



A River Runs Through It

Grades 6-8

Most communities in New Brunswick are built along or close to a river. Each river is a water system and an ecosystem combined, offering benefits and sometimes challenges to the diversity of living organisms within its reaches. This learning plan will provide you with opportunities to investigate and learn about rivers in New Brunswick. Some of the activities require a tablet or computer and an internet connection, but others can be completed offline with common household items. Math questions are categorized by grade level. Answer as many as you can, and have fun!

Materials/Resources:

- Pencils, pens, paper
- Dictionary
- Computer or mobile device with internet access (optional)
- For one of the French language activities, you can access a video through idello.org, which requires you to set up a free account using an email address.

River Roundup

Let's start by looking at the parts of a river as it moves from its source to its destination: a lake or ocean. Refresh your knowledge of rivers by watching this [video from MonkeySee on YouTube](#).

Bill Nye the Science Guy has a full episode on Rivers and Streams, and a [summary on his website](#). Check out the big ideas he shares about rivers.

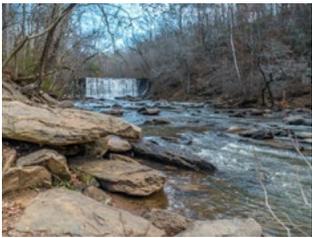
Can you identify the parts of a river? Match the words below the image with the number labels on the image. You may consult the glossary on the next page, which will be especially helpful for English language learners.



Tributary	1	
Mouth	2	
Confluence	3	
Floodplain	4	
Meander	5	
Source	6	
Delta	7	
Downstream	8	

River Vocabulary Glossary

Word	Definition	Picture	Additional Languages	
			<i>From Left to Right: Mi'kmaw, Wolastoqey, French, Arabic, Russian, Somali, Spanish, Chinese, German and Vietnamese</i>	
bank	The land at the side of the river.		kaskipune'k	pempekek
			berge de rivière	رهنلا هفض
			берег реки	wabiga wabiga
			orilla del río	河岸
			Flussufer	bờ sông
basin	The land water goes over to get to a river.		weskitpa'q	pasicuwon
			bassin de la rivière	رهنلا ضوح
			бассейн реки	dooxada webiga
			cuenca del río	流域
			Flussbecken	lưu vực sông
bed	The bed is the bottom of a river. A riverbed can be made of sand, rocks or mud.		siskuik	mocopeq
			lit de la rivière	رهنلا عاق
			русло реки	sariirta webiga
			lecho del río	河床
			Flussbett	lòng sông
canal	A man-made waterway that is used so that boats can transport products.		ppseke'kan	etqe-sukin
			canal	هانق
			канал	kanaalka
			canal	运河
			Kanal	con kênh
current	How strong and fast a river is. Water always flows downhill.		pemitk	ksicuwon
			courant de rivière	رهنلا راييت
			речное течение	wabiga hadda
			corriente de río	河水
			Flussströmung	dòng sông

Word	Definition	Picture	Additional Languages	
			<i>From Left to Right: Mi'kmaw, Wolastoqey, French, Arabic, Russian, Somali, Spanish, Chinese, German and Vietnamese</i>	
confluence	The joining of two rivers.		niktue'k	astuwicuwon
			confluence de la rivière	رمن لاءاقتلا
			слияние реки	isku-haynta webiga
			confluencia fluvial	河汇合
			Zusammenfluss des Flusses	ngã ba sông
delta	A big muddy area where some rivers meet the sea.		keskapekiaq	elomocokek
			delta du fleuve	انتل دلا رمن
			дельта реки	wabiga delta
			rio delta	三角洲
			Flussdelta	sông ngòi
downstream	The direction that the water flows, downhill towards the sea.		papkitk	papkiye
			en aval	بصم
			вниз по течению	gunta hoose
			río abajo	下游的
			Stromabwärts	hạ lưu
erosion	A fast flowing river can break the riverbank and make the river bigger.		ejiklapuek	monamkepawe
			érosion	ةيروعنتلا
			эрозия	nabaad guur
			erosión	侵蚀
estuary	Where a river meets the ocean and they mix together.		esatapa'q	pisipiqe
			estuaire	بصم
			устье реки	estuary
			estuario	河口
			Mündung	cửa sông
floodplain	The flat area around a river that can get flooded when the water gets too high.		elepma'q	kempek
			plaine inondable	ةيضي فيل لوسلا
			пойма	daadad
			llanura de inundación	泛滥平原
			Auen	vùng lũ

