

John Jarvie Historic Ranch: Ecology of Brown's Park

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Grade 4
Adaptable to Grade 5 & 6

LESSON PLAN DETAILS

Time Frame:

2 hours (2 class periods
at 60 minutes each)

Group Size:

- 2-3 Students.

Materials: See materials
list located under
ecology [Case Study](#)

Life Skills:

Critical thinking, literacy
development, scientific
inquiry, observation,
logic development

Intended Learning

Outcomes:

Students will understand
the ways in which the
environment is a
complex, interconnected
system.

Jarvie Ranch Ecology of Brown's Park Lesson Plan

By: Joel Arvizo-Zavala

This lesson plan is intended for fourth to sixth grade.

SUMMARY

Jarvie Ranch is nestled within an isolated mountain valley along the Green River in Daggett County, Utah. This area is a gem of ecological history even serving as the home of the Browns Park National Wildlife Refuge. This rich ecological history serves as the foundation to this lesson. Through learning about the Green River and the animals of Brown's Park students will have an opportunity to explore this ecology both in the classroom and during your visit to Jarvie Ranch.

The purpose of this lesson is to introduce students to the animals, plants, and ecology of Brown's Park; the area around Jarvie Ranch. Of particular importance is understanding species that are currently threatened or endangered, the role of water (the Green River) in the ecology of the Ranch, as well as issues of conservation and environmental change. By understanding how species become endangered, students will build their knowledge about human interactions with the environment and how ecological systems are created.

Relevant Core Standards

Utah Standards 4th Grade

Language Arts (Reading)

1. Informational Text – Key Ideas and Details: Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
2. Informational Text – Craft and Structure: Determine the meaning of general academic and domain-specific words or phrases in a text relevant to the subject area.
3. Informational Text – Integration of Knowledge & Ideas: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
4. Foundational Skills – Phonics and Word Recognition: Know and apply grade-level phonics and word analysis skills in decoding words.
5. Foundational Skills – Fluency: Read with sufficient accuracy and fluency to support comprehension.

Fine Arts

1. Create - Explore and invent art-making techniques and approaches by utilizing and caring for materials, tools, and equipment in a manner that prevents danger to oneself and others when making art, and by documenting, describing, and representing regional constructed environments.
2. Create - Collaboratively set goals and create an artwork that is meaningful and shows the intent of the makers.
3. Connect - Create works of art that reflect community cultural traditions.

Science

1. Standard 3; Objective 2 - Explain how the processes of weathering and erosion change and move materials that become soil.
2. Standard 5; Objective 1 - Describe the physical characteristics of Utah's wetlands, forests, and deserts.
3. Standard 5; Objective 2 - Describe the common plants and animals found in Utah environments and how these organisms have adapted to the environment in which they live.
4. Standard 5; Objective 4 - Observe and record the behavior of Utah animals.

Colorado Standards & Skills 4th Grade

1. Social Studies; Standard 2; Geography – Use several types of geographic tools to answer questions about the geography of Colorado.
 - a. Evidence Outcomes: Illustrate, using geographic tools, how places in Colorado have changed and developed over time due to human activity.
 - b. 21st Century Skills: Inquiry – How does the physical location of Colorado affect its relationship with other regions of the United States and the world?
 - c. 21st Century Skills: Nature of Geography – Spatial thinkers use tools to compare and contrast geographic locations.

2. Social Studies; Standard 2; Geography – Connections within and across human and physical systems are developed.
 - a. Evidence Outcomes: Describe how the physical environment provides opportunities for and places constraints on human activities.
 - b. Analyze how people use geographic factors in creating settlements and have adapted to and modified the local physical environment.
 - c. 21st Century Skills: Inquiry – How does the human activity affect the environment?
 - d. 21st Century Skills: Nature of Geography – Spatial thinkers evaluate how physical features affect the development of a sense of place.
3. Science; Standard 2; Life Science – All living things share similar characteristics; but they also have differences that can be described and classified.
 - a. Evidence Outcomes: Use evidence to develop a scientific explanation for similarities and/or differences among different organisms (species).
 - b. Evidence Outcomes: Use evidence to develop a scientific explanation of what plants and animals need to survive.
 - c. Nature of Science: Evaluate and provide feedback on evidence used by others to justify how they classified organisms.

