

**Lesson # 10: Setting the Stage**

Topic:	<b>Biotic Relationships &amp; Quality of the Ecosystem</b>
Science 14 Program of Studies outcome(s):  Science, Technology and Society (STS) and Knowledge	<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 biotic relationships can be explained in terms of the movement of matter and energy, using food chains, food webs and energy pyramids</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>
Skills	<p><b>Initiating and Planning:</b></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> </ul> <p><b>Performing and Recording:</b></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>• Use tools, technology and apparatus safely</li> </ul> <p><b>Analyzing and Interpreting</b></p> <p>Analyze qualitative and quantitative data, and develop and assess possible explanations</p> <ul style="list-style-type: none"> <li>• Identify and evaluate potential applications of findings</li> <li>• Identify new questions and problems that arise from what was learned</li> </ul> <p><b>Communication and Teamwork</b></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> </ul>

Attitudes	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>
Planning ahead	<ul style="list-style-type: none"> <li>• 12 nails, a small block of wood with one pre-drilled shallow hole (demo), or 5-6 sets of each for small groups to complete</li> <li>• A large space is required for the activity. Depending on weather, a field/gym/ or any open space.</li> </ul>
Type of lesson	<ul style="list-style-type: none"> <li>• Energy pyramid activity</li> <li>• Discussion</li> </ul> <p><b>NOTE:</b> Activity notes found <a href="#">here</a></p>
Word Wall	Listed in <a href="#">Appendix A</a>

### Getting Started

Topic opener “hooks”	<p>Intro/ Hook ideas: Equilibrium Activity. Depending on time, this activity could be a demo where students can come up and try a design they think may work, or this could also be a small group activity where each group has their own materials.</p> <p>Question: Can you balance 11 nails on 1 nail-head?</p> <p>Materials:</p> <ul style="list-style-type: none"> <li>• Small wood block with one shallow hole pre-set by hitting a nail a few times into the wood, then removing it (students do not need a hammer)</li> <li>• 12 nails</li> <li>• Teacher video resource with how to solve the question: <a href="https://www.stevespanglerscience.com/lab/experiments/balancing-nail-puzzle/">https://www.stevespanglerscience.com/lab/experiments/balancing-nail-puzzle/</a></li> <li>• Based on successfully completing this activity, what is equilibrium?</li> </ul>
Lesson Sketch	<p>Review food chains and food webs from lesson #3. Ask students to give a few examples of organisms to work through an example of each. Remind students which way the arrow always points: Follows the energy to the next organism! Does all of the energy get transferred? No, due to energy being used by each organism for reproduction, producing waste, heat, etc. This is why organisms further up the food chain/web need to eat more organisms more often. An example of a food chain diagram:</p> <p style="text-align: center;"><b>Grasshopper</b>    <math>\longrightarrow</math>    <b>Shrew</b>    <math>\longrightarrow</math>    <b>Owl</b>    <math>\longrightarrow</math>    <b>Hawk</b></p> <p>NOTE: arrows indicate the direction of energy flow.</p> <p>Energy pyramids activity: <a href="#">See attached activity</a>.</p> <ul style="list-style-type: none"> <li>• <b>Vocabulary:</b> Producer, Consumer (primary, secondary, tertiary), decomposer, trophic levels</li> <li>• Why would a vegetarian argue that they get energy in their diet? Think about cultures/populations that have large groups of vegetarians. (Lower in the energy pyramid = more energy)</li> </ul>

	<p>Explain how biotic relationships can be explained in terms of the movement of matter and energy, using food chains, food webs and energy pyramids. Use as a discussion point after the water collection and analysis.</p> <ul style="list-style-type: none"> <li>o Consider local industry here or other human activity</li> <li>o Who is upstream/ downstream from our field study location?</li> <li>o Predict differences if industry was not there</li> <li>o Do some “what if’s” What if the water was cloudy? How would turbidity change our data? What if the water was warmer/cooler? More/less nutrients?</li> </ul> <p>While discussing these scenarios, be sure to include previous knowledge regarding matter cycling and the flow of energy.</p> <p>Consider how humans can work to improve water quality in the area.</p>
<p>Closing ideas</p>	<p>Is Cloud Seeding the same as Chemtrails?</p> <ul style="list-style-type: none"> <li>• Cloud seeding is the practice of releasing Silver iodide into storm clouds by a small aircraft to prevent hail. This release forces the moisture in the clouds to be released before damaging hail is formed.</li> </ul> <p>Is it real?</p> <ul style="list-style-type: none"> <li>• Yes. This is a common practice in the Calgary area, as it is prone to hail, due to the proximity to the Rocky Mountains.</li> </ul> <p>Is it the same thing as Chemtrails?</p> <ul style="list-style-type: none"> <li>• No! Chemtrails is a pseudoscience belief that chemicals other than fuel are being released into the atmosphere from commercial airplanes.</li> </ul> <p>Who pays for cloud seeding?</p> <ul style="list-style-type: none"> <li>• Insurance companies pay. Why? Hail is expensive, and costs the insurance companies more money than the act of flying a plane into storm clouds and releasing silver iodide.</li> </ul> <p>Student video: <a href="https://www.youtube.com/watch?v=VIKe5Q1txxI">https://www.youtube.com/watch?v=VIKe5Q1txxI</a></p> <ul style="list-style-type: none"> <li>• Teacher article: <a href="http://calgary.ctvnews.ca/sowing-seeds-on-the-edge-of-the-storm-to-reduce-hail-damage-1.3025475">http://calgary.ctvnews.ca/sowing-seeds-on-the-edge-of-the-storm-to-reduce-hail-damage-1.3025475</a></li> <li>• Insurance info brochure: <a href="http://www.insuranceisevolving.com/files/pdf/cloud-seeding-brochure-final.pdf">http://www.insuranceisevolving.com/files/pdf/cloud-seeding-brochure-final.pdf</a></li> <li>• Along the TransCanada Highway near Kananaskis there is a billboard entitled “Look Up!!! THERE’S A NEW CLOUD IN TOWN”, promoting the belief that Chemtrails are real: <a href="http://lookupbanff.com">lookupbanff.com</a> suggesting that chemicals other than fuel are being purposefully released into the atmosphere by commercial airplanes.</li> <li>• What are the white “trails” behind a commercial airplane? They are known as Contrails, which are the products of hydrocarbon combustion: H<sub>2</sub>O vapour and CO<sub>2</sub> gas. Keep in mind, vapour at high altitudes is cold, so think of vehicle exhaust on a cold day when accelerating. Teacher Resource: <a href="https://science-edu.larc.nasa.gov/contrail-edu/science.php">https://science-edu.larc.nasa.gov/contrail-edu/science.php</a> and <a href="http://www.smithsonianmag.com/smart-news/science-officially-debunks-chemtrails-conspiracy-live-180960139/">http://www.smithsonianmag.com/smart-news/science-officially-debunks-chemtrails-conspiracy-live-180960139/</a></li> </ul>

Notes: