2. Signs of Humans

Scavenger Hunt in the Bosque

Description: Students search for impacts of humans in the bosque or other natural area by walking a trail and using a scavenger hunt list to keep track of signs of humans.

Objectives: Students will:

- identify signs of humans in the bosque;
- understand the impact of human activity in the bosque;
- consider ways to decrease these impacts; and
- evaluate their own actions while in the bosque.

Materials:

- Student Activity Sheet:— Signs of Humans--Scavenger Hunt in the Bosque, one per student There are two versions of the activity sheet.
- Pencil
- Optional: field journal
- Thermometer
- Compass
- Beaufort Wind Scale & Cloud Chart [*Bosque Field Journals*]

Phenomena: Humans impact natural areas in both beneficial and harmful ways.

Lesson Questions:

- *What signs of humans can we see during our walk in the bosque?*
- *Which signs reflect beneficial impacts of humans or harmful impacts of humans on the bosque?*

2. Signs of Humans--Scavenger Hunt in the Bosque

Grades: 3–8

Time: material preparation: 10 minutes

class activity: one hour

Subjects: science, social studies

Terms: *acequia, detrimental, domestic, exotic, graffiti, impact, levees, naturalized, sign, vandalism*

New Mexico STEM Ready! / Next Generation Science Standards

NGSS DCIs and New Mexico State Performance Expectations

NOTE: see **NGSS Connections to *Going Out: Field Activities*** at the end of this chapter for more possible field trip NGSS connections and for suggestions using each standard.

5.LS1.C Organization for Matter & Energy Flow in Organisms*
5.ESS3.C Human Impacts on Earth Systems
MS.LS2.C Ecosystem Dynamics, Functioning & Resilience*
MS.LS4.D Biodiversity & Humans
MS.ESS3.C (MS-ESS3-3 NM) Human Impacts on Earth Systems *
MS.ETS2.B (MS-ESS3-3 NM) Influence of Engineering, Technology, & Science on Society & the Natural World*

NGSS CCCs

Cause & Effect; Systems & System Models*; Energy & Matter*

NGSS SEPs

Engaging in Argument from Evidence; Obtaining, Evaluating & Communicating Information*

*indicates extension activity

Background:

This activity challenges students to think and observe with a different perspective—to look for things that would not be there except for humans, or were not in the bosque in prehistoric times.

Since the time of indigenous people of North America and as the Spanish began to settle along the Rio Grande, people have made changes to the bosque. Humans trapped floodwater and dug acequias to divert river water to irrigate crops. They cut down trees and altered the course of the river. Introduced plants and animals, roads, levees and jetty jacks, irrigation systems, homes, farms and recreational activities have altered the natural flow of the river and disrupted native ecosystems.

The bosque today reflects the many activities of homesteaders, visitors, developers and agencies, which have altered the bosque plant and animal communities and the hydrological system. Every activity has effects, some of which we are just beginning to recognize. Some of these activities are beneficial, while many others produce long-term detrimental consequences.

Here are some human-induced changes you might find on a hike in the bosque:

Many **exotic plants** are here because of humans. Russian olive and saltcedar (tamarisk) trees were originally planted along riverbanks during reclamation projects. They were intended to serve as windbreaks and to hold soil in place when the river flooded. They have now become "naturalized," meaning they reproduce and spread on their own. Others, including elm, mulberry, tree of heaven and pampas grass, were intentionally planted by people and now occur in the bosque. Mulberry and Russian olive fruits are relished by birds and other animals.

Russian olive leaves

Exotic animals have also been introduced. Starlings were brought to America in the 1800s and released into New York's Central Park and other locations in the U.S. Starlings are cavity nesters and will even oust woodpeckers that created a hole in order to use it. House Sparrow (English Sparrow) was introduced to New York City in 1852 or 1853 and by 1900 were one of the most abundant birds in North America. Since their introductions, both Starlings and House Sparrows have spread across the United States, including the Middle Rio Grande Valley.

European Starling
Sturnus vulgaris

Jetty jacks were placed in the riverbed and along the riverbank to slow the floodwater, straighten the river and protect the **levees**. Some of these jetty jacks are now buried in river sand or partially submerged in the river.

