Austin Creek
Water Quality Results
2004

Community Clean Water Institute

Site Descriptions:

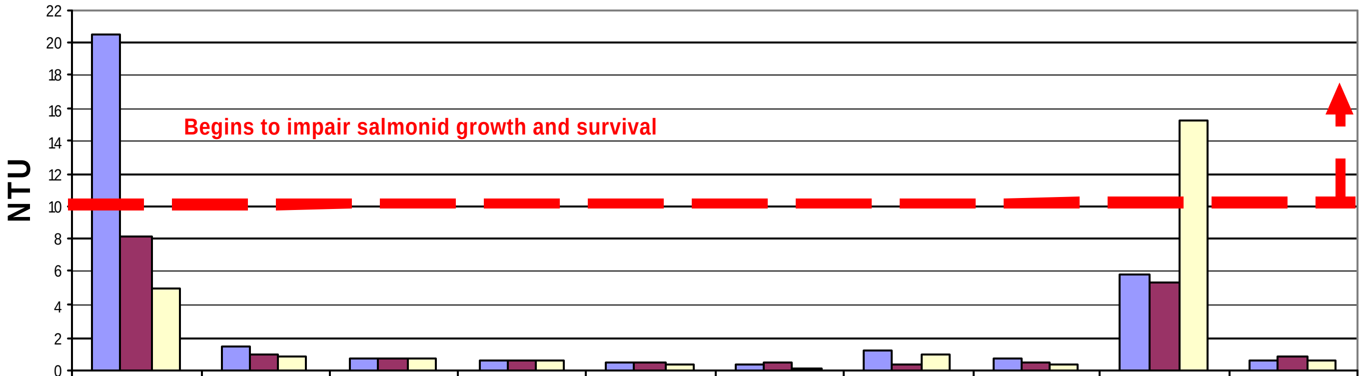
Austin Creek Watershed		
Site Name	GPS	Site Description
AUS010	38º29.024" N 123º03.213" W	First bridge, confluence with Russian River
AUS020	38º29.373" N 123º03.679" W	1180 Austin Creek Rd.
AUS030	38º31.500"N 123º05.328" W	Cazadero Bakery, just upstream of large culvert

AUS030: East side of bank approximately 50 yards from the 4th bridge off Cazadero Highway, near bakery. Access from a minor road along creek off the Highway. During the summer, it was a large pool with many small fish under the bridge on the west side. Winter flows found it a wide, shallow riffle run with numerous pockets and gravel bars.
AUS020: Here the channel is much narrower, although the gravel bed extends much farther to the east of the wetted width. Access is through an adjacent property. The stream meanders here and is cutting into the west bank. The vegetation overhangs much of the channel, and the habitat appears to be shallow, fast riffle run.
AUS010: Downstream of Green Bridge, the first bridge accessible from Old Cazadero Hwy. The west side of stream can be reached by a gravel trail in drier times, wetter weather requires sampling from bridge. During summer, this site becomes isolated stagnant pools all the way to the mouth. The channel is more narrow, and the water deeper during high flows than the other sites. This site is skimmed for gravel throughout the summer.

Sampling Conditions:

Date	Time	Air Temp(C)	Weather
2/20/2004	12:41 PM	9	Overcast recent rain
3/13/2004	12:39 PM	20	Sunny
4/27/2004	12:09 PM	21	Sunny
5/25/2004	12:15 PM	23	Overcast
6/22/2004	3:10 PM	26	Sunny
7/21/2004	4:30 PM	37	Sunny
8/31/2004	11:39 AM	17	Sunny
9/28/2004	11:57 AM	17.5	Overcast
10/26/2004	11:43 AM	16.5	Cloudy recent rain
11/24/2004	1:48 PM	18	Sunny