Word	Definition	Picture	Additional Languages	
			<i>From Left to Right: Mi'kmaw, Wolastoqey, French, Arabic, Russian, Somali, Spanish, Chinese, German and Vietnamese</i>	
meander	A curve in the river.		milewomkitk	amonicuwon
			méandre de la rivière	رهنلا جرعت
			река меандр	maro wabiga
			meandro del río	河曲
			Fluss Mäander	uốn khúc sông
mouth	The end of a river where it meets the sea, another river or a lake.		wekopa'q	nutecuwon
			embouchure de la rivière	رهنلا عبنم
			устье реки	afka wabiga
			la boca del río	河口
			Flussmündung	cửa sông
silt	Dirt that moves in the water.		epetkutqoyek	tupqanpekiye
			limon	نيط
			ил	dillaacday
			limo	淤泥
			Versanden	phù sa
source	Where the river begins.		wejtk	maciyapekon
			la source	ردصم
			источник	isha
			fuelle	资源
			Ursprung	nguồn
stream	A small river.		sipu	sipuhsis
			courant	رايت
			поток	durdur
			corriente	流
			Strom	suối
tributary	A small river or stream that joins a big river.		piskuitk	nutecuwon
			affluent	دفارلا
			данник	taliye
			afluente	支流
			Nebenfluss	phụ lưu

Additional multilingual science glossaries are [available from this website](#).

A Water Cycle Experiment

Rivers are **freshwater** systems, whose main source of water is precipitation (rain and snow) from the atmosphere. Fresh water contains less salt than ocean water. Refresh your knowledge of the water cycle by watching this [video from NASA](#). Now, try to create your own water cycle by performing the experiment below.

Why is rain not salty?

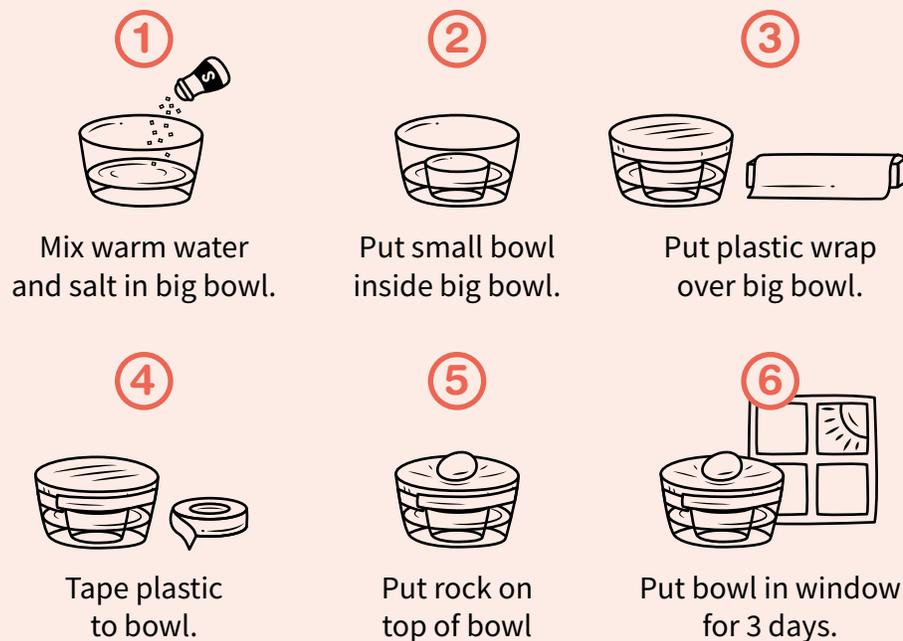


To see how your experiment imitates parts of the water cycle, watch this [similar experiment on YouTube](#).

You will need:



Steps:



What do you see?

The sun will warm the water in the bowl. Look at the bowl each day for 3 days. Taste the water in the small bowl.



What do you see?



What do you taste?

