

## Introduction

This water quality monitoring fact sheet was prepared by the Irrigated Agriculture Program of the Central Coast Regional Water Quality Control Board (Water Board) and made available on November 30, 2008. The data were delivered by Central Coast Water Quality Preservation, Inc. (CCWQP) to the Water Board as part of the monitoring and reporting requirements for all dischargers enrolled under *Conditional Waiver of Waste Discharge Requirements for Discharge from Irrigated Lands, Order No. R3-2004-0117*. Monitoring stations were selected to represent water quality in predominantly agricultural areas, but in some cases reflect mixed land uses upstream of the sites.

## 309SSP Salinas River at Spreckels Gage

The Cooperative Monitoring Program sampled the Salinas River at Spreckels Gage 33 times (approximately one sample per month) between January 2005 and December 2007, with an additional sample in February 2005, and excluding three sample dates that were recorded as dry (October 2005; October and November 2007).

## Summary of Water Quality Data

### Notable Measured Analytes for Water Quality Monitoring

Analyte/Parameter	Average	Range	Water Quality Criteria (WQC) or Guideline <sup>1</sup>	Percent Outside WQC or Guideline
Ammonia as N, Unionized	0.016 mg/L	0.000–0.132 mg/L	<0.025 mg/L <sup>+</sup>	7%
Nitrate/Nitrite as N	1.4 mg/L	0.0–7.5 mg/L	<10.0 mg/L*	0%
Orthophosphate as P	0.12 mg/L	0.00–1.35 mg/L	<0.12 mg/L*	20%
Turbidity (NTU)	157 NTU	1–2584 NTU	<25 NTU*	66%
Conductivity	0.59 mmho/cm	0.31–1.06 mmho/cm	Ranges: <sup>+</sup> <0.75 No Problem 0.75–3.0 Increasing >3.0 Severe	81% 19% 0%
pH	8.3	7.7–9.4	7.0–8.3 <sup>+</sup>	42%
Annual Median Dissolved Oxygen (% Saturation)	2005: 91% 2006: 86% 2007: 65%	46–164%	>85% annual median <sup>+</sup>	Std met Std met Std not met
Dissolved Oxygen	8.6 mg/L	4.3–13.4 mg/L	>5.0 mg/L (GEN/WARM) <sup>+</sup> >7.0 mg/L (COLD/SPWN) <sup>+</sup>	10% 26%
Chlorophyll a	3.6 µg/L	0.3–23 µg/L	<40 µg/L*	0%
Water Temperature	17.4°C	10.0–27.9°C	Water Basin Specific	--

<sup>+</sup> Indicates standard defined in the Water Quality Control Plan, Central Coast Basin (Basin Plan)

\* Indicates guideline not described in the Basin Plan or not specifically stated as applicable to the beneficial uses of the site. Origin of the guideline is described in the individual discussion of the analyte/parameter.

The present and potential beneficial uses for the **Salinas River (downstream of Spreckels Gage)** as defined in the Basin Plan include Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Migration of Aquatic Organisms (MIGR), and Fresh Water Habitat (FRESH).

<sup>1</sup> Water Quality Criteria (WQC) are defined in the Water Quality Control Plan, Central Coast Basin (also referred to as the “Basin Plan”) to protect beneficial uses such as drinking water, fish habitat, irrigation water, etc. WQC include general water quality standards for some analytes as well as specific criteria based on the defined beneficial uses. Other water quality guidelines were compiled to provide a standard in order to compare sites. Bold indicates beneficial uses that apply to this watershed.

