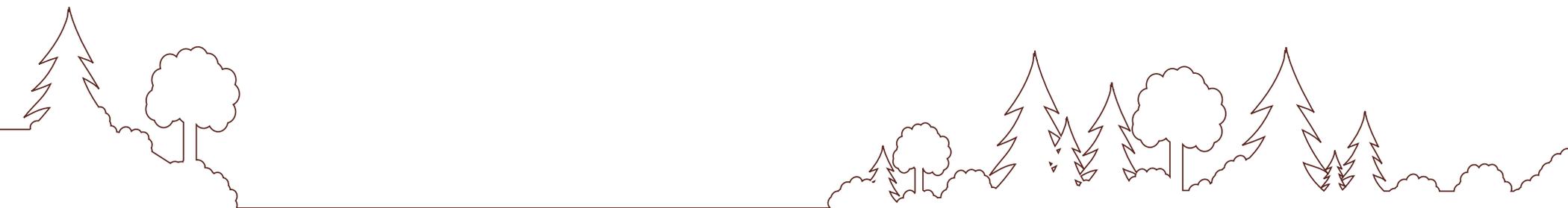




Water Transparency Measuring Protocol

Protocol developed for the Réseau de
surveillance volontaire des lacs (RSVL)
2016
3rd edition



Legal Deposit – Bibliothèque et Archives nationales du Québec, 2016

ISBN 978-2-550-83586-8 (print version, 3rd edition, 2016)

ISBN 978-2-550-83585-1 (PDF, 3rd edition, 2016)

ISBN 978-2-550-55773-9 (print version, 2nd edition, 2009).

ISBN 978-2-550-55772-2 (PDF, 2nd edition 2009)

First edition, 2007

Reference: Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) and Conseil régional de l'environnement des Laurentides (CRE Laurentides), 2016. *Water Transparency Measuring Protocol*, 3rd edition, Québec, Direction générale du suivi de l'état de l'environnement, ISBN 978-2-550-83585-1 (PDF), 9 p.

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Introduction

The present protocol is for lake associations and organizations who would like to take water transparency measurements using a Secchi disk.

Measuring water transparency on a regular basis allows us to track the evolution of this water quality parameter over time. Since a change in water transparency is an indicator of changes in the lake, measuring water transparency is one of the descriptors used to assess lake eutrophication.

CAUTION!
It is important to spread out your measurements over the summer season. For example, avoid taking daily measurements during your vacation and then not taking any over several consecutive weeks. In fact, it is preferable to take fewer measurements, but to cover the entire monitoring period.
There is no point in making more than one observation per week since the RSVL will only keep 20 readings.

Frequency of Measurements

It is recommended that water transparency measurements be taken once every two weeks, from the beginning of June to Thanksgiving. This represents about ten measurements spread out over the monitoring period. This frequency makes it possible to monitor the variation of transparency over the entire summer period, and to make a good estimation of the average transparency of your lake.

Water transparency is an inexpensive measurement, and one that is easy to carry out for the long-term monitoring of your lake. **Transparency measurements should thus be carried out every year in order to obtain time series data.**

What is water transparency?

The exact depth at which a Secchi disk disappears from the observer's view is a measurement of the water's transparency. Transparency is strongly linked to a property of water: transmitting light. Many factors may reduce water transparency. In addition to the intensity of the light, the quantity and nature of the matter and substances in the water play an important role. Suspended matter may be mineral (sand, silt, clay, and inorganic chemical compounds) or organic (microscopic algae, organic debris, and organic chemical compounds) in origin. Organic matter may be present in particulate or dissolved form.

Even though many factors may influence water transparency, we observe that it decreases with an increase in the amount of suspended matter. Since the quantity of algae increases with nutrient concentration, there is a relationship between water transparency and the degree of eutrophication, or trophic status of a lake. For further details, consult the "*La transparence*" sheet found in the "*Trousse des lacs*".

Equipment needed

In order to monitor water transparency, you must have the following equipment:

- A boat supplied with all the equipment necessary to anchor.
- A standard size Secchi disk. A Secchi disk is a 20-cm diameter circular “Plexiglass” or metal disk painted black or white in alternating quarters.
- A rope (graduated or not), and a tape measure (metric system), a clip (clothespin or something similar), and a weight to use as ballast, if necessary.
- The bathymetric map of your lake, if available.



