From Landform to Landscape: Experiences Teaching about National Parks

Kathleen M. ABBOTT* and Robert F. DYMEK, Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130 (*Now at Blasland, Bouck, and Lee, Inc. 1670 Corporate Circle-Suite 200, Petaluma, CA 94954)

Abstract

The desire to educate non-majors in the principles of geology and instill in them a sense of environmental awareness led to the development of the introductory level undergraduate course "Geology of National Parks," which is entirely lecture-based and visually oriented. This course demonstrates how geologic agents all act together to control the appearance of the landscape. Accordingly, National Parks, Monuments, Lakeshores, and Seashores provide a convenient venue for presentation of this material. The success of "Parks" led to the creation of a course for majors, "The North American Landscape," which covers much the same material but at a more-advanced level via lectures, labs, and seminars, using Physiographic Provinces as the framework for presentation.

The exercise considered here was developed as a midterm project for the "Landscapes" course. Each student selects one of the lower 48 states and, in so doing, must identify its Physiographic Provinces and geologic domains, and explain how the landscape achieved its present configuration. The final work product is a poster supported by an oral presentation to the class. The students are advised to proceed through a series of panels devoting each one to a different aspect of their state. Space limitations force them to be creative as well as to be succinct with their explanations, while being informative and at the same time avoiding overcrowding within their display.

This poster project lends itself to investigation and interpretation of various data sets, which can be overlain on a template of bedrock geology, such as topography, soil types, vegetation, habitat, agriculture, development (population density, industry), climate (rainfall, snowfall, weather patterns), hydrology (rivers, lakes), resources (mines, quarries), etc. Students are encouraged to use the EPSc library, the Internet, and to contact the state they are researching. One good resource on topography, for example, is the "Tapestry of Time and Terrain" website developed by the USGS (http://tapestry.usgs.gov/). In summary, the poster project introduces students early in their academic careers to diverse and unconventional types of geologic data, and provides the opportunity for them to compare, contrast, and interpret such data in a geologic context.

Recommended Internet Resources:

National Park Service

www.nps.gov

National Park Service Geology

http://www2.nature.nps.gov/grd/

USGS

http://www.usgs.gov/

Tapestry of Time and Terrain

http://tapestry.usgs.gov/Default.html

Association of American State Geologists home page

http://www.kgs.ukans.edu./AASG/

National Resources Conservation Service

http://www.nrcs.usda.gov/

United States Department of Agriculture

http://www.usda.gov

AGI Earth Science World Image Bank (ESWIB)

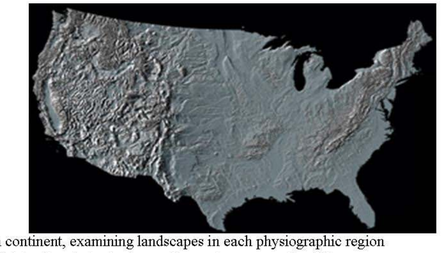
http://www.earthscienceworld.org/imagebank

Acknowledgements- Special thanks to Robert Buchwaldt for the technical assistance.

The Big Picture

GEOLOGY

TOPOGRAPHY



During the course of the semester, we travel across the North American continent, examining landscapes in each physiographic region from the Coastal Plains Province west to the Pacific Border Province. Taking time to look at a smaller scale, many units of the National Park System provide an excellent venue for the study of physiographic provinces and their underlying geology. A few examples of how national parks relate various data sets to geology are shown below. The mid-term State Map Project gives students a chance to investigate the geology and physical science data of a region at the state scale (see Instructions to the right). Selected examples of state-map posters are available for viewing.

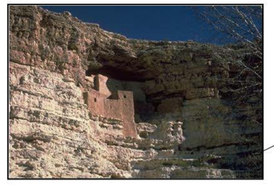
Glacial moraine in Yosemite NP

Lakes with granite islands in Voyageurs NP, Minnesota

A Closer Look

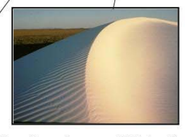
Dante's view across the valley toward Panamint Range in Death Valley NP

Rocky coastline of Acadia NP in Maine



Cliffstone Dwellings at Montezuma Castle NM in Arizona-The erosive characteristics of the Verde Formation form deep recesses in the horizontal layers of limestone, sandstone and volcanic ash, creating a unique location for development.

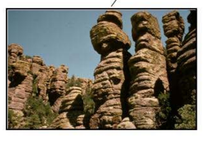
Cade's Cove at Great Smoky Mtns NP



Barchan dune at White Sands NM

Tidal flats at Padre Island NS

Controlled Burn in Badlands NP



Eroded pinnacles in ignimbrite, Chiricahua NM

GOALS:

1. Investigate the geology of a specified region.
2. Compare, contrast, and interpret data from the physical sciences in a geologic context!

Instructions for State Map Posters

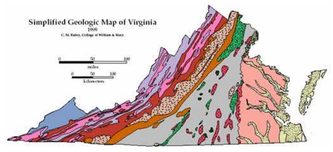
As will become apparent throughout the duration of this semester, the landscape of the conterminous United States is highly diverse, and includes plains, mountains, valleys, prairies, lakes, rivers, and deserts that have been sculpted by a variety of geologic agents. The landscapes found throughout the U.S. thus reflect the interplay between geological processes and the underlying bedrock. The purpose of this exercise is to familiarize you with the "landscape" in a particular area, in this case, one of the lower 48 states.

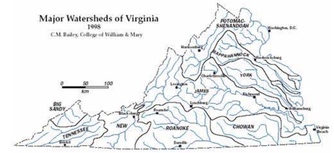
Formally, the U.S. has been divided into several *Physiographic Provinces*, which correspond to regions that share certain geomorphic features in common, whether they be mountain belts, plateaus, plains, coastlines, *etc*. As such, the boundaries among the various *Physiographic Provinces* typically cross state boundaries, such that most states lie within more than one province.

As an example, two colored maps of the state of Virginia, downloaded from the Web (http://www.wm.edu/geology/virginia/teaching_resources.html , courtesy of Professor C.M. Bailey, College of William & Mary) are attached. The first one is a colored relief map showing Physiographic Province boundaries, and the second map highlights the provinces themselves. Each map is accompanied by an explanatory legend about the various physiographic and geologic segments of the state of Virginia.

This assignment asks you to select a state, to learn as much as possible about the nature of its landscape and its bedrock geology, and to produce a report that explains how the landscape achieved its present configuration. The product of your efforts will be a poster (on a single 36x48" board), and a brief oral presentation to the class during the week before spring break.

One way to proceed is through a series of panels within your poster, each devoted to a different aspect of your state. You should make sure that an explanation accompanies each diagram. Things to consider include topography, drainage, surface features, bedrock, geologic history, and anything else that contributes to understanding the "lay-of the-land." Limitations of space will force you to be creative as well as to be succinct with your explanations, while being informative and at the same time avoiding overcrowding within your display.





You should select a state as soon as possible, which will enable you to obtain appropriate resources on a timely basis. Our EPSc library contains a set of digital relief maps for each state (or at least those that are available), which will enable you to gain a good feel for your state. Our EPSc library also is a depository for state documents, so you should be able to get started right away. However, it might prove necessary to contact a state agency to obtain information and maps (like the attached ones for Virginia). I must insist that each student select a different state.

After this exercise is done, we will hang the posters from the cases in the second floor of Wilson Hall. When we did this exercise two years ago, the poster display attracted a lot of attention and received a considerable amount of positive feedback.