



# Swimmer's Itch in Alberta

Understanding transmission dynamics to better  
inform control strategies

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**UNIVERSITY OF ALBERTA**  
SCHOOL OF PUBLIC HEALTH



**Alberta  
Innovates**  
Energy and  
Environment Solutions

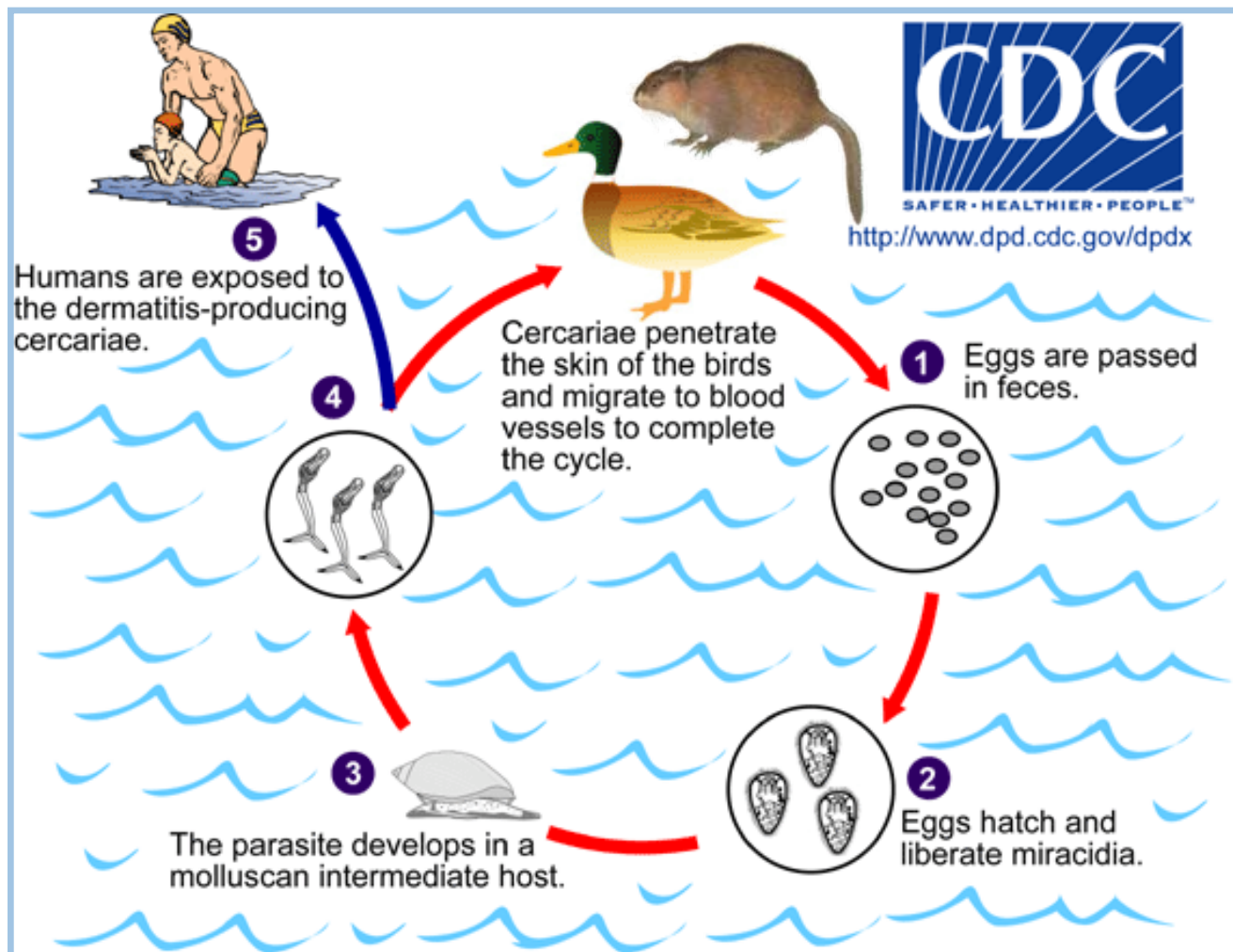
# Outline

- What is swimmer's itch?
- What impact does it have in Alberta and beyond?
- What do we need to know to address this issue?
- What steps are we currently taking?





# What is Swimmer's Itch?



# Immune response dependent on the individual and the level of exposure





# What impact does swimmer's itch have in Alberta and beyond?

- Swimmer's itch is a complex, global issue, much like other water-transmitted diseases and conditions:
  - Overlap of water use by humans and animals
- In Canada, swimmer's itch is not a reportable condition, and thus the impact cannot currently be measured.



## Factors that may affect transmission:

- Presence or absence of species to support the life cycle (i.e. snails, bird hosts, mammalian host)
  - Biological diversity
- Host-parasite interactions
  - Multiple or competing infections
  - Host specificity and variance, i.e. compatibility
  - Immunological repertoire
  - Distribution – geographical factors
- Human presence and impact on the environment







# Environmental factors that may affect transmission:

## Abiotic factors

UV-radiation

pH

Salinity

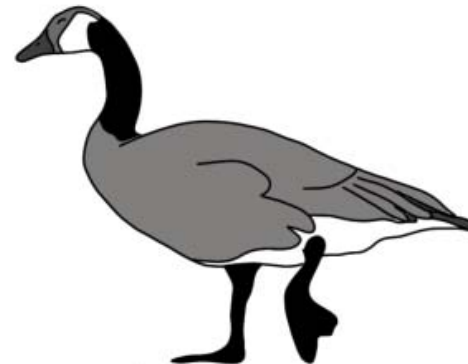
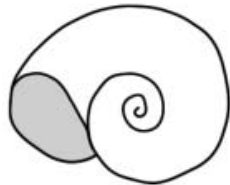
Dissolved Oxygen

Temperature

Chloride

Nitrates

Pollutants



## Biotic factors

Predation

Decoy Organisms

Hyperparasites

Alternative Hosts

Vegetation

Physical Disturbance





## Environmental factors that may affect transmission:

- Important environmental factors shown through experimentation:
  - *Temperature*- increased temperature shown to influence susceptibility of some snails to trematode infection (Ittiprasert and Knight 2012)
  - *Eutrophication/Nutrient loading*- increased eutrophication shown to have an effect on increasing snail growth/density and per snail production of trematodes. (Johnson et al 2007 and Lafferty 1997)
  - *pH/acid precipitation*- reduced snail density (Lafferty 1997)
  - *Dissolved Oxygen*- effects snail survival (Sousa 1989)





