The Effect of Storm Drain Run-off on Total Aerobic and Coliform Bacteria

Blooms In Cottonwood Creek, Wasilla, AK

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Introduction

We decided to do our project on the water quality of Cottonwood Creek because we are worried about our stream. The creek connects most of the recreational lakes in the area and we want to keep the water safe.

After doing a little background research on Cottonwood Creek, we contacted Gay and Jeff Davis at the Aquatic Restoration and Research Institute (ARRI). They suggested that we find out where storm drains are located along the creek and compare this to storm events and coliform bacteria levels. They suggested that we sample sites below Wasilla Lake. We chose our five sites because of their locations to storm drains and accessibility.

The Davises collected samples at 8 sites in 2004 and tested them for fecal coliform bacteria and *E. coli*. They suggested that in addition to collecting and analyzing our own samples, that we analyze their data to see if there is a correlation between the amount of bacteria and storm events and the amount of bacteria in areas near storm drains.

Hypothesis

There will be a positive correlation in the amount of total aerobic and coliform bacteria in Cottonwood Creek and the amount of precipitation. A positive correlation in the amount of total aerobic and coliform bacteria will occur during storm events in sites near storm drains compared to sites farther away.

Materials and methods

We collected water samples at least once a month from five sites along Cottonwood Creek. The first site is on Earl Road where Cottonwood Creek runs into Finger Lake. The second site, "Duck Pond", is at the outlet of Cottonwood Creek from Wasilla Lake. The next site is where Cottonwood Creek runs through the Creekside Plaza parking lot near the Alaska Club. Our fourth site is half a mile down Edlund road. The last site is on Surrey Road. We monitored these for aerobic and coliform bacteria. measuring the amount of alkalinity, ammonia, dissolved oxygen, pH, hardness, nitrate, and phosphate along with the air and water temperatures.

The samples for everything except dissolved oxygen were collected with glass jars (one jar per sample site).

To test the water samples for alkalinity, ammonia, pH, hardness, nitrate, and phosphate we used LaMotte water quality test kits. To test for aerobic and coliform bacteria we used Hach paddle testers. To measure the bacteria we dipped a double-sided paddle in the water sample, one side measures total aerobic bacteria and the other total coliform bacteria. We then incubate the paddles for 48 hours at 37°C, and counted the colonies on each side.

Dissolved oxygen samples were collected in air tight sample bottles that were sealed underwater. The method we used is called the Winkler Method using LaMotte D.O. test kits where we fix the samples and then titrate each sample to find the amount of D.O. in mgOxygen/L.

We collected data for storm drain locations by taking gps waypoints and plotting them on a map. We also have taken gps waypoints for several sites along Cottonwood Creek, including our five sample sites.

We recorded the total precipitation amounts for the days we collected samples and the five days prior to that for both our data and the 2004 data.

Data analysis

Fecal Coliform (# FC) and Precipitation (cm) 2007-08 Data

	Duck	AK Club	Edlund	Surrey	Earl	Precipitation cm
28-Oct	10	10	10	100	0	0.33
2-Nov	0	1000	100	100	0	0.19
25-Nov	10	10	10	10	10	0.28
10-Dec	10	1000	10	100	10	0.02
22-Jan	1000	100	1000	100	100	0.03
19-Feb	100	10000	100	100	1000	0.49
Average	188	2020	205	85	187	

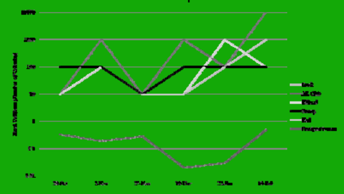
Fecal Coliform (FC/100mL) and Precipitation (cm) 2004 Data

	Settlement	Zephyr	Earl	Seward Meridian	Old Bridge	Fern	Edlund	Surrey	Precipitation cm
21-Apr	2.9	2.9	2.9	94	58	130	100	93	0.97
15-May	3	2.9	3	6	30	10	20	57	0.26
18-Jun	80	8	11	14	80	70	110	240	0.06
20-Jul	260	50	78	16	110	120	130	250	0.32
18-Aug	1600	11	8	21	130	50	170	80	0
19-Sep	30	4	8	8	50	130	240	80	0.66
Average	329	13	18	27	76	85	128	133	

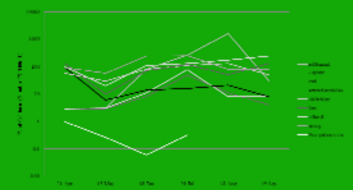

Small foam accumulation at Earl Rd Site 10/6/2007

Results

Fecal Coliform and Precipitation 2007 -08Data



Fecal Coliform and Precipitation 2004 Data



The 2007 data shows that The Alaska Club had the highest average amount of total aerobic and fecal coliform bacteria. There is a medium positive correlation between the amount precipitation and the amount of fecal coliform bacteria at Earl and The Alaska Club. These two sites are the closest to storm drains.

The 2004 data shows that the highest average amount of fecal coliform bacteria was at the Settlement site. There is a medium positive correlation between the amount of precipitation and the amount of fecal coliform bacteria at the Seward Meridian site.

Both sets of data show no positive correlation for the remaining sites.


Megan and Blake testing water quality


Blake taking water temperature at AK Club Site 1/22/2008

Conclusion

The data partially supported our hypothesis because there was a positive correlation in the Cottonwood Creek during storm events. However, this positive correlation was found only at the sites Earl and Alaska Club. At the Alaska Club site, which was located near most of storm drains, there was the highest average amount of both bacteria.

Discussion of Data

We concluded that the Alaska Club had the highest amounts of both bacteria in the 2007 data. This could be due to the increased construction and amount of storm drains in the area . The 2004 data does not support this possibly because fewer large buildings and parking lots existed.

Our measurement of bacteria in 2007 was taken with semi-quantitative test, which shows relative amounts of bacteria whereas; the bacteria measurements taken in 2004 were quantitative. We chose to take our measurements with semi-quantitative tests because of the reduced cost. The difference in measurements made it more difficult to compare the two sets of data.

The 2007 data was taken in the winter, with extensive ice cover compared to the 2004 data which was collected in the summer.

The data collected on 8/18/04 for the Settlement site had an abnormal increase in bacteria which was much higher than the rest of the data. This could be questioned.

The reason we tested the other water qualities was to see if there were any other factors that may have influence the bacteria. From what we see there was not.

In precipitation data we used, some days recorded trace amounts and not the accumulated amount. For these days we recorded .01 cm if it rained less than 5 hours and we recorded.02 cm if it rained 5 hours or more. This could cause error in accuracy.

Storm drain GPS waypoints were taken mostly this spring while there was still much snow and ice on roadways and in parking lots which made it difficult to identify the drains

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