

**Lesson # 11: Setting the Stage**

<p>Topic:</p>	<p><b>Field Study: Data Upload and Discussion of Results</b></p>
<p>Science 14 Program of Studies outcome(s):</p> <p>Science, Technology and Society (STS) and Knowledge</p>	<p>Students will:</p> <p>2. Analyze a local ecosystem in terms of its biotic and abiotic components, and describe factors of the equilibrium</p> <ul style="list-style-type: none"> <li>• explain how various factors influence the size of populations; i.e., immigration and emigration, birth and death rates, food supply, predation, disease, reproductive rate, number of offspring produced, and climate change</li> <li>• describe the relationship between land use practices and altering ecosystems (<i>e.g., swamp drainage, slash and burn forestry, agriculture</i>)</li> <li>• trace the development of a technological application that has altered an ecosystem (<i>e.g., power generation, fishing, logging, oil and gas exploration, agricultural practices</i>)</li> <li>• <a href="https://education.alberta.ca/media/3069383/pos_science_14_24.pdf">https://education.alberta.ca/media/3069383/pos_science_14_24.pdf</a></li> </ul>
<p>Skills</p>	<p>Initiating and Planning:</p> <p>Ask questions about relationships between and among observable variables and plan investigations to address those questions</p> <ul style="list-style-type: none"> <li>• Identify questions to investigate arising from practical problems and issues</li> <li>• Define questions and problems to facilitate investigation</li> <li>• Select appropriate methods and tools for collecting data and information to solve problems</li> </ul> <p>Performing and Recording:</p> <p>Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data</p> <ul style="list-style-type: none"> <li>• Organize data, using a format that is appropriate to the task or experiment</li> <li>• Select and integrate information from various print and electronic sources</li> <li>• Use tools, technology and apparatus safely</li> </ul> <p>Analyzing and Interpreting</p> <p>Analyze qualitative and quantitative data, and develop and assess possible explanations</p> <ul style="list-style-type: none"> <li>• Identify strengths and weaknesses of different methods of collecting and displaying data</li> <li>• Identify and evaluate potential applications of findings</li> <li>• Identify new questions and problems that arise from what was learned</li> </ul> <p>Communication and Teamwork</p>

	<p>Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results</p> <ul style="list-style-type: none"> <li>• Receive, understand and act on the ideas of others</li> <li>• Communicate questions, ideas, intentions, plans and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language and other means</li> <li>• Work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise</li> <li>• Evaluate individual and group processes used in planning, problem solving, decision making and completing a task</li> <li>• Defend a given position on an issue or problem, based on their findings</li> </ul>
Attitudes	<p>Most of the Attitude Outcomes stated in the Program of Studies are included into each of the <i>Wading in for Water</i> lessons. This includes; Interest in Science, Mutual Respect, Scientific Inquiry, Collaboration, Stewardship, and Safety. Please refer to the specific outcomes · <a href="https://education.alberta.ca/media/3069383/pos_science_14_24.pdf">https://education.alberta.ca/media/3069383/pos_science_14_24.pdf</a></p>
Planning ahead	<ul style="list-style-type: none"> <li>• Access to computer with a map of data available for students to compare to another biome</li> </ul>
Type of lesson	<ul style="list-style-type: none"> <li>• Compare/contrast and T chart activities</li> <li>• Word Jumble</li> <li>• Case study</li> <li>• Mock Town Hall Meeting</li> </ul> <p><b>NOTE:</b> Compare and Contrast sheet found <a href="#">here</a> and Word Jumble Sheet found <a href="#">here</a></p>
Word Wall	<p>Listed in <a href="#">Appendix A</a></p>

