

# Studies of Canada for Geography 7–10

## Canada: Beautiful, liveable, but vulnerable

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*The Bow River on its journey from the Rocky Mountains to the sea. Photo: L Chaffer*

### Part 4: THE BOW RIVER WATERSCAPE

**Part 1** in this series of articles “Canada: beautiful, liveable, yet vulnerable” investigated Canada’s landforms, landscapes and biomes and its vulnerability to natural hazards.

**Part 2** was a study of selected Canadian landforms, the geomorphic processes responsible for their formation, associated values and the protection of those values.

**Part 3** investigated Canada’s water resources and its vulnerability to atmospheric and hydrologic hazards such as storms, drought and flood.

**Part 4:** contains three approaches to geographical inquiry into the Bow River catchment using geographical skills and tools

### Geographical inquiry three ways

#### SYLLABUS LINKS

##### **CONTENT: Water in the world**

- How the operation of the water cycle connects people and places
- The quantity and variability of water resources
- The economic, cultural, spiritual and aesthetic values of water for people
- The nature of water scarcity and ways of overcoming

##### **CONTENT: Life skills Water in the world**

- The importance of water for sustaining life a
- The extent to which fresh water is available and accessible.
- Sources of water for human use and the
- Different ways people use water.
- Factors that affect access to fresh water
- Strategies used to preserve water.
- The value of water to different people across the world.

(<http://syllabus.bos.nsw.edu.au/hsie/geography-k10/content/1185/>)

# Canada: Beautiful, liveable, but vulnerable. Part 4: Bow River



The Bow River flowing through the city of Calgary in Alberta, Canada  
<http://www.theglobeandmail.com/news/national/protecting-the-health-of-albertas-bow-river/article26767720/>



The Bow River at Banff Photo: L Chaffer

## GLOSSARY (<http://syllabus.bos.nsw.edu.au/hsie/geography-k10/glossary/>)

**Catchment area:** The area drained by a river or water body. Also known as river basin.

**Groundwater:** Water located beneath Earth's surface filling the spaces between grains of soil or rock.

**Precipitation:** Forms of water falling from the atmosphere to the Earth's surface

**Spatial distribution:** The location and arrangement of particular phenomena

**Water cycle processes:** Physical changes to water that change its state and geographical location.

**Climate change:** A long-term change in regional or global climate patterns eg. annual precipitation, frequency of weather events



The location of Calgary. Screen Capture from Google Earth



## Geographical inquiry three ways

### 1: Independent inquiry

Students analyse SECONDARY SOURCES to answer an inquiry focus question about the challenges to water security in the Bow River catchment.

### 2: Guided inquiry

Students will answer sets of questions based on syllabus headings to discuss an inquiry focus question about water resources in the Bow River catchment.

### 3. Class inquiry: Life skills

The class interpret and discuss visual sources to draw conclusions about water resources in the Bow River catchment and create a visual presentation based on syllabus content and outcomes

## 1. INDEPENDENT INQUIRY

### Inquiry focus question

Why do the water resources of the Bow River catchment need careful management to reduce water scarcity in the future?

### Activities

1. Develop a set of “I need to know” questions (contributing questions) to learn about water resources, their use and management in the Bow River Catchment such as: What is the location of the catchment? What are the main sources of water?
2. Interpret and analyse Sources A – N and use to the weblinks to develop your knowledge and understanding and answer your contributing questions.
3. Communicate your answer to the inquiry focus question in a digital presentation.

Students are encouraged to use spatial technologies as part of their presentation. This could take the form of an elevation profile for the Bow River between Bow Lake and Calgary constructed using **Google Earth** (see Weblinks) OR a digital tour of the Bow River catchment created using **Google Tour Builder**.



Bow Lake at the headwaters of the bow River catchment Photo: L Chaffer

## 2. GUIDED INQUIRY

### Inquiry focus question

Why do the water resources of the Bow River catchment need careful management to reduce water scarcity in the future?

### Activities

1. Refer to Sources A to N to answer the designated questions under each syllabus heading
2. In groups discuss the answers, collaboratively mind map key ideas and contribute to a class discussion.
3. Teacher models writing an explanation that includes evidence and visual materials.
4. Students answer the inquiry focus question

## GUIDED INQUIRY ACTIVITIES

### Water resources

*Students investigate the characteristics and spatial distribution of water resources in the Bow River catchment by identifying different forms of water used as resources and examining the spatial distribution of water resources*

Refer to Sources A – C, Source G

1. Describe the location and dimensions of the Bow River and its catchment using mapping concepts such as latitude, longitude, direction, area and distance.
2. Identify the types of water resources found in the Bow River catchment
3. Identify evidence that the amount of water in the Bow River varies over time
4. List the Google earth satellite image and sources A and B from the largest to the smallest scale. Why is it important for a study of the Bow River catchment to study maps at different scales?

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## The water cycle

*Students investigate how the water cycle connects people and places in the Bow River Catchment by explaining how water flows within the catchment. They examine of factors influencing water flows and water availability.*

Refer to Sources C, D and Google Earth

5. Use Google Earth tools to create an elevation profile for the Bow River between Bow Lake and Calgary (see Weblinks). Identify the different landforms along your elevation profile.

Refer to sources D – F

6. Bow River water flows from the mountains to the sea. Explain what this means by tracking the path of the river from its source to its mouth.
7. Suggest factors that would influence flows of water in the catchment such as topography.
8. Discuss factors that could influence the availability of water in the city of Calgary in one year.

## The value of water

*Students investigate the economic, cultural, spiritual and aesthetic values of water for people in the Bow River catchment by describing ways water is used by people.*

Refer to sources H, I and the photographs

9. Identify and rank the main uses of water in the Bow River catchment
10. List examples of economic, cultural, spiritual and aesthetic values of water for people living in the catchment. Explain two of these values.

## Water scarcity and water management

*Students investigate the nature of water scarcity and ways of overcoming it by describing causes of water scarcity in the Bow River catchment in Canada. They assess of strategies used by governments, individuals and communities to overcome water scarcity by managing water sustainably and propose individual actions that can contribute to water management*

Refer to sources J–L

11. As a class discuss the concept of water scarcity and the general causes of water scarcity. Create a mind map to summarise key ideas.
12. Describe THREE potential causes of water scarcity in the Bow River Catchment

Refer to sources M and N

13. In small groups explain how the actions of either an individual, a community in the Bow River Catchment OR the government of Alberta can

cause water scarcity but also contribute to the better management of water resources.

14. Class debate: Which actions would contribute most to future water scarcity?

Which actions (individual, community or government) would have the greatest impact on the sustainable use of water resources to reduce water scarcity in the future?

## 3. CLASS INQUIRY: Life Skills/ Learning Difficulties

Classes complete introductory activities to locate the Bow River catchment and discuss the flow of water within it. The following activities can then be completed as a class, in small groups or individually. Use discussion to clarify knowledge, understanding and skills.

### Introduction

1. Complete the following activities as a class using Google Earth and Sources C, D and E:
  - Use Google Earth to locate Canada, the city of Calgary, Lake Louise and Banff.
  - Compare the location of Canada and Australia
  - Observe and describe the landscapes around Calgary that can be seen in the satellite image eg. Mountains, valley and plains
  - Discuss whether water flows from Lake Louise to Calgary or from Calgary to Lake Louise
  - Study the diagram of the Bow River and its catchment Source E.
  - Explain a catchment and discuss where water from the Bow River catchment ends up.
  - Examine the climate graphs in Source C. Discuss the link between precipitation and amount of water in the Bow River at each place.)

### Water availability

*Students investigate sources of water in the Bow River catchment and examine the water cycle. They explore how water is a renewable resource and compare the availability of water as a resource in different places.*

Refer to Source F

2. Use the illustration to discuss the movement of water in the water cycle through different locations
3. Students draw a simple diagram to show the movement of water and name water cycle processes
4. Explain why water is a resource and identify some uses of water in Source F.

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Ice skating on frozen River in Calgary Bowness Park (Sluice Gate, an arm of the Bow River. Source: <https://commons.wikimedia.org/wiki/File:Dilmaghanian00711.JPG>)

## Water for human use

*Students investigate the importance of water in sustaining life and explore different ways in which water is used eg at home, for recreation or in farming. They investigate sources of fresh water for human use.*

Refer to Source I

5. Students work in pairs to describe three ways water from the Bow River is used by people.
6. Refer to the graph in Source H to rank the main uses of water from highest to lowest

## Factors affecting water accessibility

*Students explore how people's activities and actions affect access to fresh water eg water storage and pollution and ways natural hazards affect access to fresh water eg drought. They recognise that access to fresh water is limited.*

Refer to source J

7. Study the diagram to identify FOUR ways that people make it easier to get water for farming, industry and towns.
8. Students recognise what happens to the water after it is used for human activities in this diagram?
9. Mind map some problems that could be caused by people's use of water in the Bow River catchment and how this could affect future water supplies?
10. Discuss if these problems would be the same in other catchments.
11. In small groups students suggest how droughts and floods could affect access to water along the Bow River.

Refer to Source L

12. As a class discuss the purpose of the illustration
13. Students identify three changes to water resources that could mean less water available for human activities in the future (water scarcity).

## Water as a valuable resource

*Students explore the cultural value of water, investigate the economic value of water eg cost of using water within the home and explore the spiritual value of water.*

14. Teacher explains the different values of water.

15. Students identify examples of values using the photographs and selected sources

## Water management

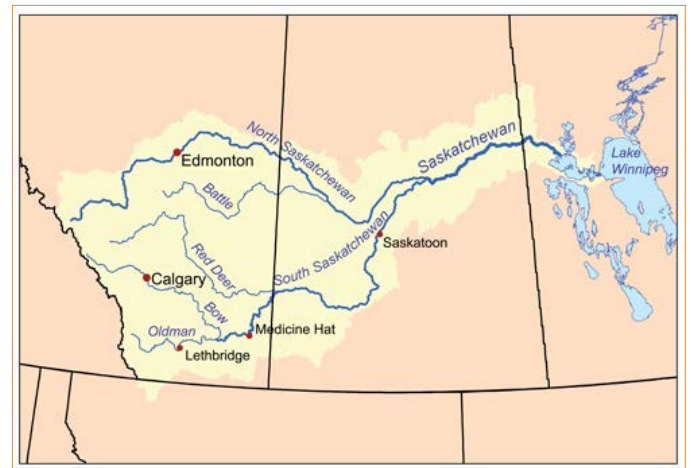
*Students examine reasons why water needs to be preserved and investigate strategies to manage water.*

Refer to sources M and N

16. Student groups study either rural or urban water management to identify the ways water is used badly and carefully. They put these ideas into a table and contribute to a class discussion.

17. Students create a poster that encourages people to use water wisely to avoid problems in the future.

## SOURCE A: Location of the Bow River within the Saskatchewan River Catchment



[https://en.wikipedia.org/wiki/Bow\\_River#/media/File:Saskatchewanrivermap.png](https://en.wikipedia.org/wiki/Bow_River#/media/File:Saskatchewanrivermap.png)

## SOURCE B: Journey of the Bow River



<http://www.theglobeandmail.com/news/national/protecting-the-health-of-albertas-bow-river/article26767720/>



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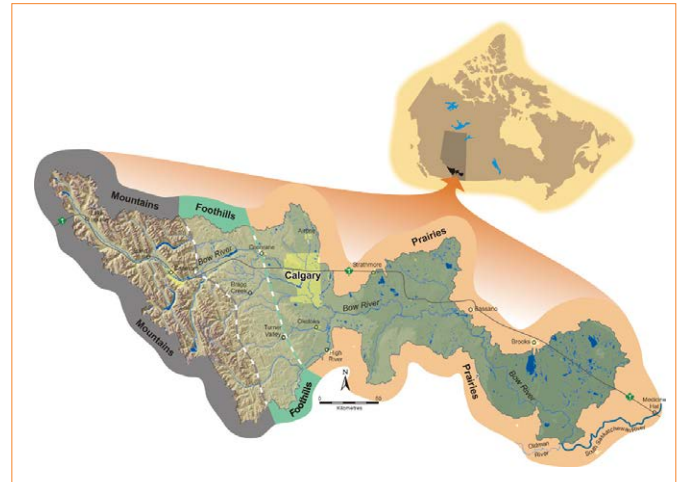
## SOURCE C: Facts and statistics

### a. Basic facts

Feature	Facts
Country	Canada
Province	Alberta
Source	Bow Glacier (Altitude 1,960 metres)
Mouth	South Saskatchewan River (Altitude 700 metres)
Length	587 kilometres
Catchment	26, 200 square kilometres
Discharge	129 cubic metres per second (Average)
	1,640 m <sup>3</sup> /s maximum discharge
	3 m <sup>3</sup> /s minimum discharge

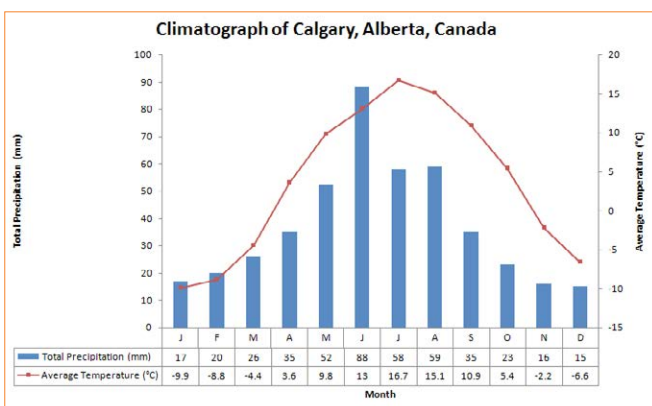
<http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/d8fb41f0-8893-11e0-92bb-6cf049291510#distribution>

## SOURCE D: Topography of the Bow River catchment (Drainage Basin)

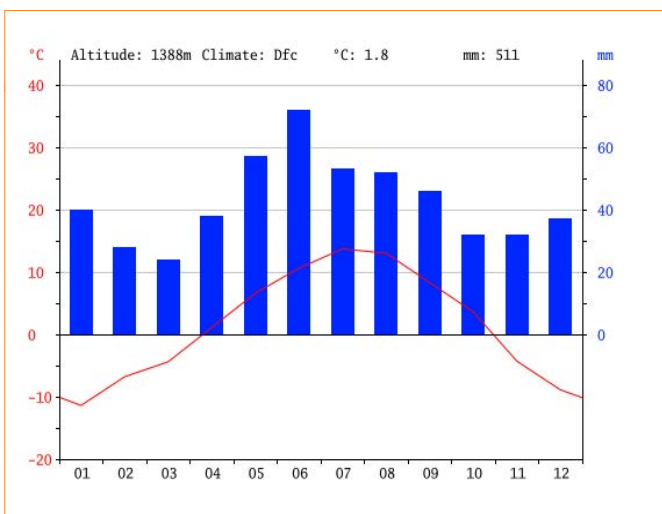


[http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)

### b. Climatic graphs for Calgary and Banff



Calgary: [https://ecozoneexperts.wikispaces.com/file/view/Calgary\\_Climate.png/125443907/Calgary\\_Climate.png](https://ecozoneexperts.wikispaces.com/file/view/Calgary_Climate.png/125443907/Calgary_Climate.png)



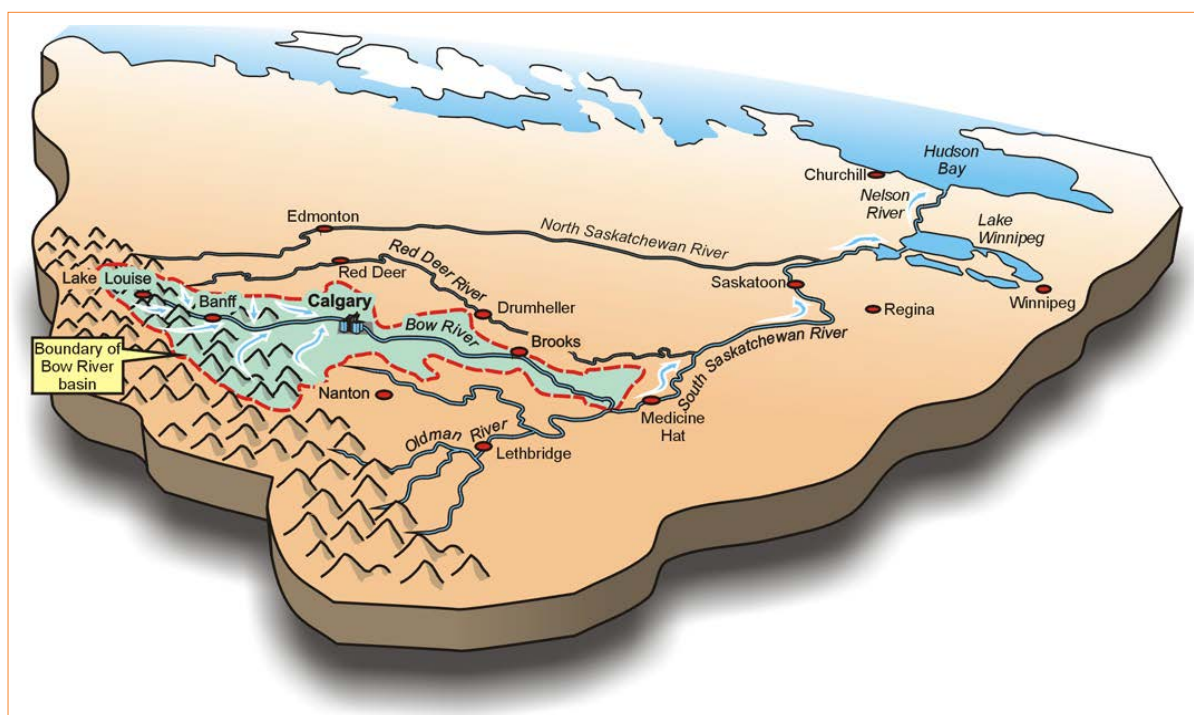
Banff: <http://en.climate-data.org/location/9245/>



