

Izzy.K

903

10/19/2021 - 11/19/2021

LOGBOOK - Science Fair Grade. 9

(Adding on from my grade 8 Science Fair).

Project Title: Calgary Stormwater Testing

Problem to Solve: Do existing constructed wetlands throughout Calgary significantly reduce pollutants in stormwater?

Source(s):	Date:	Question:	Notes:
https://www.amazon.ca/AquaVital-Coli-Coliform-Water-4-Pack/dp/B07623JYGB/ref=sr_1_7?dchiid=1&keywords=water%2Btesting%2Bkit&qid=1634842435&sr=8-7&th=1 (just browsing on Amazon)	October.21.2021	What are some best water testing kits?	- I messaged my teacher from last year and asked for the name and brand of the kit we used. - She said I could go and see her to find out.  
https://www.rjc.ca/project-details/ralph-klein-park-enviro-education-centre.html https://www.calgary.ca/csps/parks/locations/se-parks/ralph-klein-park.html https://www.ave nuecalgary.com/city-life/exploring-calgarys-parks-ralph-klein-par	October.21.2021	What is Ralph Klein Park?	- It is a man-made wetland that was constructed specifically to improve stormwater quality by the east in Calgary, before it enters the Bow River. - It was named after a previous mayor. - It is called a Shepard Wetland. It surrounds the park and was built as a natural stormwater treatment solution. It has wetland plants and microbes filtering the water, as stormwater moves slowly through a

k/ Conserving our wetlands (calgary.ca)			series of wetland areas. - “A diversion channel intercepts water from the Western Headworks Canal during major rain events, channelling it 4 km south to the wetland at Ralph Klein Park. The stormwater enters the wetland in the NW corner of the park where it flows into two large forebays.” - “Typically, it requires 2 – 3 years for wetland plants and vegetation to establish and the wetland to function as intended”.
	October.21.2021	What is a “Shepard Wetland”?	- A specific type of wetland that Ralph Klein Park came up with.
Microsoft Word - Ghobrial_et_al_HYD048 Bottom Sediment.docx (csce.ca)	October.22.2021	What are some places I can get water samples from?	- Bow and Elbow river.
https://lamotte.com/products/environmental-science-education/water-monitoring-kits/individual-test-kits/ https://www.amazon.ca/s?k=lamotte+water+test+kit&srefix=Lamotte+water+%2Caps%2C150&ref=nb_sb_ss_sc_1_14	October.26.2021	What are some test kit options?	- The most expensive kit is \$300 - \$400, but it has a lot of test kits within, and I just need some more “basic” ones. - Or I can just get a simple strip test kit. - Are test strips or tablets better? ● I asked Mrs. Shaw (my old grade 8 teacher), she said both are good. ● I asked Mr. Wiens (current science teacher), and he said test strips because after you add tablets and compare colours, the clarity would affect the results.

			- So I will get some test strips on Amazon, and use my money from my win at the CYSF to pay for supplies I need this year.
https://www.thesprucepets.com/aquarium-water-test-kits-1381915	October.28.2021	What should you test for in water?	- I looked up “what to test for in fish tank water quality”, because I use test strips for my Axoltol’s tank, and thought that would be a good way to find an answer. - pH, ammonia, nitrite, and nitrate. - I also looked into the kits we used last year. - What is in the kit: Alkalinity, Ammonia, Chloride, Chlorine, Chromium, Copper, Dissolved Oxygen, Hardness, Iron, Nitrate, Nitrite, pH, and Phosphate. - What we tested: Hardness, Nitrate, Nitrite, pH, Dissolved Oxygen, and Chlorine, if I recall correctly. - That is what I will do. For now, an idea. - Now I will research test strips that I can use. Might have to get something extra for testing the Dissolved Oxygen.
https://www.usgs.gov/special-topics/water-science-school/science/ph-and-water?qt-science_center_objects=0#qt-science_center	October.29.2021	What is “pH”? How does it affect the environment?	- pH is a measure of how acidic/basic water is. - If the pH of water is too high or too low, aquatic organisms living within it can get sick and die.

