



Cave Inventory Wrangell St. Elias National Park UAS-WSENP CESU Project

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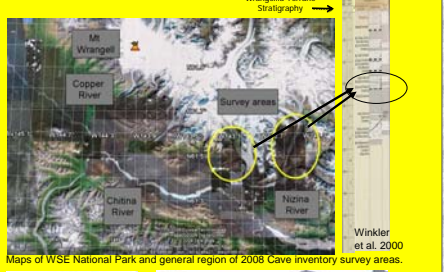
Tongass Cave Project



ABSTRACT

Between Aug 27-Sept 6, 2008 a team of 13 Alaskan and international speleologists traveled to Wrangell St. Elias National Park and Preserve to survey karst and caves in three limestone areas in the western park region near McCarthy, Alaska: 1) The Nizina River and its West Fork 2) The upper western Kennecott watershed, and 3) Hidden Valley, a Kennecott river tributary.

Preliminary results indicate greater bedrock dissolution and a richer cave resource area in the Hidden Valley region relative to the heavily glaciated areas of the Nizina and its West Fork rivers. Most of the karst was poorly developed. Numerous frost pockets formed by mechanical weathering were common in all areas. Few enterable and active underground water conduits were found during these surveys. Doline and grike intake areas at high elevation are now covered by glaciers. At lower elevations these karst intake features were common in some areas but mostly unenterable. One moderately developed cave system was inventoried within the Kennecott watershed. Most of limestone areas in the western Kennecott watershed had no surface drainage indicating the presence of subterranean conduits. Ancient structures likely formed by upwelling phreatic waters and later exposed by glacial erosion are now incidental caves unrelated to present karst processes. Small caves with wall solution features are relict features formed by ancient karst or hydrothermal systems that are no longer active. A small mammal bone recovered from one of the Hidden Valley caves yielded a calibrated radiocarbon age of 170 +/- 40 BP. Bone collagen analysis yielded stable isotope data (13C/12C = -19.0 o/oo and 15N/14N = +4.7 o/oo). The low nitrogen values coupled with a marine or C3-C4 plant signature from the carbon isotopes suggest that this mammalian cave dweller either ate marine food sources (bear/salmon) or consumed lower trophic level C3-C4 plants (caribou/lichen).



INTRODUCTION

The caves and karst lands of the Wrangell-St. Elias National Park and Preserve (WSENP) belong to citizens of the U.S., yet the NPS does not presently have a complete inventory of these resources, despite an annual increase in cavers traveling into the park to explore its karst-land resources. The Federal Cave Resources Protection Act (FCRPA) requires protection of significant caves on Federal lands. The intent of this act is to protect cave resources, not necessarily karst resources, although the caves and associated dissolution features, primarily developed in carbonate rocks (limestones and marbles), are an integral part of karst landscapes.

To begin addressing this knowledge deficiency, the WSENP provided research funds to Connor at the University of Alaska Southeast (UAS) through the Cooperative Ecosystem Studies Units (CESU) National Network. Allred and Lewis (Tongass Cave Project of the National Speleological Society) next organized a team of experienced Alaskan and international cavers to carry out ground surveys of areas identified as having potential cave and karst resources in two areas near McCarthy, AK. Here extensive outcrops of the Triassic Nizina and Chitstone limestones occur where they overlie the Nikolai Greenstone in the Wrangella terrane. Between Aug 27-Sept 6, 2008 the 13 speleologists traveled to the park and surveyed three areas 1) The Nizina River and its West Fork 2) The upper western Kennecott watershed, and 3) Hidden Valley, a Kennecott river tributary.

