Preservation of Geologic Field Sites: A Perspective from Undergraduate Instruction

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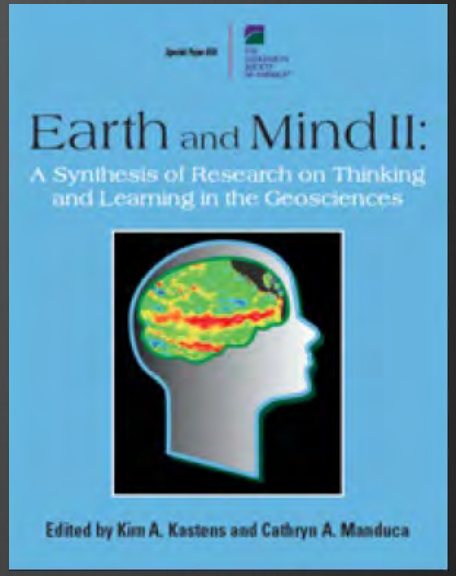
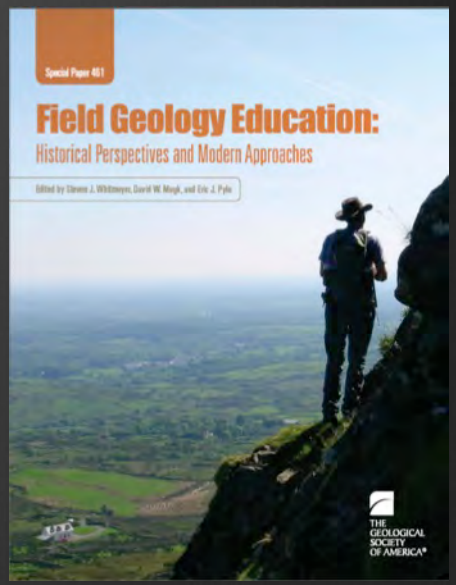
Field Work is Good….

- Cognitive benefits not attained in other learning environments (Mogk and Goodwin, 2012)
  - Temporal, spatial, systems thinking
  - Inscriptions and embodiment
- Affective gains
  - Motivation, curiosity, self-confidence
  - Engaging community of practice, recruiting mentoring, networking
- Central to the geoscience curriculum (Whitmeyer, Mogk and Pyle, 2009)



