Dutch Bill Creek Water Quality Report 2004

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Thank you for your interest in the health of your watershed!

The data in this report was collected by: Tom Austin and CCWI staff as part of Community Clean Water Institute's Citizen Monitoring Program. For more information, contact Community Clean Water Institute at (707) 824-4370, or info@ccwi.org.

About Citizen Monitoring:

Citizen monitoring is monitoring of the environment by community volunteers interested in watershed protection. By monitoring local creeks and rivers, citizen monitors learn about their watershed, help pinpoint pollution sources, and identify widespread problems. The data can provide the information needed to develop restoration projects or pollution prevention measures.

Community Clean Water Institute (CCWI) is dedicated to promoting and protecting clean water and public health by identifying water pollution, advocating for sound water policies, and providing information to the public. CCWI works with citizen groups to develop and support citizen monitoring programs.

CCWI Permissions to Use Data:

The data in this report is intended to be used for informational and educational purposes. According to CCWI's Data Permissions Policy, Watershed Groups, Regulatory Agencies, and others interested in the protection of clean water are permitted to use data collected by CCWI under the following conditions:
1) All public use of data must be accompanied by the words, "This data was collected by Community Clean Water Institute. For more information, check www.ccwi.org."
2) Data may not be used for the purpose of litigation or lawsuits.

Site Descriptions:

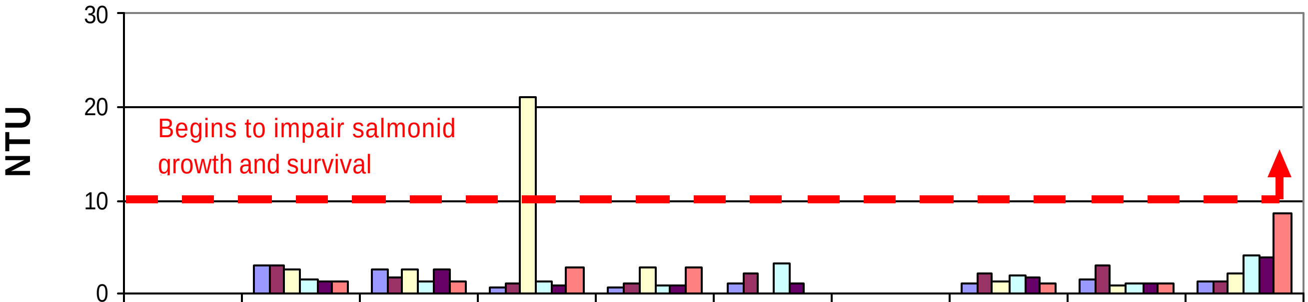
Dutch Bill Creek Watershed		
New Site Name	GPS	Site Description
DBC010	N 38°26.747" W 122°58.842"	Fish ladder
DBC020	N 38°26.309" W 122°58.517"	Westminister, downstream from Bohemian Ranch
DBC030	N 38°25.489" W122°57.504"	Camp Meeker damn
LAN010	N 38°25.293" W 122°57.154"	Lancel Creek
DBC050	N 38°24.887" W 122°57.064"	75 yards downstream from pump station
DBC060	N 38°24.645" W122°56.919"	Graton Rd. and Main St., at bridge

DBC060: East side of bridge near Graton Rd. and Main Street. Mid gradient step pool habitat, dry in summer. Downstream of wastewater discharge point.
DBC050: 75 yards downstream from pump station off the Old Rd. Bedrock and boulder formed scour pool.
LAN010: Lancel Creek– west side of culvert over old road. Large channel confluence/scour pool produced by culvert under road.
DBC030: Upstream, west corner of Camp Meeker Dam. Low gradient glide/riffle with no canopy cover. Dries up in summer.
DBC020: On Westminster Woods property at a recently placed root wad enhancement on the east bank several feet downstream of Grub Creek confluence. Run area with mild mid-channel scour.
DBC010: Fish ladder west of Bohemian Highway. Narrowly confined pool with overhanging cement within an area of high gradient natural and man-made step pools.

