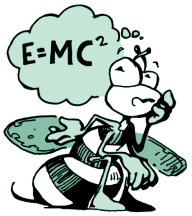
Quit Yer Horsin' Around!

The Effects of Trampling on Vegetation in Montana

Meet Dr. David Cole:

"I like being a scientist because I get to exercise my curiosity and discover things that might help make the world a better place."

Dr. David Cole



Thinking About Science...

Scientists often set up experimental conditions to study a particular problem. If scientists control what happens during an experiment, they feel more certain about the results. Often, scientists will compare what happens under different conditions. When they work in a laboratory, it is easier to control conditions. Sometimes, however, scientists cannot do their experiments in a laboratory. The scientists in this study wanted to find out whether horses or llamas do more damage to Rocky Mountain vegetation. Do you think they did this study in a laboratory?

Thinking About the Environment...

Whenever people use *natural resources*, they have an impact on them. The scientists in this study were concerned about the impact of large *domestic* pack animals used to carry equipment in the *back country*. Large animals may have more of an impact on vegetation than smaller animals and humans. This is of special concern in mountain environments, which are more *fragile* for vegetation. The scientists studied the difference in impacts between horses and llamas. Llamas are a South American member of the camel family. Llamas are about 4 feet high and 4 feet long (plus a short tail!). They were used as pack animals at least 4,000 years ago by the Indians of Peru.

Introduction

When people go hiking or camping in back country or wilderness areas, they almost always impact the natural environment in some way. For example, hiking along trails wears down the soil and caus-

es *erosion*. A look at the trails around your school yard or in your local park will show you what happens when there is a lot of trail use. When people use the back country, they sometimes use pack animals to make their trip easier. In the past, people used horses, mules, and donkeys to carry their load. More recently, people have also begun using llamas to help them carry their hiking and camping gear.

While much *trampling* occurs on trails, for pack animals, it can also occur where the animals are grazing. Scientists know very little about the environmental impacts of pack animals on vegetation. *But since so many people are using horses and llamas when they visit the back country, it is important to understand what happens to vegetation that is being used by these people and their animals.* That's why Dr. Cole and Dr. Spildie studied what happens to vegetation that is being trampled by people, horses, and llamas.

Reflection

- What problem are the scientists trying to solve?
- If you were the scientist, how would you find out about the effects of trampling by horses, llamas, and people?

Method

The scientists found places to study in the back country. To study the effects of trampling on the *vegetation*, four sets of lanes were created. A lane was created by marking a long and skinny area, like a path. The lanes went right through the vegetation (like the first time anybody uses a short cut!). One set of lanes was used as a *control*. The control, which was left untrampled, was used to compare what happened in the trampled lanes with an untrampled lane.

That left three sets of lanes for the *treatments*. One of the 3 sets of lanes was trampled by a human walking down the lane 150 times, another was trampled by a llama —being led by a human— walking down the lane 150 times, and the third was trampled by a horse—being led by a human—walking down the third lane 150 times *(Figures 1 and 2)*.

The scientists measured the forbs (or small herb-like plants) and shrubs before and within 2 weeks after trampling in each of the lanes. They measured *vegetative cover* and height. Then, they calculated the average amount of cover and the average height of the forbs and shrubs in each of the lanes. The scientists then used a *statistical test* to determine whether the measured differences in vegetative cover and height were probably due to something other than normal vegetative differences.

Glossary:

back country: (bak kun'trê) a large natural area with little or no human development

control: (ken trôl) situation in which the experimental treatment is withheld, used as a comparison

domestic: (de mes'tik) raised to live in a tame condition

erosion: (i rô'zhen) the state of being destroyed by wearing away

experimental condition: (ik sper'e men'tel ken dish' en) a situation purposely created to run a test or trial

forest manager: (for'ist man'i jer) a person who takes specific actions to protect and to use natural resources in a forest

fragile: (fraj'el) easily damaged

natural resource: (nach'er el rê'sôrs) goods occurring in nature that are used by humans

statistical test: (ste tis'ti kel test) a test that uses numbers and probability to determine relationship

trampling: (tramp'ling) treading or stepping heavily

treatment: (trêt'ment) a purposeful action taken to test something or run a trial

vegetation: (vej'i tâ'shen) all the plants or plant life in a place

vegetative cover: (vej'i tâ'tiv kuv'er) layer of green vegetation

Figure 1. Leading the llama down the test path.

Figure 2. Leading the horse down the test path

Reflection

- What were the scientists trying to measure?
- Why do you think the scientists used a control?
- What do you think the scientists discovered about the effects of trampling on vegetation? Why?

