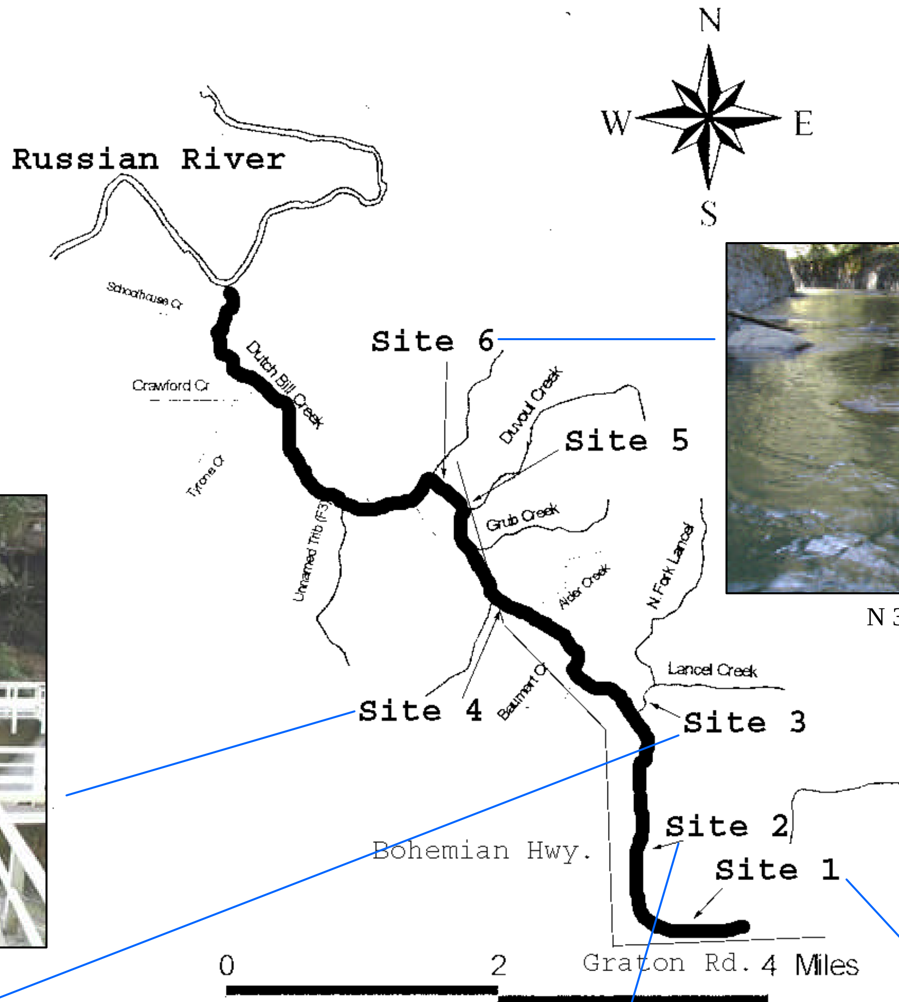
Dutchbill Creek

2002 CCWI Water Quality Results



N 38 26.309’ W 122 57.132’

N 38 25.609’
W 122 57.547’

N 38 25.372’ W 122 57.132’

N 38 24.675’ W 122 56.918’

N 38 24.887’ W 122 57.064’

DUTCH BILL CREEK DATA ANALYSIS FOR 2002

Site Descriptions : Starting from Occidental, going towards Monte Rio

Site 1: East side of bridge near Graton Rd. and Main Street. Mid gradient step pool habitat, dry in summer.

Site 2: 75 yards downstream from pump station on west side of old road. Bedrock and boulder formed scour pool.

Site 3: Lancel Creek– west side of R.R. tussle bridge over old road. Large channel confluence/scour pool produced by culvert under road.

Site 4: Upstream, west corner of Camp Meeker Dam. Low gradient glide with no canopy cover.