Secchi disk

Location of the Station

Water transparency measurements taken with a Secchi disk are carried out over the deepest zone of the lake. Use the bathymetric map of your lake to locate your station and keep this information because you will always need to return to the same spot. You may also make a note of the geographical location of this station using a global positioning system (GPS), once you are on the lake.

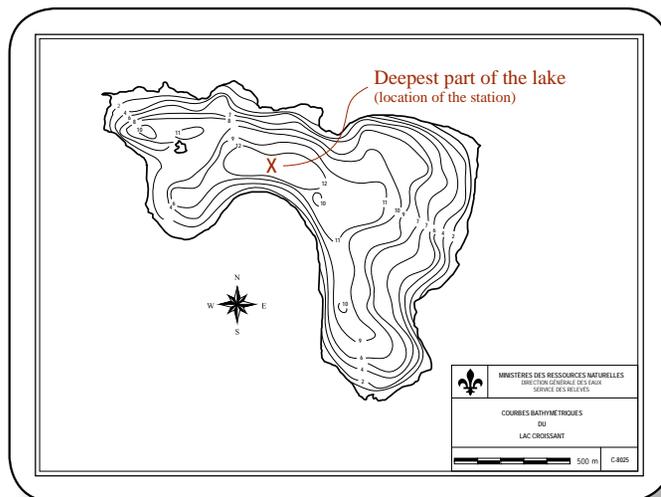
If you do not have a bathymetric map of your lake, set up your station in what is, to the best of your knowledge, the deepest part of the lake. If you have no idea where the deepest zone is, set up your station in the middle of the lake. In both these cases, indicate the location of your station on a topographical map, and if possible, make a note of the GPS coordinates.

In the case of large lakes or lakes of very irregular shape with separate basins, it may be wise to set up more than one measuring station. This makes it possible to get a good over-all picture of the transparency of the water of the entire lake.



Lakes in the Réseau de surveillance volontaire des lacs (RSVL)

The RSVL team positions the measuring station(s) on a map by talking with the participants. The precise location of each station is subsequently confirmed by the volunteer who gives the GPS coordinates to the RSVL.



A bathymetric map indicates, with lines, the depth of a lake in different areas. The closer together the lines are, the steeper the drop.

In the example shown opposite, we see that the deepest part of the lake is close to the middle of the lake.

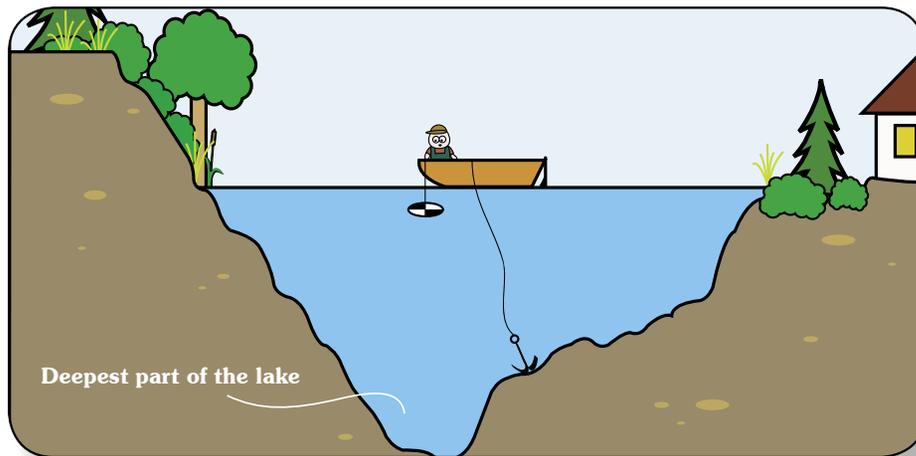
Carrying out the Measurements

Here is the procedure for carrying out your water transparency measurements.