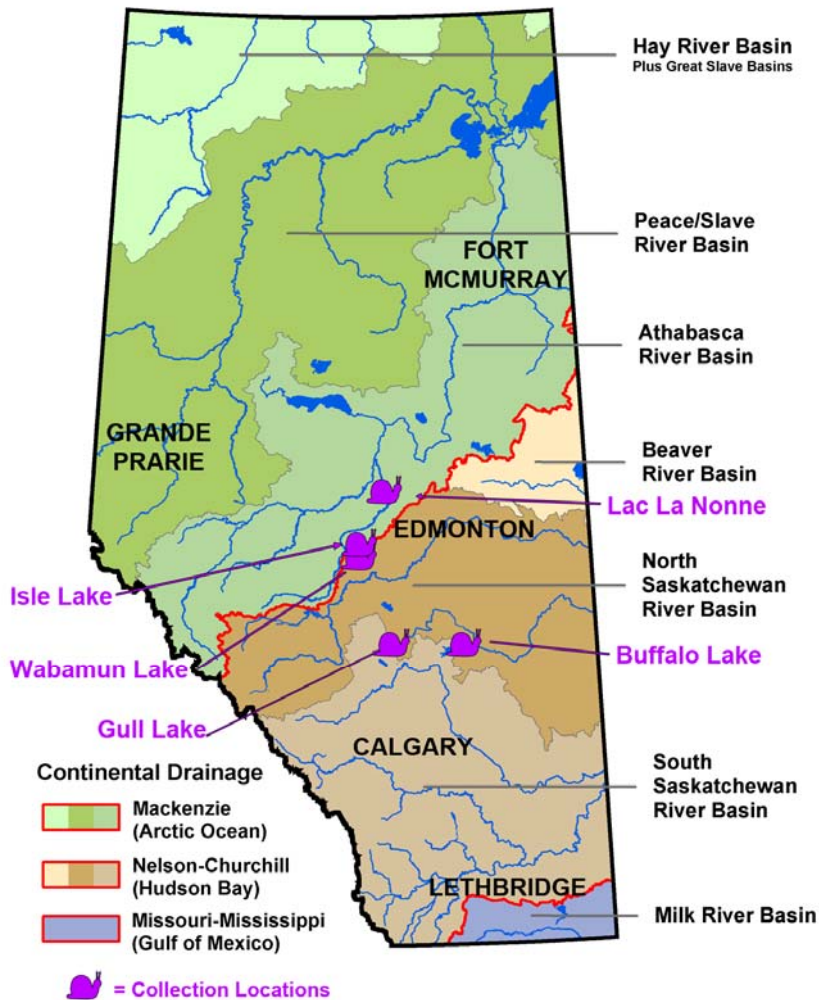


# Questions and Aims

- 1. In Alberta, which species are serving as hosts to swimmer's itch causing trematodes?
- Snail and trematode survey of high-use recreational lakes in Alberta.



# Snail and Trematode Survey Design



- Five High-Use, Recreational Lakes to be sampled every two weeks:
  - Buffalo Lake (Pelican Point)
  - Gull Lake (Aspen Beach)
  - Wabamun Lake (Prov. Park)
  - Isle Lake (Boat Launch near park)
  - Lac La Nonne (Boat launch near RV park)
- Collect 300-500 snails from each lake/each time from June-September
- Analyze each individual snail for infection
- Speciate each snail and trematode collected, using mitochondrial gene sequencing

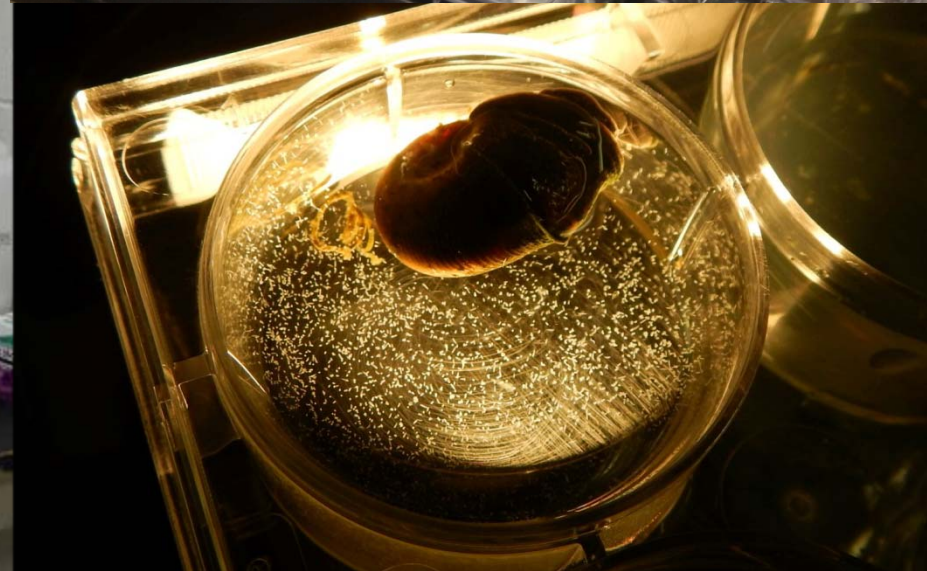
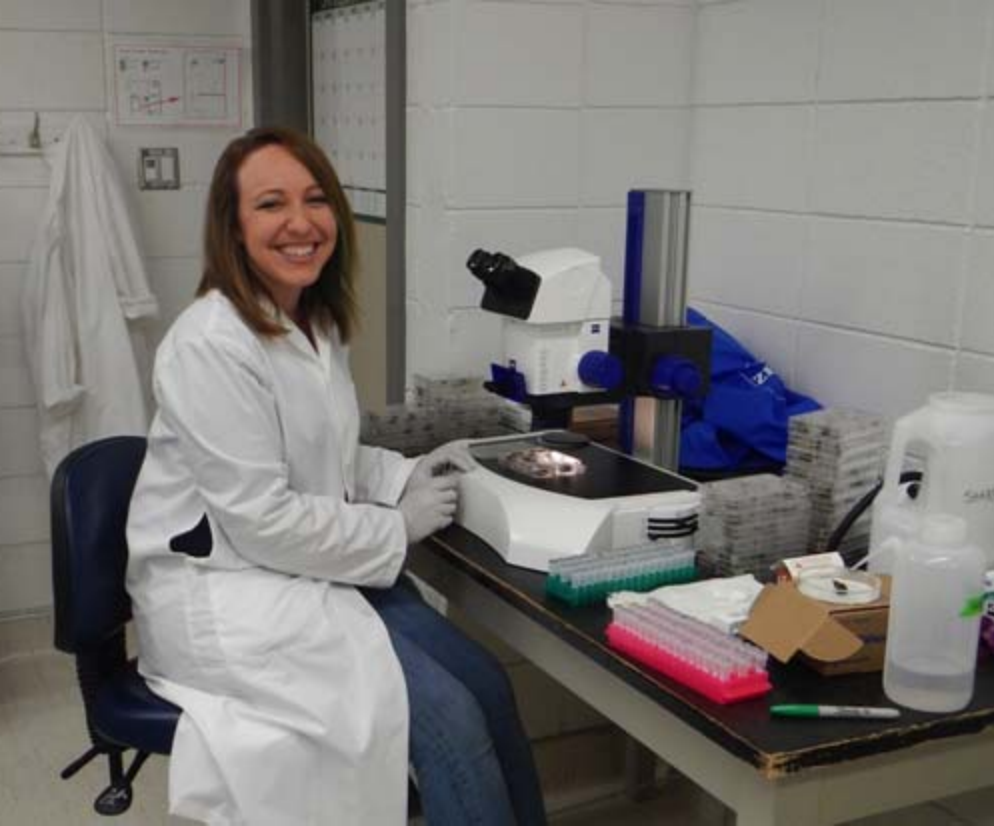
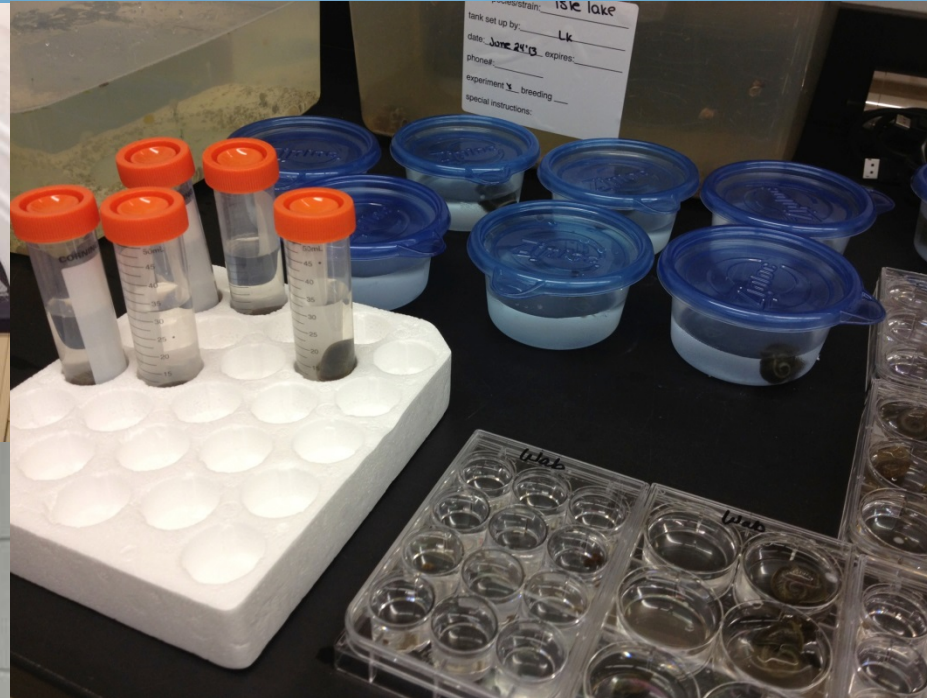


