Figure 1. Speleothems decorate the inside of Glenwood Cavern.

Potential National Natural Landmark Brief

Name:

Glenwood Caverns and Iron Mountain Hot Springs

Location:

Garfield County, Colorado

Description:

Glenwood Cavern, Lower Transfer Trail Outcrop, and Iron Mountain Hot Springs, located in Iron Mountain north of the city of Glenwood Springs, Colorado, display features that provide a unique record of the hypogenic processes (those completely independent of recharge from the surface) that eroded the Leadville Limestone in the Glenwood Springs area. These processes have been in existence since the late Pliocene-Pleistocene epoch (~2.5 million years ago). Glenwood Cavern and the Lower Transfer Trail outcrop, which includes Holly Cave, contain relict limestone conduits that were part of the regional groundwater flow system but became separated from it due to Colorado River incision. Iron Mountain Hot Springs, which are some of the youngest karst features, are the active component of the regional groundwater system. They are part of a series of conduit-fed thermal springs that discharge saline-rich, sulfidic groundwater to the Colorado River at the city of Glenwood Springs.

The relict and active conduits contain unique ecosystems and species adapted to live in the extreme environments of the hot springs and the low-nutrient conditions of the cave. Eight endemic troglobites (fully cave-adapted species) are found here, including four springtails, a millipede, a dipluran (wingless insect), a spider and a pseudoscorpion. The different caves are also host to a diversity of microbes, including 38 unique phylotypes of bacteria.

Significance:

The area containing Glenwood Cavern, Lower Transfer Trail Outcrop (Holly Cave), and Iron Mountain Hot Springs is unique for the suite of subsurface, multi-source karst processes expressed at the site that have been operational for around 2.5 million years. The downcutting of the Colorado River into the Leadville Limestone aquifer reveal the timeline and spatial relationships of the site's karstic components, from the relict conduits in Glenwood Cavern and Holly Cave, to the active thermal spring vents of Iron Mountain Hot Springs. Iron Mountain Hot Springs contain active populations of diverse extremophiles, and Glenwood Cavern is host to unique ecosystems containing endemic triglobitic species, as well as unique biothems, such as raised calcitic trails formed by long-term packrat activity, and fossilized extremophiles in the form of pool fingers and u-loops.

Figure 2. A pseudoscorpion unique to Glenwood Cavern.

Ownership:

Private

Evaluation:

December 2020, Dr. Patricia Kambesis, Western Kentucky University; Dr. Fredrick Luiszer, University of Colorado, Boulder.

General Location and Proposed Boundary:

Figure 3. General location of the site west of Denver, Colorado, and the proposed boundary, in yellow, of the Glenwood Caverns and Iron Mountain Hot Springs NNL site.

Figure 1. View northwest along the 100-ft cliff of the Helderberg Escarpment toward the Mohawk Valley.

Potential National Natural Landmark Brief

Name:

John Boyd Thacher State Park

Location:

Albany County, New York

Description:

John Boyd Thacher State Park, some twelve miles west of Albany, NY, hosts a remarkable section of Middle Paleozoic Era (Silurian and Devonian Periods) marine sedimentary rocks. The Helderberg Escarpment is a cuesta that showcases a thick exposure of this somewhat compressed but mostly complete sedimentary sequence. The landform exposes and allows natural access to the stratigraphy, provides attractive scenic views and dramatic relief of the landscape, and together with karstic processes, creates highly diverse ecologic environments. Distinctive and widespread sedimentary units and the abundant fossils they contain describe a long and complex story of where, when, and how the Appalachian Mountains formed. Since the early days of geology in North America this location was rightly recognized for its rich natural history, and the Helderbergs became the center of this new science on the continent, attracting many of the western world's greatest naturalists throughout the nineteenth century.

Figure 2. Minelot Creek flows over the 100-ft cliff above the Indian Ladder Trail. Photo by C. Ver Straeten.

Significance:

The Helderberg Escarpment at John Boyd Thacher State Park, a striking example of a cuesta, exposes the most complete and minimally disturbed record of middle Paleozoic stratigraphy in the Appalachian Plateaus region, and perhaps across North America. The uniquely accessible, fossil-rich deposits provide a master section spanning 63-million years, foundational in the early study and understanding of North American geology and of widespread ancient mountain building.