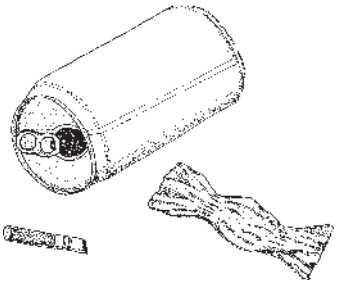
Feral dogs and cats have been abandoned in the bosque by people no longer wanting to keep them as pets. Also abandoned are **domestic** ducks, rabbits and exotic turtles like Red-eared Sliders. When the animals have lost their appeal, they are abandoned here.

Sawn logs tell of a woodcutter, someone seeking firewood, building material for their home, or clearing trails.

Burned logs indicate a fire. Lightning causes a very small percentage of bosque fires. Smoking, weed burning, fireworks and arson are the most common causes of bosque fires.

Bird/bat houses have been installed to attract owls, woodpeckers, wrens, chickadees and some bats.

A **sneaker print** or **bike track** is a record of your visit to the bosque. The paved and gravel trails are part of Albuquerque's trail system.



Trash: The bosque has a long history of being used as a dumping ground. Tons of garbage have been removed from the bosque over the years, but some of this rubbish remains. Present-day trash shows little care

for our natural areas. Plastic bags blow away and land in trees, stuck seemingly forever. Birds incorporate trash into nests, sometimes with ill effects. Trash in the river itself includes floating items that animals may mistake for food.

Graffiti/Carvings: Writing or drawings scribbled on trees, rocks or other objects within natural areas detract from the beauty of the place. Graffiti is also illegal. Carvings in tree bark open the tree's protective covering, exposing the plant to disease and insects, often with detrimental effects.

Pollution impacts water quality of the river, affecting aquatic organisms as well as terrestrial systems when the river floods. Runoff from agriculture (fertilizers), industry (heavy metals, petroleum hydrocarbons) and mining (mine waste, heavy metals, acidic water) all negatively impact water systems. Motor oil washes from city streets into the storm drains that discharge into the river. Some people dump their used motor oil directly into city drains, causing a detrimental effect on the plants and animals of the river community.

Dog poop left behind adds unwanted contamination to the river, using up precious dissolved oxygen as it decays and increasing fecal coliform bacteria, which are dangerous to many living organisms.

Procedure:

For younger students this can be a culminating focus after several trips to the bosque.

Older students can find complex effects of human interference over the last century.

♠ When you are looking for animals in the wild, you are looking for animal **"sign"**—evidence that the animal has been there. In this activity, we are looking for human "sign"—evidence that humans have been there, and have made an impact on the area. Just like finding signs of wildlife in the bosque, students are to look for evidence of human activity in the bosque.

♠ Ask students, *How have humans altered the bosque in the past and in modern times?* Next ask, *How might your activities during a field trip in the bosque also cause changes?*

Dropping trash or trampling plants are two negative effects. Reseeding native grasses, clearing deadwood or installing nesting boxes would be beneficial ones.

♠ Distribute student activity sheet *"Signs of Humans--Scavenger Hunt in the Bosque."* NOTE: the activity sheet may be added to student field journals.

♠ Have students mark the signs of human activity as they find them on their walk. Have students add other things they see that are not on the list.

- Discuss the impact of the human signs:
  - *Was this item helpful or harmful?*
  - *Was this intentional or unintentional? If intentional, what was the purpose?*
  - *What human activity caused this sign?*
  - *What might be done to mitigate any negative impacts?*
  - *What other signs of human influence can you find?*

  How do the human-caused changes to bosque habitats affect the organisms living there?

  Sometimes intentional changes made in the past were thought to be beneficial at the time, but now are considered harmful. *Do you see any examples of impacts that might have been made with good intentions, but that are now known to have negative effects?* (Jetty jacks are a good example.)

  What value can people put on the bosque?

  What benefit does the bosque give to humans? (Monetary, spiritual, ecological, mental, etc.?) **(MS.LS4.D; Cause & Effect)**

Assessment:

From your walk in the bosque, think about the signs of humans changing things in the bosque. There are great things and maybe not so great things. *Can you make some lists?* Here are some things your students might have observed.

