America's Geoheritage: Identifying, Developing, and Preserving America's Natural Legacy

Distinguished Speaker Webinar Series, Fall 2020



A Survey of Geoheritage Initiatives in the U.S.

Tuesday, September 15; 11 am ET/8 am PT

"Geoheritage in the United States" — **Tom Casadevall (USGS)** (left)

"America's Geologic Heritage: An Invitation to Leadership" — **Tim Connors (NPS)** (center)

"Geoheritage and UNESCO Global Geoparks: International Cooperation and Initiatives" — **Asier Hilario (IUGS Geoheritage Commission)** (right)

Register here: https://nasem.zoom.us/webinar/register/WN_1XqPJNGaSUunq1D7VXm0Lg

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America's GeoHeritage Initiative, 2020-2021

A Survey of GeoHeritage Initiatives in the U.S.

AMERICA'S GEOLOGIC HERITAGE:
An Invitation to Leadership
revisiting the 2015 joint National Park Service-American Geosciences Institute Publication

Tim Connors

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U.S. National Park Service

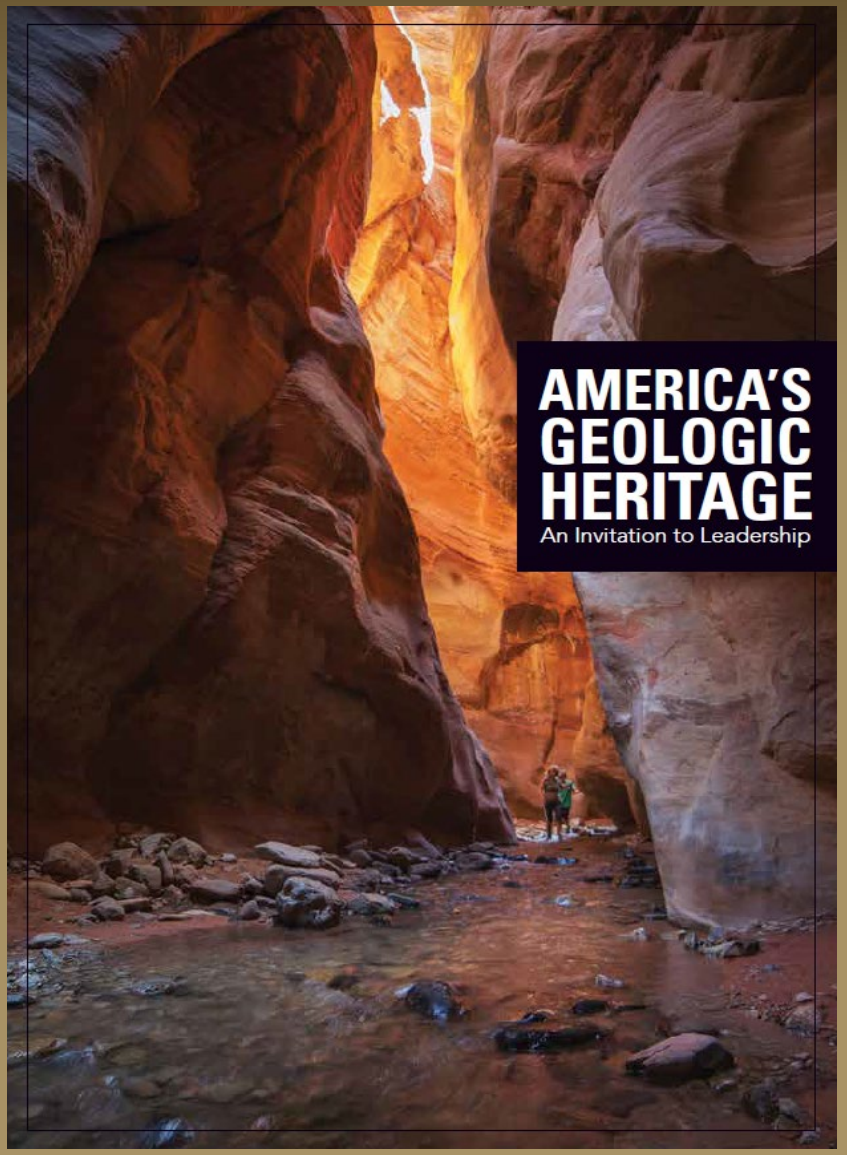
Natural Resource Stewardship and Science

Geologic Resources Division

12795 West Alameda Parkway, Denver, CO 80225

This presentation will focus on summarizing a joint effort of the US National Park Service (Geologic Resources Division) and American Geosciences Institute published in 2015 that presented "**Five Big Ideas**" on America's geologic heritage, with definitions of:

- **geologic heritage**
- **geodiversity**
- **geoconservation**



Visitors exploring Zion Narrows in Zion National Park, Utah. Copyrighted photo used courtesy of Ian Parker, Evanescent Light Photography, 2013

Bio Sketch

Timothy B. Connors is a Geologist with the U.S. National Park Service, Natural Resource Science and Stewardship Directorate, Geologic Resources Division in Lakewood, Colorado and has been with them since 1998.

His main duties have involved developing digital GIS-based geologic maps of US National Park areas, as well as supporting databases on the unique geologic features, issues and processes of these park areas. He is very active in promoting the concept of Geologic Heritage Conservation and promoting areas rich in geologic features. He has worked in park areas in Alaska, Hawaii, Virgin Islands, and the whole lower 48 states, allowing him to become quite familiar with numerous geologic terranes, processes and features of this planet.

He served on the Board of Directors for "The Friends of Dinosaur Ridge" in Morrison, Colorado, a local non-profit that supports the Morrison-Golden Fossil Areas National Natural Landmark from 1999-2014. He has taught geology courses at the University of Colorado (Denver) and Red Rocks Community College (Lakewood, Colorado).

He earned both Bachelor of Science (1991) and Master of Science (1996) degrees in Geology from the University of Toledo (Ohio).