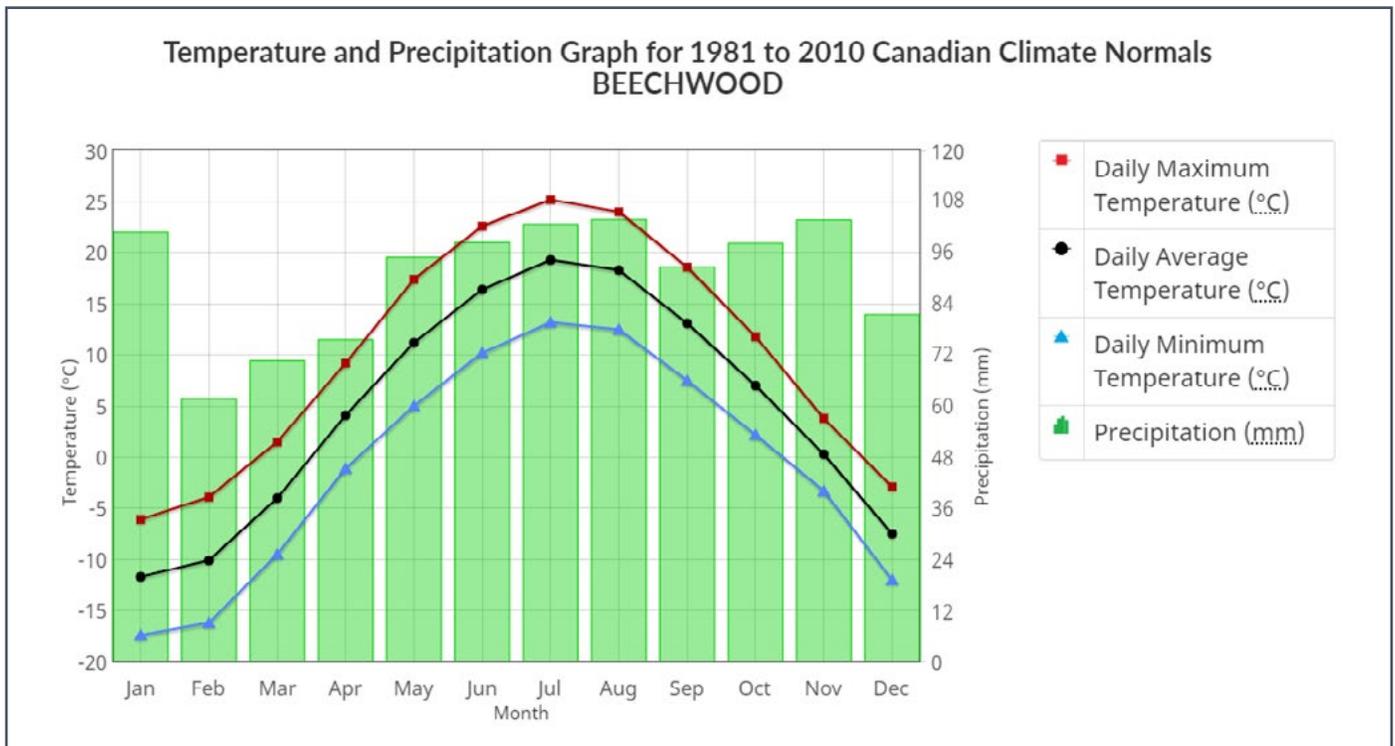


What do you feel?



How's the weather?

Examine the following graph of average monthly temperature (°C) and precipitation (mm) for a community in the Saint John River Basin. Answer the questions that follow.



Source: [Environment Canada](#). Precipitation scale modified.

Gr 6-8

1. What month has the least amount of precipitation?
2. What month has the greatest amount of precipitation?
3. What is the difference in the greatest and least amount of precipitation?
4. What month has the lowest average temperature?
5. What month has the highest average temperature?
6. What is the difference in the highest and lowest average temperature?

Gr 7-8

7. What is the range, mean, median and mode of the precipitation in Beechwood over the course of the year?
8. What is the range, mean, median and mode of the average temperature in Beechwood over the course of the year?

Helpful Hints

Range: Find the difference between the highest and lowest number.

Mean: Add the numbers and divide by the total number of numbers.

Median: List the numbers in increasing order. If the data set is an odd number, locate the number in the middle. If the data set is an even number, locate the two numbers in the middle and find their mean.

Mode: Find the number that occurs most often. (There can be more than one mode.)

Gr 8

Environment Canada reports that winter 2020 was 1.4 degrees warmer than normal, but the snow depth at the end of February was above normal by about 20%.

- Using the data above, calculate the actual winter temperature in 2020 (assuming that the overall winter months are Jan-March).
- Using the data above, calculate the average daily precipitation in February 2020.