<u>objects</u> https://www.fondriest.com/environmental-measurements/parameters/water-quality/ph/#:~:text=If%20the%20pH%20of%20water,levels%20outside%20of%20this%20range https://www.epa.gov/national-aquatic-resource-surveys/indicators-acidification#:~:text=Most%20living%20organisms%2C%20especially%20aquatic,range%20of%206.5%20to%208.5			- Depending on the aquatic organisms, pH is best between 6.5 to 8.5.
<u>Hardness of Water (usgs.gov)</u> <u>Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Hardness - Canada.ca</u> https://fishlab.com/aquarium-gh/ https://www.calgary.ca/uep/water/drinking-water/annual-water-quality-report/water	November.1.2021	What is “Hardness”? How does it affect the environment?	- Water hardness is the amount of dissolved calcium and magnesium in the water. Hard water is high in dissolved minerals, mostly calcium and magnesium. - Hard water is somewhat good for humans because minerals are good for us. - Dissolved calcium: Calcium occurs in water naturally. Dissolved calcium is from rocks and minerals that contain calcium, and when it is in or near water, it starts to dissolve, creating dissolved calcium. - Magnesium: It is from minerals such as

r-quality-parameters.html https://en.wikipedia.org/wiki/Magnesium			magnesite, dolomite, and other minerals. When in water, it starts to release magnesium. - “GH” = General Hardness. - Water with a low GH is said to be soft, and water with a high GH is considered hard. - Environmental Impact: When the water has the presence of toxic metals such as lead, cadmium, chromium and zinc. Usually, the harder the water, the lower the toxicity of other metals to aquatic life. - Hardness levels in water: 0 to 60 mg/L as soft; 61 to 120 mg/L as moderately hard; 121 to 180 mg/L as hard; and more than 180 mg/L as very hard. - “Calgary's water is considered hard because of the amount of calcium and magnesium in the water from the Bow and Elbow Rivers (https://www.calgary.ca/uep/water/drinking-water/annual-water-quality-report/water-quality-parameters.html).” - The lowest hardness levels are during spring snowmelt, and the highest hardness levels are between December and February.
https://en.wikipedia.org/wiki/Oxygen	November.5.2021	What is “Dissolved	- Dissolved oxygen is the amount of oxygen that is

gen_saturation https://www.epa.gov/national-aquatic-resource-surveys/indicators-dissolved-oxygen		Oxygen"? How does it affect the environment?	present in water. Bodies of water receive oxygen from the atmosphere and aquatic plants. - Oxygen is more soluble (will be able to dissolve) in cold than warm water. Coldwater can hold more dissolved oxygen than warm water. In the summer, warm water is above the cold water, and in the winter it is the opposite. Thus, in the summer there would be more dissolved oxygen in the bottom of water because it is colder - and in the winter, there would be more dissolved oxygen at the top because the water will be cold. More species would live where there is more water and the temperature they need to survive. - All aquatic species need oxygen to breathe. If there is not enough, species will have to come to the top of the water to breathe. Most species have a specific area of water they can live in, because of the temperature. If there are more plants, the more dissolved oxygen in the water, and the easier it is for species to thrive in their ecosystem. - You can measure dissolved oxygen by sensor and meter, chemical technologies, or fluorescence. It can be very expensive, so I will need to think about this.
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Nitrogen (N) and water (lenntech.com) Nitrates and Nitrites - RMBEL Nitrates and Their Effect on Water Quality – A Quick Study Wheatley River Improvement Group 5.7 Nitrates Monitoring & Assessment US EPA Eutrophication - Wikipedia	November.7.2021	CHANGE: “NITRATES AND NITRITES”.	- Nitrate is a chemical compound and the most common form of nitrogen found in water. - Excess nitrate in water is a source of fertilizer for aquatic plants. Usually, the amount of nitrate in water is what limits how much plants can grow. If there is too much, plants will grow excessively. - Nitrogen ends up in the environment mainly through agricultural processes and makes its way into rivers. The main source of nitrogen in water is fertilizers that mainly contain nitrate. - “Eutrophication is the process by which an entire body of water, or parts of it, becomes progressively enriched with minerals and nutrients (Eutrophication - Wikipedia).” - Kits to test water quality will have a booklet that talks about good levels, and what the compound does.
https://byjus.com/chemistry/difference-between-nitrate-and-nitrite/	ABOVE~	ABOVE~	- A nitrite can become a nitrate by the process of oxidation, and nitrate can become a nitrite by the process of reduction. - Nitrates and nitrites are very similar. The compounds are a bit different, but come into the environment the same, and can cause the same harm.