Step 1 Place your boat where your measuring station is located

Anchor your boat where the station is located. If the water is too deep for you to anchor at that location or if your boat drifts, add weight to your disk so that it goes straight down into the water. To do this, a plastic bottle filled with sand will work very well. This extra weight can easily be attached using the eyelet found under the Secchi disk.

Once anchored, wait five minutes for the suspended sediments stirred up from the anchoring manoeuvre to settle and dissipate.



CAUTION!

Water transparency may vary considerably with weather conditions and from observer to observer. Be sure to respect the instructions regarding measurement taking, and try to avoid changing observer. If you must resort to having more than one observer, be sure that their methods are similar, and that their measurements are comparable.

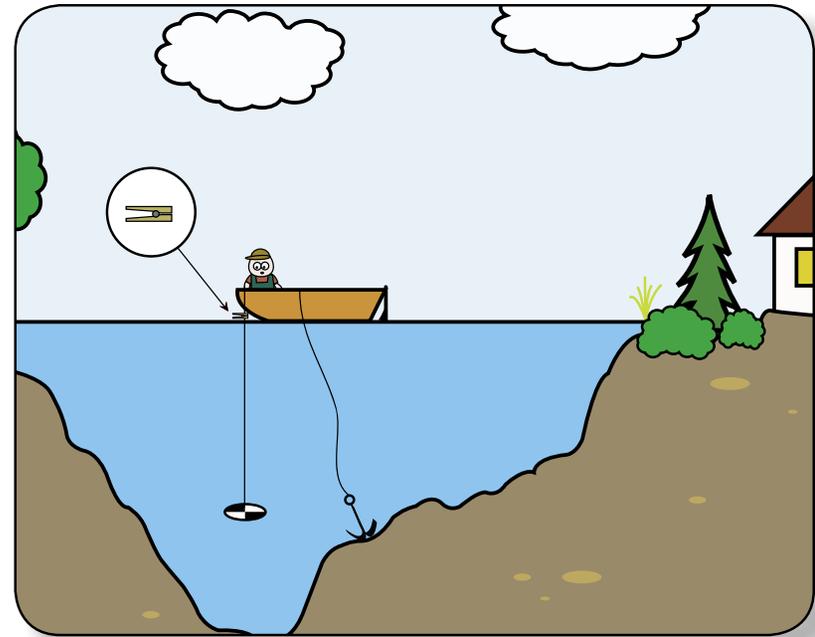
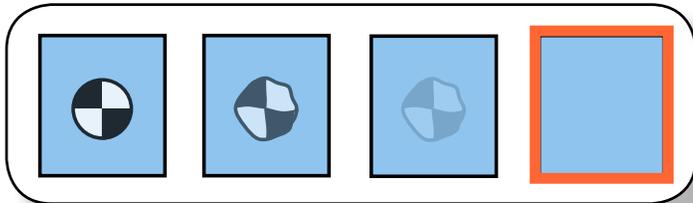
Instructions for taking a transparency reading

Take the measurements between 10 a.m. and 3 p.m. so that the light intensity will be consistent. Avoid windy and rainy conditions, and set up with your back to the sun, in a way that your shadow and that of the boat block the blinding reflections of the sun on the water. All observers should have adequate vision. Therefore, wear your glasses if you need them, and remove your sunglasses because they can reduce your visibility through water.

Step 2

Mark the depth at which the disk disappears

Slowly lower the Secchi disk into the water until you can no longer see it. Raise it back up until it reappears, and lower it again in order to find the exact point where it disappears. Mark this point by putting a clothespin on the rope at the water surface, precisely where the air and water meet.



Shallow lakes

In some shallow lakes, it is possible that the Secchi disk reaches the bottom of your sampling location and still be visible. This means the true Secchi disk reading is greater than the depth of the lake in that particular location. In this case, you must record the depth the disk has reached. It is still important to take at least one measurement per month during the monitoring period (a minimum of four). Transparency may indeed vary over the course of a season, so when you go to take the next measurement you may find that the disk will disappear from sight before it hits the bottom. If this happens, increase the frequency of the measurements in order to comply with the protocol, which provides for one measurement every two weeks.