- **Great:** paths to walk on, benches by the river, trees planted by people, ponds, wetlands and water channels created for wildlife, bird boxes, other restoration projects such as thinning exotic plants.
- **Not so great:** litter and trash, people careless with fires so parts of the bosque burned.
- **Not easy to see:** There is less water in the river. The old cottonwoods are dying and few new ones are growing. We are in a drought caused by climate change world-wide; because of drought and decreased flooding, there are more fires, and fewer new trees.

  What are ways that humans are helping the river and the bosque?

  What restoration projects did we see on our walk? Are any animals or plants helped by these restoration projects? If so, which animals or plants are helped, and in what ways are they helped through those projects?

  Is it possible to make the bosque healthier while people are still living along it? Can it be restored to what it was like before humans? In what ways might or might not this be possible?

Think about things you did not see. *Are there buildings next to the river?* In some cities, municipal development reaches the riverbanks. In this way, Albuquerque has protected its bosque to some degree. *What other things are not seen along the bosque and river that might have detrimental effects?*

Have students write a claim, evidence, reasoning statement about a human impact on the bosque. **(5.ESS3.C; Engaging in Argument from Evidence)**

Extensions:

- Have students carry (and use) a litter bag on their walk.
- Have students plan and carry out a service-learning project (see Chapter 7).
- Back in the classroom, have students draw a human-impact bosque scene and a scene as it might be without human impact.
- Research one category of human sign found on the walk. *What is its impact?* For example, look up pet waste, calculate the quantity of pet waste in your community, and research the effects of pet waste that is not disposed of properly. (City of Albuquerque has a website for pet waste and stormwater quality.) **(Math standard)**
- On your walk, look for the diversity of living organisms. Try to get a sense of the biodiversity of the bosque. Make lists of plants and animals or animal sign observed. *Do you see the introduced species saltcedar? How do introduced species, such as saltcedar, affect native plants in the bosque?* **(MS.LS2.C)**
- Compare aerial photos of Albuquerque to those of other large cities with rivers. *Which cities have preserved native vegetation?*
- Plants need sunlight, air and water to survive—they make their own food with just these things. Animals need to eat other organisms to survive. They might eat plants, or they might eat other animals. Use Species of Greatest Conservation Need as examples. These are animals that are threatened or endangered, or considered at risk of becoming so, and so need extra management attention. *How does each species get the materials and energy it needs to survive?* **Rio Grande Silvery Minnows** eat algae and tiny plant pieces found in the river. **New Mexico Meadow Jumping Mice** live in marshes where they eat flowers and seeds of grasses and other plants, in addition to insects. **Northern Leopard Frogs** eat insects that fly near water; they must feed in wet habitats. **Southwestern Willow Flycatchers** also eat insects that fly near water and so live in riparian vegetation. **Bald Eagles** eat fish or carrion (dead animals), so they typically live and hunt near water courses. All of these animals need to live in or near wetland habitats so that they can acquire the materials and energy needed for body repair, growth and motion. **(5.LS1.C; Energy & Matter)**

- Focus on habitat changes affecting wildlife:

Why have wildlife species become rare, threatened or endangered (in New Mexico they are designated Species of Greatest Conservation Need-SGCN)? A main reason is habitat change. Within the bosque ecosystem, habitat changes have major impacts on the wildlife of the bosque. *What habitats have been reduced in the last century?* These changes are human-caused changes.

  - As you do your walk in the bosque, look for different habitats. Note areas of wetland, dense vegetation, sapling tree thickets, etc.—the types of habitats that were reduced with the many changes to the Rio Grande. Also look for engineering projects that are replicating some of those lost habitats.

Below are some examples of habitat changes affecting animals listed as SGCN in New Mexico.

  - Have students research one of the species listed to understand why their numbers have been reduced.
  - Research how managers can improve habitat conditions in order to successfully manage species.

Rio Grande Silvery Minnow (*Hybognathus amarus*)—needs slow, muddy backwater areas, away from the main river current, for reproduction. These conditions were reduced when the river was confined to a narrow channel, overbank flooding was prevented and demands on the water increased. Fortunately, there are projects to create minnow habitat. One example is the Secondary Channel that was constructed west of the Rio Grande Nature Center. In high runoff years, water flows through the channel and into the floodplain to provide conditions for the Silvery Minnow to reproduce.

