results of the Sonoma County Water Agency's Mirabel Rubber Dam/Wohler Pool Fish Sampling Program – Year 4 Results: 2003.

Chase, S.D., D. Manning, D. Cook, S. White. 2007. Historic accounts, recent abundance, and current distribution of threatened Chinook salmon in the Russian River, California. California Fish and Game 93(3):130-148. California Dept. Fish and Game, Sacramento California.

Chase, S.D., R.Benkert, D.Manning, and S. White. 2005. Sonoma County Water Agency's Mirabel Dam/ Wohler pool fish sampling program: year 5 results 2004. Sonoma County Water Agency, Santa Rosa, CA.

Clarke, W. C. and J. E. Shelbourn, and J. Brett. 1981. Effects if artificial photoperiod cycles, temperature, and salinity on growth and smolting in underyearling coho (Oncorhynchus kisutch), Chinook (O. tshawytscha), and sockeye (O. nerka) salmon. Aquaculture 22:105-116.

Clarke, W. C. and J. E. Shelbourn. 1985. Growth and development of seawater adaptability by juvenile fall Chinook salmon (Oncorhynchus tshawytscha) in relation to temperature. Aquaculture 45:21-31.

Cook, D. 2004. Chinook salmon spawning study: Russian River – Fall 2002-2003. Sonoma County Water Agency.

Cook, D., 2003. Upper Russian River Steelhead Distribution Study. Sonoma County Water Agency, Santa Rosa, CA.

Crader, P. 2012. Order approving Sonoma County Water Agency's petition for temporary urgency change of permits 12947A, 12949, 12950, and 16596 (applications 12919a, 15736, 15736, 15737, 19351). Division of water Rights, Permitting and Licensing Section. Sacramento, C A.

EPA (U.S. Environmental Protection Agency). 1977. Temperature criteria for freshwater fish: protocol and procedures. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Duluth, MN. EPA-600/3-77-061.

Griffiths, J. S. and D. F. Alderice 1972. Effects of acclimation and acute temperature experience on the swimming speed of juvenile coho salmon. Journal of the Fisheries Research Board of Canada 29: 251-264.

Hallock, R. J., R. T. Elwell, and D. H. Tory. 1970. Migrations of adult king salmon (Oncorhynchus tshawytscha) in the San Joaquin Delta, as demonstrated by the use of sonic tags. Cal. Dept. Fish and Game, Fish Bull. 151.

Hinze, J. A. 1959. Annual report. Nimbus salmon and steelhead hatchery. Fiscal Year 1957-58. CDFG. Inland fish. Admin. Rept. 56-25.

Holt, R. A., J. E. Sanders, J. L. Zinn, J. L. Fryer, K. S. Pilche, 1975. Relation of water temperature to Flexibacter columnaris infection in steelhead trout (Salmo gairdneri), coho (Oncorhynchus kisutch) and Chinook (O. tshawytscha) salmon. Journal of the Fisheries Research Board of Canada 32: 1553-1559.

Jackson, T.A., 2007. California steelhead report-restoration card; a report to the legislature. Department of Fish and Game. Sacramento CA.

Klamt, R. et al., 2000. Review of Russian River Water Quality Objectives for Protection of Salmonid Species Listed Under the Federal Endangered Species Act. Regional Water Quality Control Board North Coast Region. Santa Rosa, CA.

Marine, K. R. 1997. Effects of elevated water temperature on some aspects of the physiology and ecological performance of juvenile Chinook salmon (Oncorhynchus tshawytscha): implications for management of California's Central Valley salmon stocks. Masters Thesis. University of California, Davis.

Martini Lamb, J. and D.J. Manning, editors. 2011. Russian River Biological Opinion status and data report year 2010-11. Sonoma County Water Agency, Santa Rosa, CA. P.208

McMahon, T. E. 1983. Habitat suitability index models: coho salmon. U.S. Department of Int., Fish and Wildlife Service FWS/OBS-82/10.49. 29 pp.

Moyle, P., 2002. Inland Fishes of California. University of California Press. Berkeley and Los Angeles, CA.

Myrick, C. A. and J. J. Cech, Jr. 2000. Bay-Delta modeling forum technical publication 01-1

Nielsen, J., T. E. Lisle and V. Ozaki. 1994. Thermally stratified pools and their use by steelhead in northern California streams. Transactions of the American Fisheries Society 123: 613-626.

Obedzinski, M. 2012. Personal communication. University of California Cooperative Extension and Sea Grant Program; Russian River coho salmon monitoring program. Santa Rosa, CA.

Obedzinski, M., Pecharich J., Lewis, D., and Olin, P. 2007. Russian River Coho Salmon Captive Broodstock Program Monitoring Activates Annual report July 2006 to June 2007. University of California Cooperative Extension and Sea Grant Program Santa Rosa, CA.