Wyoming Standards & Skills Elementary Grades

1. Social Studies; Content Standard 2.2; Culture and Cultural Diversity – Identify and describe ways in which expressions of culture influence people (e.g., language, spirituality, stories, folktales, music, art and dance).
2. Social Studies; Content Standard 2.3; Culture and Cultural Diversity – Identify and describe characteristics and contributions of local and state cultural groups in Wyoming.
3. Social Studies; Content Standard 4.1; Time, Continuity, and Change – Describe how small changes can lead to big changes (cause and effect) (e.g., discovery of electricity).
4. Social Studies; Content Standard 4.3; Time, Continuity, and Change – Select current events for relevance and apply understanding of cause and effect to determine how current events impact people or groups (e.g., the building of a new school means that younger students will have new classrooms to learn in or war in another country means that some children’s parents will have to leave to fight).
5. Social Studies Content Standard 5.4; People, Places, and Environments – Describe how the environment influences people in Wyoming and how we adjust to and/or change our environment in order to survive (e.g., natural resources, housing, and food).

Background for Teachers

Students will be able to:

1. Identify the names and visual markings/characteristics of animals that call Brown's Park home.
2. Be able to identify what makes a species endangered and/or threatened and how threatened status impacts the livelihood of a species.
3. Understand the idea of ecology and how the Green River is part of the ecological system of Jarvie Ranch.
4. Use the activity to develop a visual model for the relationships between animals and the Brown's Park ecosystem.
5. Understand the unique relationship between animals, ecosystems, and indigenous peoples of the Brown's Park area (and nearby areas).

Introduction to Arts-based Scientific Observation

Arts-based scientific observation (ABSO) is a tool used by teachers to help students remain highly engaged while practicing observation skills in the scientific process. In this particular lesson, students will be introduced to the ecosystem of Brown's Park; the area surrounding Jarvie Ranch. Using photos, content within the lesson, videos, and more students will make observations about the ecosystem looking at the key components to what makes an ecosystem an ecosystem. Afterwards, students will be provided with materials to create a diorama that replicates (to the best of their ability) what they have observed to constitute the Brown's Park ecosystem. These dioramas are both artistic and scientific in nature and will provide your students with opportunities to build four primary skills:

1. Students will learn what it means to filter essential information from non-essential information by

Lesson Plan Procedure

Class One & Two

- Explore the concept of ecology and build your dioramas over the course of two class periods. You are the best judge of students' abilities and time management skills.
- Explain the highlights of local ecology and why ecology matters to their daily lives.

prioritizing the elements they include in their dioramas based on the information they glean from the lesson.

2. Students will gain a better understanding of perception and how what we observe can have meaning. In the case of an ecosystem, how different elements make up a living environment for plants and animals.
3. Students will have an opportunity to self-monitor (and with support from the teacher) reduce the impact of distractions on the student's ability to make meaning of their observations. The artistic process is great at this.
4. Students will develop motivation for learning. The artistic-observation process gives students a malleable structure form which to put what they learn into production.

Teacher Resource: Ecological Systems

Introduction to Ecology and Ecosystem Science

The purpose of ecosystem science (ecology) is to help us understand the ways in which various systems interact with one another and influence the trajectory of life within time and space. As such, it is important to note that ecological science serves as a foundation for our students to understand that we as humans have an inextricable connection to the plants, animals, and insects around us. By taking time to study ecology our students will develop a deep appreciation for how the natural world functions while ultimately leading to the protection and preservation of what we currently have. In this particular lesson students will learn about the ecology of rivers and use this as a stepping stone to investigating and understanding the Green River specifically.