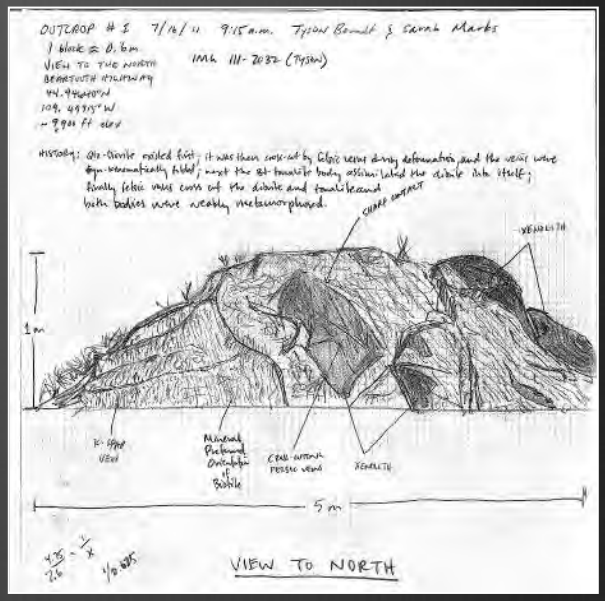


…but, Field Work is in Jeopardy

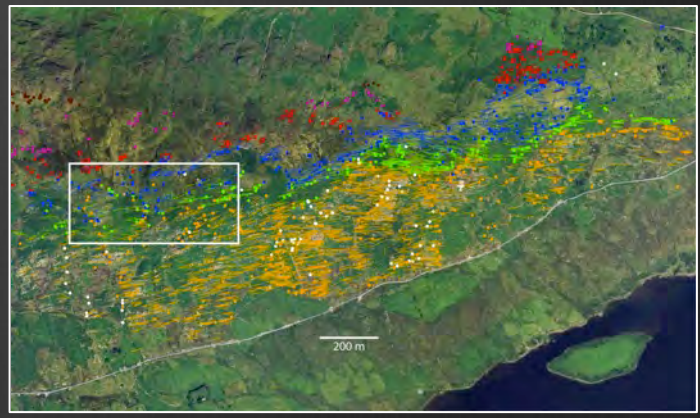
- Cost, time liability
- Changing emphasis to modeling,
- Access to field sites
  - Illustrative, representative of key geologic features
  - Safe and reliable access
- A GeoEthic of Preservation
  - For future generations of learners
  - To preserve "GeoDiversity"
  - Work with land managers
    - Inform why these features are important
    - USFS, BLM, NPS…. (federal, state)
    - Private landowners, Land trusts, Parks, ….(conservation easements)

What we need is:

- Local, regional and national catalogues of "iconic" field sites with exceptional educational value
  - Road logs, field guides, site-specific
  - "Gray Literature" moved to public place
- Teaching activities developed for sites (online)
  - All levels; K-12, undergraduate intro and majors, general public
- Databases (online)
  - Maps, reports/articles, geochemical/geochron, atlases of images, ….

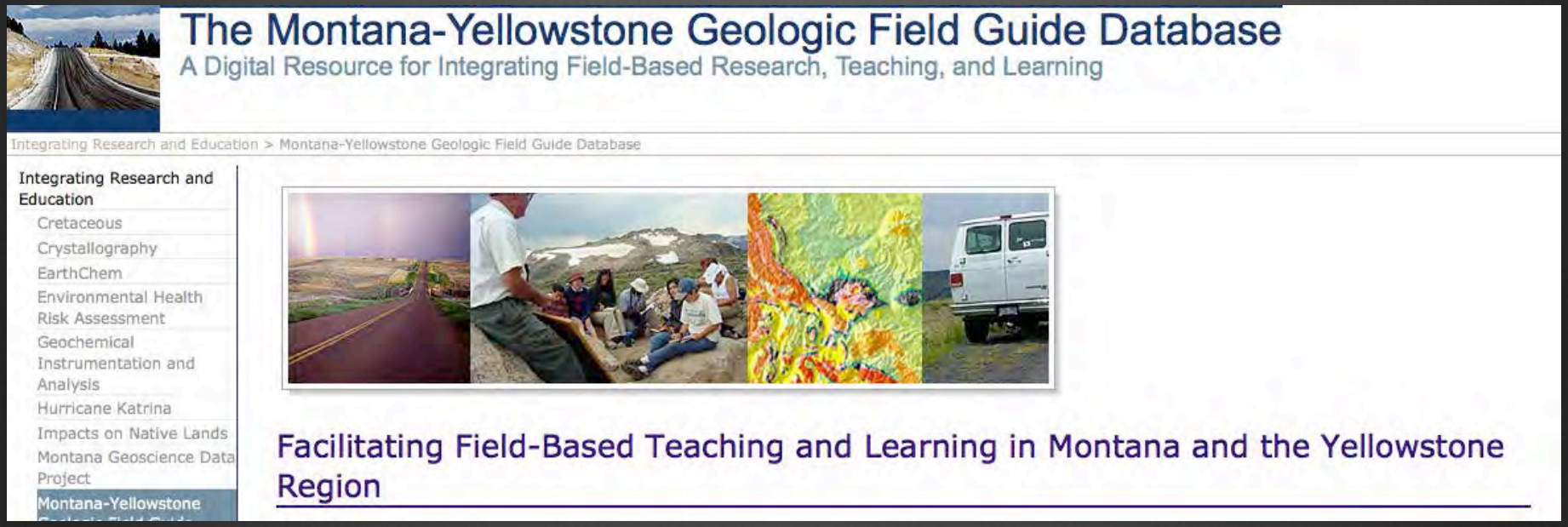


REU Yellowstone Project: Student sketch map of complex relations in Archean granitoids



From Whitmeyer, 2012: "Community mapping in geology education and research: How digital field methods empower student creation of accurate

Example 1: Road Log/Field Guide Database



Essential Information is presented to inform field trip leaders

- Route
- Access information
- Maps
- References, reports
- Activities (if available)
- Key Geologic Features
- Major structures
- Rock types
- Surficial features

http://serc.carleton.edu/9771

Rhyolite-Basalt Volcanism of the Yellowstone Plateau and Hydrothermal Activity of Yellowstone National Park, Wyoming

Route

Click for route map

Start point
Old Faithful area of Upper Geyser Basin, Yellowstone National Park

End point
Mammoth Hot Springs, Yellowstone National Park

Roads
U.S. 89

Total distance
not given

Geology

Summary
This field guide provides an overview of the major geologic and hydrothermal features along the park roads through the western and northern parts of Yellowstone National Park. A number of sites from Old Faithful to Mammoth Hot Springs are described in the context of the geologic history of the Yellowstone region. Areas receiving special emphasis are the Firehole River and Upper Geyser Basin (including the Old Faithful area), Midway and Lower Geyser Basins, Firehole Canyon, Madison Junction, Norris Geyser Basin, the Norris-Mammoth Corridor, and Mammoth Hot Springs.

Key Lithologic Features

- rhyolite flows and tuffs
- travertine terraces
- landslide deposits

Structures

- volcanic calderas

Landforms

- volcanic plateaus

Other Features

- a variety of hydrothermal features including hot springs, geysers, fumaroles, mud pots, and explosion craters

Reference

Christiansen, R.L., and Hutchinson, R.A., 1987, Rhyolite-basalt volcanism of the Yellowstone Plateau and hydrothermal activity of Yellowstone National Park, Wyoming, *in* Beus, S.S., ed., Centennial Field Guide Volume 2: Rocky Mountain Section of the Geological Society of America , p. 165-172.

Example 2: NAGT Field Activity Collection

National Association of Geoscience Teachers

NAGT
- Sections
- Divisions
- Teaching Resources
- Rock and Mineral Exchange
- Teaching in the Field
- Field Trip Examples
- Field Trip Submissions
- Field Trip Example Submission Form
- Safety in the Field
- Strategies for Successful NAGT Field Trips
- 2004 Southwest Section Field Conference
- Volcano Exploration Project: Pu`u `O`o
- Department Resources
- Education and Policy
- Publications
- Programs
- Organization

▶ **This activity is part of the On the Cutting Edge Peer Reviewed Teaching Activities collection.**

Beartooth Highway Field Trip and Activities

Darrell Henry, Louisiana State University
Dave Mogk, Montana State University

Intended Audience: This field trip and related exercises was used for a Teaching Petrology in the 21st Cen applicable to undergraduate and graduate courses in petrology.

Location:

Beartooth Highway, Montana.

Summary:

During the course of the day, students examine the high-grade metasupracrustal rocks, related gneis granitoids and mafic dikes. We have prepared a number of exercises that might be done with classes Depending on the background and preparation of your class you might want to emphasize different le class level: observation, interpretation, integration (i.e. multiple lines of evidence focused on a given relationship to the "big picture", drawing from the corpus of geologic knowledge). We have also prepa scientific results, but these are under seal and we'd like you to do the exercises first as if you were st at the supporting evidence.

Context:

Goals:

Goals of this activity are to teach fundamentals of petrology through regional examples and to instruct participants in the use of questions on a field trip.

Assessment and Evaluation:

Students have met the goals of this activity if they are engaged in the field trip and are answering the provided questions and completing the mapping exercise thoughtfully, thoroughly, and accurately.

Materials and Handouts:

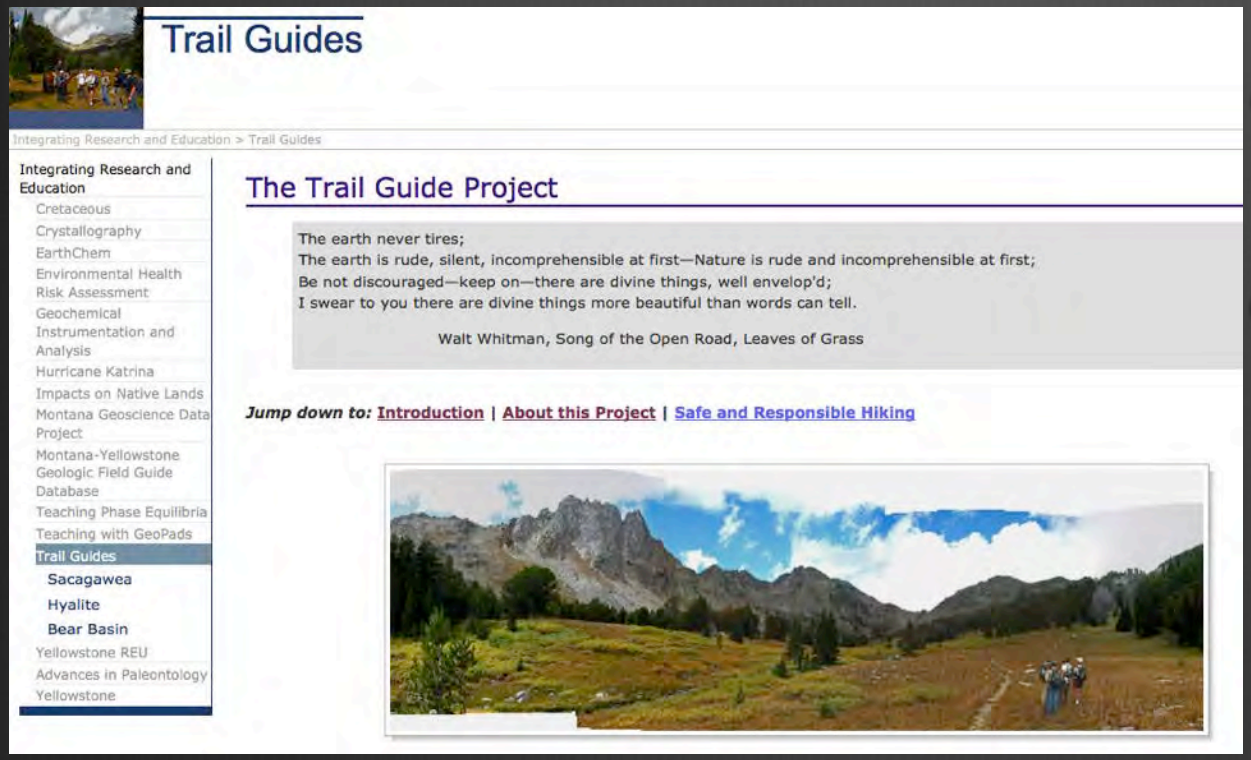
- Beartooth Highway Field Exercises and Mapping Project (Microsoft Word 57kB Dec1 03)

References:

- Migmatites and related rocks
- Selected Features of the Precambrian rocks of the eastern Beartooth Mountains, Montana and Wyoming (Microsoft Word 575kB Dec1 03)
- Data for metasupracrustal rocks of Hellroaring Plateau (Microsoft Word 959kB Dec1 03)
- Data for the plutonic complex of the Long Lake area (Microsoft Word 917kB Dec1 03)
- Useful References on the eastern Beartooth Mountains (Microsoft Word 46kB Dec1 03)
- Mafic Dykes of the Beartooth Mountains, Montana and Wyoming (Microsoft Word 4.6MB Dec1 03)

http://www.nagt.org/nagt/field/index.html

Example 3: Trail Guide Project



A service-learning project by students

http://serc.carleton.edu/37967

- Encourage citizens to get out into the field
  - Capture the aesthetics
- Details of access, trail conditions
- Step by step guide to key features
  - Hikes will be more enjoyable if you know what to look for
- Interpretations based on geoscience