https://www.calgary.ca/csps/parks/locations/se-parks/inglewood-bird-sanctuary.html		Inglewood Bird Sanctuary?	- It has provided migratory birds with a place to rest since 1929. - It is a wildlife preserve. It is a wetland.. one for nature, and the main purpose is for wildlife not to filter water.
LaMotte Test Tab Refill, Dissolved Oxygen, 50 tests : Amazon.ca: Industrial & Scientific Do I have to cite Mrs. Shaw? Mr. Wiens said no.	November.5.2021	Dissolved oxygen tablets? Test at school?	- I talked to Mrs. Shaw, and she said I could use the school's test kits. - She also said that for testing dissolved oxygen, in class we use tablets. - Tablets for five minutes or five days.
N/A	N/A	What are some questions I should research and that might be asked?	- Why did you choose those compounds to test? - It came with the test kit, and I thought they would be good to test because they are the most common. - How about oil and car fluids? How are you going to test those? - I am planning on getting water samples before the water freezes. Question: Will leaving water in a jar for a few days before I test it, will it affect the results? I do not think so, because if I get all the samples on the same day, and test all of them on the same day, it would be controlled. - I also got to take the test kit home and was able to test the water hours later.

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903

10/19/2021 - 11/19/2021

			- What are some places to get water samples from (outfalls along the river and wetlands)? How many should I get? Why in that area of the wetland?
Self-guided walking tours (calgary.ca)	CONSTRUCTED WETLANDS IN CALGARY		
Stormwater quality retrofit program (calgary.ca) A City of Stormwater Storm Water (stormh2o.com) file:///C:/Users/27096507/Downloads/stormwater-r-fact-sheet.pdf	GOOD WEBSITES		
file:///C:/Users/27096507/Downloads/stormwater-r-report.pdf		10	Total Suspended Solids (TSS) TSS is a water quality measurement that takes account of solid compounds — both organic and inorganic — that are suspended in both stormwater and wastewater.

- Take some research from last year and add it to this years' presentation. People won't know what a constructed wetland is and stuff-

School Test Kit Includes:

~ Read the booklets that come with it and take notes.

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903

10/19/2021 - 11/19/2021

Notes:

- "How to preserve water samples until testing." -> I get to take a school test kit home, so it will not sit for long.
- Maps + Samples
- Jars Bought = \$18.90 - from my CYSF winnings
- I gave my dad \$20 for "gas money". We were driving all around Calgary, and I thought that would be a nice thing to do. Also paid from my CYSF winnings from grade 8
- Procedure + Data
- Look @ Other Documents + Look Over Everything
- Take a test kit home and test, so water samples do not stay in containers for long...? I CAN! YAY!

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903

10/19/2021 - 11/19/2021

Notes:

Oct.21.2021

- Ralph Klein Park has wetlands, but the water is contaminated before it gets there, affecting ecosystems along the way. That is why the river needs constructed wetlands from start to finish - eg. when the water comes out of outfalls and into the river.
- Get samples from the Bow and Elbow river, and test to see what chemicals and toxins are in the water. Why? To further understand how a system would work better if you knew what you had to treat.
- Updated idea: Test river water, and do further research on specific plants. Then, I can make a mini model, and continue testing. If all goes well, future science fairs, I can get in touch with experts, to make this happen in the rivers.

Oct.19.2021

Questions:

- **Proof of concept recap**
 - Summarize grade 8 project and results, including CYSF feedback
- **Location and number of pilots**
 - Bow and Elbow river
 - Spaced out locations (eg. beginning, middle, and end)
 - One, two or three pilots....
- **Construction**
 - Maintenance (removing pollutants, replacing plants, fixing the rocks, fixing major weather events, etc)
 - Supplies (eg. rocks, plants, gravel, etc)
 - Cost
 - Workers and equipment (eg. trucks, diggers, specialists, etc)
- **Measuring effectiveness**
 - Water sample testing
 - Water flow consideration (eg. obstructions, slope, depth, etc)
 - Environmental impacts to surrounding areas (eg. animals and plants)
 - Seasonal impacts (eg. winter, ice, floods, etc)
- **Municipal approval**
 - City Hall

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903

10/19/2021 - 11/19/2021

Pictures:

- I have personal pictures on my laptop. -- IMPORTANT: The outfall and wetland ones.