## Unionized Ammonia (as N)

Unionized ammonia (as N) is a calculated value based on water temperature, pH, and total ammonium concentration. Ammonia can be toxic in water. With high water temperature and/or high pH, ammonia becomes unionized and is toxic at much lower levels. The Basin Plan general water quality objectives state that unionized ammonia should not exceed 0.025 mg/L. Over time, ammonia should reduce to nitrate, so long-lasting levels of ammonia may indicate continuous discharges of waste. **Two of 30 samples (7%) exceeded the standard with concentrations of 0.098 mg/L (September 2005) and 0.132 (May 2007). The average unionized ammonia concentration was 0.016 mg/L.**

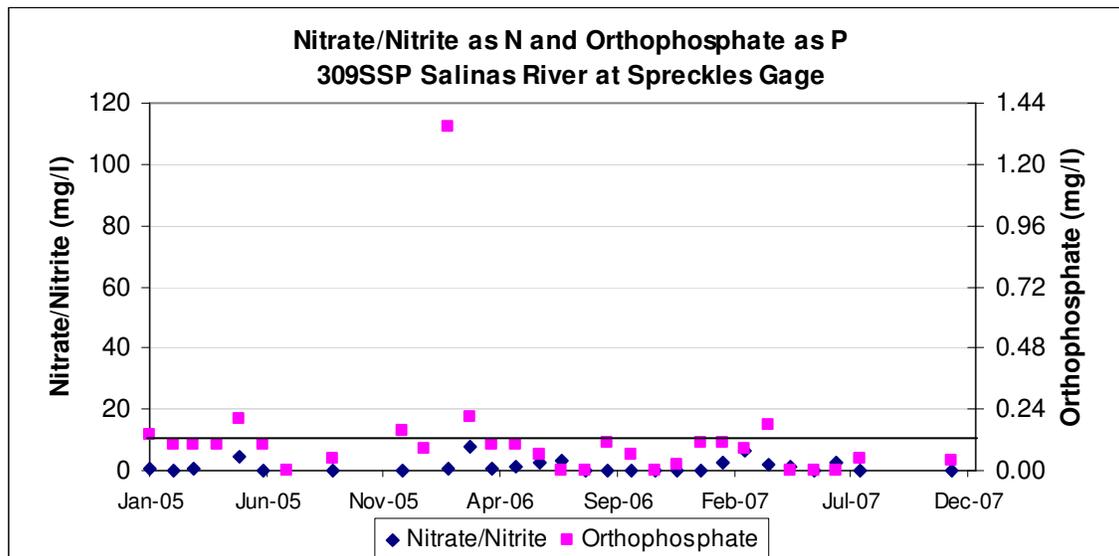
## Nitrate/Nitrite as N

The Municipal and Domestic Supply (MUN) objective states in Table 3-2 of the Basin Plan that nitrate as  $\text{NO}_3$  shall not exceed 45 mg/L. This value is equivalent to 10 mg/L of nitrate as N. Nitrite accounts for a small percent of total nitrate/nitrite, and therefore, nitrate as N criterion was used as a guideline for nitrate/nitrite. **No nitrate/nitrite samples exceeded the guideline. The average concentration was 1.4 mg/L.**

## Orthophosphate as P

The Basin Plan does not contain orthophosphate standards. The Central Coast Ambient Monitoring program (CCAMP) non-regulatory guideline for general water quality objectives states that orthophosphate concentrations shall not exceed 0.12 mg/L. **Orthophosphate concentrations exceeded the guideline in six of 30 samples (20%), all between December and April. The greatest concentration exceeded the guideline by 11.3 times (February 2006 – 1.35 mg/L). The average concentration was 0.12 mg/L. Excluding the sample from February 2006, the average would be 0.08 mg/L.**

The chart below shows the nitrate/nitrite and orthophosphate concentrations throughout the sampling period. The guidelines for nitrate/nitrite as N and orthophosphate as P state that their concentrations shall not exceed 10 mg/L and 0.12 mg/L, respectively, shown by the black horizontal line on the graph.



## Turbidity

The Basin Plan states: “Water shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.” Sigler et al.<sup>2</sup> shows that turbidity levels of 25 NTU or greater caused reduction in juvenile salmonid growth due to interference with their ability to find food. Turbidity is often affected by suspended material in runoff. **Twenty-one of 32 turbidity readings (66%) exceeded the guideline. Turbidity levels in the Salinas River at Spreckels Gauge averaged**

<sup>2</sup> Sigler, J.W., T.C. Bjornn, & F.H. Everst. (1984). *Effects of chronic turbidity on density and growth of steelhead and coho salmon*. Transactions of the American Fisheries Society. 113:142-150.

