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Investigating Impacts of UV Filters on the Cowichan River Ecosystem

Project Update: Spring 2022



BRITISH COLUMBIA
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AERL
Applied Environmental Research Laboratories



The second full year of sunscreen monitoring has been completed for the Cowichan watershed. Read on below for some highlights from the year.

This project was made possible thanks to financial support from:

- **Habitat Conservation Trust Foundation** (hctf.ca/grants)
- **RBC Foundation** (rbc.com/community-social-impact)
- **Mitacs** (mitacs.ca/en/programs/accelerate)

We're excited to keep analysis costs local through VIU's Applied Environmental Research Lab, and to provide opportunities for student research at VIU.

What is ultraviolet (UV)?

A form of electromagnetic radiation emitted by the sun. It is classified into three types: UVA, UVB,

for causing sunburn.

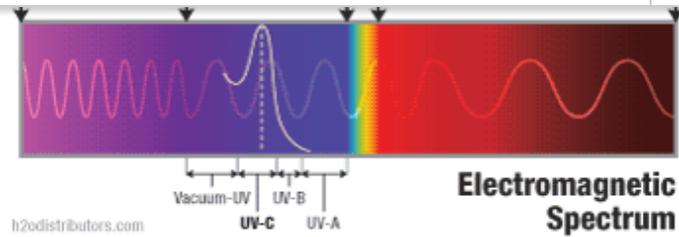


Image source: h2odistributors.com

What is oxybenzone?

An ingredient added to many sunscreens. It's just one of many different "UV Filters", which block or absorb UV radiation from the sun. Oxybenzone protects against both UVA and UVB.

Oxybenzone negatively impacts aquatic life at high doses, and has potential to bioaccumulate & biomagnify within the food web.

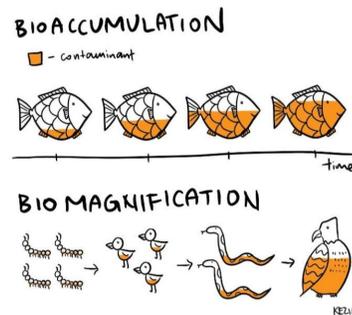


Image source: National Geographic Society

2021 Highlights:

- 108 water samples collected for analysis of oxybenzone
- 2 sediment samples collected for analysis of oxybenzone
- 18 tissue samples collected and stored for future analysis
 - juvenile & adult brown, cutthroat or rainbow/steelhead trout
- 86 volunteer hours contributed
 - Thank you Jim, Karen, Mike, Dianne, Marley, Eli, Rebekah and Joseph!
- 1 peer-reviewed paper published in ACS ES&T Water (Vandergrift et al. 2022)



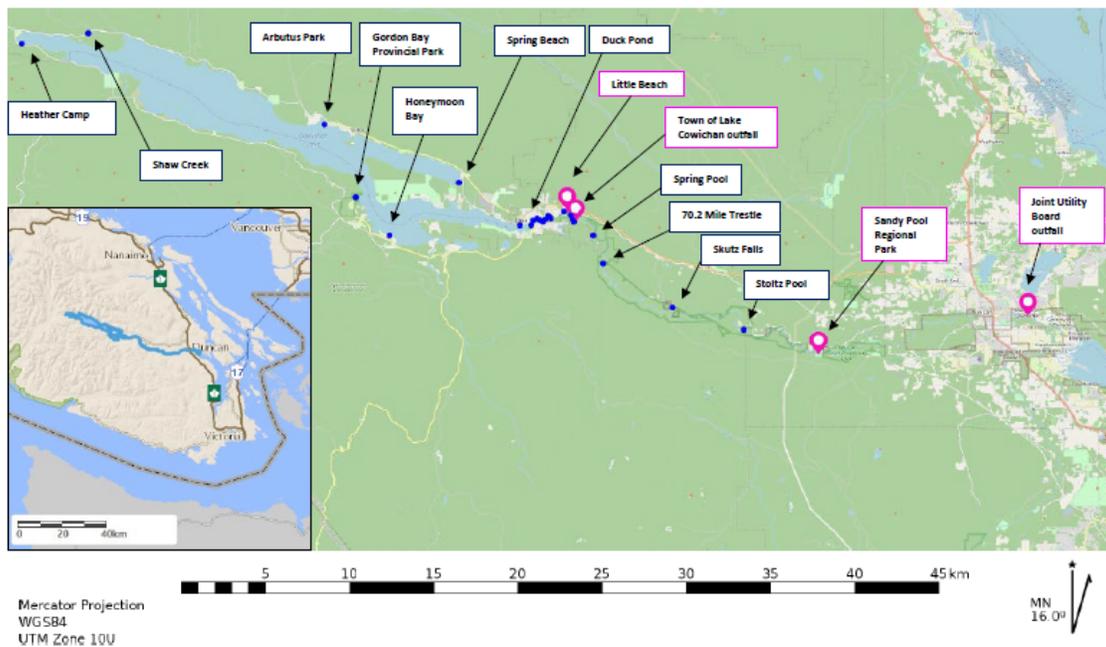
Key Findings:

- Oxybenzone concentrations in water were higher in 2021 than in 2020.
- The highest sunscreen contamination was measured at swim beaches around the lake (Arbutus Park and Gordon Bay).
- 2021 had the highest concentration of oxybenzone found in a single sample (1,761 ng/L).
- Oxybenzone does not accumulate in the water column and the high concentrations do not last all summer long - peaks in contamination are concentrated on long weekends.
- No oxybenzone was detected in lake sediment.

Public & product questionnaire results:

- 45 people were interviewed. 76% of people interviewed were wearing sunscreen at the beach. 36% of people interviewed waited fewer than 5 minutes between applying sunscreen and swimming.

- Product application was roughly split between creams (47%) and sprays (42%).
- Most products assessed contained only chemical UV Filters (68%). The most common chemical UV Filters were homosalate, avobenzone, octocrylene, and octisalate. The most common physical UV Filter was Zinc Oxide.
- Oxybenzone was listed as an ingredient in only 2 of 19 products assessed.



What's the Risk?

Results in 2021 were above previously reported limits which have a "predicted no-effect" in freshwater (as determined by the [European Chemicals Agency](#) (670 ng/L) and [past studies](#) (1,320 ng/L)). However, [a new study](#) (published last year) suggests the "no-effect" value should be closer to >70,000 ng/L, arguing that past numbers were too conservative.

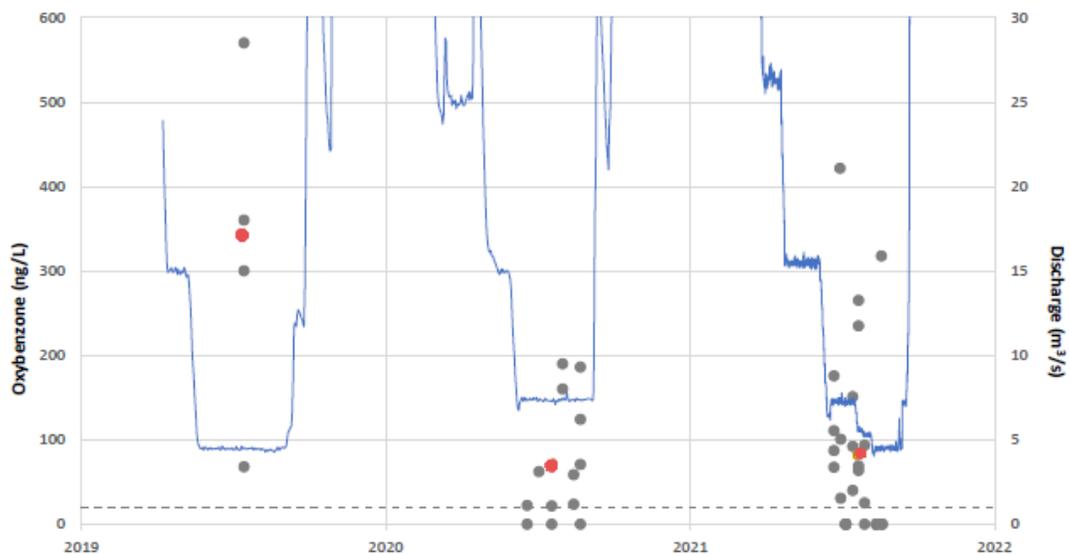
This "predicted no-effect" example shows how rapidly this field of research is evolving. New research is being published almost weekly.

Considering all study results available to us, the long-term average concentrations of

Changes through time:

This graph shows sample results from summer 2019 to summer 2021 at four sites in the upper Cowichan River, from the weir to 4.5 km downstream of the weir.

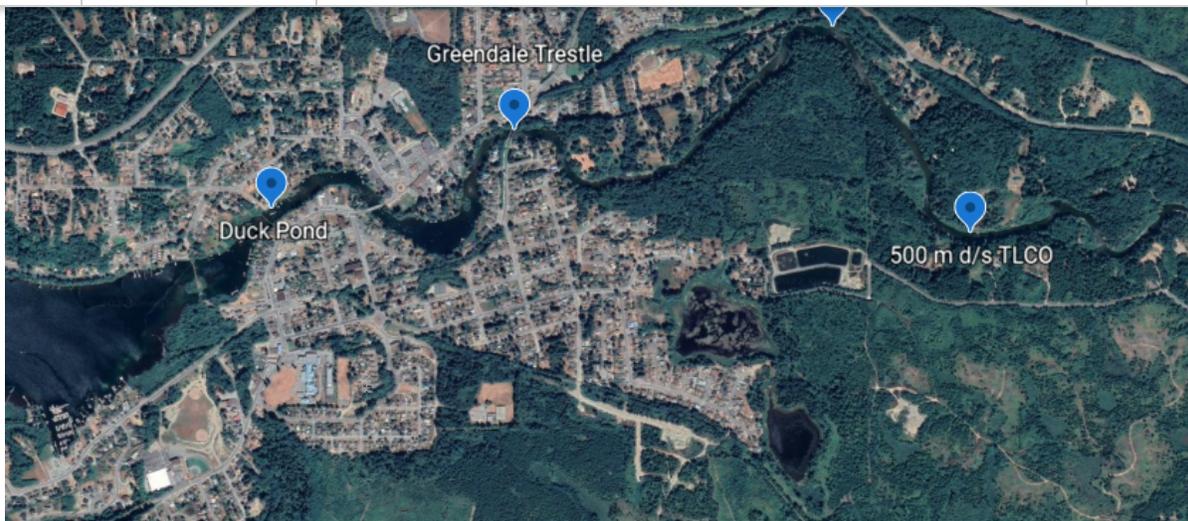
The blue line is river discharge (read from the right-hand y-axis). Grey dots are individual sample results, while red dots show the average for the sampling year (read from the left-hand y-axis). The dashed line is the detection limit for oxybenzone.



In 2019, four samples were collected on August Long Weekend only .

