



**NATIONAL
CONSERVATION
LANDS**

Biodiversity

An Educator's Field Trip Guide for the
Red Rock Canyon National Conservation Area
Nevada

Cover Image: - A view of Red Rock Canyon National Conservation Area looking towards Pine Creek Canyon (BLM Photo)

©2024 Southern Nevada Area Partnership

Southern Nevada Area Partnership (SNAP) Accessibility Statement

The Bureau of Land Management (BLM) is committed to creating accessible content. It is our policy to ensure that everyone, including persons with disabilities, has full and equal access to our digital offerings. This document conforms to the PDF/Universal Accessibility (PDF/UA) (ISO Standard 14289) accessibility standards as required for Section 508 compliance.

Purpose of the Guide

The purpose of this guide is to support teachers in conducting independent field trips onto public lands, specifically the Pine Creek Canyon and Fire Ecology Loop Trails at Red Rock Canyon National Conservation Area outside of Las Vegas, Nevada.

This guide provides detailed information about what to bring and who to contact to arrange a field trip. It also provides biodiversity-related activities to conduct along the Pine Creek Canyon and Fire Ecology Loop Trails, as well as pre- and post-field trip activities for the classroom to enhance the field trip experience. The classroom-based activities are encouraged but not required to conduct the field trip and its accompanying lessons.

The Red Rock Canyon trip content supports standards-based knowledge in biodiversity targeting grades 6-9 and beyond, but activities can be adapted for lower grade levels.



Table of Contents

Section 1 – About this Guide.....	1
Welcome.....	1
How to Use This Guide.....	2
Activities at a Glance	2
Classroom Activities	3
Science Content Standards.....	4
Section 2 – Field Trip and Onsite Activities	7
Site Considerations	7
Recreate Responsibly & Leave No Trace.....	8
Safety	9
Southern Nevada Federal Public Lands Field Trips.....	9
Conducting a Field Trip to Red Rock Canyon	15
Pine Creek/Fire Ecology Loop Trail 2-hour or 3-hour Field Trip Options	16
Pine Creek and Fire Ecology Loop Field Trip Map	19
Background Information.....	20
Field Trip Activities.....	25
Section 3 – Classroom Activities	30
At Your Service.....	30
Survival!	34
A Grass Invasion.....	36
Ecosystem House Calls - Assessing the Health of an Ecosystem.....	44
Charting the Data	51
Section 4 – Additional Background Information and Resources	53
Public Lands	54



Section 1 – About this Guide

Figure 1. Visitors read a wayside at the first pull off at Calico (BLM Photo).

Welcome

Welcome to the “Biodiversity” educator’s field trip guide for Red Rock Canyon National Conservation Area!

This is one of four guides developed for educators to independently conduct field trips on public lands in southern Nevada. The other guides are for **Lake Mead National Recreation Area** (managed by the National Park Service), **Spring Mountains National Recreation Area** (managed by the U.S. Forest Service), and the **Desert National Wildlife Refuge** (managed by the U.S. Fish and Wildlife Service).

These guides were funded through an award from the Southern Nevada Public Lands Management Act (SNPLMA), which financially supports recreation, conservation, and education on public lands in southern Nevada. The award was given to a team representing five different federal agencies who are part of the Southern Nevada Area Partnership (SNAP): The Bureau of Land Management (BLM), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service (USFS), and the Bureau of Reclamation (BOR).

SNAP was established in 1999 to address shared and common land management issues in southern Nevada, as well as to work with outside partners and community members to support education, interpretation, and research to advance conservation.

Thank you for your commitment to educating youth about our beautiful and unique natural areas in southern Nevada. We hope you explore all of the Teacher Guides and enjoy your time at Red Rock Canyon National Conservation Area!

Sincerely,

The Bureau of Land Management &
The SNAP Team



Figure 2. Southern Nevada Agency Partnership Logo



How to Use This Guide

This guide is intended for use in conjunction with an educator-led field trip to the Pine Creek Canyon/Fire Ecology Loop Trails at Red Rock Canyon National Conservation Area. The field trip content focuses on biodiversity and bioblitz-style data collection targeting middle school but can easily be adapted for other grade levels. The on-site activities are intended to be experiential and immersive and designed to engage students in ecology while developing empathy and fostering a sense of place.

The guide has four sections: (1) About this Guide; (2) Background Information; (3) Field Trip and Onsite Activities; and (4) Classroom Activities.

The Background Information section provides content and context for the field trip experience and the classroom activities. The Field Trip and Onsite Activities section explains how to conduct a school field trip to the Red Rock Canyon National Conservation Area and contains all educator instructions and student handouts for the field trip. The Classroom Activities section contains classroom-based pre- and post-field trip activities to prepare for, expand upon, and reinforce the field trip experience and content. Although complementary to each other, all activities can be implemented independently, allowing teachers to pick and choose those best for their students.

Activities at a Glance

Field Trip Activities

Onsite activities at the Pine Creek Canyon and Fire Ecology Loop Trails, Red Rock Canyon National Conservation Area

Mini-BioBlitz

- Overview: Students inventory the plant species on the Pine Creek Canyon Trail using a leaf guide and use it to determine the associated animals in the area.
- Location: Pine Creek Canyon and Fire Ecology Loop Trails
- 1.5 - 2 hours (includes walking 0.8 miles round-trip along the trail and stopping at the creek)

In the order presented in the guide: field trip activities are listed first, classroom (pre-field trip and post-field trip) follow.



Classroom Activities

Pre-Field Trip Activities

At Your Service

- Overview: Students play a charades-like game to discover some of the free services ecosystems provide.
- Location: Classroom (or can be done on site with a 3-hour field trip)
- Time: 15 minutes

Survival!

- Overview: A game which reinforces basic needs of animals required to keep an ecosystem in balance and maintain biodiversity.
- Location: Classroom
- Time: 1 class period or less

A Grass Invasion

- Overview: A simulation in which students explore the effects of invasive grasses on native plants and animals at Red Rock Canyon.
- Location: Classroom
- Time: 1 class period or less

Post-Field Trip Activities

Ecosystem House Calls: Assessing the Health of an Ecosystem

- Overview: A picture-sorting activity designed to reveal characteristics of a healthy ecosystem and an ecosystems under stress.
- Location: Classroom
- Time: 1 class period or less

Charting the Data

- Overview: Students use the data they obtained during the Mini-BioBlitz to chart and compare the data they acquired with existing data.
- Location: Classroom
- Time: 1-2 class periods (depending on the extent of data analysis)



Figure 3. A car drives on the one-way, 13-mile loop in Red Rock Canyon National Conservation Area (BLM Photo).



Science Content Standards

This program is intended for middle school students but can easily be adapted for higher or lower grades.

The field trip and activities in this guide connect students to science, social studies, mathematics, English language skills, physical education/health, and art. Students gain experience using fundamental skills and concepts such as observing patterns in nature; cause and effect; using systems and system models; analyzing stability and change in systems; and examining the structure and function of the natural world.

Activities have been created for the cognitive, social, emotional, and academic development of the intended age group. The following are some connections to the Nevada Academic Content Standards for Science.

Biodiversity: Red Rock Canyon Teacher Guide Nevada Science Standards/NVACSS

Middle School

EMS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Interdependent Relationships in Ecosystems

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Natural Selection

MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

High School

Interdependent Relationships in Ecosystems

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6: Evaluate the 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-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Natural Selection and Evolution

HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Human Sustainability

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Engineering Design

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problems.



Figure 4. A tortoise rambles between several hardy desert plants (BLM Photo).



Section 2 – Field Trip and Onsite Activities

Figure 5. The Red Rock Canyon National Conservation Area entrance sign (BLM Photo).



Site Considerations

Red Rock Canyon National Conservation Area is a wonderful place to visit and explore. To ensure an enjoyable trip, consider the following:

- The area is popular with both locals and tourists. There is a reservation system to reserve entry into the area as well as associated fees. Information about the conservation area and current conditions are available at <https://www.blm.gov/programs/national-conservation-lands/nevada/red-rock-canyon>.
- Call (702) 515-5350 for specific questions about scheduling a visit.
- A water fountain and flush toilets are available at the visitor center. There are no available food services in the area. Most trailheads have pit toilets, but make sure to check before you go.
- Cell phone service is spotty and nonexistent in some areas, so plan accordingly.

When visiting any natural area, the BLM encourages following the Leave No Trace (LNT) principles (www.lnt.org). These principles are a set of outdoor ethics that encourage visiting our natural places in a careful, sustainable way that allows others to also enjoy them for years to come. The principles were established by the Leave No Trace Center for Outdoor Ethics, and built on work by the US Forest Service, National Park Service, and Bureau of Land Management in the mid-1980s. This relationship continues today. The principles are based on and informed by scientific research in the fields of recreation ecology and human dimensions of natural resources.

Recreate Responsibly & Leave No Trace

Whether exploring desert spaces or mountain places, remember to #RecreateResponsibly and follow Leave No Trace principles when you visit.

Know Before You Go

Check the status of the area you want to visit for closures, fire restrictions, and weather. Learn the rules and regulations for the site. Visit in small groups when possible. Consider splitting larger groups into smaller groups.

Plan And Prepare

Schedule your trip to avoid high use times and locations. Reservations and permits may be required. Each location and agency has different field trip and entrance requirements. Make sure you have the gear you need (such as student medications, plenty of water and snacks, sunscreen, and clothing layers), and have a back-up plan.

Build An Inclusive Outdoors

Be an active part of making the outdoors safe and welcoming for all identities and abilities.

Respect Others

There is space for everyone and countless outdoor activities. Be kind to all who use the outdoors and nature differently. Teach students basic trail etiquette – like step aside and let people pass, stay on the trail, use quiet voices, and play music only in headphones. Students should be informed that loud noises scare off wildlife and disturb other people who enjoy the outdoors for quiet and relaxation..

Leave No Trace

Respect the land, water, plants and animals, historic sites, and Native American communities. Follow Leave No Trace principles:

- Stay on trails and walk single file in the middle of the trail, even when wet or muddy.
- Travel and camp on durable surfaces (durable surfaces include maintained trails, designated campsites, rock, gravel, sand, dry grasses, or snow).
- Protect riparian areas by camping at least 200 feet (60 meters) from lakes and streams.
- Good campsites are found, not made. Altering a site is not necessary.
- Pack out all waste and leave what you find (this includes rocks, plants, and historic remnants).
- Examine, photograph, **but do not touch** cultural or historic structures and artifacts.
- Minimize campfire impacts by using only designated fire rings.
- Use a lightweight stove for cooking.
- Determine if there are fire restrictions.
- Never feed animals; control pets and clean up after them.
- Repackage food to minimize waste.
- Use a map and compass or GPS to eliminate the use of marking paint, rock cairns, or flagging.
- Utilize toilet facilities whenever possible, otherwise use “wag bags” and pack out all solid waste.
- Avoid introducing or transporting non-native species (use shoe scrapers provided at trailheads).
- Do not create structures, furniture, or trenches.

Protect And Make It Better

We all have a responsibility to sustain the places we love. Help clean up others' trash or volunteer.

Safety

Keep Your Distance From Wildlife

Do not follow or approach them. Avoid wildlife during sensitive times (mating, nesting, raising young, or winter). Do not feed wildlife. It hurts them because human food can be toxic to different species and because animals that become food-aggressive must be relocated or euthanized.

Be Aware Of Your Surrounding Terrain

Stick to trails and stay on the safe side of barriers. Use extra caution on steep, loose, or rocky terrain. Stay away from ledges and drop-offs.

Wear Hiking Shoes Or Boots With Sturdy Soles

Bring Water, Food, Medications, and Clothing

A good rule of thumb is to bring one liter of water for every two hours (more when it's warmer). On a field trip, teachers and chaperones should carry a backpack with student medicines, extra food and water, as well as a first aid kit.

Be Weather-Aware

Avoid walking in washes when rain is possible. (It can be raining in higher elevations miles away and water can flood the wash). Avoid hiking in exposed areas during lightning storms or when temperatures are high.

