

# Lehman Caves, Nevada

- Introduction 0900 PDT
- Stop 1 – Cueva de Villa Luz 0905 PDT
- Stop 2 – Frasassi Caves 0930 PDT
- Stop 3 – Carlsbad Cavern 0955 PDT
- Stop 4 – Lechuguilla Cave 1015 PDT
- Stop 5 – Sacramento Pass 1035 PDT
- Break/Intermission 1055 PDT
- **Stop 6 – Lehman Caves 1105 PDT**  
**Gretchen Baker, Harvey DuChene,**  
**Louise Hose, Dan Jones, Zoe Havlena**
- Break/Intermission 1245 PDT
- Stop 7 – Burial Cave 1255 PDT
- Stop 8 – Crystal Ball Cave 1305 PDT
- Stop 9 - Pescio Cave 1315 PDT
- Stop 10 – Discovery Cave 1325 PDT
- Stop 11 – Old Mans Cave 1335 PDT
- Summary and questions 1345 PDT



# Introduction



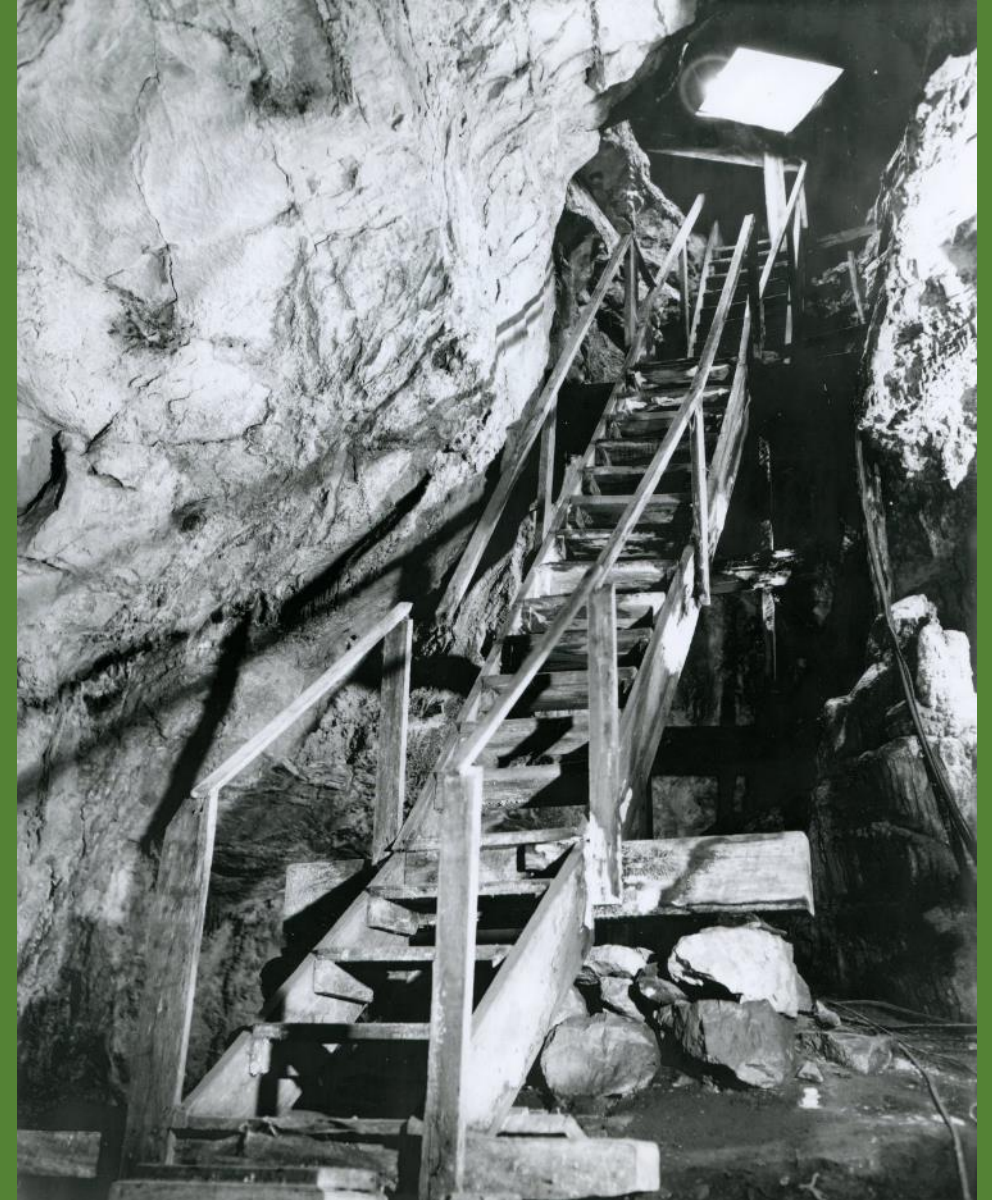
Figure 70. Exposed carbonate rocks in the Great Basin region. Modified after Veni (2002).





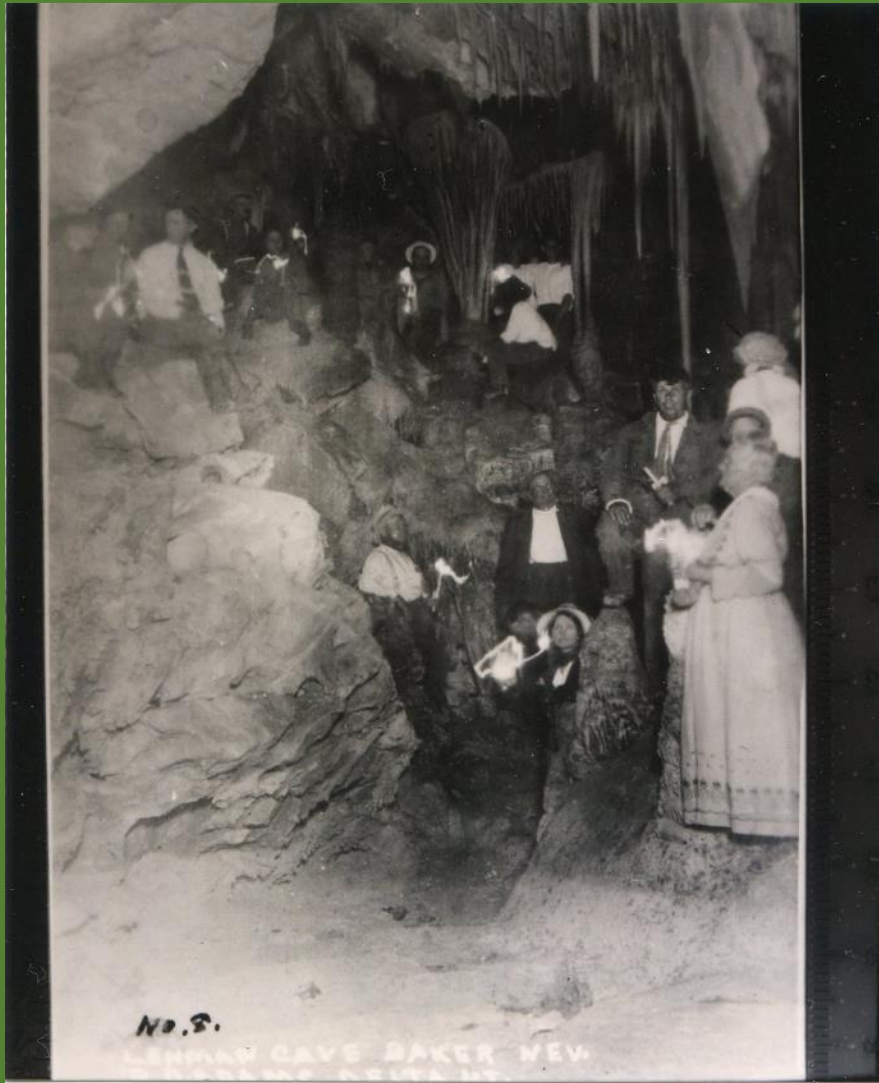
# Lehman Caves, Nevada

- Cultural History





# Lehman Caves, Nevada