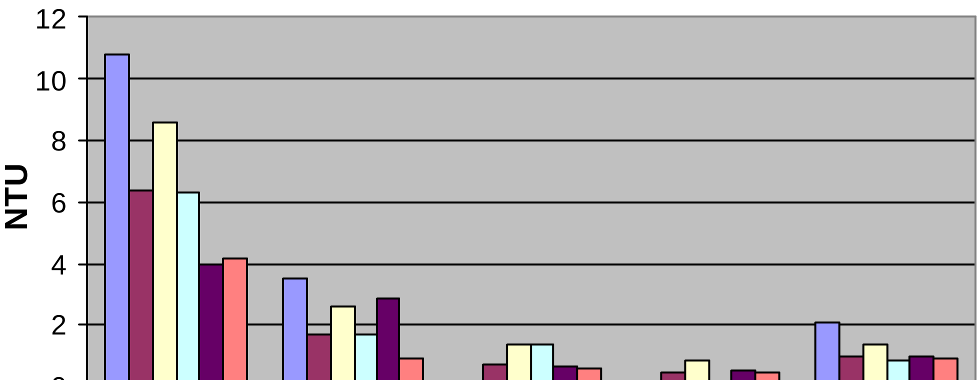
Site 5: On Westminster Woods property at a recently placed root wad enhancement on the east bank several feet downstream of Grub Creek confluence. Run area with mild mid-channel scour. (see picture)

Site 6: Fish ladder west of Bohemian Highway. Narrowly confined pool with overhanging cement within an area of high gradient natural and

Site 5: N 38 26.309' W 122 58.517'

Dutch Bill Creek is home to Steelhead and Coho Salmon.

Turbidity



	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2002
Site 1	10.8	3.56	No flow	No flow	2.07
Site 2	6.40	1.68	0.69	0.46	0.98
Site 3	8.60	2.57	1.38	0.85	1.37
Site 4	6.30	1.72	1.41	No Flow	0.81
Site 5	4.0	2.87	0.65	0.48	1
Site 6	4.2	0.86	0.57	0.42	0.91

3/26/02 preformed by Analytical Sciences of Petaluma.

4/30/02 light rain.

6/20/02 sunny, no rain for months. Site 1 not flowing.

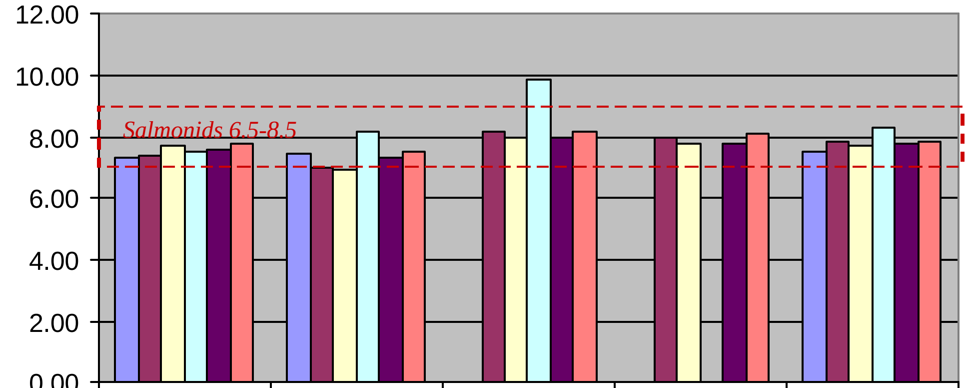
8/20/02 Sunny, no rain for months. Site 1 not flowing. Site 4 puddling, not flowing, lots of algae growth. Juvenile Salmonids spotted in larger pools of site 2, 5, 6.

12/12/02 Site 5 has flow of 1.32 ft3/s. Sunny, rain in last week.

Turbidity can loosely be described as suspended solids. Erosion caused by winter rains will spike Turbidity readings temporarily, but ambient and summer levels should remain below 10NTU's. Chronic high turbidity creates an unhealthy environment in North Coast cold water streams. Phosphates and other unwanted substances will adhere to particles in the water column. Turbid water also absorbs sunlight, warming waters. When particles settle out, they may smother salmonid embryos and macroinvertebrates. For adult and juvenile fish, gills can become clogged and decreased visibility reduces their feeding success. Soil erosion from timber harvesting, construction, agricultural clearing and poor range management can contribute to high Turbidity. Algae is also a culprit, as is natural soil erosion.

pH is the concentration of Hydrogen ions. Most life forms tolerate a narrow range of pH, usually between 6.5 and 8.5. Factors that increase pH, or make it more basic, are limestone bedrock, algae growth (as in site 4), and nutrients (ammonia is at 11 on the pH scale). Factors decreasing pH making water more acidic are redwood needles, acid rain as well as normal rain (pH 5.8), carbon dioxide from plant decomposition and respiration, sulfur fertilizers, industrial discharges, and high temperatures. Acidic water poses further risk because acids often make other substances more toxic. Here it seems that winter rain brings summer pH down a bit, and site 4 seems high, perhaps due to algal activity in the sunny, shallow stretch.

