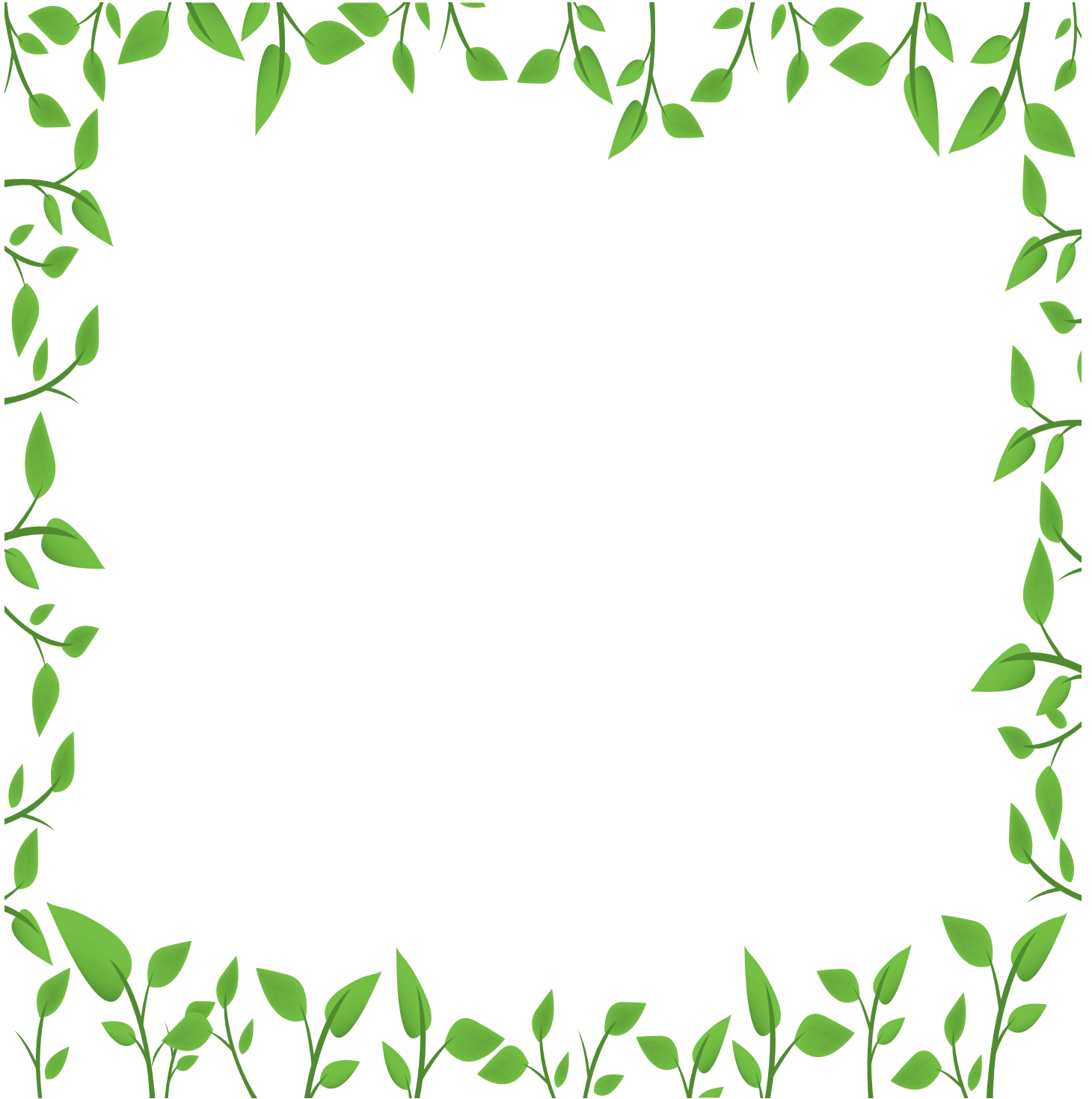





STUDENT HANDOUT

Baseline

Use the space below to create a response to the overarching question, What **can nature teach us about sustainable design?** You may respond in writing or graphic representation of any kind. At the end of the lesson, you will return to this response and revise it based on your experiences during the lesson.



