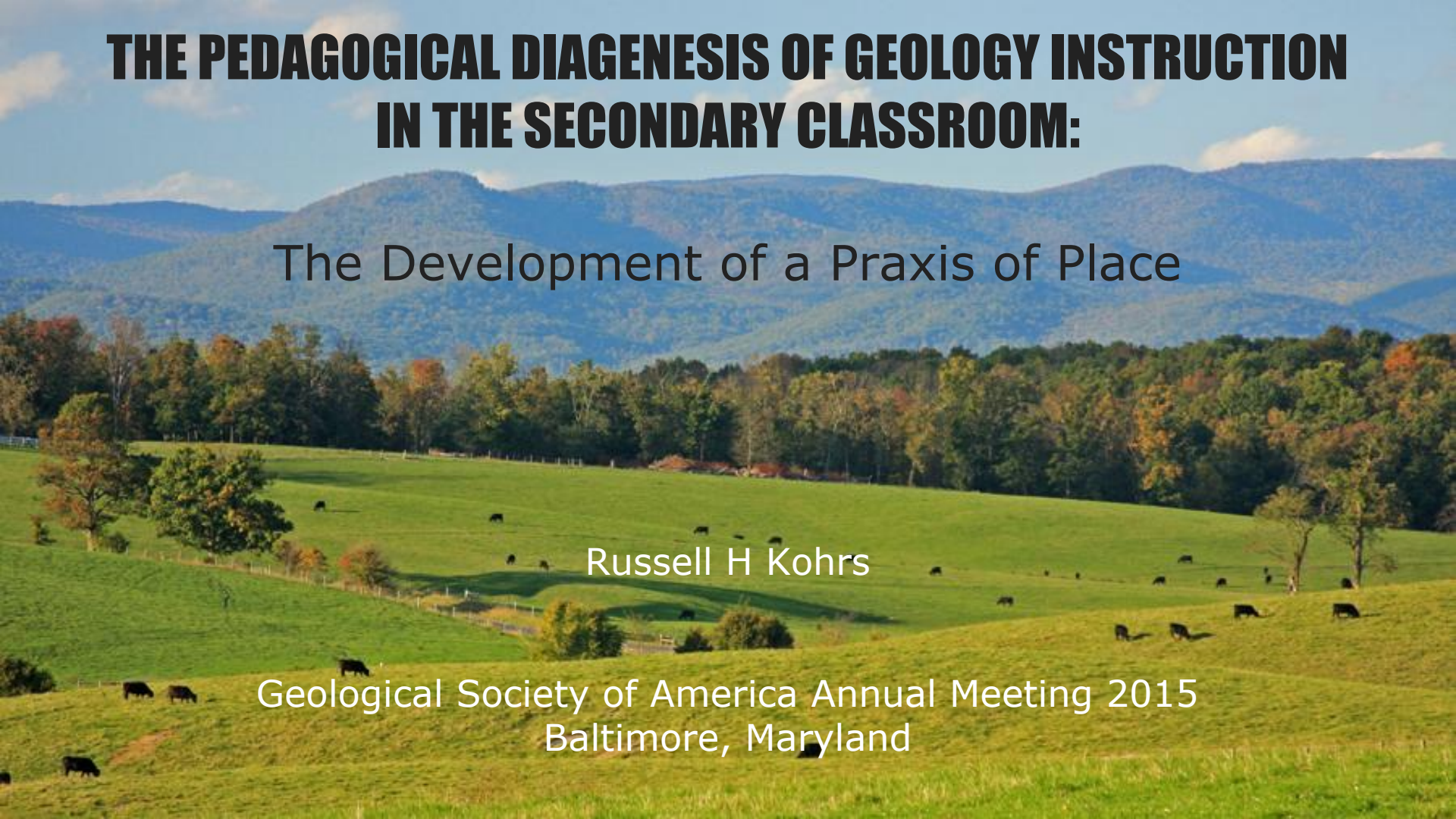
THE PEDAGOGICAL DIAGENESIS OF GEOLOGY INSTRUCTION IN THE SECONDARY CLASSROOM:

The Development of a Praxis of Place



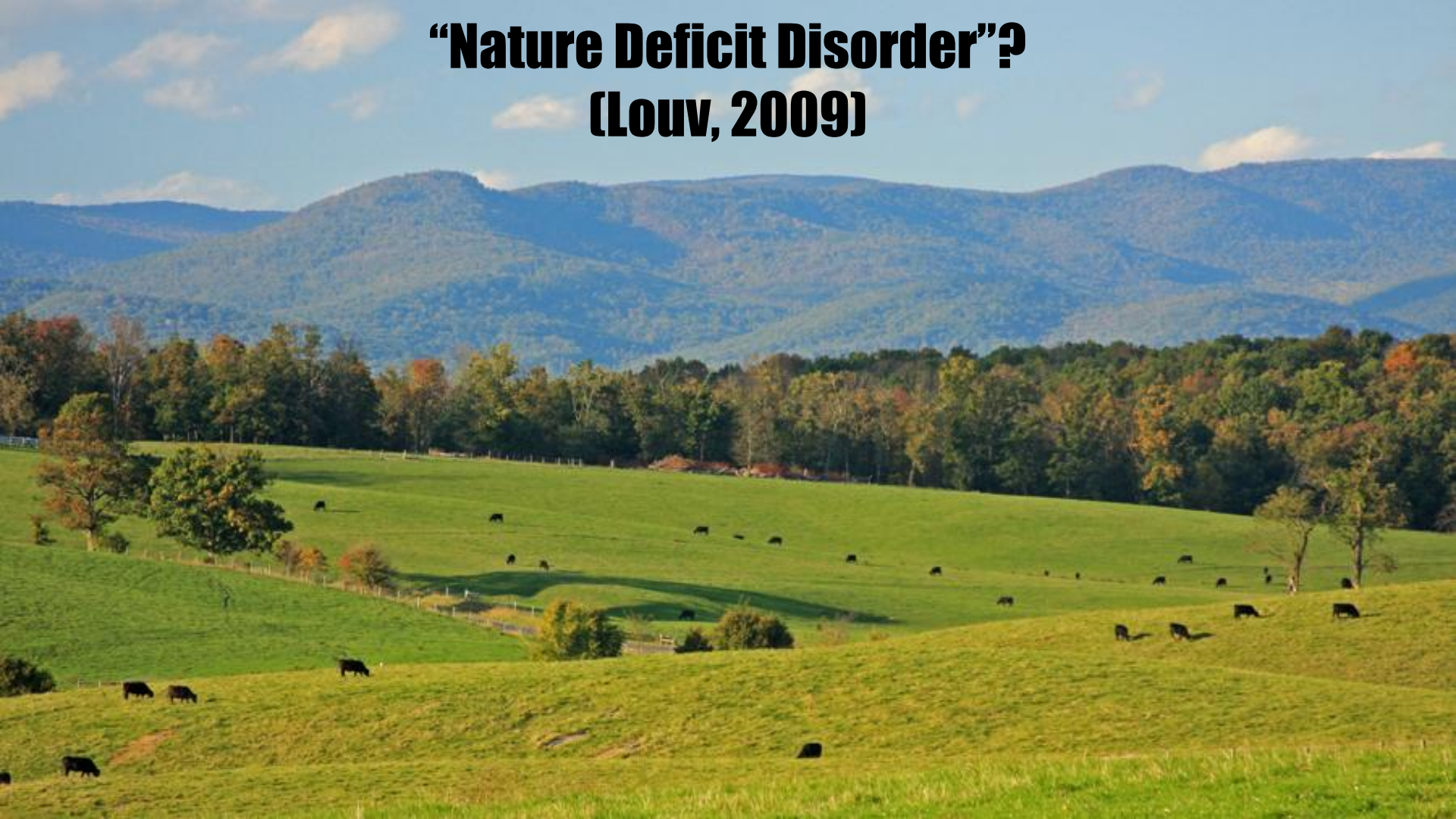
Russell H Kohrs

Geological Society of America Annual Meeting 2015
Baltimore, Maryland

Connecting Access to Nature to Childhood Development
(Strife and Downey, 2009)