Ownership:

State (New York State Office of Parks, Recreation and Historic Preservation)

Evaluation:

August 2021, Nicholas L. Venti, Massachusetts Geological Survey; Charles Ver Straeten, New York State Museum and Geological Survey; Sarah C. Osgood, University of Massachusetts at Amherst; Alycia L. DiTroia, University of Massachusetts at Amherst.

General Location:

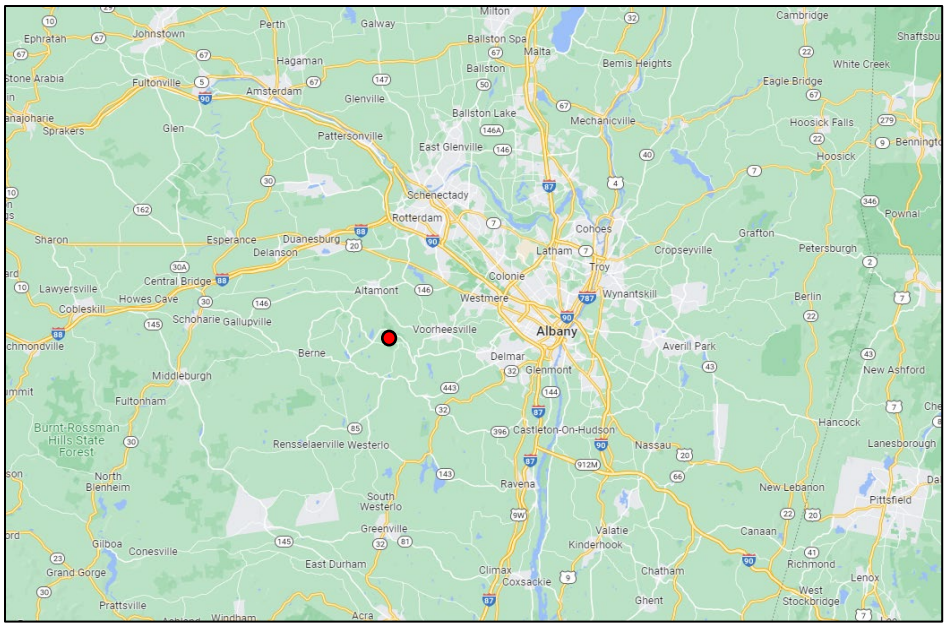

Figure 3. General location of the site approximately 12 miles west of Albany in eastern New York.

Proposed Boundary:

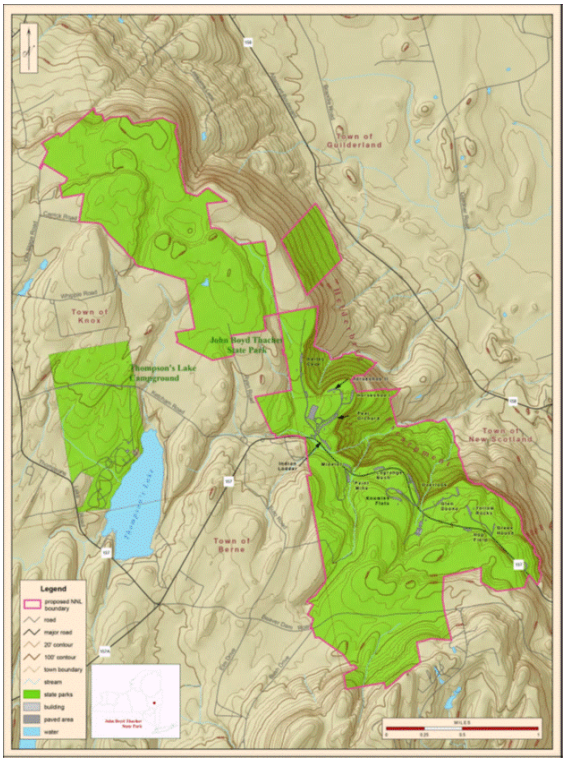

Figure 4. Proposed boundary, outlined in pink (3 parcels; 2,185 acres), of the John Boyd Thacher State Park NNL site.