Overview of River Ecology

It is important to note that rivers have a life of their own and in fact, it is this very idea that has captured the interest of river ecologists for decades. A river has the ability to sustain life while shifting and winding around the landscape over time. A river has the ability to change the landscape through properties of erosion and more but it is the relationship of the river to animals and plants that is of particular interest. When looking, specifically, at the Green River (found on Jarvie Ranch) it is important to see this river as an everchanging structure of the landscape not separate from the life it supports but directly integrated with it. There is a reason why human beings have built homes and communities around rivers and it is because of our direct need for water to sustain our own lives. In this lesson you will have the opportunity to teach your students about this inextricable connection. When we say water is life, there is no joke in that and we must do all that we can to understand and preserve the rivers around us.

The Green River Ecosystem

There are a number of threats to the Green River ecosystem that are important to note. First is the Flaming Gorge Reservoir located upstream on the Utah/Wyoming border. Although reservoirs have allowed human beings to store water and create hydroelectricity these systems also directly impact the ecosystem of rivers. When cold, less oxygenated water exits the bottom of the reservoir into the river below, this has dramatic effect on the river's ability to sustain life. As a result of human interventions on rivers, there are a number of fish species that are in need of conservation such as the Bluehead Sucker, the Colorado River Cutthroat Trout, Flannelmouth Sucker, Kendal Warm Springs Dace, and the Roundtail Chub (Wyoming State Action Plan, 2017). One species in particular that has been documented in the area,

the Bonytail Chub, unfortunately no longer exists in the Brown's Park Basin and is under conservation in areas of the lower Colorado River.

Why A Conservation Standpoint?

Scientists worldwide are in agreement that the earth's climate is changing due to human behavior. The landscapes and ecosystems surrounding Jarvie Ranch are no exception. As teachers, we can play a pivotal role in supporting our students in developing compassion and consciousness regarding how our behavior – and the modern systems that we depend on – impact our environment. Students will learn what it means for humans to negatively impact animal species but also learn how we can stop negative impact on animal ecosystems through the development of a conservation mindset. We anticipate that this lesson will create much fruitful inquiry and discussion between you and your students as a result.

The Beloved Greater Sage Grouse

The first animal of study in this lesson is the greater sage grouse which is found throughout the great basin and has experienced significant threats to their survival due to human influences. Currently, the animal is listed as 'near threatened' in terms of conversation status and numerous agencies are collaborating to ensure protection of the species. The greater sage grouse is an important species in three ways. One, it is a species that is sacred to many indigenous nations across the Great Basin region. Two, it is a unique species that has evolved and adapted to the great basin terrain and is thus a deep reflection of its environment. And third, studying the species has helped us to better understand how human behavior influences not only the Great Basin but also the often-delicate relationship between an animal and its natural habitat. These ideas will be explored in this lesson in greater detail with your students.

Lesson Vocabulary

Erosion	The process of being broken down or made smaller by wind, water, or other natural processes.
Grouse	A medium to large bird with a round body and feathered legs.
Rough	Having an uneven surface; not smooth.
Unique	Being the only one of it's kind; unlike anything else.
Achieve	To be successful at doing something.
Thrive	To grow or develop well.
Ranch	A large farm where animals are kept.
Dynamic	A process of constant change.
Shallower	Something that is less deep or having little depth
Ecosystem	A community of plants, animals, and insects interacting together in their physical environment.

Ecology Case Study: Diorama

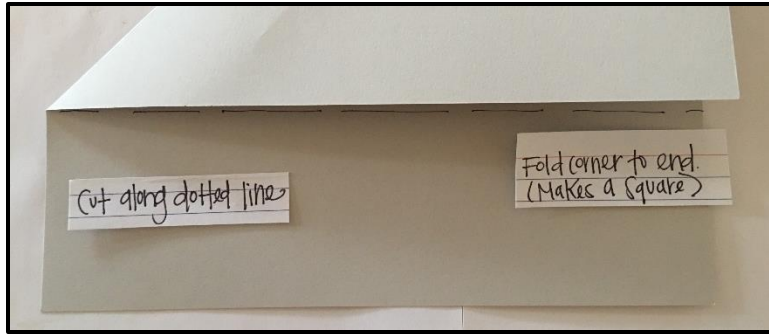
Students will be provided with a set of materials to brainstorm and then create a diorama that addresses some of the major ecological elements to the Brown's Park area and Jarvie Ranch. The process for the students is the following:

1. Provide students with materials listed in the table below
2. Using the additional resources section, the student handout, and other information regarding Jarvie Ranch and the Green River Ecosystem, introduce students to the ecosystem. Use vocabulary learning, direct reading of the student handout, and the supplemental videos to share more about Jarvie Ranch and it's ecosystem with your students.
3. Set a timer for 10 minutes to give students the ability to brainstorm major ecological elements to include in their diorama.
4. Set a timer for 30 minutes for student collaboration time to build their diorama.
5. Set a timer for 20 minutes for students to present their replica to the class. This step can occur on another day.

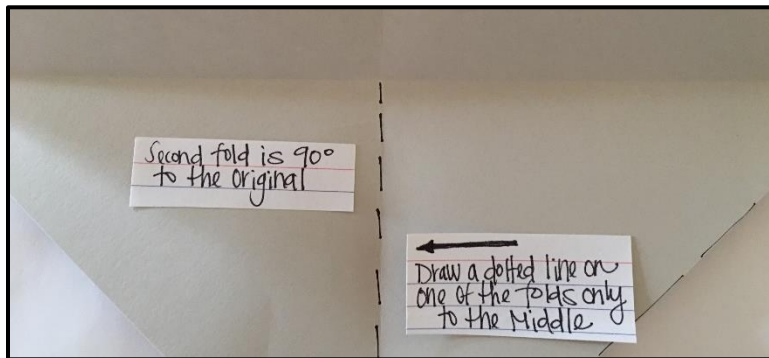
Materials List – Case Study – Sage Grouse		
Item	Purpose	Quantity per Model
White Cardstock 8/5"x11"	Diorama	1
Regular Glue (Liquid or Stick)	Attaching items to diorama	1 bottle or 1 stick
Tissue Paper (Green, Brown & Yellow Primarily) But various colors appreciated	Landscape for Diorama	About 3 or 4 sheets
Quick Drying Clay	Landscape for Diorama	About 4 oz.
Acrylic or Standard School Paints	Painting Details for Landscape Items	One pallet per group or student
Small cut-outs of Greater Sage Grouse	To emphasize their habitat on diorama	Two or three

Step-by-Step Guide for Ecosystem Dioramas

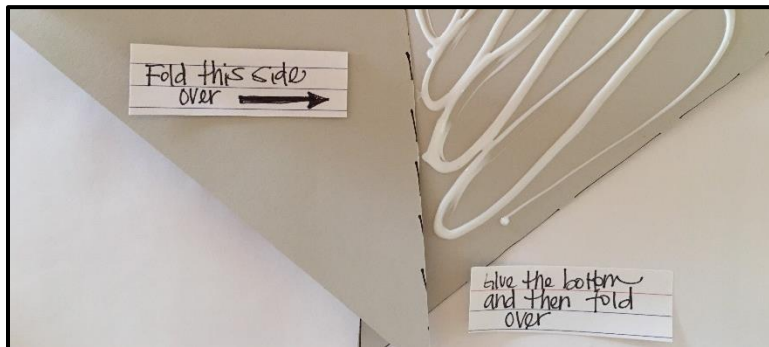
1. Pass out materials to students one-by-one starting with the white cardstock. Have the students pick a corner of the cardstock and fold inward until the corner aligns with the opposite site of the paper. This will form a triangle edge where the corner used to be. Next, draw a dotted line where the edge of the top cardstock folds meets the bottom of the cardstock fold. Using scissors, cut along the dotted line to form an equilateral triangle.



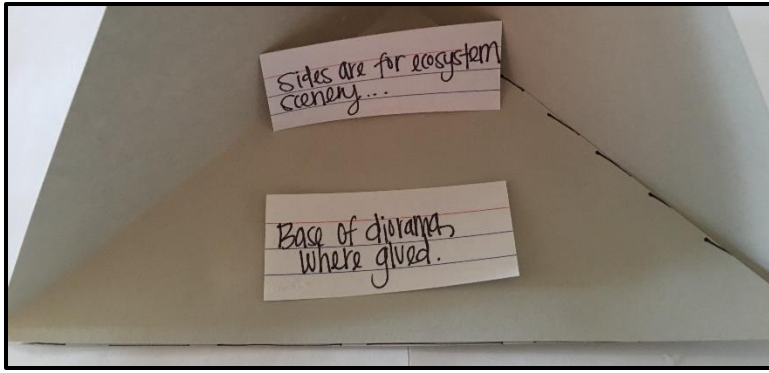
2. Open the triangle and fold again using the opposite corner as a guide meeting the other corner to form a new equilateral triangle. This will form a fold that is perpendicular to the original fold. Next, draw a dotted line on one of the fold marks from the corner to the middle where all four folds meet.



3. Using the dotted line as a guide, cut the cardstock from the edge and to the middle only. Once cut, glue the bottom triangle with school glue/glue stick and fold under the other side of the cut in order to form the base. This will serve as the frame for the diorama.



4. Once adhered, you will have a diorama with three sides that students can use to create their Brown's Park ecosystem.



5. Using the images and captions below, have students recreate the Brown's Park and Jarvie Ranch ecosystem. Encourage students to add animals they think might also be at the park that we may not see every day. Have them draw their own Sage Grouse to add to their diorama as well.

<p>The Green River: The banks and flow of the river at Jarvie Ranch</p>	<p>Rock Formation: Geological history of the site</p>	<p>Flowers at Jarvie Ranch: Attracts pollinators, native species</p>
<p>Cactus Plants: Arid conditions that can occur in the ecosystem</p>	<p>Juniper Tree in Rock Formation: Examples of large plant species on the Ranch</p>	<p>Irrigation Ditch on the Ranch: Human intervention on the ecosystem</p>

Student Content

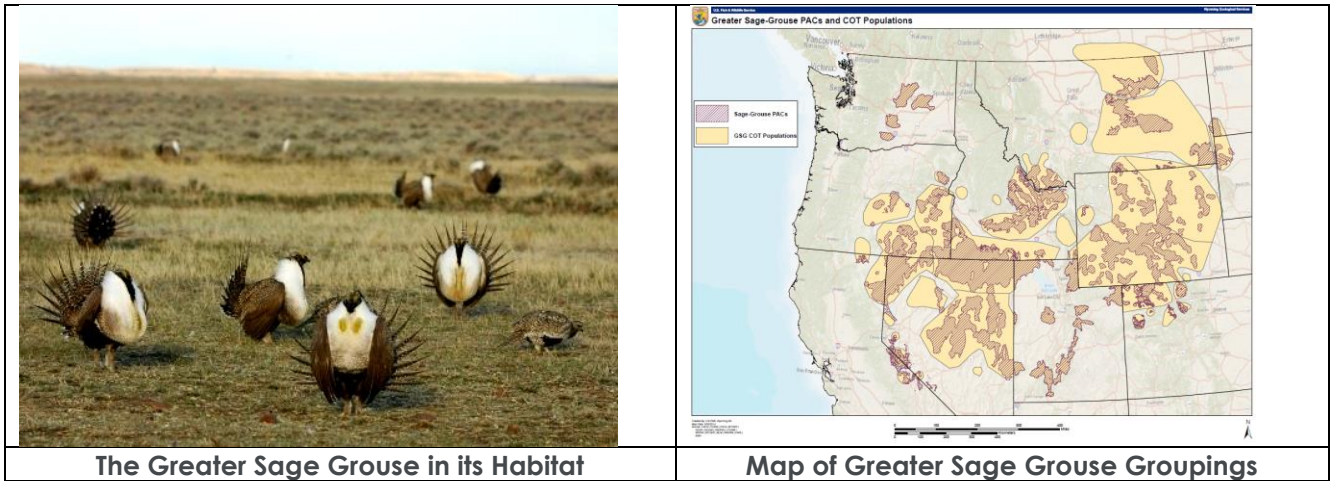
What is an Ecosystem and why do Ecosystems Matter?