National Park Service

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The Geologic Resources Division assists the National Park Service and partners in the servicewide coordination, support, and guidance necessary to understand and implement science-informed stewardship of geologic and associated park resources; reduce impacts from energy, mineral, and other development; and protect visitor values.

P.O. Box 25287, Denver, CO 80225 | www.nps.gov

American Geosciences Institute

AGI was founded in 1948, under a directive of the National Academy of Sciences, as a network of associations representing geoscientists with a diverse array of skills and knowledge of our planet. The Institute provides information services to geoscientists, serves as a voice of shared interests in our profession, plays a major role in strengthening geoscience education, and strives to increase public awareness of the vital role the geosciences play in society's use of resources, resilience to natural hazards, and the health of the environment. With a network of 50 member societies, AGI represents more than a quarter-million geoscientists.

4220 King Street, Alexandria, VA 22302-1502 | www.americangeosciences.org

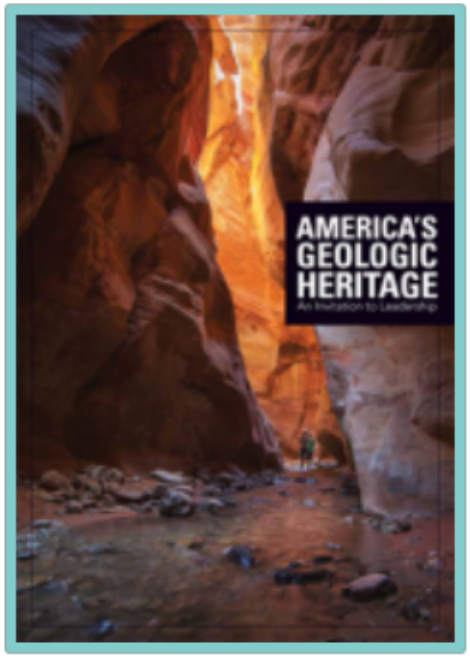
Credits and Recognitions

- NPS
  - Jim Wood
  - Jason Kenworthy
  - Lynn Moore (Geoscientist-in-the-Parks (GIP) for 2013 workshop)
  - **Numerous** other NPS Geologic Resources Division staff who reviewed the publication and partook of 2013 workshop
- AGI
  - Geoff Camphire
- Publication design by Angela Terry Design; won AWARD
  - *Angela Terry won an American Graphic Design Award from the Design Magazine Graphic Design USA.*
  - *The design of the book underscores the great beauty and irreplaceable value of our geologic heritage.*

Angela Terry Design won an award for design excellence!

"America's Geologic Heritage: An Invitation to Leadership" Recognized for Design Excellence

Submitted by mmoses on Fri, 2016-09-23 12:35



The book, "America's Geologic Heritage: An Invitation to Leadership" published by the National Park Service and the American Geosciences Institute has won an award. Book designer, Angela Terry, just won an American Graphic Design Award from the Design Magazine Graphic Design USA. The design of the book underscores the great beauty and irreplaceable value of our geologic heritage. The recognition is especially timely as Earth Science Week prepares to celebrate the 2016 theme of "Our Shared Geoheritage" in October. The book is available as a free PDF download.

Tags: geotimes, earth science week, geologic heritage, national parks

https://www.americangeosciences.org/geotimes/americas-geologic-heritage-invitation-leadership-recognized-design-excellence

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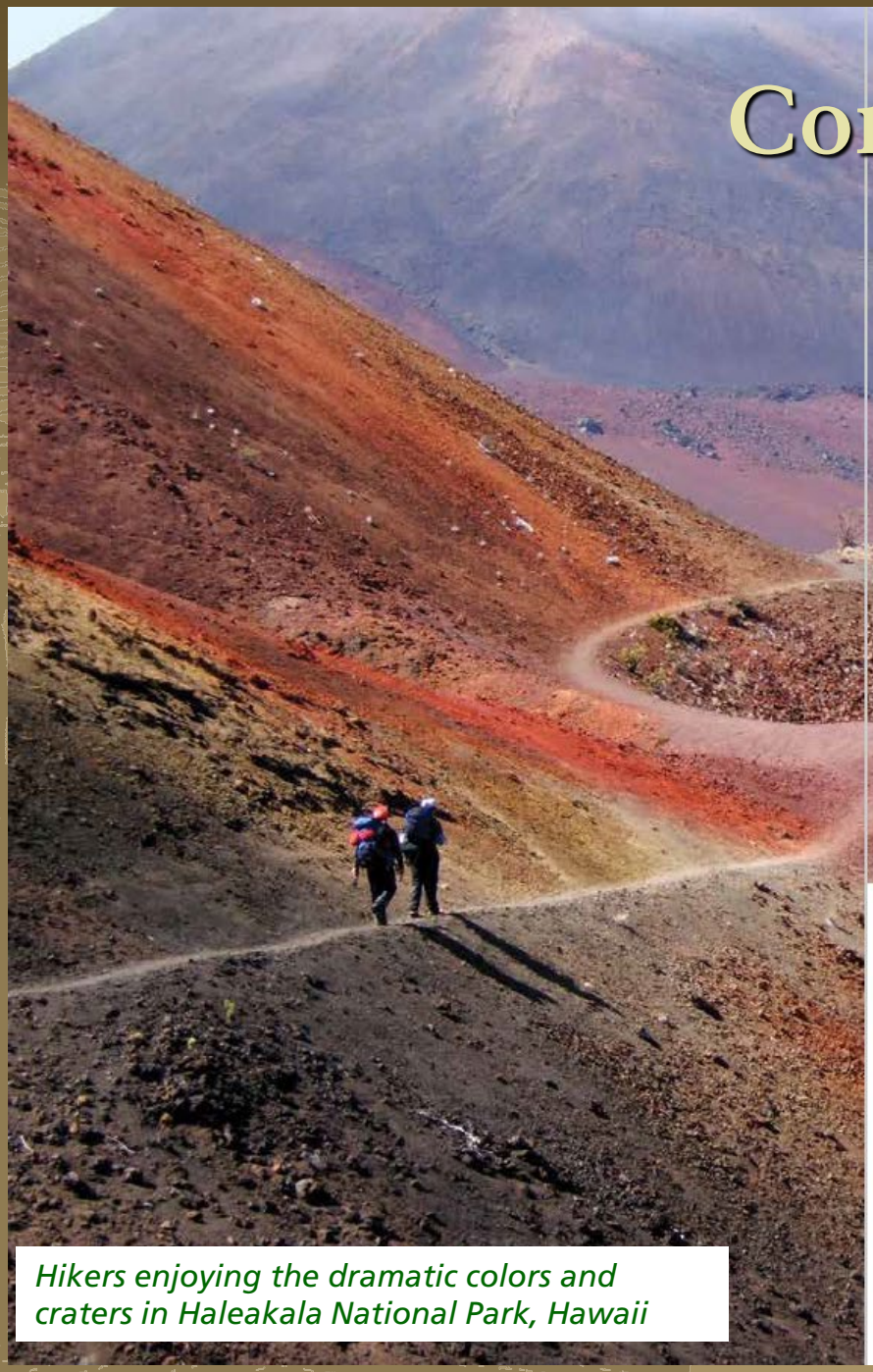