# Collecting methods





# Lab Processing





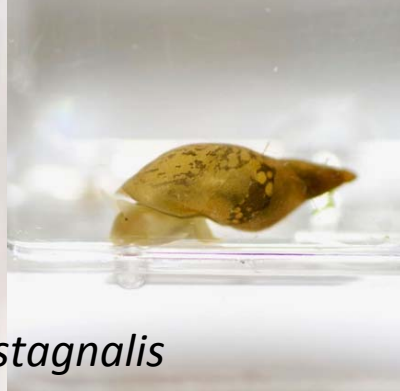
# Snail species



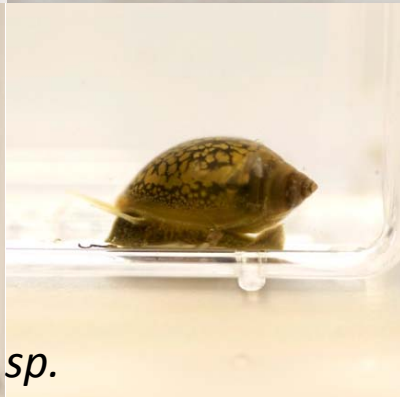
*Stagnicola elodes*



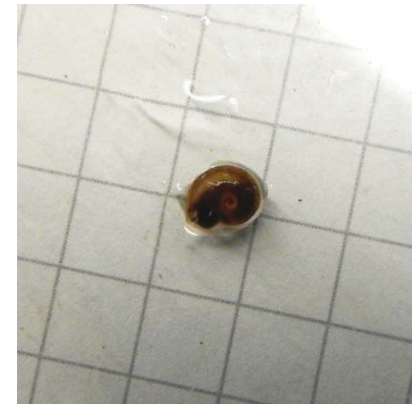
*Lymnaea stagnalis*



*Physa sp.*



*Heliosoma sp.*

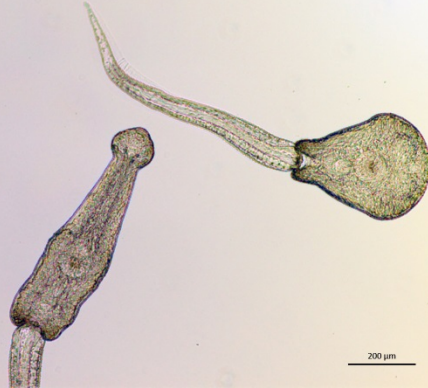


*Gyraulus sp.*





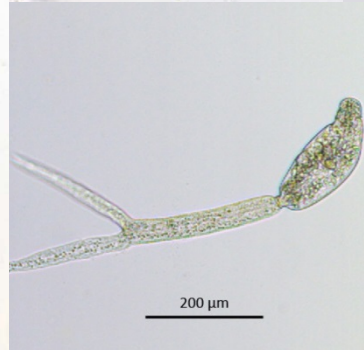
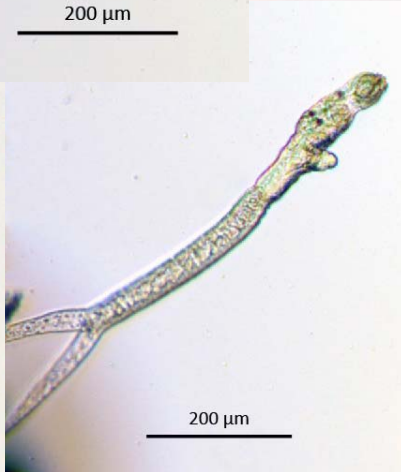
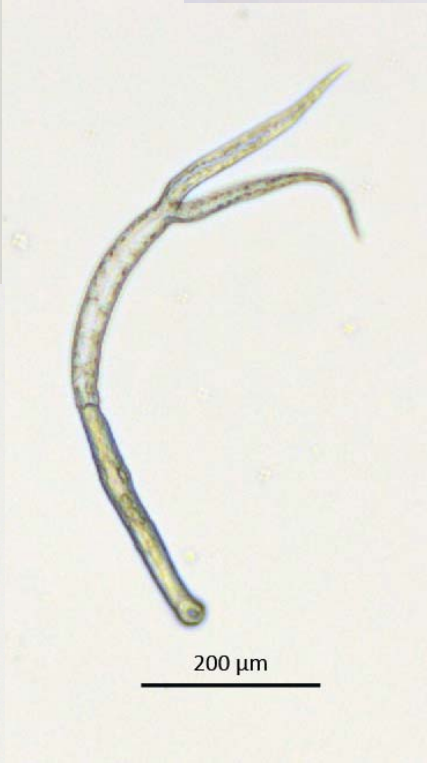
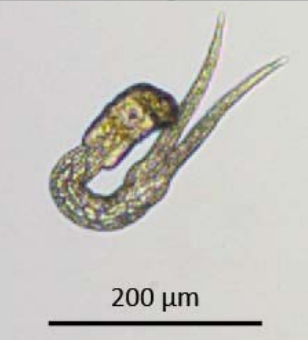
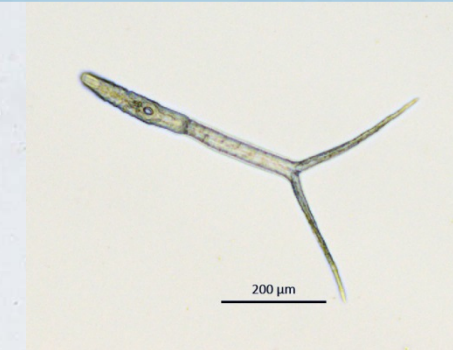
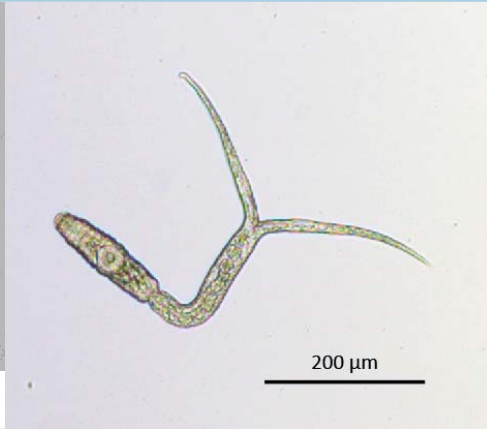
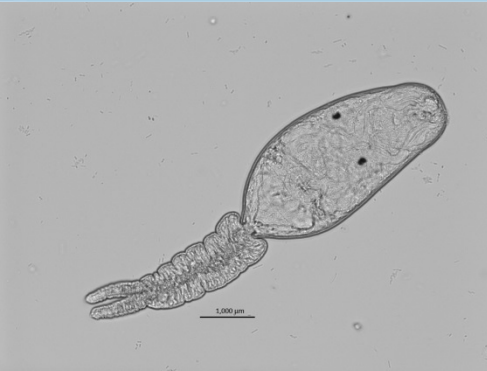
# Trematode species







