

**Lesson #3: Setting the Stage**

Topic:	<b>Energy Flows; Matter Cycles</b>
Science 14 Program of Studies outcome(s):  Science, Technology and Society (STS) and Knowledge:	<p>Students will:</p> <ol style="list-style-type: none"> <li>1. Describe how the flow of matter in the biosphere is cyclical along characteristic pathways and can be disrupted by human activity               <ul style="list-style-type: none"> <li>• explain the role of living systems in the <b>cycling of matter</b> in the biosphere (<i>e.g., food chains</i>)</li> <li>• explain why the <b>flow of energy</b> through the biosphere is linear and noncyclical</li> <li>• compare the <b>recycling of matter</b> by society with the natural <b>cycling of matter</b> through ecosystems</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> </li> </ol>
Skills	<p>Initiating and Planning:</p> <p style="padding-left: 40px;">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>Performing and Recording:</p> <p style="padding-left: 40px;">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>• 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 style="padding-left: 40px;">Analyze qualitative and quantitative data, and develop and assess possible explanations</p> <ul style="list-style-type: none"> <li>• Identify new questions and problems that arise from what was learned</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</p> <ul style="list-style-type: none"> <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>
Planning ahead	<ul style="list-style-type: none"> <li>- Book a computer lab</li> <li>- Demo: Bowl, tap-water, cooking oil, and 2 feathers</li> <li>- Make sure the digital activity loads/works for the chain/cycle activity</li> </ul>
Type of lesson	<p>Group computer activity</p> <p><b>NOTE:</b></p>

	<ul style="list-style-type: none"> <li>• Student Sheets found <a href="#">here</a> for Aquatic Food Chains and Food Webs</li> <li>• Student Activity Sheets found <a href="#">here</a> for Energy Pyramids</li> </ul>
Word Wall	Listed in <a href="#">Appendix A</a>

### Getting Started

Topic opener “hooks”	<p><b>Intro/ Hook ideas:</b>          Ever heard the expression “like water off of a duck’s back”? What does this mean? Birds have natural oils in their feathers that protect the body of the duck from getting wet and suffering from hypothermia. Remember oil and water do not mix.</p> <ul style="list-style-type: none"> <li>• Dip a feather into a bowl of water, and observe what happens to the feather.</li> </ul> <p>What will happen when a duck lands in an oil spill?</p> <ul style="list-style-type: none"> <li>• Pour some cooking oil into the bowl of water, and make some observations. Discuss how this may affect the duck</li> <li>• Dip the dried feather into the bowl and remove it. Make some observations on how the feather looks. Can this oil be washed off by the duck? No, because oil and water do not mix. Now the natural oils have been removed by the spill, and makes the duck vulnerable as the water no longer beads on the feather. Now the duck is prone to getting hypothermia.</li> </ul> <p>How can the duck’s natural oil be restored? How do you remove oil from your hand?</p> <ul style="list-style-type: none"> <li>• Pour a drop of cooking oil onto a volunteer student’s hand. Soap!             <ul style="list-style-type: none"> <li>○ Play the Dawn commercial (0:30): (<a href="https://www.youtube.com/watch?v=CLU1wB1Tzkc">https://www.youtube.com/watch?v=CLU1wB1Tzkc</a>).</li> </ul> </li> </ul>
Lesson Sketch	<ol style="list-style-type: none"> <li>1. Ask students: What is the ‘biosphere’? What makes up the biosphere?              [Answer: Hydrosphere, lithosphere, and atmosphere and their interactions]</li> <li>2. Emphasize past learning (review) from lesson #2: matter cycles</li> <li>3. Matter cycles, but what about energy from the sun? It flows. Let’s take a look: Where does energy from the sun go? The Plants = producers; then where? Consumers. Each time there is energy transferred energy is used for the organism to produce body heat, waste, reproduce, etc. So, if a bird eats a mosquito, does 100% of the energy get transferred to the bird? No. Energy is used for the mosquito to fly, to mate/produce eggs, etc.</li> <li>4. Aquatic Food chain/web computer activity (See <a href="#">activity page</a>)             <ul style="list-style-type: none"> <li>• Important, before heading to the lab: <b>Internet safety chat &amp; reliable sources reminder</b></li> </ul> </li> <li>5. Energy pyramids             <ul style="list-style-type: none"> <li>• Using the following resource (turn on sound/volume), go through the terms and scenarios, of Forest, Prairie, Ocean.  <a href="http://www.harcourtschool.com/activity/science_up_close/314/deploy/interface.swf">http://www.harcourtschool.com/activity/science_up_close/314/deploy/interface.swf</a></li> </ul> <p>Discussion questions (draw the pyramid to work out answers):</p> <ul style="list-style-type: none"> <li>• Will you consume more energy from eating shrimp (primary consumer) or tuna fish (tertiary consumer)? Which is more sustainable? If we were to remove these from the pyramid how would the outcome differ?</li> <li>• Which level of the pyramid is most important to protect? This would also be a good place to discuss endangered species.</li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>Should a primary consumer or a tertiary endangered consumer take priority when considering protection?</li> </ul> <p>7. Question: What is the difference between <b>recycling of matter</b> by society and the natural <b>cycling of matter</b> through ecosystems?</p>
<p>Closing ideas</p>	<p>How wolves change rivers video (time 4:34): <a href="http://blog.ted.com/video-how-wolves-can-alter-the-course-of-rivers/">http://blog.ted.com/video-how-wolves-can-alter-the-course-of-rivers/</a></p> <ul style="list-style-type: none"> <li><b>Note:</b> Red deer are also known as elk.</li> </ul> <p>Questions relating to the video:</p> <ul style="list-style-type: none"> <li>Why were the wolves missing from this ecosystem?</li> <li>How can wolves change a river?</li> <li>How do you feel, when you see how adding one species (wolves), can change everything?</li> <li>Think of an example of an organism (plant or animal) that has either been added to a place it <u>never</u> existed before.</li> <li>Think of an example of an organism that has gone extinct or is at risk of extinction, and how that may change the ecosystem</li> </ul> <p>Now let's think of the natural ecosystem where we live.</p> <ul style="list-style-type: none"> <li>What are the main sources of water in our community?</li> <li>What is upstream/downstream?</li> </ul> <p>Let's talk about Water Quality. Quality is a term used to determine how good, or how safe the water is for humans. Are there any contaminants? Is it clean? Can you get sick from it, what condition is it in, etc. Later in the unit, we will be conducting a Water Quality Action Project to help us determine what the water quality is of a nearby water source. Things to consider:</p> <ul style="list-style-type: none"> <li>Is it safe to drink directly from the water we just identified as our main water sources? Why?</li> <li>Even if the water LOOKS safe, clear, and fresh, is it safe to drink? Are there animals upstream that may have defecated in the water? Dogs, cattle, deer, etc.</li> <li>Might the concerns of water quality be different in other parts of the world? Although a universal concern, less developed countries may not have a way to deal with any water quality concerns, and the risk of getting sick is more likely. Teacher web resource: <a href="http://waterbornepathogens.susana.org/">http://waterbornepathogens.susana.org/</a></li> <li>What do we know about <i>E.coli</i>? Giardia (Beaver Fever)? Salmonella? Hepatitis? Rotavirus? Botulism (Botox connection)?             <ul style="list-style-type: none"> <li>Video (time 1:28): <a href="https://www.youtube.com/watch?v=0YAfpGINLmc">https://www.youtube.com/watch?v=0YAfpGINLmc</a></li> </ul> </li> </ul> <p>Video (time 4:42) <a href="https://vimeo.com/56012237">https://vimeo.com/56012237</a></p>

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