- Access to nature:
  - is not just a problem of socio-economics
  - is a provider of numerous cognitive, social, and emotional benefits (Faber Taylor and Kuo, 2006)
  - may lead to better physical health and reduce risks of some problems (Wells, 2000)
  - develops lifelong environmental attitudes and values (Chawla, 2006)
  - leads to better economic success for our nation through better mental health and cognitive functioning (Center for Health, Environment, and Justice, 2001)
- Do kids (teens included) access these benefits?
  - Increasingly not (Louv, 2007)
  - Particularly disparate access due to race and class (Pyle, 2002)

“Nature Deficit Disorder”? (Louv, 2009)



Problem:

- How can I help create meaningful connections between my students and nature?
- Can geoscience education uniquely develop environmental:
  - connection
  - concern
  - cognition

Who Are My Students?

- Rural students
- Wide mix of academic abilities
- Most are not college-bound
- ~50% FRL
  - Lower economic classes
  - Largely caucasian
- Limited academic resources
- Wide range of parental education
- Appalachian and agricultural

Ward, 2013

Can these students access nature best in the classroom?

- Probably not (Falk and Dierking, 2010)
- Geoscience provides the ideal set of tools

Geoscience Place-Based Education (PBE) as a Solution?

- Place-Based Geoscience Education (Semken, 2005)
  - "Situated Learning Theory" (Lave and Wenger, 1990)
  - Ethnogeology (Murray, 1997)
  - Five Principles (Semken, 2005)
    - emphasis on interactions with geosystems
- How has it been used in the past?
  - Indigenous student populations (Navajo, Alaskan, Cree, etc.)
    - cultures with deep ties to the land
    - build Geoscience knowledge from those ties
- But, can it work in reverse with other students?
  - Can we use Geoscience PBE to build ties <u>toward</u> the land/environment in students suffering from NDD?
  - Geosystems - Emphasize nodes of contact between their lives and their local geology

How Do I Use PBE To Teach Geoscience, Connection to Nature, and Values?

By Using the Five Principles of Geoscience PBE
Semken (2005)

1) Focus explicitly on the geological and other characteristics of a place

- Teach rocks in the field with local rocks
- Teach local stratigraphy
- Local geologic history
- Highlight local sites of geological interest
- Take lots of field trips
- Create school rock garden with local specimens

