

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.

309NAD Natividad Creek u/s from Salinas Reclamation Canal

The Cooperative Monitoring Program sampled Natividad Creek upstream from Salinas Reclamation Canal 31 times (approximately one sample per month) between January 2005 and December 2007, with an additional sample in February 2005, and excluding four sample dates that were recorded as dry (October, November, and December 2005; October 2007).

Two samples, one in May 2005 and one in May 2007, showed extremely high values for several analytes. The sample from May 2005 contains the highest ammonia, conductivity, and nitrate/nitrite levels, and third highest orthophosphate level at the site, and turbidity greater than 3000 NTU. The May 2007 sample shows the highest orthophosphate concentration, second highest nitrate/nitrite concentration (after May 2005), and third highest turbidity reading at the site. There was no written indication as to why these samples were drastically different from the remaining dates; however, it may indicate a single large deposit of contaminants, and may indicate contamination during the month of May.

Summary of Water Quality Data

Notable Measured Analytes for Water Quality Monitoring

Analyte/Parameter	Average	Range	Water Quality Criteria (WQC) or Guideline ¹	Percent Outside WQC or Guideline
Ammonia as N, Unionized	0.040 mg/L	0.001–0.886 mg/L	<0.025 mg/L ⁺	10%
Nitrate/Nitrite as N	26.8 mg/L	2.0–150 mg/L	<10.0 mg/L*	81%
Orthophosphate as P	0.66 mg/L	0.00–3.96 mg/L	<0.12 mg/L*	93%
Turbidity (NTU)	501 NTU	13–3000 NTU	<25 NTU*	97%
Conductivity	1.11 mmho/cm	0.28–2.42 mmho/cm	Ranges: * <0.75 No Problem 0.75–3.0 Increasing >3.0 Severe	% in Range: 23% 77% 0%
pH	7.8	7.2–8.9	7.0–8.5 ⁺	3%
Annual Median Dissolved Oxygen (% Saturation)	2005: 86% 2006: 74% 2007: 75%	48–136%	>85% annual median ⁺	Std met Std not met Std not met
Dissolved Oxygen	7.7 mg/L	5.1–11.3 mg/L	>5.0 mg/L (GEN/WARM) ⁺ >7.0 mg/L (COLD/SPWN)*	0% 35%
Chlorophyll a	4.1 µg/L	0.0–31.7 µg/L	<40 µg/L*	0%
Water Temperature	18.5°C	10.6–31.0°C	Water Basin Specific	--

+ 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.

¹ 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.

The present and potential beneficial uses for **Natividad Creek** are not specified in the Basin Plan. General Basin Plan water quality objectives will apply. Any analytes not specified under the general objectives in the Basin Plan are compared to a different water quality guideline to create a better understanding of the site's condition.

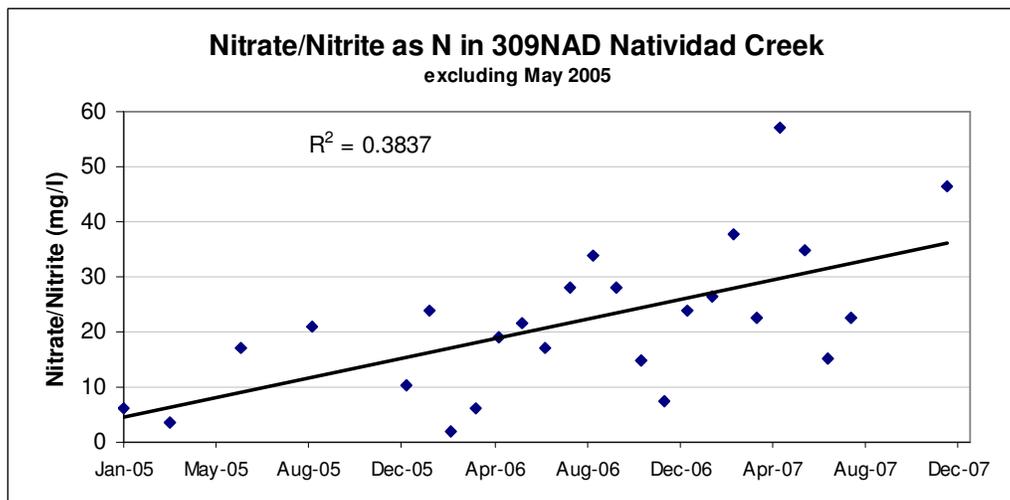
Unionized Ammonia (as N)