Obedzinski, M., Pecharich, J., Vogeazopoulos, G., Davis, J., Lewis, D., and Olin, P. 2006. Monitoring the Russian River Coho Salmon Captive Broodstock Program: Annual Report July 2005 to June 2006

Raleigh, R. F., W. J. Miller, and P. C. Nelson. 1986. Habitat suitability index models and instream flow suitability curves: Chinook salmon. U.S. Fish and Wildlife Service Biological Report 82(10.022). 64 pp.

Reese, C. D., and B. C. Harvey. 2002. Temperature-dependent interactions between juvenile steelhead and Sacramento pikeminnow in laboratory streams. Transactions of the American Fisheries Society. 131:599-606.

Rich, A. A. 1987. Report on studies conducted by Sacramento County to determine the temperatures which optimize growth and survival in juvenile Chinook salmon (Oncorhynchus tshawytscha): McDonough, Holland & Allen, 555 Capitol Mall Sacramento.

Roelofs, T. D. W. Trush, and J. Clancy. 1993. Evaluation of juvenile salmonid passage through Benbow Lake State Recreation Area. Fisheries Department, Humboldt State University, Arcata, California. Santa Rosa, CA.

Stein, R. A., P. E. Reimers, and J. H. Hall. 1972. Social interaction between juvenile coho (Oncorhynchus kisutch) and fall Chinook salmon (O. tshawytscha) in Sixes River, Oregon. Journal of Fisheries Research Board of Canada 29: 1737-1748.

Sullivan, K. D J. Martin, R. D. Cardwell, J. E. Toll, and S. Duke. 2002. An analysis on the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria. Sustainable Ecosystems Institue.

Thomas, R. E., J. A. Gharrett, M. G. Carls, S. D. Rice, A. Moles, S. Korn, 1986. "Effects of fluctuating temperature on mortality, stress, and energy reserves of juvenile coho salmon. Transactions of the American Fisheries Society 115: 52-59.

Welsh, H. H. Jr., G. R. Hodgson, B. C. Harvey, and M. F. Roche. 2001. Distribution of juvenile coho salmon in relation to water temperatures in tributaries of the Mattole River, California. North American Journal of Fisheries Management. 21:464-470.

Werner, I, T. B. Smith, J. Feliciano, and M. Johnson. 2005. Heat shock proteins in juvenile steelhead reflect thermal conditions in the Navarro River Watershed, California. 134:399-410. Transactions of the American Fisheries Society.

Wurtzbaugh, W. A. and G. E. Davis. 1977. Effects of temperature and ration level on the growth and food conversion efficiency of Salmo gairdneri Richardson.

SONOMA
COUNTY
WATER
AGENCY

CF/42-0.19-9 SWRCB ORDER APPROVING TEMPORARY URGENCY
CHANGE IN PERMITS 12947A, 12949, 12950 & 16596 FOR 2011
(ID 3215)

March 27, 2013

Ms. Barbara Evoy
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 Provisions 12, 13 and 14 of the State Water Resources Control Board Order Dated May 2, 2012

Dear Ms. Evoy:

Enclosed please find the following Reports:

- Provision 12 – Coordinated Efforts with Agricultural Russian River Water Users;
- Provision 13 – Water Loss and Water Use Efficiency; and
- Provision 14 – Progress of Santa Rosa Plain Groundwater Management Planning Program.

These reports have been prepared to meet the requirements of Provisions 12, 13 and 14 of the State Water Resources Control Board Order dated May 2, 2012. If you have any questions or comments, please do not hesitate to contact me directly.

Sincerely,

Don Seymour

Don Seymour, P.E.
Water Agency Principal Engineer

c Katherine Lee – State Water Resources Control Board, Division of Water Rights
Pamela Jeane, Jay Jasperse, Todd Schram, Carrie Pollard – Water Agency
Alan Lilly, Bartkiewicz, Kronick & Shanahan

DS\rw\\fileserver\data\CL\pinks\week 03-25-13\2012 Term 12 13 14 Trans.docx

State Water Resources Control Board
Order 05/02/2012

Provision 12 – Coordinated Efforts with Agricultural Russian River Water Users

March 29, 2013

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 Provision 12 of the State Water Resources Control Board (State Board) Order dated May 2, 2012 (Order).

Provision 12 of the Order directs the Water Agency to take the following actions:

> SCWA shall continue to work with agricultural Russian River water users to pursue opportunities that will result in improved management of the Russian River by better anticipating periods of high water demand. SCEA shall provide a written update to the Deputy Director regarding the progress of these efforts by March 31, 2013.