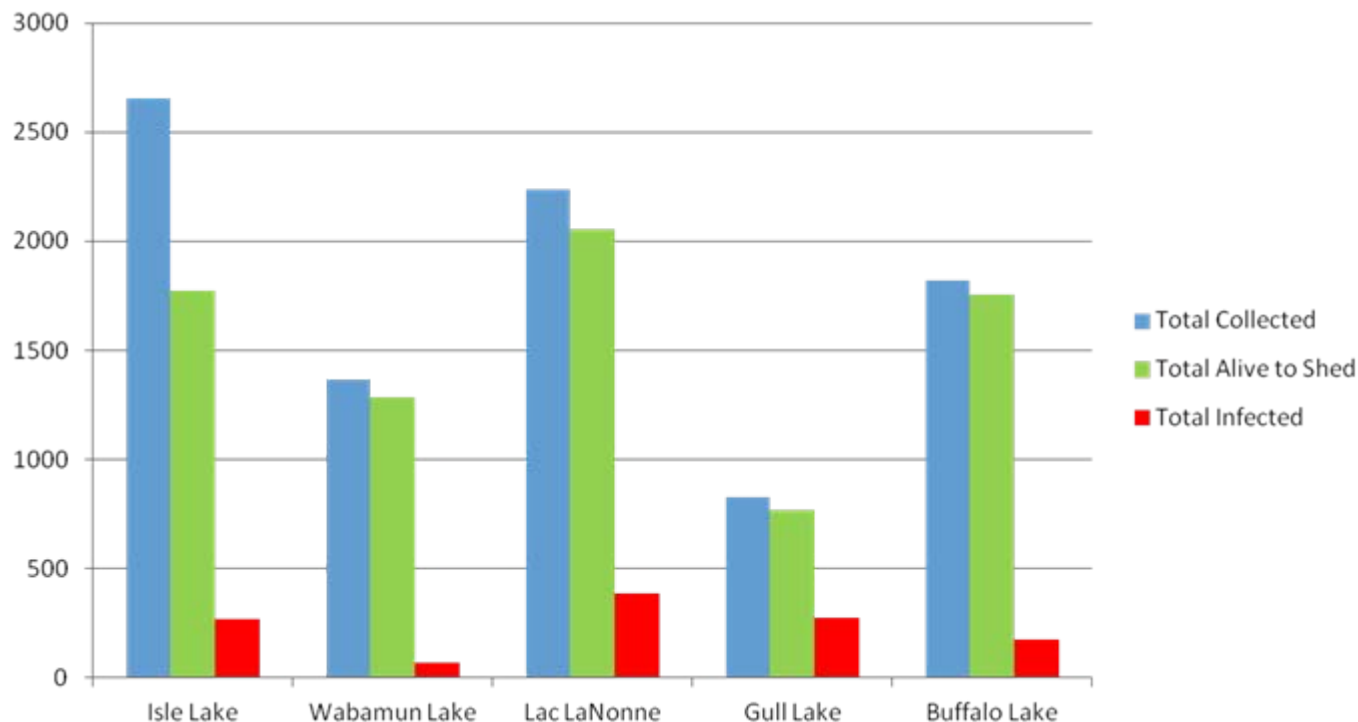
# Trematode species





# Preliminary Results from Season 1

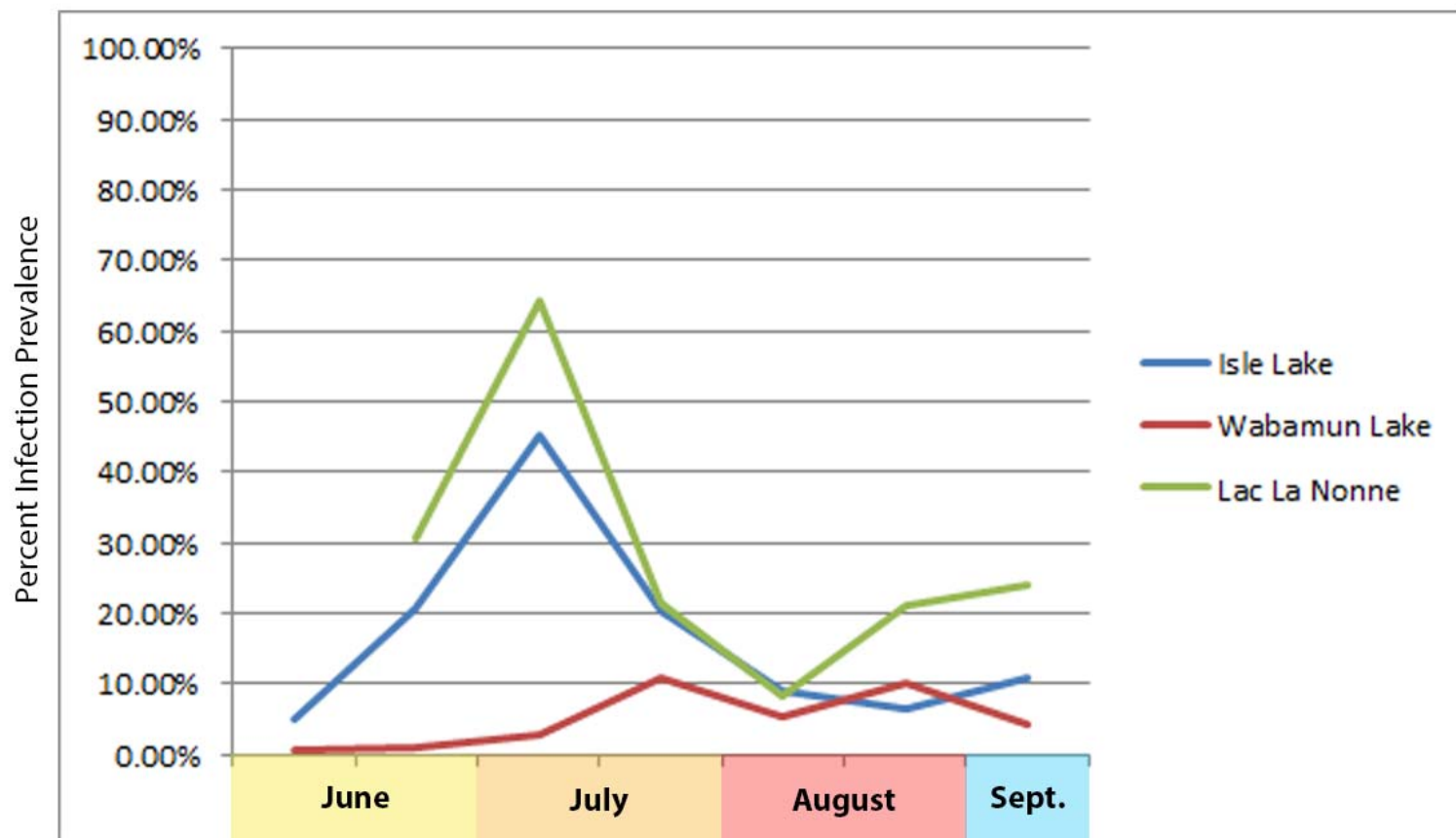
Site Name	Total Collected	Total Alive to Shed	Total Infected	Total %Prevalence
Isle Lake	2653	1772	271	15.29%
Wabamun Lake	1370	1287	69	5.36%
