Marsh Magic

How has human agriculture had an effect on coastal wetlands? What are the differences between undisturbed, restored, and impacted wetlands?

Overview

South Slough National Estuarine Research Reserve on the southern Oregon coast has three wetland sites: one least-disturbed, one impacted (diked, drained and converted to agricultural lands in the early 1900's) and in need of restoration, and one impacted but then restored (2002). For the past few years, Reserve staff have been collecting data at the three sites including: beaver, lamprey, vegetation, historical imagery, hydrology, birds, and stream data.

Students will understand the importance of natural wetland ecosystems by exploring data in an online format. They will fill out digital field notebooks with guided inquiry within and explore hypothesis creation and critical analysis of other students' hypotheses (HS-LS2-6).

Essential Questions Based on HS-LS2-6

- *What is a wetland ecosystem?*
- *Why are wetland ecosystems important?*
- *What factors affect the health of a wetland ecosystem?*
- *How do changes to land us affect the health of a wetland ecosystem?*

Learning Goals

Students will learn the following:

- *Wetlands provide important ecosystem services.*
- *Many wetlands in Oregon have been lost since the early 1900s.*
- *Wetlands that have been impaired have a much reduced function compared to natural wetlands or even restored wetlands.*

Skunk Cabbage, South Slough NERR

Learning Objectives

Students will be able to:

- *Make and evaluate a claim using evidence to explain differences across wetland ecosystems.*
- *Analyze data and charts to identify patterns.*
- *Articulate explanations that other scientists have developed.*

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Grade Level

7-12

Time

1-2 weeks

Anchoring Phenomenon

Marsh Magic

Driving Question

How has human agriculture had an effect on coastal wetlands? What are the differences between undisturbed, restored, and impacted wetlands?

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Standards

Next Generation Science Standards

LS2.C – Ecosystem Dynamics, Functioning, and Resilience

Common Core Math Standards

HSN.Q.A.1
HSN.Q.A.2
HSS.IC.B.5
HSS.IC.B.6

Introduction

According to the National Park Service, "Wetlands are highly productive and biologically diverse systems that enhance water quality, control erosion, maintain stream flows, sequester carbon, and provide a home to at least one third of all threatened and endangered species." (See *Why are Wetlands Important?*). In the early 1900's when humans changed wetlands to farm or build on them (usually by filling or diking and draining them), they lost much of their highly productive systems and diversity was diminished. This was the case within Oregon's South Slough National Estuarine Research Reserve, our nation's oldest Reserve.

In this unit, students explore three wetlands in the South Slough Reserve: One least-disturbed, one impacted (diked, drained and converted to agricultural lands in the early 1900's) and in need of restoration, and one that was impacted but then restored to a more natural condition in 2002. Staff have been collecting data at all three sites including: beaver, lamprey, vegetation, historical imagery, hydrology, and stream data since the early 2000's.

In the first phase of the unit, students will understand the importance of natural wetland ecosystems by exploring a Prezi that has a lot of data about the three wetland sites. As they explore (probably in teams of two), they will fill out digital field notebooks with guided inquiry within. In the second phase, students will create a claim using the Summative Assessment Tool about how humans have impacted the wetlands, and support it with evidence and reasoning. Finally in phase three, students will be asked to achieve NGSS standard HS-LS2-6 by evaluating the claims, evidence and reasoning put forth by another student in their summative assessment tool.

LESSON RESOURCES

National Park Service

- *Reading: Why are Wetlands Important?*

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- *Reserve Site Profile*
- *Field Trips & School Programs*

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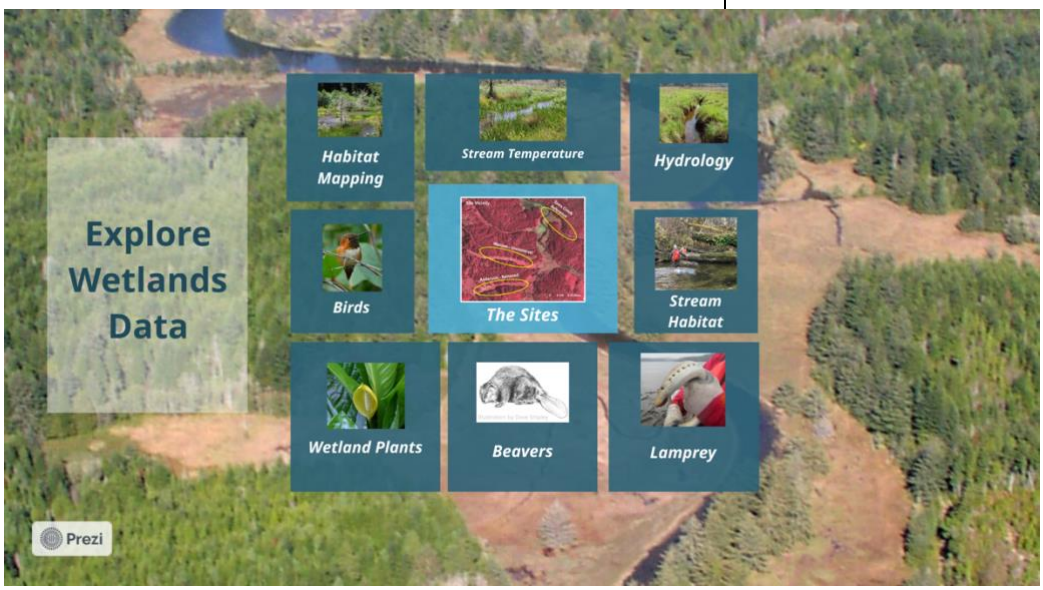


Lesson Procedure

ENGAGE

To begin, the teacher shares the South Slough Reserve presentation video *Marsh Magic* to identify why wetlands are so important. NOTE: A *Spanish version* of this video is also available. Then, the teacher leads a brief discussion using the following questions:

- What is a wetland ecosystem?
- Why are wetland ecosystems important?
- What kinds of benefits to humans do they provide?
- What factors affect the health of a wetland ecosystem?
- How and why have Oregon coastal wetlands changed since the early 1900's?
- How do these changes affect the health of a wetland ecosystem?

