Inquiry, Exploration & Service Learning in the Sagebrush Ecosystem

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www.fws.gov/greatersagegrouse/education.php
Training Objectives

Educators and partners will be able to employ a wide-range of strategies to engage students in learning about the sagebrush ecosystem. Educators and partners will have their questions answered about the curriculum and supporting resources.

Student Objectives
Listed at start of each lesson
Partners include . . .
Inquiry, Exploration & Service Learning in the Sagebrush Ecosystem

10 Lesson Plans and supporting resources aligned to Next Generation Science Standards and Common Core State Standards

Teacher’s Guide
Grades 4-8+
SAGEBRUSH ECOSYSTEMS

Web of Life

More than 350 species call the sagebrush ecosystem home. All are linked together in a food web during when plants make food from sunlight. Each species is adapted to survive with little water during hot, dry summers and cold winters.

Help Preserve Sagebrush Habitat

Learn and Share
Learn more about sagebrush ecosystems and ways to help. Explore them and spread the word.

Don’t Let Invasives Spread
Remove seeds from shoes, clothes, pets, and vehicles/tires before and after visiting natural areas.

Volunteer
Make vendors safe for wildlife. Restore invasive plants like cheatgrass and plant natives species.

Visit www.fws.gov/GreaterSageGrouse to learn more!
Sagebrush Ecosystem Trunks
Created by Audubon Rockies
Funded in part by BLM
Lessons

1. Intro to Greater Sage-Grouse and the Sagebrush Ecosystem
2. The Sagebrush Sea’s Web of Life
3. Invasive Plants: A Threat to Sagebrush Ecosystems
4. Native Plants in the Sagebrush Ecosystem
5. Fire! Impacts on the Sagebrush Ecosystem and Human Communities
6. Succession in the Sagebrush Ecosystem
7. Sagebrush Sea Survival
8. Human Connections in the Sagebrush Sea
9. Developing Plans to Restore Habitat for Sage-grouse and Other Wildlife
10. Wildlife Community Presentations and Engagement
Lesson 1

Intro to Greater Sage-Grouse and the Sagebrush Ecosystem
Suggested Lesson Plan

Essential question about systems
Brainstorm parts of a system
Pre-test
Short PowerPoint presentation with questions, such as . . .
What is a greater sage-grouse?

Male

Female
Suggested Lesson Plan (continued)

Short video of a lek
Show artifacts from Trunk and discuss concept of adaptations
Groups observe artifacts, think about adaptations, and present ideas
Adaptations / Extensions

Get students out; field journaling
Sage-Grouse Scavenger Hunt
Students sketch one or more of the artifacts
Wildlife Skull Activities
In-depth research projects on organisms

More Resources / References
Lesson 2: The Sagebrush Sea’s Web of Life
Suggested Lesson Plan

Arrange class in circle
In 5 groups, discuss favorite species
Groups choose volunteers to act out food chain as class
Food web diagrams with images of organisms and colored arrows for interactions
Class creates simulation of ecosystem with yarn
Species removed from web to show importance of biodiversity
Adaptations / Extensions

Start with essential question
Students explore local ecosystem, record organisms in field journals, and create food webs
Create short videos about food web
Research and give presentations on diverse species
Write poems about organisms and roles in ecosystem
Create food web diagrams using technology

More Resources / References
Lesson 3: Invasive Plants
A Serious Threat to Sagebrush Ecosystems
Suggested Lesson Plan

Go to area with invasive plants or gather around table with invasive and native plants

What is an invasive species? Discuss

How do invasives negatively impact habitat for wildlife species such as sage-grouse?

Create **monocultures**, poor habitat; lack the complex structure and varied plant height needed to support diverse ecological community

Do not provide as much food and shelter

Increase threat of severe wildfire

Tend to have shallower roots and less complex root structures, causing increased erosion of soil

Lack natural predators

Use water that could be used by beneficial native plants
Adaptations / Extensions include:

- Design wind-dispersal methods for a seed
- Invasive plant simulation
- Press and dry samples
- Invasive Species Project
- Germinate seeds and observe with microscopes and/or magnifying glasses

More Resources / References
Lesson 4
Native Plants in the Sagebrush Ecosystem

Big sagebrush leaves and flowers
*Artemisia tridentata*

Mountain big sagebrush
*Artemisia tridentata* subsp. *vaseyana*

Wyoming big sagebrush
*Artemisia tridentata* subsp. *wyomingensis*
Suggested Lesson Plan

Go to area with native plants or show specimens in classroom
Identify and share characteristics of:
  Shrubs such as sagebrush
  Grasses like native perennial bunchgrasses
  Forbs: wildflowers like arrowleaf balsamroot
  Trees like juniper
Discuss invasives on site and review impacts
  How do native plants help to create healthy ecosystems?
Transect line surveys using data collection sheet
Calculate results; share findings
If Students Planting Natives