Make Sure People Know Where You Are And When You Will Return

Make sure cell phone batteries are charged and GPS locaters (which can provide a location to 911 in case of an emergency) are on.

Southern Nevada Federal Public Lands Field Trips

Places And Teacher Guides

The Las Vegas Valley is surrounded by amazing public lands managed by different federal agencies including the National Park Service (NPS), the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service (USFWS). Each of these agencies has developed specific activities to help you plan and implement a field trip highlights unique experiences at each location and meets specific educational standards and topics.

Taking students on field trips to the public lands around the Las Vegas Valley is a rewarding experience for students and teachers alike, but field trips take planning to go smoothly. Each land agency has different contacts and processes to make field trip arrangements. For example, some locations have entrance fees, so you will need to apply for a fee waiver. Other locations are free but have limited space, so you will need to obtain permission to visit with a group and will need to know where and how to park the bus.

This document provides checklists and information you can use for field trips to any location, while subsequent pages provide specific steps, contact information, and links to forms (if needed, e.g. fee waiver forms).

The four federal agencies (BLM, USFWS, NPS, and USFS) developed detailed materials to help you conduct a field trip to a specific location/trail. Below is a summary of each location and activity, as well as topics covered as part of the field trip.

Red Rock Canyon National Conservation Area

BLM – Teachers are required to have attended a pre-approved training to conduct self-guided field trips. As this is a fee area, a fee waiver is needed. Space is limited, so coordinate with the agency ahead of time.

- **LOCATION:** Fire Ecology Loop Trail (Pine Creek Canyon Parking Area near the end of the Scenic Drive)
- **Field Trip ACTIVITIES:** *Mini-Bio Blitz* – Students identify desert plants at specific stops along the Pine Creek Canyon trail on their way to the Fire Ecology Trail. At points along the trail students work in pairs to conduct a “bio blitz inventory” to see how many different leaf arrangements and leaf shapes they can find in a square meter. Students compare the areas and make decisions about biodiversity based upon the data they collected.
 - ◆ **TOPICS:** Biodiversity/plant identification/data collection and analysis



Figure 6. A group of students hiking at Red Rock Canyon National Conservation Area

Lake Mead National Recreation Area

NPS – fee area, fee waiver needed, limited parking space, coordinate with the agency ahead of time via lake_education@nps.gov.

- **LOCATION:** Bluffs Trail, Las Vegas Bay Campground
- **Field Trip ACTIVITY: *Geology: Erosion, Weathering, and Deposition and Colors in Stone*** – The Bluffs Trail provides an incredible view of the mountains that surround the Las Vegas Valley and a front-row look at geological processes like erosion, deposition, and fault lines. Also, nearly every major category of rock is represented on this trail – volcanic, metamorphic, sedimentary, and conglomerate – which tells an amazing story about the geology of the Las Vegas Valley. Students stop at points along the Bluffs Trail to learn about these land-forming processes, then finish with a watercolor activity “Colors in Stone.”
- **TOPICS:** Geology/erosion/land formation

Desert National Wildlife Refuge

U.S. Fish and Wildlife Service – free entrance, limited space, coordinate with the Agency ahead of time.

- **LOCATION:** Desert National Wildlife Refuge Visitor Center
- **Field Trip ACTIVITY: *Habitats: Refuge Residents*** – Students are assigned a desert animal that lives at the National Desert Wildlife Refuge. As the class follows the trails near the visitor center, there are specific stops that highlight different habitats. At each stop students consider the availability of food, water, and shelter and record whether their assigned animal would live in that habitat.
- **TOPICS:** Habitats/animal and plants found in different habitats along the trail

Spring Mountains

Forest Service – free entrance, limited space, coordinate with the Agency ahead of time at programs@gomtcharleston.com.

- **LOCATION:** Spring Mountains Visitor Gateway
- **Field Trip ACTIVITY: *Nature Detective*** – Nature Detective is an activity that connects students to their surroundings and allows them to practice observational skills. Students begin their observations on the ride up Kyle Canyon Road, learning about different life zones as they move from desert to pine trees. Once at the Spring Mountain Visitor Gateway they explore the nearby trails and record observations of nature, including evidence of insect and animal life. Students then take their observations and craft them into a poem.
- **TOPICS:** Life zones/evidence of plants and animals in nature/recording observations using their senses

General Checklists and Planning

STEP 1: DATES & PAPERWORK (minimum 1-2 months prior)

All of the agencies featured in this field trip guide require schools to schedule the field trip ahead of time.

- **Select a field trip date** with at least one or two alternatives. Some areas have limited space with multiple schools potentially interested in the same space. The more optional dates you have, the more likely you will be able to reserve your desired field trip spot. If your original field trip location is not available, consider going to one of the other three agency locations.
 - ◆ It is strongly recommended you plan at least one or two months in advance to give the agency time to process your paperwork. If your trip is less than one month away, you may not be able.
- **Determine how the class will get to the location and reserve buses.** Funds may be available to help pay for buses or even rent a charter bus. Get Outdoors Nevada is a non-profit organization that may be able to connect schools to mini-grants for buses. NOTE: There may be some restrictions on chartered buses in some areas due to size or contractual agreements between the managing agency and private companies.
- **Complete all paperwork** required by your school and/or school district (including obtaining permission slips, ordering lunches and water ahead of time, etc.)

STEP 2: CONTACT THE AGENCY (minimum 1 month prior, preferably several months prior)

- Refer to specific field trip activities for information about who to contact and the necessary forms required for the agency/location you are interested in visiting.
 - ◆ Read forms carefully and include all of the requested information. Missing information/documents will result in a delay. For example, in order to process fee waivers, some agencies require the teacher to complete and sign the form, provide proof of school accreditation or non-profit status, and give a description of the educational activity and learning objectives. Just because you are using one of the lessons developed by the agency, do not expect the front desk or fee booth staff to know this information. Copy and paste descriptions and educational standards from the specific guide into paperwork or attachments as needed.

STEP 3: PLAN THE ITINERARY

Plan a detailed itinerary. A sample general itinerary is provided below. Specific itineraries are provided with the specific field trip information. Itineraries will vary depending on the following:

- Distance from the school. Use your favorite map application to estimate the time needed to travel from your school to the field trip location, adding time for traffic, checking in at the fee booth, and unexpected delays.
- What time your school day starts and ends.
- Whether you are using school buses or chartered buses. School buses often have to be back sooner.
- The number of students participating in the field trip and where you are going. If you have a large group, your itinerary may need to include rotations. Suggestions for student group size and rotation times are included with each specific agency/location field trip.

Sample Itinerary:

- 9:00 – 9:15 a.m.: Depart school
- 10:00 a.m.: Arrive at field trip location
- 10:00 – 10:15 a.m.: Restrooms (we highly recommend all students go to the bathroom before heading onto the trail)
- 10:15 – 10:20 a.m.: Introduction
- 10:20 a.m. – 12:00 p.m.: Trails, activities, and lunch
- 12:00 – 12:15 p.m.: Restrooms and load buses (or lunch on the bus)
- 12:15 p.m.: Depart
- 1:00 p.m.: Arrive back at school

STEP 4: DO A SITE VISIT (minimum of 1 week prior)

- **Visit the site ahead of time.** Site visits will make you much more comfortable conducting the field trip. Scope out where the bus(es) will park, bathroom locations, and the safest and most direct path between the bus and the trail. Print out a copy of the field trip activity and accompanying maps to bring with you. Try a dry run by yourself or with friends or family, taking note of specific stopping points described in the activity.

STEP 5: GATHER SUPPLIES FOR YOUR FIELD TRIP (1 week – 2 days prior)

- **Bring permission slips as needed/required by the school and/or agency** – Make sure you are aware of all students' medical concerns.
- **Distribute student packing lists** – Each student needs to wear comfortable, weather-appropriate clothing and closed-toed tennis shoes. Each student also needs to bring a backpack, extra clothing layers or a jacket (depending on the season), a full water bottle, snacks, a pen or pencil, and required medicines.
- **Prepare supplies and copies of handouts needed for the activity (e.g. photo print-outs, pens/pencils)** – Supplies are listed at the beginning of each activity.

- **Copy of approved Fee Waiver Form (if needed)** – Print out a copy of your **agency-approved** field trip fee waiver and bring it with you on the bus to show the entrance station. Field trips that will need fee waivers include: Lake Mead National Recreation Area and Red Rock Canyon National Conservation Area.
- **Bring fully-charged cell phones** – All adult chaperones on the trip should bring fully charged cell phones in case of an emergency. Emergency phone numbers for each agency are provided on the agency-specific field trip pages. These numbers will get you the fastest response. Not all locations will have a strong, **or any**, cell signal, and reception will vary by the carrier and area (e.g. Verizon, AT&T, T-Mobile). Having a variety of phones and carriers among your chaperones will increase the likelihood someone will have reception.
- **Consider getting an emergency GPS locator/alert device such as SPOT or a Garmin InReach** – Emergency GPS locators are excellent safety devices in case of emergencies outside of cell coverage or without working phones. Some basic alert devices that do not require a recurring fee will send a simple alert and location to 911, while others allow text communication with contacts or agency dispatch to provide details about the emergency. These more sophisticated devices typically require monthly or limited plans. Outdoor stores are a good place to learn more about both options. If a school plans to do frequent self-guided field trips in outdoor settings, you may consider purchasing a shared device for check-out by teachers.
- **Field Trip teacher/chaperone backpack** – Assemble one or more field trip backpacks for teacher(s), group leaders, or chaperones with the following:
 - ◆ **Field trip activity materials for each group leader** (handouts, data sheets, and background information per the specific field trip activity instructions)
 - ◆ **Large and small trash bags** – Teach students to practice Leave No Trace principles by bringing both large and small trash bags with you. Small bags are easy to bring on the trail, while large bags will be convenient for consolidating large amounts of trash (such as if you plan to eat lunch on site). Some students enjoy contributing by picking up trash along the trail, and you can encourage their interest in stewarding their public lands by giving small trash bags any who want to participate. Remember to reinforce their interest with lots of praise and potentially rewards.
 - ◆ **Gloves** – Consider having some gloves for the students who are excited to pick up trash, as this will be safer and will potentially encourage individuals who don't want to touch anything "gross" to participate.
 - ◆ **Hand sanitizer**
 - ◆ **Spare water and snacks**
 - ◆ **First aid kit**
 - ◆ **Sunscreen**
 - ◆ **Student emergency medicine** (epipens, asthma inhalers, insulin)

- ◆ **Identify students who cannot be in photos** (in case someone from the agency wants to take a picture for social media or their records)
- ◆ **2 Wag bags** - Wag bags are emergency bathroom kits in case someone needs "to go" while out on the trail and cannot make it to a bathroom. Most outdoor stores (including online outlets) sell wag bag kits. These kits include instructions, toilet paper, hand wipe, anti-odor, and absorbent materials, and multiple opaque bags to prevent spills and to conceal the waste from view. NOTE: Students should **not** urinate in the bags, they are for feces.

STEP 6: CONFIRMATIONS (the day before)

- Confirm bus(es), student lunches, permission slips, student checklists, and all above supplies, as needed.

STEP 7: HAVE FUN AND FOLLOW-UP WITH THE AGENCY!

- **Celebrate the joy** the students experience out in nature and on our public lands!
- **Follow up with the agency** to let them know how the field trip went. Give the agency suggestions for improving the field trip activities or materials, so they can take note for future revisions.

Conducting a Field Trip to Red Rock Canyon

Below is a detailed description of the fee waiver/fee exemption process for Red Rock Canyon National Conservation Area (Bureau of Land Management). **This information is for 2024. Prices, forms, and details may change.** Remember, each agency has their own field trip process and requirements.

Arranging a Field Trip Independently

Schools and other educational institutions can arrange field trips without partners or guides through our recreation team. Group sizes for hiking are limited to 15 people, including all students, chaperones, guides, and participants, except in certain areas.

Fees may or may not be waived depending on the group and purpose of the activity.

