



Pocket Canyon Creek Water Quality Results 2004

Community Clean Water Institute

Site Descriptions:

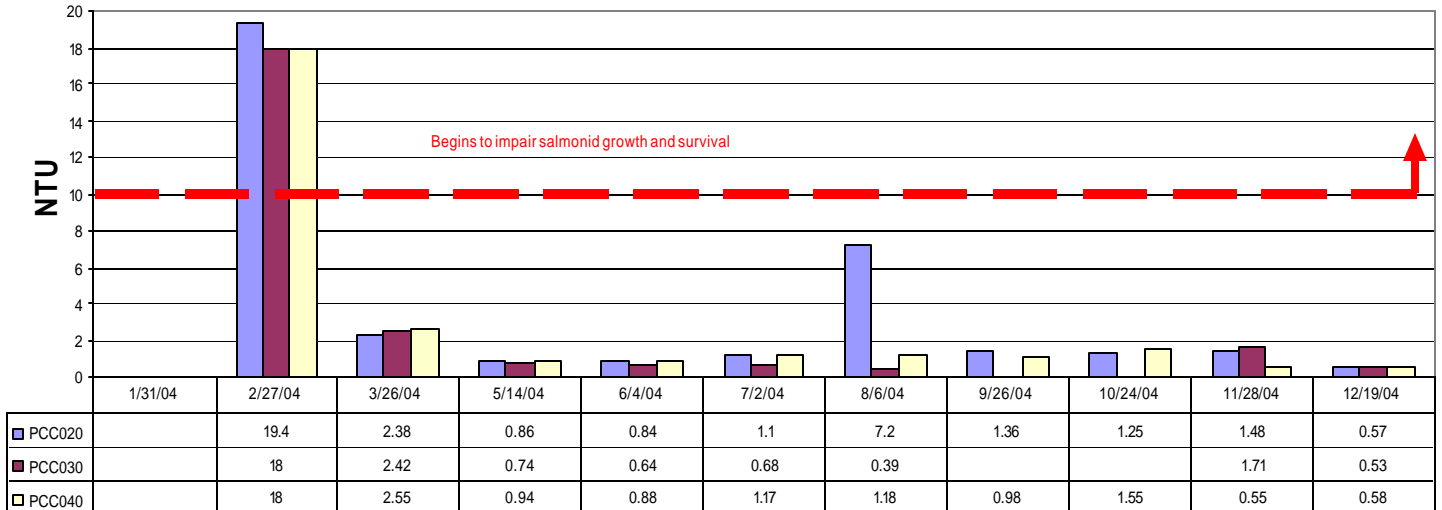
Pocket Canyon Creek	
New Site Name	Site Description
PCC020	12170 Hwy 116, downstream of Inn and the tank in the creek
PCC030	11900 Hwy 116, backyard
PCC040	50 feet upstream from bridge along Hwy 116 at May's Canyon Rd.

Pocket Creek is a cold water tributary to the Russian River, running along HWY 116 west to Guerneville. It represents a single body sub-watershed where Salmonids have been sighted. Land uses include single family dwellings, mixed second growth redwood forest, and vineyards. Threats include silt from roads, development, and timber harvest, subsurface wells, and pollution from vineyards and septic systems.

Sampling Conditions:

Date	Time	Air Temp(C)	Weather
1/31/2004	1:20 PM	9	Showers
2/27/2004	11:40 AM	9.5	Partly Cloudy Recent Rain
3/26/2004	12:00 PM	12	Partly Cloudy Recent Rain
5/14/2004	12:00 PM	17	Sunny
6/4/2004	11:00 AM	15	Sunny
7/2/2004	1:40 PM	24	Sunny
8/6/2004	10:40 AM	22	Sunny
9/26/2004	3:45 PM	22	Sunny
10/24/2004	4:10 PM	13.5	Partly Cloudy
11/28/2004	5:05 PM	6	Sunny Recent Rain
12/19/2004	12:30 PM	9	Sunny