Ralph Klein Park.

<https://www.stockaerialphotos.com/media/49421c1d-8de1-4fe1-ad2a-9667474c00cd-shepard-wetlands-calgary>.

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903

10/19/2021 - 11/19/2021

Citations:

In report. Some information has been changed or added for other science fair documents.

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903

10/19/2021 - 11/19/2021

Emails:

Christine O'Grady
Program Coordinator, Biological Sciences
University of Calgary

Dear Christine,

My name is Isabelle Klaassen, and I am a grade nine student at R.T. Alderman school. My Aunt Nicole Wheeler works at the University, and she referred me to you.

I am writing to ask some questions related to my grade nine science fair project "Calgary Stormwater Testing". This is an extension to my grade eight science fair project "Phytoremediation of Calgary Stormwater". Please [see this link](#) to view my presentation to the Calgary Youth Science Fair judges in March 2021 (if the CYSF link does not work, you can access my stand alone presentation [here](#)). I earned a gold medal for my submission, and went on to receive the *City of Calgary BiodiverCity* award in my age category. Feedback received from the CYSF judges, suggested that next steps should be to conduct stormwater analysis, and that is specifically what I am asking you about. This data will provide the basis for measuring the effectiveness of pilot installations that I plan to pursue in grade 10.

I will be collecting water samples from certain stormwater outfalls along the Bow and Elbow rivers within the city. I will also be gathering water samples at existing constructed wetlands designed to naturally treat approx. 20% of Calgary stormwater.

Questions:

1. What compounds and characteristics would you suggest I test for?
 - > My research has indicated that the following would be relevant: hardness, nitrates, nitrites, pH, dissolved oxygen and chlorine.
 - > I am unsure about how to test for the various vehicle chemicals that find their way from the streets to the rivers: oil, gas, washer fluid, antifreeze, etc.
2. Is there a limited time that water samples can be stored before testing?
 - > I plan to gather these samples before freeze-up, but will not likely be testing for a few weeks - will that affect my test results?
3. Can you please recommend an effective water testing kit that will provide the appropriate results for my project.

I am very grateful for your time and expert perspective, and look forward to hearing back from you in email, or if you would prefer I can set up a Zoom meeting for us to talk about this further!

Thank you.

Sincerely,
Isabelle Klaassen

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903

10/19/2021 - 11/19/2021

----- Replied with:

Hello Izzy and thank you for reaching out. Congratulations on your project!

Advancing Canadian Wastewater Assets (ACWA) actually represents in the 'wastewater space' as opposed to storm water. The difference as you very likely know is that one comes from your sink and toilet, the other from storm drains and runoff in your neighborhood. The City of Calgary handles these waters' separately, although that is not the case for all municipalities.

I have attached some documents that should help you on your quest. With respect to testing, there is not a kit that can test all and everything. Analytical lab costs can be quite expensive. Generally, TSS and TP would be the two parameters of concern with the organics you mention from industry ect not fully regulated. It is assumed that nobody dumps contaminated water down the drains and are penalties for doing so. You may want to test for those two items, looking why these two may matter the most and use The City data (attached) to support. Each parameter has different holding requirements and sometimes preservatives to maintain integrity. Bottles can be provided by the lab (AGAT). If you use a field kit I would suggest reaching out to Riverwatch to see what they use. <https://data.calgary.ca/Environment/Watershed-Surface-Water-Quality-Data/y8as-bmzj>

If you have more questions, I can schedule a Zoom call. Thanks again for your interest.

'Stewardship is about taking care of something that we do not own. Good water stewards recognise the need for collective responses to the complex challenges facing the water resources we all rely on.'

<https://www.calgary.ca/uep/water/water-and-wastewater-systems/storm-drainage-system/storm-drainage-system.html>



Stormwater management - Calgary

Stormwater is the water from rainstorms or melting snow that goes into the storm drains in the road through an underground pipe system to our rivers. These pipes start out small and get larger the closer you are to the river. They direct stormwater to the river by the way of gravity. Every time it ...

www.calgary.ca

<http://nosecreekpartnership.com/wp-content/uploads/2011/01/Stormwater-Monitoring-2014.pdf>

Nose Creek Watershed Partnership – Stormwater Quality Study

Nose Creek Watershed Partnership – Stormwater Quality Study Palliser Environmental Services Ltd. Page 1 1.0