Hikers enjoying the dramatic colors and craters in Haleakala National Park, Hawaii

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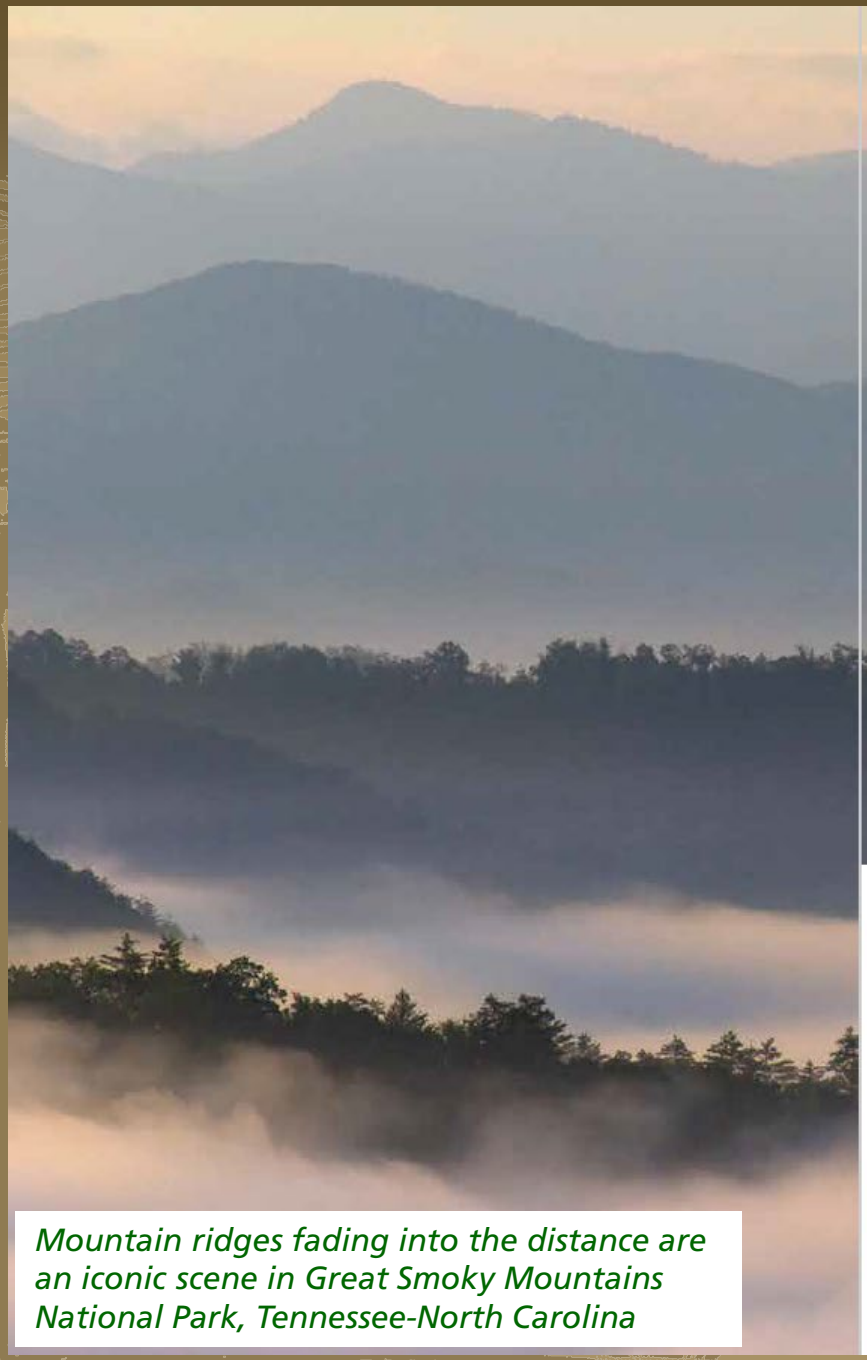

Mountain ridges fading into the distance are an iconic scene in Great Smoky Mountains National Park, Tennessee-North Carolina

"Here is your country.... Cherish these natural wonders, cherish the natural resources, cherish the history and romance as a sacred heritage, for your children and your children's children."

President Theodore Roosevelt
1903

CHAPTER ONE

Discovering Our Nation's Rich Geologic Heritage

America's geologic heritage arises from the features, landforms, and landscapes characteristic of the United States, which are conserved in consideration of the full range of values that society places on them, so that their lessons and beauty will remain as a legacy for future generations.

