

HABITAT LOSS LESSON PLAN

For Instructor Use Only



**PRICKLY PEAR
LAND TRUST**

Habitat Loss

Location: In classroom or Southhills Trails

Aim: What causes habitat loss and how do we help prevent it?

Time: 1.5-2 hours

Common Core State Standards: LS2.C, LS1.A

Next Generation Science Standards:

HS-LS1-3, HS-LS2-6, HS-LS2-7, HS-LS4-6, HS-ESS2-2, HS-ESS3-1, HS-ESS3-4

Guiding Questions:

What do we mean when we say habitat loss?

What role do humans play in critical habitat loss?

Can you think of an example in Montana where species are experiencing habitat loss?

Learning Objectives:

Understand the devastating consequences of habitat loss and the role people play in habitat loss

Think through habitat loss prevention strategies

Understand that there are many levels of habitat loss and we only hear about the dramatic habitat loss in the news

Lesson Timeline

Note: A good portion of this lesson will be spent hiking. The purpose is to get the students to a spot where they can look out over the valley and see the amount of development. If it has to be inside due to weather, give the students an introduction, then play the game with them and finish with a discussion about human impacts on habitat.

This lesson requires a small amount of setup before the students arrive both outdoors and indoors. Please arrive 10-15min early to allow for set up. If outdoors, set up the cones and papers before the students get there. If indoors, set up in gym or classroom before the lesson starts.

Students arrive, greet them and introduce yourself

**10
MIN**

Try to be as engaging as possible. The introduction with the students is what sets the tone for the rest of the lesson. This does not require you to have any special skills, just be friendly and be yourself. It would be great if you included some information about what you do, or did, for work. It is a good opportunity to introduce the students to different careers and does not need to be related to the lesson you are leading.

Ask the students to introduce themselves. Up to you how you want to do this.

Optional Mt. Helena Hike

**10
MIN**

At the trailhead give a brief introduction to the types of habitat loss. Ask the students if they can think of ways the area they live in contributes to habitat loss. Ask them to come up with species that might be affected by habitat loss.

**30
MIN**

Near the trailhead, in that open area, play the habitat loss game with the students

Lesson Timeline Cont.

We will hike to a location on Mt Helena where they can see the whole valley. This gives some perspective on how much space we take up. While there, discuss:

**1
HOUR**

What the students learned from the game.
How do human actions and infrastructure impact bears?
Fire suppression and the consequences for plant life and people
Habitat fragmentation and the consequences for grizzlies
Ask the students to think of ways we can help reduce or mediate habitat loss

**10
MIN**

Back at the trailhead, discuss with the students green corridors and the importance of planning development correctly

In Class Directions

**10
MIN**

In the classroom, give a brief introduction to the types of habitat loss. Ask the students if they can think of ways the area they live in contributes to habitat loss. Ask them to come up with species that might be affected by habitat loss.

**30
MIN**

Give a brief introduction to the habitat game and then lead the habitat loss game with the students in an open area of the school or in the classroom

**10
MIN**

After finishing the game, gather the students again and ask them to reflect on the game. What did they learn? How did humans impact bears? How much harder was it to survive with human impacts? Discuss habitat fragmentation

**5
MIN**

Discuss the additional ways humans impact wildlife habitat in the game
Fire suppression and the consequences for plant life and people
Human expansion into bear habitat and the impacts on bears

**15
MIN**

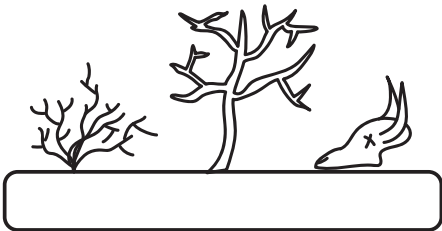
Ask the students to come up with ways to conserve habitat. What are their ideas? Discuss green corridors and the importance of planning development correctly

Background Info

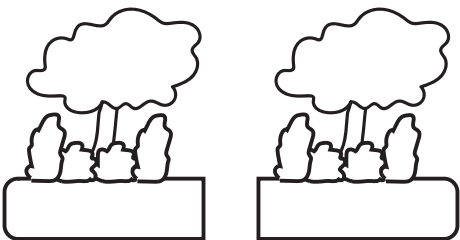
Introduction

When we hear the term habitat loss, I believe many of us think about the rainforest. It is a hot button issue in the news and has been for a long time now. And there is good reason, as improper logging practices have led to the loss of almost half the world's rainforests. However, what we often don't hear about in the news is the habitat loss that is happening all over the United States every day. Every house, road, and shopping mall removes habitat used by, and that is often critical to, wildlife. This lesson will discuss what habitat loss is, a practical example of a species that is affected by habitat loss, and how we can help mitigate these losses.

THREE TYPES OF HABITAT LOSS



Habitat destruction causes the most immediate damage to wildlife, but there are many other practices that take longer for us to see the effects, but are just as harmful. When we talk about habitat loss we often discuss the complete destruction of an area used by wildlife. Logging is the most popular issue, but we also destroy habitat when we dredge rivers, fill in wetlands to create more land, and when we mine for minerals and metals.



Habitat fragmentation occurs as we build towns and roads. When we protect specific areas of wilderness, we are only protecting pockets. Even our national parks, areas we describe as wilderness, are divided by roads and are often surrounded by developed land.



Habitat degradation is the third type of habitat loss. This happens when pollution, the introduction of invasive species, or the disruption of ecosystem processes degrade habitat to the point that it cannot support native wildlife.

Less Well Known Contributors to Habitat Loss

Some causes of habitat loss, such as pollution and destruction to create space for infrastructure, are clearly harmful. But why is habitat fragmentation, or the suppression of ecosystem functions considered just as harmful?

One of the ecosystem functions we suppress, that in the long run harms both people and wildlife, is the suppression of wildfires. Fires are scary and destructive and, unlike other large mammals, we cannot run away as easily. We have belongings and homes that we do not want to lose. So we suppress wildfires. However, regular wildfires have many benefits to ecosystems. Wildfires burn plants down, which releases nutrients stored in the plants back to the soil, revitalizing the soil and allowing for new growth. It also serves the purpose of thinning forest undergrowth and reducing canopy cover, which decreases competition for space and allows light to reach the forest floor. Some plants have evolved to only be able to sprout new growth after a fire. They grow seeds that are either coated in a hard resin that can only be removed naturally by fire, or require chemical signals to sprout that only occur after a wildfire. Small, regular wildfires also serve the purpose of burning dead plant material and cleaning an area. One of the reasons wildfires spread so quickly and become so dangerous is because we suppress wildfires. Dead plant material builds up for so long that when a fire starts it cannot be contained because all the wood and leaves acts as kindling, allowing the fire to spread too fast to stop. Recently experts have recognized this, and small prescribed fires to clear the dead brush have become more common.

Habitat fragmentation, while not discussed in the news very much, is becoming an increasing threat to wildlife. Many species, especially migratory species and large mammals, require large areas of land to feed and find shelter. Migratory species require places to stop and rest and feed. When resting areas that have historically been used by migratory species are developed, it forces those species to find new feeding grounds, which can result in exhaustion and starvation. Top predators, such as big cats and bears, require enormous amounts of land to hunt. They often have to travel for hundreds of miles to find prey or a mate. When their territory is broken up into small isolated pieces it makes it difficult to find food and a mate. It also increases the chance of these large predators encountering people.

Grizzly Bears

Grizzly bears, like all other top predators, are keystone species. This means that without healthy grizzly bear populations the ecosystems they are a part of deteriorate. Female grizzly bears have an average home range of 70 square miles, while male grizzlies have an average home range of 300-500 square miles because they need to find a mate. Because they roam over such large territories that have been fragmented by human development, grizzlies have a high chance of encountering humans. These interactions put grizzlies and people at risk. The more roads they have to cross, the more likely it is that they will be hit and killed by a car. Hungry grizzlies will also wander onto private property in search of food. This increases the chance that they will become habituated to people and be deemed a threat, which leads to them being shot by wildlife officials or private landowners.

Grizzly bears are critical to maintaining healthy ecosystems. They are important to forest ecosystems as seed dispersers and fertilizers. Grizzlies eat berries and the seeds pass through them and are dispersed in a new location with their own pile of fertilizer. Grizzlies also regulate prey populations, which prevents overgrazing from ungulate populations. After grizzly and wolf populations disappeared from the Grand Teton National Park the number of herbivores increased, which decreased the density of plant growth. The decrease in plant density led to a decline in migratory bird species that rely on plant cover for shelter. Similarly, in Yellowstone after the wolves were wiped out, the loss of plant density led to erosion problems in the rivers because there were not enough plants to stabilize the banks.

Management Practices

Top predators are critical to healthy ecosystems and we need to ensure their survival. Organizations across the country are working on developing plans for greenway corridors. These would be connected areas of protected habitat that would allow wildlife to roam for hundreds of miles with little to no human interactions. To allow wildlife to safely cross freeways, organizations are designing and building greenways over or under freeways. These are bridges or tunnels that are designed specifically for wildlife to use.

In addition to greenways, we need to encourage our representatives to take into consideration critical wildlife habitat when we plan city development. Before building new infrastructure, biological factors need to be taken into consideration. We have the ability to build in a different location, but a species that relies on a specific ecosystem often does not have the ability to relocate.

Bear Game

Overview

This is an outdoor game illustrating: the seasonal food availability sequence for grizzly bears; the effects of whitebark pine decline; and the impacts of human activity on bear survival.

Grades: 7 – 12

Time: 1 – 2 hours

Materials: 10 tag-board signs (8 1/2 X 11 or larger) with months in large letters, "April" through "November", plus "hibernate"

10 colors of tag-board paper, cut with paper cutter into 2-inch squares (need 12 of each color per student, 2 of them marked with a dot on the back side)

At least 10 orange playground cones (more is better) or plastic flagging to mark two concentric rings of 50 and 100 feet diameter

Stick-on name tags, one for each student and markers

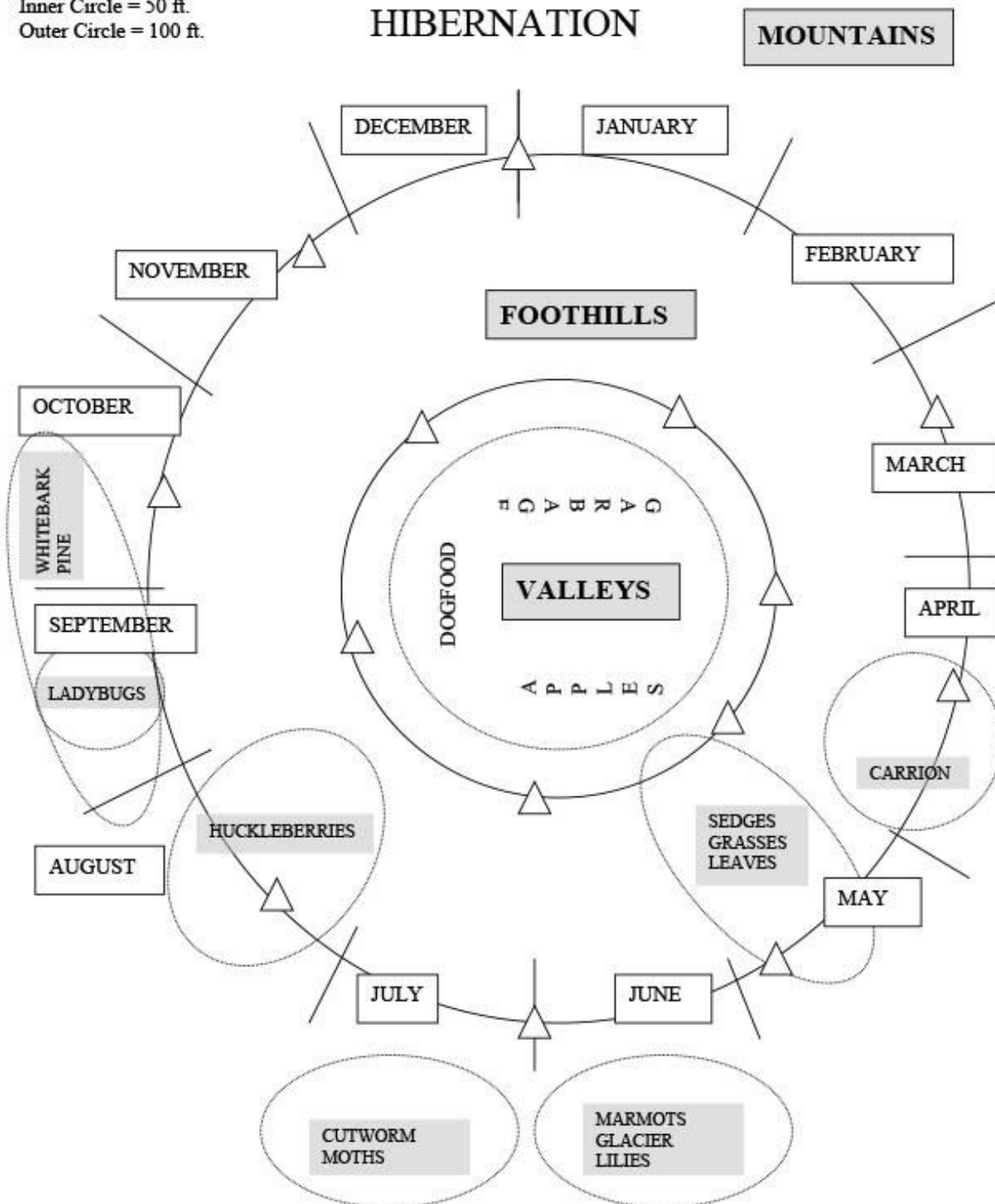
Clock with timer setting or stopwatch

Teacher Background:

This is a game illustrating opportunistic grizzly bear feeding. Bears follow a seasonal cycle of food-gathering, changing foods as different plants become ripe or as other foods become available in other ways. This game takes a fair amount of preparation, but it is worth it! Your students will play the game in a marked playing field, shown above.

The Setup

----- Boundary of food areas
 Inner Circle = 50 ft.
 Outer Circle = 100 ft.



Game Narrative

Grizzly bears are 300 to 600 pound animals with 4-inch claws and powerful jaws. Contrary to some opinions, they are also shy – most of the time... Only about 5% of their food is larger animals, on the average, and they are masters at finding the plants that are ripe at different times of the year. Some of the bears' "seasons" for different foods are only a few days long – then they move to the next "berry du jour". In the game you will play, you will move through the seasonal cycle of the grizzly bear, foraging for different foods in different months of the year. The object for bears, and for you, is to gather enough calories to put on enough fat to last through the November-to-April hibernation.

The foods you will eat, in order from spring to late fall, are (1) carrion from winter-kill, (2) grasses, sedges, new leaves and newborn fawns or calves, (3) glacier lilies, ground squirrels and mar-mots, (4) cutworm moths under rocks in the high alpine zone, (5) ladybugs, (6) huckleberries, and (7) whitebark pine nuts.

Grizzlies use their long claws for a number of things including: to dig up roots and burrowing animals, and to remove pine nuts from cones. Grizzlies also have sensitive and flexible lips and tongues for eating bugs, and the "hump" on their backs is a huge shoulder muscle for digging and turning over rocks.

Whitebark pine is especially important to them for three reasons. The season when pine nuts are ripe is long (August to October), the nuts inside whitebark cones are high in calories, and pine nuts are the last natural food of the season – ready just before bears hibernate. Whitebark pines are also located high in the subalpine zone, just below treeline, near where the grizzlies dig their dens. Red squirrels are an important player in the grizzly's whitebark pine diet. Squirrels bury the cones close together in "middens" of one to thirty square yards (meters). Sometimes a single squirrel will bury 800,000 cones in a single year! Obviously, this concentrated source of food is a "gold mine" for a bear.

When grizzlies aren't around, black bears climb whitebark pine trees for cones, and eat the seeds in the tree. Black bears sometimes lose all the hair from their chests and inside front legs because the pitch on the tree trunk pulls it out.

Cutworm moths spend much of the year out on the great plains, but they migrate by the millions to alpine areas to escape the heat of the summer. They hide under rocks in talus slopes. Bears turn over hundreds of rocks to find them, because the moths are high in fat and protein. Ladybugs come to the alpine in September to hibernate, also by the millions. Grizzlies find them by the bucket-load on the north and east slopes above treeline. The ladybugs hibernate on those slopes because insulating snow is deepest there.

The Procedure

1. Begin by reviewing what students already know about bears. Read together the narrative above and discuss how, in this activity, students will mimic how bears change their feeding behavior to suit the seasonal availability of different foods.