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 shall 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. **Three of 29 samples (10%) exceeded the standard. Two of the exceedances were in August, and the third, highest exceedance was in May 2005 (as explained above). Ammonia in May 2005 measured 0.886 mg/L, more than 35 times the standard. The remaining two exceedances measured 0.0797 mg/L (August 2005) and 0.0282 mg/L (August 2007). The second highest sample (August 2005 – 0.0797 mg/L) may have been greatly affected by the high pH (8.87) and warm water temperature (31°C) during that sample. The average unionized ammonia concentration was 0.040 mg/L. Excluding the sample from May 2005, the average would be 0.010 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 NO₃ 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. **Twenty-one of 26 nitrate/nitrite samples (81%) exceeded the guideline, including all (9) samples in 2007. The average concentration was 26.8 mg/L.**

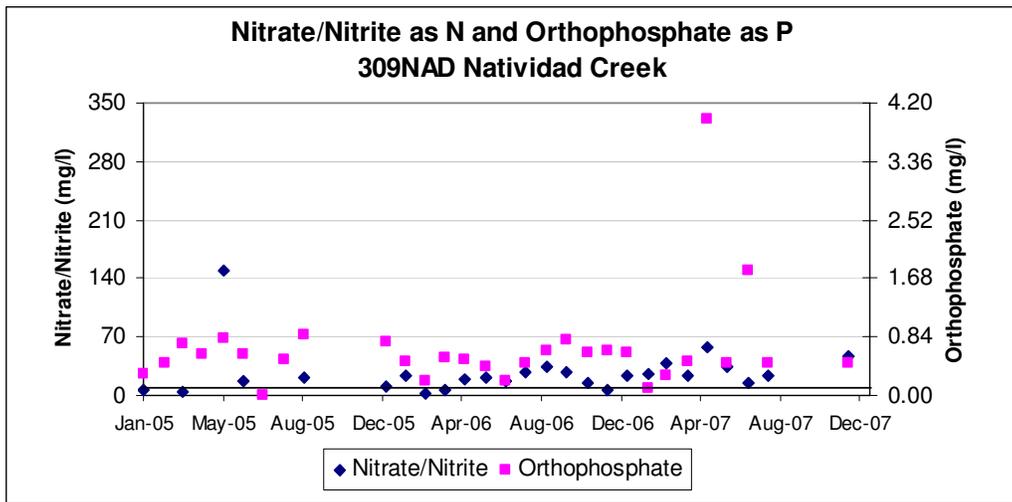
The chart below shows the nitrate/nitrite concentrations throughout the sampling period. The guideline for nitrate/nitrite states that its concentration as N shall not exceed 10 mg/L. A linear trendline was applied to the given samples, and its R² value is shown. The data appears to show an increasing trend.



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 28 of 30 samples (93%). The average concentration was 0.66 mg/L. The standard deviation was 0.70 mg/L, indicating extreme (high and low) readings.**

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.² 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. **Thirty of 31 turbidity readings (97%) exceeded the guideline. The probe showed turbidity values above 3000 NTU in three readings, and turbidity values greater than 500 NTU in an additional five readings. Turbidity levels in Natividad Creek averaged 501 NTU. Turbidity averaged 726 NTU between December and May, and 229 NTU between June and November. This may indicate an annual cycle.**

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. **Seven of 31 conductivity samples (23%) indicated no problems to irrigation water; 24 samples (77%) 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 irritation to humans and makes water inhospitable to many species. **Five of 31 pH samples (16%) exceeded the MUN, AGR, REC-1, REC-2 standard for pH, and one pH sample (3%) exceeded the GEN standard for pH. The pH levels averaged 7.8.**

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. **All 31 samples met the general and WARM concentration standard, but 11 samples (35%) did not meet the COLD and SPWN concentration standard (possibly not applicable). Dissolved oxygen did not meet the saturation standard during 2006 or 2007, with median annual values of 74 and 75% saturation, respectively. The median annual value for 2005 (86%) met the standard for dissolved oxygen saturation.**

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

² 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.

40 µg/L are considered problematic by North Carolina Administrative code (NCAC). **No readings exceeded the guideline. The Chlorophyll a readings averaged 4.1 µg/L.**

Temperature

Sullivan et al.³ 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 18.5°C and ranged from 10.6 to 31.0°C. Though weekly averages were not taken, the temperatures taken at this site indicate averages that regularly exceed the maximum temperatures for fish protection.**

Summary of Toxicity Data

Species with Significant Mortality

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

⁺Indicates complete mortality within 24 hours of test initiation

*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



February 2006



July 2006

³ 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.

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 (805) 549-3869 or **Amanda Bern** at abern@waterboards.ca.gov (805) 594-6197.

Attachment: Monitoring Data