pH

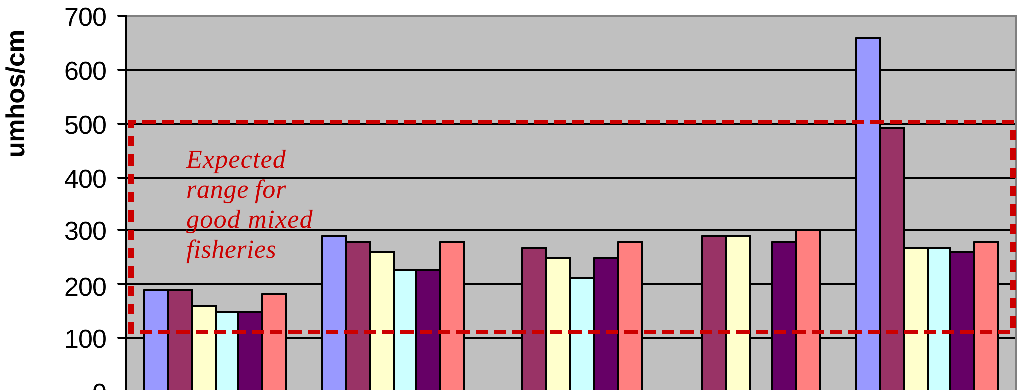


	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2002
Site 1	7.30	7.4	No Flow	No Flow	7.5
Site 2	7.34	7.0	8.2	8.0	7.9
Site 3	7.77	6.9	8.0	7.8	7.7
Site 4	7.48	8.2	9.9	No Flow	8.3
Site 5	7.52	7.3	8.0	7.8	7.8
Site 6	7.78	7.5	8.2	8.1	7.9

Instrument: Oakton double-junction pHTestr 2

Conductivity is the measure of water's ability to conduct an electrical current. Dissolved ions, or salts, conduct easily, increasing conductivity. The higher the conductivity, the faster electricity travels. It is measured in micro siemens per centimeter. Objectives vary widely for each stream, but a general guideline for good mixed fisheries is between 100 and 500umhos/cm.[3] Factors increasing conductivity are high temperatures, nutrients, clay soils, wastewater, and agricultural runoff which is high in salts. Also, in low flows and the heat of summer, evaporation causes concentration of ions. In the winter rains conductivity will fall as rain dilutes ions. Oil, phenol, alcohol, and sugars found in urban runoff will decrease conductivity as they do not carry a current well.

Conductivity



	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2002
Site 1	190	290	No Flow	No Flow	660
Site 2	190	280	270	290	490
Site 3	160	260	250	290	270
Site 4	150	230	210	No Flow	270
Site 5	150	230	250	280	260
Site 6	180	280	280	300	280

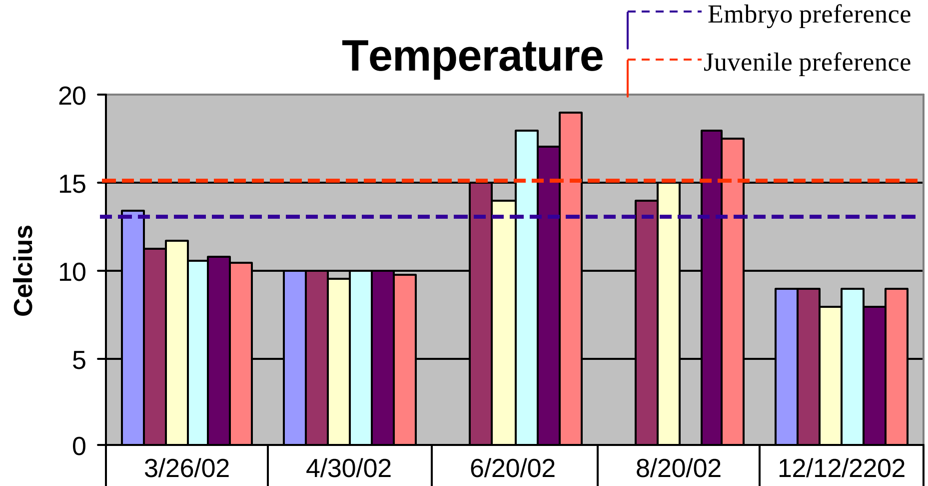
Instrument: Oakton ECTestr

12/12/02 Depths:

Site 1: 0.45 ft	Site 4: 0.55 ft
Site 2: 3.2 ft	Site 5: 1.7 ft
Site 3: 4.3 ft	Site 6: 3.8 ft

Dutch Bill Creek is a cold water stream, and supports the corresponding flora and fauna. Factors that affect temperature include canopy cover, seasonal changes, and stream velocity. Suspended solids absorb sunlight, heating the water, while groundwater seepage usually cools it. Deeper water stays cooler, as does water shaded from the sun by canopy cover. Summer brings hot sun and no replenishing rain, creating naturally higher temperatures.