How deep? How wide?

The main stem of the Saint John River upstream of Edmundston averages 50m wide and 2m deep, and at Fredericton, the river's average width is 750m while its depth is 3m.

Gr 6-8

- What is the difference in the average width of the Saint John River above Edmundston and at Fredericton?
- What is the difference in the average depth of the Saint John River above Edmundston and at Fredericton?

Gr 7-8

- Give five possible widths of the Saint John River upstream of Edmundston, if the average is 50m wide.
- Give five possible depths of the Saint John River in Fredericton if the average depth of the river is 3m.

Gr 8

- What is the percent increase in the width of the river from above Edmundston to Fredericton?
- What is the percent decrease in the depth of the river from Fredericton to above Edmundston?

Helpful Hint

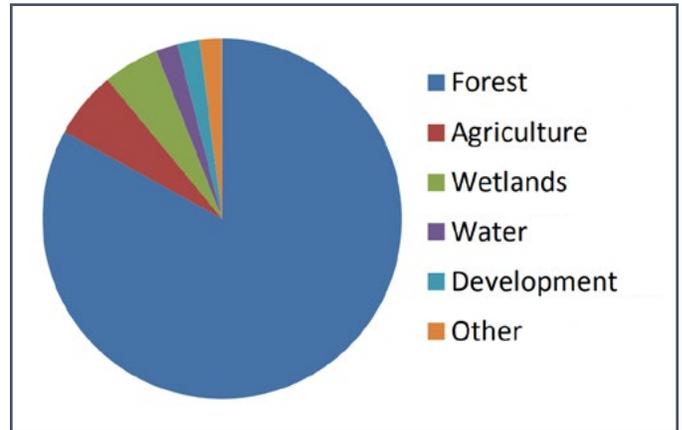
$$\text{Percent change} = \frac{(\text{Highest} - \text{Lowest})}{\text{Original}} \times 100$$

Using the Land

Gr 6-8

1. Approximately what percent of the Saint John River Basin is dedicated to each of the land uses found in the chart below? Fill in the table with your estimates:

Land use in the Saint John River Basin (NB)	%
Forest	
Agriculture	
Wetlands	
Water	
Development	
Other	



Information from [UNB/Canadian Rivers Institute](#)

2. What types of land use could fit in the **Other** category?
3. Since **Forest** is the largest percentage of land use, what industries could this include?

Going Fishing

Fishing licenses go on sale in New Brunswick in April. An adult fishing license costs \$26.45. There are 85 000 adults living in New Brunswick and approximately 30 000 of them will purchase fishing licenses this year. Estimate how much money this will generate for revenue for the province.

Communities on the Saint John River

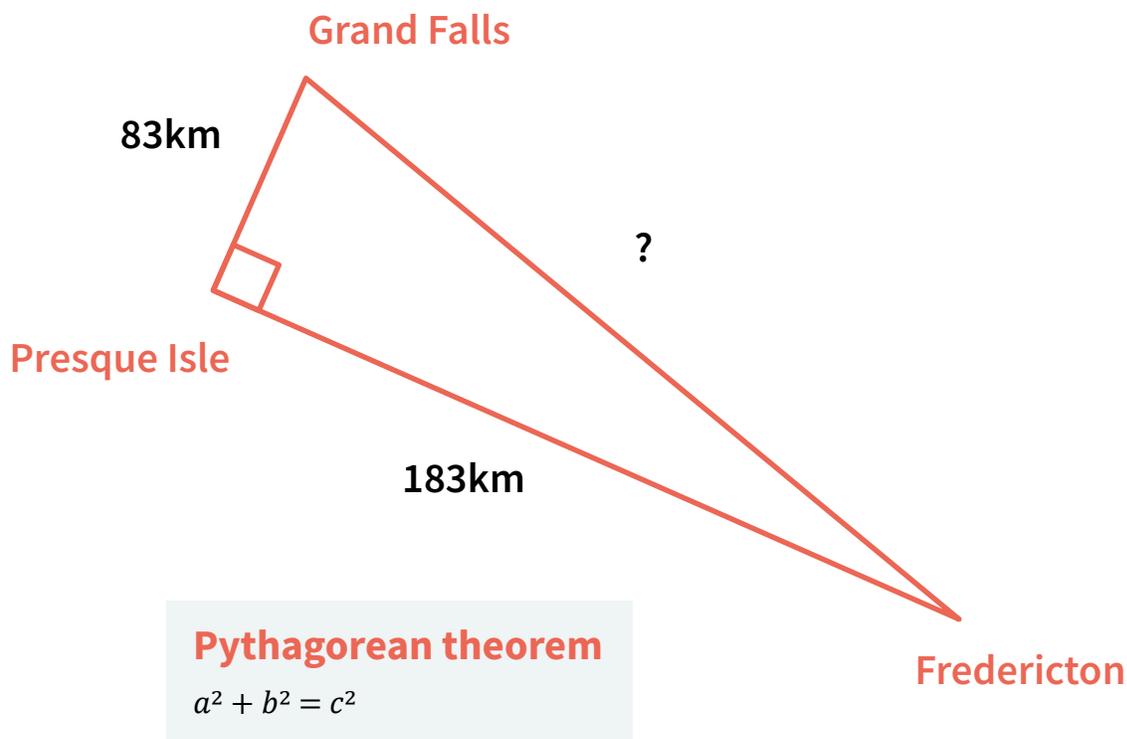
The Saint John River is the second longest river in northeastern North America, with a basin area of more than 55 000 square kilometres. It flows through a large area in Maine and a large area in New Brunswick, with many communities on its banks and nearby. Read more about the Saint John River from this [Canadian Rivers Institute \(UNB\)](#) resource. Pay particular attention to **Section 1.3: General Description of the Saint John River**, and **Figure 1.1: The Saint John River Basin**. Then, answer the following questions:

Gr 6-8

1. What is the definition of **lacustrine**? (You may have to consult a dictionary or the internet.)
2. Name the seven largest communities on the Saint John River Basin.
3. Which of the seven communities is not in Canada?
4. Name the two communities in the highest elevation for the Saint John River Basin.
5. Estimate how many kilometers the province of New Brunswick is from north to south using the scale on the map in Figure 1.1.
6. The green line on the map is the border between New Brunswick and Maine and Quebec. The province of New Brunswick is filled in with an ivory colour. Estimate the percentage of the Saint John River Basin that lies in the province of New Brunswick.

Gr 8

7. Using the driving distances shown in the diagram below, how far is it from Grand Falls to Fredericton?



Waterfalls in New Brunswick

New Brunswick’s rivers and streams offer many hidden waterfalls to discover, as well as several well-known sites. A few are listed below. Examine the table and answer the questions that follow.

Waterfall	Height in metres	Height in feet
Third Vault Falls, Fundy National Park	15.8m	52 feet
Reversing Falls, Saint John	11m (from the underwater ledge to the water’s surface at low tide)	36 feet
Grand Falls Gorge, Grand Falls	23m	75.5 feet
Fuller Falls, Fundy National Park	14.6m	48 feet
St. George Falls, St. George	20.7m	68 feet

- Gr 6-8 1. Place the waterfalls of NB in increasing order. What is the highest waterfall in NB?
- 2. Is there another way we can represent the “height” of the Reversing Falls? (Hint: It is below sea level.)
- 3. If the Reversing Falls is 11m at low tide and the tide rises 8.5m, what is the total depth of the underwater ledge?
- Gr 7-8 4. What is the range, mean, median and mode of the different heights of the five waterfalls? (See the “How’s the weather?” activity for hints on calculating these values.)
- Gr 8 5. What is the percent increase in the size of the St. George Falls and Third Vault Falls?

Flooding and Contaminated Well Water

Following the spring flood of 2019, homeowners who rely on well water in flooded areas were directed to chlorinate their wells. Chlorination is the process of flushing your well and water system with a chlorine solution to kill harmful microorganisms. The table below lists the recommended volumes of chlorine solution for wells of various sizes.

Well Depth (ft)	Vol. of Chlorine Solution (litres) per Diameter of Well		
	4 inch	5 inch	6 inch
less than 50	1	2	3.5
50-100	2	4	7
101-150	3.5	7	10
151-200	4.5	9	13.5
201-250	5.5	11	17
251-300	7	13.5	20.5
301-350	8	16	24
351-400	9	18	27

Source: [Government of New Brunswick](#)

