A NEW NATIONAL SERIES OF "TEACHER-FRIENDLY GUIDES" TO REGIONAL EARTH SCIENCE: CONTENT FOR PLACE-BASED APPROACHES TO EARTH SYSTEM SCIENCE EDUCATION

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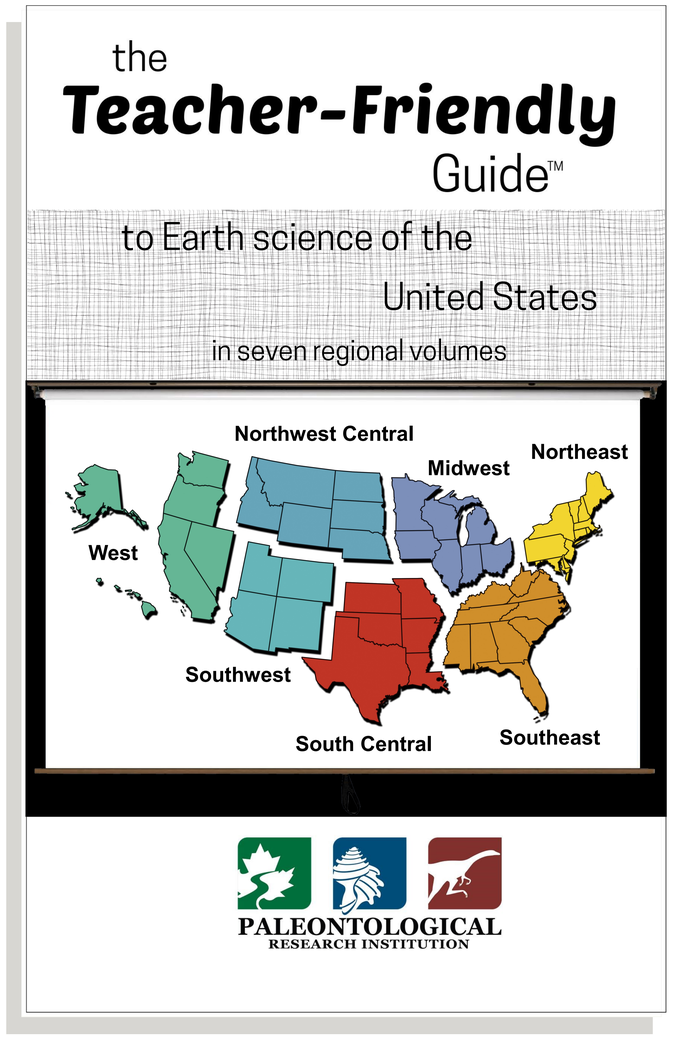
A deep understanding of why a place looks the way it does requires understanding of core ideas from several disciplines, application of cross-cutting concepts (such as scale, models, energy and matter, stability and change), and use of a variety of scientific and engineering practices. Thus place-based Earth system science is an outstanding case for full application of the three dimensions of the Next Generation Science Standards. In principle, **much of an Earth science curriculum could be taught through the lens of repeated reference to familiar local sites and sites approximately a day's drive from school.**

A stumbling block to such an approach is lack of teacher familiarity with the real-world Earth science around them, particularly for teachers teaching out-of-field and those with little previous fieldwork experience. **To meet this need, we have constructed a complementary program of "teacher-friendly" guides to regional Earth science (teacherfriendlyguide.org) and uses of "virtual fieldwork" (virtualfieldwork.org).**

The *Teacher-Friendly Guides* to regional Earth science consists of a set of seven *Guides* together covering all 50 states. Each *Guide* begins with cross-cutting Big Ideas, followed by a chapter on the geological history of the region: this set of concepts and major historical events together can explain many of the features of any given region, such as distribution of landforms, rock types, fossils, mineral resources, Earth hazards, and so on, each of which is represented by a chapter.



Big Ideas & NGSS: Each *Guide* begins with a chapter on Big Ideas in Earth system science and ends with an appendix on the Next Generation Science Standards.

The first chapter of each *Guide* is about geologic history, because that history explains the geographic distribution of many other Earth science features within the region.