2 Improved Frost and Heat Event Forecast Project

SCWA continues to work with the National Oceanic and Atmospheric Administration (NOAA) and the Sonoma County WineGrape Commission to improve the spatial and temporal resolution of forecast models for frost and heat events in the Alexander Valley. To date, this demonstration project has resulted in improved forecasting of these events. Improved forecast tools can provide agricultural water managers better information regarding the location and duration of frost events with a goal of more efficient and coordinated water use. Future work includes: (1) continued improvements to the forecast tool, (2) installation of equipment that measures the height of inversion layers so that vineyard managers can better determine whether fans (lower inversion layers) can be used rather than water (higher inversion layers); and (3) working with the WineGrape Commission and other stakeholders to "roll out" the modeling tool should it be determined that it is reliable for operations.

3 Frost Event Coordination with Mendocino County Grape Growers

SCWA continues to work with Mendocino County grape growers, the Mendocino County Russian River Flood Control and Water Conservation Improvement District and the Mendocino WineGrape and Wine Commission on coordinating releases from Coyote Valley Dam in response to forecasted frost events. Coordination efforts include: (1) Mendocino County grape growers providing SCWA operations staff with estimated pumping rates that will likely be applied during an eminent frost event; and (2) developing strategies for refilling off stream ponds following frost events. This ongoing coordination has improved SCWA's ability to manage Russian River flows in response to frost events.

4 Independent Science Review Panel (ISRP)

In 2012 SCWA, California Land Stewardship Institute, Russian River Water Conservation Council, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District funded the Russian River Independent Science Review Panel (ISRP). The purpose of the ISRP is to develop a comprehensive conceptual model of hydrologic and ecologic processes for the upper Russian River (above the confluence with Dry Creek), the Mark West watershed and Green Valley watershed. In addition, the ISRP is tasked with evaluating and prioritizing data gaps to inform stakeholders where their resources for monitoring and data collection should be prioritized. Panel members were chosen from a pool of applicants by a selection panel comprising a broad range of constituencies in accordance with National Academies conflict of interest protocols. The panel is comprised of nine scientists representing a variety of disciplines from the physical and biological sciences. More information regarding the ISRP can be found at www.russianriverISRP.org.

.

State Water Resources Control Board
Order 05/02/2012

Provision 13 – Water Loss and Water Use Efficiency

March 29, 2013

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 Provision 13 of the State Water Resources Control Board (State Board) Order dated May 2, 2012 (Order).

Provision 13 of the Order directs the Water Agency to take the following actions:

> SCWA shall provide a written update to the Deputy Director by March 31, 2013 regarding activities and programs being implemented by SCWA and its Water Contractors to assess and reduce water loss and promote increasing water use efficiency.

2 Water Loss and Water Use Efficiency

The Water Agency has been working on two new pilot projects, funded through the California Water Foundation, with the intent of increasing water use efficiency and reducing water loss. The California Water Foundation (Foundation) supports innovative projects and policies that address water challenges today, while bringing together experts, stakeholders, and the public to achieve long-term, science-based solutions for the future. The Foundation's goal is to create a sustainable water management system that can capitalize on increased supply in wet years to meet water needs in dry years. The Foundation does this by:

- Providing incentives and tools to better manage water resources
- Supporting critical innovative demonstration projects, technologies, and research
- Engaging broad-based coalitions in decisions about the state's water future and support for effective policies

The Foundation has provided funding to the Water Agency for the Residential Unaccounted for Water Leak Detection Project and the Aquajust Demand Response Pilot Project. Each project is briefly described below:

> **Residential Unaccounted Water Leak Detection Program (Leak Detection Program):** The Leak Detection Program seeks to address the problem of water that has been produced by a water utility and is subsequently lost to leaks that are undetected by current meter technology. The Leak Detection Program will purchase and install approximately 100 devices on residential accounts within the Water Agency's service area. The devices allow low linear flows that would normally go undetected through the meter to be registered by the meter. The Water Agency will collect and analyze data for one year to determine if low flows are in fact moving through meters and contributing to unaccounted for water.

> **AquaJust Demand Response:** The Water Agency is partnering with SmartMarkets, Inc. to test an innovative program called AquaJust. The AquaJust Program will test the theory that water awareness combined with direct customer benefits will increase water efficiency. It will

establish customer baselines for each account. Users below that threshold will be awarded efficiency credits, or "EcoShares"; those exceeding it may choose to pay as per usual, or purchase EcoShares from their more efficient neighbors. The City of Sonoma is interested in participating in this pilot to reduce demand and meet their statewide goal of 20% reduction by 2020, which current projections show may not be achieved.

3 Sonoma-Marin Saving Water Partnership Annual Report

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 in 2010. The purpose of the Sonoma-Marin Saving Water Partnership is to establish the financial obligation for the eight local water utilities, Marin Municipal Water District and Sonoma County Water Agency, identify and recommend implementation of water conservation projects and to maximize the cost-effective projects for the Partnership.