BACKGROUND The Nose Creek watershed is a small tributary to the Bow River.

nosecreekpartnership.com

<https://www.stormh2o.com/home/article/21145028/calgary-develops-citywide-stormwater-loading-targets>

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903

10/19/2021 - 11/19/2021



A City of Stormwater | Storm Water

Calgary develops city-wide stormwater loading targets with an eye to the future

www.stormh2o.com

<https://data.calgary.ca/Environment/Watershed-Surface-Water-Quality-Data/y8as-bmzj>

Watershed Surface Water Quality Data | Open Calgary

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data.calgary.ca

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-- Then I said:

Thank you so much Christine! Your feedback was very helpful.

Isabelle Klaassen

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903

10/19/2021 - 11/19/2021

Dear Polly,

You organized my CYSF presentation to the City of Calgary in May of this year. Please [see this link](#) to view my presentation "*Phytoremediation of Calgary Stormwater*" for which I received a gold medal and the *City of Calgary BiodiverCity* award for my age category (grade eight at the time). If the CYSF link does not work, you can access my stand alone presentation [here](#).

The feedback I received was valuable and informative, including several people who offered their future support. To help me with my current grade nine science fair project, where I will now be focusing on testing Calgary stormwater, I would really like to connect with one or more people who provided feedback and offered their time.

Would you be able to please provide me with contact info for someone on the City of Calgary Biodiversity Advisory Committee who attended my virtual presentation? Someone who would be willing to communicate with me and provide information related to stormwater outfalls (e.g. locations), stormwater constructed wetlands, and other related areas of interest?

Thank you very much!

Sincerely,
Isabelle Klaassen

----- She replied right away with:

Hi Izzy,

Thank you for your message, and it's really great to hear you are continuing your work for the next science fair.

Wasn't it great that now-Mayor Jyoti Gondek attended your presentation!

I will forward your message asap to the rest of our committee, and we will come up with some contact suggestions for you.

Our next meeting is in about two weeks, on November 15, and I hope to be back in touch with you around that time.

Meanwhile, all the best, and Happy Hallowee'en,
Polly

----- Then I said:

Thank you for the follow up, I appreciate it.

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903

10/19/2021 - 11/19/2021

Follow Up From Polly:

Dear Izzy,

As mentioned, the BiodiverCity Advisory Committee met this week, and we have identified two fine contacts for you from the City of Calgary!

As copied here, both Travis Shaw and Sarah Marshall would be delighted to talk with you further about your project.

After that, they may also recommend other personnel for you to contact, as your project appears multifaceted.

So, perhaps the three of you could now communicate with each other to assist Izzy in her research.

For my part, I will look forward to the 2022 Calgary Youth Science Fair, and will be on the lookout for Izzy's project.

Thank you so much for your dedication to a healthy and sustainable environment, zzy, and to lending her your expertise, Travis and Sarah.

Sincerely,

Polly Knowlton Cockett

----- I said:

Hello Polly!

Thank you for this information and comment, and hello to Travis Shaw and Sarah Marshall.

I have finished my science fair experimenting and I'm almost done with my research because I have early due dates this year.

I do have a question for Travis and Sarah, so I will send them a follow-up email very soon.

Thanks again.

Yours Truly,

Isabelle (Izzy) Klaassen

Polly replied with:

Well done on being so far along with your project already, Izzy.

Best wishes, and I hope Travis and Sarah will be able to help you with your questions.

Polly

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903

10/19/2021 - 11/19/2021

Then I emailed Travis and Sarah with:

Hello Travis and Sarah,

I am unaware if Polly showed you my CYSF Science Fair video, if you would like to see it, here is the link: [click this](#)

Thank you for the opportunity to ask you questions. Like I mentioned in the email with Polly, I am basically finished my science fair for this year. I am thinking ahead to a future science fair in grade ten, and I would appreciate a map that shows all the outfalls in Calgary. With an outfall map, I can plan where I think constructed wetlands would work best, and I can map out specific areas I can test for water pollutants.

Thank you for your time.

Yours Truly,
Isabelle (Izzy) Klaassen

- Then Sarah and I sent emails back and forth.

New/Special Emails:

plknowlton.cockett@gmail.com

Travis.Shaw@calgary.ca

Sarah.Marshall@calgary.ca

christine.ogrady@ucalgary.ca