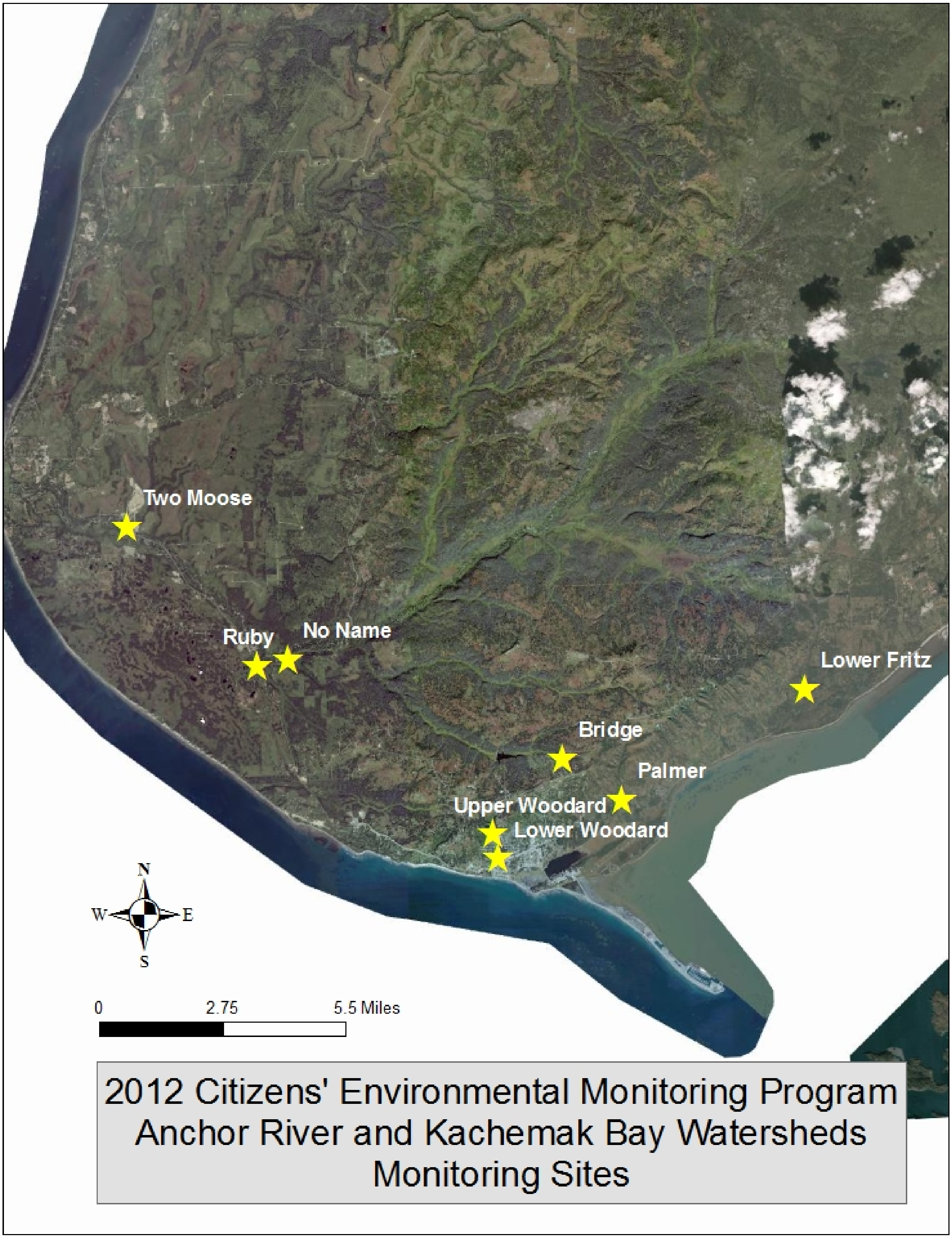
Citizens’ Environmental Monitoring Program



2012

Year In Review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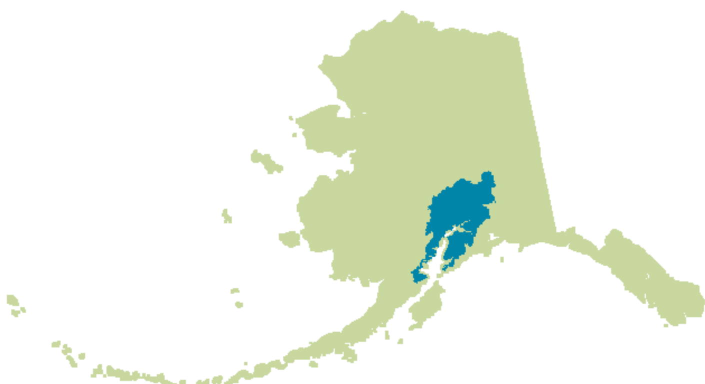
2012 Citizens' Environmental Monitoring Program
Anchor River and Kachemak Bay Watersheds
Monitoring Sites

2012 Year In Review

Table of Contents



Cook Inletkeeper is a community-based non-profit organization that combines advocacy, outreach, and science toward its mission to protect Alaska's Cook Inlet watershed and the life it sustains.

Cover Photos:

(l-r) No Name Creek is located about a mile up the North Fork Road and is a tributary to the Anchor River, Cindy Detrow and George Matz assess their catch during macroinvertebrate sampling, Splash Bash is held every July to celebrate and thank our wonderful volunteers.

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2012 In Review

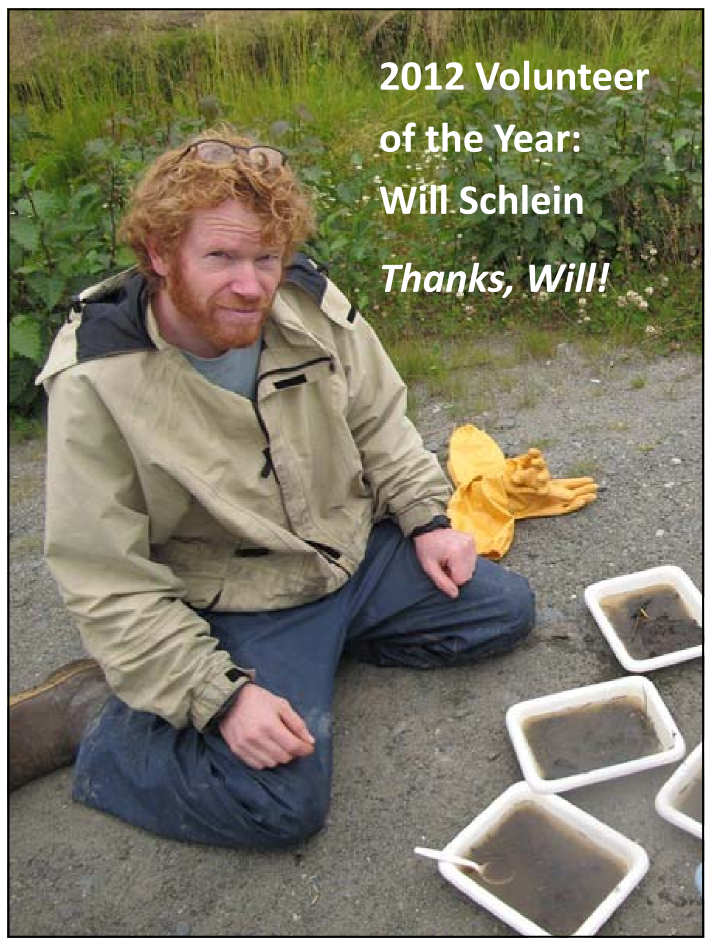
In 2012 we had another successful year of water quality monitoring in the Kachemak Bay Citizens' Environmental Monitoring Program! Volunteers collected water quality data at all of our active monitoring sites, staff and volunteers conducted the third and final year of bioassessment at six of these sites, and Inletkeeper staff released one baseline water quality report. This is the third year in a row of 100% complete datasets on our streams, and we can't stress enough how important this is for baseline data collection. This obviously could not be done without the ongoing efforts of our volunteers – a continued big thank you to all of them!