What is an ecosystem? An ecosystem is a scientific word used to describe where plants, animals, and insects live. It is also a word that helps us understand how living things connect to one another. Ecosystems are important because they are the homes of plants, animals, and insects. We need ecosystems that are healthy in order to make sure that living things can thrive. Imagine the place where you live. What if it didn't have electricity? What if there wasn't water? Would you be able to thrive? More than likely not. Ecosystems need sunshine, water, shelter, food and more for all living things to do their best. When you visit Jarvie Ranch, you will see an ecosystem. Take time to notice the different plants. Stay quiet so you can see animals. Where is there water? How much sunshine is there? Are there hiding places or shelter for animals? Be careful though, something might be living inside! These are all parts of an ecosystem. And when we understand these parts, we can better understand plants and animals.

		
Wetlands Ecosystem in Browns Park	Uintah National Forest	Sagebrush Steppe in Utah

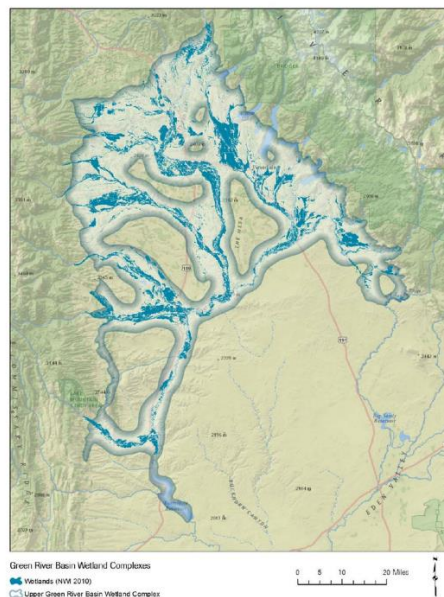
Getting to Know the Sage Grouse

When you visit Jarvie Ranch you might see a Sage Grouse. The Sage Grouse is a bird that has lived in the area for a long time. It has beautiful feathers and resembles a turkey, but much smaller. It is called a Sage Grouse because it lives among plants known as sagebrush. There are a few fun facts about the Sage Grouse that you should know. First, the male has feathers much different than the females. The males have a unique dance that shows off their feathers. The male Sage Grouse also makes a unique sound. But how? There are pockets of skin on the male bird's chest. These pockets are filled with air to make the sound. Lastly, the home of the Sage Grouse is called a lek. Scientists use the leks to figure out how many Sage Grouse might be living in that area.



The Green River

The Green River is an important river to Jarvie Ranch. It winds its way from the Windriver Mountains in Wyoming. Then the river shows up in parts of Utah where Jarvie Ranch is located. The Green River is also found going through the state of Colorado. Finally, the river joins the larger Colorado River just south of Moab, Utah. When you look at the map, you will see how the river flows back and forth. Rivers are important for many reasons but you will learn about two here. First, rivers are dynamic. This means that they change shape over time. During part of the year, they are deep such as during spring. During another part of the year, they are shallower such as during autumn. Rivers also have the ability to change direction over time. Although, this can take many years to achieve. The second important topic about rivers is erosion. As rivers move, they produce the force that we call erosion. Over time, the water cuts away at soil and rocks underneath its surface. This can cause changes to the riverbed such as smoother rocks or sandy soil. These are important ideas to have in mind for when you visit Jarvie Ranch. When you are there, take a good look at the river. Notice how wide and how deep the river is. If you can see the rocks underneath the water, are they rough or are they smooth? Make sure you take a notebook and pencil when you visit the ranch. You can draw what you see in the river and share with your classmates.