Mole Hill - Volcanic Neck

Columnar Basalt - Blue Ridge, Shenandoah NP

Local Fossils

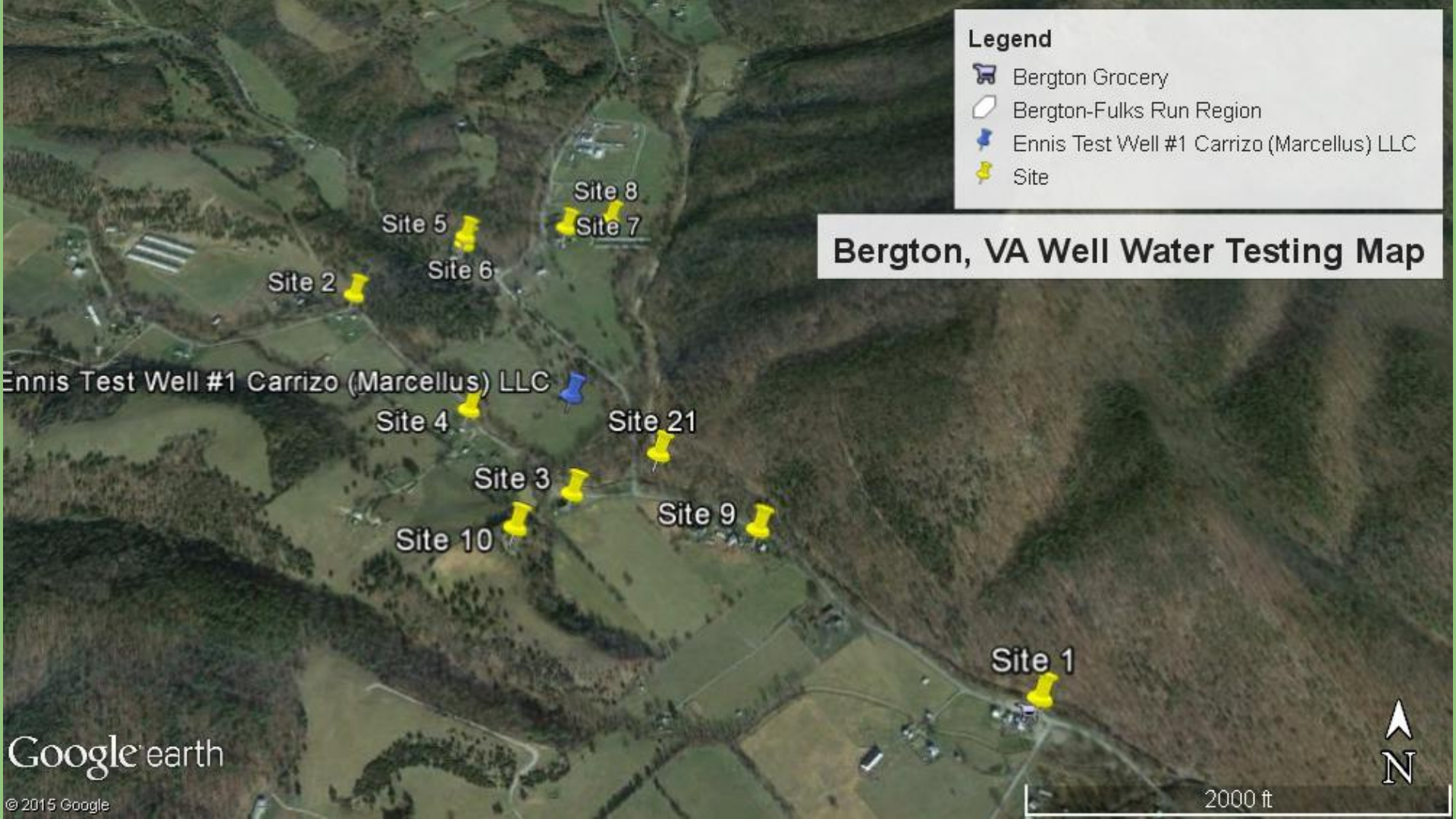
Chimney Rock
Fulks Run, VA

Seneca Rocks, WV

Exploring Local Karst at a cavern near Quicksburg, VA

2) Integrates, or acknowledges, the diverse meanings that a place holds for the community

- Ethnogeology (Murray, 1997)
- Reflections on the Shenandoah River
- Hydraulic Fracturing in Bergton, VA
- Studying local zinc ore and the history of its mining locally


Legend
Bergton Grocery
Bergton-Fulks Run Region
Ennis Test Well #1 Carrizo (Marcellus) LLC
Site
Bergton, VA Well Water Testing Map
Site 8
Site 5
Site 7
Site 6
Site 2
Ennis Test Well #1 Carrizo (Marcellus) LLC
Site 4
Site 21
Site 3
Site 9
Site 10
Site 1
Google earth
© 2015 Google
N
2000 ft