Resource lists: Every chapter includes a list of resources, both general and specific to the area of the *Guide*. Each *Guide* also contains a comprehensive glossary at the end, and a list of general resources such as books and maps that cover the geology of the US and the geographic area of the *Guide*.

Chapters include:

- Geologic History
- Rocks
- Fossils
- Topography
- Mineral Resources
- Glaciers
- Energy
- Soils
- Climate
- Earth Hazards

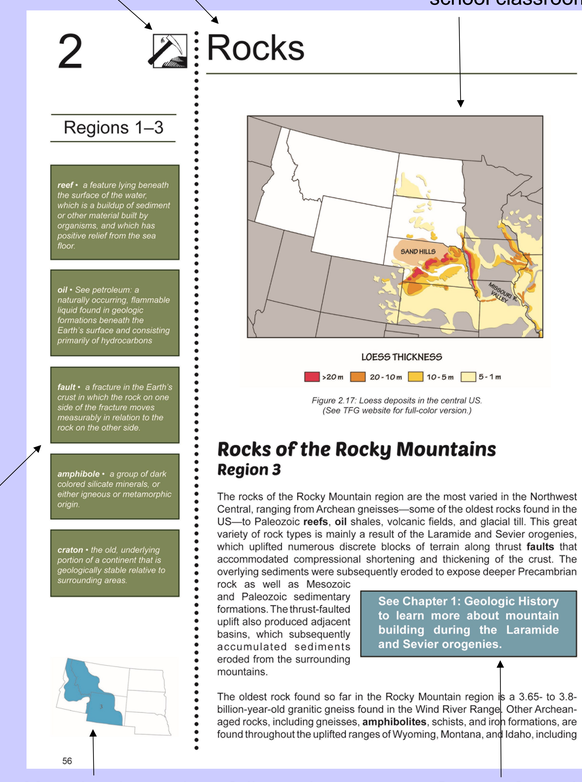
Drawing by Christi Sobeli.

Guides have dozens of original pen-and-ink fossil illustrations to illustrate important taxa in each region.

***Teacher-Friendly Guides* are designed to make it easy to find information and illustrations as teachers need them.**

Clear chapter page icons and headings

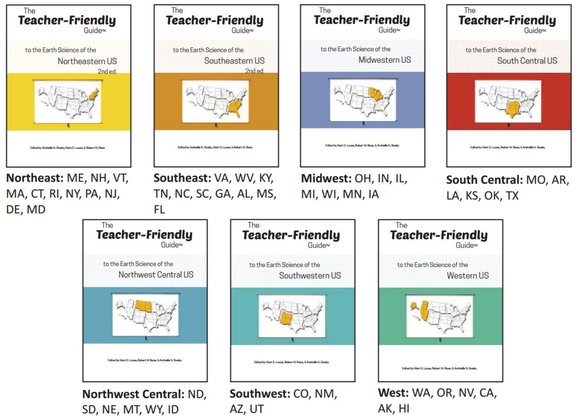
Tailor-made graphics appropriate for secondary school classrooms



Definitions of geological terms as they appear, & roll-over definitions on the website version

Map showing region of discussion

Cross-referencing throughout the *Guide*



Each volume is available in three convenient forms at

teacherfriendlyguide.org:

- as hyperlinked webpages in color (free)
- as pdf downloads in color (free)
- as black-and-white printed books (for purchase)

Real and Virtual Fieldwork Experiences

Real fieldwork engages learners in applying concepts to understand real places; *virtual* fieldwork allows multiple revisits to a site, or the opportunity to experience places that cannot otherwise be visited firsthand (whether near the classroom or on Mars). Through the *ReaL Earth Inquiry* project, PRI has pioneered the use of virtual fieldwork as a bridge from the classroom to the outdoors, working with teachers to create virtual fieldwork experiences for their own classes.

Each *Guide* ends with a chapter on fieldwork, covering both basic concepts on doing fieldwork and ways to bring field exploration back to the classroom in the form of "virtual techniques" such as zoomable panoramic images, maps, and data.

To learn more about virtual fieldwork, visit

virtualfieldwork.org.

Workshop, Nov. 2017, Dalton Park, Baraboo Quartzite, near Rock Springs, Wisconsin.

Guides contain photographs of selected localities & specimens.

Outcrop of the Wind River Formation, Fremont County, Wyoming.

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