Letter of Agreement and/or Fee Waiver Process

Red Rock Canyon National Conservation Area utilizes Letters of Agreement for groups and schools. We require a minimum of four weeks for processing and approval.

Email blm_nv_sndr_rrc_recreation@blm.gov with your request, including:

- Number of vehicles, number of participants, and areas to visit
- Proof of accreditation
- Curriculum or teaching guide when conducting standalone field trips

Campgrounds/Camping Fees Group Campsites

Campground fees are not usually waived unless there is a partnership with Red Rock Canyon National Conservation Area. Please contact us if you believe you may qualify for waiving camping fees.

Volunteer/Service Project Entry

If you are interested in volunteering or doing a service project, please contact blm_nv_rrc_volunteer@blm.gov with your request directly to see if we can accommodate you.

Pine Creek/Fire Ecology Loop Trail 2-hour or 3-hour Field Trip Options

Location

Pine Creek Canyon and Fire Ecology Loop Trails near the end of Red Rock Canyon National Conservation Area's Scenic Drive.

NOTE: The Red Rock Canyon Scenic Drive is a 13-mile one-way loop with a maximum speed of 35 mph (56 kph) with lower speeds indicated near parking areas and sharp turns. The Pine Creek Canyon Parking Area is around $\frac{3}{4}$ of the way around the Scenic Drive. Travel time should include time waiting and checking in at the fee station, as well as traveling the majority of the Scenic Drive.

Overview

This section of the Red Rock Canyon National Conservation Area Teacher's Guide contains a two- or three-hour field trip itinerary with two field trip activities teaching students about the importance of **and threats to** biodiversity.

Biodiversity is an important indicator of ecosystem health, and factors such as invasive plants and animals, climate change, and human use can decrease an ecosystem's ability to support high biodiversity. These factors can also allow additional stressors, such as fire, to become more common in an ecosystem. Despite formal protection, evidence of these threats is evident in Red Rock Canyon National Conservation Area. Prolonged drought, invasive species (especially grasses), increasing visitation, and other factors putting pressure on already stressed animal and plant populations have had an evident impact, decreasing the conservation area's biodiversity.

Materials

- Student Handouts for the Mini Bioblitz and At Your Service activities
- Clipboards
- Pencils
- Field trip teacher/chaperone backpack (listed under Step 5: Gather Supplies for Your Field Trip)

Time

This itinerary is based on a single-class field trip and has two-hour and three-hour options.

Procedure

1. Welcome and Orientation

Location: Pine Creek Canyon Parking Area (or Visitor Center, time permitting)

Time: 30 minutes

Overview: Orient students to the site and field trip

Procedure: Cover the following topics with the students

- Bathrooms
- Red Rock Canyon Overview (see Background Information)
- What to Expect
- Groups
- Logistics
- Schedule
- Safety and Leave No Trace
- Introduction to Main Onsite Activity: Mini-BioBlitz

2. Main Onsite Activity: Mini-BioBlitz

Location: Pine Creek Canyon and Fire Ecology Loop Trails

Groups: No more than 15 people are allowed per group on the trail at a time. You will need to plan for the number of groups needed to accommodate student and chaperone numbers. We suggest having one group of 15 stay at the top of the trail near the parking lot to do part of the BioBlitz, while one group of 15 heads down to start at the Fire Ecology Loop Trail.

Time: 1-1.5 hours – Includes 0.8-mile hike to and from the picnic table along the Fire Ecology Loop Trail.

NOTE: The beginning and end of the trail are steep, and several sections are rocky. It is not wheelchair accessible. It may be difficult for students or adults with limited mobility. Participants should wear sturdy shoes with good traction.

This is a learner-centered activity, with teachers and leaders providing support. Groups use the marked trail map to follow the designated paths. Students will explore and investigate the landscape using observation skills while filling in their checklist. Groups will return to the parking lot together or at a designated meeting time.

NOTE: Fire Ecology Loop Trail trail traverses a sensitive riparian area with a seasonal stream most active in spring and late summer. Please make sure students avoid crushing or removing plants, playing in the water, disturbing wildlife, collecting rocks or artifacts, or going off trail.

Overview: Students will participate in a mini-BioBlitz in which they will inventory as many plant species as possible in one portion of the Pine Creek Canyon or Fire Ecology Loop Trail. Using leaf shape, color, size and other distinguishing characteristics, students will count species. Students will have a better understanding of the area's biodiversity by connecting plant species to possible associated animal species.

END TWO-HOUR FIELD TRIP OPTION

THREE-HOUR FIELD TRIP OPTION

3. LUNCH

Location: On the trail/near the activity location

NOTE: Students should bring lunch in their packs, and teachers/leaders should have trash bags to make sure nothing is left behind. The Fire Ecology Loop Trail is in a sensitive riparian area, so there is potential for damage if students are off trail. There are also trees, which provide shade but could make it difficult to watch students. If the students want to hike more and you'd like a more open area to eat lunch, consider leaving the Fire Ecology Loop Trail and heading further into the canyon another 0.25-mile along the Pine Creek Canyon Trail. There is an old building foundation on the left (as you face towards the canyon) side of the trail near an open area. The next activity "At Your Service" can also be done at this location (or any location students are having lunch).

Time: 20-30 minutes

4. Second Onsite Activity: At Your Service

Location: Picnic table on the Fire Ecology Loop Trail or other alternative trail locations (see Lunch description above)

Groups: No more than 15 people are allowed per group on the trail at a time. You will need to plan for the number of groups needed to accommodate student and chaperone numbers. We suggest having one group of 15 stay at the top of the trail near the parking lot to do part of the BioBlitz, while one group of 15 heads down to start at the Fire Ecology Loop Trail.

Time: 30 minutes

Overview: Ecosystems and the individual organisms that comprise them provide many services. The functions that enable their survival provide benefits that increase our quality of life. In this activity, students play a charades-like game to discover some of the services ecosystems provide.

END THREE-HOUR FIELD TRIP OPTION

Pine Creek and Fire Ecology Loop Field Trip Map



Figure 7. Pine Creek Canyon and Fire Ecology Loop Trails map with stops.



Background Information

Red Rock Canyon National Conservation Area

The Story of Red Rock Canyon

Red Rock Canyon National Conservation Area contains a portion of a mountain range called the Spring Mountains, which forms the western boundary of the Las Vegas Valley. This spectacular landscape is known for its striking sandstone cliffs, diverse desert lowlands, and canyons with numerous seasonal waterfalls.

First set aside as Red Rock Recreation Lands in 1967, Red Rock Canyon was designated Nevada's first national conservation area in 1990. This designation was intended to protect this area's unique geologic features, diverse desert ecology, and extensive human history. National conservation areas are designated by Congress to conserve, protect, enhance, and manage public lands for the benefit and enjoyment of present and future generations. These lands offer exceptional scientific, cultural, ecological, historical, and recreational value in support of the BLM's mission of multiple-use and sustained yield..

For an introductory video, visit this link: <https://finleyholidayproductions.com/project/intro-to-red-rock-canyon>.

Red Rock Canyon National Conservation Area is managed by the Bureau of Land Management (BLM) and encompasses almost 200,000 acres. Two congressionally-designated wilderness areas -- La Madre Mountain Wilderness and Rainbow Mountain Wilderness -- offer greater protections and opportunities for unconfined recreation..

Red Rock Canyon National Conservation Area is home to many species, from the Red Rock sunflower and Blue Diamond cholla cactus -- found nowhere else on Earth -- to the charismatic Mojave desert tortoise and desert bighorn sheep, both protected as Nevada state symbols. Its variety of soil and rock types, elevation ranges, precipitation, exposure, and use create a diversity of habitats and species that is unparalleled in the region.

Red Rock Canyon National Conservation Area has many microclimates: small environments that differ from the surrounding area in climate. For example, Ice Box Canyon is a relatively cool, moist canyon due to its narrow canyon walls and the seasonal stream that runs through the canyon bottom. Its orientation relative to the sun also creates shaded conditions throughout the day.

There are five distinct major plant communities in Red Rock Canyon National Conservation Area: creosote bush scrub, Joshua tree woodland, blackbrush chaparral, pinon-juniper woodland, and pine-fir forest. Each of these communities is home to a variety of plants that have similar soil, temperature, and moisture requirements and support a unique combination of animals. Some animal species, such as the Mojave desert tortoise, are becoming increasingly rare due to human impact. Their protection within the conservation area helps support these species' recovery over time.

While there are at least 45 different mammal species at Red Rock Canyon National Conservation Area, most of them are nocturnal, meaning they are primarily active at night to take advantage of cooler temperatures and more available moisture. One of the most commonly seen animals, the white-tailed antelope squirrel, is active during the day. You can often see them lying flat against the ground to cool themselves against cooler surfaces in the shade..

Red Rock Canyon National Conservation Area is home to a great diversity invertebrate species such as insects, many of which live in close association with the plants they feed on or pollinate. Some insects, such as the assassin bug, are predators that feed on other insects. The desert tarantula – a normally reclusive arachnid – is often seen in fall when males leave their burrows in search of a mate.

People of Red Rock Canyon

Since time immemorial, people have been a part Red Rock Canyon's landscape and environment. Evidence of indigenous people's connection to the land is found in the still visible rock writing and agave roasting pits they created, as well as the ancient but constantly evolving traditions practiced by their descendants. The Ancestral Pueblo People – ancestors of the Hopi People of Arizona and the 20 recognized Pueblo people groups of New Mexico and Texas – forged a connection with the land here, as did the Southern Paiute People. The United States government and private militias forced these most recent indigenous inhabitants to abandon their traditional lands and practices to make way for European-style agriculture and industry, but many Southern Paiute people defiantly maintained what traditions they could to the present day in the face of all attempts to erase their culture. For more information about some of the affiliated tribes at Red Rock Canyon National Conservation Area, see this video: <https://www.youtube.com/watch?v=HdSOROTswic>

Early explorers to the Las Vegas Valley included Spanish scout Rafael Rivera. During the first successful roundtrip expedition on the Old Spanish Trail from Sante Fe to Los Angeles, he got lost and found the Las Vegas Valley, eventually adding his route to the main trail. Early travelers along this new route would travel into the Red Rock Canyon area for water.

Over time, more people began settling in the Las Vegas Valley. In 1876, James B. Wilson and George Anderson homesteaded in the area now known as Spring Mountain Ranch. Wilson later settled in Red Rock Canyon's Pine Creek area. Other areas in Red Rock Canyon National Conservation Area also hosted homesteads and ranches.

Sandstone was quarried at RRC from 1905-1912, but the quarry was never financially successful because of the high cost of transporting the rock. Some buildings still standing in San Francisco have Red Rock Canyon sandstone foundations. Many abandoned mines dot Red Rock Canyon National Conservation Area; all were quickly abandoned when the the claims' remoteness made profitable business impossible.

Today, Red Rock Canyon National Conservation Area draws people from all over the world, with nearly four million visitors coming every year. Visitors come to enjoy diverse activities such as rock climbing, bicycling, bird watching, auto touring, and hiking.

A Healthy Ecosystem

To keep our bodies strong, we eat healthy foods and keep active, but what does it mean to have a healthy ecosystem? A healthy ecosystem is one where the ecosystem as a whole is resilient to change and to natural stresses such as fire, flooding, or drought. A healthy ecosystem is composed of native species with population trends more-or-less stable over the long term. A balance is evident, with no species seeming to "take over," and none in danger of dying out.

A healthy ecosystem is typically home to many different species, each with a role in maintaining the ecosystem's health, structure, and function over time. Unfavorable environmental conditions can lead to scarcity of food or habitat, causing a species' population – along with its role in the ecosystem – to decline..

Many unfavorable conditions can result in decreased ecosystem health, including disease, fire, invasive species, and drought. Unnatural species interaction, lack of sufficient resources, and overcrowding can contribute to disease spread. For example, bighorn sheep have experienced outbreaks of a fatal disease spread by domestic sheep. Unnaturally high fuel loads can cause fires to burn especially hot, killing not only shrubs and trees but also the microbes and fungi that inhabit the soil. This means the soil is sterile, and seeds planted will never germinate.

Seed dispersal and pollination are necessary parts of a healthy ecosystem. For a plant species to persist, it must reproduce via pollination and disperse its seeds somewhere the new plants will not compete with the parent. Having numerous and diverse pollinators, favorable environmental conditions for seed production and germination, and the right types of biotic and abiotic seed dispersal is essential.

Each species is adapted to the conditions in which it evolved, including seasonal changes and natural year-to-year weather patterns and cycles. However, climate change creates additional environmental pressures that affect all species' ability to survive. Availability of food, water, and suitable habitat will all be affected by climate change.

The Importance of Biodiversity

You'll find it everywhere, from the largest ocean to the smallest puddle, from the densest forest to the driest desert, from the richest marsh to the most barren mountaintop. It marches in vast parades across the African savanna and lurks in the merest pinch of city-lot soil. It's a living bank account, providing the "capital" that underlies all human enterprise and prosperity, and its beauty, abundance, and complexity continually fascinate and inspire us.

Life on Earth has been evolving for billions of years and today is a complex web of species, each dependent on the others for survival. Humans are a fairly new addition to this web of life, our species only having been here for a fraction of most other species' time. We are dependent on the species around us for our food, products, clean water, clean air, and even many medicines.

What it is, is biodiversity – the wonderful variety of life on Earth.

-Biodiversity Basics

We are beginning to understand the complex interrelatedness and dependent nature of each species on the others. We are also beginning to understand how a species' extinction affects all the others. For example, the Gila monster's saliva contains a hormone that can regulate blood glucose, now used as a pharmaceutical drug for people to help manage diabetes. Imagine if Gila monsters had been "lost" to extinction, and that drug was not available to help people. What other life changing drugs or potentially useful products are waiting undiscovered in the plants and animals around us?

Scientists estimate there are 8.7 million species on Earth, but it is likely that less than 15% of all species have been discovered and described.

To see some of Red Rock Canyon National Conservation Area's species, view this video: <https://finleyholidayproductions.com/project/red-rock-canyon>.

Types of Biodiversity

Biodiversity encompasses the variety of all life forms on Earth. Biodiversity has increased and decreased corresponding to changing pressures since life began, but today we see that humans' actions have a significant impact on biodiversity. This impact is only increasing.

Climate Change

Climate change is evident around the world. It has many observable impacts, such as melting glaciers and thinning sea ice, changing weather patterns, and more frequent natural disasters like floods. The average global temperature has warmed about 1 degree Celsius (1.7° degrees Fahrenheit) in the last 150 years. While it doesn't sound like much, it can have devastating effects. Plants like Joshua trees evolved to tolerate a specific temperature range, so, as their habitat warms, they struggle to survive.

Habitat Loss & Degradation

Many species rely on specific habitats and places to live. Without their habitats or enough room, food, or access to water, they can be threatened. Las Vegas is rapidly expanding. Since 1990 the population of the area has tripled. Construction for neighborhoods and business has been digging up the ground and disturbing plants. Desert tortoises, who burrow underground, have been displaced or lost their food sources. They are considered threatened and are at risk for extinction due to habitat loss.

Pollution

Pollution can affect everything: air, water, soil, and especially living things. We often see air pollution as smoke from large wildfires, which is unhealthy for people and animals to breathe. Water pollution, like an oil or chemical spill, can directly kill plants and animals in the water. Buildup of other toxic substances can also cause things like algae blooms, which can poison water or change the habitat. In Lake Mead, algae blooms happened in the early 2000s because too much phosphorus was coming from the recycled water. Since then, we have improved the water quality and treatment.

Invasive Species

Sometimes a species enters a new ecosystem. In this new environment, some species thrive due to better temperatures, availability of food sources, or lack of competition. In Lake Mead, the Quagga mussel, originally from Eastern Europe, has taken over and significantly impacted the lake due to its high numbers. This species is thriving in the warmer waters of the lake with limited predators and is causing many changes. Quagga mussels displace native species that fish and other local animals need for food, and clog pipes at Hoover Dam, cover boat motors, and travel to other rivers and streams.



Field Trip Activities

Mini-BioBlitz

Location(s)

Pre-field trip practice and data collection at school

Pine Creek Trail/Fire Ecology Loop Trail

Overview

A BioBlitz focuses on finding and identifying as many species as possible in a specific area over a short period of time. A BioBlitz is also known as a biological inventory. The primary goal of a BioBlitz is to get an overall count of the plants, animals, fungi, and other organisms that live in a place. A BioBlitz can reveal important changes in the biodiversity of an ecosystem or portion of an ecosystem. In this activity students will participate in a mini-BioBlitz in which they will specifically inventory as many plant species as they can in one area of your school grounds and on a portion of the Pine Creek/Fire Ecology Loop Trail. Using leaf shape, color, size and other distinguishing characteristics, students will count species. By connecting the plant species to possible associated animal species, students will have a better understanding of the biodiversity of the area.

Materials

BioBlitz Inventory Packet:

One set of student handouts per pair of students for the practice-run at school. 3 sets of student handouts per pair of students for the field trip (one set is used to collect data at each of the three stops).

Time

1 hour at school

1-1.5 hours on the field trip (this includes hiking time from the parking lot, to the picnic table on the Fire Ecology Loop Trail, and hiking back)

Procedure

1. Biodiversity refers to all the different kinds of living organisms within a given area. It is a key ingredient in a healthy ecosystem. Functioning ecosystems supply our most fundamental needs, like oxygen, clean water, and food security. Additionally, ecosystems provide critical services such as pollination, seed dispersal, climate regulation, water purification, nutrient cycling, and control of agricultural pests. One way to check the status of an ecosystem is to check its biodiversity. This can be done with a biological inventory or BioBlitz!

Students will conduct a mini-BioBlitz in which they survey the plant species at a location at school and then on field trip to the Pine Creek trail using a plant and leaf inventory sheet.

NOTE: There are two different student inventory handouts. You can use one or both of them. It is recommended that the main data collection be done using the leaf arrangement and shapes to help students differentiate different species (without “naming” individual species of plants). This approach helps them use observation and clues to differentiate between plants. There will also be different types of plants on the school grounds versus out at Red Rock Canyon – and even different types of plants at various locations along the trail. The idea is for them to see how biodiversity works – different plants in different areas with different adaptations to suit that area – as well as how observation and data collection works (along with comparisons).

Students should be broken into small groups or pairs. Students should have a clear understanding of the outcome of this inventory: to gain knowledge based on data about the diversity of plants in different areas. Students can conclude that the more plants they distinguish, the more biodiversity. Fewer distinguishable plants would indicate less biodiversity. Later you can discuss why there might be more or less biodiversity in one area versus another (e.g. the school grounds will likely have less because they are “manicured” grounds. At Red Rock Canyon the high desert at the start of the trail versus the areas along a wash or the creek will have more biodiversity because of the presence of water. Students can also speculate other things that could impact the biodiversity of an area – e.g. invasive plant or animal species, fire, erosion, soil nutrients, presence of people, etc.)

2. Establish a schedule and data collection parameters for the inventory.

- ◆ **School:** Determine and describe the “transect” process for inventorying plants. This same process will be used to collect data on the field trip. By using the same data collection (transect) process, this will allow the students to compare the number of plant species they see at school versus on the trail at Red Rock Canyon.

When students collect data in different areas, make sure they use a different data sheet and the data sheets are labeled with the location (so there is no risk of data getting incorrectly combined or attributed to the wrong spot.)

Transect examples: Students can have one string [all groups should have the same length of string (e.g. 2 feet)], and then inventory a pre-defined distance from the string (e.g. one hand length) on either side. Or you can distribute four cuts of string for students to make a box that determines the area for data collection. Students should collect data in a minimum number of boxes or line lengths (depending on the data collection transect you choose). Students will need to record how many “boxes” or string lengths they collected. These details should be part of a data collection procedure defined ahead of time. At some point, either before or after the field trip, you can discuss with students why it would be important for all of the groups to be collecting data in a similar way (to decrease variability, and improve accuracy).

- ◆ **Field Trip:** No more than 15 people at a time can be on the trail, so you may need to split the class. One group can begin their BioBlitz data collection at the top of the trail, while the other group can go to the picnic table on the Fire Ecology Loop Trail to collect their data.) If there are more than 30 students, a 3rd stop can be added in the wash at the bottom of the hill as you leave the parking lot area. Students should collect the data on a separate sheets with the location noted (or clearly differentiate the data location on the same sheet). Students should be given a timed period at each location they stop and collect data (depending on your field trip length and whether you will also be doing the "At Your Service Activity" as well. Remind students of "transect" process being used to inventory (distribute materials as needed).


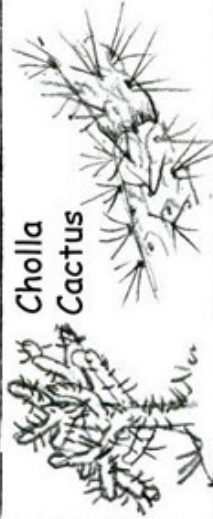

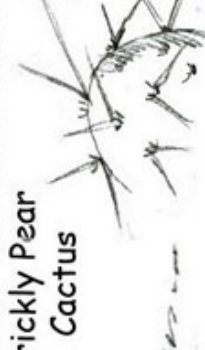
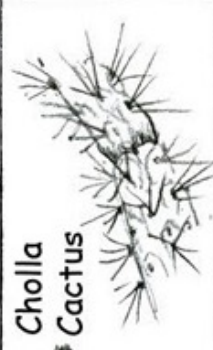
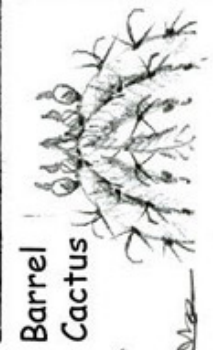



If students conduct a mini BioBlitz along the trail, have them note where they are along the trail for each data collection transect. Are they up high near the parking? Are they in a dry wash? A wet wash? Plants will change based upon the elevation and access to water. You would want students to be able to combine their data for similar areas in the analysis (NOTE: Data would be inaccurate if students added together tallies from near the parking lot versus tallies in a dry wash, versus tallies in a wet wash/riparian area.)

Regardless of the strategy you choose, teams or pairs should be given an inventory packet and some time to review the images.

3. Following your directions, students investigate the surrounding plant community. Each time they identify an individual plant using the guide, they should make a tally mark for that plant in the appropriate inventory box. Remind students, they are not counting actual leaves, but rather, individual plants.
4. At the conclusion of the time allowed for the inventory, have students add up their totals. Have a discussion about some general results. Ask students what conclusions they can draw about the state of biodiversity in a given area based on their inventory. Tell students that once back at school they will have an opportunity to further analyze and compare data.