Trail Guide to Sacagawea Peak, Northern Bridger Range, MT

By Travis Corthouts and Donald Bent, geology majors, Department of Earth Sciences, Montana State University

Fossils to look for on this stretch of the trail

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The rocks seen along the majority of the trail are limestone from the Mississippian Madison Formation, which include the lower thinly-layered Lodgepole Limestone, and the upper section which is the more massive Mission Canyon Limestone. These limestones were originally deposited in warm, shallow seas that covered this part of North America ~340 million years ago. This environment was similar to modern day sub-tropical carbonate platforms--thus, this geologic occurrence has been referred to as "**Bahama Montana**" (a term coined by Dr. David Lageson). Imagine this countryside once covered by coral reefs and all the organisms that typically live there....

▶ Show Caption

▶ Show Caption

Geomorphology and Landscape Evolution

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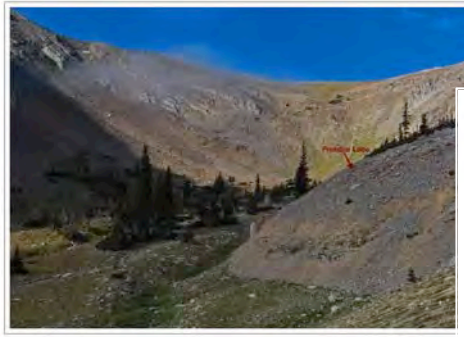

Structural Geology

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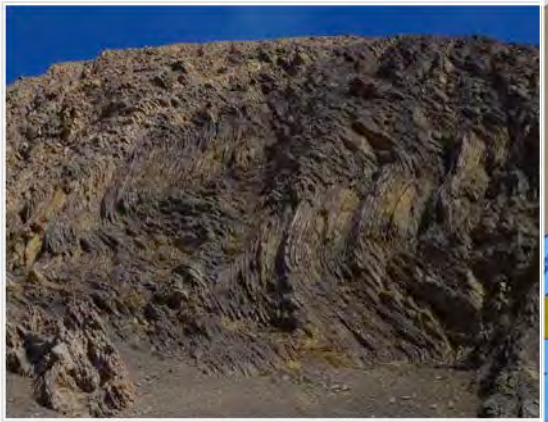

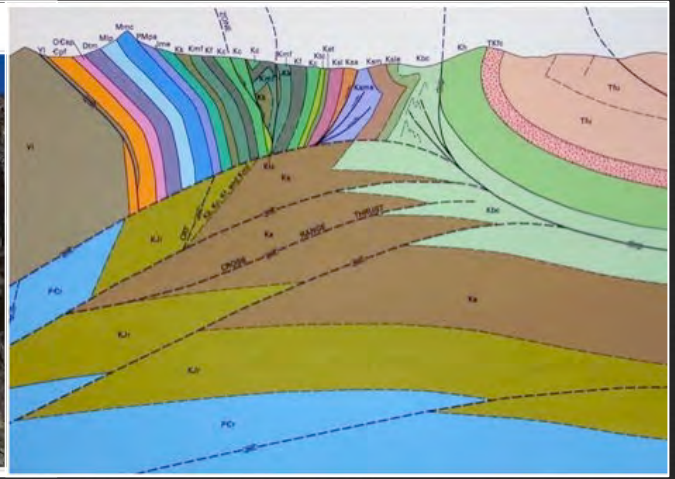

Teaching in the Field Resources

- ***On the Cutting Edge*** **Teaching Geoscience in the Field**
  http://serc.carleton.edu/36914
- **NAGT Teaching in the Field**
  http://nagt.org/nagt/field/index.html
- **NAGT Geoscience Teachers in the Parks**
  http://www.nagt.org/nagt/programs/GTIP.html
- **Synthesis of Research on Thinking and Learning in the Geoscience**
  http://serc.carleton.edu/21144