## Getting Started

<p>Topic opener “hooks”</p>	<p>Intro/ Hook ideas: Scenario: Water supply in Okotoks</p> <ul style="list-style-type: none"> <li>• Community is running out of water (Sheep River) and is negotiating with the City of Calgary to access treated water from the Bow and then move it via a pipeline to the southern city. Recently the City approved expanding the population by building more houses. Is this a wise idea when there are already concerns about access to water? What would you recommend if people are interested in moving outside of Calgary to smaller communities?</li> <li>• Teacher resources:             <ul style="list-style-type: none"> <li>○ <a href="https://albertaventure.com/2014/01/future-water-wars-alberta/">https://albertaventure.com/2014/01/future-water-wars-alberta/</a></li> <li>○ <a href="http://www.cbc.ca/news/canada/calgary/okotoks-water-pipeline-1.3809473">http://www.cbc.ca/news/canada/calgary/okotoks-water-pipeline-1.3809473</a></li> <li>○ <a href="http://www.okotoks.ca/doing-business/public-tenders/potable-water-pipeline-detailed-alignment-consultant">http://www.okotoks.ca/doing-business/public-tenders/potable-water-pipeline-detailed-alignment-consultant</a></li> </ul> </li> </ul>
<p>Lesson Sketch</p>	<ol style="list-style-type: none"> <li>1. Data entry into database (upload video/photo). <b>Teacher:</b> check in, to make sure the upload is complete (<a href="https://seedsconnections.org/share-about-water">https://seedsconnections.org/share-about-water</a>)</li> <li>2. Guided questions to compare/contrast             <ul style="list-style-type: none"> <li>• What do you think will happen if (<u>insert an abiotic factor</u>) is changed in the ecosystem you just visited? Keep it local, based on the data from the water sample analysed.</li> <li>• Students should stay in their lab groups, and compare data with another class from another location in Alberta - preferably a different biome. A map of the 6 natural regions of Alberta is available from Alberta Advanced Education: <a href="http://advancededucation.alberta.ca/englishexpress/articles/pdf/ra11_09_13.pdf">http://advancededucation.alberta.ca/englishexpress/articles/pdf/ra11_09_13.pdf</a></li> <li>• Detailed information about Albert’s Grassland Region is contained in the document. Challenge students to find similar information about your region or regions that are dissimilar for comparison of data.</li> <li>• Each group should look at a different set of data to compare to their own.</li> <li>• See the attached <a href="#">Compare and Contrast Analysis</a> sheet.</li> </ul> </li> <li>4. Presentation of findings: Each lab group will informally share their findings with the class. See checklist.</li> <li>5. Write the following terms on the board, or create a <a href="#">Word Wall</a>. Ask students if they recognize or already know what these words mean. In pairs they can write operational definitions based on their current understandings of the words.             <ul style="list-style-type: none"> <li>○ Immigration</li> <li>○ Emigration</li> <li>○ Birth rate</li> <li>○ Death rate</li> <li>○ Food supply</li> <li>○ Predation</li> <li>○ Disease</li> <li>○ Reproductive rate</li> <li>○ # of offspring produced</li> <li>○ Climate change</li> </ul> </li> </ol>