[https://upload.wikimedia.org/wikipedia/commons/6/63/View\\_over\\_Bow\\_River\\_Valley\\_from\\_Sulphur\\_Mountain\\_Summit\\_-\\_Banff\\_-\\_Alberta\\_-\\_Canada.jpg](https://upload.wikimedia.org/wikipedia/commons/6/63/View_over_Bow_River_Valley_from_Sulphur_Mountain_Summit_-_Banff_-_Alberta_-_Canada.jpg)

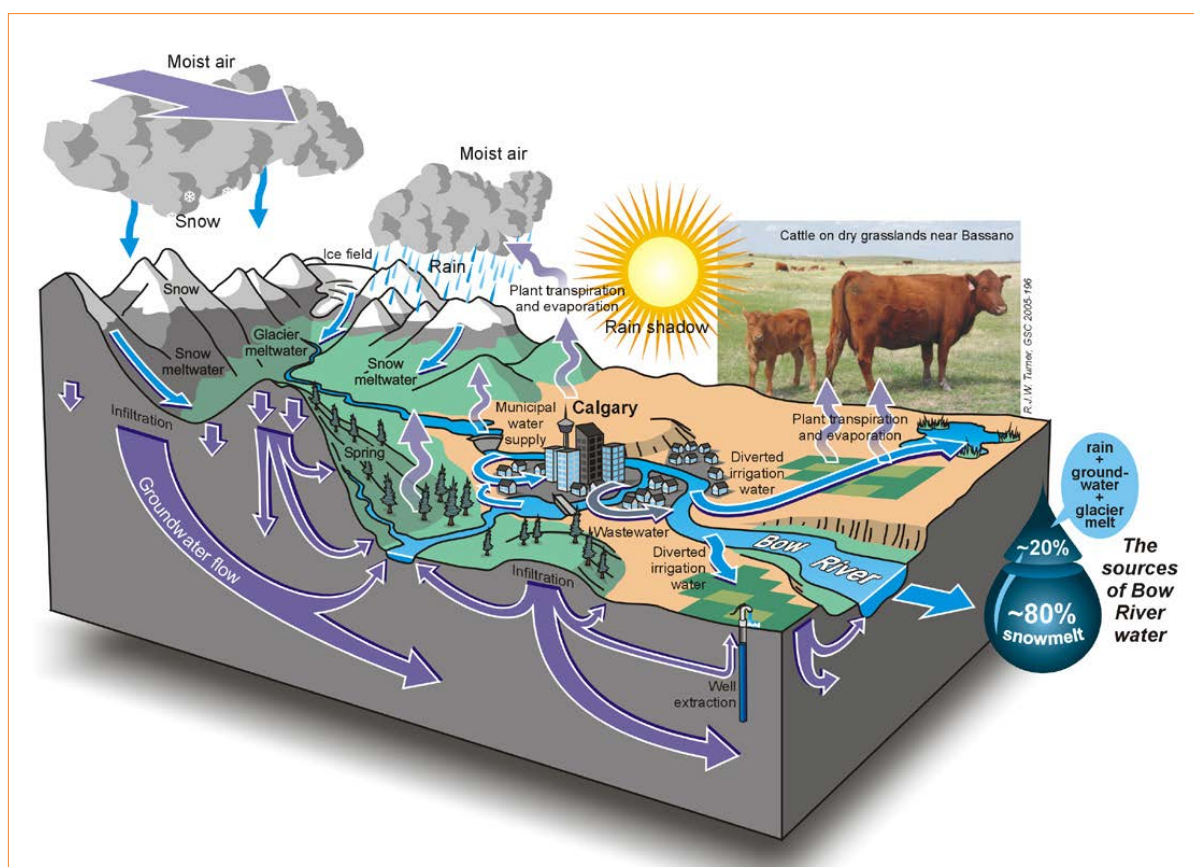
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SOURCE E: Journey of the Bow River



[http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)

SOURCE F: Bow River Catchment water cycle

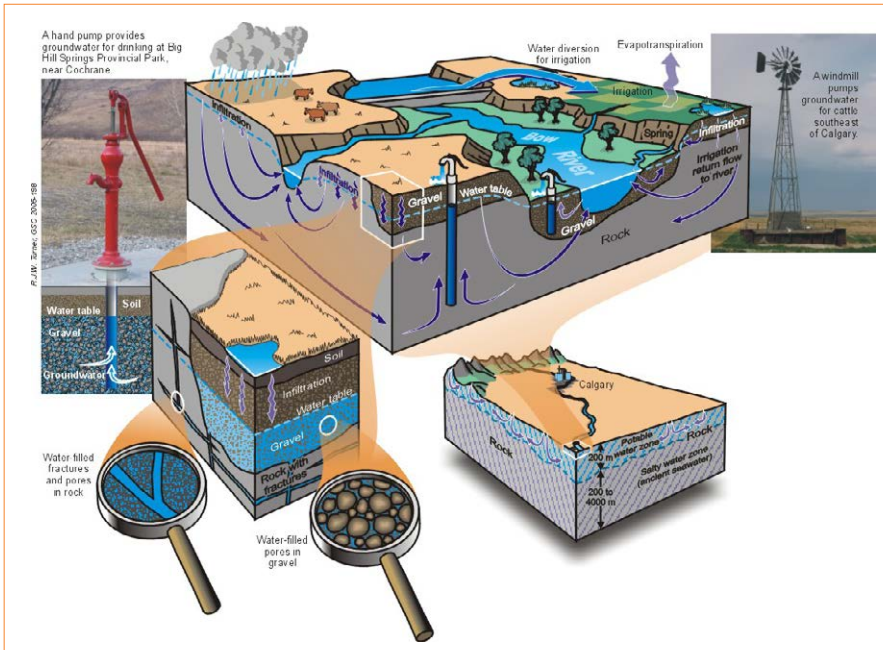


[http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)



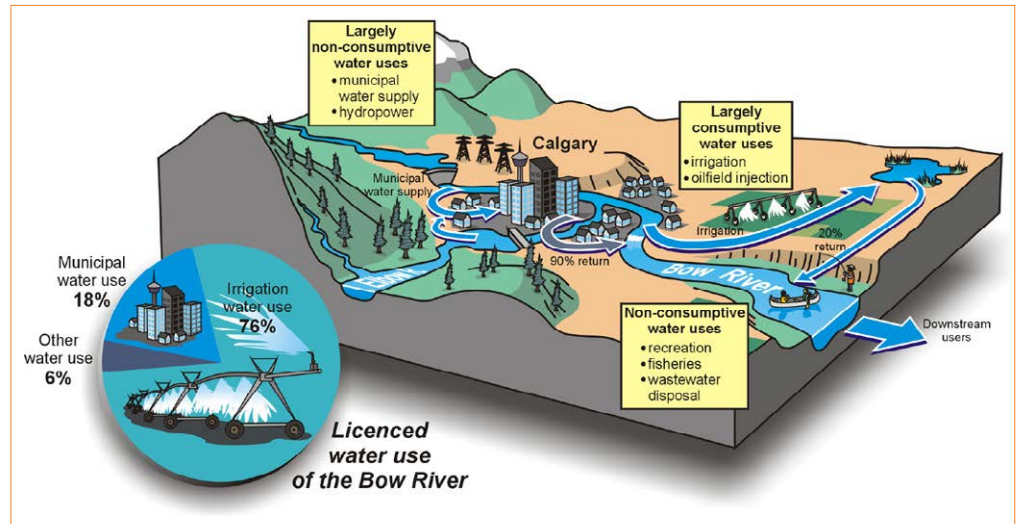
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## SOURCE G: Groundwater resources

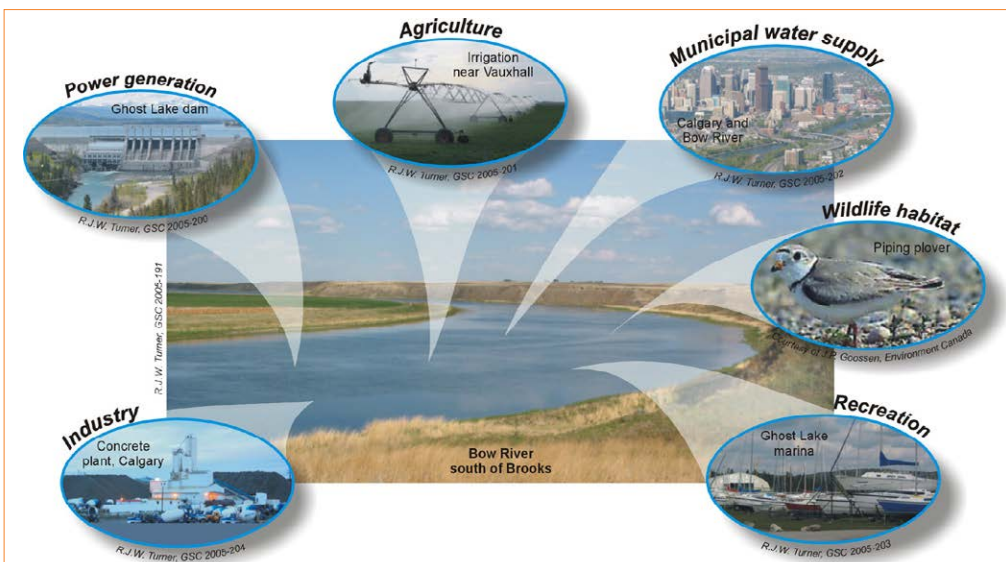


[http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)