- Gr 6-8**
1. If your well is 225 feet deep with a diameter of 5 inches, how many litres of chlorine solution will you need?
 2. How deep does your (5-inch) well have to be for the recommended volume of chlorine solution to be a multiple of the recommended volume for the 4-inch diameter well?
- Gr 7-8**
3. If the diameter of your well is 6 inches, what is the circumference of the well? $c = \pi d$
 4. What is the mode of litres of chlorine solution used for all three diameters of the well?
- Gr 8**
5. Which well has a greater surface area? Calculate your answer. $A = b \times h$
 A well with a 6-inch diameter and 145 feet deep.
 OR
 A well with a 4-inch diameter and 225 feet deep.
 6. What is the volume of a 333-foot well with a 5-inch diameter? (Let's assume the well has a base and a cap.) $V = \pi r^2 \times h$
 $V = 3.14 \times r^2 \times h$

Sandbag Math

When floods threaten built structures, people often turn to sandbags and plastic sheeting to help keep the water out. Answer the questions below to find out how much work and material this requires.

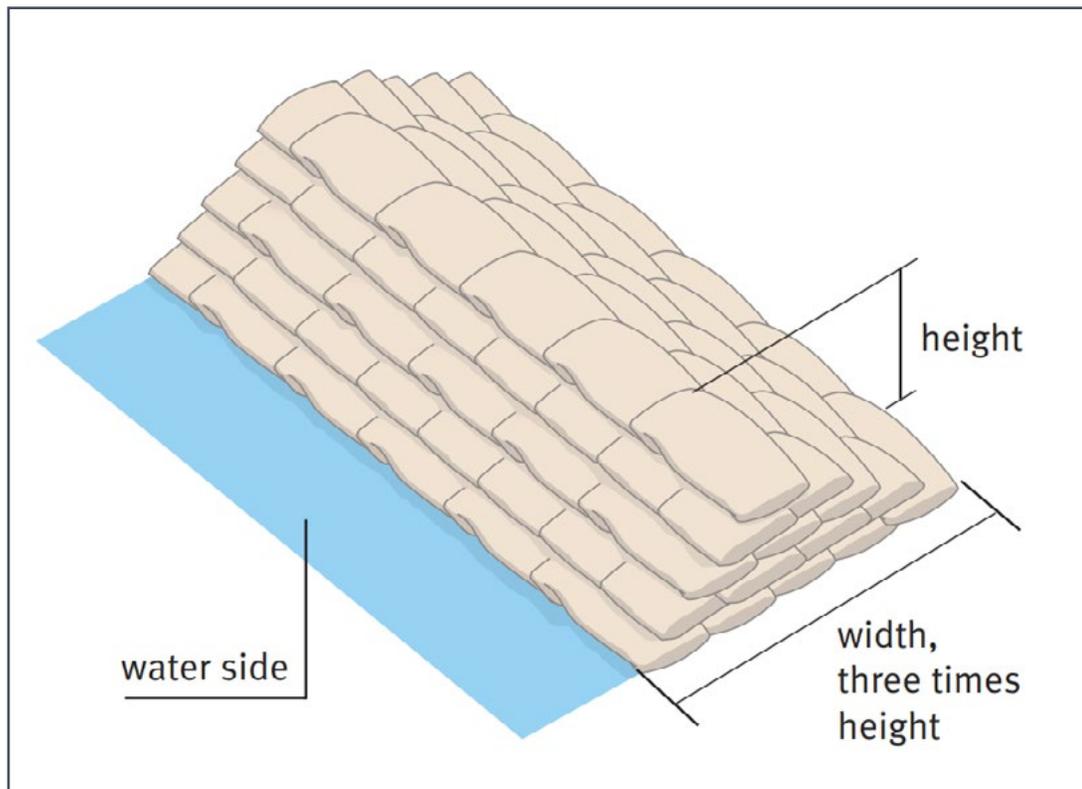
Gr 6-8

1. If it takes 2 people to fill 12 bags in 1 hour, how many bags will they fill in 6 hours?
2. If 1 person can fill 8 bags in 1 hour, how many hours will it take to fill 44 bags?
3. According to the pros, you will need 6 sandbags to keep out 20cm depth of water for a standard door opening (80cm). Each sandbag will need approximately 15kg of sand.
 - a. Use a referent to show/explain how deep 20cm of water is.
 - b. How many kg of sand will you need to protect 2 doors?
 - c. A cubic metre of sand contains about 1600kg. How many bags will this fill?

Gr 8

4. To create sandbag protection that is more than 3 layers high you will need to build in a pyramid style. For the structure to be stable, you should build the sandbag wall 3 times as wide as you need it to be high. One sandbag measures 25cm wide x 52cm long x 10cm tall when filled.