“Geoheritage” defined aka. Geologic Heritage

GEOLOGIC HERITAGE BUZZWORD

Geoheritage is simply an abbreviated form of the term geologic heritage. Many international organizations use it commonly, and its use in the United States is increasing. (Note: Because the prefix “geo” is also used to denote geographical or sustainability-related topics in the United States, this booklet uses geologic heritage throughout.)

AMERICA'S GEOLOGIC HERITAGE

Five Big Ideas of America's geologic heritage are explored in this publication:

- America's geologic landscape is an integral part of our history and cultural identity, and we have a proud tradition of exploring and preserving our geologic heritage;
- America's geologic heritage, as shaped by geologic processes over billions of years, is diverse and extensive;
- America's geologic heritage holds abundant values—aesthetic, artistic, cultural, ecological, economic, educational, recreational, and scientific—for all Americans;
- America's geologic heritage benefits from established conservation methods developed around the world and within the United States; and
- America's geologic heritage engages many communities, and your involvement will ensure its conservation for future generations.

Five Big Ideas…

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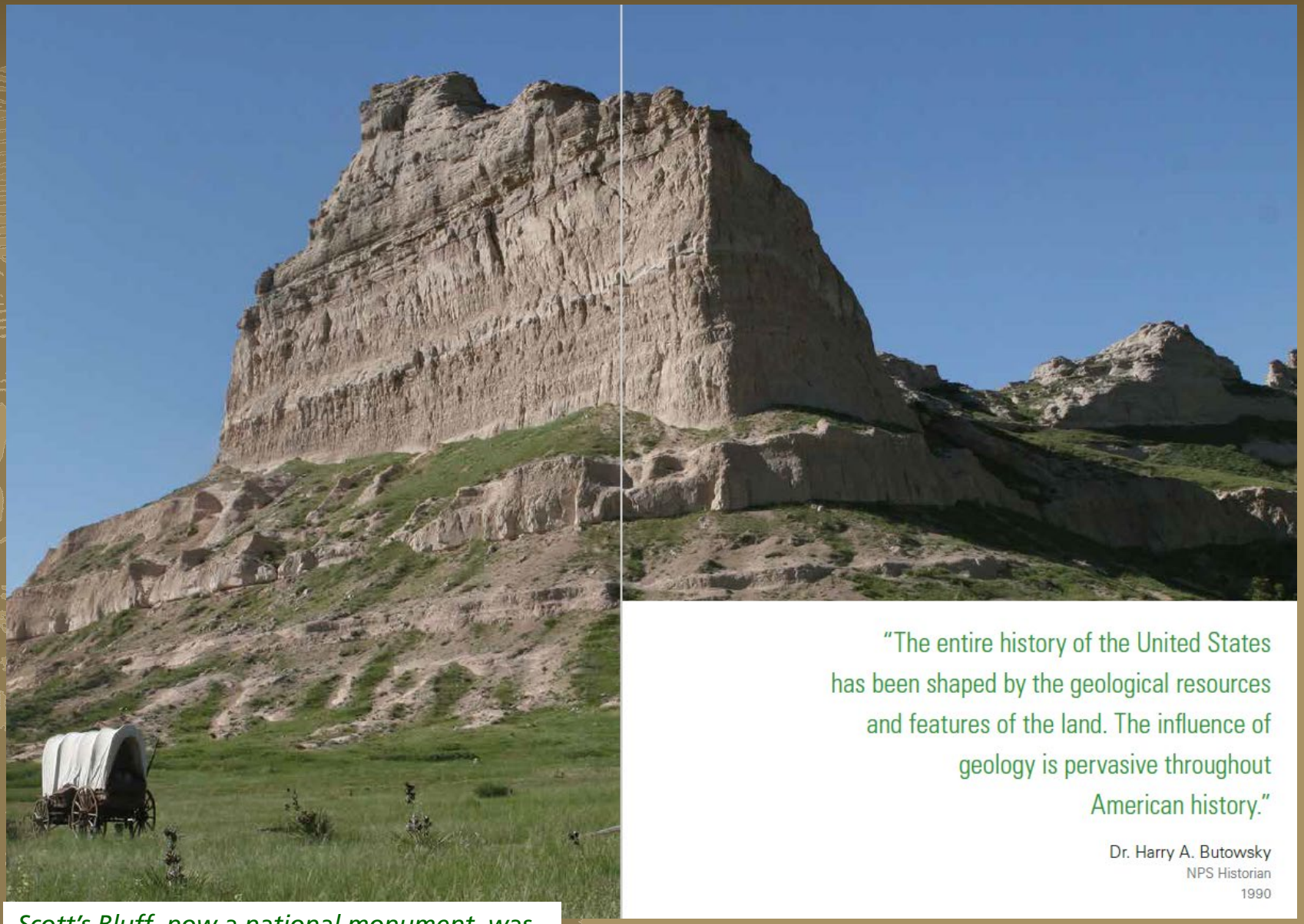


"The entire history of the United States has been shaped by the geological resources and features of the land. The influence of geology is pervasive throughout American history."