## SOURCE H: Water use



### SOURCE I: Competing water uses

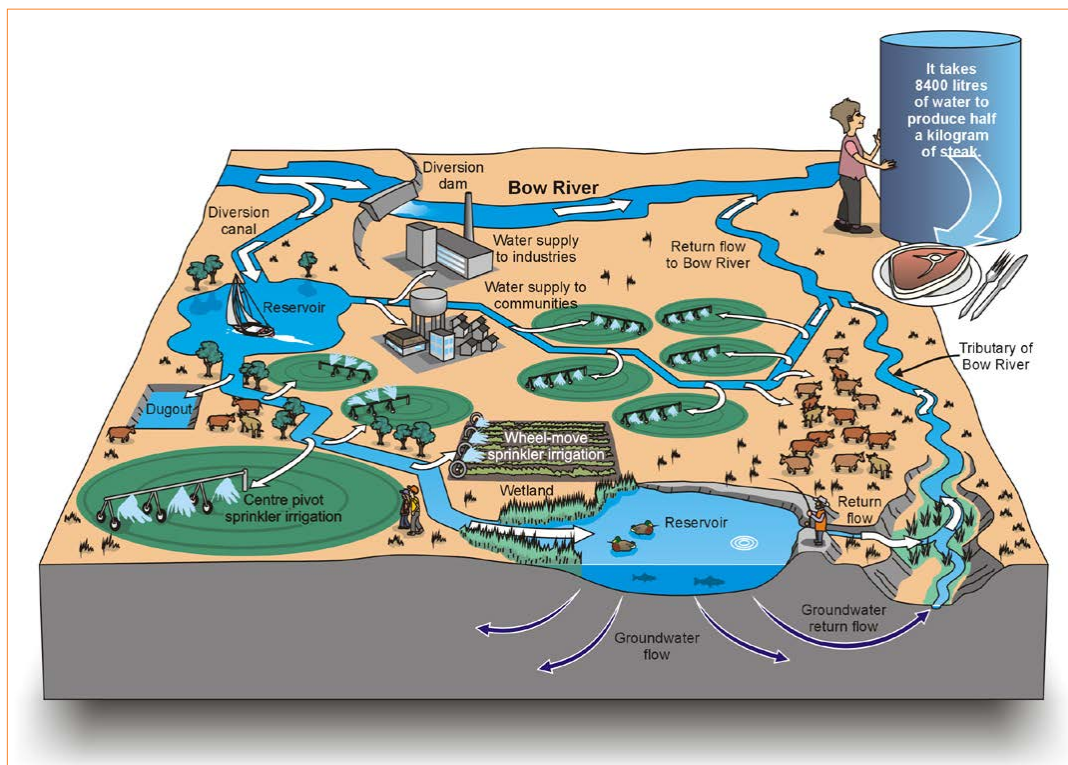


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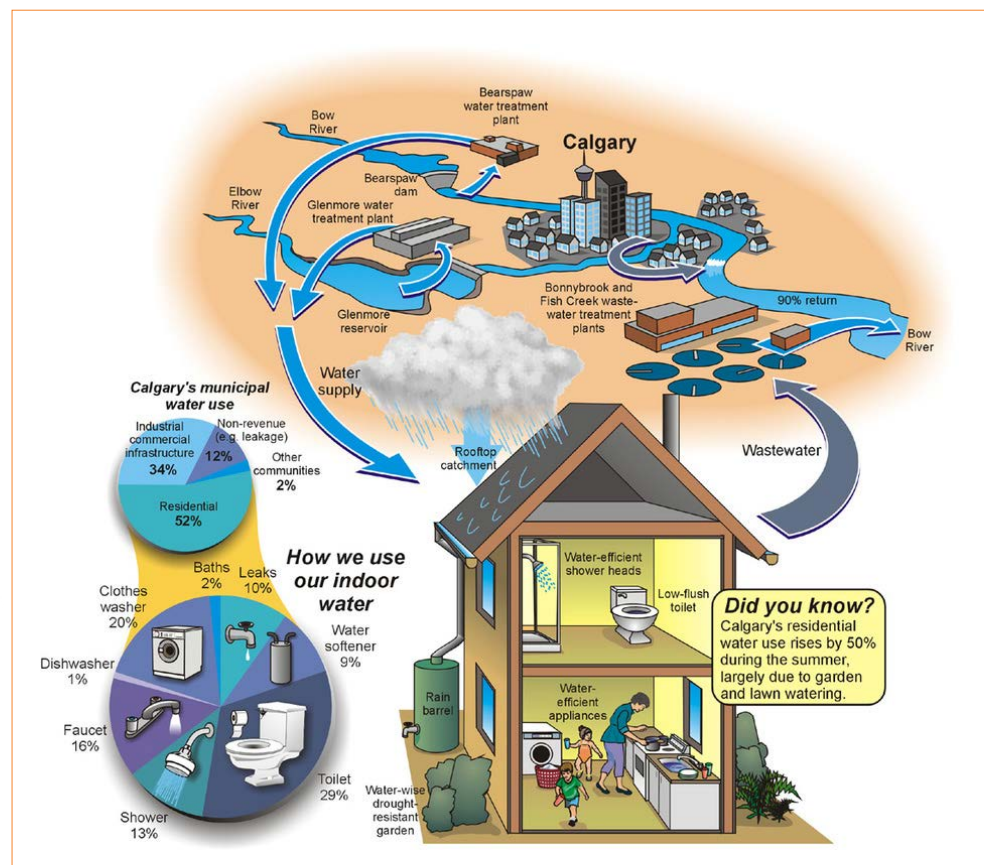
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SOURCE J: Making water available for human use