Sampling Conditions:

Date	Time	Air Temp(C)	Weather
1/30/2004	1:35 PM	9.5	Sunny Recent Rain
3/20/2004	12:00 PM	21	Sunny
5/9/2004	11:45 AM	22	Sunny
6/19/2004	6:20 PM	16	Sunny
7/17/2004	5:00 PM	20	Sunny
8/29/2004	5:35 PM	No Data	Sunny
9/26/2004	12:40 PM	19	No Data
10/24/2004	2:30 PM	14	Cloudy Recent Rain
11/21/2004	3:55 PM	7.5	Sunny
12/19/2004	1:50 PM	9.5	Sunny

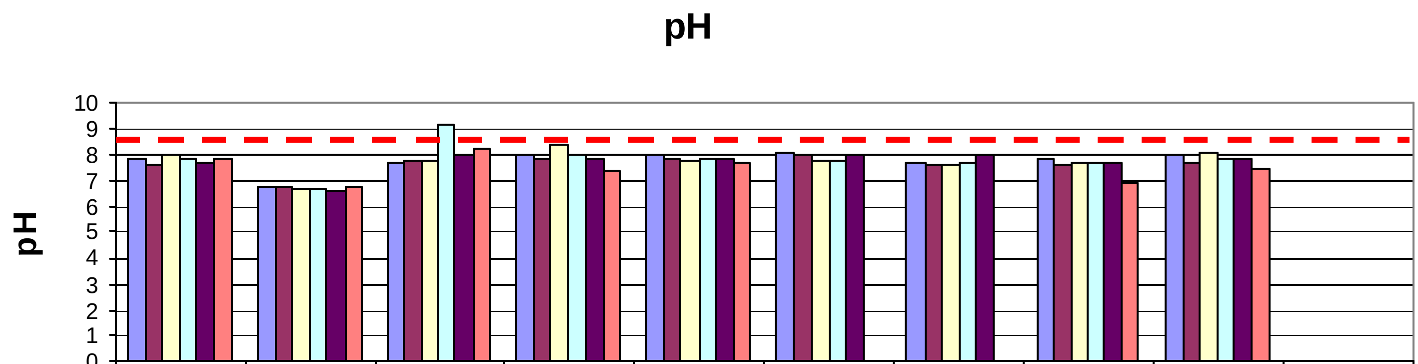
Turbidity



	1/30/2004	3/20/2004	5/9/2004	6/19/2004	7/17/2004	8/29/2004	9/26/2004	10/24/2004	11/21/2004	12/19/2004
DBC010		2.84	2.39	0.6	0.58	0.94		0.87	1.44	1.09
DBC020		2.82	1.75	0.85	1.05	2.17		2.13	2.92	1.23
DBC030		2.45	2.43	21.06	2.73			1.15	0.7	2.23
LAN010		1.44	1.14	1.16	0.8	3.15		1.95	0.99	4.02
DBC050		1.15	2.52	0.74	0.75	1.08		1.67	0.97	3.9
DBC060		1.2	1.1	2.66	2.65			1.08	0.93	8.42

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. 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.