In 2012, 11 volunteers donated 225 hours of their time collecting baseline water quality data at eight sites, making a total of 121 site visits in the Homer area. All volunteers were re-certified in the early spring at the Cook Inletkeeper laboratory. Find out more about our quality assurance measures online at www.inletkeeper.org.

With the help of 15 additional volunteers we conducted the third year of sampling of aquatic invertebrates at six CEMP sites in June and again in August. We placed temperature data loggers at six CEMP sites from May through October. We put out the 2011 Year In Review and published one CEMP Baseline Water Quality Report (McNeil Creek). The weather held out and was dry again for Splash Bash in July. We had good food, and excellent music provided yet again by the local band Work In Progress.

Congratulations to Will Schlein, our 2012 CEMP Volunteers of the Year. Will was trained to be a CEMP volunteer water quality monitor in 2008 and since that time he has spent 109 hours sampling water quality at Woodard Creek in the backyard of his business, the Homer Hostel. Will has also helped out for many years with bug sampling during the summer.

Finally we also want to thank our 2012 summer interns Kelly Barber and Greg Goforth for their help over the summer!



Our Volunteers

We can't thank our volunteers enough for the work that they do. They are dedicated to collecting high quality data for the Kachemak Bay and Anchor River Citizens' Environmental Monitoring Program. Through their efforts we are reaching our goal to document baseline water quality in these watersheds. These data will help inform our conservation efforts and guide development projects to protect clean water and healthy salmon in the Kachemak Bay and Anchor River watersheds.

Left Top: Summer intern Kelly Barber learns how to filet Sockeye salmon for Splash Bash.

Left Bottom: Will Schlein was our 2012 CEMP Volunteer of the Year. He has donated over 100 hours of his time monitoring water quality on local streams since 2008.

Right: Good food and music were enjoyed during the 2012 Splash Bash at Bishop's Beach Pavilion in July.

Many thanks to our 2012 CEMP volunteers:

Bronwynn Kelly, Cynthia Detrow, Debbie Oudiz, Dexter Lowe, Diana Carbonell, Francie Roberts, Frank Vondersaar, George Matz, Holly Aderhold, Jim Brown, Jim Levine, Jenny Stroyeck, Karen West, Kevin Walker, Kim Brae, Kyra Wagner, Lee and Jenny Dewees, Maggie Bursch, Marcus York, Melisse Reichman, Nykkole Poindexter, Patty Jay, Sachiko Knisely, Scott Miller, Tala Woodward, and Will Schlein.

CEMP Reporting

Over the past decade, Cook Inletkeeper has produced annual reports that detail the water quality monitoring efforts during the past year. This *Year In Review* provides the public and interested stakeholders with an overview of CEMP monitoring efforts during 2012, including monthly water quality sampling and summer bioassessment efforts. Graphs, raw data, and quality assurance records from all of our 2012 monitoring efforts and previous annual reports are available at our website: www.inletkeeper.org.

Baseline water quality reports are released as baseline datasets are completed on a site-by-site basis. These comprehensive reports include GIS analysis for each watershed, all CEMP water quality data, a habitat assessment and photos. In 2011, Cook Inletkeeper released the first two baseline reports: Upper Beaver Creek (monitored by Neil & Kyra Wagner from 2002-2010), and Bidarka Creek (monitored by Steve Hackett, Joel Cooper, Marla McPherson, and Frank Vondersaar from 2000-2010). In 2012, Inletkeeper released the baseline report for McNeil Creek (monitored by Willy and Jenny Dunne, Abbey Kucera, and Scott Miller from 2000 – 2009).

We use the following as guidelines for defining a baseline dataset:

- Five or more years of data with at least 80 site visits
- At least 40 site visits during summer months
- At least five site visits during every month of the year
- Three years of continuous temperature monitoring (at select sites)
- Six bioassessment sampling events over at least three years (at select sites)

For more information about these guidelines, see the CEMP Effectiveness Report (2003) available online at http://www.inletkeeper.org.

Top: The baseline report for McNeil Creek was released in 2012. Middle & Bottom: The Diamond Creek watershed Baseline Report will be released in 2013.

Monitoring Water Quality

CEMP volunteers monitor the following water quality parameters: temperature, dissolved oxygen, pH, specific conductance, coliform bacteria, and turbidity. Volunteers attend a 3-day training to become certified monitors, and attend performance evaluation sessions every year to maintain their certification. Data collected through CEMP are stored in a Microsoft Access database, and Cook Inletkeeper's Outreach & Monitoring Coordinator manages the data. A full description of CEMP methods, our Quality Assurance Project Plan (QAPP), and our quality assurance documents can all be found on Cook Inletkeeper's website: www.inletkeeper.org. As part of our assessment we compare our data to the Alaska Department of Environmental Conservation's water quality standards (see the table below). Each CEMP site is held to the water quality standards for its designated use. These uses are included in the CEMP site table on the next page.

Department of Environmental Conservation Alaska Statewide Water Quality Standards 18 AAC 70					
Designated Use	**Water Temperature**	**Dissolved Oxygen**	**pH**	**Fecal Coliform Bacteria (FC)**	**Turbidity**
Water Supply: drinking, culinary, and food processing	May not exceed 15C	Dissolved Oxygen (DO) must be > or = 4.0 mg/l	May not be < 6.0 or > 8.5	In a 30-day period, the geometric mean may not exceed 20 FC/100ml, and not more than 10% of the samples may exceed 40 FC/100ml	Not to exceed 5 NTU above natural conditions when the turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when natural turbidity is more than 50 NTU, not to exceed a maximum increase of 25 NTU
Water Supply: Growth and propagation of fish, shellfish, aquatic life, and wildlife	May not exceed 20C. May not exceed where applicable: Fish migration routes: 15C Fish spawning areas: 13C Fish rearing areas: 15C Egg & fry incubation: 13C	DO must be > or = 7.0 mg/l. For waters not used by anadromous or resident fish, DO must be > or = 5.0 mg/l. The concentration of DO may not exceed 110% of saturation in any samples collected.	May not be < 6.5 or > 8.5. May not vary more than 0.5 pH units from natural conditions.	Not applicable	Not to exceed 25 NTU above natural conditions
Water recreation: contact recreation (freshwater)	May not exceed 30C	DO must be > or = 4.0 mg/l	May not be < 6.5 or > 8.5	In a 30-day period, the geometric mean may not exceed 100 FC/100ml, and not more than one sample, or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100ml	Not to exceed 5 NTU above natural conditions when the turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when natural turbidity is more than 50 NTU, not to exceed a maximum increase of 15 NTU

CEMP Monitoring in 2012

CEMP volunteers conducted baseline water quality monitoring at eight sites in 2012. Four sites were located in the Anchor River watershed and four in the Kachemak Bay watershed (see map on the back of the front cover). The table below shows each site, the year it was first monitored, the total number of site visits to-date, the number of site visits from 2012, and its designated uses.

Cook Inletkeeper volunteers monitor local streams 16 times per year, once a month in the winter (September through April) and twice a month in the summer (May through August). Our annual minimum requirement is 75% completed site visits (at least 12) per site for baseline data collection. In 2012, for the third year in a row, all sites met the criteria for a full dataset! CEMP monitors each site for water temperature, air temperature, dissolved oxygen, pH, conductivity, turbidity, and bacteria. Photographs are taken quarterly at all sites.

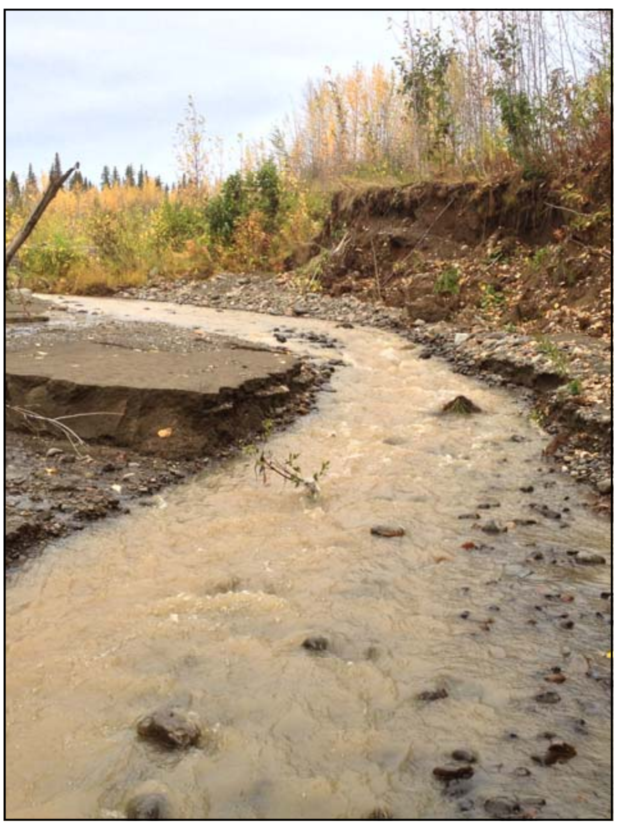
For the purposes of displaying data from 2012, sites are grouped into geographically similar locations. These groups, used throughout this report, are: Anchor River Sites (Two Moose Creek, Ruby Creek, No Name Creek, and Bridge Creek), Town Sites (Upper and Lower Woodard Creek and Palmer Creek), and Lower Fritz Creek.

2012 CEMP Sites

Creek Sites	Year Began	2012 Monitors	Total Site Visits	2012 Site Visits	Designated Use
Two Moose	2002	Marcus York	86	14	Growth & propagation of fish
Ruby	1997	Jenny Stroyeck/Diana Carbonell	117	16	Growth & propagation of fish
No Name	2002	Jim Levine	113	16	Growth & propagation of fish
Bridge	1997	Jim Brown, Lee & Jenny Dewees	102	14	Water supply
Upper Woodard	1998	Frank Vondersaar, Diana Carbonell, Jim Brown	114	14	Water recreation
Lower Woodard	1998	Will Schlein, Holly Aderhold	149	15	Water recreation
Palmer	2005	Karen West	106	16	Water recreation
Lower Fritz	2009	Scott Miller	59	16	Growth & propagation of fish

2012 Water Quality Summary

Our water quality sampling indicated no persistent effects of pollution in most CEMP streams during 2012. Summer temperatures in Two Moose Creek, an anadromous tributary to the Anchor River, continued to be higher than the state standards for fish migration, spawning, egg incubation and fry rearing. Temperature data from 2012 indicated 48 days where these state standards were violated at Two Moose Creek. We will continue to place temperature data loggers in this stream for the next several years to better assess the status and potential needs for restoration or watershed action. Unlike 2011, we saw no preliminary exceedences of *E. coli* bacteria in any streams in 2012; generally we see some high spikes in bacteria levels, especially during spring break-up. The big story for CEMP monitoring in 2012 focused on habitat destruction and high turbidity at Two Moose Creek. See page 10 for a summary of the events at that site and Cook Inletkeeper's ongoing response through 2012.



(Top) Volunteer Frank Vondersaar and summer intern Greg Goforth examine aquatic insects during the lab training for summer macroinvertebrate sampling. (Bottom) Heavy winter rains flooded many sites. This photo is looking across the North Fork Road at No Name Creek, which flooded over the road in December. (Left) A gravel pit in Anchor Point released warm and turbid water into Two Moose Creek (a salmon stream that is a tributary to the Anchor River) all summer and fall. See page 10 for more information on Cook Inletkeeper's response.

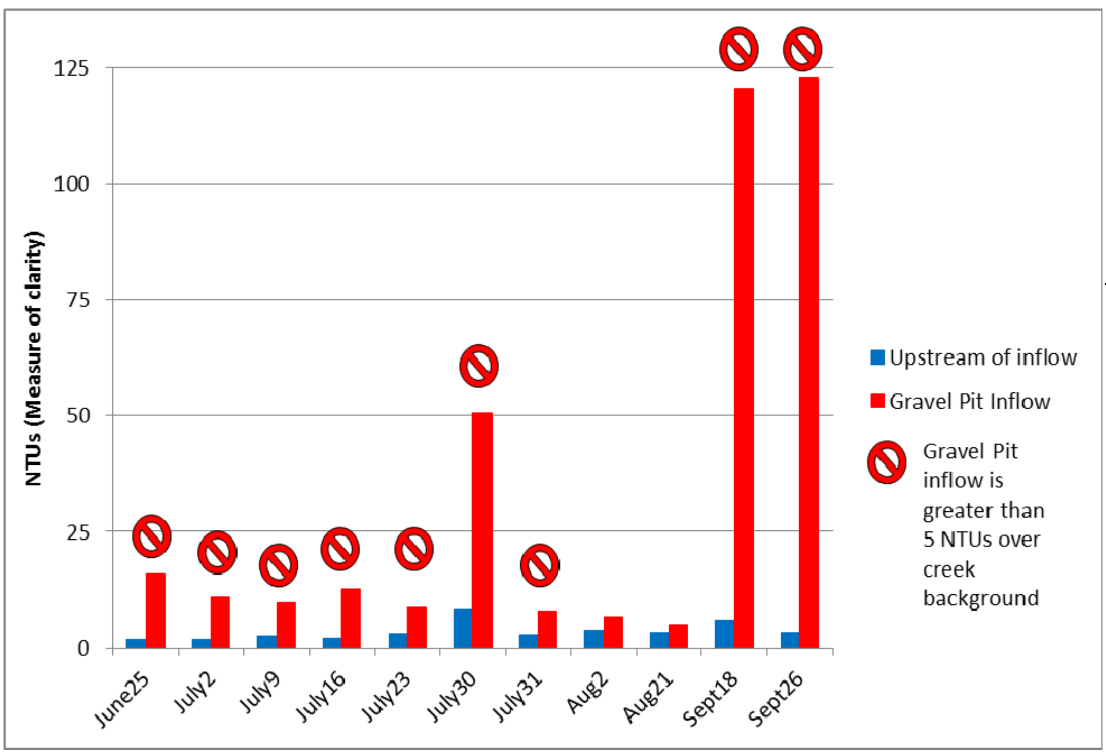
Two Moose Creek in 2012

Two Moose Creek is a tributary to the Anchor River. It runs year-round, and is a stream where King salmon, Silver salmon, Dolly Varden, and Steelhead are known to spawn and rear. Cook Inletkeeper has monitored water quality at Two Moose Creek since 2002 above the culvert which runs under the Sterling Highway (just after milepost 160, on the north side of the Sterling Hwy).