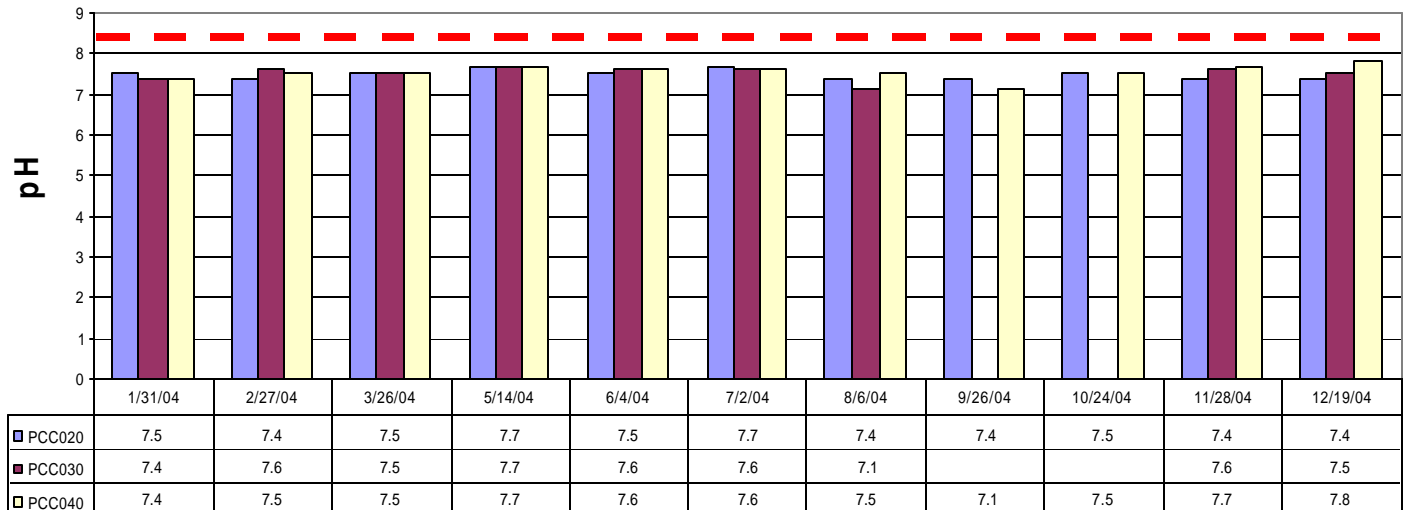
Turbidity



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 produce increased turbidity. This is the likely cause of the swell in turbidity for February in the above graph for Pocket Canyon 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.