157 NTU, with two readings greater than 1000 NTU (February 2005 and April 2006). However, the standard deviation was 477 NTU, indicating extreme (high and low) readings.

## Conductivity

Conductivity is measured from a water sample. Based on Table 3-3 of the Basin Plan showing Guidelines for Interpretation of Quality of Water for Irrigation, conductivity below 0.75 mmho/cm causes no problems to irrigation, between 0.75 and 3 mmho/cm causes increasing problems, and conductivity above 3 mmho/cm causes severe problems. The conductivity level can be greatly affected by geologic and biological influences and is not necessarily related to agricultural activities. **Twenty-six of 32 conductivity samples (81%) indicated no problems to irrigation water; six samples (19%) indicated increasing problems; no samples indicated severe problems.**

## pH

Multiple beneficial uses have objectives for pH. The Basin Plan general water quality objective for pH is between 7.0 and 8.5; MUN, AGR, REC-1, and REC-2 pH objectives are between 6.5 and 8.3. The standard, therefore, is 7.0-8.3 if one or more of MUN, AGR, REC-1, and REC-2 is defined as a beneficial use. pH above 9 can cause skin irritant to humans and makes water inhospitable to many species. **Thirteen of 31 pH samples (42%) exceeded the standard, with all four pH samples greater than 9.0 between June and September. The average pH between May and September was 8.5, while the average between October and April was 8.2.**

## Dissolved Oxygen Concentration and Dissolved Oxygen Saturation

The Basin Plan general water quality objectives state annual median dissolved oxygen shall remain above 85% saturation. General and WARM objectives state that the dissolved oxygen concentration must remain above 5.0 mg/L at all times, and SPWN and COLD objectives state that the dissolved oxygen concentration must remain above 7.0 mg/L at all times. **Three of 31 samples (10%) did not meet the general and WARM concentration standard, and eight samples (26%) did not meet the COLD and SPWN concentration standard. Dissolved oxygen did not meet the saturation standard during 2007, with a median annual value of 65% saturation. The median annual values for 2005 (91%) and 2006 (86%) met the standard for dissolved oxygen saturation. All samples with concentrations less than 7.0 mg/L occurred between August 2006 and April 2007.**

**Though no standards have been set in the Basin Plan regarding dissolved oxygen supersaturation (>100%), studies have shown that supersaturation of gases may cause gas bubble trauma in fish<sup>3</sup>. Dissolved gas saturation levels were not collected at this site; however, oxygen levels reached 203% saturation, which may indicate dissolved gas supersaturation.**

## Chlorophyll a

Healthy and appropriate Chlorophyll a levels are not defined in the Basin Plan. Chlorophyll a indicates phytoplankton growth, a necessary component of healthy water bodies. Because turbidity causes interference for the Chlorophyll a probe, measurements of Chlorophyll a may not be accurate when turbidity is above 1000 NTU. Chlorophyll a levels over 40 µg/L are considered problematic by North Carolina Administrative Code (NCAC). **No readings exceeded the guideline. The Chlorophyll a readings averaged 3.6 µg/L.**

## Temperature

Sullivan et al.<sup>4</sup> state that the maximum weekly average temperatures for protection of steelhead or rainbow trout, and coho salmon are 19.6 and 19.7°C, respectively. **The temperature averaged 17.4°C and ranged from 10.0 to 27.9°C. Though weekly averages were not taken, the temperatures taken at this site indicate averages that may regularly exceed the maximum temperatures for fish protection.**

---

<sup>3</sup> Mesa, M.G., L.K. Weiland, & A.G. Maule. (2000). *Progression and severity of gas bubble trauma in juvenile salmonids*. Transactions of the American Fisheries Society. 129:174-185.