Jarvie Ranch Visit Extension

1. **Watercolor of Jarvie Ranch and Brown’s Park Ecosystems:** The area surrounding Jarvie Ranch lends itself to inspiring students to think critically and to observe keenly. From the river, the Jarvie store, and more students have an opportunity to really take in all that this state historical site has to offer. Utilizing watercolor, brushes, pencils, and paper students can re-create elements of the Jarvie Ranch that speak most to them. After passing out materials for the lesson (see list below), have the students create groups of three or four. Each group can then find a quiet spot to do their paintings. Additionally, the reflection questions below will help spark students’ interest in the activity and get them focused on the imagery around them.
 - a. *What are some of the plants that you notice? Which ones do you want to including in your painting? Why?*
 - b. *If you’re quiet enough, you might hear or see animals. If you do, what kind of animals do you notice? How would you draw and paint them on your paper?*
 - c. *What do you notice about the river at Jarvie Ranch? What colors do you see in the river? Can you see anything reflected on the surface of the water? How would you draw and paint the river on your own paper?*
 - d. *Notice the mountains and the sky. What colors do you see? How would you describe the shape of the clouds? What shapes do you see in the mountains?*




Materials List – Jarvie Ranch Water Color Project		
Item	Purpose	Quantity per Student
White Cardstock 8/5”x11”	Medium for Water coloring	1
Watercolor Palette	Painting Scenery	1 palette
Pencil #2	Outlining images and/or landscape	1
Watercolor brushes	Painting Scenery	2
Reusable cups	To hold water	1
Clean Water	For paints	To Fill Cup

2. **Traditional Ecological Knowledge and the Greater Sage Grouse:** when students and educators come o Jarvie Ranch there is a unique opportunity to have students understand the relationship that all parts of the ecosystem have with one another. This holistic perspective that takes into account the knowledge of tribal and indigenous communities is referred to as traditional ecological knowledge (TEK). This traditional knowledge is important because it helps us understand how every living thing is interconnected and if one thing in the ecosystem changes so do others. When students are onsite at Jarvie Ranch, they can do a field study of the ranch and

surrounding areas. Students should be able to identify parts of the ecosystem that may be beneficial to the Greater Sage Grouse and parts that are not beneficial. Below are three living things that students can search for while at the ranch. The first is Big Sagebrush which is an essential plant to maintain a healthy ecosystem for the Sage Grouse. The next photo is a secondary source of food for the Sage Grouse, burclover and should be really easy for students to find and identify. Last, is a picture of one of many butterflies that can be found in the great basin area of the western United States. Students can use their field study to see how many different types of butterflies (and moths) they are able to find.

Two important elements to traditional ecological knowledge include using both observations and experiences to answer questions about the natural world. The purpose of this lesson extension is for students to start building connections to how every living thing (plants, animals, insects, etc) help or hinder the survival of a species. Starting students on their field study requires some questions. The questions that students are going to study are: Are there enough beneficial species for the Greater Sage Grouse to survive on or near Jarvie Ranch? And if something is missing, what might happen to the Greater Sage Grouse? These questions can be provided to students on an index card before they head out in groups of five or six for their field study. In this lesson extension students should do the following:

- a. *Identify the number of each plant or insect they are able to find and where they found it.*
- b. *Write down their observations on a card, piece of paper, or notebook.*
- c. *Bring back their notes to the Ranch house lawn and share with their peers and field guides.*
- d. *Students will then state – based on the evidence they gathered – whether or not the Sage Grouse could survive at Jarvie Ranch.*

		
Big Sagebrush <i>Artemisia tridentata</i>	Burclover <i>Medicago polymorpha</i>	Pine White Butterfly <i>Neophasia menapia</i>