Turbidity

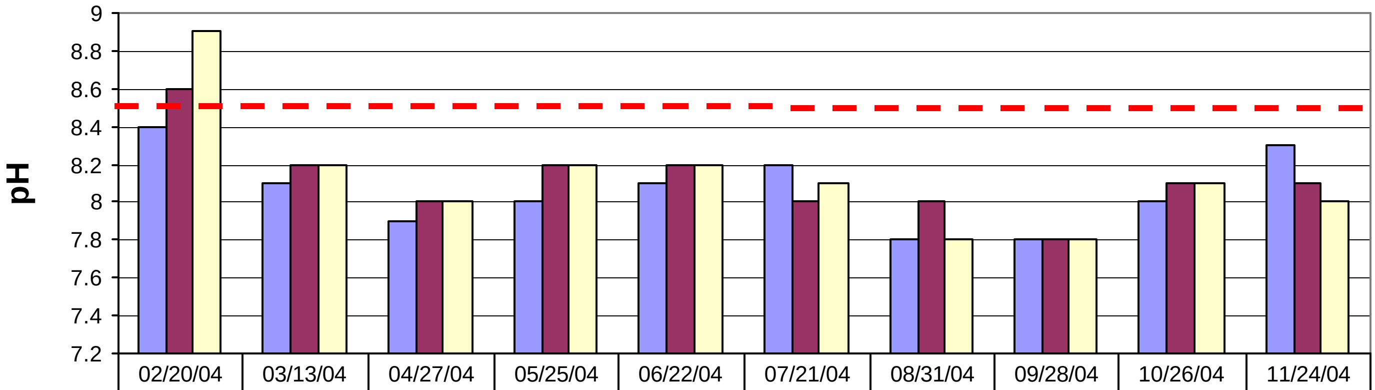


	02/20/04	03/13/04	04/27/04	05/25/04	06/22/04	07/21/04	08/31/04	09/28/04	10/26/04	11/24/04
AUS010	20.5	1.4	0.74	0.54	0.42	0.27	1.15	0.76	5.75	0.54
AUS020	8.16	0.92	0.69	0.56	0.42	0.44	0.3	0.46	5.3	0.79
AUS030	4.89	0.91	0.69	0.57	0.33	0.21	0.96	0.34	15.2	0.63

Instrument: Hach 2100P Turbidimeter

Turbidity is the measure of the amount of suspended particles in the water column. These particles may consist of algae, sediment, or organic matter. There are several natural factors, like erosion from winter rain storms, that cause an increase in turbidity. This is the likely cause of the swell in turbidity for October and February in the above graph for Austin Creek. Turbidity can also be a result of human impacts like nutrient loading due to waste discharge and erosion from timber harvesting and construction. For recreational purposes the recommended level of turbidity is 5 NTU, Nephelometric Turbidity Units. For optimum salmonid survival the turbidity should remain under 10 NTU. The effects of increased turbidity depends on the type of suspended particle. Sediment clogs the gills of fish and after the sediment settles out of the water column the particles may smother the fish eggs. Organic matter results in dissolved oxygen depletion because bacteria will use more oxygen to decompose the increased amounts of organics. Turbidity due to increased algal growth will reduce light penetration and in turn will limit primary production to the surface waters. Also toxins that are produced by some of the algae are harmful to humans.