<sup>4</sup> Sullivan, K., D.J. Martin, R.D. Cardwell, T.E. Toll, & S. Duke. (2000). *An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria*. Portland, OR: Sustainable Ecosystems Institute.

## Summary of Toxicity Data

### Species with Significant Mortality

	Feb-05	Mar-05	Apr-05	Jul-05	Feb-06	May-06	Aug-06	Sep-07	Feb-07	Mar-07	Apr-07
Invertebrate (Water Column)	No*	No*		No	No*		Yes	No	No	Yes	
Invertebrate (Sediment)			No			No					No
Fish (Water Column)	Yes	No			No		No	No	No	No	
Algae (Water Column)	No	No			No		No	No	No	No	

\*Indicates significant effect on growth or reproduction (even though mortality did not have a significant effect)

Significant effect is determined by statistically significant rates of mortality, growth, or reproduction compared to a control sample and provides an indication that something is affecting plant or animal life in the stream. Invertebrates show significant sensitivity to organophosphates and pesticides. Significant effect to algae often indicates the presence of herbicides and metals such as copper. Fish are less sensitive to organophosphates but can be impacted by other pollutants such as ammonia and pyrethroid pesticides.

### Photos of Site



Above: February 2006

Right: July 2006



## **QAQC**

The data in this water quality monitoring fact sheets meet the quality assurance and quality control requirements of the Water Board's Surface Water Ambient Monitoring Program (SWAMP). Additional surface water monitoring data are available at the Water Board's Central Coast Ambient Monitoring Program website <http://www.ccamp.org>. Any questions regarding the data or analysis should be directed to either **Peter Meertens** at [pmeertens@waterboards.ca.gov](mailto:pmeertens@waterboards.ca.gov) (805) 549-3869 or **Amanda Bern** at [abern@waterboards.ca.gov](mailto:abern@waterboards.ca.gov) (805) 594-6197.

**Attachment:** Monitoring Data

SiteTag		Salinas River at Spreckels Gauge											
309 SSP		Beneficial Uses: MUN, AGR, REC2, WILD, COLD, WARM, MIGR, FRSH											
		Ammonia as N, Unionized	Chlorophyll a	Conductivity	Instantaneous Flow	Nitrate/Nitrite as N	Orthophosphate as P	OP / STD	Oxygen, Dissolved	Oxygen, Saturation	pH	Turbidity	Water Temp
Units		mg/L	µg/L	mmho/cm	CFS	mg/L	mg/L	none	mg/L	%		NTU	°C
1/27/2005	Jan-05	0.0125	1.15	0.531		0.8	0.140	1.17	9.5	91	8.38	110	13.2
2/17/2005	Feb-05			0.323	1035				9.43	90	8.10	151.9	13.4
2/23/2005	Feb-05	0.0125	1.66	0.341	909	0.007	0.098	0.82	9.52	90	7.67	1012	12.6
3/22/2005	Mar-05	0.0125	1.34	0.525	936	0.9	0.100	0.83	9.01	88	8.15	159.9	14.4
4/14/2005	Apr-05	0.0125	1	0.808	531		0.103	0.86	10.03	104	8.30	66.7	17.4
5/25/2005	May-05	0.0125	1.64	0.970	98	4.4	0.200	1.67	8.41	91	8.29	27.3	19.1
6/29/2005	Jun-05	0.0125	7.15	0.825	0	0.2	0.102	0.85	7.62	69	7.96	1.4	19.4
7/27/2005	Jul-05		23	0.544	20		0.004	0.03	11.13	142	9.15	16	27.9
8/30/2005	Aug-05			0.428								16	
9/28/2005	Sep-05	0.0980	9.58		0	0.007	0.050	0.42	12.85	164	9.43	14.3	27.7
Oct-05	Oct-05				Dry								
11/29/2005	Nov-05	0.0125		0.380									
12/13/2005	Dec-05	0.0125	1.23	0.496	36	0.155	0.155	1.29	11.01	105	8.42	29.2	13.5
1/24/2006	Jan-06	0.0125	1.09	0.406	9		0.084	0.70	12.61	115	8.67	7.5	11.5
2/23/2006	Feb-06	0.0041	1.09	1.063	669	0.879	1.350	11.25	11.3	106	8.31	70.1	12.6
3/30/2006	Mar-06	0.0125	3.13	0.657	103	7.5	0.210	1.75	8.75	77	8.08	13.1	10.0
4/25/2006	Apr-06	0.0025	3.89	0.551	794	0.395	0.100	0.83	9.11	88	8.17	2584	13.8
5/26/2006	May-06	0.0125	0.95	0.718	1490	1.3	0.102	0.85	8.92	91	8.27	48.9	16.1
6/28/2006	Jun-06	0.0125	1.51	0.807	620	2.7	0.066	0.55	7.67	83	8.29	35	18.9
7/26/2006	Jul-06	0.0125	1.27	0.570	6	2.92	0.004	0.03	7.36	84	8.34	37.8	22.1
8/24/2006	Aug-06	0.0035	6.94	0.519	1	0.007	0.004	0.03	4.86	56	8.30	17.4	22.0
9/28/2006	Sep-06	0.0125	1.58	0.587	3	0.007	0.110	0.92	4.34	46	7.65	1.9	17.9
10/24/2006	Oct-06	0.0019	3.18	0.572	1	0.018	0.060	0.50	4.83	50	7.80	4.5	17.5
11/14/2006	Nov-06	0.0065	0.95	0.676	0	0.007	0.004	0.03	9.42	108	8.60	1.9	22.0
12/13/2006	Dec-06	0.0063	3.77	0.402	0	0.007	0.022	0.18	9.16	93	8.51	28.9	16.0
1/31/2007	Jan-07	0.0125	2.65	0.595	2	0.3	0.105	0.88	5.03	48	7.93	70.5	14.2
2/15/2007	Feb-07	0.0015	0.3	0.673	64	2.3	0.112	0.93	6.18	59	8.15	32.2	13.3
3/22/2007	Mar-07	0.0017	1.89	0.751	22	6.5	0.085	0.71	6.9	65	8.16	52.1	12.9
4/16/2007	Apr-07	0.0177	3.46	0.631	29	2.02	0.176	1.47	5.42	59	8.37	71.5	19.6
5/30/2007	May-07	0.1322	7.5	0.501	10	1.03	0.004	0.03	13.4	146	9.28	65.6	19.6
6/27/2007	Jun-07	0.0164	9.3	0.310	6	0.145	0.004	0.03	9.1	99	9.00	171.3	19.3
7/24/2007	Jul-07	0.0004	4.32	0.568	0	2.5	0.004	0.03	8.13	83	7.81	32.6	16.4
8/29/2007	Aug-07	0.0033	1.17	0.596	0	0.007	0.051	0.42	11.24	131	8.57	35.8	23.1
Oct-07	Oct-07				Dry								
Nov-07	Nov-07				Dry								
12/17/2007	Dec-07	0.0068	0.48	0.520	0	0.007	0.040	0.33	5.53	64	7.69	23.9	22.5
Average		0.016	3.6	0.59	247	1.4	0.12		8.6	Below	8.3	157	17.4
Standard Deviation		0.028	4.5	0.18	413	2.0	0.24		2.5		0.4	477	4.5
Maximum		0.132	23	1.06	1490	7.5	1.35		13.4	164	9.4	2584	27.9
Minimum		0.000	0.3	0.31	0	0.007	0.004		4.3	46	7.7	1.4	10.0
Standard		<0.025	<40	<0.75		<10	<0.12		>7.0		7-8.3	<25	
%Outside		7%	0%	81%		0%	20%		26%		42%	66%	
Standard 2				>3.0					>5.0				
%Outside				0%					10%				
indicates times exceeding standard													
Flow Avgs									Median Annual DO %				
feb-may								Year	Median	Meet Criteria			
549		cfs						2005	91%	Yes			
june-jan								2006	86%	Yes			
41.52		cfs						2007	65%	No			