Dr. Harry A. Butowsky
NPS Historian
1990

Scott's Bluff, now a national monument, was an important waypoint for travelers on the Oregon and Mormon trails in the 1800s

CHAPTER TWO

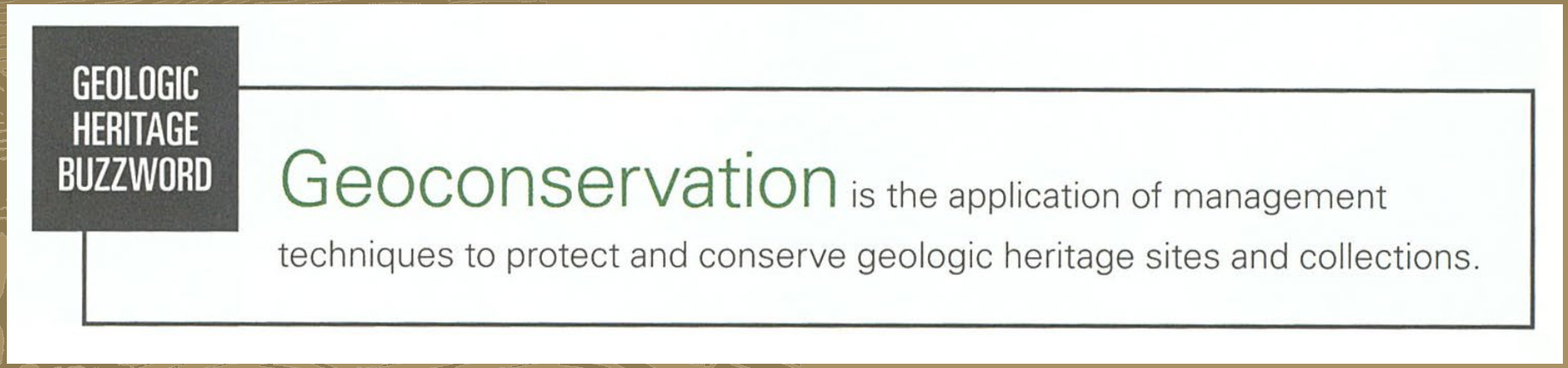
Building an American Geologic Conservation Legacy

Human history is connected to local geologic landscapes and resources, and geologic heritage is an integral part of cultural identities around the world. This chapter introduces those connections in America and provides a brief history of how Americans explored their country's geologic landscape and began to preserve portions of America's geologic heritage for future generations.

Chapter 2
Building an American Geologic Conservation Legacy

- Creation Stories and Connections to the Landscape
- The United States reaches Westward
- A new era of geological exploration
- Calls for preservation of America's Geologic Heritage
- Guarding a vulnerable heritage
- Additional protections for America's natural resources

Geoconservation defined



1969: Florissant Fossil Beds National Monument (Colorado)

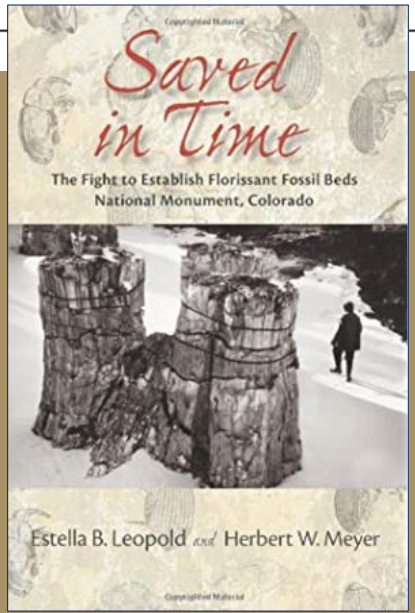
- Local grassroots effort to stop developers from building houses atop world-class fossil site; *"Defenders of Florissant"*
- Landmark legal case played out in Federal court in Denver, Colorado; environmental law born
- ***Saved in Time: The Fight to Establish Florissant Fossil Beds National Monument, Colorado*** by Estella Leopold and Herbert Meyer University of New Mexico Press, 2012.

CASE STUDY

Fossilized wasp, Florissant Fossil Beds National Monument

Defenders of Florissant

Preserving geologic heritage does not always start with governmental protection. Grassroots efforts from concerned citizens can play critical roles. The fight to save Colorado's Florissant Fossil Beds from real estate development is one such example that culminated in a landmark legal case for the geologic heritage movement in the United States. In response to a plan to build houses atop one of the world's most important fossil sites, a grassroots coalition—the Defenders of Florissant—secured a restraining order to prevent the housing development. Argued in the Federal District Court in Denver, the case ultimately was won by the Defenders of Florissant. Florissant Fossil Beds National Monument was subsequently established in 1969 and remains among the richest and most diverse fossil sites on the planet. For more on this story, read *Saved in Time: The Fight to Establish Florissant Fossil Beds National Monument, Colorado* by Estella Leopold and Herbert Meyer, University of New Mexico Press, 2012.



CHAPTER THREE

Understanding Our Country's Geologic Heritage

The rich diversity of geologic heritage features in the United States results from a wide variety of geologic processes occurring over billions of years. This chapter discusses the role that the science of geology plays in understanding and describing the features and processes that comprise our nation's geologic heritage. It is an introduction to some of the regional-scale features and processes that may be found near you.

Chapter 3
Understanding our Country's Geologic Heritage

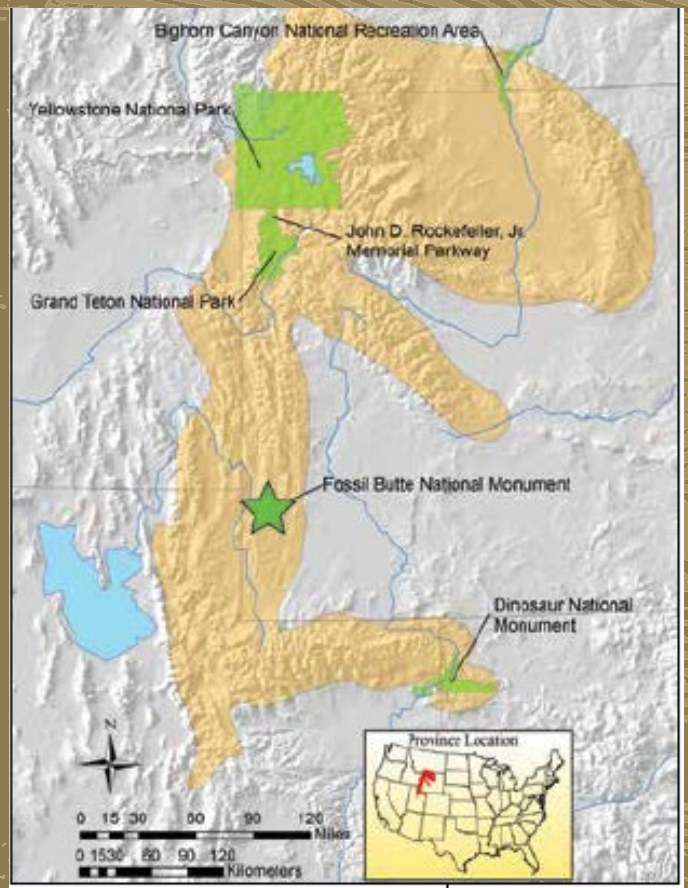
- Science informs Geologic Heritage
- America's Geologic Diversity yields a rich heritage
- Plate Tectonics Built the Foundation of America
- Geologic Features