The Partners are committed to remain as members in good standing of the California Urban Water Conservation Council (CUWCC) and implement the Best Management Practices (BMPs) for water conservation. The Partners will 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 will track program implementation, highlight program milestones, and reinforce the importance of protecting and preserving water resources for future generations. The 2011/2012 Annual Report for the Partnership is attached in Appendix A.

Appendix A

2011/2012 Annual Report for the Sonoma-Marin Saving Water Partnership

(begins on the following page)

SONOMA - MARIN SAVING WATER PARTNERSHIP

ANNUAL REPORT
FISCAL YEAR 2011/2012

A Team Effort

Every day we wake up and turn on the tap to draw water and begin our daily routine. It's a marvel that fresh water appears instantly and this marvel is a testament to the men and women of the Sonoma County Water Agency and area retail water providers working together to ensure a safe, reliable water supply is available for residents of Sonoma and Marin counties. Whether the water is naturally filtered from the Russian River, local groundwater sources or treated surface water from local lakes, the coordinated effort to extract, treat and deliver water to area residents is often taken for granted. Conservation of precious water resources is critical as we strive to make water available for our communities while preserving our natural resources.

The Sonoma-Marin Saving Water Partnership (Partnership) was formed in late 2010. The Partnership 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.

The time and energy invested in the Partnership is paying off. The 2011/2012 winter and spring saw limited rainfall and dry year conditions in our service area. Nevertheless, water use in the Sonoma-Marin region remained at significantly reduced levels compared to prior years resulting in no need for extreme water use restrictions. The Partnership will continue to offer educational resources, programs and incentives to aid our communities in meeting water use efficiency requirements in the future, responding to variable water year conditions and maintaining supplies for beneficial use and instream needs.

Sincerely,

Susan Gorin, Chair
Water Advisory Committee
Council Member
City of Santa Rosa

Efren Carrillo
Board of Directors
Sonoma County Water Agency

About the Partnership

The Sonoma-Marin Saving Water Partnership (Partnership) represents 10 water utilities in Sonoma and Marin counties who 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 you in reducing your 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 (CUWCC) and implement the Best Management Practices (BMPs) for water conservation.

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.

Wildlife, including threatened and endangered species, such as steelhead, coho salmon and Chinook salmon, recreational interests, and agricultural crops, 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.

CONTENTS

Partnership Achievements by the Numbers

Fiscal Year 2011/2012

Volunteers work on sheet mulching a lawn.

57 graywater systems were installed.

37 students graduated from the Qualified Water Efficient Landscaper (QWEL) and Spanish QWEL programs.

332 parents volunteered to chaperone their child's class during their field study visit to the Water Agency's Russian River Field Study Site near Forestville. The parents participated along with the students allowing the Field Study Program to reach adults as well as children.

Do-it-yourself graywater kits ready for distribution.

10,104 students experienced "The Musical Watershed" performed by the ZunZun performing arts group in 35 shows at 25 different elementary schools.

23,696,000 gallons of water per year are being saved by local businesses through sustained reduction programs where rebates are provided for implementing process changes and equipment upgrades resulting in measurable water use efficiencies.

Water Education Program staff lead students through a watershed exercise.

202 landscapes were upgraded through our rebate programs.

317 rebates were issued to businesses for installing high-efficiency toilets.

Old, inefficient toilets on their way to recycling facilities.

5,801 students received direct instruction, 2,426 in the classroom only program and 3,375 in the classroom and Field Study program.

2,155 high-efficiency clothes washer rebates were issued. These EPA EnergyStar rated clothes washers use 40 to 60% less water than older, top loading models and they save energy from heating less water and wringing out more water before the clothes go into the dryer.

3,031 Water Smart Home evaluations were performed. These in-home water efficiency assessments are performed by trained technicians to find opportunities for improvements, identify leaks, and inform homeowners about their indoor and outdoor water use.

1,757 rebates were issued to residents for replacing their old, inefficient toilets with new, EPA WaterSense labeled high-efficiency toilets that flush at 1.28 gallons per flush or less.

511 businesses participated in our water use survey programs.

23,050 gallons of rainwater storage capacity have been rebated through rainwater harvesting rebate programs.

Water Education Program staff explain the life cycle of salmon to 5th grade students.

444 high school students went on technical tours of the Water Agency's Mirabel and Wohler water transmission facilities. Students learned about the water system and explored career opportunities in the field of water.

A beautiful, water-wise landscape.

340,607 square feet of lawn were removed through turf conversion programs — enough to cover nearly six professional football fields.

3,375 students participated in the Field Study Program where the 5th grade students performed water related experiments along the banks of the Russian River and learned about the riparian ecosystem.

Residents participating in a "Laundry to Landscape" workshop.