- 3. Assessing the Quality of the Green River:** when onsite at the Jarvie Ranch, it is impossible to not notice the Green River in all its glory. A foundational test in ecosystem science is the assessment of water quality. Luckily, we have many different ways for both youth and adult scientists to understand the quality of the water that comes in and out of an environment. The use of litmus paper to test the pH of a water source is a wonderful learning opportunity for students. But why does pH matter?

pH of water is important because it is connected to two important variables. First is about solubility or how much of an element (e.g. oxygen) can be dissolved in the water. Second is about availability or how much of a nutrient (e.g. nitrogen) can be used by living organizations that call the body of water home. pH's greater than 7 are considered acidic and pH's less than seven are considered alkaline. For many scientists, an optimum pH for river water is around 7.4 and extremes in pH can make the river less capable of supporting life. In this lesson extension students should do the following:

- a. *Work in pairs to test three available water sources onsite at the Ranch. One of these water sources must be the river. The other sources can be ponds, pools, rainwater, or potable water that's available onsite.*
- b. *Utilize the reusable cups to safely collect water with adult supervision. It might be interesting for the students to collect water from the Green River at a few different landing points to see if there are any differences.*
- c. *Carefully dip the litmus paper into the cups fills with water samples and then accurately read the pH according the scale and record the findings. Finds should be recorded in three areas:*
 - i. *Location of Sample (e.g. pool of water by the house, or river's edge by water wheel).*
 - ii. *General description of water turbidity (e.g. color of water, anything floating in it, level of transparency, etc.)*
 - iii. *The best possible estimate of pH as recorded for each sample using the litmus paper.*
 - iv. *Which water sources are closest to the ideal pH of 7.4.*
- d. *Come back as a group and discuss findings. Students should be given an opportunity to ask questions and to share any similarities or differences that they notice from other groups results.*

Materials List – Jarvie Ranch pH Testing		
Item	Purpose	Quantity per Student
Index Card or Cut Paper	Record Findings	1
Litmus paper	To Test pH of Water Sources	3
Pencil #2	Writing	1
Reusable cups	To hold water from sources	3
Hand Sanitizer	To clean hands after experiment	N/A

Lesson Assessment: Exit Tickets

Exit Tickets for Student Engagement & Self-reflection

The sample exit ticket below emphasizes general assessment of how the students experienced the lessons and then some self-reflection questions. Responses to the questions in this exit ticket can help the teacher gather data to improve lesson delivery in the future.

Jarvie Ranch – Ecology Lesson Exit Ticket	
Question	Response
What was most confusing for you?	
I need more practice with...	
What did you learn from the lesson today?	
What is one question you still have after the lesson today?	
Write a text message summary of today's lesson.	
How do you feel about your work today?	
What helped you understand the lesson today?	
How hard did you work today?	

Other Resources

Sage Grouse Initiative: <https://www.sagegrouseinitiative.com/sagebrush-community/the-bird/>

Prairie Chicken Dancers (Indigenous Peoples and the Sage Grouse):
<https://www.wyomingpublicmedia.org/post/audio-postcard-prairie-chicken-dancers-strut-their-stuff-northern-arapaho-powwow#stream/0>

Types of Erosion: <https://www.youtube.com/watch?v=QV2HOfcCJaM>

Erosion, Weathering, and Decomposition:
<https://www.youtube.com/watch?v=8ISfVu8Y-GY>

Sagebrush Ecosystem Curriculum:
<https://www.fws.gov/greatersagegrouse/education.php>

What is Observational Learning: <https://examples.yourdictionary.com/examples-of-observational-learning.html>

Native Knowledge: <https://e360.yale.edu/features/native-knowledge-what-ecologists-are-learning-from-indigenous-people>

Traditional Ecological Knowledge: <https://www.nps.gov/subjects/tek/learning.htm>

Indigenous Knowledge & the Sage Grouse:
<https://www.bistatesagegrouse.com/general/page/finding-common-ground-western-science-meets-indigenous-knowledge-sage-grouse-summit>

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