On April 30, 2012, one of our Citizens' Environmental Monitoring Program volunteers was taking water quality samples at this site. He came back to the lab with some concerns about the slope above the creek culvert, and the surrounding riparian area. In the fall of 2011 we noticed that cutting was done along the banks of the highway, which are quite steep through this small valley. During April 2012 more cutting had occurred and logs from that job fell into and over the culvert, restricting the flow of Two Moose Creek into the Anchor River.

At the same time, trouble was brewing upstream. A dam that was built to hold back water from a large gravel pit broke sometime between April 30th and May 14th. This breach sent a huge amount of sediment and water downstream all at once. The trees just below the inflow point lost their bark on the upstream side, and all the trees were debris-filled over six feet high. Both sides of Two Moose Creek are now covered in two to three feet of sand and mud. The steep banks along the left side of the creek were scoured and continue to slough off into Two Moose, sending more sand and gravel into the creek bed.

Cook Inletkeeper staff and interns began monitoring Two Moose Creek weekly for turbidity. We set up four sampling locations: 1) our regular CEMP site just above the culvert, 2) approximately 15 feet up the gravel pit inflow stream, 3) Two Moose Creek approximately 30 feet upstream of the gravel pit inflow, and 4) downstream approximately 50 feet



Results from turbidity sampling at Two Moose Creek. The blue bars indicate turbidity levels above the gravel pit inflow. The red bars show the measured turbidity levels entering Two Moose Creek from the gravel pit. As seen in the graph, throughout the summer of 2012 the gravel pit inflow consistently exceeded the turbidity of Two Moose Creek by over 5 NTUs.

where the inflow waters and the background creek waters were fully mixed.

Turbidity is a measure of water clarity, and gives you an idea of the amount of sand and other fine materials suspended in water. As these sand particles travel, they fall out onto the creek bed, filling in spaces between rocks where fish food – aquatic insects – live. High turbidity has also been linked to stressing spawning adult salmon, growing juvenile salmon, and the overall reproductive health of salmon.

As seen in the chart on the facing page, the gravel pit inflow (red bars) contributes water significantly more turbid than Two Moose Creek (the blue bars). The state of Alaska's water quality standard is exceeded when the discharge is more than 5 NTUs (Nephalometric Turbidity Units, the units we use to measure turbidity) above the background. Since sampling began on June 25th, the gravel pit discharge has exceeded state water quality standards during the majority of our visits. During the middle and end of September, inflow exceeded background turbidity by over 100 NTUs.

Cook Inletkeeper has attempted to engage the Alaska Dept. of Environmental Conservation (Division of Water), the Alaska Department of Fish & Game (Div. of Habitat), the U.S. Environmental Protection Agency, the Kenai Peninsula Borough Borough and state legislators on the ongoing degradation of a King salmon stream on the Lower Peninsula. As of November 2012, we have seen no enforcement action and no efforts to remediate the ongoing water quality standard violations. However sedimentation of the creek is continuing, and the riparian zone around this creek is heavily degraded and unstable. Communication with regulators and monitoring of the situation at Two Moose Creek will continue in 2013.

(Top) Turbid water flowing into Two Moose Creek from an upstream gravel pit on May 21, 2012.This discharge continued through sampling in the fall. (Bottom) The breach of a retainment dam from an upstream gravel pit released a huge amount of water and fine sediment down Two Moose Creek in the spring of 2012. This picture shows the resulting riparian damage, with over 2' of sediment deposited along the banks of this salmon stream.

2012: Water Temperature

During CEMP site visits, monitors record water and air temperatures using alcohol-filled thermometers. Continuous measurements are also taken using data loggers at selected CEMP sites. Both results are presented in this section. Fish and other aquatic organisms are adapted to living within a certain temperature range. Changes in riparian (or streamside) vegetation, groundwater inputs, weather, and climate patterns can all affect water temperatures.

Average air temperature across all sites was 45°F, with a maximum of 70°F at Bridge Creek in July and a minimum of 1°F at No Name and Bridge Creeks in January. The average water temperature across all sites was 5.9°C, with a maximum temperature of 14.5°C at Two Moose Creek in August and a measured minimum of 0°C at all sites with open water sampled throughout the winter. According to the alcohol thermometers, water quality standards for fish spawning (>13°C) were violated twice in our anadromous streams; both exceedences occurred at Two Moose Creek. In 2011 there also were two exceedences of water quality standards for spawning in Two Moose Creek, as measured by volunteers using the same methods.

Water temperatures rose in late-May and early-June, and stayed fairly warm (8.5°C – 14.5°C) through August. Temperatures began to fall by September, and reached lows quickly in October.

We placed continuous temperature data loggers in five CEMP streams in 2012: Two Moose Creek, Ruby Creek, No Name Creek, Lower Fritz Creek, and Beaver Creek. These loggers recorded temperature every 15 minutes from mid-May through mid-October (when they were removed). The figures on the facing page show the maximum daily temperatures at each site for 2010, 2011, and 2012, except for Beaver Creek. The baseline dataset for this site was closed in 2010, and future monitoring recommendations from the Beaver Creek baseline report included resumption of continuous temperature monitoring at this headwater site in 2011.

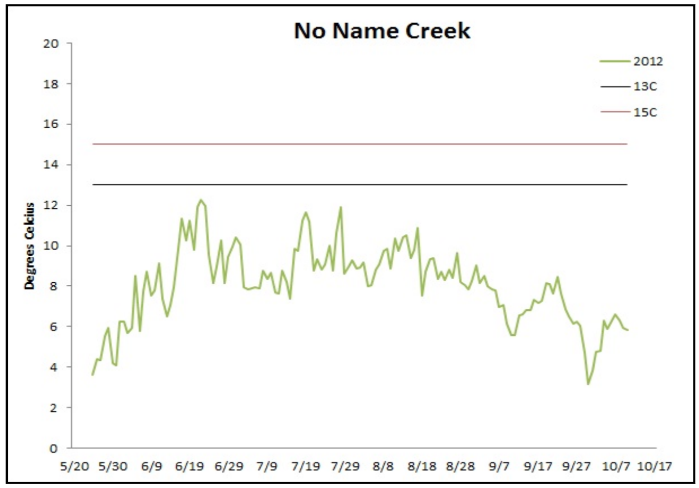
During 2012, daily maximum temperatures measured by data loggers exceeded water quality standards for fish spawning (>13°C) on 48 days at Two Moose Creek. Standards for fish migration (>15°C) were violated 20 times at Two Moose Creek. Two Moose saw 6 to 12 day stretches in June, July and