6. Briefly go over each word describing how they change the population (increase vs. decrease). Use your discussion to refine the students' definitions from #5 above.
7. **Word Jumble** ([see student sheet here](#)): On a T chart, partners will be asked to sort the above words into two groups using the following headings:
  - *Causes an INCREASE in population, and Causes a DECREASE in population.* See attached example.
  - Can any of these factors both increase and decrease? Why? Students may place food supply and climate change on both. Food supply may be interrupted or improve. Climate change may increase agriculture in some northern locations, but decrease in areas close to the equator, or locations that are prone to drought.
8. Reflect on the site where the class collected their water samples. Was it ever disturbed in any way? Are there buildings nearby? A road? Do lawn mowers visit the area? Did you see any garbage/litter? Are there other signs of human or animal activity in the area?
  - Now imagine what a water body would be like in a setting that was different than the one you visited. How might the following settings look?
    - Forest
    - Prairie
    - Tundra
    - Mountains
  - Imagine what a water body would be like with more or less industry in the area, specifically upstream. Consider some of these industries:
    - Oil and gas
    - Paper mill/forestry (such as slash and burn or clearcutting)
    - Agriculture
    - Fishing
    - Municipality (such as draining water before building new neighborhoods)
    - Power plant/ dam
  - Humans use the land in many ways. What is the relationship between land use practices and altering ecosystems? We tend to jump to the negative impacts. Could we think of some positive changes? How might some of these industries improve conditions? As a society, if we value our natural environments, government and industry will put a priority on these things. In Canada, most industries must submit a plan on how they will clean up, or remove and restore the area when they are done **BEFORE** they are allowed to open. What are some of the positive efforts being made by industries and others to promote and sustain water quality?
  - Can you see yourself working in one of these industries as a career?
  - What worries you in regards to industry and land use?
  - How might you be able to change or improve practices?
9. The construction of the Site C Dam along the Peace River in northern British Columbia is underway. We will trace the development of this technological application that is altering the local ecosystem. It is important because geological features do not respect provincial or national boundaries – decisions made in one area impact other locations as well. For instance, the Peace River flows into Alberta. What are the pros and cons to building dams?

Teacher resource: <https://www.siteproject.com/>

- Pros: “Clean” energy, no pollution, etc.
- Cons: human displacement (how vulnerable people are moved off their land such as the Three Gorges Dam on the Yangtze River in China, or the Churchill River in northern Manitoba, compensation to land owners, etc.),
  - Impact on animal on land and in the water
  - Methylmercury: mercury naturally occurs in the soil in a form that is immobile. When saturated, it becomes mobile and toxic to animals that are exposed to it. A dam saturates a large area of soil. The mercury moves into and up the food chain. Follow the food chain to see what plants and animals are affected along the way. Review ‘**biomagnification**’ and ‘**bioaccumulation**’ from Lesson #5.
  - How does pollution change how organisms interact?
  - <https://www2.usgs.gov/themes/factsheet/146-00/>
  - <https://www.epa.gov/mercury/how-people-are-exposed-mercury>

10. How can we detect exposure? (Hair, blood, eating fish/organisms from dam etc.)

- General Dam Resource: <https://www.siteproject.com/>
- A brief overview video (5:16) helps to show what is taking place: <https://www.siteproject.com/news-and-information/project-videos>
- Information sheets from the BC Hydro perspective discuss the: process of interacting with Aboriginal groups; methylmercury concerns; protecting native wildlife; environmental reviews, etc. Information found here: <https://www.siteproject.com/news-and-information/information-sheets>
- Information about how Aboriginal groups challenged the Dam in court and lost their appeal: <http://www.cbc.ca/news/canada/british-columbia/federal-court-dismisses-first-nations-challenge-of-site-c-dam-1.3948830>
- Land expropriation from local farmers: <http://www.cbc.ca/news/canada/british-columbia/site-c-dam-project-forces-expropriation-of-b-c-family-farm-this-spring-1.3893783>
- Concerns about how this Dam will affect Wood Buffalo National Park, a UNESCO World Heritage Site that the water will pass through: <http://www.cbc.ca/news/canada/edmonton/unesco-sees-fort-chipewyan-s-low-water-levels-up-close-1.3785316>
- Fines due to environmental missteps: <http://vancouver.sun.com/business/local-business/bc-hydro-facing-federal-order-heavy-fines-for-site-c-sediment-and-erosion-problems>
- Human rights concerns with Amnesty International: <http://globalnews.ca/news/3119627/amnesty-international-takes-aim-at-site-c/>

11. Mock Town Hall Meeting: There are many pros/cons and many perspectives to a large development such as the Site C Dam. Students can take on different roles to argue the perspective they have been assigned. Having students who are not assigned a specific role act as local community members who are able to stand up and ask questions (line up at a pretend microphone) at any point during the discussion.

