

Snowmastodon Project™ FAQs - REVISED March 11, 2011

Project Overview

What is the Snowmass Village Ice Age fossil site?

The Snowmass Village Ice Age fossil site is one of the most significant scientific discoveries ever made in Colorado. To date, this single site has produced eight to 10 American mastodons; four Columbian mammoths; four Ice Age bison; two Ice Age deer; a Jefferson's ground sloth; many tiger salamanders; evidence of beavers, insects, snails; and large quantities of well-preserved plant matter—some of which is still green after tens of thousands of years. In just 18 days of excavation in fall 2011, Museum crews at the Ziegler Reservoir recovered approximately 600 bones and bone pieces, 15 tusks, two tusk tips, hundreds of tusk fragments, and more than 130 samples of peat, wood, leaves, rocks, and invertebrates.

What is the Snowmastodon Project™?

The Snowmastodon Project™ encompasses the excavation, research, preservation, educational, fundraising, and marketing activities surrounding the Snowmass Village Ice Age fossil site.

Science Behind Ziegler Reservoir Ice Age Fossil Ecosystem

What fossils have been found?

The Ziegler Reservoir site preserves an entire Ice Age lake. To date, Denver Museum of Nature & Science crews have excavated parts of

- Eight to 10 American mastodons
- Four Columbian mammoths
- Two Ice Age deer
- Four Ice Age bison
- One Jefferson's ground sloth (the first ever found in Colorado and the highest elevation example anywhere in North America)
- Many tiger salamanders
- Distinctly chewed wood that provides evidence of beavers
- Insects, including iridescent beetles
- Snails and microscopic crustaceans called ostracods
- Large quantities of well-preserved wood, seeds, cones, and leaves of white spruce, subalpine fir, sedges, pollen, and other plants

Museum excavation crews have recovered

- Approximately 600 bones and bone pieces
- 15 tusks and two tusk tips
- 14 bags full of tusk fragments
- More than 130 samples of peat, wood, leaves, rocks, and invertebrates

How old are the fossils?

Museum scientists are working with outside experts to determine the age of the Snowmass Village fossil site, but right now scientists know it is somewhere between 45,000 and about 150,000 years old.

At the present time, this understanding of the site is based on regional glacial history and multiple radiocarbon dates. Scientists hypothesize that the lake can be no older than 130,000 to 150,000 years based on the fact that the Bull Lake Glaciation, which ended at about this time, likely created the moraines that formed the lake. While working at the dig site, scientists took radiocarbon samples through the layers of sediment that formed the lakebed. These samples were analyzed by two different labs, and in all cases the samples were “radiocarbon dead,” meaning that there is so little radioactive carbon 14 left in the samples that it is no longer measurable. This is evidence that the samples are more than 45,000 years old, which implies that the infilling of the lake basin occurred prior to that time.

Thus, scientists hypothesize that the lake deposits preserve a time span extending from 130,000 to 150,000 years ago (the end of the Bull Lake Glaciation) to about 45,000 years ago (based on the results of radiocarbon dating). This means the dig site may span a significant period of time and may preserve both glacial and interglacial records.

What is the significance of the find?

The Ziegler Reservoir excavation site is one of the most important paleontological sites in Colorado.

- The **high-altitude** setting of this fossil site (8,874 feet) is consistently underrepresented in the Ice Age fossil record.
- It is exceedingly rare to discover such a **diversity** of plants and animals from an Ice Age ecosystem in one place. Normally, scientists must use information from many different sites to piece together a picture of what plant and animal life was like in the Ice Age. Here, they can assemble a very complete picture from one site.
- The **preservation** of the fossils discovered at Ziegler Reservoir is exceptional. Some of the plant matter found at the site is still green, and at least one of the tusks and some of the bones recovered from the site are still white after tens of thousands of years. Scientists think there is a good chance of recovering ancient DNA from some of the fossils.
- The **age of the site** is also of particular interest to scientists. Initial radiocarbon dating indicates that the Ziegler Reservoir site is more than 45,000 years old, and local glacial geology suggests that the moraine that formed the lake was formed between 130,000 and 150,000 years ago. Discovery of such an old Ice Age site is very rare and will provide scientists with an opportunity to learn about an earlier part of Ice Age history.
- The thickness of sediments at the reservoir and the presence of fossils at many levels suggest that there is a **sequence of ancient Ice Age ecosystems** preserved at the site.

What happened to the fossils after they came out of the ground?