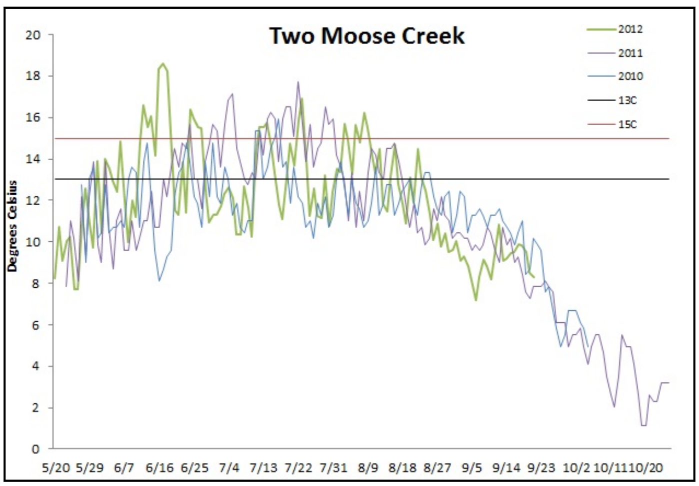
(**Continued on the next page)**

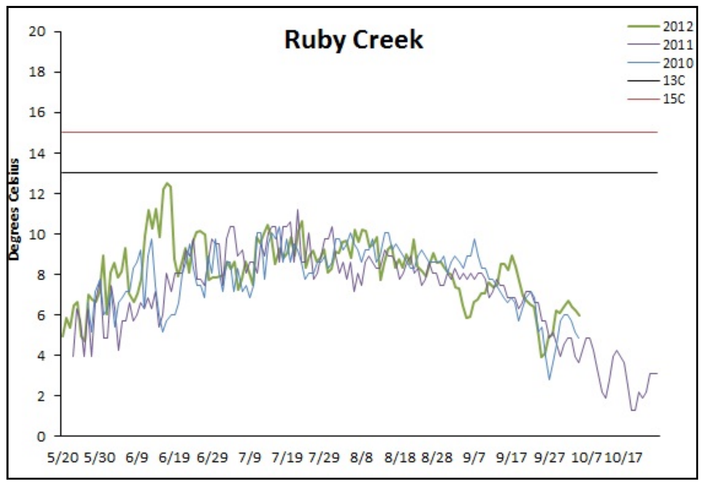
(Top) An in-stream temperature data logger housing at Beaver Creek. (Bottom) Inletkeeper staff Rachel Lord installs a data logger at Fritz Creek.

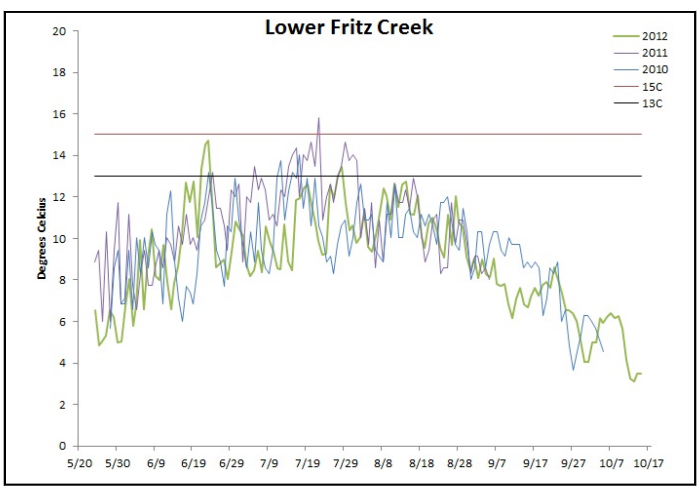
Water Temperature (Continued)

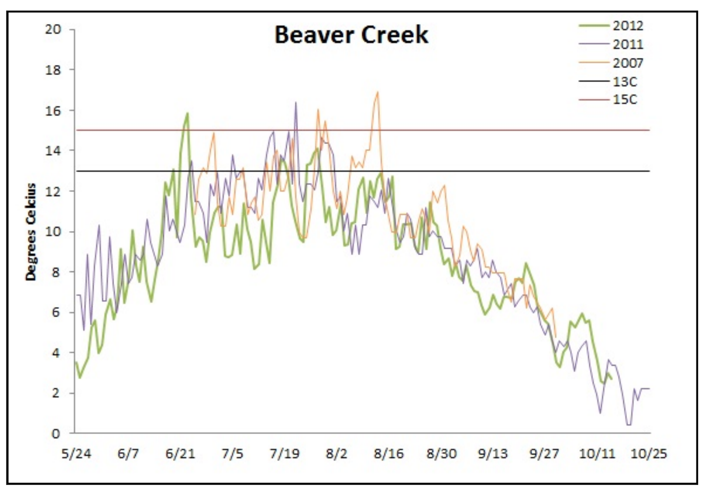
August where daily maximum temperatures rose above water quality standards every day. Water quality standards for fish spawning (>13°C) were violated 10 times at Beaver Creek in 2012 (13 times in 2011), and there were two violations of the standard for fish migration (>15°C) that occurred in late-June (1 violation in 2011). In 2012 there were five days during which water temperatures exceeded 13°C at Lower Fritz Creek, which is fewer than the 15 days in 2011. No exceedences were seen at Ruby Creek. Hand-held thermometers continue to dramatically underestimate the number of violations of state water quality standards for temperature at CEMP sites. Inletkeeper will continue to place temperature loggers at priority streams to better understand the impacts of temperature on aquatic communities.











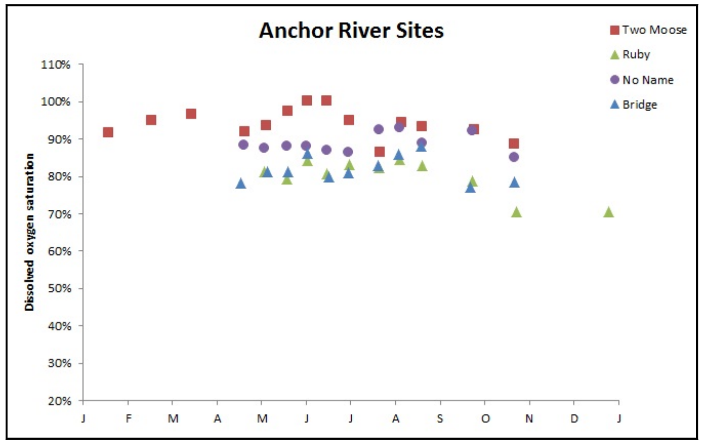
Maximum daily water temperatures, recorded by continuous data loggers, in five CEMP streams from May through October. Streams that have anadromous fish also show the state water quality standards for temperature in black (13 ℃) and in red (15 ℃) . Note the Lower Fritz Creek CEMP site is located above the area where salmon are listed by the Alaska Department of Fish and Game.

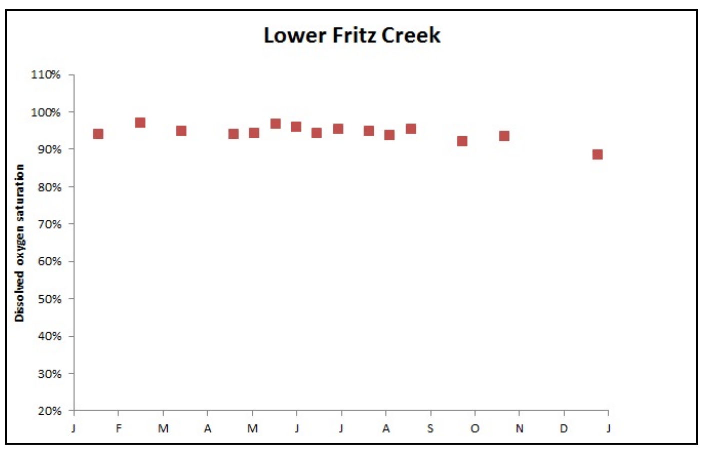
2012: Dissolved Oxygen

CEMP monitors the levels of dissolved oxygen (DO) in our streams. Oxygen is needed by fish and other aquatic organisms to live. We measure DO using a chemical titration, and express it as a concentration of milligrams of oxygen per liter of water. The amount of oxygen that can be dissolved in water is temperature dependent; colder water can hold more oxygen. Therefore we also look at how saturated the water is with oxygen, that is – how much oxygen does it hold compared to what it could hold at that temperature. Saturation is expressed as a percent.