2. Each color of the paper squares represents a different seasonal food source for bears. There should be 12 squares of each color for each student "bear". Here is an example of how the paper squares would be divided and marked, keeping in mind that you can change the colors to suit your preferences:

White – carrion – April – 10 per student plain, 2 per student marked with 2 dots

Blue – grass/leaves/fawns – May – 10 per student plain, 1 per student marked with a dot, 1 per student with 2 dots (fawns)

Red – glacier lilies/marmots – June – 10 / student plain, 1 per student with one dot, 1 per student with 2 dots (marmots)

Green – cutworm moths – July – 10 / student plain, 2 per student with a dot

Orange – huckleberries – August – 10 / student plain, 2 per student with a dot

Purple – ladybugs – September – 10 / student plain, 2 per student with a dot

Yellow – whitebark pine – Sept. / Oct. – 10 per student plain, 2 per student with 2 dots (you may wish to throw in 2 or 3 extra squares with 4 dots on the back, to represent some giant squirrel middens)

Pink – apples/garbage/dog food – outer edge of inner circle - 10 per student plain, 2 per student with a dot

Chartreuse – sheep/cattle – middle of inner circle – 10 per student plain, 2 per student with 2 dots

Game 01

Set up the playing field with cones according to the dimensions in the diagram (approximately).

There should be a 50-foot circle and a 100-foot circle outside of it. The inner circle is where humans live (in the valleys). The bears will forage mostly outside the outer circle (high in the mountains). The paper squares should be spread evenly through each month according to the drawing. Be sure to place the squares with dots so the dots are down and not visible.

The “dots” represent calories, and are the only squares that will be gathered by the bears. They must forage through the other squares, picking them up and re-placing them, until they find those with dots on the back side.

Have 3 or 4 students be “humans”, who stay in the center 50-foot circle. Their job is to protect the apples, garbage, dog food, cattle and sheep from being “stolen” by the bears.

The rest of the class will be grizzlies. Have them begin in “hibernation”. Tell them they will be given 30 seconds for each month. Their job is to forage through the squares and collect the squares with dots. They may go anywhere inside the inner circle, but outside they must stay in the proper month for the 30 seconds. If they are tagged by a human in the inner circle, they must give up one of their “dot” cards (the effects of capture and relocation). If they are tagged a second time, they are a “repeat offender” and will be considered dead.

Time them, 30 seconds per month, through the year into hibernation. There they will count their dots. If they have 15 dots or more, they made it into hibernation in fine shape. If they have 12 to 14, they made it, barely. Less than 12, they will never wake up...

Your objective is to set up the game so a few bears do not survive. This is the way it happens every year. In the unlikely event that all of your “bears” survived, simply say it was a great year for bears.

Do some grizzly bears die every year?

How would you define a stable population?

Can poor nutrition affect reproduction as well as mortality?

Game 02

Explain to the students that the first game was played under ideal conditions for bears (even then, some probably died). It was in the 1800's. In the early part of the 1900's, a shipment of white pines from overseas brought pine blister rust to North America. It killed 80% of the whitebark pines, and few have come back because we humans also suppressed fires which make suitable openings for re-planting the whitebarks.

Ask them to give you all but 4 of the whitebark pine squares with dots. Then have them replace the squares, dots-down, in the proper months, and gather in the hibernation area.

Will the whitebark pine demise change your survival strategy? How? Will knowing how many dots you need affect your risk-taking in the human-populated area?

Choose new "humans" to occupy the center circle. Play the game again. Compare results with game one.

What was the critical time of the year for most of you? Why were the cattle and sheep in the most difficult area to raid?

Game 03

Have the students replace the squares again and announce that now we are moving into modern times. Humans are now building homes in the woods and foothills, and the humans can now move freely in the 100-foot circle. And, there are more humans. Choose 5 or 6 (assuming an average-sized class) replacement "humans" and send them to occupy and protect the larger circle. Play the game again and compare results.

Are people now living in huckleberry areas? With the absence of whitebark pines, is the huckleberry area especially critical now? How important is it to have a large bear sanctuary area like the Waterton-Glacier International Peace Park?

Game 04 & 05

Remove most of the huckleberries (bad seasons are fairly common) and play Game 4. Compare results. For Game 5, you will need the stick-on nametags. Have about one-half of the students (gender does not matter) put on a nametag. They are the females with cubs. They need at least 15 dots to keep their cubs alive. Play the game again and compare results.

Non-Classroom Activities

Sensitive Species Interactive Habitat Map

<https://www.arcgis.com/apps/MapSeries/index.html?appid=37580f0a1daa43ac950fa7bf88e008dc%20%20>

Elk Habitat Preservation in Helena-Lewis and Clark National Forest

<https://www.youtube.com/watch?v=Q4LHd59vhXk>

Habitat Fragmentation Lesson

<https://www.youtube.com/watch?v=98MtYbenTXU>

HAPPY.

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TRAILS.

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