Once fossils were removed from the ground, they were immediately placed in a process chain designed to maximize their preservation. Due to the moisture content of the bones, which were buried in wet silt and peat for tens of thousands of years, the bones are very fragile and would disintegrate if allowed to dry out too fast. The Museum has a preservation team that is assigned specifically to care for the bones found at Ziegler Reservoir. It can take many months for the fossils to properly dry.

Some of the fossil bones required a plaster of paris jacket to remove them from the ground and protect them during transportation to Denver. In the Museum fossil preparation lab, the jackets are being removed, the fossils are being cleaned, and the slow drying process is ongoing.

Are there signs of human activity associated with the find?

The area surrounding Snowmass Village was covered by glaciers at different times in the last 150,000 years. The high mountains and ice would have made the area a difficult place for humans to access.

In spite of this, Museum crews excavated the site using archeological techniques, just in case. At the close of the fall 2010 excavation, no signs of human association with the fossils had been discovered.

How were the fossils found?

The original discovery of a single juvenile Columbian mammoth was made by a bulldozer operator named Jesse Steele who was working on the expansion of Ziegler Reservoir on October 14. Steele unearthed approximately 20 percent of the animal's bones, which were cleaned and put on display in the Snowmass Water and Sanitation District office in Snowmass Village. The Museum began the full excavation of the site on Tuesday, November 2, after reaching a written agreement with the District related to donation of the fossils. The excavation concluded for the season on November 15, 2010, and will resume on May 15, 2011.

How big was the Museum team involved in the excavation in fall 2010?

Over 18 days, a Museum team of more than 60 staff and trained volunteers logged more than 3,600 man hours of fieldwork. They recovered approximately 600 bones and bone pieces, and more than 130 other samples of peat, wood, leaves, rocks, and invertebrates.

What is happening to the site over the winter?

The Museum created frost-free barriers around the site to help protect the area. The fossils left in the ground will be protected by the dirt and the deep snow over the winter.

Future Plans at the Site

Is the Museum going back to the dig site this spring?

Museum crews will spend seven weeks between May 15 and July 1 continuing the excavation. Having additional time to excavate this spring will further enhance our scientific understanding of this amazing find.

When and where will the dig occur?

The agreement between the Museum and Snowmass Water and Sanitation District, and an excavation permit from the state archaeologist allow Museum crews to excavate in the same area of Ziegler Reservoir. Crews will remove any fossils that are in the ground below the dam construction site. This will allow the District to complete dam construction on schedule without damaging or burying any fossils. The agreement also allows the Museum to leave a small excavation crew at the site after July 1, as construction continues on Ziegler Reservoir. The crew will recover additional fossils that might be exposed by large machinery excavating clay to build the dam.

Who will work on the dig?

The Museum has assembled a team of 34 scientific experts from 15 institutions in the United States, Canada, and England to study the discoveries. Some members of the science team will be joining the excavation team at Ziegler Reservoir for a portion of the dig. The Museum expects to have as many as 40 people working at the dig site at a time, including a small number of formal and informal educators from the Roaring Fork Valley who will be selected and trained as volunteers.

How are locals from the Roaring Fork Valley involved with the dig?

The Denver Museum of Nature & Science is offering a small number of formal and informal educators in the Roaring Fork Valley a chance to volunteer on the fossil excavation. Educators who are selected for the Adult Excavation Volunteer Program will work side by side with renowned scientists and other Museum staff doing the actual work of the excavation. The volunteer program aims to give educators real-world experience with the science happening right in their own backyard, so they can inspire their students and neighbors with their knowledge and personal experiences from working on the fossil dig.

Will visitors be allowed at the site?

The site is not open to the public. Access to the site will be very limited during the excavation this spring, for two important reasons: safety and productivity. The site will be an active construction site with heavy machinery, and the Museum will be working as quickly as possible to complete the excavation in a timely fashion, in order to allow Snowmass Water and Sanitation District the time they need to complete their dam and reservoir. To address this, the Museum is planning to share our findings with the community in the Roaring Fork Valley through outreach, lectures, special events, website updates, and photo/video from the site.

What will happen to the reservoir project?

The Snowmass Water and Sanitation District doesn't expect delays in the reservoir project as a result of this find. The District is currently ahead of schedule with the construction of the dam and 2011 completion of the Ziegler Reservoir enlargement project. The District submitted construction plans to the State Engineer's Office in November 2010 and expects to start construction of the dam in the spring.

Note: Ziegler Reservoir was purchased for use as a municipal water supply, and it is being expanded to provide additional water for the Town of Snowmass Village.

Funding for the Project***How much will this project cost?***

The total cost of the planned activities (including the funds expended in 2010) is estimated at \$1 million, with approximately \$750,000 to be spent in 2011. This plan includes scientific research, excavation, preservation, documentation, education, media/public relations, and logistics.

How will funds be raised to cover the cost of the project?

The Denver Museum of Nature & Science, the Town of Snowmass Village, and the Snowmass Water and Sanitation District are all working together to raise funds for the project and to maximize the scientific and educational potential of this important discovery. The three organizations approached the Aspen Community Foundation together to create The Snowmastodon Fund to support the entire project.

Ownership of the Land and the Fossils

Who owns the fossils and the reservoir?

The Snowmass Water and Sanitation District owns Ziegler Reservoir, but because the District is a political subdivision of the state, the fossils found at Ziegler Reservoir are under the jurisdiction of the State of Colorado. Pursuant to Colorado Statute 24-80-401 (1), the State of Colorado reserves to itself title to all historical, prehistorical, and archaeological resources in all lands, rivers, lakes, reservoirs, and other areas owned by the state or any county, city and county, city, town, district, or other political subdivision of the state. Upon discovery, the District immediately contacted the Museum, one of two state-approved repositories for these fossils. As part of the original agreement between the District and the Museum, the Museum will provide the District with a cast model of the bones of one of the animals recovered during the excavation. The agreement also calls for the Museum to provide the District with additional cast models of the bones of other animals if the District agrees to pay the cost of the casting process.

Exhibition of the Discovery

Short-term: What will be presented in Snowmass Village?

Visitors and residents can visit a new Ice Age Discovery Center on the Snowmass Mall next to Gene Taylor's in Snowmass Village, located less than a mile from the site of this once-in-a-lifetime find. The Ice Age Discovery Center project was initiated by Snowmass Tourism and the Denver Museum of Nature & Science, with thanks to the Snowmass Water and Sanitation District. The area, which is approximately 2,000 square feet and generously donated by Related and Snowmass Hospitality, opened to the public on March 11, and be open daily from 10 a.m. to 5 p.m. through Sunday, April 10 (subject to change based on guest interest). The Ice Age Discovery Center will reopen Friday, June 3, through Sunday, September 19, with potential public and private events through Saturday, October 15. The center will be staffed with more than 20 trained volunteers from throughout the Roaring Fork Valley.

Visitors to the Ice Age Discovery Center learn about

- The story of the Ice Age discovery
- Major finds to date and their significance
- What's happening next

At the Ice Age Discovery Center, visitors can

- See amazing photographs documenting the excavation and once-in-a-lifetime moments last fall
- Touch casts of example mammoth and mastodon teeth to learn the difference between the two species
- See a wooden half-scale model of the discovery mammoth, Snowy, and learn how she got her name
- Watch videos of Dr. Kirk Johnson sharing the excitement of the dig last fall and Snowmass Village residents sharing their reactions to the discovery as well as an entertaining video produced by Snowmass Tourism
- Participate in crafts and activities for children
- Access SnowmassIceAge.com to learn more about local activities Snowmass Village is planning in connection with the find
- See the cast of another local discovery that's been given to the Town of Snowmass Village by the Denver Museum of Nature & Science, an 80 million-year-old fish discovered in 1966

Long-term: What will be presented in Snowmass Village?

The Town of Snowmass Village Ice Age Discovery Committee (the “Tusk Force”) is building the long-term plan to capitalize on the educational and economic development opportunities that this discovery offers to the TOSV and the Roaring Fork Valley. The Museum has offered to lend their paleontology expertise to the Town of Snowmass Village to develop a business plan that will guide efforts to maximize this opportunity. The goal will be to communicate the science behind the fossil ecosystem preserved in Ziegler Reservoir.

What will be presented at the Denver Museum of Nature & Science?

The Museum does not have a plan for a large-scale permanent display of the fossils right now. We are still in the very early stages of the discovery and scientific analysis of the fossils. Once the fossils are properly dried and preserved—which could take as long as a year for some of the bones—it will be possible to put more of the bones on temporary display on carts and at special programs at the Museum.

Can the fossils travel to schools or go on public display?

Because this is one of the most significant scientific discoveries in Colorado history, the Museum’s top priority and critical responsibility is to provide the best possible care and preservation for these fossils so they will last for generations. Due to the fragility and scientific significance of these fossils, they cannot travel or go on immediate public display as part of an exhibition. Instead they are in the Museum’s conservation laboratory to undergo cleaning and a careful preservation process so they can be stabilized. Simultaneously, our scientists—working with colleagues from around the world—will be very busy learning from the bones themselves and from information gathered at the site, which will enrich our knowledge of Ice Age ecosystems.

How can people learn more about this amazing find?

Even though the fossils from Snowmass Village are not immediately available for education or display, and the busy schedules of our scientists prohibit them from making numerous public appearances, the Museum offers several opportunities to learn about this amazing find.

Ongoing: At the Denver Museum of Nature & Science

Most of the fossils recovered in Snowmass Village are in the Museum’s conservation lab where they are drying out very slowly. This will be a long process—a year or more. If the fossils dry too fast, they can crack and fall apart. It’s the Museum’s job to make sure the fossils are preserved for future generations. BUT, there are a few fossils on display around the Museum, and there are a number of ways to learn more about the discoveries.

- **Mammoth Cart**—Daily in Prehistoric Journey, near the Schlessman Family Laboratory of Earth Sciences
 - Real tusk fragments from Snowmass Village (touchable!)
 - Peat samples from Snowmass Village
 - Touchable mammoth and mastodon teeth (not from Snowmass Village)
 - Mammoth bone fragments (not from Snowmass Village)
 - Photos, video, and interpretive information about the Snowmass Village discoveries
- **Snowmass Peat Bog Display**—North American Wildlife Hall

- Check out a new display about the ecology of Ice Age peat bogs in Snowmass Village in North American Wildlife Hall. A piece of a mastodon rib from Snowmass Village will be part of the display.

Ongoing: Museum website resources at dmns.org

The Museum website (www.dmns.org) has plenty of information about the Snowmass Village fossil excavation, background information on mammoths and mastodons, and resources for families and children. The website is continually updated at www.dmns.org/snowmastodon-project as developments occur.

***How can people learn more about this amazing find?
(for Snowmass/Aspen/Roaring Fork Valley inquiries only)***

Spring 2011: Education and outreach in Snowmass Village

Denver Museum of Nature & Science educators will return to Roaring Fork Valley schools this spring with programs about the Ice Age fossil discoveries, including assemblies, distance-learning, and teacher professional development programs. Programs will include the most exciting and current information about the mammoths, mastodons, and other prehistoric animals found in the area. They will combine top-notch professional science educators, real objects and artifacts from our collections, props, and multimedia presentations to create a fun and educational experience for students and teachers. Programs include Time Scene Investigation: Snowmass Village, an outreach assembly program for grades K–2 and 3–5; Mammoth of a Find, a distance-learning program for grades 6–12; The Snowmastodon Project, a teacher update webinar; and Snowmastodon Project Activities for Preschoolers. Additional information is available at www.dmns.org/snowmastodon-project.

March 22, 2011: Snowmastodon-A Tale of Ice Age Discovery

The Aspen Historical Society and the Denver Museum of Nature & Science are presenting Snowmastodon: A tale of Ice Age Discovery in Snowmass Village. Chief Curator Kirk Johnson will tell the tale of one of the most significant scientific discoveries in Colorado history and share future plans for The Snowmastodon Project™. First, come celebrate the grand opening of the Snowmass Ice Age Discovery Center from 10:00 am to 5:00 pm hosted by Snowmass Tourism. This is followed by a presentation and Q&A by Dr. Johnson at the Snowmass Conference Center at 5:30 pm. Tickets are available at Sundance Liquor & Gifts and The Wheeler/Stallard Museum and are \$5 in advance and \$8 on the day of the event.

June 25-26, 2011: Snowmass Ice Age Discovery Weekend

Snowmass Tourism and the Denver Museum of Nature & Science will bring family fun, Ice Age style targeting families with children in the Roaring Fork Valley. Hear from Museum experts, play Ice Age games, puzzles and crafts, and enjoy interactive activities for the whole family. Plans are underway to offer additional public lectures and events in the area. For more information, go to www.snowmassiceage.com.

Media Contacts:

Denver Museum of Nature & Science: Heather Hope, Public Relations Manager, 303-370-8372 or heather.hope@dmns.org

Snowmass Tourism: Patsy Popejoy, Public Relations Manager, 970-922-2285 or ppopejoy@snowmass tourism.com.