Lac LaNonne	2236	2056	387	18.82%
Gull Lake	829	771	273	35.41%
Buffalo Lake	1822	1756	174	9.91%
<i>Total Overall</i>	<i>8910</i>	<i>7642</i>	<i>1174</i>	





# Preliminary Results from Season 1

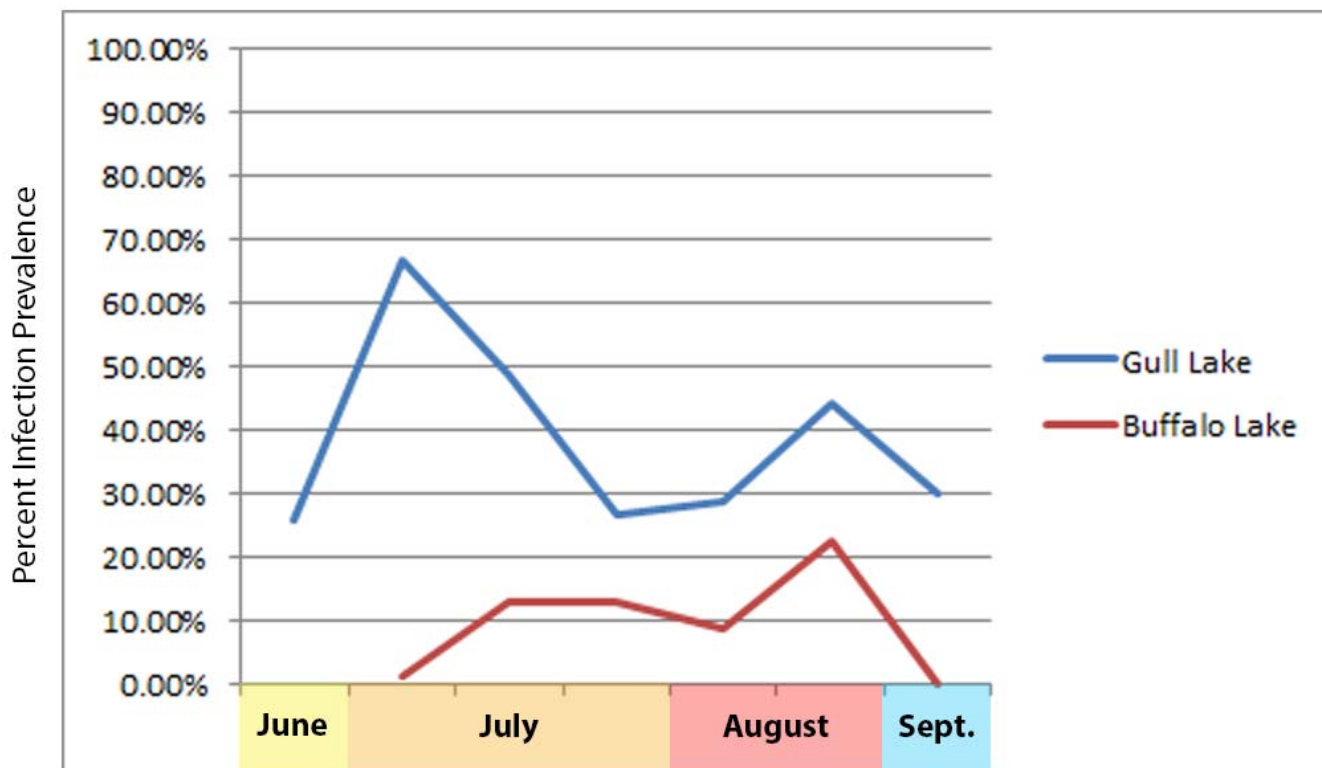
Seasonal Changes in Infection Prevalence of Western Lakes





