Forest Management in PNW: Middle Schoolers Design Experiments to Examine Impacts.

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Teacher: Rebecca Hawk	Unit: Science experiment creation
Grade/Course: Middle School Integrated Forest	Lesson Title: Forest Management in PNW: Middle Schoolers Design Experiments to Examine Impacts.

NGSS Performance Expectation:
1. MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
2. MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Real-World Phenomenon Addressed in the Lesson:
● Forests are managed using different techniques

3 Dimensions of Science

Science & Engineering Practice(s) Used:

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
● Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.
● Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)

Crosscutting Concept(s) Used:

Influence of Science, Engineering, and Technology on Society and the Natural World
● The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

Science Addresses Questions About the Natural and Material World
● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.

Stability and Change
● Small changes in one part of a system might cause large changes in another part.

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Disciplinary Core Idea(s):

LS2.A: Interdependent Relationships in Ecosystems
- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
- Growth of organisms and population increases are limited by access to resources.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

Additional Skills:

- Working in a team
- Mapping

Background Information

Prior Student Knowledge:
Various Forest Management techniques
- [Nature Lab Educator Resources: Seeing the Wood for the Trees: Introduction to Sustainable Forestry](#)
- [The Confederated Tribes of Grande Ronde Harvesting Timber Lesson](#)
- For more advanced background:
  - [Oregon Forest Resources Institute: Inside Oregon's Forests Curriculum](#)
    - [Oregon Forest Resources Institute Lesson 1: What Is Forest Management?](#) (p 163)

Resources specific to Hopkins Demonstration Forest:
<u>General resources</u>:
- Hopkins website: [Hopkins Demonstration Forest](#)
  - History: [History - Hopkins Demonstration Forest](#)
  - Trail map: [HOPKINS TRAIL MAP](#)
  - Critter list: https://demonstrationforest.org/wp-content/uploads/2021/02/plant_animal_list.pdf

<u>If considering amphibians</u>:
- [Ponds survey results from 2019](#)
- Videos of the area (taken for a past instructor): https://drive.google.com/drive/folders/16SrLm5ULi26nhbxjVAJ806yfHIP_Kv-b?usp=sharing

Possible Preconceptions/Misconceptions: Students may believe that management techniques don't have an impact on on variety or abundance of species.

Content Information for Teacher:

- **Websites:**
  - [Nature Lab Educator Resources: Seeing the Wood for the Trees: Introduction to Sustainable Forestry](#)
  - [The Confederated Tribes of Grande Ronde Harvesting Timber Lesson](#)
  - For more advanced background:
    - [Oregon Forest Resources Institute: Inside Oregon's Forests Curriculum](#)
      - [Oregon Forest Resources Institute Lesson 1: What Is Forest Management?](#) (p 163)
- **Videos:**
  - **[Forest Fact Break-Forest Management | Learn Forests](#)**
  - ▶ **Clearcutting Is Killing Our Forests | Fixing Forestry in the Pacific Northwest**
  - ▶ **The Consequences of Clear Cutting Old Forest**
  - ▶ **Ask a Forester: Why and when do you thin a forest?**

5E	Evidence of Use/Student Activity

Engagement
● Capture attention
● Activate prior knowledge
● Connects to the real world phenomenon
	1. Hook: Students will work in teams to research the following:
	    a. Clearcut forests
	    b. Thinned Forests
	    c. Old Growth Forests
	    d. Cultural or Controlled burning in forests
	
	2. Discussion: What do we see? What do we notice? How do you feel about these techniques and why?

Exploration
● Test ideas and develop knowledge using explorations, investigations, experiments
● For NGSS, provide an initial activity/lab that allows for investigation of real world phenomenon (ABC:
	1. **Task A:** Visit the Hopkins Demonstration Forest
	    a. (If you cannot visit the Hopkins Demostration Forest, reach out to locally managed forests near you)
	    b. If you cannot visit any managed forest, I suggest reading this description and having students draw the different portionf of the map in detail.
	        i. [OSU Research Forest Intensive Management Trail](#)

Activity Before Content)	- Explore - Nature journal differences in different areas - Remind them to note which species they see, how dense the forest is, if they see any creatures or bugs, and how much sunlight they notice in each area - Listen to the ranger describe what he know about thai forest and how it has been managed over time - Notice what organisms are present in fall 2. Task B: Students should label each of the areas that we visited with an accurate forest management technique that they think was used there (and explain why they think this).

Explanation
   - Analyze data/information and construct explanations   - Communicate understandings orally and in writing   - Describe possible solutions
	1. **As a class, create a huge map of Hopkins Demonstration Forest on the wall in the classroom**
	   a. Bird's eye view of different management techniques
	   b. Zoomed in photos and drawings in the different area
	2. Discuss what we notice in different sections

Extension
   - Modify/refine procedures, prototypes, models, solutions, arguments, essays, etc.   - Apply or practice in a new setting
	1. Gather info about what insects are present at Hopkins in February
	
	2. Work as a class to develop our plan for how to use pitfall or malaise traps to collect insects
	3. Set up the traps at Hopkins 3-5 days ahead of class visit (teacher, ranger, or group of students could do this)
	
	4. Feb 13th Return to Hopkins for collection/ observation
	   a. Collect insects from the traps in the different areas
	      i. Collect the insects frm the traps
	      ii. Identify the insects using microscopes
	            ● (Identify down to Order)
	      iii. Record the number of each insect that we identified in each area
	
	5. Return to class with data
	   a. Make a table of the data
	   b. Organize data in graphs
	      i. Discuss which types of graphs might make most sense with the dtaa that was

	collected (probably bar graph)
	c. Analyze data
	i. Ask students what they notice when they look at the data in the chart and what they notice when the look at the data in the graph
	d. Consider what the data suggests about the different areas in the forest at Hopkins
	i. Discuss how this data can give us some clues that would allow us to form a hypothesis but that we would need much more loing term data in order to make any kind of conclusion about how forest management technique might impact the insects in a aprticualr place. This is because there are many other variables that could be contributing to these differences, beyond management technique (like microclimate).
	ii. Refer back to the giant map previously created and discuss what other factors might contribute to any differences that we see between number of insects in each area.
	Note: We chose to study insects but you could also look at camera trap data and study animals or your could collect plant specie data)
Evaluation ● Self-assess understanding of concepts ● Demonstrate understanding of concepts through performance-based tasks ● Reflect and/or revise answers or solutions to a complex question, issue, challenge, or real world problem	1. Create informational writing/art/brochures/presentations about Forest management suggestions based on our research 2. Hopkins is interested in our help creating thoughtful interpretive signage- we can do that!

Lesson Closure	1. Class discussion: Summarize what they've learned in these lessons and think about: What went well? What could have gone better? What are our next steps as humans in this region where there is much discussion about forest management? What do we think should be the goal when managing forests? Is high biodiversity something we want to aim for or not in forest management practices?
Lesson Closure ● Summarize the lesson ● Check for understanding via exit slip or exit ticket	

Note: This is an overview of a series of lessons that will include 2-3 visits to Hopkins Demonstration Forest (Nov, Feb, and possibly May). We will learn in the field and prepare for, analyze data, and explain meaning back in our classroom.