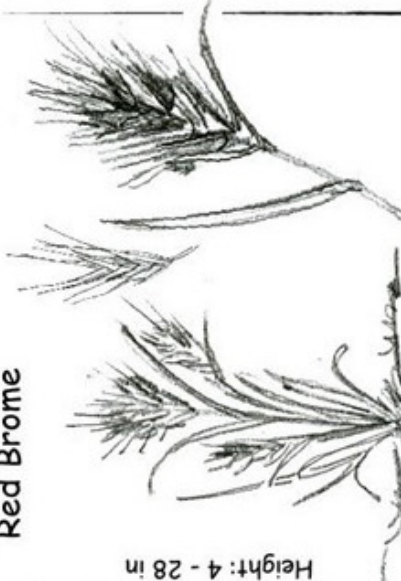
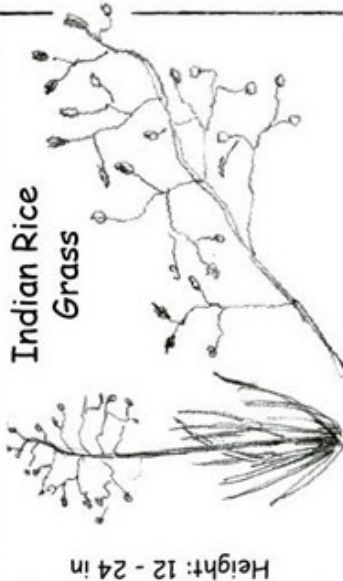

Location _____

Cactus, Agave & Yucca

 <p>Prickly Pear Cactus</p>	 <p>Cholla Cactus</p>	 <p>Barrel Cactus</p>	<p># Observed</p>
			<p># Observed</p>
			<p># Observed</p>

BIO BLITZ INVENTORY

Common Grasses

<p>Red Brome</p>  <p>Height: 4 - 28 in</p>	<p>Indian Rice Grass</p>  <p>Height: 12 - 24 in</p>	<p>Fluff Grass</p>  <p>Height: 2 - 6 in</p>	<p># Observed</p>
---	---	--	-------------------

Location _____

Leaf Arrangement

<p>Simple Leaf</p>	<p>Compound Leaf</p>
<p>Opposite</p>	<p>_____</p>
<p>Alternate</p>	<p>_____</p>
<p>Whorled</p>	<p>_____</p>
<p>Rosette</p>	<p>_____</p>
<p>Compound</p>	<p>_____</p>
<p>Pine Needles</p>	<p>_____</p>

Leaf Shape

<p>Spade-like</p>	<p>_____</p>
<p>Oblong</p>	<p>_____</p>
<p>Deltoid</p>	<p>_____</p>
<p>Lance-Like</p>	<p>_____</p>
<p>Trilobed</p>	<p>_____</p>
<p>Linear</p>	<p>_____</p>
<p>Oval</p>	<p>_____</p>
<p>Leaf Edge</p>	<p>_____</p>
<p>Serrate</p>	<p>_____</p>
<p>Entire</p>	<p>_____</p>
<p>Wavy</p>	<p>_____</p>
<p>Crenate</p>	<p>_____</p>



Section 3 – Classroom Activities

Figure 7. Students participating in an activity at the Red Rock Canyon National Conservation Area (BLM Photo)

Pre-Field Trip Classroom Activity



At Your Service

Location

Pine Creek Trail/Fire Ecology Loop Trail (picnic table or other lunch location)

If you have 2-hours or less for the fieldtrip, this activity can be done in the classroom.

If you have 3-hours for the fieldtrip, this activity can be added and used to help break up students into groups so there is no more than 15 students per group in any given location along the trail.

Overview

Ecosystems and the individual organisms that inhabit them perform many services. Their daily functions, which enable their survival, actually perform jobs that benefit humans and make our lives more livable. In this activity, students play a charades-like game to discover some of the free services ecosystems provide.

Materials

One set “At Your Service Student” cards

Time

30 minutes

Procedure

1. Ask students to give some examples of how the natural world helps us in our built environment. Students will likely include things on their list such as recreation, fresh air, resources such as food, timber, clothing, etc. Explain that ecosystems are also performing services that are harder for us to see and easy for us to take for granted. To better illustrate



Figure 8. Cactus at the Red Rock Canyon National Conservation Area (BLM photo)

these “secret services,” explain how plants produce oxygen, which we need to breathe while absorbing carbon dioxide, which can become toxic in high amounts.

2. Explain that we can understand more “secret services” of ecosystems through an activity in which they will be put into small groups and given a “Secret Service” card. Divide into small groups. Distribute one “Secret Service” card to each group. Instruct groups to not share their service out loud. They should be kept “secret” until they perform. Each group will perform a skit depicting their ecosystem secret service. They may not use any words but may make sound effects to help illustrate their service.
3. Provide a boundary area for groups to go practice. Allow about 5-10 minutes for them to practice their skits. Make sure to remind them of LNT principles, like traveling on durable surfaces!
4. Bring the groups back together to perform their skits.

Secret Services include (you may want to have a list printed/written on a piece of paper for the students to refer to in order to help them guess the skits)

- ◆ Pollination
- ◆ Pest Control
- ◆ Organic Matter Decomposition
- ◆ Water Cleaning
- ◆ Erosion and Flood Control
- ◆ Energy Production
- ◆ Atmospheric Gas Regulation

**SECRET SERVICE: POLLINATION**

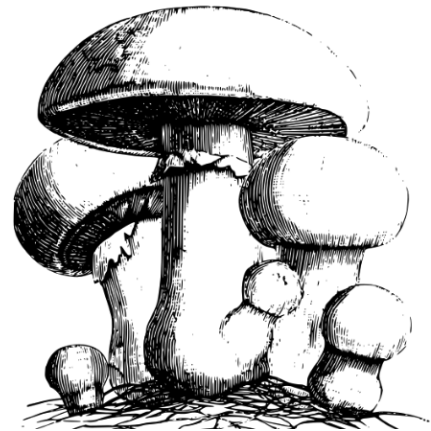
Bees move plant pollen from plant to plant. While stopping for a sip of nectar, plant pollen brushes against a bee who then moves the pollen to the next plant and the next plant and so on, ensuring seed production. Birds and bats can also be pollinators.

**SECRET SERVICE: PEST CONTROL**

Birds, bats and dragonflies eat millions of dangerous insects which could infest agricultural crops, native plants and human communities.

**SECRET SERVICE: DECOMPOSITION**

Without decomposers, dead organisms would pile up in our natural environment and valuable nutrients would be lost in the pile. By eating decaying material, decomposers make those nutrients available to other organisms that eventually eat them.





SECRET SERVICE: NATURE'S WATER FILTER

Dirty, polluted water that passes through a wetland ecosystem is filtered as if passing through a giant sponge. Plants in the wetlands absorb waste and toxins as food while cleaning the water.



SECRET SERVICE: EROSION CONTROL

Plants growing along a hillside prevent rainwater from quickly washing away soils. Plants slow down the water preventing erosion and potential flooding.



SECRET SERVICE: ENERGY PRODUCTION

Green plants capture the sun's energy and convert it to sugars and starches. This is called photosynthesis. The Sugars and starches are stored as energy in the leaves, stems and fruit of the plant. When people or other animals eat the plant, we receive the energy.



Pre-Field Trip Classroom Activity



Survival!

Location

Classroom or outside on a field

Overview

A healthy ecosystem depends on the diversity of plants and animals whose ecological relationships are woven together to create a complex and balanced system. Each unique species depends on a set of basic needs: food, water, shelter, and, each individual animal is in competition with hundreds, perhaps thousands, of other individuals to make sure those needs are met. The end game: survival! Students will discover that an animal's basic needs can be impacted by the other animals living in the ecosystem competing for those same resources. In this activity, students will compete against each other for resources representing an organism's basic needs.

Materials

- 4 bowls (containers) for each group.
- 2 plastic spoons (per group)
- 2 plastic forks (per group)
- 2 pencils (per group)
- 2 drinking straws (per group)
- A handful of marbles (per group)
- A handful of Legos (per group)
- Note: other found objects can be used as well.

Time

1 class period

Procedure:

Remind students that all animals, in every environment and ecosystem on the planet have the same basic needs: food, water, shelter. Organisms inhabit ecosystems in which their unique behaviors and adaptations will ensure that they secure resources to meet their needs so they can get on with what they really want: A mate. Organisms have an overwhelming desire to find a mate so their species can continue. Ensuring their basic needs are met is critical to this desire. Unfortunately, they are not the only ones competing for those resources.

Explain to students that in this activity they will be competing against each other to retrieve resources to meet their needs. If everyone gets the resources they need, the ecosystem remains in balance. If anyone begins to outcompete the others, the system may become unbalanced, and the biodiversity will be impacted. When the biodiversity changes and fewer species inhabit an area, earth systems, which humans depend on, may be impacted. Systems that produce human resources such as clean water and air quality or even food sources.

1. Divide the class into small groups (only 2 players in each group will play at the same time).
2. Distribute materials. Each group will receive 4 bowls (containers). The bowls should be placed in such a way that each player in the first round (2 players) has equal access to the bowls. In one bowl place 2 plastic spoons, 2 plastic forks, 2 pencils, and 2 drinking straws. In the next bowl, place a handful of marbles. In the 3rd bowl, a handful of Legos and in the last bowl, a handful of pennies or other coins. Note: other found objects can be used as well.
3. Explain that each of the bowls contains items representing one of your basic needs. Students may choose to label the bowls: food, water, shelter. There is also a bowl containing adaptations to help you retrieve your basic needs (forks, spoons, straws, etc.).
4. Explain that when prompted, players must quickly select their adaptations. Each player in the first round should quickly select two utensils from the adaptation bowl. They can get the same two or they can get two different adaptations but once they have two, they may not trade them in for different utensils. As soon as they have their adaptation utensils, they may proceed to use their adaptations (and only their adaptations, not their fingers) to retrieve resources. Begin with one resource from each bowl: food, water and shelter. If players hands or fingers touch the bowl they are out. This will help prevent bowls from tipping over in the fight for resources. Once a player has all three resources, the round is over. Discuss the round. Was it difficult? Easy? How do you think this round was similar or different then organisms in the wild competing for resources?
5. For the next round, explain that in this round, they need to stock up on resources for a long season in which resources will be scarce. Explain that on your go, they need to get as many resources as they can to survive the long season.
6. Discuss.
7. For the next and final round, resources are scarce. Remove all but one resource from each of the three basic needs bowls. On your go, players have to compete for that one resource in each bowl.
8. Discuss.

Pre-Field Trip Classroom Activity



A Grass Invasion

Location

Classroom

Overview

Introduced species can change an ecosystem quickly and sometimes with devastating and lasting effects. In this activity, students will simulate the effects of non-native grasses in a native Mojave ecosystem. Using a simulated model, students will discover how invasive plants enter an area, displace native plants and over-fuel an area already fire sensitive. Students will also investigate possible solutions to the problem of invasive grasses at Red Rock Canyon National Conservation Area.

Materials

“A Grass Invasion” game board and pieces

Time

30 minutes

Procedure

Type of Species

Native - A species that is naturally occurring in a place; due to natural processes; native to that place.

Non-Native - A species that has been introduced by human action, either accidentally or deliberately, outside of its natural range.

Invasive - An organism that causes ecological or economic harm in a new environment where it is not native.



Figure 9. Red brome grass, an invasive species. (photo by Robb Hannawacker, image – BLM)

1. Grasses not native to the Mojave began sprouting up probably sometime in the 1500's when Spanish missionaries began exploring and settling in the area. Additional grasses were introduced to the area a hundred years ago both to feed livestock and were also present in the seeds of agricultural plants. Still other grasses were probably brought in to control erosion. Unfortunately, grasses such as Red Brome, which entered the area in the 1880's, crowds out and kills native vegetation before dying and becoming fuel for wildfires. Animals living in the area prefer and get more nutrition from the native vegetation but have found these plants replaced with less desirable invasive grasses. The loss of native plants by invasive grasses has other consequences. Native plants help to maintain a healthy ecosystem balance, supporting pollination and helping to diversify the food supply. They also provide medicine, food, and other products to people living in the desert. Invasive plants compete with native plants for sunlight, moisture, nutrients, space, and reproductive advantage.

Discuss the differences between native, non-native and invasive species. Show pictures of native Mojave plants and invasive grasses.

Resource Links

Mojave Desert Inventory and Monitoring Network, National Park Service:

<https://www.nps.gov/im/mojn/invasive-and-exotic-plants.htm>

Invasive Plant Guide for National Parks in the Mojave Desert Network:

https://www.nps.gov/im/mojn/upload/MOJN_Invasive-Plant-Guide_2016_SCREEN_Quality-508.pdf

2. Ask students: What are some of the ways a non-native plant might enter an area?

After they have had a few moments to make some guesses, explain ways plants move to new areas such as: in our hiking boots, on our hiking equipment, through pet and horse waste, and even with the wind. Humans also sometimes bring non-native plants into the environment on purpose such as to control erosion (Tamarisk) or as an ornamental plant (Palm trees, Oleander), or a food source (Potato). Sometimes they bring them on accident, such as in the waste of new livestock. Sometimes non-native plants enter a new environment and have no real effect on the native populations but sometimes, they take over the area. These invasive non-native plants are difficult to eradicate.

