



Forest Carnivores On-line

Objectives: Students will...

- Learn about the role of forest carnivores in ecosystems
- Analyze data to determine the results of wildlife inventories in area national parks

Essential Academic Learning Requirements:

- Reading 1.2, 1.5, 2.1, 3.1, 3.2
- Mathematics 2.1
- Science 1.1, 1.2, 1.3

Materials:

Computer with web access—for pairs or displayed via projector for class, map of Washington State (for Roger's Updates Activity), printed copies of pages 3 through 11 of this document

Background: Forest Carnivores

Martens and Fishers and Lynx, Oh My!

Lions, tigers and bears get a lot of press, yet the forests of Washington have their own toothy creatures that can take down the most illusive prey. In 2003, national park scientists began searching for signs of carnivore activity in these wild forests. Marten, fishers, lynx and wolverines are in their research scope. Finding these creatures isn't as easy as one might imagine—4x4 vehicles can't carry researchers on old-growth safaris. They must hike the trails and travel cross-country through old-growth forest to set up their study sites.

Researchers record animal activity using cameras and motion detectors. An animal snaps its own picture by crossing in front of the electronic sensor.

Forest carnivores are excellent indicators of forest health, because only healthy forests can sustain reproducing populations of these always-hungry animals.

Related Materials:

The following four activities were generated from information on this web-site: www.nps.gov/noca/journey/home.htm. To get there, click on "Teachers" in the left hand column, scroll down to "Featured Activities", click on "Forest Carnivores."

Activity 1: What's in Your Periphery?

This activity focuses on the vision of carnivores and herbivores. The location of the animal's eye sockets (also called orbits) is a skull characteristic that is useful in determining if an animal is a carnivore or herbivore.

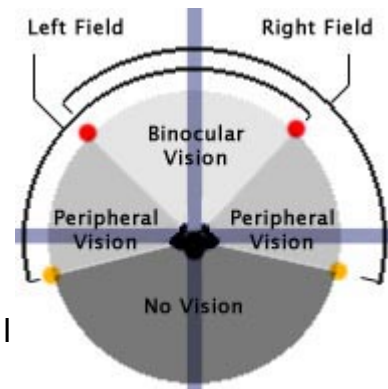
Carnivores have forward eye placement and binocular vision. Binocular vision means that both eyes can focus on an object providing the predator with the depth perception needed to determine the distance to its prey.

Most herbivores have eye orbits located on the side of their skull and monocular vision. Monocular vision means that just one eye can focus on an object providing herbivores with a broad field of view or peripheral vision. By using the vision of both eyes, some herbivores have a field of view of almost 360 degrees. By comparison, humans with sight in both eyes have a field of view of about 180 degrees.

Procedure

Gather your class outside on a large field of sand or basketball court. Break them up into groups of four and give each group four small rocks and a piece of chalk.

Have each student plot their binocular and peripheral vision on the pavement using chalk or using a stick in sand. Each member of a group should stand in the same location so they can compare their vision types. The student being tested is to be looking straight ahead at all times. A good way to keep students from twisting their heads is to have them line up along a cross, such as is found with basketball court lines. Drawing a cross per group in the sand may also be helpful. When done plotting, each student should label their lines with their name.



Questions to think about:

1. Besides hunting, why do some animals need keen binocular vision?
2. Besides watching for predators, why do animals need keen peripheral vision?
3. Why do humans have binocular vision?

Activity 2: Rogers Updates (Researchers Real Research)

Questions and activities related to Rogers Updates found on the first forest carnivore page. Students should read the updates and answer the questions that follow.

Hi all,

Just wanted to briefly update you on the progress of the forest carnivore project. During the past two weeks we have successfully installed 20 remote cameras distributed evenly in three major zones of the park complex. These zones include the Ross Lake area, the Hwy 20 corridor, and the Stehekin Valley. We intend to leave each of the 20 cameras in place for a 28-day sampling period. At the end of the first 28-day sampling period we will move each camera to a new site for another 28-day sampling period. So far, field logistics have gone very smoothly, radio communication has been working well, troubleshooting situations have been consistently solved, weather conditions have been amazingly favorable, cooperation across other divisions and with volunteers has been commendable, and team morale is high! All this has helped to keep us on schedule.