pH

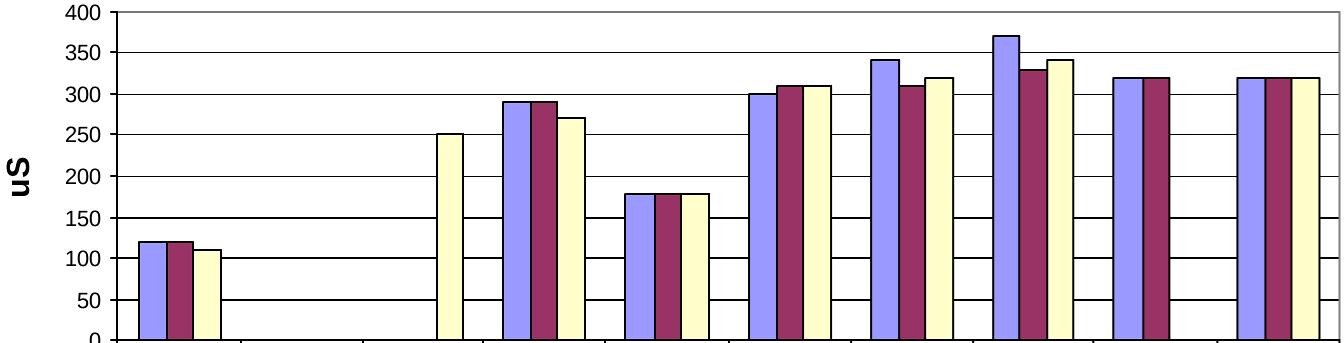


	02/20/04	03/13/04	04/27/04	05/25/04	06/22/04	07/21/04	08/31/04	09/28/04	10/26/04	11/24/04
AUS010	8.4	8.1	7.9	8	8.1	8.2	7.8	7.8	8	8.3
AUS020	8.6	8.2	8	8.2	8.2	8	8	7.8	8.1	8.1
AUS030	8.9	8.2	8	8.2	8.2	8.1	7.8	7.8	8.1	8

Instrument: Oakton double-junction pHTestr

pH represents the concentration of hydrogen ions. It measures how acidic or basic the water is. According to the Regional Water Board, the pH should remain between 6.5 and 8.5 for fresh water communities in order to protect the organisms. Many aquatic organisms can only survive between this narrow pH range. Changes in the pH may elevate the concentrations of other elements to higher toxicity and amplify their effects. Some factors that may result in more basic waters (>7 pH), are algal growth, limestone, marble, and bleach. Excess nutrient levels due to anthropogenic pollutants cause increased algae growth which in turn raises pH levels. Some factors that produce more acidic waters (<7 pH), are acid rain, acid mine drainage, and sulfur fertilizers. Decomposing organic matter and root respiration also decreases the pH because the carbon dioxide byproduct of these processes forms a weak organic acid in water. The increased pH for Austin Creek for the month of February is most likely connected to increased nutrient levels due to runoff during the winter storm season. The decreased levels of pH in the summer months are due to increased temperatures.

Conductivity

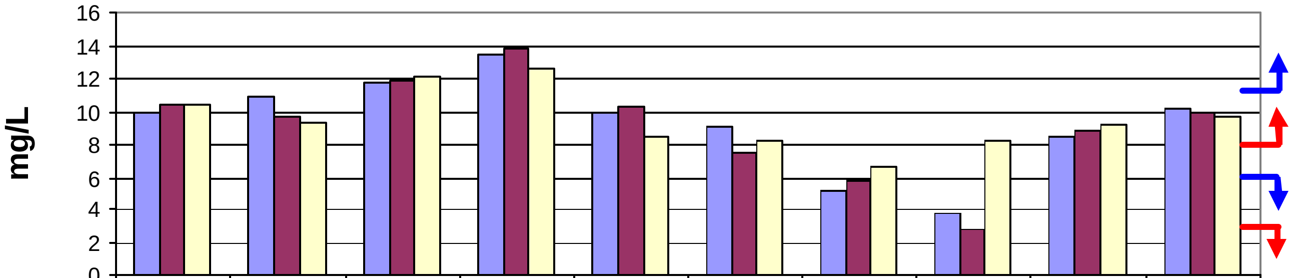


	02/20/04	03/13/04	04/27/04	05/25/04	06/22/04	07/21/04	08/31/04	09/28/04	10/26/04	11/24/04
AUS010	120			290	180	300	340	370	320	320
AUS020	120			290	180	310	310	330	320	320
AUS030	110		250	270	180	310	320	340		320

Instrument: Oakton ECTestr

Conductivity is the measure of water's ability to conduct an electrical current through dissolved ions. These ions include sodium, calcium, potassium, magnesium, iron, aluminum, chloride, sulfate, carbonate, and bicarbonate. The recommended conductivity for streams supporting good mixed fisheries is between 150 and 500 uS. The main impact of increased conductivity is a decline in dissolved oxygen levels. The natural causes of conductivity include granite bedrock, clay soils, and evaporation. Granite bedrock will lower conductivity because it does not ionize easily. Clay soils will increase conductivity because the clay will ionize when it contacts the water resulting in the production of more ions to conduct electrical current. Also evaporation of water increases the concentration of dissolved solids and salts which in turn will elevate conductivity during the summer months. In February, Austin Creek had fairly low conductivity that is mostly attributed to rain fall that diluted the ions. Some human related factors that increase conductivity are failing sewage and septic systems. These malfunctions will dump chloride, phosphate, and nitrate into the waters. Another factor is that agricultural runoff contains high levels of dissolved salts. Organic compounds like oil, phenol, alcohol, sugar and other less conductive materials will decrease conductivity. These compounds will enter the water column through urban runoff.