3. After providing this introduction, divide the class into groups of approximately four people. Distribute a game board, game pieces, and scenario cards to each group. (Have the groups cut out the game pieces and scenario cards, or have these materials pre-cut before the activity.) Explain that they are going to use this game board to simulate what happens when invasive plants enter an ecosystem. The game board will represent an ecosystem at Red

Rock Canyon. Allow groups to arrange their plant and animal communities. Once they have their game boards set up explain the next step.

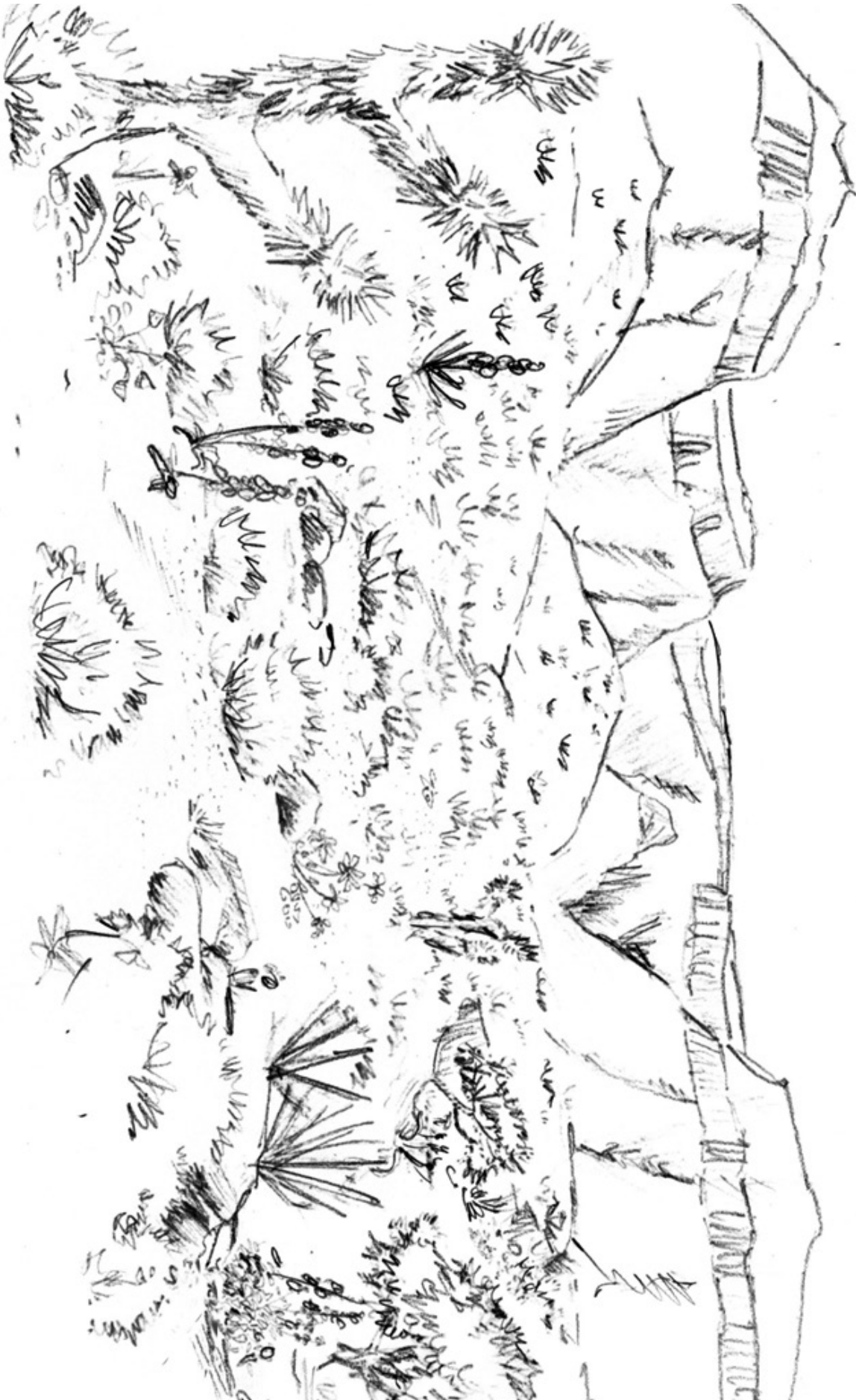
4. One hundred years ago, ranchers brought sheep to the Mojave region from Northern California. Unfortunately, with the livestock came unwanted seeds in their waste. Soon Red Brome grass was cropping up on grazing lands. The Red Brome grass was hearty and spread quickly. In no time the grass had moved into natural areas. The Red Brome grass outcompeted the native plants for resources such as nutrients in the soil and water.

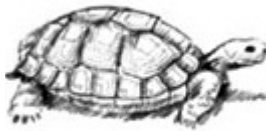
Distribute grass playing pieces to each group. Tell the groups to add five grass pieces to their native landscape. Ask the groups if the grass is having a big impact and why? Students might conclude that there is still plenty of native plants and plenty of space.

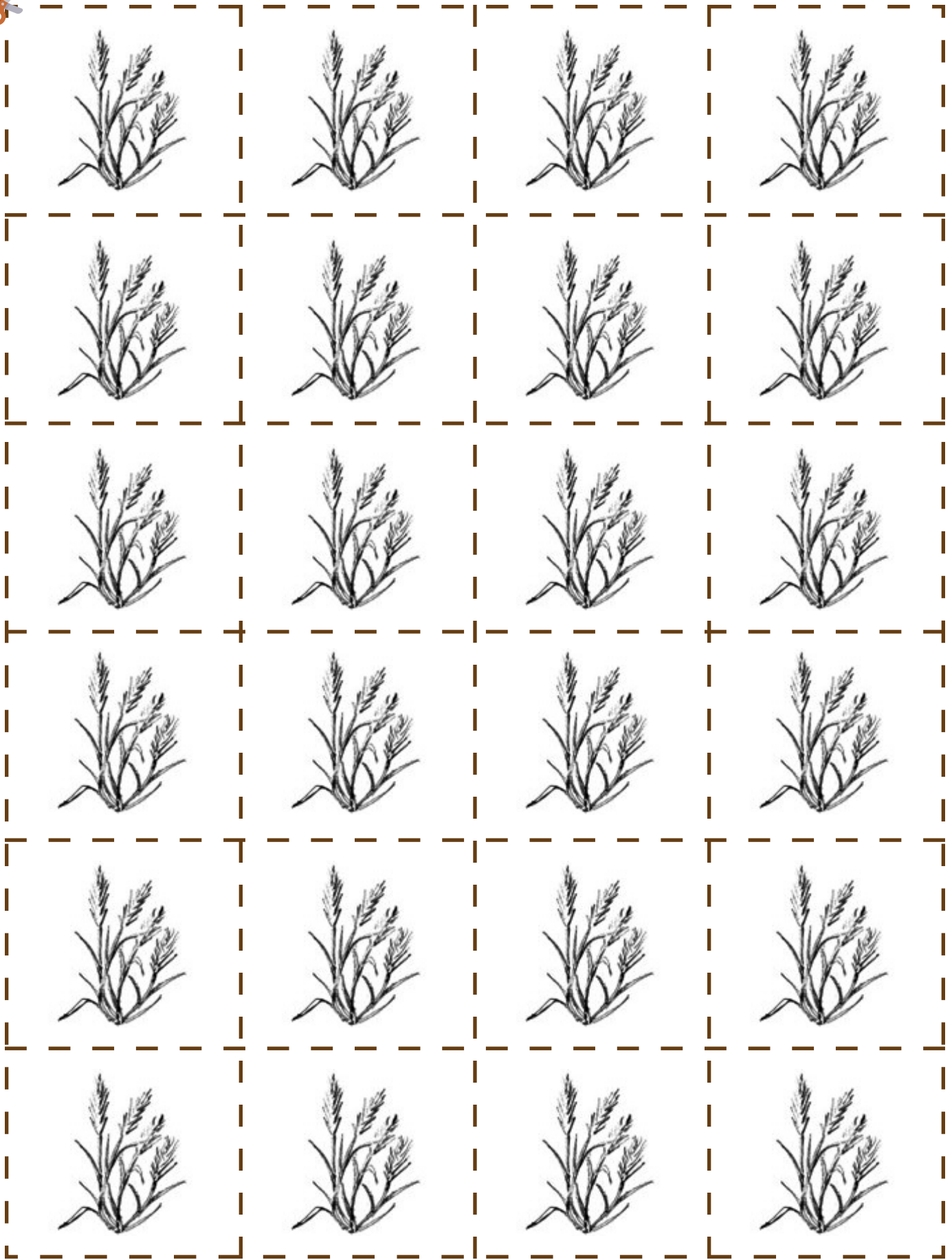
5. Now that the students have a game board started, have the game continue by having the students select the scenario cards, and play out the actions on the cards. When the native plants are all gone, the native animal loses and the game is over.

Groups can play and remove a scenario card each turn, giving the game 8 possible rounds, or they can return the card to the deck each hand, and shuffle before each draw, extending the game.

6. After each round, discuss with the students questions related to the standards, including:
 - ◆ What is the state of your ecosystem? Is it healthy?
 - ◆ What are the signs that it is still healthy or showing signs of stress?
 - ◆ What do you predict will happen in the next year, five years, ten years? What do you think will happen if the weeds are allowed to continue unchecked?
 - ◆ What patterns in the changes of the native plants and animals occur throughout the game?
 - ◆ What are some ways the ecosystem could be saved?
7. Extension: If you wish, you can have the students monitor and graph the number of species/plants each round.









Ecosystem Services Helped!

Your ecosystem has healthy pollinators, who helped native plants reproduce and flourish

**Remove 2 Invasive
Red Brome**

Add 1 Native Plant

Ecosystem Services Helped!

Your healthy ecosystem reduced erosion, giving native plants plenty of soil to grow in.

**Remove 2 Invasive
Red Brome**

Add 1 Native Plant

A Park Ranger Helped!

A Park Ranger helped the community remove excess Red Brome and helped plant native species.

Reset the game board to 6 invasive Red Brome and 4 Native Plants.

Add all cards back to the deck and reshuffle cards.



Ecosystem Is Stressed!

Overuse and overgrazing by sheep and cows has stressed out your ecosystem.

**Add 4 invasive
Red Brome**



**Your Ecosystem
Burned!**

The buildup of invasive plants, from too many stresses, has caused a fire which destroyed your ecosystem.

Leave Red Brome

**Ecosystem
Is Stressed!**

Off trail use by bikes and jeeps had damaged the soil, leaving more room for invasive plants to spread.

**Add 4 invasive
Red Brome**

Post-Field Trip Classroom Activity



Ecosystem House Calls - Assessing the Health of an Ecosystem

Location

Classroom

Overview

A variety of factors can contribute to the health of an ecosystem. Biodiversity can be one indicator of a healthy system. The biodiversity of plants and animals indicates the system is in balance and a balanced system results in healthy water supplies, good air quality, healthy and productive vegetation, and a robust animal population. All these results benefit the human world in some measurable way. But what does a healthy ecosystem look like? What are its characteristics? What are the stressors that might impact biodiversity? In this activity, students will explore the characteristics of a healthy ecosystem and the signs and indicators of stress in the natural world. Students will complete a picture sort in which they will have to make decisions about what constitutes a healthy system and what are the signs of stress in a system.

Materials

Ecosystem House Call cards – one set per group

Ecosystem Stress Cards – two sets per group

Time

1 class period

Procedure

1. Ask students, what are some indicators of a healthy ecosystem? How would you know if an ecosystem is under stress?
2. Divide the class into small groups.
3. Distribute a set of “Ecosystem House Call” cards to each group. Instruct students to work together to divide their cards into two sets: one set depicting healthy systems, and one set depicting systems which display signs of stress.