Next, the teacher shares short video clips of three different wetland sites and asks students to take brief notes on what they see. After watching each video, the teacher leads a brief discussion on the question: What differences did you observe about the wetlands shown in the three videos?

- **Tom's Creek** - least-disturbed wetland
- **Anderson Creek** - Restored Wetland
- **Wasson Creek** - Impacted Wetland

EXPLORE

Next, students use the *Oregon Wetlands* Prezi to explore the three wetland sites in more detail. They are given graphs and charts in the Prezi to identify patterns in the data across the three wetland sites. As they explore, they will answer the questions in their *Digital Field Notebooks*. One student can have the Prezi up on their chromebook, and the other student can have the Field Notebook open. See the *Educator Guide* for further instructions and supplemental discussion questions.

This activity will take several class periods. We recommend starting each one of these days with an *Vocabulary Quizizz*, and then setting a goal for students to work toward in the field notebook. Finish each class period with short student presentations from the field notebooks or discussions about the questions.

LESSON RESOURCES

Why are Wetlands Important?

- *Video: Marsh Magic*
- *Spanish version*

Three Wetland Sites

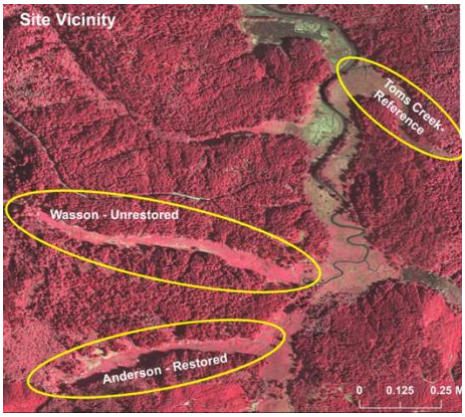
- *Video: Tom's Creek*
- *Video: Anderson Creek*
- *Video: Wasson Creek*

Exploring Wetlands

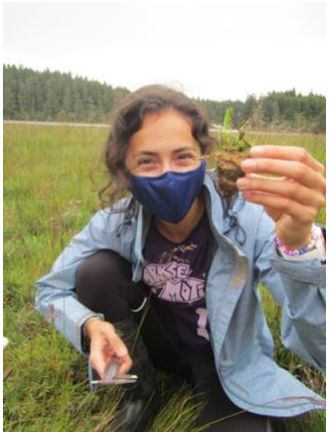
- *Prezi: Oregon Wetlands*
- *Digital Field Notebook (ppt)(slides)*
- *Educator Guide*

Vocabulary Quizziz

- *Quizizz #1*
- *Quizizz #2*
- *Quizizz #3*
- *Quizizz #4*
- *Quiziz – Final*



Study site locations, South Slough NERR



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EXPLAIN

Students have been answering questions about the graphs, data, and images in their Field Notebook as they go through the Prezi.

To wrap up each section, the teacher can lead a class discussion on major topics or use some of the supplemental questions provided in the *Educator Guide*.

Find additional helpful resources in the *Glossary of Wetland Terms* and the list of *Related Education Links*.

ELABORATE

After students have explored the wetland sites and have filled out their Field Notebooks, they will use the *Summative Assessment Tool* to create a hypothesis that is backed up by evidence and sound reasoning.

Additionally, students will analyse another student's claim, evidence, and reasoning to fulfill the requirements for NGSS HS-LS4-6.

Further explore the topic by taking a field trip to a local wetland area and/or to South Slough NERR to collect your own data. Invite a wetland researcher to speak to students about current research in wetland areas, and career pathways that are connected to wetlands research.

EVALUATE

Formative Assessments

- Digital Field Notebook
- Class Discussions
- Quizizz # 1-4

Summative and Standard Achievement Assessments

- Use the *Grading Rubric* to evaluate the Summative Assessment Tool. The teacher may prefer to grade these by having the student give a private, informal presentation followed by a one-on-one conversation.
- Use the *Quizizz vocab Final* to assess vocabulary gains.

Additional Resources

- *Glossary of Wetland Terms (pdf)(doc)*
- *Related Links (pdf)(doc)*

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Assessment

- *Summative Assessment Tool (pdf)(ppt)(slides)*
- *Grading Rubric (pdf)(doc)*

Career Connections

- *Researcher bio (pdf)*

Jenni Schmitt, South Slough NERR

Next Generation Science Standards

Performance Expectations:

HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

Science & Engineering Practice:

Engaging in Argument from Evidence

Disciplinary Core Ideas:

LS2.C – Ecosystem Dynamics, Functioning, and Resilience

Crosscutting Concepts:

Stability and Change

Common Core Math Standards

Math Standards:

HSN.Q.A.1 – Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN.Q.A.2 - Define appropriate quantities for the purpose of descriptive modeling.

HSS.IC.B.5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

HSS.IC.B.6 - Evaluate reports based on data.

Math Practices:

Reason abstractly and quantitatively.

Construct viable arguments and critique the reasoning of others.

Model with mathematics.

Look for and make use of structure.

Acknowledgments

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See more lessons on the ORSEA webpage: oregoncoaststem.oregonstate.edu/educators/orsea