# Preliminary Results from Season 1

Seasonal Changes in Infection Prevalence of Southern Lakes





# Swimmer's Itch Search Trends

swimmer's itch  
Search term

United States

Canada

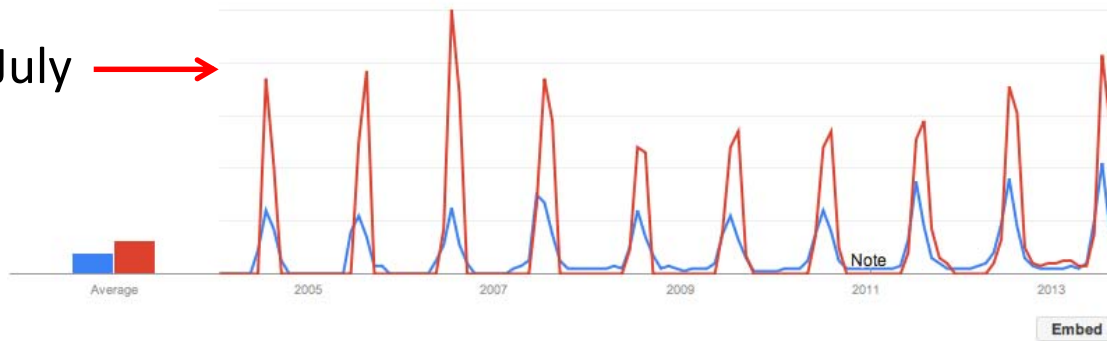
+ Add location

Interest over time ?

☐ News headlines ?

☐ Forecast ?

Peaks all in July →



Regional interest ?

United States **Canada**



Subregion   City	
Manitoba	100
British Columbia	88
Alberta	55
Ontario	27







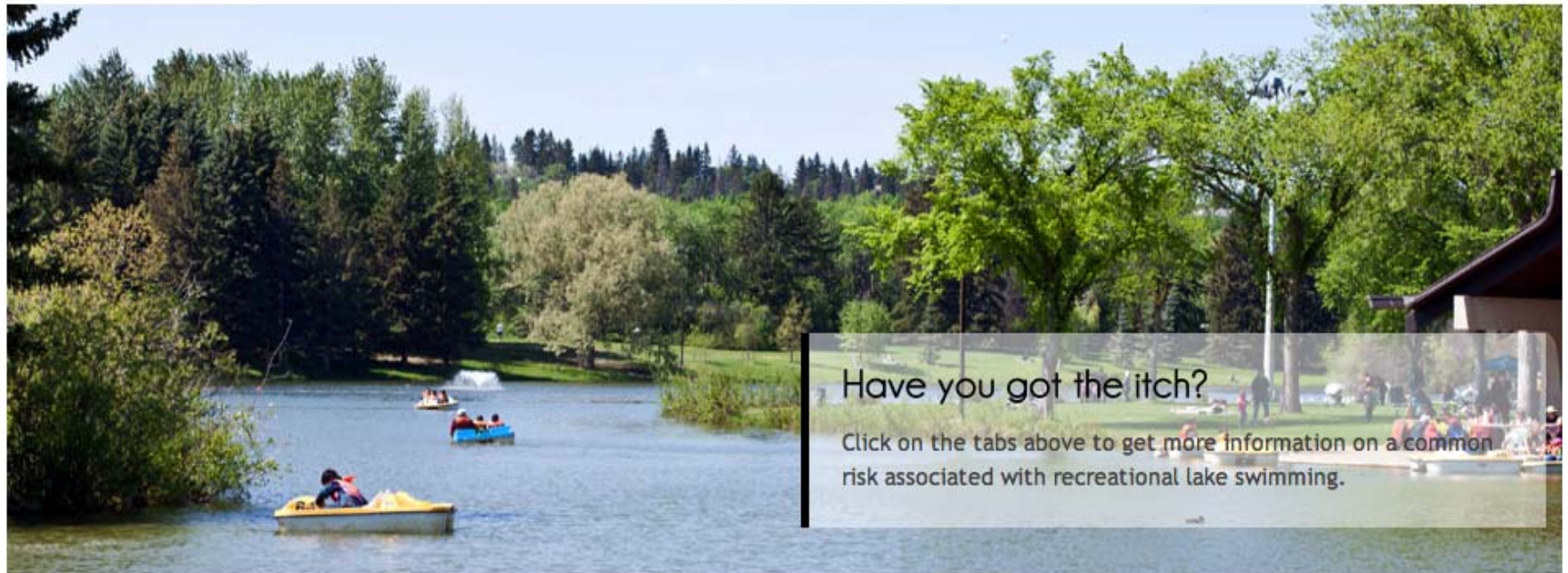
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- 1. In Alberta, which species are serving as hosts to swimmer's itch causing trematodes?
- 2. What lakes are affected and how many people experience swimmer's itch each year?
- Snail and trematode survey of high-use recreational lakes in Alberta.
- Swimmer's itch survey on an informational website, [swimmersitch.ca](http://swimmersitch.ca)





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Have you got the itch?

Click on the tabs above to get more information on a common risk associated with recreational lake swimming.

## Get the Latest Information on Swimmer's Itch Outbreaks in Lakes across Canada

Welcome to our website! We hope you find the information here helpful in deciding when and where to swim this season. Please keep checking back, as we will continuously update the information as we gather it through our field collections and lab analysis.



# SWIMMERSITCH.ca



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Home » [Report Your Itch!](#)

The information gathered from this survey will be used to record and report current swimmer's itch outbreaks across Canada and help us in predicting future outbreaks, so we can better inform the public. Because we do not ask for your name or other personal information, you will remain anonymous. However, if you would like to be updated on current conditions and join our e-mail list, please provide your e-mail address in the comments section below. You can also follow us on Twitter!

For the purpose of clarification, we will define Swimmer's Itch, also known as Cercarial Dermatitis as the following:

"An itchy, red, raised rash usually characterized by small reddish pimples that appears after time spent in lakes or ponds. Symptoms can start within a few minutes to 48 hours after being in the water."

## Survey

\* Date you contracted swimmer's itch:

\* Did someone you know also contract swimmer's itch on the same day?

- ☐ Yes  
☐ No

\* Name of lake/water body:

## Did You Know...

Alberta Has **73** Provincial Swimming Areas?



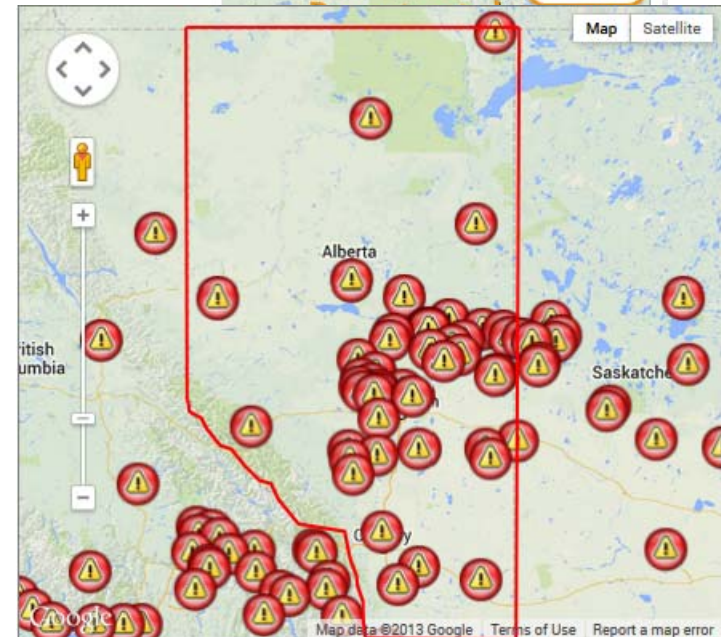
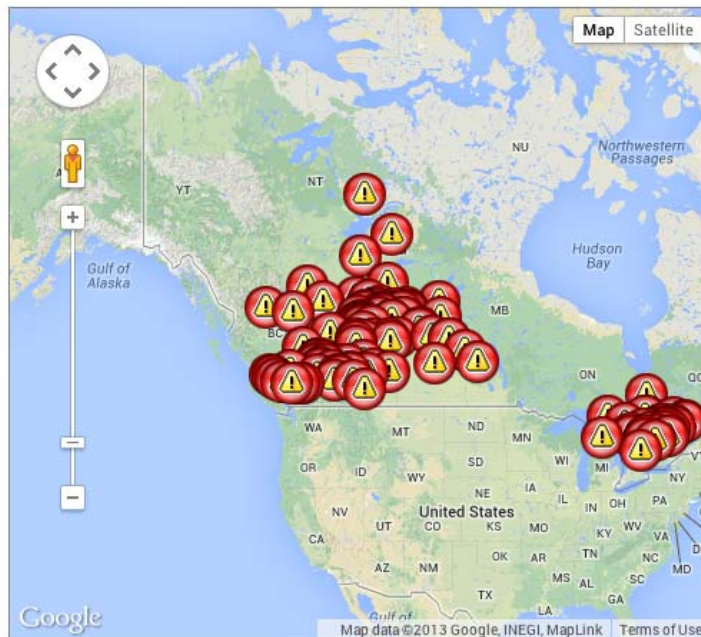




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## Home » Risk Map

The map below displays markers to show where swimmer's itch has been reported in Canada. Click on the marker you are interested in for further information. Please note that these reports have been generated through the use of our online survey, found on the "Report Your Itch" tab on the home page. Some of these lakes we are able to investigate for the presence of the parasite that causes swimmer's itch for confirmation purposes, but at most lakes we are unable to do this.



Lost Lake, Ontario: reported August 8 2013

Pigeon Lake, Alberta: reported July 2 2013, July 6 2013, July 10 2013, August 4 2013, August 11 2013, July 19 2013, August 6 2013, August 8 2013, September 2 2013, and September 1 2013

Suffern Lake, Saskatchewan: reported July 2 2013

Bass Lake, Ontario: reported July 20 2013, and August 5 2013

Chilliwack Lake, British Columbia: reported August 4 2013, and August 4 2013

Lac Phillipe, Quebec: reported August 18 2013



# Results from Swimmer's Itch Survey

Province/Location of Report	# Reports	% Total
Alberta	124	42.18
British Columbia	95	32.31
Saskatchewan	32	10.88
Manitoba	4	1.36
Ontario	29	9.86
Quebec	4	1.36
Nova Scotia	1	0.34
Newfoundland	2	0.68
Northwest Territories	1	0.34
United States	2	0.68
<b>Total</b>	<b>294</b>	<b>100</b>

Lake Name	Frequency	% Total
Buffalo Lake	24	19.36
Pigeon Lake	13	10.48
Cold Lake	8	6.45
Wabamun Lake	7	5.65
Moose Lake	6	4.84
Jackfish Lake	5	4.03
Long Lake	5	4.03
Lessard Lake	4	3.23
Lesser Slave Lake	3	2.42
Whitefish Lake	3	2.42

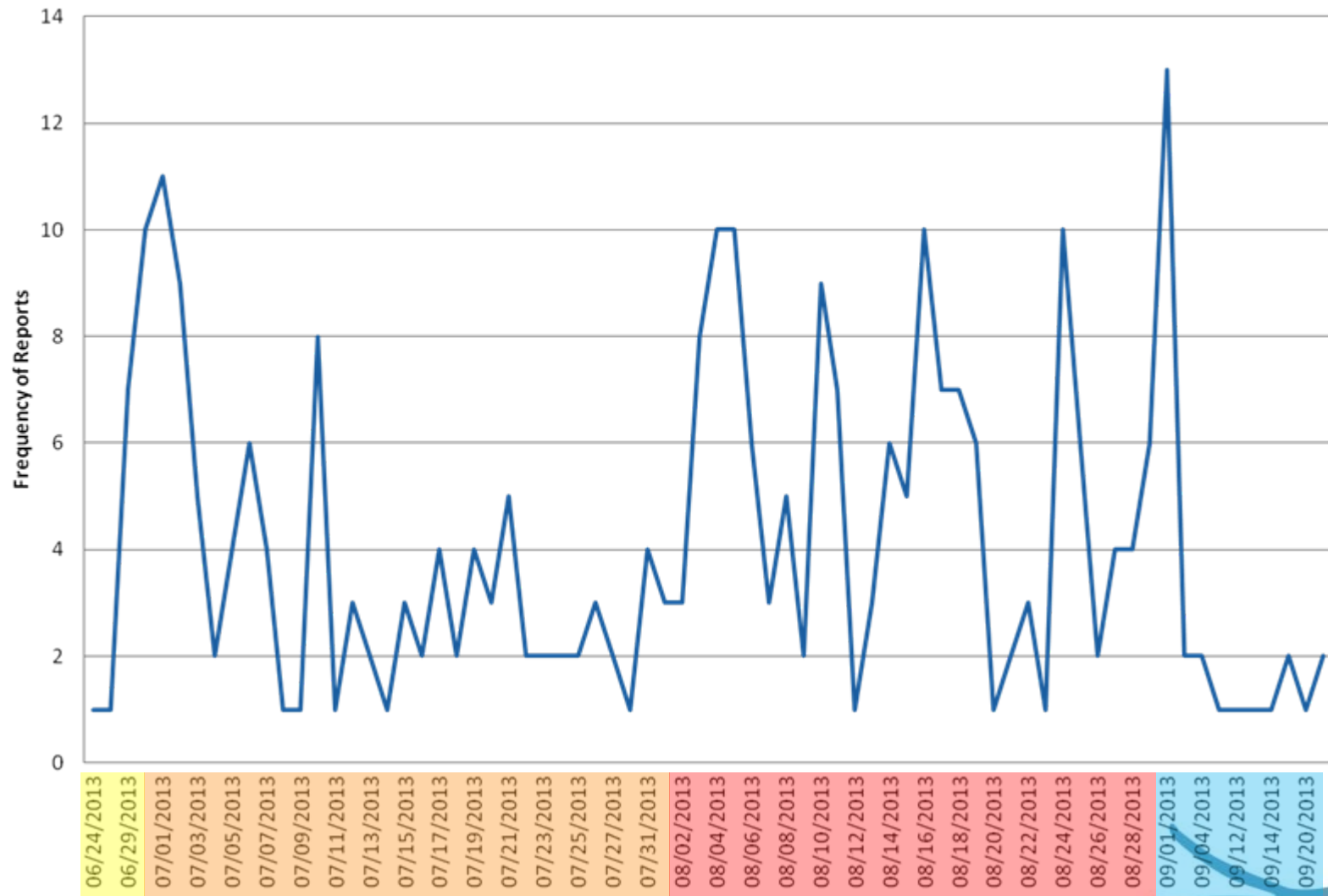
**50 Lakes reported to have swimmer's itch in Alberta**





# Swimmer's Itch Survey Trends

Frequency of Swimmer's Itch Survey Reports throughout Season 1





# Questions and Aims

- 2. What lakes are affected and how many people are affected by swimmer's itch each year?
- 3. What are the transmission dynamics that can be manipulated to reduce the occurrence of swimmer's itch while maintaining a healthy ecosystem?
- Swimmer's itch survey on an informational website, [swimmersitch.ca](http://swimmersitch.ca)
- Experimentally test specific water quality parameters and their affects on infection in snails





## Water Quality



- Using a YSI multiparameter probe, measure during each snail collection:
  - pH
  - Temperature
  - Salinity
  - Dissolved Oxygen
  - Barometric Pressure
- Compare to past reports provided on ALMS website





# Water Quality



Gull Lake –  
Aspen Beach  
Collecting Area

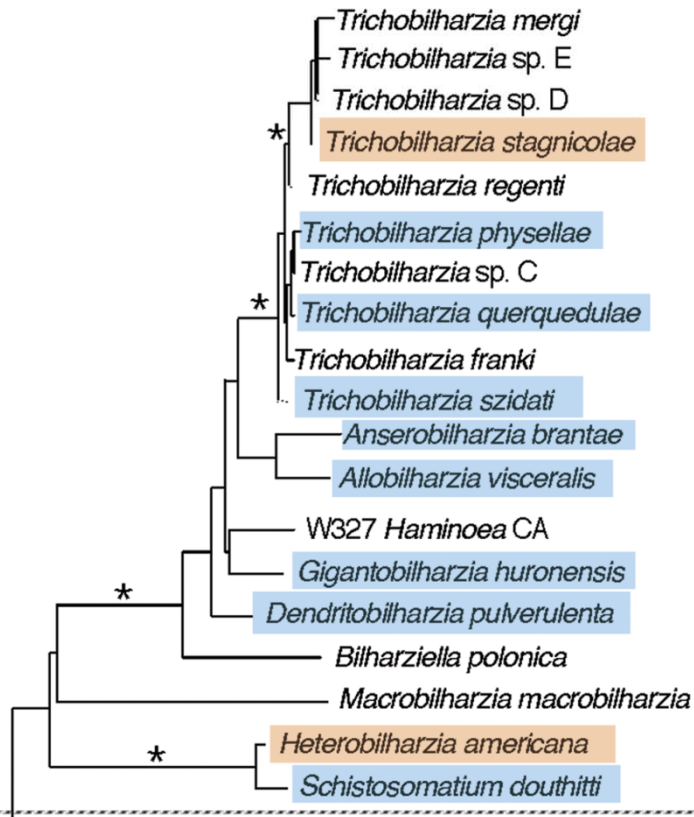


# Some future directions

- Increase our sampling range to better connect swimmer's itch reports with species causing the itch
- Complete water quality experiments
- Collect detailed genome information about Alberta snail species
- Long-term goal of implementing the use of an informational, preventative sign to analyze its effects on reducing swimmer's itch cases












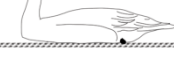










## Swimmer's Itch Causing Trematodes



### Intermediate Host

### Definitive Host

	<i>Stagnicola elodes</i>		Common merganser
	<i>Physa gyrina</i> , <i>Physa parkeri</i>		Bufflehead, Lesser Scaup, Mallard, Canvas back
	<i>Physa gyrina</i>		Blue-winged teal, Cinnamon teal, Northern shoveler
	<i>Lymnaea stagnalis</i>		Mallard
	<i>Gyrulus parvus</i>		Canadian Goose
	?		Whooper Swan
	<i>Physa gyrina</i>		Passerines, Red-winged Blackbird
	<i>Gyrulus parvus</i>		Mallard
	<i>Bakerlymnaea</i> sp.		Canines, Raccoons, Horses
	<i>Lymnaea stagnalis</i> , <i>Stagnicola reflexa</i>		Meadow Vole, Muskrat, Snow Hare

Both intermediate and definitive hosts present in Alberta

Similar genus of intermediate host and same definitive host present in Alberta



# Thank You ALMS!!

Arin MacFarlane Dyer, Bradley Peter, Dana Stromberg, Nicole Meyers, Elynne Murray, and Jared Ellenor

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**Alethe Kabore**



**Sheila Merritt**