Partnership Highlights

680 guests visited the 18 gardens that participated in the First Annual Eco Friendly Garden Tour.

19,722 students in 911 different classrooms received curriculum materials provided by the Water Education Program.

ANNUAL MULTI-MEDIA PUBLIC EDUCATION CAMPAIGN

The annual public education campaign continued this year to increase awareness about water efficiency rebates available through the Partnership. The campaign featured local residents from throughout the North Bay region who have participated in rebate programs.

Advertisements were placed in local and regional newspapers, in local movie theaters, on various media websites and a radio campaign was also developed.

PROGRAM EXPENDITURES

Partners have pledged to fund water use efficiency programs. The baseline funding is established in the MOU and is based on historic water deliveries through the Water Agency's water transmission system, ensuring that programs will always be available to help residents use our water resources efficiently.

Minimum funding levels are presented in the orange bar in the table below. Current expenditures and those of the previous two fiscal years are included.

For the Town of Windsor, additional required funding paid through a direct diversion water conservation sub-charge is not included with their MOU minimum. These additional funds are designated for the Town's water use efficiency programs and is included in their annual program expenditures.

The Water Agency's Water Use Efficiency Program is funded by the water contractors through the Water Conservation Sub-Charge as part of the Water Agency wholesale water rates. The amount of money deposited in the fund is calculated based on the estimate of the total costs for all regional Water Conservation Projects for each fiscal year.

The Sonoma-Marin Saving Water Partnership does not specify a minimum amount that should be utilized for regional programs.

Program Expenditures (in thousands of dollars)

	City of Cotati	Marin Municipal Water District	North Marin Water District	City of Petaluma	City of Rohnert Park	City of Santa Rosa	City of Sonoma	Valley of the Moon Water District	Town of Windsor	Sonoma County Water Agency	Regional Total
FY 09-10	$74	$2,500	$479	$528	$13	$1,883	$168	$239	$235	$1,583	$7,701
FY 10-11	$107	$1,900	$383	$657	$17	$1,221	$137	$120	$158	$1,573	$6,220
FY 11-12	$115	$1,900	$270	$638	$21	$909	$117	$75	$243	$1,505	$5,794
Minimum	$25	$177	$241	$242	$120	$557	$55	$72	$10	NA	$1,500

2011 TEMPORARY URGENCY CHANGE PETITION

On April 18, 2011, the Water Agency submitted a Temporary Urgency Change Petition to the State Water Resources Control Board (SWRCB) requesting to modify the minimum in-stream flow requirements for the Russian River and preserve water in Lake Mendocino for late release to benefit returning Chinook salmon.

On June 1, 2011 the SWRCB responded with an Order approving the request. The Order contained two terms that pertained to water use efficiency: the SBx7-7 targets and 2011 gallons per capita per day (GPCD) status for each Partner (Provision 12) and assigned water budgets to dedicated irrigation customers designed to achieve a Maximum Applied Water Allowance (MAWA) of 60% reference evapotranspiration (ETo) (Provision 13).

The purpose of the SBx7-7 report was to update the SWRCB on the long term per capita water use goals for our region and document the 2011 measurement. The report detailed GPCD for each of the Partners and as a region, which is identical to the chart on Page 7. This report was submitted to the SWRCB on March 28, 2012.

The MAWA provision required each Partner to develop and notify their dedicated irrigation customers of a site specific water budget. This site specific water budget was then compared to the site's actual water use to determine if the site adhered to the water budget. The average MAWA achieved by the Partners from May to November 2011 was 53% ETo. This Report was submitted to the SWRCB on March 28, 2012.

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 with an interim goal of a 10% reduction by 2015.

The chart below displays 2011 per capita water use in each Partner service area and the region as a whole. The 2015 and 2020 goals are indicated by the green and red lines, respectively.

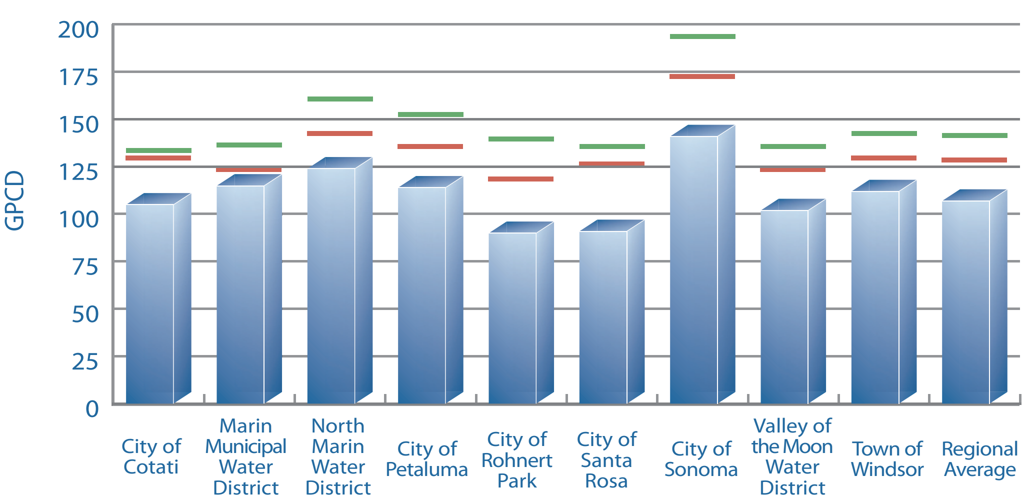
While the chart shows that all Partners are currently meeting the 2020 targets, we recognize that water use efficiency must continue. Many factors can affect water use patterns as has been seen in recent years. This downward trend is a result of many factors including the California drought, slow economy, changes in weather conditions, and active water conservation programs.