<http://www.cgenarchive.org/bow-river-clean.html>

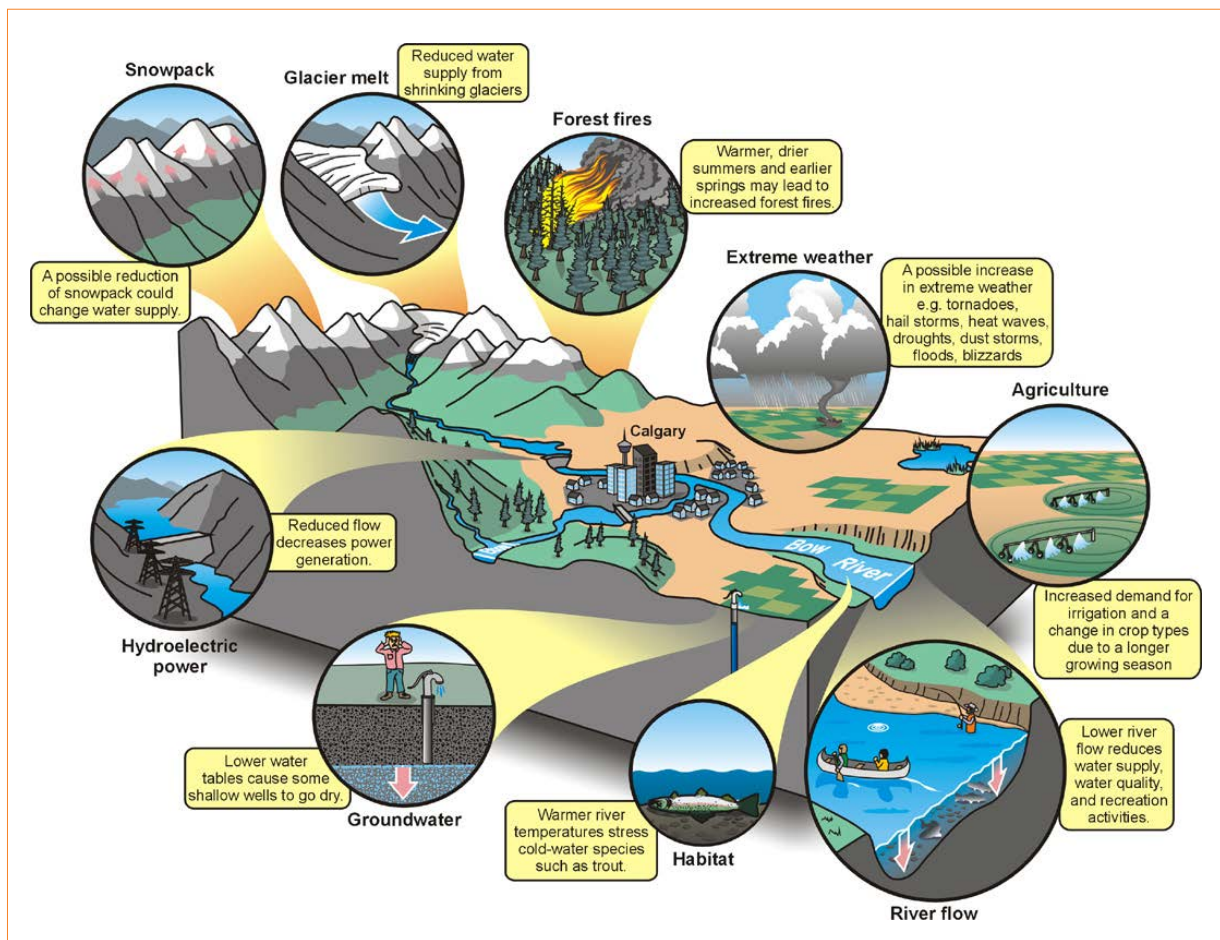
SOURCE K: Urban Water use



<http://www.cgenarchive.org/bow-river-clean.html>

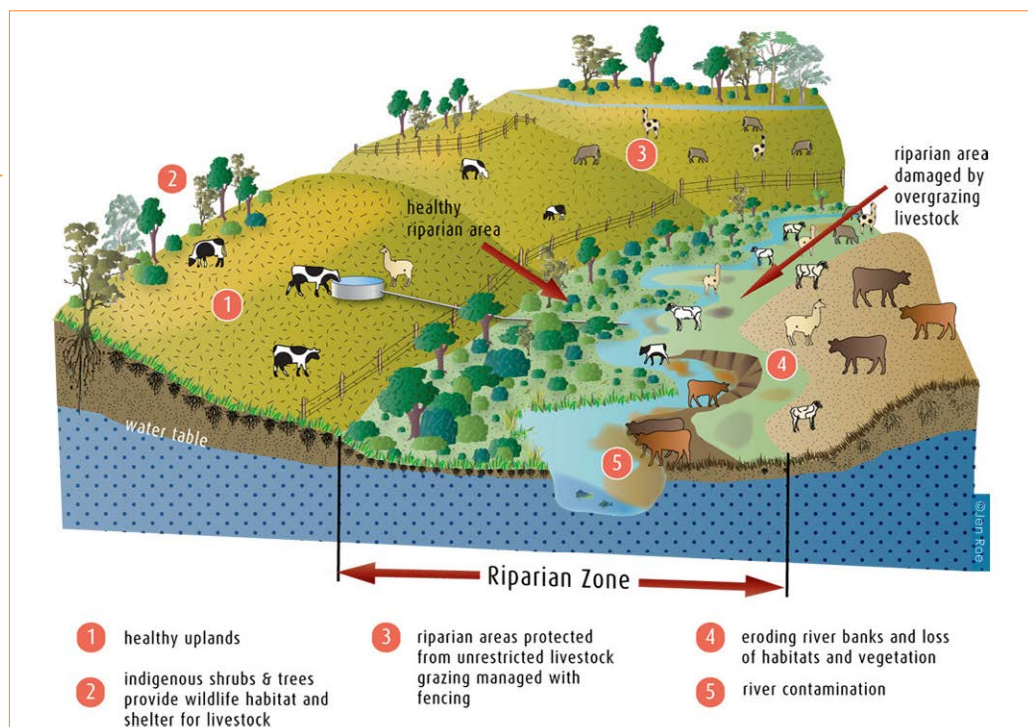
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Source L: Climate change threats



[http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)