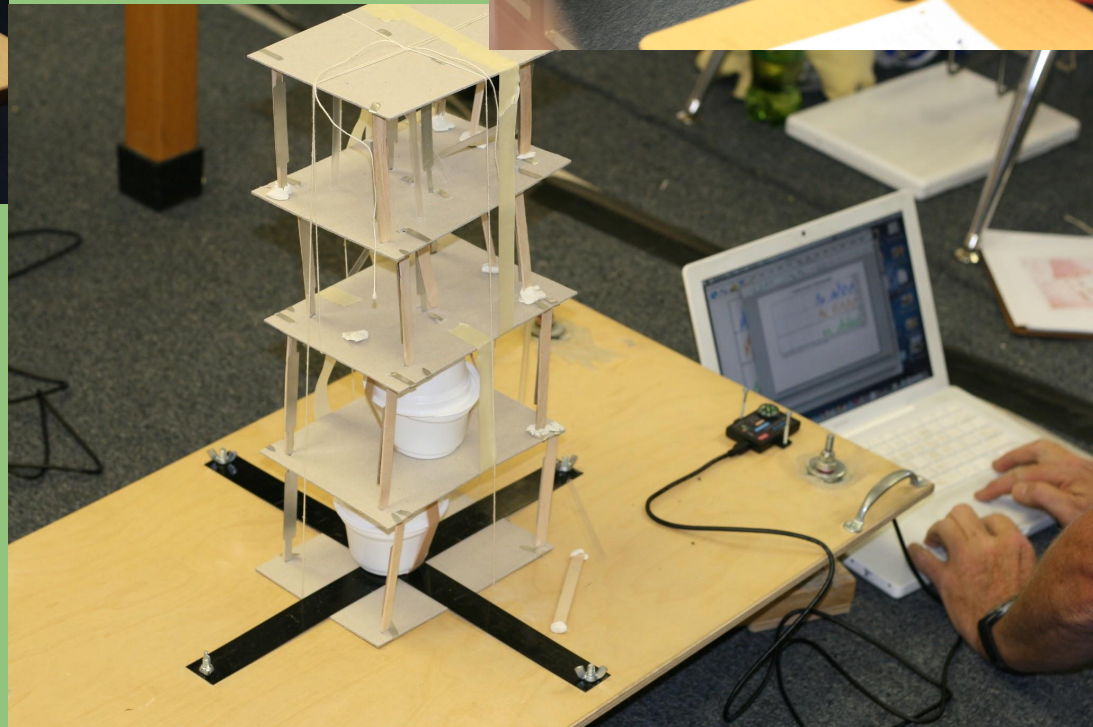
Local Stone Quarries

Bower-Campbell Zinc Mine, Timberville, VA

3) Authentic experiences in that place or in an environment that strongly evokes that place

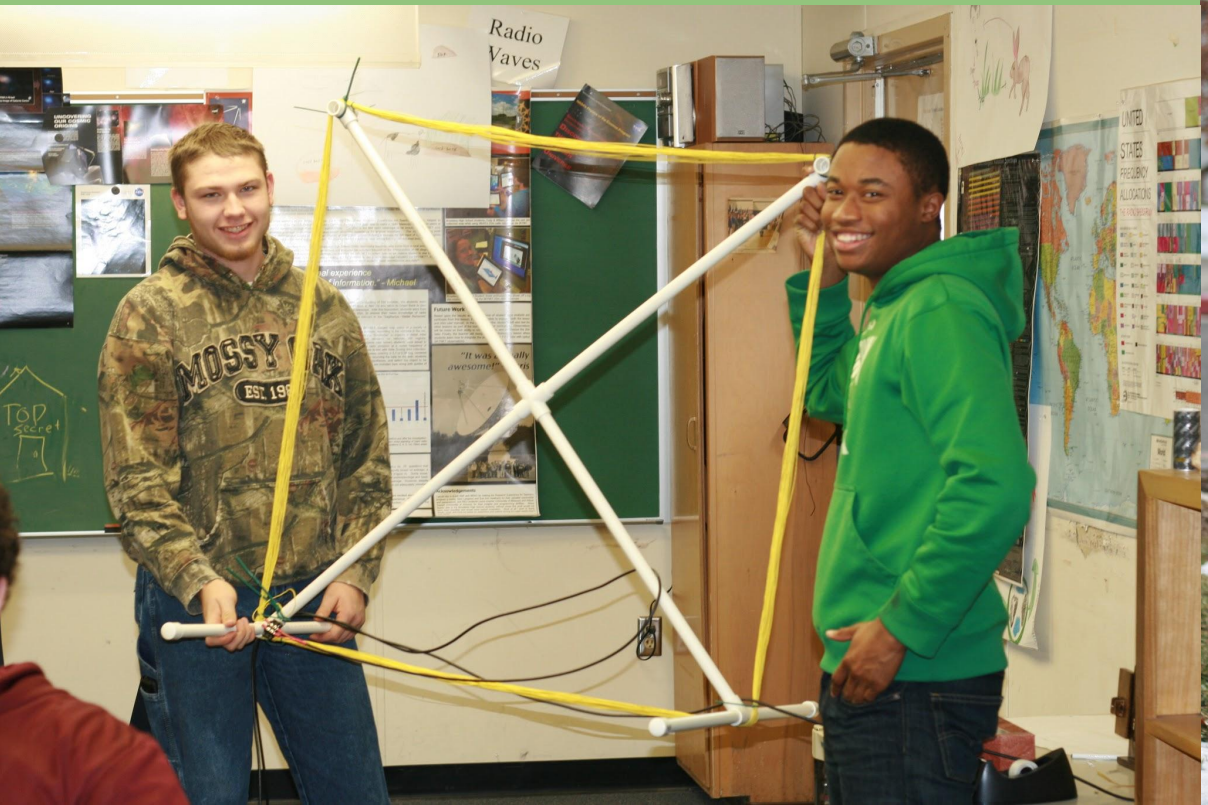
- Stream gauging and flood frequency
- Exploring soils and sediments
- Well water and surface water testing in the community
- 2011 Virginia earthquake - building design