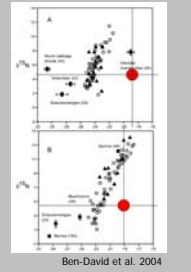
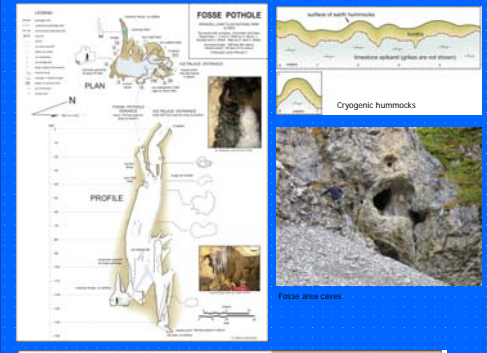
Field Methods

The 3 cave survey teams were flown into their respective areas and set up a series of spike camps from which to operate. Cave survey forms, approved by the WSENP, were of two types: 1) Each cave or karst feature had a "entrance sheet" which has the name, feature type, location, number of satellites or error, GPS owner and model, waypoint name, location of fix in relation to feature, camera and image number of location photo, camera and image number of entrance, location description (how to get there), location sketch, entrance description, entrance sketch, prospects and equipment needed, special observations, and reconnaissance team (note keeper underlined). 2) Preliminary Cave Inventory, which is used only for those caves surveyed. This one has a whole list of check off items graded as significant, minor, or none. These are marked at every survey station, and include features such as pit, slippery slope, damage impacts, biological things, other speleogens, speleothems, sediment types, rock types, water amounts, airflow, were utilized to standardize data collection methods for information about karst feature locations, volume and orientation, and feature descriptions. Clinometers, measuring tapes, compasses and GPS receivers completed the research tool kit. The cavers used a variety of climbing and caving methods to access some of the caves located midway up steep cliffs. Of note was the discovery of a lack of surface water in the Hidden Valley area, suggesting an active underground drainage system. This was also a hardship for that survey team. The Kennecott River area team found mostly frost pockets and not much cave development.



Data analysis

Cave profile and plan maps were constructed by Carlene and Kevin Allred from the cave survey field data and notes captured on survey sheets. Examples from selected caves and surface landscapes are shown below.



A small piece of bone (2 cm maximum dimension), found in one of the caves was sent to BETA Analytic, Lab for AMS radiocarbon dating and bone collagen analysis for stable isotopes.

Radiocarbon age results
 Measured Age = 80 +/- 40 years BP
 Calibrated age = 170 +/- 40 years BP
 2 sigma calendar age = 1650 to 1890 calendar AD

Stable Isotope results
 13C/12C = -19.0 o/oo
 15N/14N = +4.5 o/oo

Discussion and Conclusion

Preliminary results indicate greater bedrock dissolution and a richer cave resource area in the Hidden Valley region relative to the heavily glaciated areas of the Nizina and its West Fork rivers. Most of the karst was poorly developed. Numerous frost pockets formed by mechanical weathering were common in all areas. Few enterable and active underground water conduits were found during these surveys. Doline and grike intake areas at high elevation are now covered by glaciers. At lower elevations these karst intake features were common in some areas but mostly unenterable. One moderately developed cave system was inventoried within the Kennecott watershed. Most of limestone areas in the western Kennecott watershed had no surface drainage indicating the presence of subterranean conduits. Ancient structures likely formed by upwelling phreatic waters and later exposed by glacial erosion are now incidental caves unrelated to present karst processes. Small caves with wall solution features are relict features formed by ancient karst or hydrothermal systems that are no longer active. A small mammal bone recovered from one of the Hidden Valley caves was dated to 170 +/- 40 years BP (calibrated radiocarbon age). Bone collagen analysis yielded stable isotope data (13C/12C = -19.0 o/oo and 15N/14N = +4.7 o/oo). The low nitrogen value coupled with a marine or C3-C4 plant signature from the carbon isotopes suggest that this mammalian cave dweller either ate marine food sources (bear/salmon) or consumed lower trophic level C3-C4 plants (caribou/lichen), or was possibly a caribou eaten by a wolf (See Diagram above, Ben-David et al. 2000, Szepeanski et al. 1999). Future surveys will continue to identify dissolution features and cave development in other regions of the WSENP.

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For further information:

Alaska Caving
<http://www.uas.alaska.edu/envs/caving/index.html>

American Speleological Society
<http://www.caves.org/>