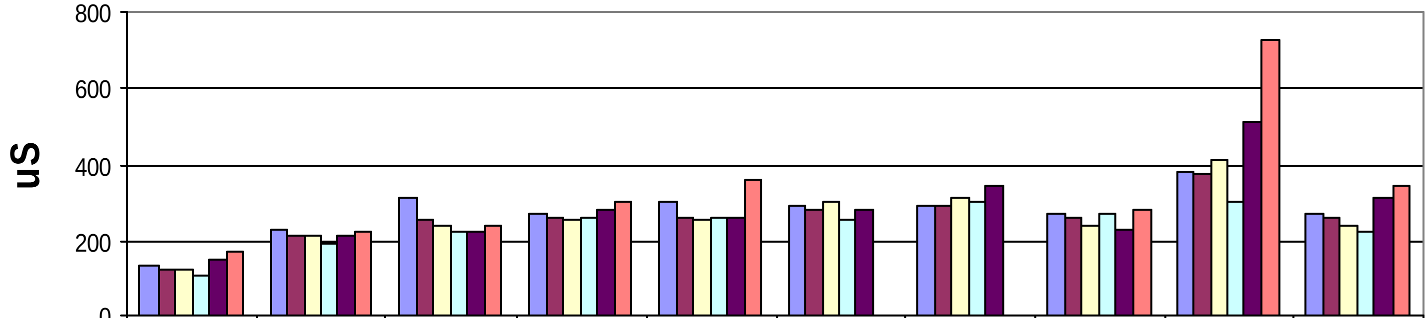


	1/30/2004	3/20/2004	5/9/2004	6/19/2004	7/17/2004	8/29/2004	9/26/2004	10/24/2004	11/21/2004	12/19/2004
DBC010	7.9	6.75	7.7	8	8	8.1	7.7	7.9	8	
DBC020	7.6	6.75	7.8	7.9	7.9	8	7.6	7.6	7.7	
DBC030	8	6.7	7.8	8.4	7.8	7.8	7.6	7.7	8.1	
LAN010	7.9	6.7	9.1	8	7.9	7.8	7.7	7.7	7.9	
DBC050	7.7	6.6	8	7.9	7.9	8	8	7.7	7.9	

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

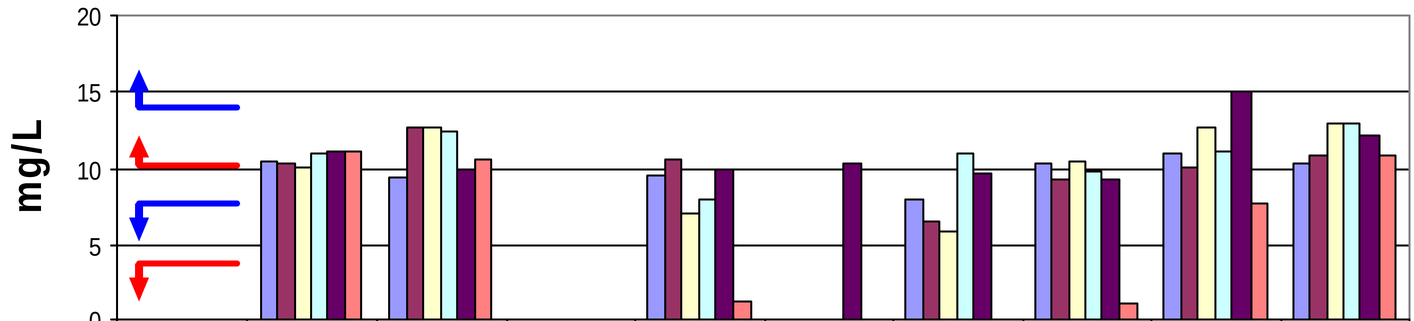


	1/30/2004	3/20/2004	5/9/2004	6/19/2004	7/17/2004	8/29/2004	9/26/2004	10/24/2004	11/21/2004	12/19/2004
DBC010	130	230	310	270	300	290	290	270	380	270
DBC020	120	210	250	260	260	280	290	260	370	260
DBC030	120	210	240	250	250	300	310	240	410	240
LAN010	110	190	220	260	260	250	300	270	300	220
DBC050	150	210	220	280	260	280	340	230	510	310
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]

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, Dutch Bill 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