If the sandbag wall is built to protect a garage door that measures 244cm and the height of the wall must be at least 50cm, what is the minimum number of sandbags you will need? (Remember: You cannot use part of a bag.)



[Sandbags and how to use them properly for flood protection](#). Environmental Agency, United Kingdom. 2009.

Mapping Wabanaki Canoe Routes

The Wolastoqiyik (Maliseet) are the First Nations people who lived all along the Wolastoq (Saint John) River in New Brunswick and Maine, and the St. Lawrence River in Quebec. The word Wolastoqiyik means “people of the beautiful river” in their language.

Rivers have played an important role in Wolastoqiyik culture and way of life. One of the many important roles is transportation. Take a look at the CBC article, [Mapping the Wabanaki Canoe Routes of Yesteryear](#), to learn how hundreds of rivers, creeks, and streams made up the highways used for centuries by First Nations communities for trade and travel using birch-bark canoes.

- Gr 6-8**
1. Find out how UNB researcher Chris Shaw uses 21st century technologies to learn more about how First Nations interacted with these waterways. **How did the seasons affect travel for Wabanaki peoples?**
 2. Discover why artist Shane Perley-Dutcher believes it’s important to discover more about the river’s impact on culture, community, and daily life. **What can we learn about Wabanaki peoples by studying New Brunswick’s rivers?**
 3. Rivers continue to play an important role in our society and influence our culture and way of life. Transportation is only one of the many ways rivers are used by past and present people. **Can you think of some more?**

Aspect of culture and practice	Observations on the role of rivers
Travel	Canoes, boats, ships Transport cargo to other locations
Economy	
Recreation	
Food	
Art	
Other	
Other	

Diversity of Life: Atlantic Salmon

Atlantic salmon lead a remarkable life! Read about the lifecycle of Atlantic salmon in these resources from the [Atlantic Salmon Federation](#) and the [Canadian Department of Fisheries and Oceans](#). Then, answer the following questions. You might need to consult a dictionary or online resource.

Gr 6-8

1. Define “living things.” What distinguishes living things from nonliving things?
2. Make a list of at least 15 biotic (living) things that exist in our rivers in NB. How many abiotic (nonliving) things can you list? Which list was easier to create?
3. Define “vertebrate” and “invertebrate.” Which category do you belong in? Why? Which category does the Atlantic salmon belong in? Why?
4. Imagine that a human being lived a lifecycle similar to that of an Atlantic salmon. Think about the long-distance travel, the physical changes, the needs, and the dangers that salmon face from the time they hatch to the time they spawn. If the salmon were a thinking, speaking character, wouldn't it make a thrilling movie or novel? Write a journal, short story, or news article that tells the story of a person facing the kind of challenges and adventures that salmon do in their lifetime. Or, tell the story from a salmon's point of view.

A River Career?

Have you ever thought of working with rivers? There is much to discover, preserve, and protect about New Brunswick's rivers and their diverse ecosystems. Use your account with [myBlueprint.ca](#) to explore river-related careers that interest you.

Une nouvelle – Les inondations au Nouveau-Brunswick

Chaque année les rivières et les lacs du Nouveau Brunswick débordent les communautés. Parfois il y a les conséquences extrêmes pour les résidents, les commerces, et les infrastructures. Regardez comment la pluie peut causer des inondations avec [ce diagramme du siteweb 1jour1actu](#).

Vous allez imaginer que vous êtes journaliste et écrire une nouvelle avec le thème des inondations au Nouveau-Brunswick (spécifique à votre région, si possible). Vous pouvez inclure les prédictions pour les niveaux de la mer, les conditions météorologiques, des craintes des résidents, et les restrictions municipales.

Présentation : Vous pouvez communiquer votre nouvelle comme article écrit ou vous pouvez enregistrer la nouvelle comme journaliste à la télévision. Partagez-le avec votre famille ou vos amis.

Active-Toi

Visionnez le vidéo : [Active-Toi, Saison 1 Épisode 20, Lacs et Rivières](#) (Idéllo).

