

# Group 12: GeoHeritage & Research

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(contributions from other GHW  
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*Image: C. Higgins*

# What do we mean by Research?

GH sites provide natural laboratories to:

- ↳ Test theories & models
- ↳ Observe past & present natural processes
- ↳ Reveal important events/places in Earth's history
- ↳ Study current alternation (eg climate change, land use change)

We consider research broadly and include the fields of:

- ↳ **geosciences**
- ↳ paleontology & evolutionary biology
- ↳ learning sciences/cognition
- ↳ cultural & human history
- ↳ indigenous knowledge
- ↳ interdisciplinary/transdisciplinary linkages to biodiversity, ecology, hydrology, atmospheric sciences, marine sciences, conservation.



K/Pg Boundary, Raton NM: LPI

# Topics Outline of Group 12 Discussion

*Here we focus on geoscience research*

1. Science for site selection: Places with special scientific value
2. Science opportunities in support of current GH sites
3. Science Infrastructure and Facilities provided by GH sites
4. Building Human Infrastructure in Science through GH



*Eddy Covariance Tower:  
Harvard Forest*

# 1. Science for site selection: Places with special scientific value

- ↳ What is the uniqueness or representativeness of the place and its integrity? What is the scientific loss if not protected?
- ↳ Does the site have value as an important reference site ?
- ↳ Is the site significant in the history of geology and related disciplines?
- ↳ What is the importance of the site in a larger geologic context (eg wrt to plate tectonics)?
- ↳ What social-environmental dimensions add value to the site, including indigenous and Euro-american heritage?
- ↳ What is the site's potential for education and training in the Earth Sciences?



*Florida Everglades and SL rise:  
Miami Herald*

## 2. Science opportunities in support of current GH sites

- ↳ Updated inventories of assets, including rocks, landforms, fossils, & processes of special value
- ↳ An integrated socio-environmental framework for the site--past, present, future & including incorporating indigenous knowledge, value & use of the site
- ↳ Research & monitoring sites to understand natural processes (eg NEON, EarthScope, LTER, Network CZN)
- ↳ Research & monitoring of threats to GH sites & similar settings (eg climate change, land use change, pollution)
- ↳ New scientific partnerships & opportunities for inter/transdisciplinary research at GH sites because of the diversity of environments that they represent, e.g. shorelines, high-latitudes environments, atmosphere-land interactions, coupled human-natural systems
- ↳ New geological research & discovery (observation, experimentation, exploration): **“Earth in Time” priority questions**



# Science Priority Questions from "Earth In Time" (NAS Decadal Survey for NSF)



1. How is Earth's internal magnetic field generated?



2. When, why, and how did plate tectonics start?



3. How are critical elements distributed and cycled in the Earth?



4. What is an earthquake?



5. What drives volcanism?



6. What are the causes and consequences of topographic change?



7. How does the critical zone influence climate?



8. What does Earth's past reveal about the dynamics of the climate system?



9. How is Earth's water cycle changing?



10. How do biogeochemical cycles evolve?



11. How do geological processes influence biodiversity?



12. How can Earth science research reduce the risk and toll of geohazards?

National Academies of Sciences, Engineering, and Medicine. 2020. A Vision for NSF Earth Sciences 2020-2030: Earth in Time. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25761>.

### 3. Science Infrastructure and Facilities provided by GH sites

- ↳ Support Earth science research (providing a location for integrating technologies, data analysis)
- ↳ Understand the critical zone, landforms & topography, climate, water cycle, geohazards
- ↳ Enable active/continuous observation, experimentation & proxy measurements
- ↳ Promote national research initiatives
- ↳ Allow data sharing & maintain data repositories
- ↳ Implement new technologies in Earth system science



*Image: Deep Carbon Observatory*

## 4. Building Human Infrastructure in Science through GH

- ↳ Use of place to improve diversity, equity & inclusion within Earth science community
- ↳ Invest in geoconservation training in Earth science programs, including geoethics
- ↳ Include GH in Broader Impacts plans
- ↳ Partner with REU projects and other training/pipeline programs



Image: UT Jackson School