Geodiversity defined

GEOLOGIC HERITAGE BUZZWORD

Geodiversity refers to the existence of a wide variety of different geologic forms and processes within a specific geographic region. Geodiversity is similar to biodiversity (the variety of life-forms in a region). Maintaining a wide diversity of geologic habitats and systems is vital to life on Earth.

Geologic Heritage Resources come in all sizes



The amazing diversity of America's geologic features occurs at many scales. Mineral specimens, sand dunes, beaches, lava flows, karst landscapes, fossils, faults, and many more features contribute to our geodiversity. Protecting examples, from regional-scale to the microscopic, is important to the future of America's geologic heritage. An example of this can be seen at Fossil Butte National Monument in Wyoming, where individual fossils such as the 52 million-year-old *Knightia eocaena* fish include microscopic details that aid in their identification and contribute to their scientific significance and beauty. Different fossil specimens found together at an outcrop of rocks provide information about the ancient community of plants and other animals preserved there. The outcrops of Fossil Butte National Monument are found on the prominent landforms Cundick Ridge and Fossil Butte within the park. These landforms are part of the larger landscape—a high desert basin—amid the fold and thrust belts of the middle Rocky Mountain physiographic province.

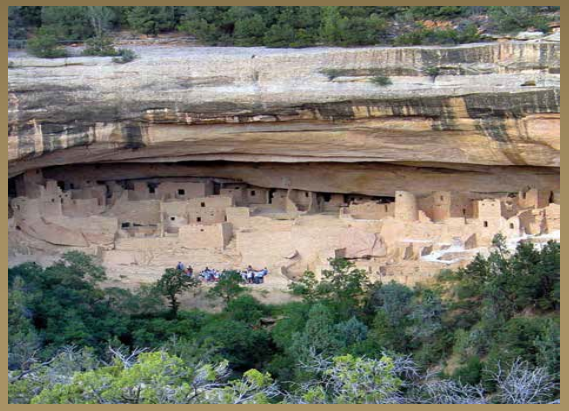
CHAPTER FOUR

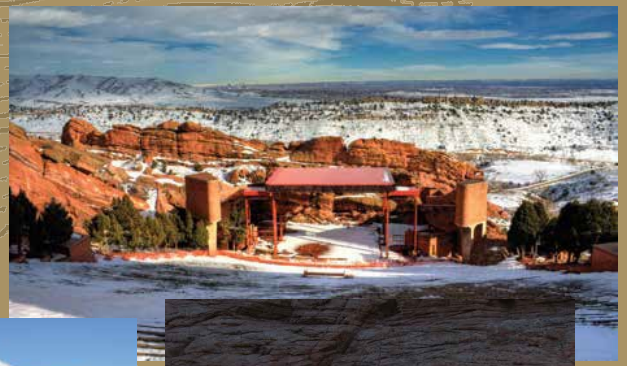
Valuing America's Geologic Heritage in Many Ways

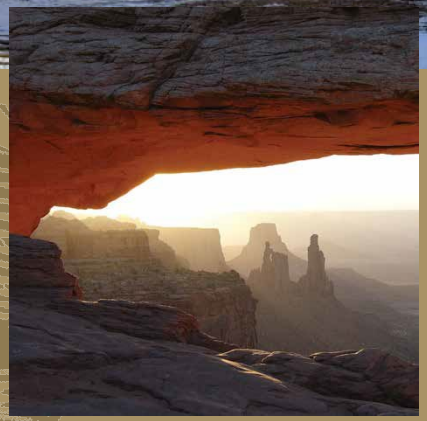
In previous chapters, we have explored the scientific foundation for America's geodiversity and its geologic heritage, and summarized some of the early attempts to recognize, understand, and conserve our geologic heritage. Next, we explore the values that our geologic heritage holds, regardless of social, ethnic, religious, economic, or educational background. Americans have recognized a portion of our shared geologic heritage by formally designating national park units at significant sites such as Badlands National Park, Acadia National Park, Big Bend National Park, and Santa Monica Mountains National Recreation Area. We celebrate and safeguard thousands of other undesignated geologic features and locations in many ways. We choose to conserve and protect examples of our geologic heritage for ourselves and future generations, because they are meaningful to us in specific ways.

Chapter 4
Valuing America's Geologic Heritage in Many Ways

- Aesthetic
- Artistic
- Cultural
- Ecological
- Economic
- Educational
- Recreational
- Scientific







CHAPTER FIVE

Doing the Important Work of Geologic Conservation

America's geologic heritage is conserved for the full range of values that society places on them, so that their lessons and beauty will remain as a legacy for future generations. This document has shown how billions of years of Earth history are responsible for the diverse geologic features and processes found in America. We have explored the tradition of geologic heritage conservation in the United States and outlined eight key values associated with geologic heritage areas. This chapter provides examples of geologic heritage conservation methods and describes some of the practices of international programs as well as ongoing conservation efforts in the United States.