Temperature is critical to Salmonid lifecycles. Temperatures up to 25 are tolerated for shorter periods of time, however chronic temperatures above the thresholds shown on the chart begin to impair fisheries production. Note that Salmonids generally spawn throughout the fall and winter, so embryonic requirements are restricted to these months.

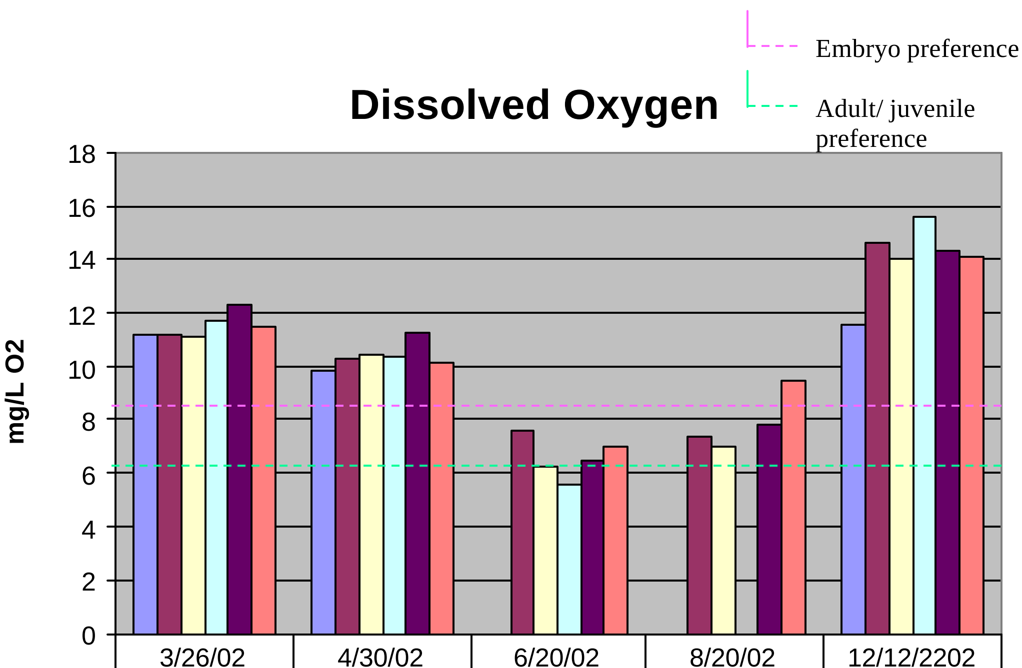


	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2202
Site 1	13.4	10	No Flow	No Flow	9
Site 2	11.2	10	15	14	9
Site 3	11.7	9.5	14	15	8
Site 4	10.6	10	18	No Flow	9
Site 5	10.8	10	17	18	8
Site 6	10.4	9.8	19	17.5	9

Instrument: Hach analog thermometer, alcohol filled

The North Coast Water Quality Control Board Objective for Dissolved Oxygen requires between 6 and 8mg/L minimum on streams like Dutch Bill Creek. Reduced oxygen supply will negatively affect nearly every organism in streams.

Dissolved Oxygen levels increase directly with temperature, and inversely with conductivity (minerals and salts), stream flow, and nutrients. Since oxygen enters water through contact with air, turbulent waters such as riffles and waterfalls, as well as high flows, will have higher oxygen contents than calm pools. Salmonids spawn in riffles where oxygen is higher, and spend time in pools later as adults.