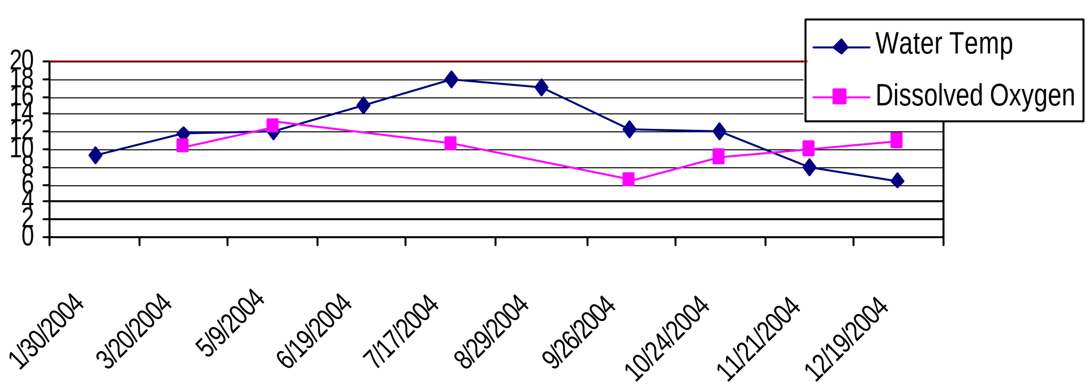


	1/30/2004	3/20/2004	5/9/2004	6/19/2004	7/17/2004	8/29/2004	9/26/2004	10/24/2004	11/21/2004	12/19/2004
DBC010		10.4	9.3		9.4		8	10.2	11	10.3
DBC020		10.2	12.7		10.6		6.5	9.2	10.1	10.9
DBC030		10.1	12.7		7		5.8	10.4	12.6	12.9
LAN010		11	12.4		8		11	9.7	11.1	13
DBC050		11.2	10		10	10.3	9.6	9.1	15.1	12.2
		[illegible]	[illegible]		[illegible]			[illegible]	[illegible]	[illegible]

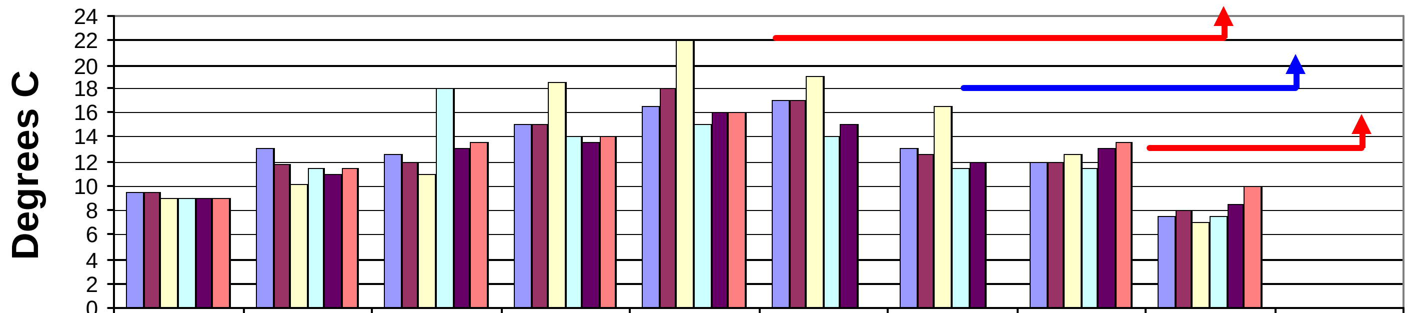
Instrument: ICM Portable Dissolved Oxygen Meter

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 Dutch Bill 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



	1/30/2004	3/20/2004	5/9/2004	6/19/2004	7/17/2004	8/29/2004	9/26/2004	10/24/2004	11/21/2004	12/19/2004
DBC010	9.5	13	12.5	15	16.5	17	13	12	7.5	
DBC020	9.5	11.8	12	15	18	17	12.5	12	8	
DBC030	9	10.2	11	18.5	22	19	16.5	12.5	7	
LAN010	9	11.5	18	14	15	14	11.5	11.5	7.5	
DBC050	9	11	13	13.5	16	15	12	13	8.5	
DBC060	9	11.5	13.5	14	16			13.5	10	