Northern Leopard Frog (*Lithobates pipien*s)—needs marshy ponds. Humans, in narrowing the river and reducing the volume of water, have reduced wetlands up and down the river corridor. By allowing domestic livestock to spend extended time near water, they disturb frog habitat. Other threats are chemical pollutants and pesticides that drain into the marshes, as well as introduced/exotic predators including fish and bullfrogs. Restored wetlands benefit this species.

Bald Eagle (*Haliaeetus leucocephalus*)—generally winters in New Mexico, where they prefer to fish in large water bodies such as rivers and lakes. Their decline in North America is due to pesticide use, because the poison becomes more concentrated in animal tissues as it moves up the food chain (bioaccumulates) from herbivores to carnivores, such as Bald Eagles, which are predators and scavengers. Maintaining water in streams, banning DDT and reducing the use of other pesticides have helped increase the population numbers of Bald Eagles, but vigilance is still needed.

Yellow-billed Cuckoo (*Coccyzus americanus*)—nests in riparian forests with dense understory vegetation. They have been found nesting in saltcedar thickets along the Pecos River. Cuckoos do well in restored areas where cottonwoods and willows have been replanted.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)—needs thickets of young riparian trees to build its nest. Since the river has been confined to a narrow channel, reproduction of riparian trees has decreased as overbank flooding was mostly eliminated. There are fewer patches of young cottonwoods and willows available for flycatcher nesting. Restoring degraded riparian ecosystems and protecting those that remain are essential to the flycatcher's survival.

New Mexico Meadow Jumping Mouse (*Zapus luteus*)—needs moist, dense habitats supporting grasses, sedges, forbs, and willows, particularly along permanent waterways. The destruction of streamside vegetation by mowing and livestock grazing, lowering water levels, drought and wildfires has decreased this mouse's habitat. Restoring these wetland habitats will benefit this mouse.

San Juan River species:

Colorado Pikeminnow (*Ptychocheilus lucius*)--needs long stretches of free-flowing, warm, muddy water for most of its life, but will move 125 miles (200 kilometers) upstream to cold water rapids to lay their eggs. Then the fry need shallow backwater to grow to 8 inches (20 cm) before moving into faster water. Today, there are dams obstructing the river, there are few backwater areas, and the river flow is reduced; there are also pollutants that affect the young fish. Protecting stream flow and backwater habitats will help pikeminnows.

Razorback Sucker (*Xyrauchen texanus*)—needs high spring flows to lay eggs, then the young fish need to find quiet backwater areas to survive and grow. Though the fish will lay eggs in river reservoirs, the fry do not survive because there is not enough suitable food and too many non-native fish predators. Protecting natural stream flow and backwater habitats will help razorback suckers as well.

(5.LS1.C; MS.ESS3.C (MS-ESS3-3 NM); MS.ETS2.B (MS-ESS3-3 NM); Cause & Effect; Systems & System Models; Engaging in Argument from Evidence; Obtaining, Evaluating & Communicating Information)

Reference: bison-m.org New Mexico Department of Game & Fish, Biota Information System of New Mexico.

Signs of Humans--Scavenger Hunt in the Bosque

Name:

Date:

Temperature:

Mark wind direction

Describe amount of wind

Sometimes the only proof of animals in the bosque is the sign they leave which tells of their activities. A feather from a preening bird falls to the ground; scratches in the soil mark the hole of a hiding mouse. Perhaps scat on the trail tells the story of a night's hunt. Tracks in mud record the passage of those who came to drink. Humans also leave signs of their activities. As you walk the trail look for signs of human activity.

Human signs: Mark those you see.

__ Russian olive

__ elm

__ mulberry

__ saltcedar

__ man-made wetlands/marsh

__ acequia

__ trash

__ carving in tree

__ jetty jacks

__ sawn log

__ burned log

__ bird house

__ trail

__ trash in river

__ starling

__ dog poop

__ household pets

__ graffiti

__ sneaker print

__ bike track

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	Item	Helpful / Harmful	Intentional / Unintentional	What human activity caused this?
	Russian olive			
	elm			
	mulberry			
	saltcedar			
	man-made wetlands/marsh			
	acequia			
	trash			
	carving in tree			
	jetty jacks			
	sawn log			
	burned log			
	bird house			
	trail			
	trash in river			
	starling			
	dog poop			
	household pets			
	graffiti			
	sneaker print			
	bike track			