SOURCE M: Rural water management

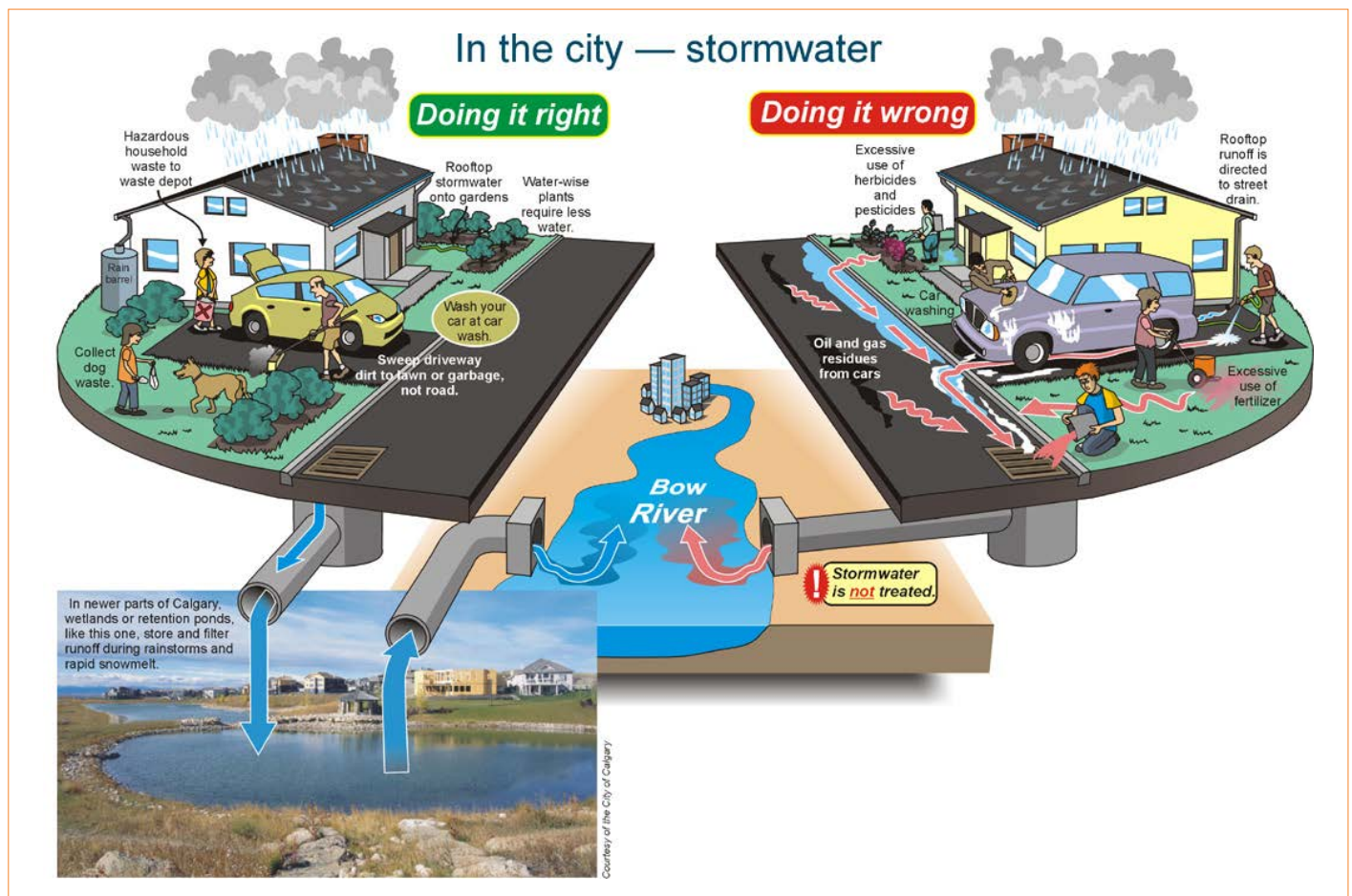


<http://theriparianproject.com.au/about> and <http://www.cgenarchive.org/bow-river-clean.html>



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SOURCE N: Urban water management



<http://www.cgenarchive.org/bow-river-clean.html>

## Weblinks

### The Bow River Catchment

The Bow River: Where does it come from? Where does it go to? [http://www.thebowriver.com/bow\\_river\\_basin\\_waterscape.htm](http://www.thebowriver.com/bow_river_basin_waterscape.htm)

Waterscape: Bow River Basin

<http://www.cgenarchive.org/bow-river-watercycle.html>

POSTER: PDF file

<http://www.cgenarchive.org/uploads/2/5/2/6/25269392/bowriverwaterscape.pdf>

POSTER: Picture file – [http://www.cgenarchive.org/uploads/2/5/2/6/25269392/bowriver-poster1\\_e.jpg](http://www.cgenarchive.org/uploads/2/5/2/6/25269392/bowriver-poster1_e.jpg)

Alberta's Bow River: Climate change and human impacts – <http://www.sciencemediacentre.ca/smc/docs/SMCC-BowRiver.pdf>

### Video Series: The Bow River

Bow River "Settlers wanted" – <https://www.youtube.com/watch?v=NjwVdVgsXNo>  
<https://www.youtube.com/watch?v=5e00c1IJHL8>

Bow River water management

<https://www.youtube.com/watch?v=cpL11ROPoPE>

Eastern irrigation district

<https://www.youtube.com/watch?v=GcR2xJlhPik>

Bow River Irrigation District

<https://www.youtube.com/watch?v=4vKWXAiNNdU>

Western irrigation district

<https://www.youtube.com/watch?v=lr7p-XM-2Uk>

Bow River Irrigation and food

<https://www.youtube.com/watch?v=t0J28uJkyTQ>

Future of water in the Bow River

<http://caringforourwatersheds.com/canada/southern-alberta/watershed-information/>

### Spatial technologies

Creating an elevation profile in Google Earth

<https://www.youtube.com/watch?v=TZZ-dKOp8NY>

ESRI global elevation – <http://esriukeducation.maps.arcgis.com/apps/Profile/index.html?appid=f0a2a2a3e1964129b22c715e31282f6c>

Google Tour Builder – <https://tourbuilder.withgoogle.com>

# ATTENTION – ALL GEOGRAPHY TEACHERS



## Geography Teachers' Association of NSW **ARTHUR PHILLIP AWARDS**

### **TIME TO PREPARE FOR THE 2016 GEOGRAPHY FIELDWORK COMPETITION**

The Geography Teachers' Association of NSW (GTANSW) organises an annual competition for students and schools to foster an enthusiasm for Geography through engagement and rewards. The emphasis of the competition is fieldwork and the gathering of primary data as part of authentic research in geography.

**The competition is open to all primary and secondary schools, both members and non-members of GTANSW.**

All categories of the competition are based on the research action plan outlined on page 17 of the Years 7–10 Geography syllabus. The steps of this research plan have also been applied to the senior Geography course for the purposes of this competition and fit neatly with the Senior Geography Project.

### **COMPETITION ENTRIES CLOSE FRIDAY 25 NOVEMBER 2016**

#### **COMPETITION CATEGORIES:**

1. The GTA Fieldwork and Visual Presentation Competition for Years K–9  
Sub-categories: Primary – Stage ES1-1 (Years K, 1 & 2), Stage 2 (Years 3 & 4), Stage 3 (Years 5 & 6). Secondary – Stage 4 (Years 7 & 8), Stage 5 (Year 9 only))
2. The Global Education Research (Fieldwork) Competition for Years 7–12  
Three categories: Stage 4, Stage 5, Stage 6
3. The Dr Don Biddle Issues in Australian Environments Fieldwork Competition for Year 10 only
4. The Brock Rowe Senior Geography Project Fieldwork Competition for Year 11 only

**2016 Arthur Phillip Geography Fieldwork Competition information and student entry forms are available for download from:**

**[www.gtansw.org.au](http://www.gtansw.org.au)**