Stream gauging, water testing, and “Waterslide Barbie”



Earthquake-Resistant Structures following the 2011 Virginia earthquake

Exploring atmospheric and exospheric interactions...

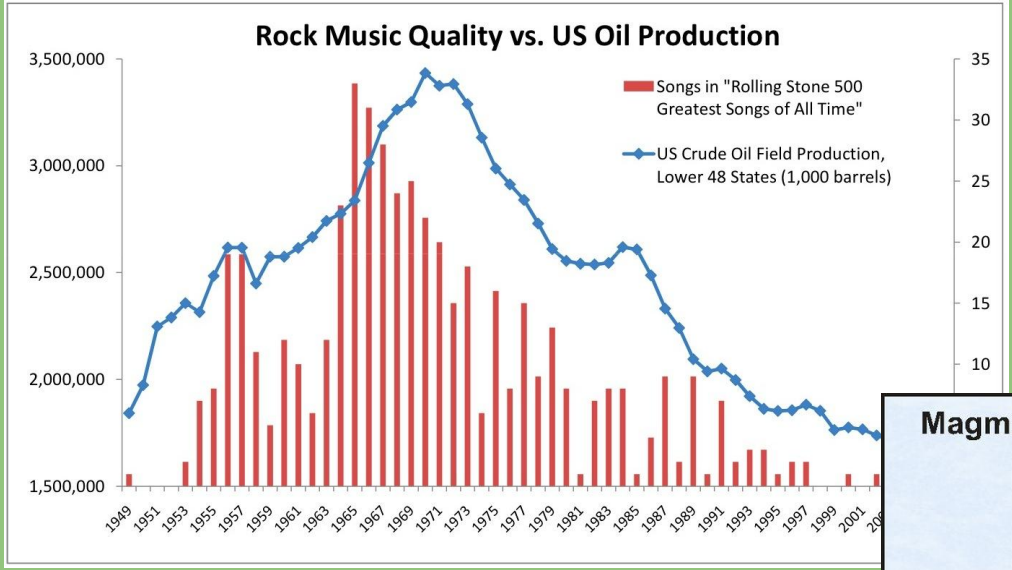


Soil explorations

4) Promotion of ecologically-sustainable living in that place

- Economic Geology
- Climate change and its local effects
- Water and wastewater treatment
- Home energy and water usage
- Energy and agriculture