Dissolved Oxygen

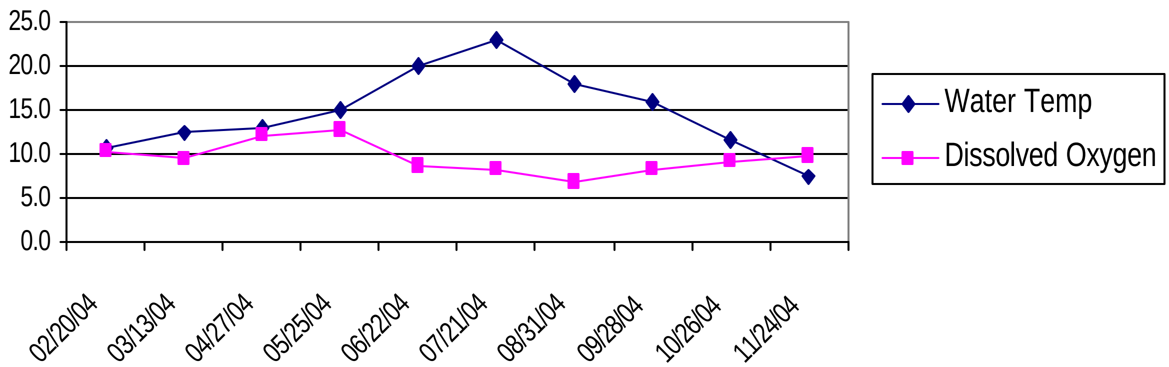


	02/20/04	03/13/04	04/27/04	05/25/04	06/22/04	07/21/04	08/31/04	09/28/04	10/26/04	11/24/04
AUS010	10	10.9	11.7	13.5	10	9.1	5.2	3.8	8.5	10.2
AUS020	10.4	9.7	11.9	13.8	10.3	7.5	5.8	2.8	8.8	10
AUS030	10.4	9.3	12.1	12.6	8.5	8.2	6.7	8.3	9.2	9.7

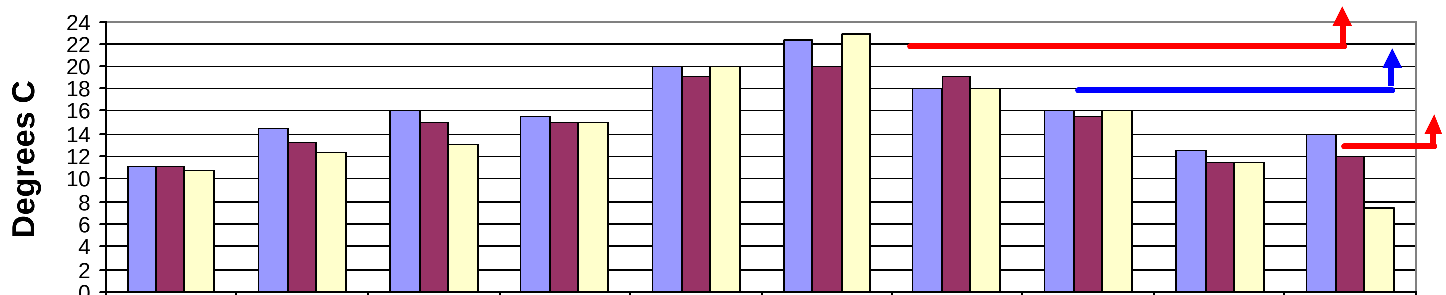
Instrument: ICM Portable Dissolved Oxygen Meter

Above 11=no embryo impairment
Below 6=embryo acute mortality
Above 8=no adult impairment
Below 3=adult acute mortality