Changes in dissolved oxygen can be caused by turbulence and interactions with the air (like in a waterfall), decaying plant matter, sewage, and effluent wastewater inputs. High levels of photosynthesis and increased mixing with the air through riffles and small waterfalls could increase saturation levels above 100%, creating a condition of supersaturation. There were no instances of supersaturation recorded during CEMP sampling in 2012.

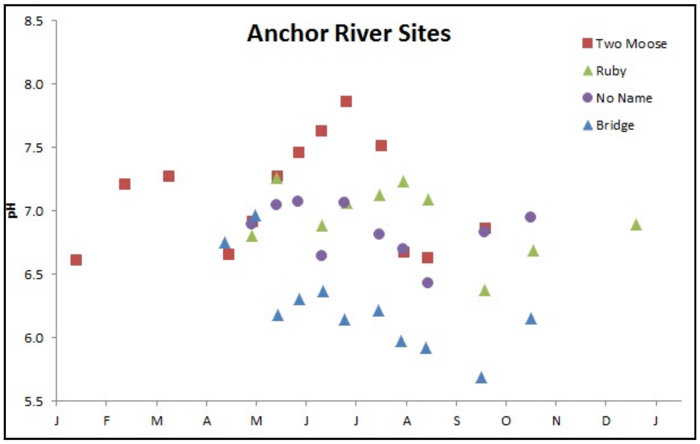
There were no exceedences of the dissolved oxygen water quality standard at any CEMP site during 2012. Lower saturation levels tend to occur in the spring and winter when water samples are often taken through holes in ice. The lowest recorded DO saturation value was 66% at Lower Woodard Creek in March. Patterns in DO saturation over the year at all sites were similar to patterns seen in 2011.

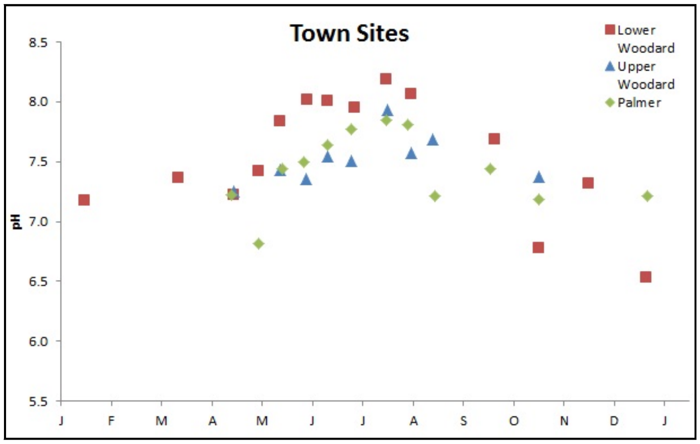


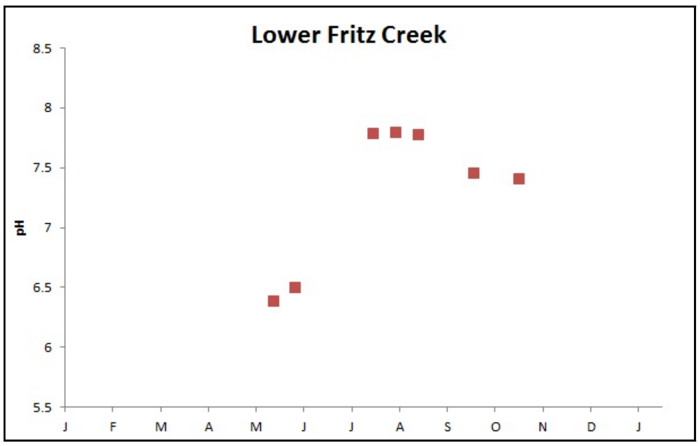


Dissolved oxygen saturation levels at all CEMP sites during each month of 2012.

2012: pH







pH at all CEMP sites during each month of 2012.

pH is a measure of the level of activity of hydrogen ions in the water. It is expressed on a logarithmic scale and ranges from 0 (acidic) to 14 (basic). Most streams naturally range between 6.5 to 8.0 pH units. Monitoring pH provides CEMP with a background level of acidity in streams in the Kachemak Bay and Anchor River watersheds. Differences in pH can result from rain and groundwater inputs, decaying plant material, and inputs from runoff. Rain water tends to have a lower pH, ranging from 5.6-5.8.

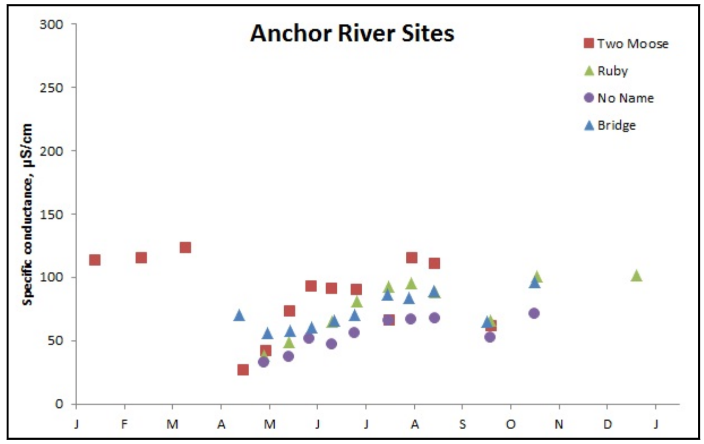
Each year we see seasonal variation in pH at CEMP sites; this variation in 2012 is typical of what we have seen in previous years. pH generally increased as the year progressed and spring rains picked up, and began to drop back down by early winter. This seasonal pattern was most pronounced at Lower Fritz Creek, Two Moose, and Lower Woodard Creeks. Bridge Creek had consistently low pH values throughout 2012; however, these values showed the same consistent trend of increasing and then decreasing throughout the year as the other monitored sites.

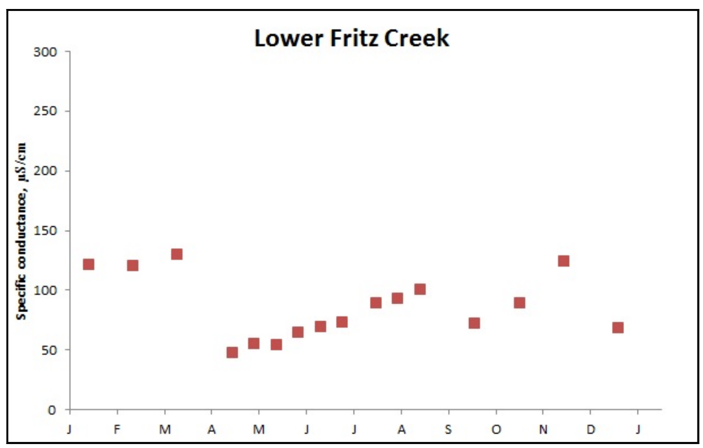
2012: Specific Conductance

Specific conductance measures the ability of water to conduct an electrical current at a given temperature. It is recorded as micro Siemens per centimeter (µS/cm). The presence of ions, or salts, in water increases its ability to conduct electricity; thus, conductivity is a measure of the dissolved solids in a stream. Conductance is influenced by groundwater and rainwater inputs as well as road and other urban runoff. Since conductance is a measure of dissolved solids, high turbidity levels may not lead directly to high conductance levels.

Specific conductance in CEMP streams during 2012 ranged from 27 µS/cm at Two Moose Creek to 278 µS/cm at Lower Woodard Creek. Generally we see higher conductivity at streams located in the town sites located within the City of Homer and surrounded by increased amounts of impervious cover such as roads and parking lots. Runoff from these surfaces during rain events generally increases the amounts of dissolved solids in the water and thereby increases conductivity levels. Similar to pH, we see seasonal variation in specific conductance at most CEMP sites. Drier weather in the summer often leads to increased relative input from groundwater, which has a higher specific conductance than snow melt and rain water that tends to increase in our stream systems in the spring and fall, respectively.