Show students species they will be planting; share characteristics
Demonstrate how students will prepare and plant natives
Stop working 20 minutes before time to leave and clean up

Student journals
Draw favorite plant in DETAIL; label plant structures
Haiku or other type of poem about plant(s) and benefits

Close with discussion of how transect line surveys will help document changes to landscape over time
Adaptations / Extensions include:

- Graph % of each type of vegetation or ground cover calculated from transect data
- Record GPS coordinates of data points; can be used to record data at same points over time
- Document condition of site using photos and/or video; show changes over time (Photo Point Monitoring in Appendix)
- Save samples of plants; can be preserved by pressing and drying; see Idaho Rangeland Resource Commission's Rangeland Plants Education page: [http://idrange.org](http://idrange.org)
- Class field guide or display pressed plants and descriptions
- Collect seeds and have students experiment testing growth rates of different plant species under different conditions
- Create field journals prior to site visit; IRRC's page has good lesson, Cornell's Birdsleuth site has another
Lesson 5
Fire! Impacts on the Sagebrush Ecosystem and Human Communities
Suggested Lesson Plan

Identify expert partner, if possible

What does fire need to burn?
  Heat
  Oxygen
  Fuel
  (Fire triangle)

Fire demonstration

PowerPoint presentation / video(s)

Scenario: Tragedy in Sageview

Plans and dioramas for fire adapted community
Adaptations / Extensions include:

- Matchstick fire simulations
- Test dioramas (and plans) with real fire
- Pass out more fire information to use for plans
- Public service announcements or posters
- Research statistics related to wildfires
Lesson 6
Succession in the Sagebrush Ecosystem
Suggested Lesson Plan

What do you think happens after a serious wildfire burns through an area of the sagebrush ecosystem?
Short PowerPoint presentation
  Plant Wars of Succession game
Reflection questions and drawings
Class discussion
Plant Wars of Succession

**Future Events**
- You are besieged by a nasty fungus! Go back 1 space.
- You disperse all your seeds! Move ahead 2 spaces.

**Current Event**
- Go back 1 space.

**Interaction Cards**
- You freeze when temperatures plummet. Go back 1 space.
- You are pollinated by bees! Move ahead 2 spaces.
- You are infested by a deadly wilting disease. Go back 2 spaces.
- You are attacked by ravenous insects! Move back 1 space.
- You make seeds! Move ahead 1 space.
Adaptations / Extensions include:

- Field trip to area with recent wildfire; restoration work and/or observations/reflections
- Short essay to reflect on game
- Research an organism to learn about how it is being impacted or could be impacted by wildfires and other disturbance events
- Develop and play other creative versions of game

More Resources / References
Lesson 7
Sagebrush Sea Survival
Suggested Lesson Plan

Brief PowerPoint and/or video(s)
Trunk artifacts
Centers
Scientific drawings of artifacts with labels
Study track impressions, rubber scat, books, cards, etc.; create summary doc of how to identify wildlife and/or poems
Clay and natural materials to create new organism that is ideally suited to survive year-round in sagebrush ecosystem
Computer workstations: research and presentations
Adaptations / Extensions

Teach a peer
Knock, Knock . . .
Who's There?
Presentations on creatures, etc.
Field trip / field guide
In-depth research
Camouflage game

More Resources / References
Lesson 8
Human Connections to the Sagebrush Sea
Suggested Lesson Plan

Stories of Native American traditions
Ethonobotany
Graphic organizer for info
Modern practices: harmful and beneficial
Detailed diagrams of human connections to ecosystem
Adaptations / Extensions include:

Activity involving juniper
  Juniper cookies and count rings
Discuss reasons for differences in width
Creative projects
Ideal building material for things placed in ground

More Resources / References
Lesson 9
Developing Plans to Restore Habitat for Sage-grouse and Other Wildlife
Suggested Lesson Plan

Stories and images of ways scientists and ranchers helping to restore habitat

Scenario

Groups develop plans to restore habitat.

- Budget using worksheet
- Written component
- Visual representation such as poster, diorama, or computer-aided diagram
Adaptations / Extensions include:
Field trip to model ranch and/or service learning
Lesson 10
Community Presentations and Engagement
Suggested Lesson Plan

Present restoration plans and/or restoration work to community
Provide guidance
Rubric in Appendix
Adaptations / Extensions

- Collaborate with ELA teachers
- Present to younger students
- Record or photograph presentations and share as allowed by policy
- Present awards
Questions???

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Thank You!