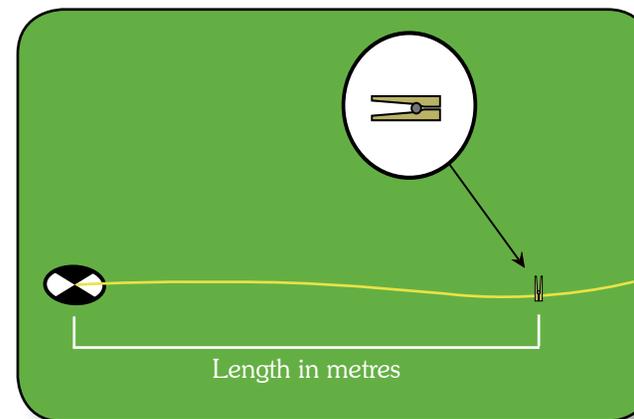
When aquatic plants are abundant and mature, their foliage can negatively impact the transparency measurement. In some cases, the bottom of the lake may be completely covered with plants. As a result, taking a transparency measurement may not be feasible due to plant foliage trapping the disk and preventing it from dropping down. If you encounter such difficulties, it is important to record this information on the data collection sheet in order to alert those responsible for interpreting the measurements.

Suspended sediments may also cause a temporary decrease in water clarity. Violent winds, heavy boating activity and heavy storm runoff are examples of conditions that may suspend sediments. If you are able to associate a lowering of transparency to one of these conditions, it is also important to record it on the data collection sheet in order to bring it to the attention of those responsible for interpreting the measurements.

Step 3

Measure the length of the rope and fill out the data collection sheet

Raise the Secchi disk and measure the length of the rope between the clothespin and the disk. Your measurements (metric units) must be accurate within a tenth of a metre (decimetre). Record the measurement on the data collection sheet, and also indicate the weather conditions and anything else that may have affected your measurement.



Data collection sheet – Transparency

Date (DD-MM-YYYY)	Time	Secchi Disk (metre)	Secchi Disk visible but reaches lake bottom (metres) <input type="checkbox"/> Yes <input type="checkbox"/> No	Weather Conditions								Useful observations			Visibility reduced by			Measurement not possible due to:		
				Sunshine Level				Wind Strength				Recent heavy rain	Numerous watercraft	Different observer	Suspended algae	Suspended particles	Aquatic plants	Surface algae	Aquatic plants	Other (provide details)
							NA	Calm (glassy)	Low (ripples or light waves)	Medium/strong waves	NA									
Ex.: 122-06-19	2:15 PM	4.5	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
1	16-07-24	11:15 AM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	16-06-20	2:25 PM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	16-07-03	12:00 PM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	16-07-19	10:45 AM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	16-08-02	10:30 AM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	16-08-04	1:45 PM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	16-08-29	11:00 AM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8	16-09-10	1:00 PM	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



Lakes in the Réseau de surveillance volontaire des lacs (RSVL)

If your lake is registered with the Program, you must submit your data to the RSVL team at the end of the season. Based on the data, information sheets illustrating the evolution of the water's transparency will be produced by the Ministère.

Data collection sheet – Transparency

Lake Name:		No RSVL:	Current year:
Person(s) taking measurements		Telephone:	
		Telephone:	
GPS coordinates of the measuring station (NAD 83)		Latitude (e.g.: 46.72505113):	
		Longitude (e.g.:75.15491801):	

Date (DD-MM-YYYY)	Time	Secchi Disk (metre)	Secchi Disk visible but reaches lake bottom (metres)	Weather Conditions								Useful observations			Visibility reduced by			Measurement not possible due to:		
				Sunshine Level				Wind Strength				Recent heavy rain	Numerous watercraft	Different observer	Suspended algae	Suspended particles	Aquatic plants	Surface algae	Aquatic plants	Other (provide details)
							NA	Calm (glassy)	Low (ripples or light waves)	Medium/strong waves	NA									
Ex.: 122-06-19	2:15 PM	4.5	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Comments:

NA: not available

*Environnement
et Lutte contre
les changements
climatiques*

Québec 

 **CRE**
Laurentides
Votre réseau environnemental