- Set up a Town Hall Meeting with students. The following resource is very useful for teachers dealing with potential controversial issues: [http://csip.cornell.edu/Curriculum\\_Resources/CSIP/Dudley%26Schneider/Dudley%26Schneider.html](http://csip.cornell.edu/Curriculum_Resources/CSIP/Dudley%26Schneider/Dudley%26Schneider.html)
- Suggested roles:
  - Farmers and landowners that live and work on the banks of the river

	<ul style="list-style-type: none"> <li>○ Laid off oil and gas worker (pipefitter, other trades, etc.)</li> <li>○ Local Native reserve member, who use this land in a traditional way (hunt and fish)</li> <li>○ Local Politician</li> <li>○ Scientist</li> <li>○ UNESCO representative</li> <li>○ Amnesty International representative</li> <li>○ BC Hydro</li> <li>○ Recreational hunter and fisher</li> <li>○ Environmentalist</li> <li>○ Local business owner</li> <li>○ Local community members attending the Town Hall to ask questions of all the stakeholders</li> </ul> <p>11. With any industrial development, what happens to ecosystem equilibrium? What is the disturbance over the long run? Are there enough measures in place to reduce environmental harm? How are decisions made when considering all of the perspectives? (Bring the discussion back to the nail demonstration).</p>
Closing ideas	<p>In the southwestern corner of the province of Alberta, on the eastern slopes of the Rocky Mountains, there is another debate underway. The Alberta Government has decided to protect an area known as the Castle Wilderness, and set it aside as a Wildland and Provincial Park. In doing this, recreational users who enjoy camping, off-roading, snowmobiling, picnicking, hunting, fishing and hiking have found themselves on all sides of the debate, and at odds with the government and environmentalists. If this area becomes a park, motorized vehicles such as quads, snowmobiles, and dirt bikes would be banned, along with those who roadside camp and are used to not needing to pay/book/ buy a permit, or reserve a site. It has been argued, that garbage and debris is left, and continued use without designated paths and trails causes great harm to the ground and the water. This area is also known as a HEADWATER. This means that water is at the beginning of its journey, or source for the region. If a headwater is damaged, the water quality and availability, along with habitat will also be affected downriver. These areas are known to be very sensitive and it is difficult to undo any damage. Who should have a say? Should these users be cut out of this area? Is that fair, if they have been doing this for generations? Are all land users causing harm? Does this area need protection?</p> <ul style="list-style-type: none"> <li>• Castle wilderness/headwaters/: <a href="https://albertawilderness.ca/issues/wildlands/areas-of-concern/castle/#parentHorizontalTab2">https://albertawilderness.ca/issues/wildlands/areas-of-concern/castle/#parentHorizontalTab2</a></li> <li>• CPAWS supports the park, and has many links at the bottom of the page to science, maps, pamphlets, etc.: <a href="http://cpaws-southernalberta.org/campaigns/castle">http://cpaws-southernalberta.org/campaigns/castle</a></li> <li>• Alberta Government: <a href="https://www.albertaparks.ca/albertaparksca/about-us/public-consultations/archives/enhancing-the-protection-of-the-castle-area/">https://www.albertaparks.ca/albertaparksca/about-us/public-consultations/archives/enhancing-the-protection-of-the-castle-area/</a></li> <li>• Alberta Wilderness Association: <a href="https://albertawilderness.ca/issues/wildlands/areas-of-concern/castle/">https://albertawilderness.ca/issues/wildlands/areas-of-concern/castle/</a></li> <li>• Science document: <a href="http://cpaws-southernalberta.org/upload/CMP_-_EWG_Science_Summary_Oct._26,_2016_(updated_Dec._1,_2016).pdf">http://cpaws-southernalberta.org/upload/CMP_-_EWG_Science_Summary_Oct._26,_2016_(updated_Dec._1,_2016).pdf</a></li> </ul>

Notes: