Everest Education Expedition Curriculum

Classroom Activity: Research Gear and Equipment Photo Monitoring/Repeat Photography (includes Montana Case Study)

Created by Montana State University Extended University and Montana NSF EPSCoR with support from Scott Powell at Montana State University
www.montana.edu/everest

Note: This activity requires your classroom to purchase or borrow a standard digital camera or a timeplapse camera such as the TimeLapseCam by Wingscapes http://www.wingscapes.com/timelapse-cameras/timelapsecam8

Overview of the activity:
Students will use a digital camera to conduct a photo-monitoring project of approximately three months in duration. Each school day (or every day, if possible) students will take one photograph of the same natural object or scene from the exact same position. Over time, the photographs will reveal change that may not be obvious from day today.

Photo monitoring / repeat photography is widely used by researchers who study rangelands, glaciers, forests and other natural areas that change over time. This tactic is also widely used in "citizen science," in which individuals or groups of volunteers help scientists and researchers by contributing their own data and observations.

Equipment needed:

- Digital camera plus needed accessories (e.g., batteries, memory card cord for connecting to computer, etc.) or a timelapse camera such as that sold by Wingscapes (http://www.wingscapes.com)
- tripod (optional)

Background information:
At locations throughout the Himalaya and around the world, digital cameras have been stationed in order to record the impacts of climate change. As part of the Extreme Ice Survey project, these visuals are then transformed into time-lapse videos that condense the movement and demonstrate how glaciers change over time.

From the EIS Website http://www.extremeicesurvey.org/index.php/about/:
Founded in 2007 by James Balog, the Extreme Ice Survey (EIS) is an innovative, long-term photography project that merges art and science to give a "visual voice" to the planet's changing ecosystems. One aspect of EIS is an extensive portfolio of single-frame photos celebrating the beauty–the art and architecture–of ice. The other aspect of EIS is time-lapse photography; currently, 27 cameras are deployed at 18 glaciers in Greenland, Iceland, the Nepalese Himalaya, Alaska and the Rocky Mountains of the U.S. These cameras record changes in the glaciers every half hour, year-round during daylight, yielding approximately 8,000 frames per camera per year. We edit the time-lapse images into stunning videos that reveal how fast

climate change is transforming large regions of the planet. Finally, EIS supplements the time-lapse record with episodic repeat photography in the French and Swiss Alps, Canada, Iceland, and Bolivia.
http://www.extremeicesurvey.org/

Connection to the Everest Education Expedition:
Conrad Anker, leader of the EEE team, has been affiliated with EIS for several years. During his Spring 2012 trip to the Himalayas, Anker will be servicing some of the Extreme Ice Survey cameras, including pulling out their memory cards and replacing them with new ones.

Connection to Montana:
Many researchers in Montana use repeat photography to study rangelands, forests, wetlands, stream restoration, livestock grazing and other areas. See the case study below regarding land management at City of Rocks, Idaho.

Classroom activity:
Create your own photo monitoring project and observe changes in the natural environment over time. These changes may be small and unnoticeable from day to day, but when photos are taken each and every day from the same location, the compilation of these photos will give a visual depiction of change over time.

Choose a natural environment location that will show change over time, such as a tree, a snow bank, a body of water, a grassy field, etc. You will be taking a photo each day for several months. This could be a scene from your classroom window, or one that you photograph outside. The key is taking the same photo from the same location at the same camera angle every day.

If you are selecting a shot out your classroom window, you can use a tripod to fix the camera to one location and use it only for this project. Or, ask the kids to brainstorm ways that they could be sure they are taking the same photo from the same location each day.

Consider appointing one student per day as the "official photographer." It will take just a moment to snap the photo, but it should be done as many days as possible. If you are using an automatic timelapse camera, you will be taking a new photo every hour or 30 minutes.

Resources:
The U.S. Forest Service provides a great Photo Point Monitoring Handbook, which will provide background information for your students.
www.fs.fed.us/pnw/pubs/gtr526/gtr526A1.pdf

MSU Case Study: How photo monitoring / repeat photography is used in land management

Scientists from Montana State University are working with the National Park Service at City of Rocks National Reserve in Idaho to help them understand how the expanded growth of trees over time is affecting the area's natural sagebrush ecosystem and the plants and animals that live there.

City of Rocks is located in southern Idaho, near the Utah border. In the mid-1800's, it was an important stop on the California Trail as pioneers came in wagon trains from the Midwest and East toward the gold rush of California. The area is known for its huge granite pinnacles…some of them more than 60 stories tall and 2.5 billion years old! These rock formations are a big draw for rock and ice climbers, and the park has a program that helps kids and adults learn to climb.

In the mid-1800s, the City of Rocks area was mostly sagebrush and grasslands, but since then, more trees (pinyon and juniper) have been growing on this area. Land managers are interested in whether the encroachment of these trees is negatively affecting the plants and animals that live in the sagebrush and grassland areas. They also want to know how quickly the landscape is changing, why the trees have begun to encroach on the grasslands, and what—if anything—they should do about it. They are also studying whether changes in climate have affected this growth.

One of the tools the MSU researchers use to tackle this problem is photo monitoring – the use of photographs taken at the exact same location at different times.

Scott Powell, who is with the MSU Department of Land Resources and Environmental Sciences, and Andrew Hansen, who is with MSU's Department of Ecology, have examined aerial photographs of the City of Rocks area taken in 1950, 1990 and 2009. They used a software program to help determine how much of the area was covered by evergreens, shrubs, and deciduous trees. They also looked at whether recent events such as fires or insect infestations had affected the area.

Professors Powell and Hansen also reviewed a photo from 1868 and compared it to a modern photo taken from exactly the same spot. You can see a vast change in vegetation over the years.

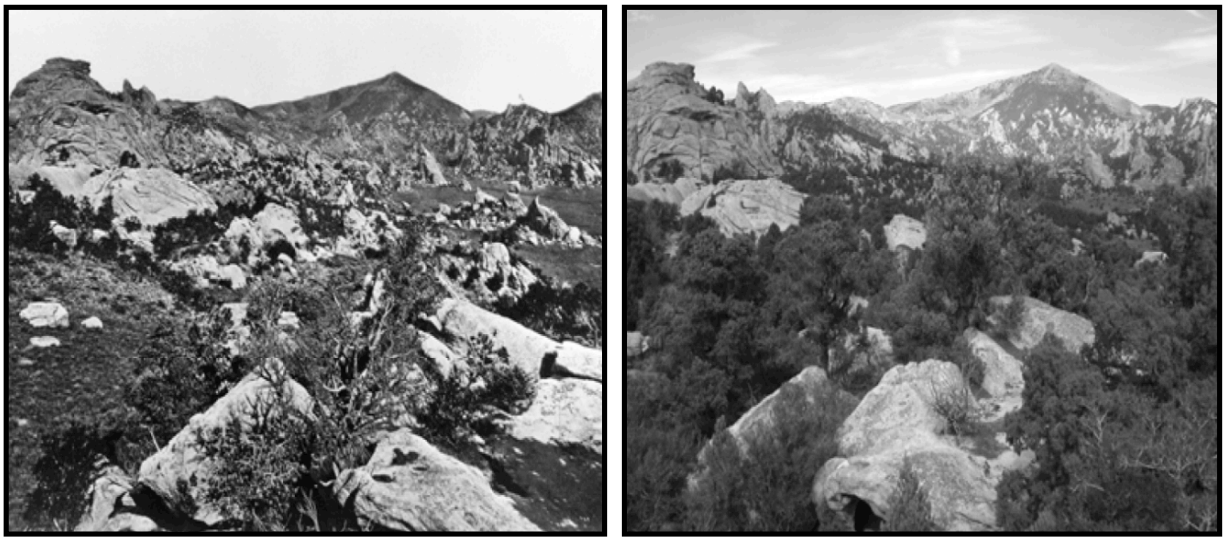
By examining the changes over time, Professor Powell and Professor Hansen were able to determine how much more of the land was covered in evergreens (7% more since 1959) and how quickly that rate was changing. They could also tell which types of trees were growing most quickly and at what elevations. They even examined how much sunlight particular areas were getting and whether that affected growth.

With the repeat photography and the use of computer software, Professor Powell and Professor Hansen were able to help the National Park Service land managers better understand how the ecosystems at City of Rocks change over time in association with changes in climate and the impacts of fires and other natural occurrences. They were able to make some recommendations that will help the land managers develop goals for managing the lands, for monitoring future

changes, and for using prescribed fire or mechanical treatments to reduce the density of pinions and junipers in sensitive areas and to protect old-growth stands in favor of new growth.

Figures:

Figure 1. Repeat photographs from CIRO from 1868 (left) and 2005 (right) showing increase in woody vegetation (from Morris 2006).



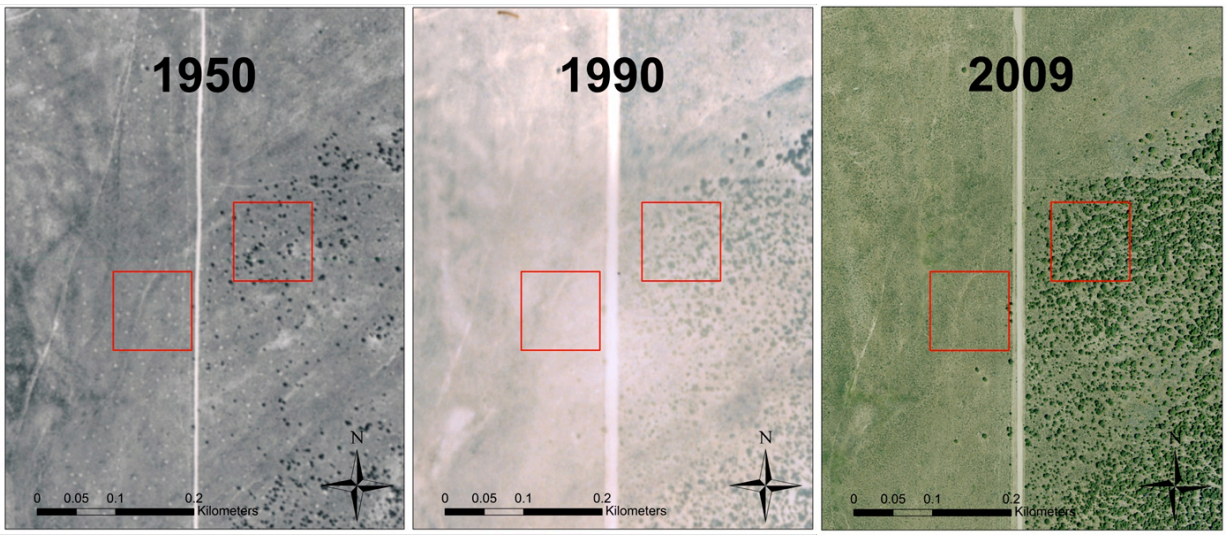


Figure 2. Repeat aerial photographs from CIRO from 1950, 1990, and 2009 with reference sample plots.