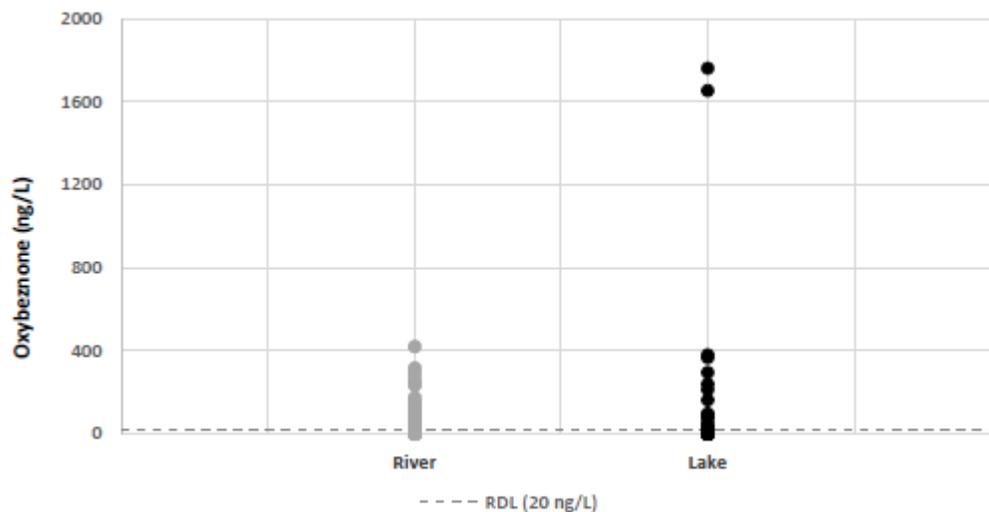
In 2020 and 2021, several samples were collected on multiple weekends through the summer, with many samples below detectable levels. This explains why the average (red dot) is reduced in these years.

The sites included in this graph are shown below:



Other Findings:

- The average count of in-water users at Lake sites was approximately 1.4x greater than the average count of in-water users at River sites.
- Daily maximum air temperatures above 28°C prompted a significant increase in the number of in-water users.



- Overall, results were similar between the river and the lake, except for a few very high samples from swim beaches around the lake.

Download 2021 Report

Please note, the file may auto-download in your web browser -- please check your Downloads folder after clicking the orange button if you are having trouble finding it.

Method updates:

Thanks to the efforts of students Will, Joseph, Rebekah, and professors Chris and Erik at VIU,

- Progress was made this year to develop new methods for 4 more UV Filters in water - 3 of which were successful! In 2022, we will be able to analyze a single water sample for multiple UV Filters of concern.
- Progress was also made on sediment analysis methods. We can now analyze sediment for oxybenzone at a fraction of the cost compared to doing it at a traditional lab.
- Tissue analysis methods are proving challenging for the instruments, and commercial labs are also not set up to do this. We are continuing to work on alternate methods that will help progress with tissue analysis. This is required to determine if bioaccumulation or biomagnification are occurring in resident aquatic species.



Meet the team!



Thea Rodgers is a biologist with BCCF. She has been involved with investigating sunscreen contamination in the Cowichan watershed since 2019, and also recently within the Regional District of Nanaimo. Catch her this summer paddling down the river, sample vials in hand.



William Lattanzio-Battle is a graduate from VIU's bachelor of science program with a major in Chemistry. He has been working with the Applied Environmental Research Laboratories since 2019 and is the outgoing student researcher involved on this project. Thank you for all the hard work Will!



Jamieson Atkinson is a Senior Biologist with BCCF, based out of the Vancouver Island office. Jamieson has been involved in the sunscreen project since its inception in 2018. On a sunny



Rebekah Aplin is a fourth-year chemistry undergraduate student at VIU, and has worked on several research projects through the AERL. Rebekah is interested in the method development and quantification of

shades, sun-shirt and wide-brimmed hat.

incoming student involved on this project. Welcome, Rebekah!

And, finally....



We are now recruiting volunteers for summer 2022

Please reply to this email or contact trodgers@bccf.com if you would like to be involved! Deadline is June 10, 2022.

A great opportunity for students or residents of the Cowichan Valley who are looking to contribute their time, expertise, and interest this summer.

No experience necessary - we will train you!

Please contact us to learn about the volunteer roles available



Made possible with funding support from:

Habitat Conservation Trust Foundation (*Enhancement & Restoration* grant)

Mitacs (*Accelerate* grant) &

RBC Foundation (*Tech for Nature* grant)



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Additional support from the BC Ministry of Environment,
Regional District of Nanaimo, and community volunteers

Follow the Vancouver Island regional office for BCCF at [@bccf_vi](https://www.instagram.com/bccf_vi) on Instagram and keep up to date about all of our projects and initiatives.



The sunscreen project only sends one email update per year!

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