Dissolved oxygen is essential for the survival of most aquatic organisms. Dissolved oxygen has two main sources. At the air-water interface oxygen is dissolved into the water through processes like turbulence. Oxygen is also produced through plant photosynthesis. Dissolved oxygen has an inverse relationship to water temperature. As water temperature increases dissolved oxygen levels decrease. This is apparent in the Austin Creek graph above. The lowest levels of dissolved oxygen are between June and September which correlate to the highest water temperatures of the year (see graph below). Another factor that leads to decreased DO is an increase in animal waste and human waste from sewage. Bacteria will use up more oxygen in order to decompose the increased levels of organic material. Low dissolved oxygen levels can impair growth and survival of the salmonids that inhabit the creek. Adult salmonids require less oxygen than the embryo and larval stages. For adults and juveniles growth begins to become impaired below 8 mg/L and for embryo and larval stages growth is affected at levels below 11 mg/L. Acute mortality occurs at 6 mg/L and below for embryo stages and adult mortality can occur at 3 mg/L and below.



Water Temperature



	02/20/04	03/13/04	04/27/04	05/25/04	06/22/04	07/21/04	08/31/04	09/28/04	10/26/04	11/24/04
AUS010	11.1	14.5	16	15.5	20	22.5	18	16	12.5	14
AUS020	11.1	13.2	15	15	19	20	19	15.5	11.5	12
AUS030	10.7	12.4	13	15	20	23	18	16	11.5	7.5

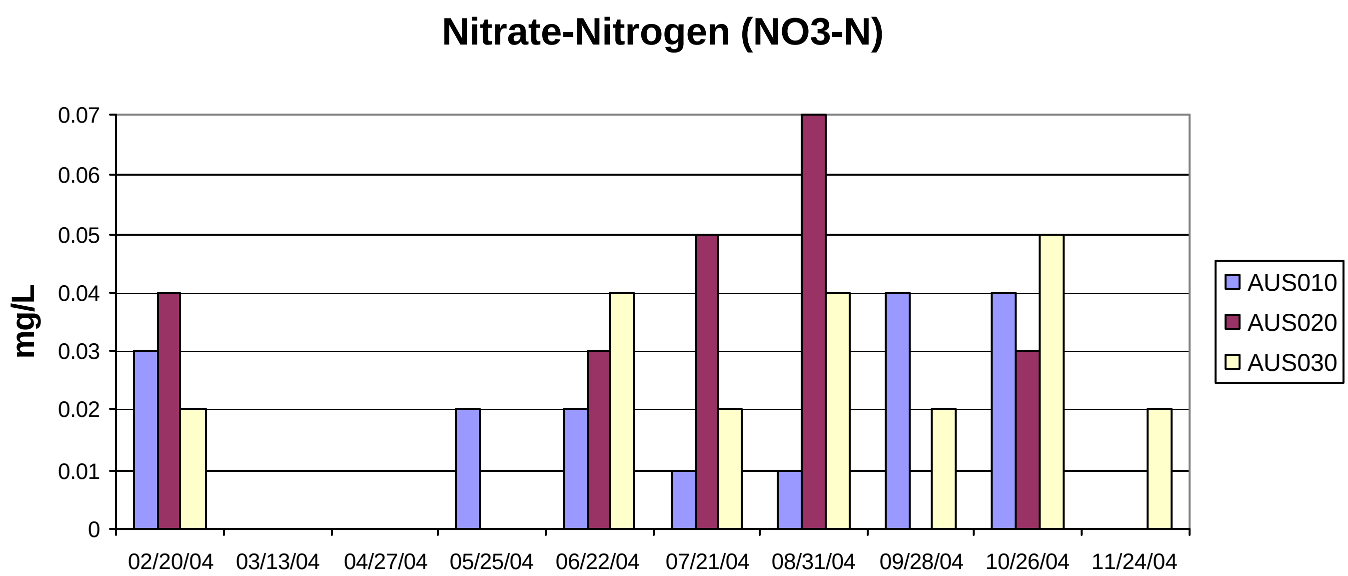
Instrument: Bulb Thermometer

Above 22= Adult/Juvenile Mortality
Above18= Growth Impairment
Above 13= Embryo Mortality