Chapter 5
Doing the Important Work of Geologic Conservation

- Geologic Heritage Conservation Methods
  - Laws and Policies
  - Geologic Monograph
  - Determination of site significance
  - Gap analysis
  - National and International Registries
  - Site Management
  - Periodic Condition Assessments
  - Vulnerability Index
  - Resource Protection
  - Documenting Damaged and Threatened sites
  - Education and Outreach

The American Approach

- Designated state or federal lands
  - USFS: National Forest Service
  - BLM: Bureau of Land Management
  - NNL: National Natural Landmarks
  - NPS: National Park System
- Undesignated geologic heritage sites
  - Building stones
  - Community landmarks
  - Geologic points of interest (trackways, roadcuts, quarries)
  - Highpoints and peaks
  - Scenic overlooks

CHAPTER SIX

Coming Together to Protect Our Geologic Heritage

America has a long history of conservation and a rich diversity of geologic resources. The nation enjoys and values its geologic heritage, and has the tools and methods necessary for geoconservation. Next, we turn our attention to an essential element in any conservation effort—participation.

Chapter 6
Coming Together to Protect our Geologic Heritage

- Geologic Heritage Communities
  - Artists
  - Avocational organizations
  - Business groups and associations
  - Educators
  - Elected officials
  - Historic preservation community
  - Land managers
  - Museum professionals
  - Scientists

World Heritage Sites (United States)

GEOLOGIC HERITAGE

Hawai'i Volcanoes National Park contains two of the most active and accessible volcanoes in the world.

World Heritage Sites

UNESCO World Heritage sites are places that have been deemed to hold universal human value. There are 1,007 of these cultural and natural sites in 161 countries worldwide, and all are protected by international law. The United States hosts 22 World Heritage sites, 16 of which can be considered geologically significant:

- Carlsbad Caverns National Park, New Mexico (1995)
- Chaco Culture National Historical Park, New Mexico (1987)
- Everglades National Park, Florida (1979)
- Grand Canyon National Park, Arizona (1979)
- Great Smoky Mountains National Park, Tennessee and North Carolina (1983)
- Hawai'i Volcanoes National Park, Hawaii (1987)
- Kluane / Wrangell-St. Elias / Glacier Bay / Tatshenshini-Alsek, Yukon Territory and British Columbia (Canada) and Alaska (United States) (1979)
- Mammoth Cave National Park, Kentucky (1981)
- Mesa Verde National Park, Colorado (1978)
- Monumental Earthworks of Poverty Point, Louisiana (2014)
- Olympic National Park, Washington (1981)
- Papahānaumokuākea, Hawaii (2010)
- Redwood National and State Parks, California (1980)
- Waterton Glacier International Peace Park, Montana and Alberta, Canada (1995)
- Yellowstone National Park, Idaho, Montana, and Wyoming (1978)
- Yosemite National Park, California (1984)

To see the current official World Heritage list for all sites, visit http://whc.unesco.org/en/list.

U.S. World Heritage Sites (24)

Cultural (11)

- Cahokia Mounds State Historic Site (1982)
- Chaco Culture (1987)
- Independence Hall (1979)
- La Fortaleza and San Juan National Historic Site in Puerto Rico (1983)
- Mesa Verde National Park (1978)
- Monticello and the University of Virginia in Charlottesville (1987)
- Monumental Earthworks of Poverty Point (2014)
- San Antonio Missions (2015)
- Statue of Liberty (1984)
- Taos Pueblo (1992)
- The 20th-Century Architecture of Frank Lloyd Wright (2019)

Natural (12)

- Carlsbad Caverns National Park (1995)
- Everglades National Park (1979)
- Grand Canyon National Park (1979)
- Great Smoky Mountains National Park (1983)
- Hawaii Volcanoes National Park (1987)
- Kluane / Wrangell-St. Elias / Glacier Bay / Tatshenshini-Alsek (1979,1992, 1994)
- Mammoth Cave National Park (1981)
- Olympic National Park (1981)
- Redwood National and State Parks (1980)
- Waterton Glacier International Peace Park (1995)
- Yellowstone National Park (1978)
- Yosemite National Park (1984)

Mixed (1)

- Papahānaumokuākea (2010)

http://whc.unesco.org/en/statesparties/us

Where to find the publication (1)

https://www.earthsciweek.org/content/our-shared-geoheritage

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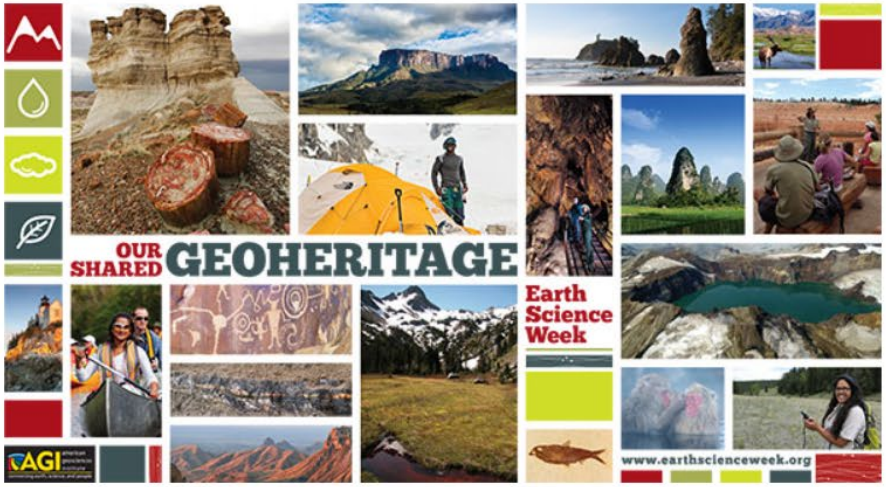
Our Shared Geoheritage