NATURE'S BASIC OPERATING PRINCIPLES (EXAMPLE CHART)

OPERATING PRINCIPLE	EXAMPLE IN NATURE	EXAMPLE OF HOW HUMANS USE THIS TO SOLVE A PROBLEM (SPECIFICALLY MENTION THE PROBLEM)
<p>Nature runs on sunlight.</p> 	<p>Leaves use the sunlight for photosynthesis.</p>	<p>Humans are mimicking how plants process sunlight in order to one day split water into clean-burning fuels. This helps eliminate the problem of pollution-causing energy production.</p>
<p>Nature uses only the energy it needs.</p>	<p>Leaves fall from a tree and are turned into nutrients for the tree.</p>	<p>A business decides to locate its waste recovery facilities close to the facility where waste is produced, to eliminate the need to transport the waste a great distance.</p>
<p>Nature fits form to function.</p>	<p>Vulture wings</p> 	<p>The Wright brothers analyzed vulture wings to come up their designs for airplanes. This solved the problem of figuring out how to design planes.</p>
<p>Nature recycles everything.</p>	<p>Oak-hickory forests</p>	<p>Closed-loop manufacturing – a manufacturing plant that runs on sunlight and reuses all its waste. This eliminates waste material.</p>
<p>Nature rewards cooperation.</p>	<p>Old field succession</p>	<p>Do-nothing farming – method that sows rice, barley, and clover together in one field, so they grow in each other's shade. This eliminates the need for possibly hazardous fertilizer (and eliminates the need to weed).</p>
<p>Nature thrives on diversity.</p>	<p>Red-wood forest</p>	<p>Industrial eco-parks - Co-located industries work in a food chain, consuming each other's waste. This eliminates waste from several industries, at one time.</p>
<p>Nature demands local expertise.</p>	<p>Native grazers (native animals that naturally migrate as they graze)</p>	<p>Holistic ranching mimics the way that native animals graze. This allows grassland to naturally recover, preventing it from becoming unusable.</p> 
<p>Nature curbs excesses from within.</p>	<p>Forest fires clear out space for new healthy growth</p>	<p>Natural selection forestry.</p>
<p>Nature taps the power of limits.</p>	<p>Plants in a given environment thrive within the range of temperatures of that region.</p>	<p>Architects design a building without overdesigning – that is, they don't design a home in a moderate climate for extreme temperature conditions. This results in the use of less building material.</p>

DIRECTIONS: In pairs or triads, complete the second chart below by thinking about your community and the world as well. You can look at the first chart below for examples to help you in completing your own chart. Be prepared to share our thinking with the class.

NOTE: If your examples do not fit into the box on the chart, simply put them on a separate page or space and include them as part of your discussion.

- a. Identify specific examples of each principle in nature. You may use words, pictures, models, and/or symbols to communicate your examples.
- b. Describe problems that humans are trying to solve that relate to each Operating Principle. Once again, you may use words, pictures, models, and/or symbols to clearly communicate your ideas.

NATURE'S BASIC OPERATING PRINCIPLES

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Nature taps the power of limits.		

LOOKING TO NATURE FOR HELP

1. Describe the context of a problem or a challenge faced by you, your friends, your family or your community.

Example: My family lives in a region with very variable rainfall - near drought for half the year, and torrential rains for the other half.

2. Next pose the challenges that this situation presents in the form of a series of questions that focus on doing or accomplishing something.



Example: How can we capture and store rainwater from the rainy season to use during the drought? How can we minimize or prevent the saturation and erosion that happens during the rainy season? How can we capture and manage our use of water? How can we distribute water during rainy or dry seasons?

3. To help shift out of your own mindset and into a biomimicry frame, change the focus of the question from yourself or society to Nature. Shift the structure of your questions so that they now question how Nature accomplishes what you want to achieve.

Example: How does Nature capture and store rainwater? How does Nature minimize or prevent saturation and erosion from too much rain? How does Nature capture and manage its use of water? How does Nature distribute water during rainy or dry seasons? Add to your questions if more come to mind.

4. Share these questions in groups of three or four and help one another revise or identify additional questions.

5. Finally, push your thinking even further by trying to identify an analogy in Nature, which could contribute to a solution to that problem.



Example: Squirrels have to contend with an analogous problem. They get all their nuts in the fall, so they too are in a "feast or famine" situation with regard to the availability of a crucial natural resource. Squirrels store their nuts; perhaps your region could do something similar with your water? The squirrel's problem and solution provides an analogy or a metaphor that can help solve this problem.

6. Review your How does Nature... questions and your analogy.

- a. **What ideas are you getting for possible solutions?**
- b. **What can you do to continue thinking or learn more about this?**

POST TEST

Revisit your response to the overarching question and revise it to reflect your current thinking.
When you look at the revised response, what do you think you have learned?