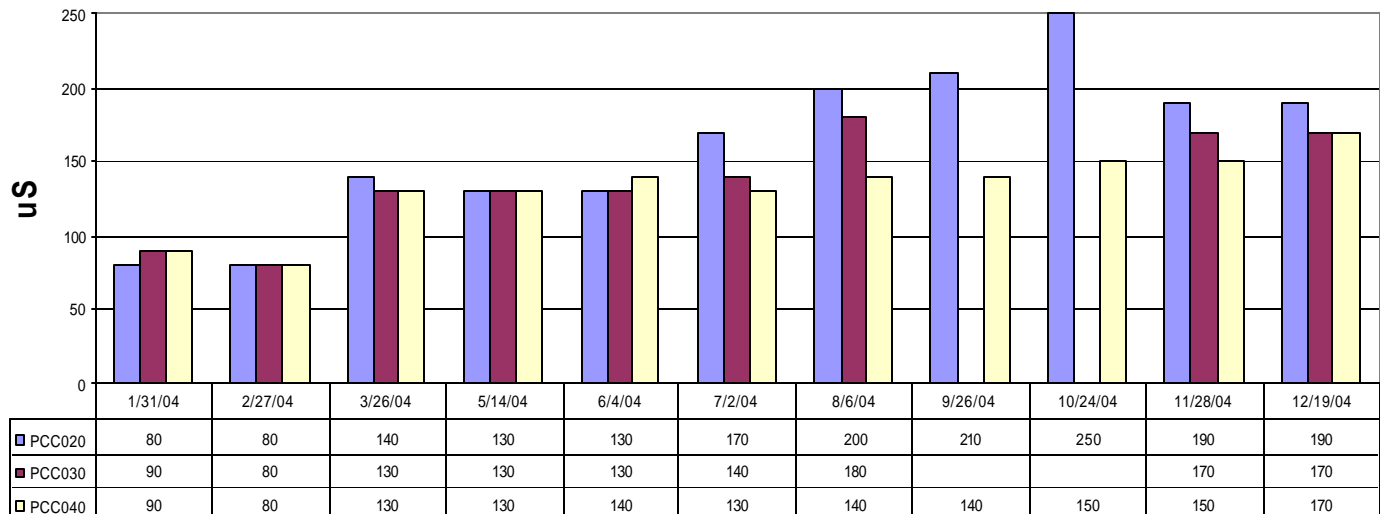
pH



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. In the winter months pH tends to be slightly higher due to increased nutrient levels as a result of runoff from winter storms. The warmer temperatures during the summer months produce lower pH levels.

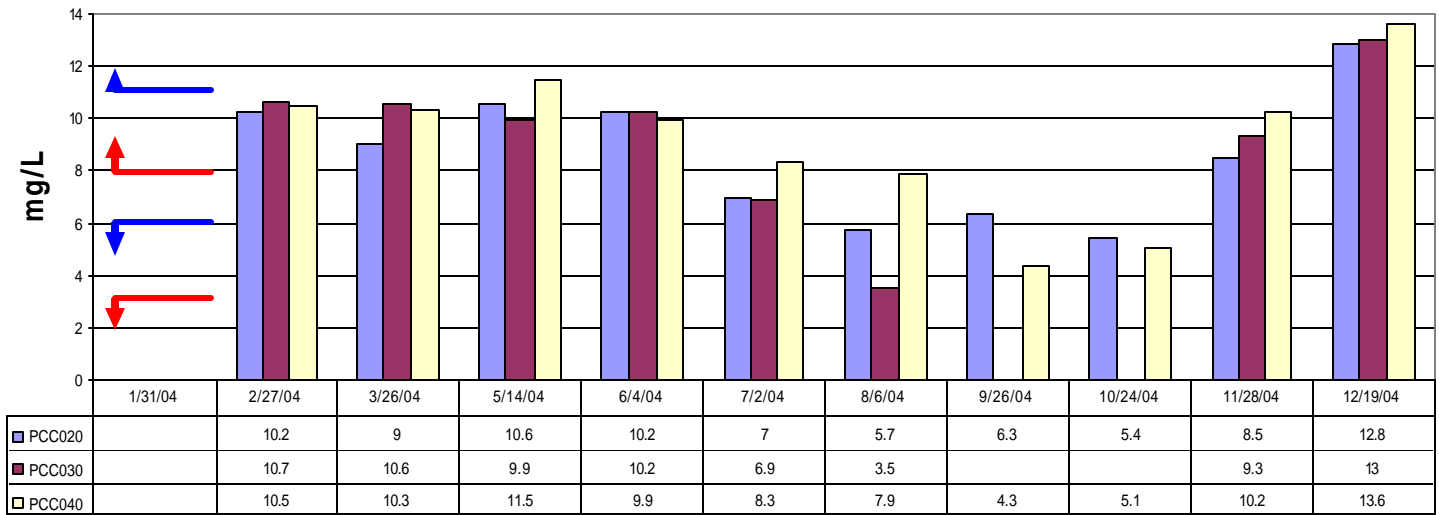
Conductivity



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 January and February, Pocket Canyon 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

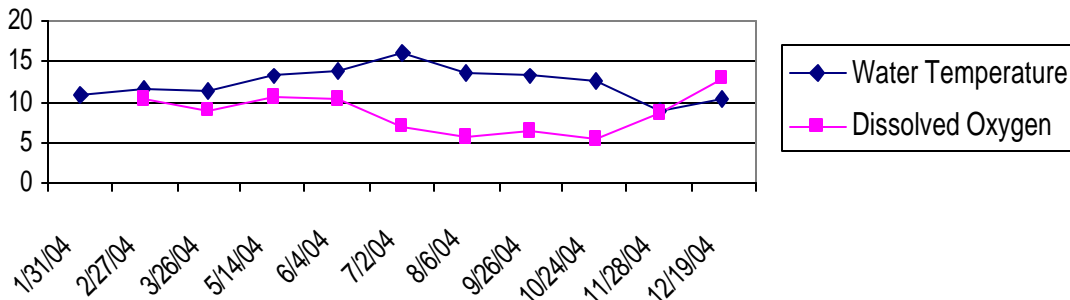


Instrument: ICM Portable Dissolved Oxygen Meter

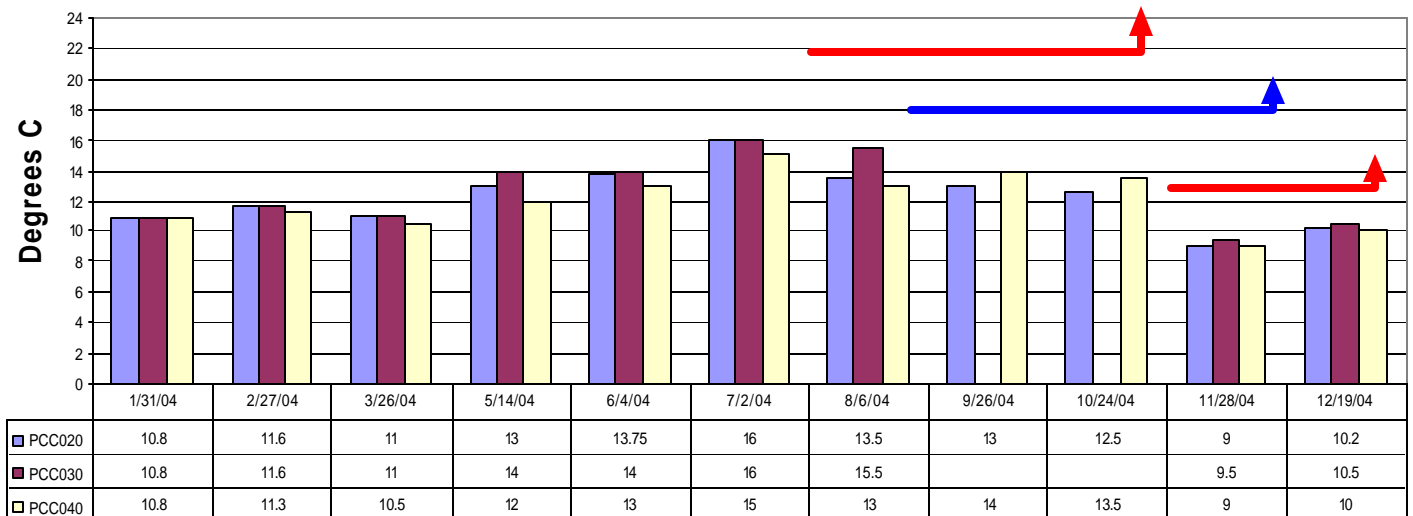
Above 11= no embryo impairment
Below 6= embryo acute mortality

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 Pocket Canyon Creek graph above. The lowest levels of dissolved oxygen are between July and October 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



Instrument: Bulb Thermometer

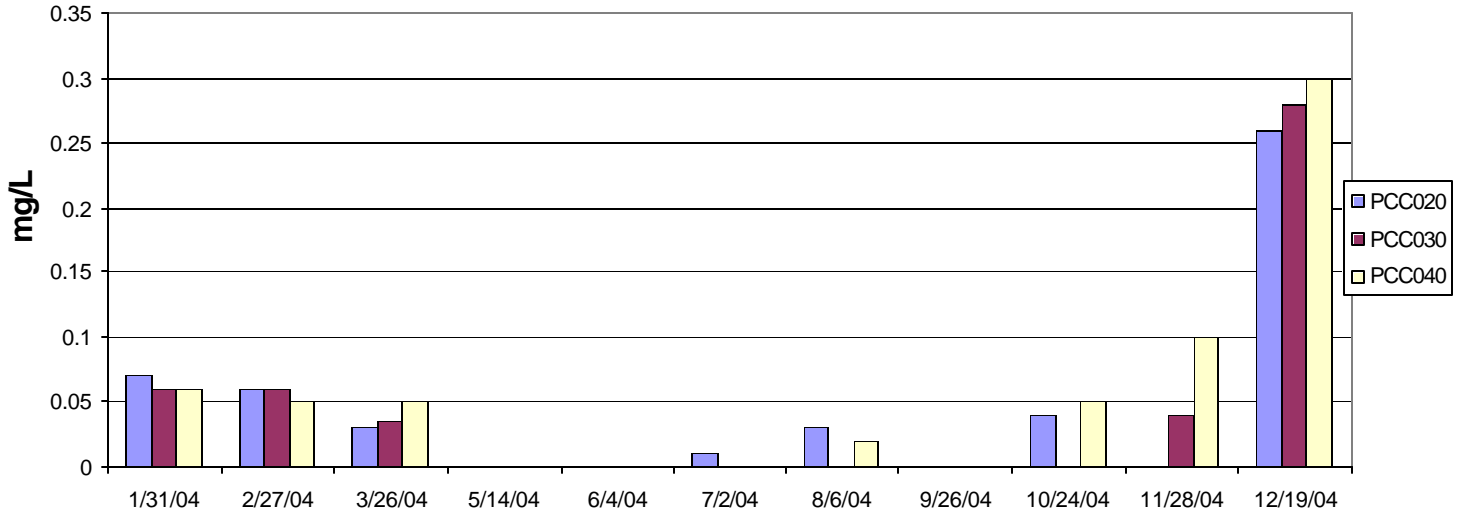
Above 22= Adult/Juvenile Mortality
 Above 18= Growth Impairment
 Above 13= Embryo Mortality

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:

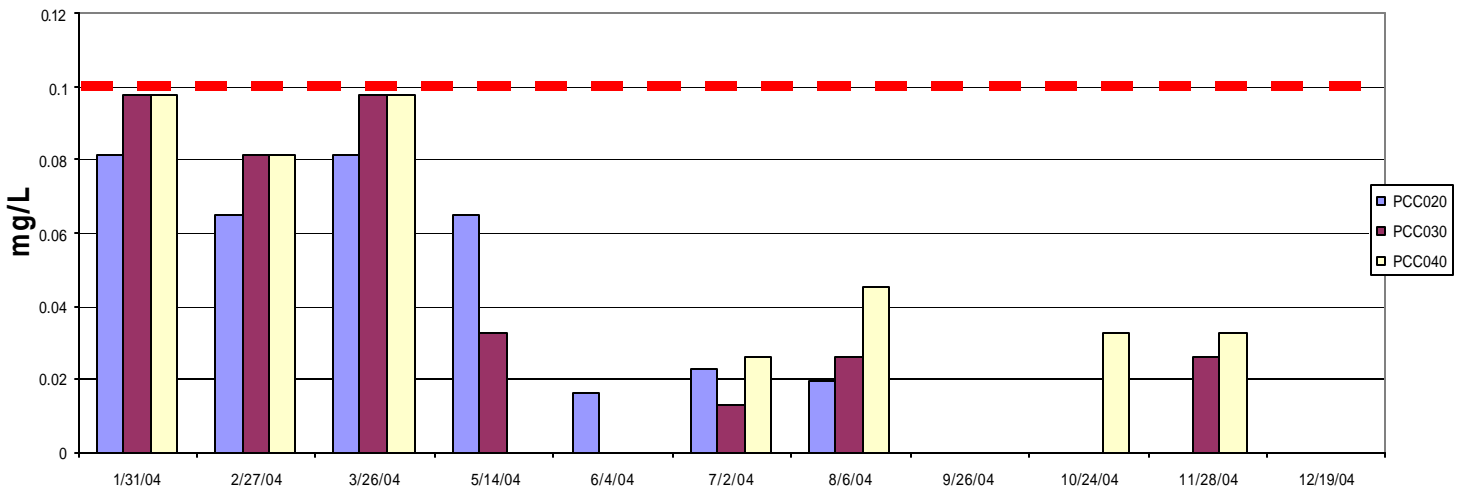
- EPA: Volunteer Stream Monitoring: A Methods Manual
- State Water Resource Control Board Fact Sheets

Nitrate-Nitrogen (NO₃-N)



Nitrogen is found in several forms as it cycles through the water column. It moves from organic matter to ammonium (NH₄), to nitrite (NO₂), and then to nitrate (NO₃) 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 may be 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-Phosphorus (PO₄-P)



Phosphate (PO₄) 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.