Wastewater Treatment

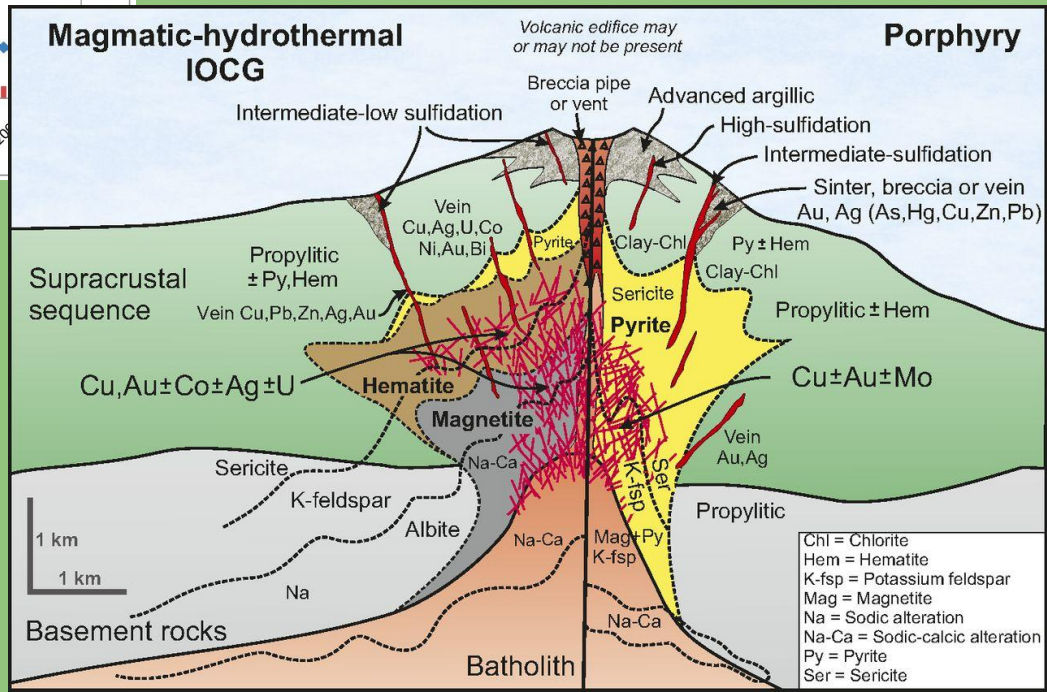


(Lee, 2008)

Lessons in Economic Geology

- Whence came the gasoline in your car?
- Whence came the copper and other metals in your cell phone?

Richards, et al., 2013



Sustainable Farming Using Earth Science Resources

Sinclair Farm CSA - Virginia

- Stormwater reclamation
- Solar Energy
- Systems Interactions

Drinking water as a geological resource

5) Enriching a sense of Place for all

- Deeper learning for the students
- Deeper learning for the instructor
- A collective learning experience

Exploring the universe and our place in it

Future PBE Experiences...Where do I Go From Here?

- Experimental geoarchaeology - limestone masonry foundations, etc.
- Mills and waterwheels
- Local iron furnaces
- Local lime kilns
- Exploring local climatic variation

Summary - and Success!

- High school Geoscience should:
  - provide experiences in nature
  - explore geoscience systems and their nodes of connection in nature
  - connect students to geosystems
  - engage ethnogeological experiences - wisdom of elders in community
  - be both STEM and liberal arts in focus
  - foster a connection with nature
  - lead to the development of an environmental ethic
- My Successes - qualitative and anecdotal, but still useful
  - a couple of college geology majors, sure…but,
  - tangibly more engaged students
  - tangibly more aware students
  - fewer disciplinary issues in class

How Shall We Make Geoscience PBE Work in the Public School Setting?

- Identify and mitigate obstacles
- Administrative support
- Plan for implementation of standards
- Connect to community knowledge
- Start where the students are…
- Field trips - obtain a Class B CDL
- Technology as a tool
- Get dirty
- Encourage the experience
- Authentic assessments

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