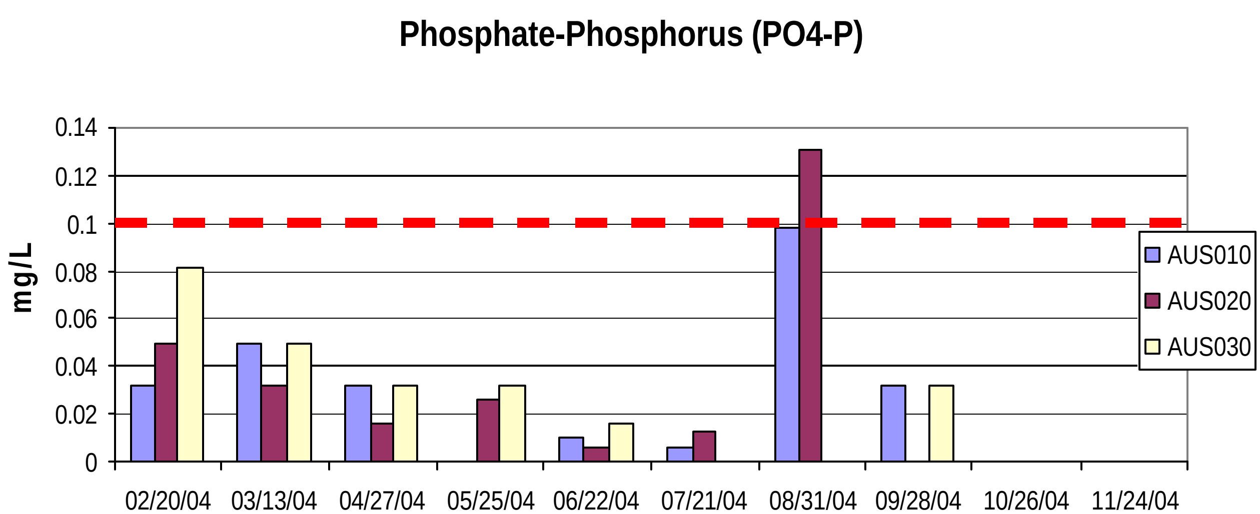
Temperature is the measure of the average kinetic energy of water molecules. Temperature changes are caused by weather, removal of shading vegetation, alterations to stream flow by dams and other barriers, storm water runoff, cooling water discharges from industries, and suspended sediment as it absorbs heat. Both biological and chemical processes are affected by temperature. For fish, there are two main limitations. There are those that can be tolerated for short periods and weekly average temperatures that vary with the different life cycles. Adult salmon can survive temperatures up to 22 degrees Celsius for short periods of time, but longer exposure may result in death. Growth impairment begins around weekly averages of 18 for juveniles and embryo mortality can occur at 13 degrees Celsius. The optimum temperature for spawning is around 10 degrees Celsius. Temperature influences the amount of dissolved oxygen in the water, pH, conductivity, the rate of photosynthesis, metabolic rates of organisms, and sensitivity of organisms to toxic elements, parasites, and disease.

Information in this report is referenced from:

- EPA: Volunteer Stream Monitoring: A Methods Manual
- State Water Resource Control Board Fact Sheets



Nitrogen is found in several forms as it cycles through the water column. It moves from organic matter to ammonium (NH_4), to nitrite (NO_2), and then to nitrate (NO_3) as bacteria break down the organic matter. Increased levels of nitrate are caused by fertilizers, sewage disposals, (ie septic systems and wastewater treatment plants), livestock facilities, and industrial discharge. Natural levels in surface waters are less than 1 mg/L but wastewater treatment runoff can be as high as 30 mg/L. Excess levels maybe toxic to warm blooded animals at concentrations of 10 mg/L or higher. High levels may also result in eutrophication which is a condition where the increased nutrients lead to increased production. This causes algal blooms and decreases in dissolved oxygen due to elevated decomposition.



Phosphate (PO_4) is converted to phosphorus by plants. Phosphorus can be found as three different types. Orthophosphorus is produced by sewage. Polyphosphorus is used in detergents and organic phosphorus is produced in the break down of pesticides. The USEPA recommends that phosphate levels for streams should be no higher than 0.1 mg/L. Increased levels can result in algal blooms, eutrophication and decreased oxygen.