Dans le vidéo, trois jeunes découvrent que les lacs et rivières du Canada sont en péril. Il est, la plupart du temps, impossible de se baigner près des grands centres et encore moins d'en boire l'eau. Les jeunes font une analyse d'eau en ville et découvrent la présence de coliformes néfastes pour la santé. Leur enquête les amène à constater que la situation n'est pas plus rose dans bien des régions rurales, que l'urbanisation menace les écosystèmes qui aident à garder les cours d'eau propres et que les cyanobactéries tuent nos lacs à petit feu. Pour renverser la vapeur, nos trois jeunes patrouillent un lac et informent les plaisanciers des mesures à prendre pour protéger leur lac. Ils fabriquent des savons écologiques, font signer une pétition pour sauver de magnifiques milieux humides grouillant de vie et plantent des arbustes sur le bord de l'eau pour protéger un lac.

Questions à compléter et discuter avec vos familles :

- Pouvez-vous dire comment les plantes comme les arbustes et les arbres aident à prévenir ou à réduire la croissance des algues bleu-vert dans nos lacs et rivières?
- De quelle autre manière pouvons-nous contribuer à réduire la croissance des algues bleu-vert dans nos systèmes d'eau?
- Pensez-vous que les gens utiliseront le nettoyant pour des vitres et le nettoyant tout usage? Pourquoi ou pourquoi pas? Donne deux raisons.
- Fais un ou les deux produits de nettoyage de la vidéo et essaie-les à la maison. Comment se comparent-ils aux produits que ta famille utilise déjà? Utiliserais-tu ces produits? Pourquoi ou pourquoi pas? Donne deux raisons.

Answer Keys

Parts of a River

1. Source
2. Tributary
3. Confluence
4. Meander
5. Floodplain
6. Downstream
7. Delta
8. Mouth

How's the weather?

1. February
2. November
3. 43mm
4. January
5. July
6. 31 degrees difference
7. Using the data below, in mm (your answers may vary slightly)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
105	62	70	76	95	98	102	103	93	98	104	81

Range: 43mm
Mean: 90.6mm
Median: 96.5mm
Mode: 98mm

8. Using the data below, in degrees Celsius (your answers may vary slightly)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
-12	-10	- 4	4	11	16	19	18	14	7	0	- 3

Range: 31°C
Mean: 5°C
Median: 5.5°C
Mode: none

9. -7.3°C (using the above data for Jan, Feb, March)
10. 74.4mm (using the above data for Feb)

How deep? How wide?

1. Width: 700m difference
2. Depth: 1m difference
3. Answers may vary but the easiest would be 52, 52, 50, 49, 48
4. Answers may vary but the easiest would be 5, 4, 3, 2, 1
5. 1400% increase in the width
6. 33% increase in the depth

Using the Land

1. Answers may vary slightly:
Forest 85%
Agriculture 5%
Wetlands 4%
Water 2%
Development 2%
Other 2%
2. Answers will vary. e.g., Desert - land that cannot grow food, people cannot occupy, water is scarce.
3. Answers will vary. e.g., Lumber, sawmills, pulp and paper, newsprint, tissues

Going Fishing

1. \$793 500.00

Communities on the Saint John River

1. Lacustrine means relating to or associated with lakes
2. Fort Kent, Edmundston, Grand Falls, Presque Isle, Woodstock, Fredericton, Saint John
3. Presque Isle
4. Fort Kent, Edmundston
5. Approximately 300km
6. Approximately 40-50%
7. It is 200.9km

Waterfalls in New Brunswick

1. Reversing Falls, Fuller Falls, Third Vault Falls, St. George Falls, Grand Falls Gorge
2. -11m or -36 feet
3. 19.5m
4. Range: 12m or 39.5 feet
Mean: 17.02m or 55.9 feet
Median: 15.8m or 52 feet
Mode: none
5. 24%

Flooding and Contaminated Well Water

1. 11 litres of chlorine solution
2. The first is 151-200 – 4.5, 9, 13.5
Second is 310-350 – 8, 16, 24
Third is 351-400 – 9, 18, 27
3. 18.84 inches
4. The mode is 7
5. The second well: a well with a 4-inch diameter and 225 feet deep
6. $V = 6535.125 \text{ in}^3$

Sandbag Math

1. 72 bags
2. 5.5 hours
3. a. Answers will vary. About the width of a sheet of paper, a stair tread, a step, elbow to wrist
b. 180kg of sand
c. 106 sandbags
4. Wall height: 50cm. Wall width: 150cm. Garage needs 5 sandbags for length and 6 rows wide at base. Therefore you will need 105 sandbags.