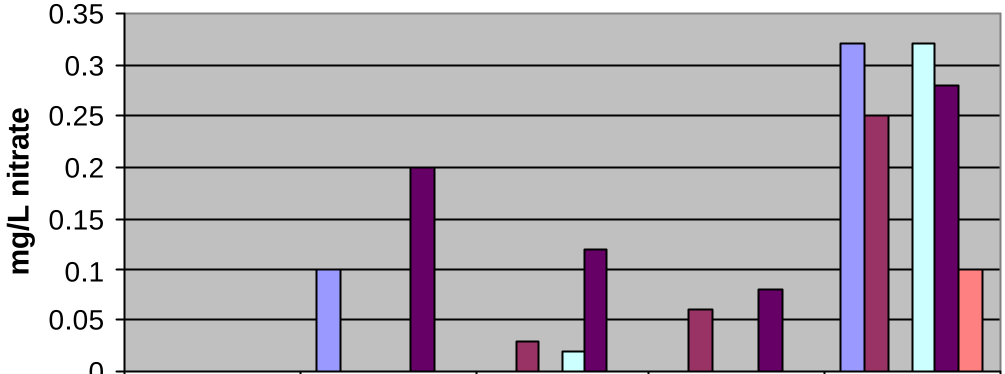


	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2202
Site 1	11.2	9.8	No Flow	No Flow	11.6
Site 2	11.2	10.3	7.6	7.4	14.6
Site 3	11.1	10.5	6.3	7	14
Site 4	11.7	10.4	5.6	No Flow	15.6
Site 5	12.3	11.3	6.5	7.8	14.3
Site 6	11.5	10.1	7	9.5	14.1

Instrument: ICM Portable Dissolved Oxygen Meter

Nitrates are typically found as less than 1mg/L in surface waters. It begins to become toxic to infants and pregnant women and cause miscarriages in animals at 10mg/L[3], the SWRCB Maximum Contaminant Level for Drinking Water. Nitrates come from soil erosion, groundwater, decaying organic matter, fertilizers, wastewater, industrial discharge, and animal waste. Eutrophication can occur at high levels, and dissolved oxygen decreases. Nitrogen cycles from ammonia nitrate (NH4) to nitrate (NO3), to nitrite (NO2). All of these forms are toxic at relatively low levels, especially ammonia and nitrite.

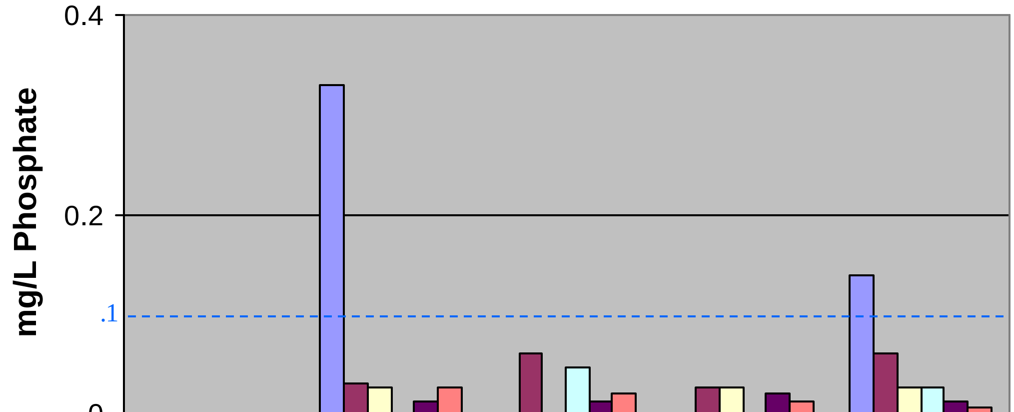
Nitrate-Nitrogen (NO3-N)



	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2002
Site 1		0.1	No Flow	No Flow	0.32
Site 2			0.03	0.06	0.25
Site 3				0	0
Site 4			0.02	No Flow	0.32
Site 5		0.2	0.12	0.08	0.28
Site 6			0	0	0.1

The USEPA recommends phosphate levels for streams of below 0.1mg/L.Phosphates enter streams through natural erosion, storm runoff, wastewater, household and industrial cleaning products, and animal waste. Organic pesticides and fertilizers also manifest as phosphate in streams. Phosphate is not very water soluble, and will cling to soil particles. Therefore, higher turbidity will increase Phosphate. This nutrient is critical to life in streams, but should be tied up in animals, plants, and soil. Not enough phosphate leads to decreased production, but too much leads to over production and eutrophication. Phosphate is only toxic at extremely high levels.

Phosphate-Phosphorous (PO4-P)



	3/26/02	4/30/02	6/20/02	8/20/02	12/12/2002
Site 1		0.33	No Flow	No Flow	0.14
Site 2		0.03	0.06	0.026	0.06
Site 3		0.026		0.026	0.026
Site 4			0.046	No Flow	0.026
Site 5		0.013	0.013	0.02	0.013
Site 6		0.026	0.02	0.013	0.007

[3] *EPA Office of Water: Volunteer Stream Monitoring: A Methods Manual*
All other information gathered from SWRCB fact sheets
**Community Clean Water Institute is not an EPA certified lab. All data subject to error.*