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.

2,304 actions were inspired by the 350 Home & Garden Challenge.

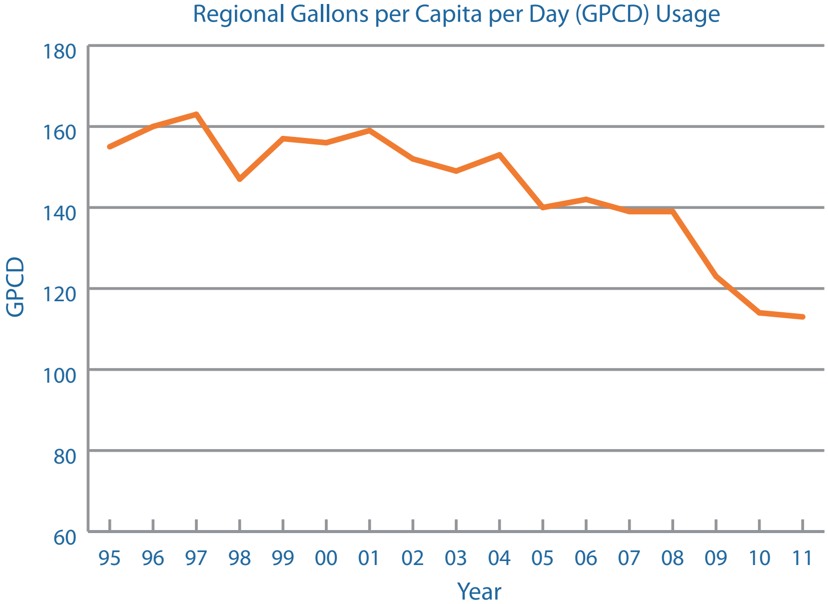
211 people attended Rainwater Harvesting classes.

2011 GPCD and 20 x 2020 Goals



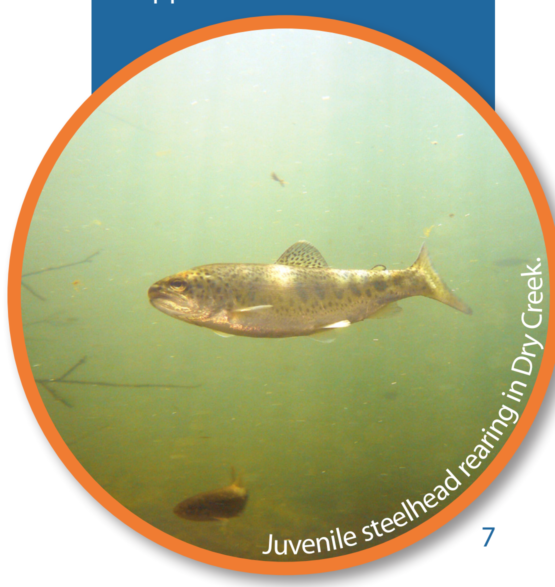
	City of Cotati	Marin Municipal Water District	North Marin Water District	City of Petaluma	City of Rohnert Park	City of Santa Rosa	City of Sonoma	Valley of the Moon Water District	Town of Windsor	Regional Average
2011 Actual	111	121	130	120	96	97	147	108	118	113
2015 Target	134	137	161	153	140	136	194	136	143	142
2020 Target	130	124	143	136	119	127	173	124	130	129

Regional Gallons per Capita per Day (GPCD) Usage



WATER USE EFFICIENCY HELPS MEET FEDERAL MANDATE

The National Marine Fisheries Service Biological Opinion (BO) determined that the summertime flows in the Russian River established under State Water Board regulations are too high for young coho and steelhead. The BO requires that the Water Agency reduce minimum water flow rates in the Russian River and Dry Creek during the summer months. Water use efficiency programs will help ensure the Agency meets these reduced flow requirements while continuing to provide reliable drinking water supplies.