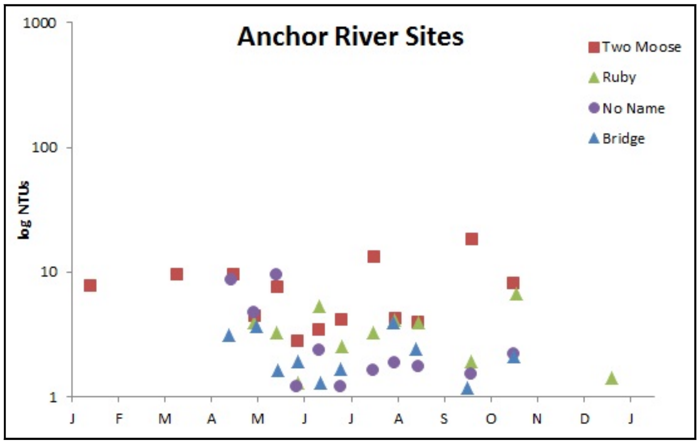
Conductance at No Name Creek, Ruby Creek, and Bridge Creek, which are located in areas with largely undeveloped upstream landscapes, stayed below 100 µS/cm throughout the year. Two Moose Creek had slightly higher specific conductance values than the other Anchor River watershed sites after May. Town streams, including Upper and Lower Woodard and Palmer Creeks, had higher average conductance levels over the course of the year, a trend similar to that seen in 2011.

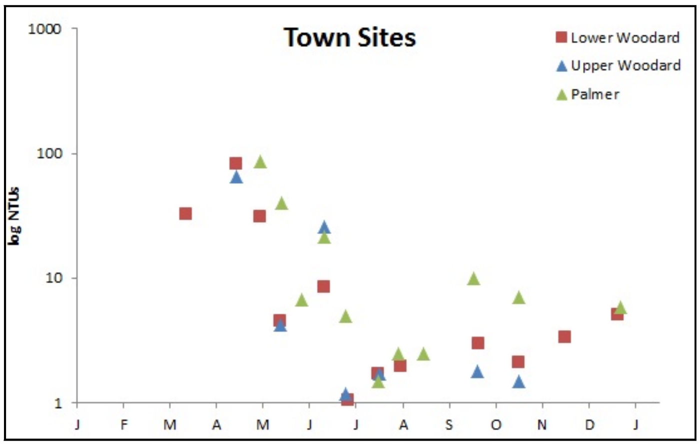


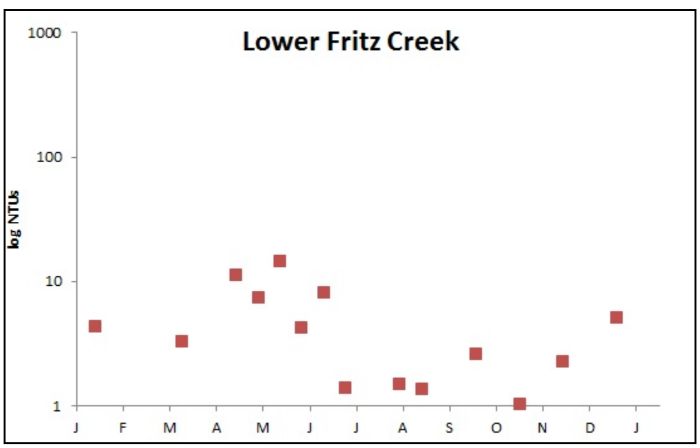


Specific conductance at all CEMP sites during each month of 2012.

2012: Turbidity







Turbidity, shown here on a log scale, at all CEMP sites during each month of 2012.

Turbidity is a measure of water clarity and describes the amount of light scattered or absorbed by water. Silt, clay, organic material, and colored organic compounds can all influence turbidity. Natural and human caused erosion, as well as storm water runoff can increase turbidity. Negative impacts from increased turbidity may include increased water temperatures, decreased habitat for fish and other aquatic organisms, and more opportunities for the growth of potentially harmful bacteria.

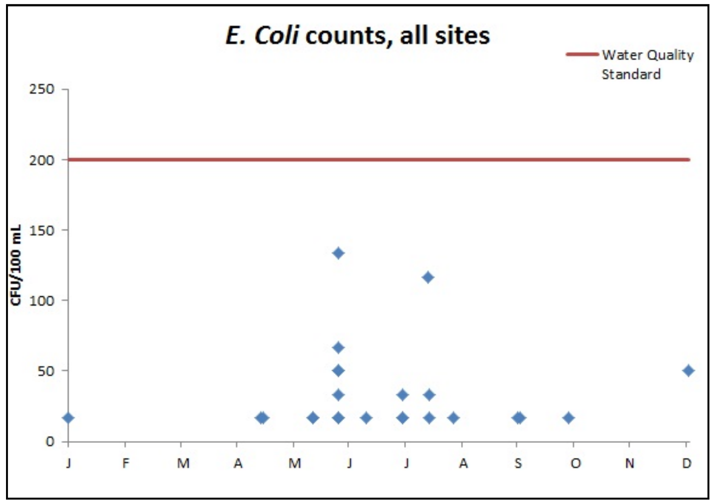
Turbidity (expressed on a logarithmic scale in the graphs on the left) was higher in most CEMP streams during the spring months of April and May. These months typically see increased precipitation and stream flows, and are influenced by the effects of snow melt and spring breakup. This is a typical pattern that we have seen during previous years through CEMP data.

In 2011 we saw turbidity at Two Moose Creek drop after May to below 10 NTUs; however, in 2012 turbidity levels at Two Moose were greater than 10 NTUs in July and again through the fall. Although we see this evidence of higher turbidity levels at the CEMP site in 2012, it is well below what we measure coming from the gravel pit inflow. It's possible that sediments deposited into Two Moose Creek from the gravel pit inflow (see page 10) largely settle out prior to reaching the CEMP site, approximately 1/4 mile downstream. With only two exceptions, the turbidity of the inflow was 5+ NTUs over the background turbidity levels in Two Moose. Bridge Creek had the lowest turbidity levels throughout 2012, and turbidity at this site was consistently lower than in 2011. Town sites remained below 100 NTUs throughout 2012, which is a considerable difference from 2011 when values spiked to above 500 NTUs in the spring. This overall reduced turbidity is a positive water quality trend that we hope to see continue in 2013.