Inform students that not every image or choice is obvious and to consider different types of ecosystems (e.g. a forest versus a desert). Ask them if one might look healthy and actually be unhealthy? Or, vice versa, might one be unhealthy and look healthy? Ask them if there is specific information they might need to know about an area to determine if it is health or unhealthy, and if so, what type of information? Allow plenty of time for discussion and debate. Have to students note responses to the question you pose and any questions they have, why they decided one way or the other, whether it was clear or unclear whether an ecosystem was healthy, etc.

4. Once groups have their cards divided, lead a discussion about what the students decided for each card and address some of the questions posed in #3. NOTE: There are not necessarily "correct answers", although some images may be more obviously "unhealthy" than others. Discuss what the possible impacts are when a system is under stress?

After students have sorted the cards, have them share self-selected answers from the healthy and stressed categories. You can have them share their whole sort, have them give a brief presentation, or have them select individual cards, depending upon your time and interests.

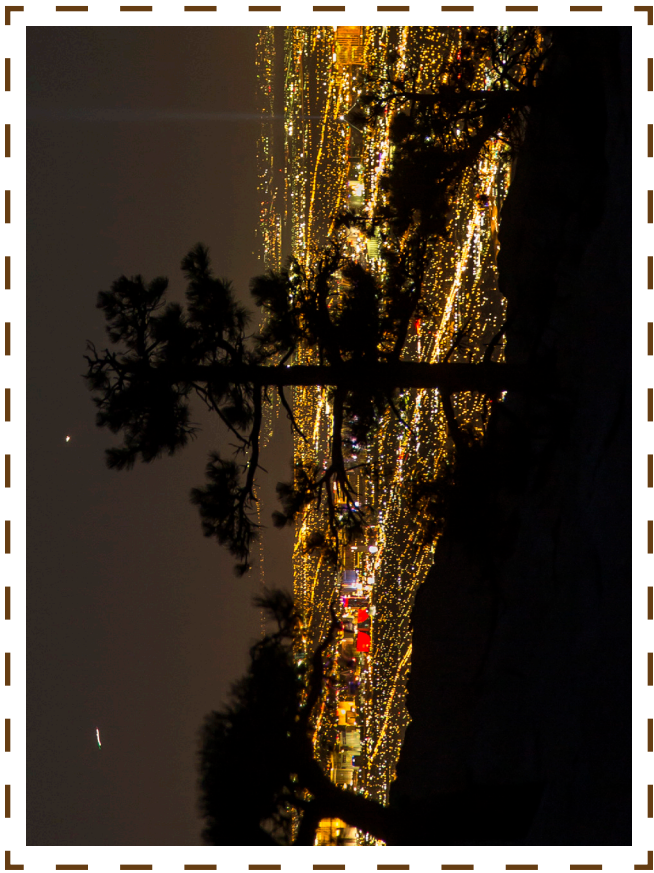
You could ask: share one card that was easy to sort into its category, or share one card that you were unsure of its category. Tie discussion to standards, asking questions like: What evidence or reasoning do you see to support you placing your card in the healthy or stressed category? How might changing conditions affect things? What patterns will emerge if a stress is happening? How might organisms interact with other organisms if a stress is occurring?

5. Once you have finished the picture sorting activity, pass out the Ecosystem House Call Card Descriptions and have the students match the text descriptions to the pictures. Again, there are not definitive right or wrong answers for this and it is not essential that the matches are correct. It is more important that students are creating claims, reasons, and explanations on why they are matching and choosing what they picked.

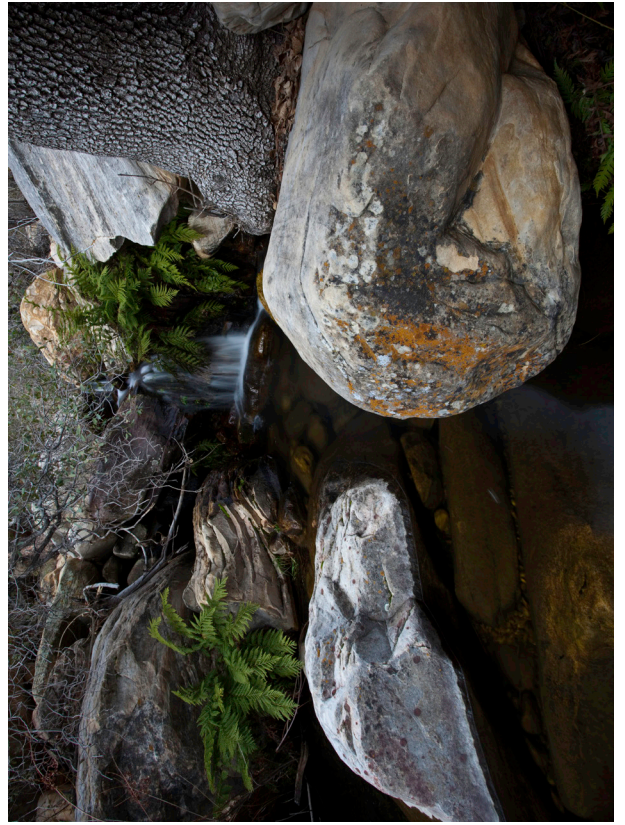
Now that they have context and descriptions for their photos, again lead a discussion on the stresses and healthy categories, related to the standards. Which description cards had the most pictures? Which descriptions were hard to match to pictures?

Now that you know the descriptions, which stress/service most impacts their animal? Which would most impact the ecosystem at Red Rock Canyon? What patterns of interactions would occur if a certain service/stress occurred at Red Rock Canyon?





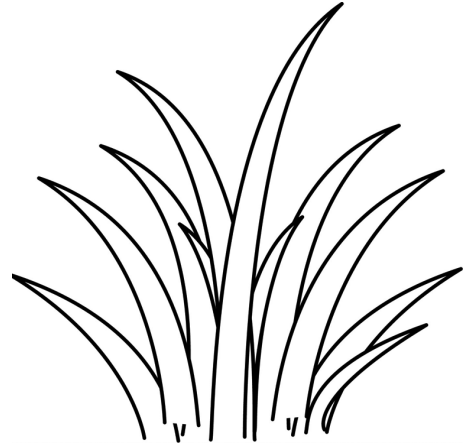
LVR 2022





ECOSYSTEM STRESS: INVASIVE WEEDS

Invasive plants can out compete native species and take over an ecosystem, harming habitat, biodiversity, and food sources for local animals. Human disturbances can make invasives worse.



ECOSYSTEM STRESS: FIRE

Although fire is natural in many ecosystems, fragile, slow growing desert plants can be severely damaged by fire. Combined with flammable invasive weeds, frequent fires can destroy Mojave Desert habitats.



ECOSYSTEM STRESS: OFF TRAIL USE

In popular areas, off trail use from people, bikes, jeeps, or other vehicles can create numerous social paths. These paths destroy native vegetation, and increase dust and decrease biodiversity.



ECOSYSTEM STRESS: LITTER

Litter can cause land and water pollution, and negatively impact biodiversity. Native animals may mistake bright litter or balloons for food, and be harmed, and excess litter attracts non-native nuisance animals.



ECOSYSTEM STRESS: TAKING WHAT YOU FIND

In popular areas, taking native plants and flowers, butterfly's, lizards, frogs, or tortoises can negatively impact biodiversity. Taking rocks, fossils, or other items can have significant impacts, especially in areas with high visitation.



ECOSYSTEM STRESS: OVERUSE OF RESOURCES

Although humans must use nature to meet all their needs, taking too much from natural habitats decreases biodiversity and leaves the ecosystem unable to provide water, food, or minerals for our use.



Post-Field Trip Classroom Activity



Charting the Data

Location

Classroom or location with computers

Overview

In this activity, students will be using the data they collected for the BioBlitz to create a spreadsheet then graph the data.

Materials

- Computer
- Google Sheets or Excel
- Completed BioBlitz data sheets

Procedure

1. Students should collect their BioBlitz data sheets and review their existing data (from the school and field trip data collection). To continue, students can use a spreadsheet program like Google Sheets or Excel to organize their data.
2. Students should open the desired program and name the file using the file save as function in Excel or the rename function in Google Sheets.
3. Students should label the first worksheet with the name of one of the locations where they collected data (e.g. school grounds, top of Pine Creek trail, dry wash Pine Creek trail, Riparian area Fire Ecology Loop, etc.). Each location will have its own sheet.
4. In the A1 cell, students should add the term 'Category' and in B1 the term '# Observed'.
5. In column A starting with cell A2, students will begin listing the different categories of plants from the worksheet. For example, Red Brome or Yucca or Agave or leaf type.
6. In column B starting with cell B2 students will begin adding in the number of each plant category that they observed. After all categories are complete it is time to chart the data!
7. In Google Sheets select the 'insert chart' button on the function bar (it looks like a mini-graph). The data will be charted using a pie chart. In excel, highlight the data then select insert chart. Select the type of chart desired. The chart will load on the screen. Repeat to change the type of chart created.
8. Have the student try different types of charts by changing the chart type in the dialogue box on the right of the screen.

9. Discuss with the students why some charts fit particular types of data more effectively than others. When the students decide on which chart to use, have them make sure the title in the chart includes the location of the data.
10. Looking at the charts, have the students compare the biodiversity of each location. What do the data show?

Have the students pair up with another group and compare their charts for the same location. How similar or different are they? Discuss things that might cause differences in the data at a same location (different spots, variability in how the data were collected, variability in identifying the plants, etc.)

EXTENSION: Share the raw data across the groups and have each group combine all of the data for each matched area (e.g. all of the data from the top of the Pine Creek trail) and re-graph. Discuss: How did the results change when you combined the data? When you add more data does it more accurately reflect the reality on the ground? (Yes, assuming data were collected in a consistent and similar manner).

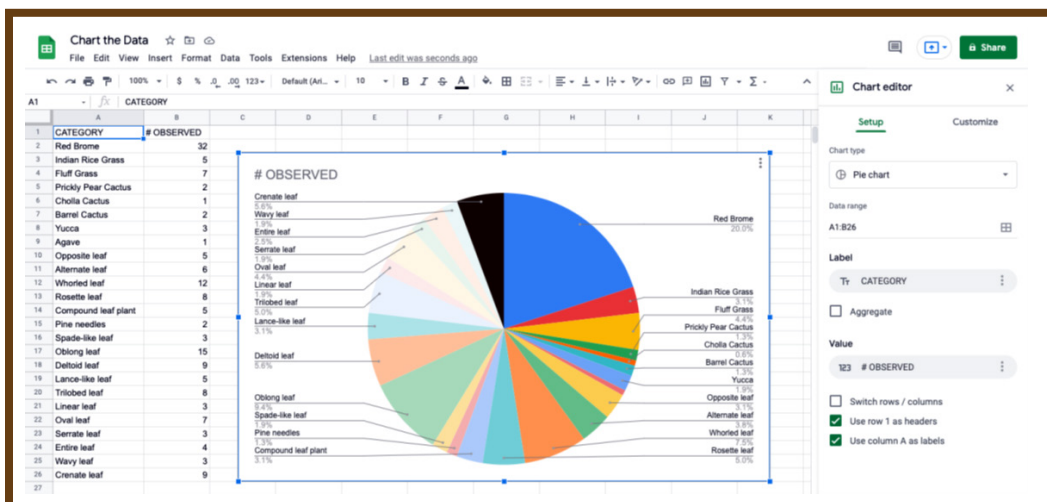


Figure 10. Example number 1 of charted data using Google Sheets.

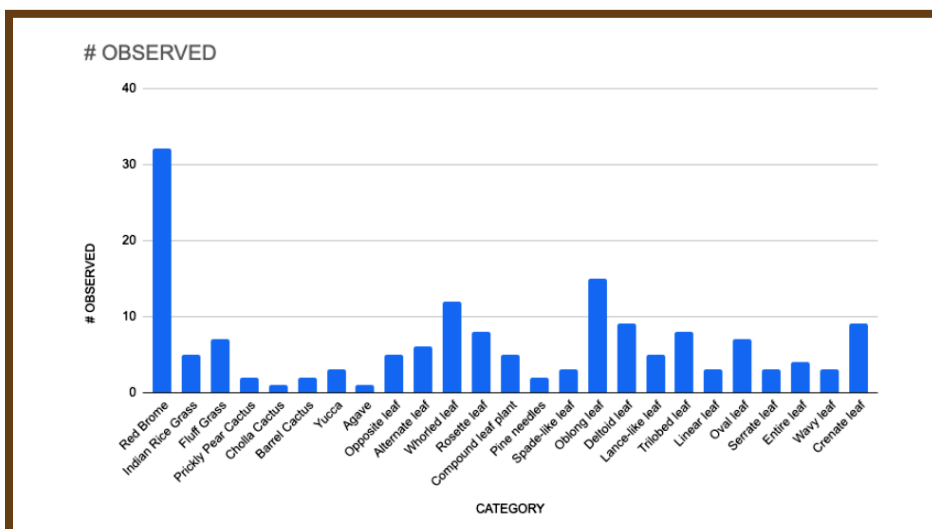


Figure 11. Example number 2 of charted data using Google Sheets.



Section 4 – Additional Background Information and Resources

Figure 12. The Aster flower, which grows wild in the Red Rock Canyon National Conservation Area (BLM photo).

“A land acknowledgment is a formal statement that seeks to recognize the unique and enduring relationship that exists between Indigenous Peoples and place. Although they have recently become more commonplace, land acknowledgments have been conducted for centuries by many Indigenous communities.”

Quote from Public Lands in the United States: Examining the past to build a more equitable future. Curriculum by The Wilderness Society and the Avarna Group.

We acknowledge that the area discussed in this text is the ancestral land of the Southern Paiute, Chemehuevi, and other associated tribes. We respect their communities, past, present, and future, and recognize them as the original people of this land. We honor and respect their unique connection to and knowledge of this area.



Figure 13. The Red Rock Canyon (Photo by [Daniel Halseth](#) on [Unsplash](#)).

Public Lands

“Public lands” is a broad term used to describe the lands and waters that are owned collectively by the citizens of the United States. These areas are managed by either federal, state, or local governments. There are also other lands beyond “public lands” that are available for public use, such as private lands that are accessible by special conservation easements or hunting/fishing permits.

The majority of public lands are managed by four federal agencies: National Park Service (NPS), U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), or Bureau of Land Management (BLM). The focus and mission of each of these agencies differ and subsequently affect the way they manage the lands.



Bureau of Land Management – To sustain the health, diversity, and productivity of America’s public lands for the use and enjoyment of present and future generations.



National Park Service – To preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.



U.S. Fish & Wildlife Service – To work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.



U.S. Forest Service – To sustain the health, diversity, and productivity of the nation’s forests and grasslands to meet the needs of present and future generations.



Bureau of Reclamation – To manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

The Bureau of Reclamation manages land primarily along waterways for which it is responsible.

How lands are managed is dependent on the agency managing those lands, the mandates set for that land, and the type of land designation defining the scope and breadth of the use and protection. For example, some lands are preserved for wildlife (e.g. refuge or wilderness), while others may allow commercial activities such as mining or grazing.

The percentage of federal lands in each state varies, with the western states having higher percentages than eastern and midwestern states. Nevada has the highest percentage of federal land in all fifty states. Of Nevada’s 70 million acres of land, 56 million acres or 80.1% of Nevada is federal lands.

For more information about our nation’s public lands visit <https://www.doi.gov/blog/americas-public-lands-explained>.

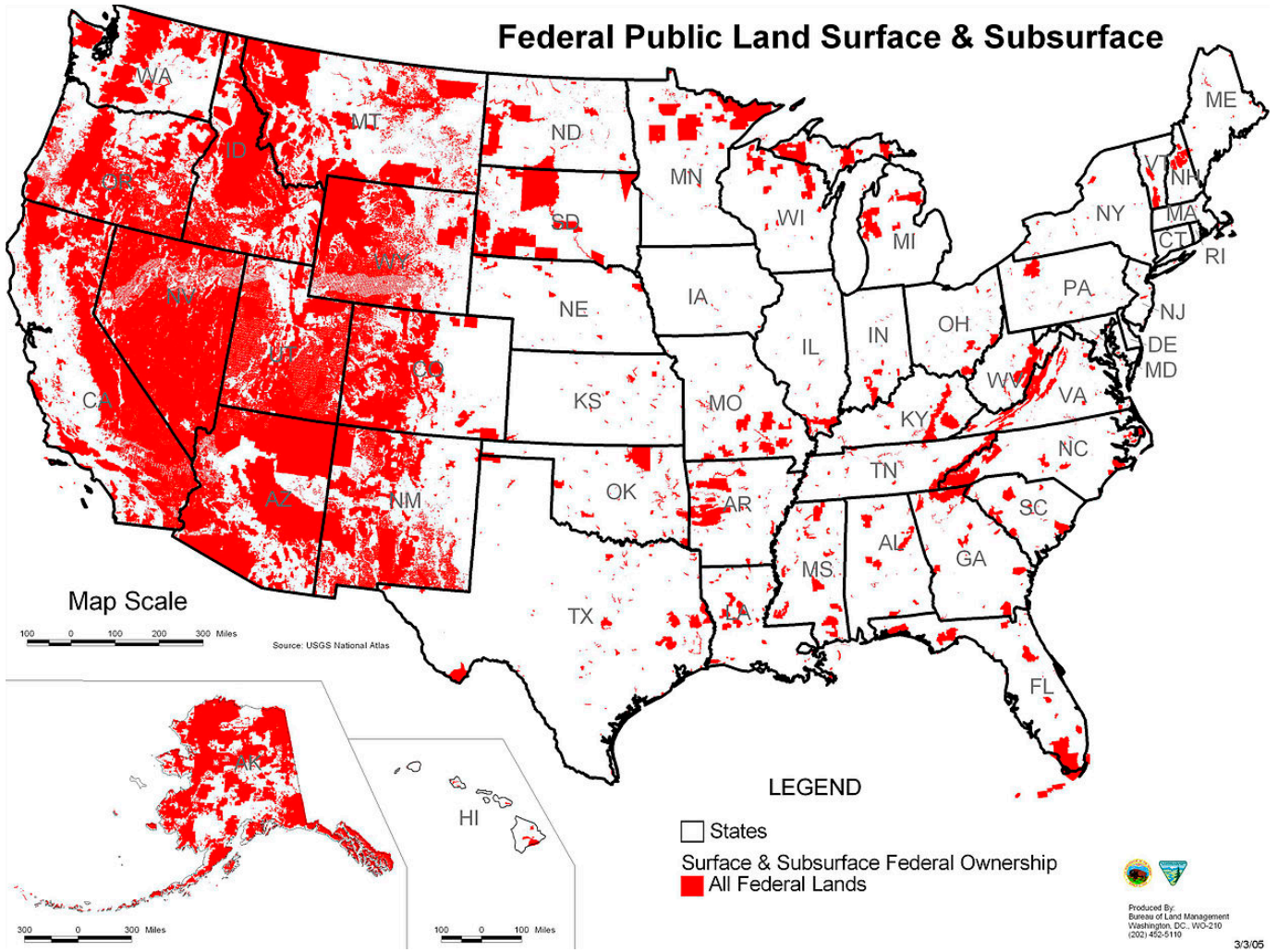


Figure14. Map of the Federal Public Lands in the United States. (Image Courtesy of Bureau of Land Management – <http://wilderness.org/blm-lands>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=26857120>)

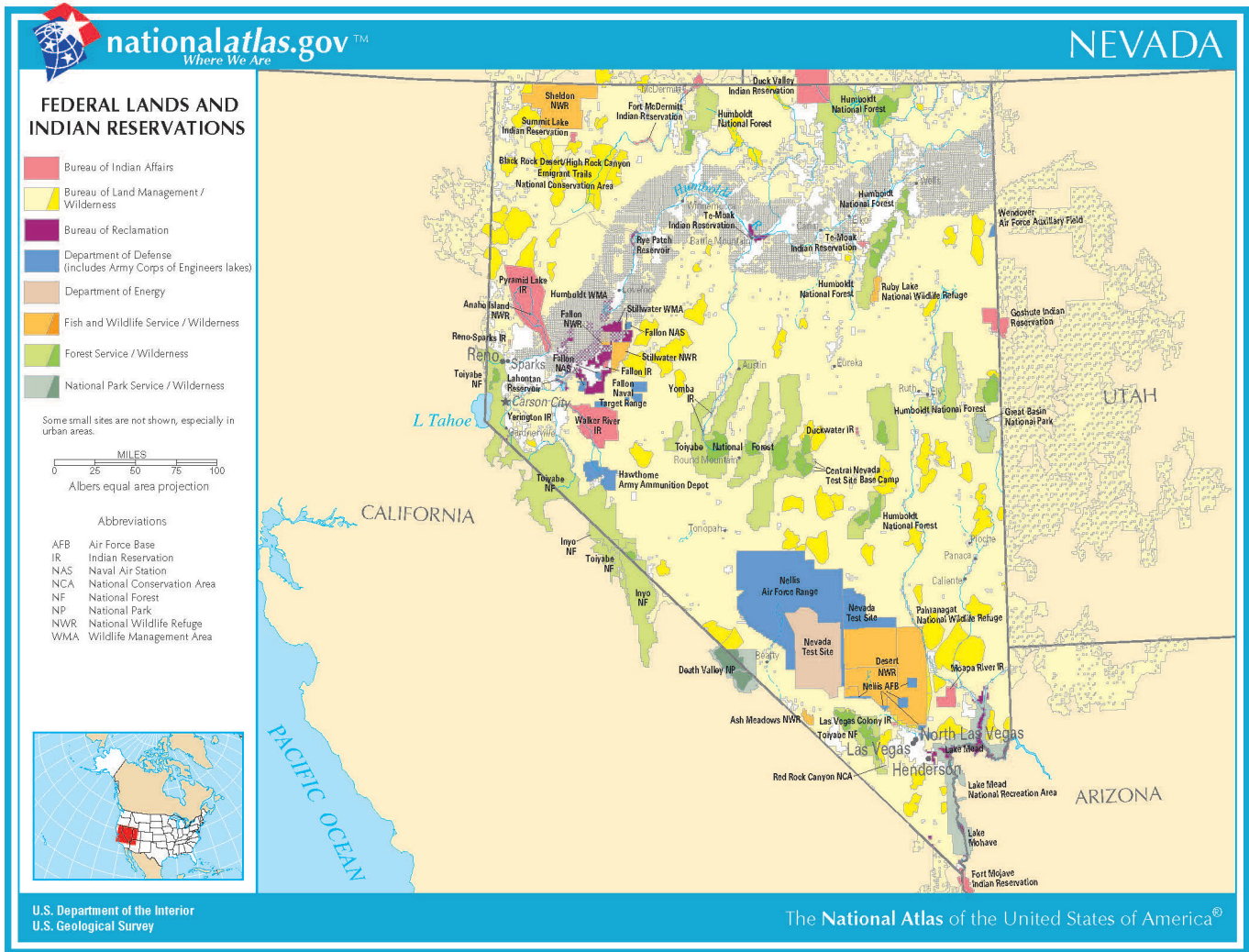


Figure 15. Map of the Federal Public Lands in Nevada (nationalatlas.gov)

Educator Resources

<https://www.blm.gov/nevada/red-rock-canyon-national-conservation-area/teachers-and-parents-resources>

Acknowledgements

Authors/Creators:

Amy Page

Paula M. Jacoby-Garrett

Reviewers:

Anica Mercado

Alexandra Rothermel

Amanda Royal

Michelle Zehentner

Stefani Dawn

Formatting and 508 Complainece:

Digital Echo

Funding: SNPLMA Round 17: This project was funded by the Southern Nevada Public Land Management Act (SNPLMA), which authorized the sale of BLM-administered federal lands within a designated boundary in the Las Vegas Valley and required proceeds to be used on projects to fund federal, state and local projects that benefit communities and public land.