Juvenile steelhead rearing in Dry Creek.

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

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

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

North Marin
Water District
(415) 897-4133 x8412
www.nmwd.com

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

Valley of the Moon
Water District
(707) 996-1037
www.vomwd.com

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

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

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

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

SONOMA-MARIN **SAVING WATER** PARTNERSHIP
www.savingwaterpartnership.org

Printed on paper made with 100% certified renewable
energy and 30% post consumer recycled fiber content.

State Water Resources Control Board
Order 05/02/2012

Provision 14 – Progress of Santa Rosa Plain Groundwater Management Planning Program

March 29, 2013

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 Provision 14 of the State Water Resources Control Board (State Board) Order dated May 2, 2012 (Order).

Provision 14 of the Order directs the Water Agency to take the following actions:

> SCWA shall provide a written update to the Deputy Director regarding the progress of the Santa Rosa Plain Groundwater Management Planning Program by March 31, 2013. The update shall include a discussion of: (1) progress being made towards implementation of groundwater recharge in the Santa Rosa basin; and (2) efforts by SCWA and its Water Contractors to conjunctively manage surface water and groundwater resources within SCWA's service area. Such management should emphasize the conservation and replenishment of groundwater resources and utilization of available surface water supplies to the extent feasible.

2 Santa Rosa Plain Groundwater Management Planning

In October 2011, the Water Agency's Board of Directors approved a workplan and a Cooperative Agreement with the Sonoma County Water Agency, County of Sonoma, City of Santa Rosa, City of Rohnert Park, City of Sebastopol, City of Cotati, Town of Windsor, and California-American Water Company to fund the preparation of a non-regulatory, voluntary groundwater management plan for the Santa Rosa Plain.

A Basin Advisory Panel (Panel) was convened in December 2011 and will guide the development and implementation of the groundwater management plan. The Panel is comprised of 30 members representing key groundwater interests: Agriculture (Dairies, Farmers & Grape Growers and Wineries); Business / Developers; Environmental; Government (Tribal, State, County, and Cities); Public Health; Rural Residential Well Owners; and Water Supply & Groundwater Technical Expertise. The Panel has met 10 times between December 2011 and February 2013 and has undertaken several actions including development of a charter, governance proposal, and draft basin management objectives and formation of a Technical Advisory Committee. In addition, the Panel has received presentations on different topics including groundwater basin conditions by United States Geological Survey scientists, regional and local water resource management strategies, and enhanced recharge studies and programs. The Panel selected the Water Agency as the lead agency for developing the groundwater management plan and the Water Agency's Board of Directors, following a public hearing on October 23, 2012, adopted a Resolution of Intention to Prepare a Groundwater Management Plan for the Santa Rosa Plain of Sonoma County (attached).

The Panel and Technical Advisory Committee will continue to meet on an approximate monthly basis to develop elements of the groundwater management plan and integrate the results and findings of a forthcoming scientific study of the Santa Rosa Plain being developed by the U.S. Geological Survey. The elements to be developed for the plan include groundwater management components, such as groundwater recharge initiatives, a monitoring program and public outreach elements. Panel members will continue briefing their constituencies and other interested organizations on the groundwater management plan development. Further information regarding the Santa Rosa Plain Groundwater Management Planning Program can be found on the program website www.scwa.ca.gov/srgroundwater/.

3 Groundwater Recharge and Conjunctive Management Efforts

Among other strategies, the Water Agency and its local partners, including many of its Water Contractors, are evaluating opportunities to enhance the existing conjunctive use of the region's surface water and groundwater resources. The Water Agency's Water Supply Strategies Action Plan identifies enhancing groundwater recharge through groundwater banking and stormwater recharge as primary strategies that emphasize the conservation and replenishment of groundwater resources and utilization of available surface water supplies to the extent feasible. Updates on the status of two studies the Water Agency and its local partners are conducting to pursue these strategies are summarized below:

Groundwater Banking Feasibility Study: To improve the reliability of future water supplies (both surface water and groundwater), the Water Agency partnered with the Cities of Cotati, Rohnert Park and Sonoma, the Town of Windsor and the Valley of the Moon Water District to conduct a feasibility study for a regional groundwater banking program. The feasibility study is investigating the viability of enhancing the conjunctive management of surface water and groundwater resources. 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 Water Agency and the study participants are exploring groundwater banking in a systematic and phased approach utilizing information obtained from completed and ongoing scientific studies and groundwater management activities sponsored by the Water Agency and its partners.

A draft regional feasibility study report has been prepared and will be finalized in Spring 2013. The following primary findings from the study will provide a framework for developing a groundwater banking program:

- The groundwater banking program would provide enhanced reliability of the regional water supply during droughts, natural hazard events (e.g., earthquakes), and periods of peak seasonal water demands.
- Additional potential benefits include improved habitat conditions by enhancing tributary base flows by reducing groundwater pumping, or in the case of Dry Creek, reducing summer releases

from Warm Springs Dam (due to reduced peak demands) thus improving flow conditions for ESA-listed salmonids.