For the next two weeks we'll be going back to each camera station in the same order in which they were installed and check to make sure they are functioning properly, change batteries and film as needed, re-scent the station, and download data from the camera sensor. This should be interesting as I'm sure there will be a plethora of troubleshooting situations to deal with. More importantly, we'll be able to tell if we're getting some activity at the site by the number of events on the sensor and the number of photos taken by the camera. We won't be able to discern what sort of activity until we extract and develop the film. Interestingly, we have observed signs of bobcat, pine marten, coyote and cougar near some of the sites.

Much of the success of this project so far is owed to those who have assisted with logistics, whether it be radio dispatch, boat use, snowmachine and vehicle support, use of a snow sled for hauling gear, remote cabin use including cooking fuel and wood caches, and of course the dedication and enthusiasm of my crew and volunteers doing the ground work. Thank you very much and may the trend continue!!

Cheers,
Roger

For update #1

- Locate the following on a map:
- North Cascades National Park Complex
- Ross Lake
- Stehekin River
- Highway 20 corridor through the North Cascades National Park

Roger's Update #2

Hi all,

Well, update #1 was met with such great reception that I figured more of a good thing can't hurt. So, moving along, the past 2 weeks were spent checking the 20 camera stations that we installed during the first 2 weeks of the project. Overall, things went extremely well. However, there were some moments of harsh reality as we were pelted with rain, sleet and snow while deployed on Ross Lake and the trials and tribulations of contending with those bitter cold temperatures in the upper Stehekin Valley when your fingers are so frozen they lose their dexterity and ability to grasp a pencil. And the best part is when they finally come back to life!!! Ouch!!! Or, how about the time a couple of us inadvertently brushed against a tree harboring the essence of skunk lure! It would ruin the fun if I told you whose chair we sat in next!! We love our jobs!!!

Briefly, all camera stations were found operational and free of any major technical malfunctions. This in itself was an amazing surprise, given any number of things that could go wrong (ie., dead batteries, connector cables chewed by small mammals, snow loading, flash inoperable, film not advancing, leaky gaskets, corrosion of connector terminals, etc.). However, from a nontechnical standpoint, we did experience a couple of "situations" (but not "problems"). For example, at a couple of sites the bait was nearly devoured or stolen with no remains. Typically, these sites had a lot of detections, which therefore exposed all the film prematurely. This is to say we lost a couple of sampling days at these sites, hence they will require a slight extension to meet the required 28-day sampling period. We anticipated this happening and allowed extra days in our schedule to compensate for this. It may mean an adjustment to the original schedule, but won't affect those interested parties signed up for the week of 17 Mar. 03.

So, what sort of activity have we documented? Well, during the 2 week period we retrieved 6 rolls of film. Two of those have returned from the developers and that's all I can report on at this time. One roll was taken in the Newhalem Creek drainage where 23 slides were developed to include 14 shots of Pine Marten, 6 Spotted Skunk (skunks are important carnivores too!), 1 Stellar's Jay and 2 unknown. The other roll was taken in the North Fork Cascade River drainage where 24 slides were developed including 22 Spotted Skunk, 1 Pine Marten and 1 unknown. Furthermore, something "big" managed to tear a gaping hole in the poultry wire used to hold the bait at 2 of the sites in the upper Stehekin Valley. Bigfoot or possibly wolverine!! Stay tuned for the next exciting update where film is truth!

I'll try to include some explanations on what all this means in terms of population indices, distribution, relative abundance, etc. Until next time....see attached photos.

Cheers,
Roger

For update #2

- What time of year was it when this study was conducted?
- What species were found in the pictures?
- Write a brief description of the following animals: Bobcat, American marten, coyote, cougar, fisher, lynx, wolverine, and spotted skunk. Where are they found and what do they eat? (You will need to look outside of this website to find your answers.)

Roger's Update #3

Hi all, Another 2 weeks of forest carnivore inventory work has passed since the last update and operations continue to run smoothly. We are now at the half-way point with the second round of cameras being installed at various sites. Every day is an adventure and we've witnessed some very interesting situations along the way. For example, the other day part of the crew filmed in real time a pine marten diligently gnawing away at one of the bait stations. A few days later, other team members observed and photographed in real time a short-tailed weasel foraging on some carrion near another bait station. The data is really beginning to roll in now, adding to the intensity and challenge of keeping on top of things.

Here's a brief summary and photos of what we've detected so far. To date I've examined 395 photographic slides from 13 individual camera stations. From that 187 were spotted skunk, 114 pine marten, 5 short-tailed weasel, 6 deer, 22 cougar, 2 mice, 1 Stellar's jay, 4 northern flying squirrel, 22 unidentifiable (primarily due to a foggy lense) and 32 no animal observed in the frame. Bear in mind these are not necessarily individual animals and says little about absolute abundance. However, we can say something about relative abundance, whereas site A is x times more productive relative to site B. We can also say something about distribution, whereas pine martens appear widely distributed within the park complex and thus far have been documented at 7 of 13 sample sites. Until next time...enjoy!

Cheers,
Roger and crew

For update #3:

- What is the difference between absolute and relative abundance?
- Make a graph showing the relative abundance of each different species they have recorded in their pictures to date.
- What does this information tell you?

Roger's Update #4

Hi all,

The following is a brief update of the forest carnivore project with a couple of new photos attached. Your task is to correctly identify the two photos to species and justify your answer.

To date we have examined 804 photographic slides from 23 separate camera stations. Of those, 340 were pine marten, 229 spotted skunk, 26 gray jay, 22 cougar, 6 deer, 5 short-tailed weasel, 5 mouse, 5 Douglas squirrel, 4 northern flying squirrel, 3 Townsend's chipmunk, 2 canids, 1 other felid, 1 Stellar's jay, 29 unknown (due to foggy lens), and 126 frames with no animal observed.

Again, pine marten appears to be widely distributed and have been documented at 14 of the 23 sites. Spotted skunks appear to be abundant in specific areas, but patchily distributed and documented at only 4 of 23 sites.

Target species such as wolverine, fisher and lynx have not yet been documented by the remotely triggered cameras. We are getting close to the finish line with just a couple of weeks remaining for this year's field work. Until next time....be happy!

Cheers!

Roger and crew

For update #4

- Make a graph showing the relative abundance of each different species they have recorded in their pictures to date. What are your conclusions?
- Compare the graphs made from the information found in update #3 and update #4. What does this tell you about sample sizes and data sets?

Activity 3: Why Study Carnivores?

Aldo Leopold, a well known naturalist, once said "the art of creative tinkering is to save all the pieces." That is as true of motors as it is of ecosystems. If you forget a gear, gasket or screw in a motor, it may run for a while, but eventually, vibration from the other moving parts or loss of fluids, will lead to complete failure. In an ecosystem, missing parts such as nutrients, clean water or even certain species, can also lead to failure.

Biologists are particularly interested in the health of carnivore populations. These rare and secretive animals are an important group of mammals to monitor since, as predators, their health indicates the health of other animals and plants below them on the food chain.

Furthermore, some studies have shown that healthy predator populations actually help enhance healthy ecosystems. For example, the reintroduction of wolves in Yellowstone National Park, have had positive effects on riparian systems (land along side streams and rivers) by keeping the populations of elk and deer in check. Fewer elk and deer prevent over-grazing of riparian vegetation. Trees have been able to mature. Other species of plants have also thrived now that they are not being over-grazed. Another little expected benefit came when beaver recolonized areas because the plants they require were once more growing abundantly. Beaver ponds produced more wetlands supporting a host of other species.

All this because wolves eat elk and deer.

Activity:

Review Table 1 describing the protection status of some of Washington's carnivore species. Discuss with your class or have students research the following:

- What are the species listed in this table?
- What is the difference between endangered, threatened and listed species.
- Why would a species like fisher be endangered in Washington but not in another state?

Table 1. Forest carnivores thought to occur in North Cascades National Park Service Complex (Johnson and Cassidy 1997).

Common Name	Scientific Name	Federal/State Status
Weasels		
American Marten	<i>Martes Americana</i>	P
Fisher	<i>Martes pennanti</i>	FCo, E
Wolverine	<i>Gulo gulo</i>	FCo, SC
Ermine	<i>Mustela erminea</i>	None
Long-tailed weasel	<i>Mustela frenata</i>	None
Mink	<i>Mustela vison</i>	None
Western spotted skunk	<i>Spilogale gracilis</i>	None
River otter	<i>Lutra Canadensis</i>	None
Felids		
Canada lynx	<i>Lynx canadensis</i>	T, T
Bobcat	<i>Lynx rufus</i>	None
Cougar	<i>Puma concolor</i>	None
Canids		
Coyote	<i>Canis latrans</i>	None
Gray wolf	<i>Canis lupus</i>	E, E
Red fox	<i>Vulpes vulpes</i>	None
Ursids		
Black bear	<i>Ursus americanus</i>	None
Grizzly bear	<i>Ursus arctos</i>	T, E
Racoons		
Racoon	<i>Procyon lotor</i>	None

E=Endangered

T=Threatened

P=Proposed (coastal marten)

FCo=Federal Species of Concern

SC=State Candidate

None=Not Listed

Activity 4: Real Data

Camera sites were set up in randomly selected study blocks of suitable habitat at Olympic and North Cascades National Parks. You have to figure out what this real data means.

Answer the following questions using the data found in Tables 2 and 3:

- What species was most common at Olympic National Park?
- What species was most common at North Cascades National Park?
- What trends do you notice in the data?
- Was there anything in the data that surprised you?
- What do you notice about groups (example: the birds, or forest carnivores) of animals and their frequency recorded in this data?
- What questions do you have about this study?
- What difficulties can you imagine that wildlife researchers experience working in large national parks? (Imagine: there are over 600 miles of trails in Olympic National Park).
- What studies would you design to discover more about wildlife in your national parks?

Hint: You may want to make a graph or chart to illustrate your answers.

Note about the data: “Number of Pictures” in Table 2 refers to the number of times animals triggered the “photo trap.” In Tables 2 & 3, “Number of times Species was Detected in a sample area” refers to the number of times each species was found in one of the 39 survey sites in the park. Each survey site was four square miles in area.

This data does not refer to the number of animals found in a site. If, for instance, there was a herd of 40 elk in one survey site, a one would be recorded indicating that elk had been found in that survey site. There is no reference to how many animals were found at a site, just that they were found. A population study would focus on the number of animals. This data is part of a distribution study, or inventory.

Table 2. Number of pictures and frequency of detection for all species found during an inventory of Olympic National Park 2002 – 2004.

<i>Species</i>	Number of Pictures	Number of times Species was Detected in a sample area (26 total)
<i>Forest Carnivores</i>		
Ermine	83	7
Long-tailed weasel (<i>Weasel species</i>)	15	1
	11	4
Spotted skunk	630	11
Bobcat	24	6
Cougar	3	3
Coyote	12	2
Black Bear	9	5
<i>Miscellaneous Mammals</i>		
Mouse or vole	158	15
Red Backed Vole	1	1
Douglas Squirrel	4	4
Flying Squirrel	40	4
Snowshoe Hare	2	1
Black-tailed Deer	7	4
Elk	6	2
<i>Birds</i>		
Northern Spotted Owl	2	1
Raptor: Accipiter	1	1
Stellers Jay	72	3
Gray Jay	185	8
Northern Flicker	1	1
Hairy Woodpecker	1	1
Brown Creeper	2	1
Blue Grouse	1	1

Table 3. Frequency of detection for all species found during the inventory in North Cascades National Park 2003-2004.

Species: Common Names	Number of times Species was Detected in a sample area (39 total)
<u>Forest Carnivores</u>	
American marten	25
Spotted skunk	9
Coyote	6
Short-tailed weasel	5
Bobcat	4
American black bear	2
Cougar	1
<u>Misc. Mammals</u>	
Mule deer	9
Douglas squirrel	8
Mouse	6
Northern flying squirrel	3
Townsend's chipmunk	1
Snowshoe hare	1
<u>Birds</u>	
Steller's jay	6
Gray jay	5
Common raven	2
Red-tailed hawk	1
Turkey vulture	1