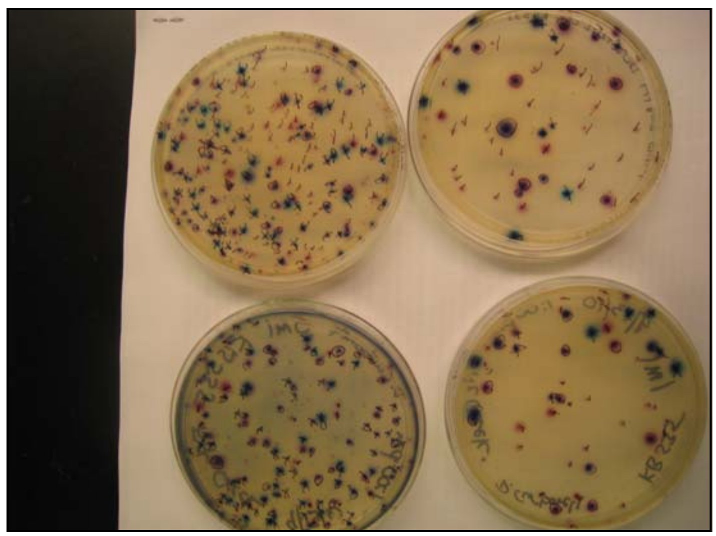
2012: Coliform Bacteria

CEMP volunteers monitor for total and fecal coliforms at all sites throughout the year. Many types of coliform bacteria are normally found in soil and water. *E. coli* is an indicator of fecal bacteria that is found in the intestines of human and other warm blooded animals. State water quality standards are for fecal coliforms. CEMP tests reveal the number of colony forming units (CFUs) of *E. coli*, which we utilize as a preliminary indicator of fecal coliforms. In the event of a persistent exceedence through both high and low stream flows, the CEMP Coordinator would send samples to a lab in Anchorage for official fecal coliform testing. Finding *E. coli* levels that are above state water quality standards may be indicative of contamination by runoff from animal waste, decaying animals, or human waste from sewage or septic tanks.

From a total of 91 regular site visits where bacteria tests were successfully performed, 74% (or 67 visits) had no *E. coli* colonies present; this was a similar percentage as in 2011 and we have seen a consistent decrease over the past few years. Of the 24 site visits with *E. coli* present, there were no preliminary exceedences of the state water quality standard in CEMP streams. This is a decrease from 4 exceedences in 2011, and is the first year since 1998 (when CEMP volunteers began monitoring bacteria year-round) that there were no preliminary exceedences reported.



E. coli *levels at all CEMP sites during 2012 (expressed on a log scale of Colony Forming Units per 100 mL). Only sites with detected colonies are shown. The red line indicates the state water quality standard for a single sample in a waterbody that is protected for contact recreation (200 CFU/100 mL).*



Water samples are plated with a bacteria-growing medium that shows E. coli *colonies in purple.*

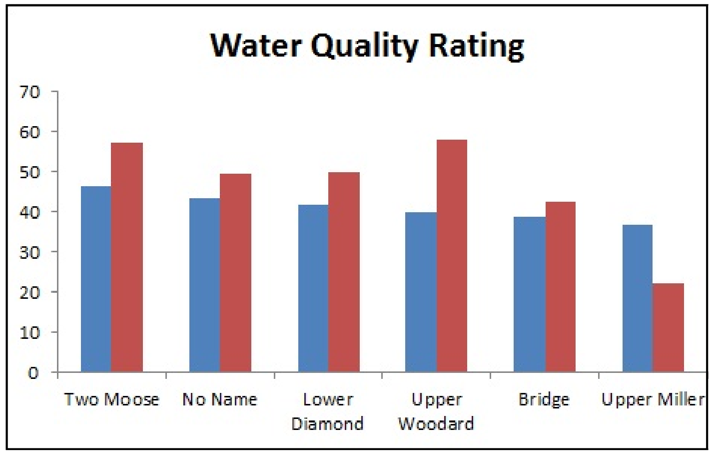
2012: Biological Monitoring

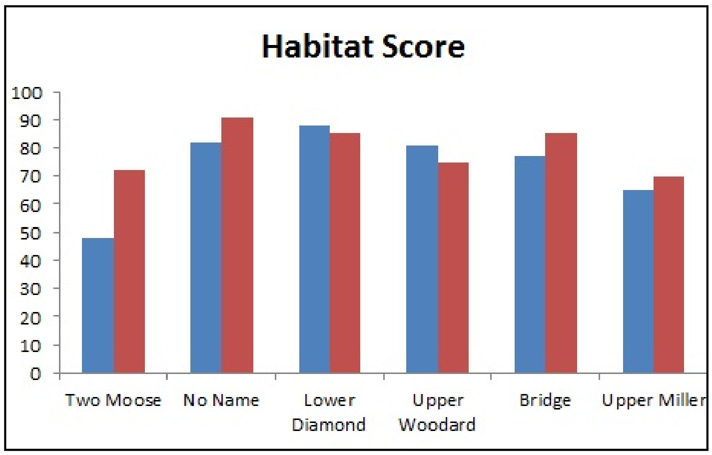
Our summer Stream Team of specially-trained volunteers conducted biological monitoring at six CEMP sites in 2012: Two Moose, No Name, Lower Diamond, Upper Woodard, Bridge and Upper Miller Creeks. We had sampled Two Moose periodically from 2002 - 2009 and decided to sample again in 2012 following the riparian habitat destruction in the spring (see page 10). We do bioassessment twice per summer for three years, in June and August, to capture seasonal and year-to-year variation.

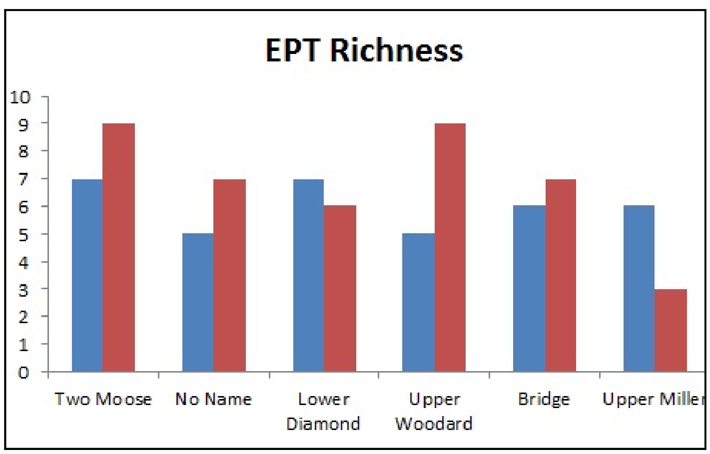
Water quality ratings (WQRs) are calculated for each site based on the types of macroinvertebrate communities present, taking into account different types of aquatic insects found in the stream and how those types typically respond to pollution or disturbance. Higher WQRs indicate there were more sensitive taxa present in the stream than tolerant bugs. The highest WQRs in 2012 were Two Moose (57.1) and Upper Woodard (57.8) in August. The high WQR at Two Moose is surprising considering the widespread habitat destruction and ongoing turbidity issues at that site. WQRs in June are consistently below August values at all sites.

Habitat scores were high at all five sites again in 2012, with the exception of Two Moose in June (48). The highest habitat scores were found in August at No Name (91) and Lower Diamond and Bridge Creeks (both 85). Habitat scores take into account 10 different aspects of macroinvertebrate habitat, including how full the streambed is and the amount and diversity of habitat types available.

EPT richness counts the number of insect taxa that are sensitive the pollution in each stream. 'EPT' stands for Ephemeroptera, Plecoptera, and Tricoptera. EPT richness varied from 3 at Upper Miller in August, to a high of 9 at Two Moose and Upper Woodard in August. These higher EPT values correspond with the higher WQRs during August.







Water quality rating, habitat scores, and EPT richness counts for all CEMP sites with biological assessment done in 2012. Blue bars are for June samples and red bars indicate August samples.

Thanks for a great 2012!

Clockwise, from top left: Great food & fun at Splash Bash in July at the Bishop's Beach Pavilion with music by Work In Progress, Summer interns Kelly and Greg, Two Moose Creek looking upstream, Looking for macroinvertebrates, Kevin Walker and Sue Mauger help net bugs in August, Fresh Sourdough Express donated another beautiful cake for the 2012 Splash Bash, Lower Fritz Creek during high water in May. Center: Flooding of No Name Creek over the North Fork Road after heavy rains in December.