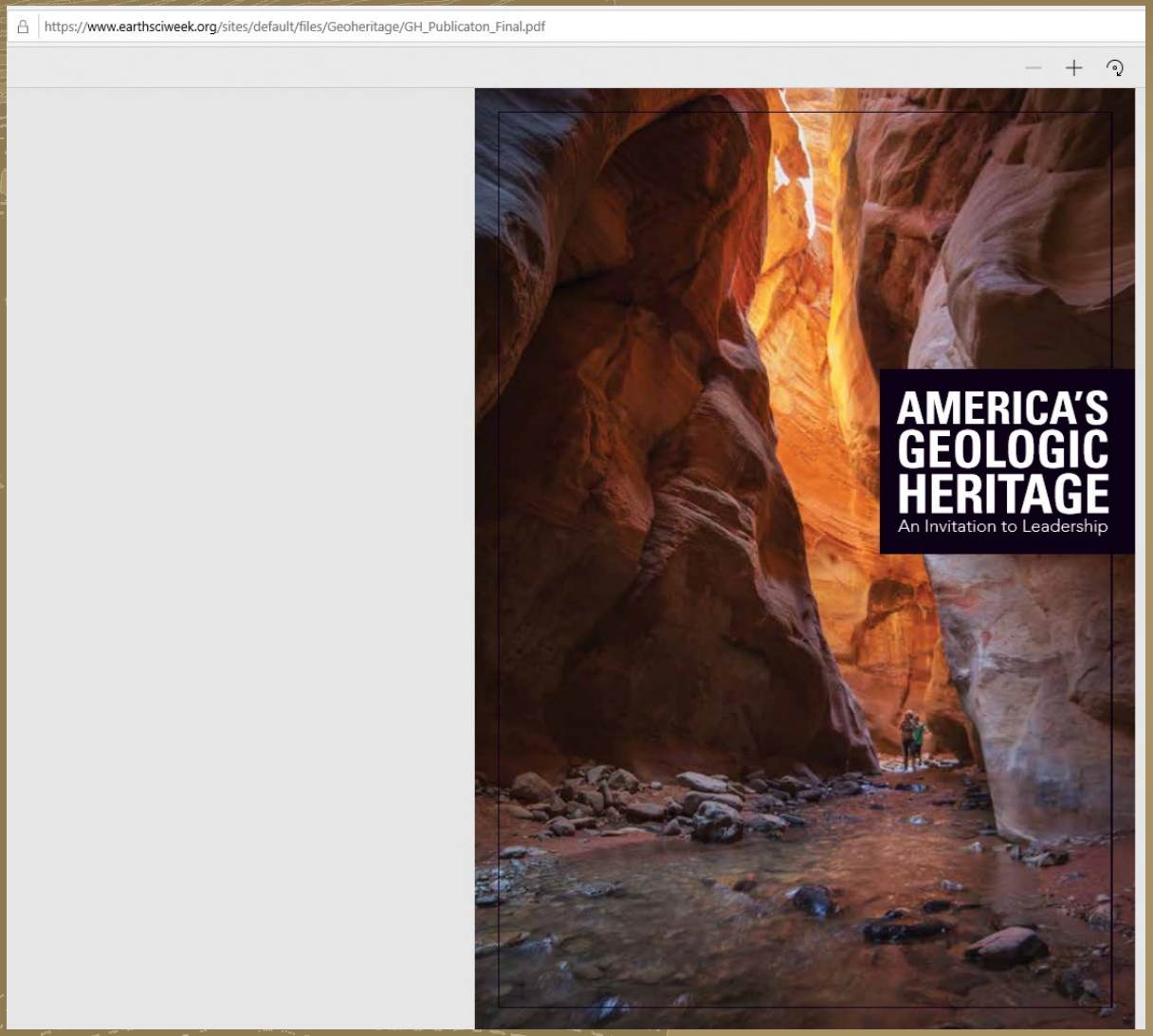
Geoheritage provides an excellent way to teach and learn about geoscience. Check out these education resources and opportunities to find out more about geoheritage.

- America's Geologic Heritage: An Invitation to Leadership by AGI/NPS
- "Geoheritage: Preserving Earth's Legacy," EARTH Magazine
- "One Shared Place" Video Contest
- Our Shared Geoheritage 2016-2017 School-Year Activity Calendar
- Earth Science Week 2016 Theme Announced (Press Release)
- America's Geologic Heritage (National Park Service)
- Geoheritage Position Statement (Geological Society of America)
- A Natural Beauty: American Geoheritage (Blog)
- Unofficial National Register of Geoheritage Sites (National Park Service)
- National Natural Landmark Sites (National Park Service)

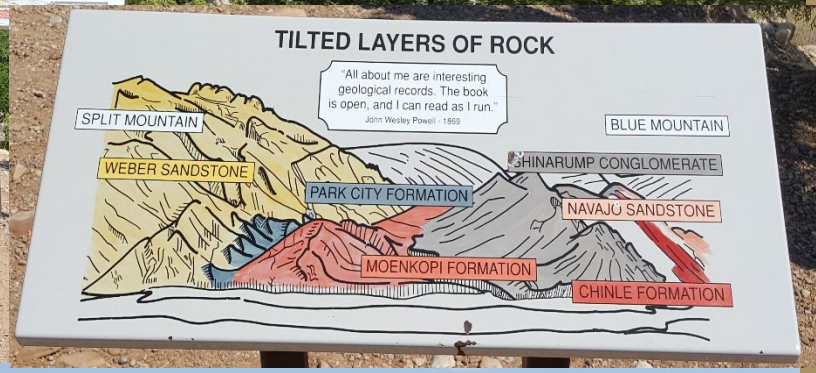


Where to find the publication (2)

https://www.earthsciweek.org/sites/default/files/Geoheritage/GH_Publicaton_Final.pdf



Visitors exploring Zion Narrows in Zion National Park, Utah. Copyrighted photo used courtesy of Ian Parker, Evanescent Light Photography, 2013



Tim Connors explaining the Split Mountain Anticline to his family at Dinosaur National Monument, 2020