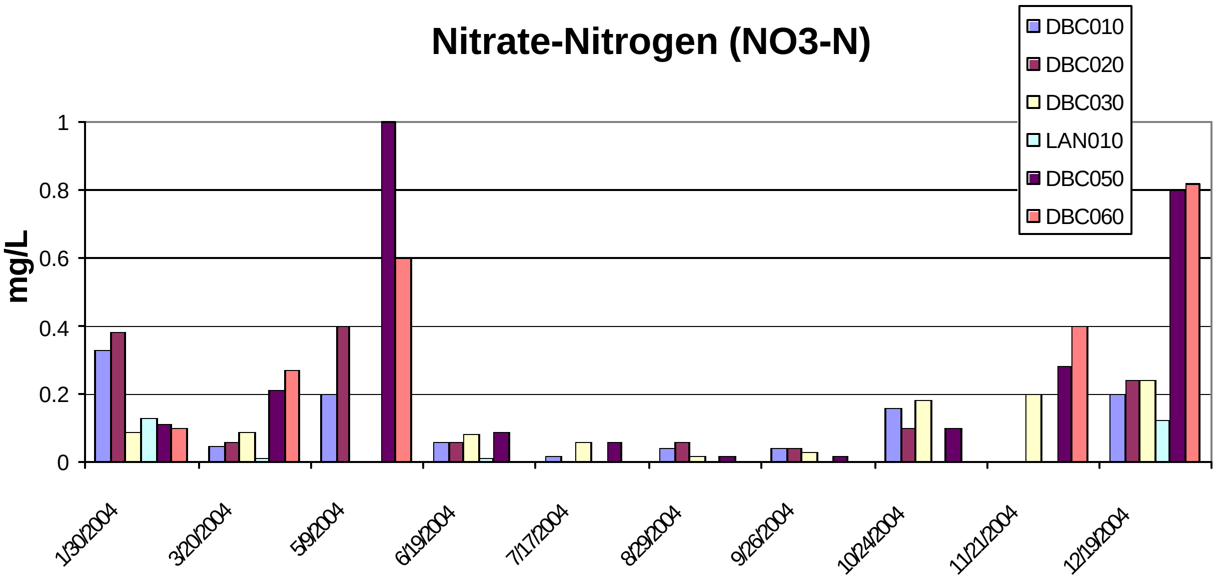
Instrument: Bulb Thermometer

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

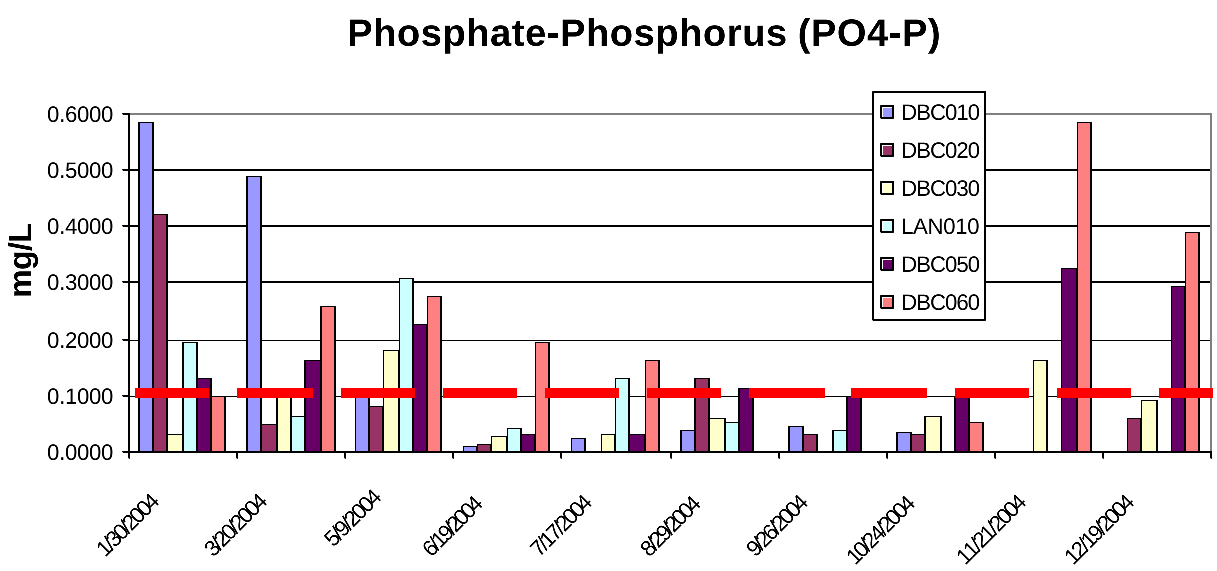
Temperature is the measure of the average kinetic energy of water molecules. Temperature changes are caused by weather, removal of shading vegetation, alterations to stream flow by dams and other barriers, storm water runoff, cooling water discharges from industries, and suspended sediment as it absorbs 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



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.