Results

The amount of vegetative cover was so much lower for the lanes trampled by the horse, the scientists knew it had to be due to the horse *(Figure 3)*. However, the scientists found no statistical difference in the height of the vegetation. This means that even though the average heights were different for the vegetation in each of the treatments, they were not different enough to know for sure whether the horse or llama caused any more damage to the height of the plants than the human.

In general, the horse caused a lot more damage to the vegetation than either the llama or the human. The scientists were surprised to find that llamas did not cause more damage to the vegetation than humans. Are you surprised?

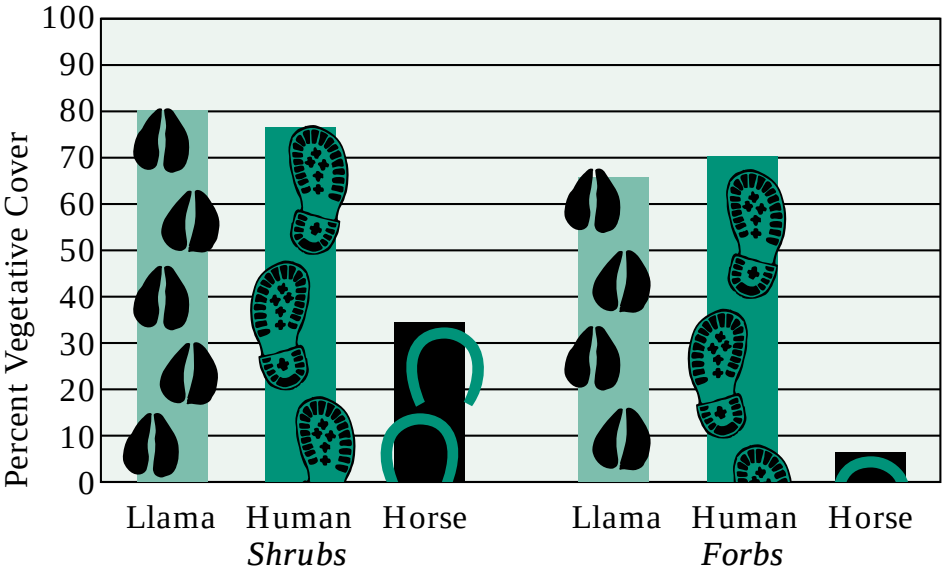


Figure 3. Bar chart of the results of the experiment.

Reflection

- Do you think the results are accurate? Do you believe that llamas do not create any more damage to vegetation than humans? Why or why not?
- If you were a forest manager, what would you do to protect vegetation from too much damage?

Implications

If forest managers want to minimize the impact of visitors to the back country environment, they need to be aware that horses are more damaging to vegetation than llamas or people. Managers may want to limit the use of horses for packing gear, and encourage the use of llamas instead.

Reflection

- When people use the back country for hiking and camping, even if they don't use horses, they have an impact on the environment. Do you think

people should be allowed to go in to the back country? Why or why not?

From: Cole, D. N. and Spildie, D. R. (1998). Hiker, horse and llama trampling effects on native vegetation in Montana, USA. *Journal of Environmental Management, 53*, 61–71.

Discovery FACTivity

The scientists in this study wanted to know whether trampling has an impact on plants. We're going to try the same experiment, but instead of using horses and llamas, we'll use aluminum cans and a plastic bottle. And instead of trampling, we'll be pounding!

Line four shoe boxes with plastic. Dig up four small rectangles of weeds, small enough to fit in the shoe boxes. Make sure to dig up some of the soil as well. The four weed samples should be as similar as possible, so dig them from the same area. Place one sample in each shoe box. Number each of the boxes. Using a ruler, measure the height of the weeds at each corner and in four places in the middle.

Calculate the average height of the weeds in each shoe box. Make a record of the average height of each sample.

Compare the average heights of the weeds in all four boxes. They should be very similar. If they are not, you will need to dig samples again until you get four samples with very similar average heights.

Get a plastic bottle filled with water, and two empty aluminum cans. Fill one can with sand or small rocks and tape the hole shut. Leave the other can empty.

Box number 1 will be your control. You will use it for comparison, so you will not do anything to the weeds in it. Have your class form three teams, choosing three members from each team to pound the weeds. Assign one of the remaining boxes and the plastic bottle or one of the aluminum cans to each team. Have the 3 members of each team pound the weeds 50 times (for a total of 150 times) with the bottle or can. Make sure all areas of the box are pounded.

After the weeds have been pounded 150 times, measure their height once again. Measure in each corner, and in four places in the middle. Calculate an average of the height of the weeds in each box, and record it. Compare the average heights of the weeds in all four boxes. Which box contains the lowest weeds? Which contains the highest? Why do you think there are differences between the heights of the weeds? What is the purpose of the control box?

Using the average heights you calculated for each box, create a bar chart showing your results using the empty chart below.

For more information, see: http://absaroka.wilderness.umt.edu/leopold