- Facilities owned and operated by the study participants, including drinking water production facilities along the Russian River and groundwater supply-wells within the two groundwater basins, are well-suited for further testing and developing a groundwater banking program in an incremental and phased manner.

- There appears to be adequate wintertime Russian River water supplies, transmission system capacity, and aquifer storage space to meet preliminary conceptual storage targets through a combination of in-lieu and direct groundwater recharge.

- The quality of drinking water from the Water Agency and Town of Windsor's drinking water facilities and conveyance piping indicate that the potential source water represents an excellent candidate for direct recharge and Aquifer Storage and Recovery (ASR) operations.

- Evaluation of regional hydrogeologic and geochemical conditions has identified 14 potential groundwater banking alternatives in the Santa Rosa Plain and Sonoma Valley, which include a combination of indirect (in lieu) and direct (surface spreading and ASR) recharge methods. Of the two direct recharge methods, ASR is deemed to be the most practical to implement in the near term based on: (1) the ability to incrementally establish an ASR program; (2) the ability to pilot test ASR alternatives in a phased manner; (3) the relatively lower costs associated with ASR; and (4) uncertainties related to the ability of surface spreading alternatives to convey water to aquifers suitable for storage and subsequent recovery.

Based on the above summary of findings, several recommended next steps for establishing a groundwater banking program have been identified and initiated:

- Suitable locations for performing pilot-scale ASR demonstration testing consisting of existing active and inactive municipal supply wells are being evaluated.

- Site-specific groundwater quality data from existing wells deemed suitable for pilot-scale ASR testing have been collected and analyzed. The results of the groundwater quality testing are being incorporated into a geochemical model, along with the source water quality data, to assess the potential interaction between the source water and native groundwaters.

- Work plans for performing pilot-scale demonstration testing are being developed for each of the study participants. The work plans will incorporate site-specific hydrogeologic, engineering, and water quality information and form the basis for designing and permitting a pilot-scale ASR demonstration test.

- Briefing of local stakeholders has been accomplished through sharing information on this study at regular Sonoma Valley and Santa Rosa Plain Basin Advisory Panel meetings.

- Briefings and discussions with representatives of the San Francisco Bay and North Coast Regional Water Quality Control Boards (RWQCBs) have occurred to frame likely permitting requirements for pilot-scale ASR demonstration testing.
- Identifying funding sources for performing pilot-scale demonstration testing. Potential funding sources include grants through the California Department of Water Resources Integrated Regional Water Management program.

Along with completion of the above activities, additional recommended next steps include:

- Obtaining necessary permits/approval for performing the pilot-scale ASR testing from applicable regulatory entities, including Regional Water Quality Control Boards, the State Water Resources Control Board and the California Department of Public Health; and
- Evaluating results from pilot-scale demonstration testing to design and develop full-scale groundwater banking programs and facilities.

<u>Stormwater Management & Groundwater Recharge Scoping Studies:</u> In three of its flood zones, the Sonoma County Water Agency is identifying opportunities to alleviate flooding, while recharging groundwater aquifers and providing other benefits. The "Stormwater Management-Groundwater Recharge" studies are currently assessing the feasibility of projects in Laguna-Mark West watershed, the Sonoma Valley watershed and the Upper Petaluma River watershed.

The goal of the initial scoping studies (one in each watershed) is to establish the project objectives, identify potential project concepts, and determine, at a preliminary level, the technical and practical feasibility of projects that would reduce flooding while providing additional community benefits. These benefits could include groundwater recharge, water quality improvements, water supply improvements, improved ecosystem functions, preservation of agricultural land use, preservation or enhancement of open spaces, system sustainability or benefits like recreation, public access or education.

To accomplish this goal, consultants in each watershed are collecting and assessing technical data and information about the watersheds, and have met with active stakeholders to discuss project objectives and goals and to solicit ideas on potential projects. The second phase of the studies is to identify possible project opportunities and evaluate at a more detailed level the feasibility of implementing those projects, as indicated by the following process timeline.

- **Phase 1 –** Initiated in December 2010. Draft studies were submitted in Spring 2011. Stakeholder input was provided in Spring-Summer 2011.
- **Phase 2 –** Based on comments received in Phase 1, consultant teams are drafting studies identifying possible project areas. Meetings were held in fall and winter 2011-2012 to discuss findings with stakeholders and community members.
- **Phase 3 –** For those projects where partners and potential partners express interest, the Water Agency will move forward with engineering and other supporting studies. The goal is to be positioned to take advantage of potential grant and other funding sources.