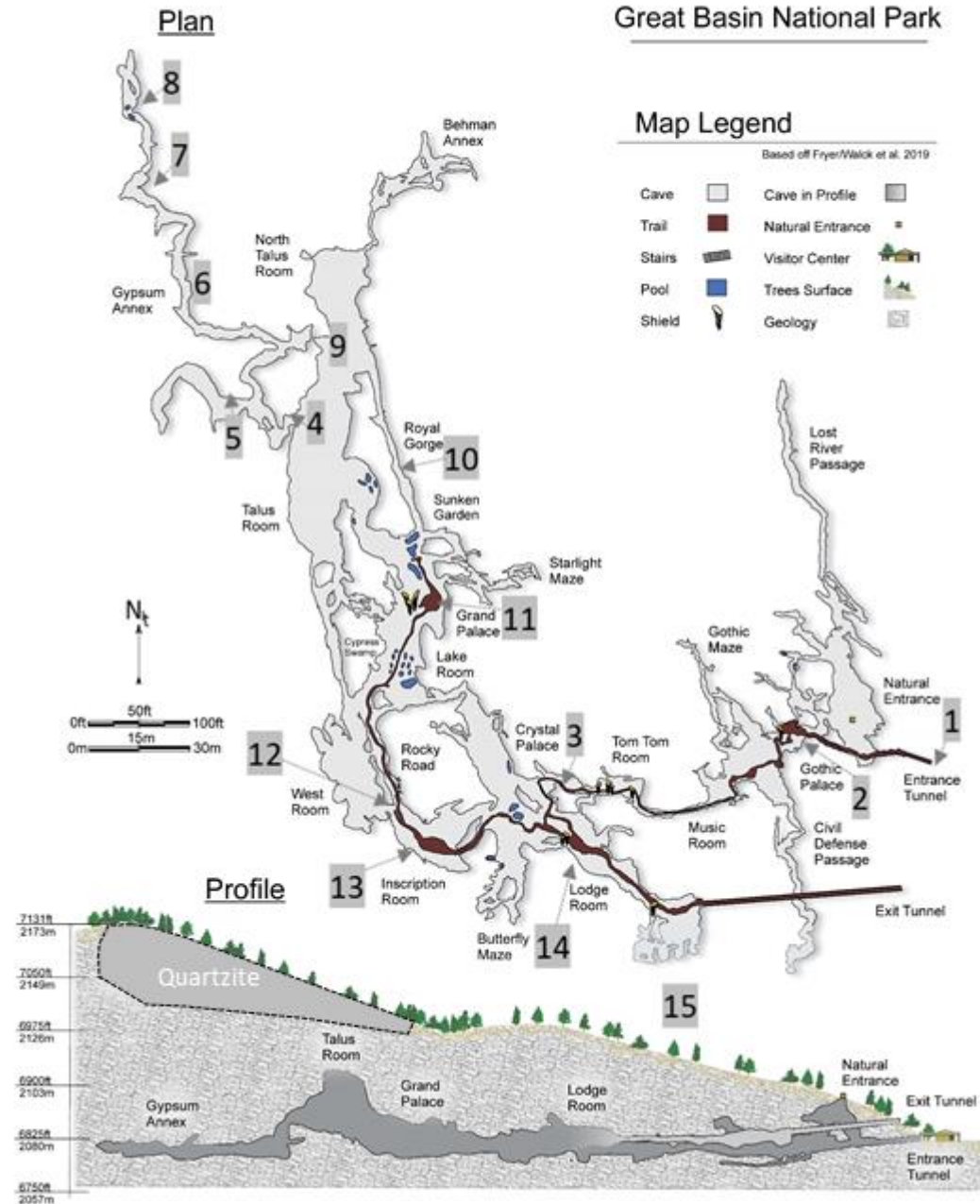


*Hypogenic Caves of the Great Basin: Lehman Caves*



# Overview

## Lehman Caves Great Basin National Park

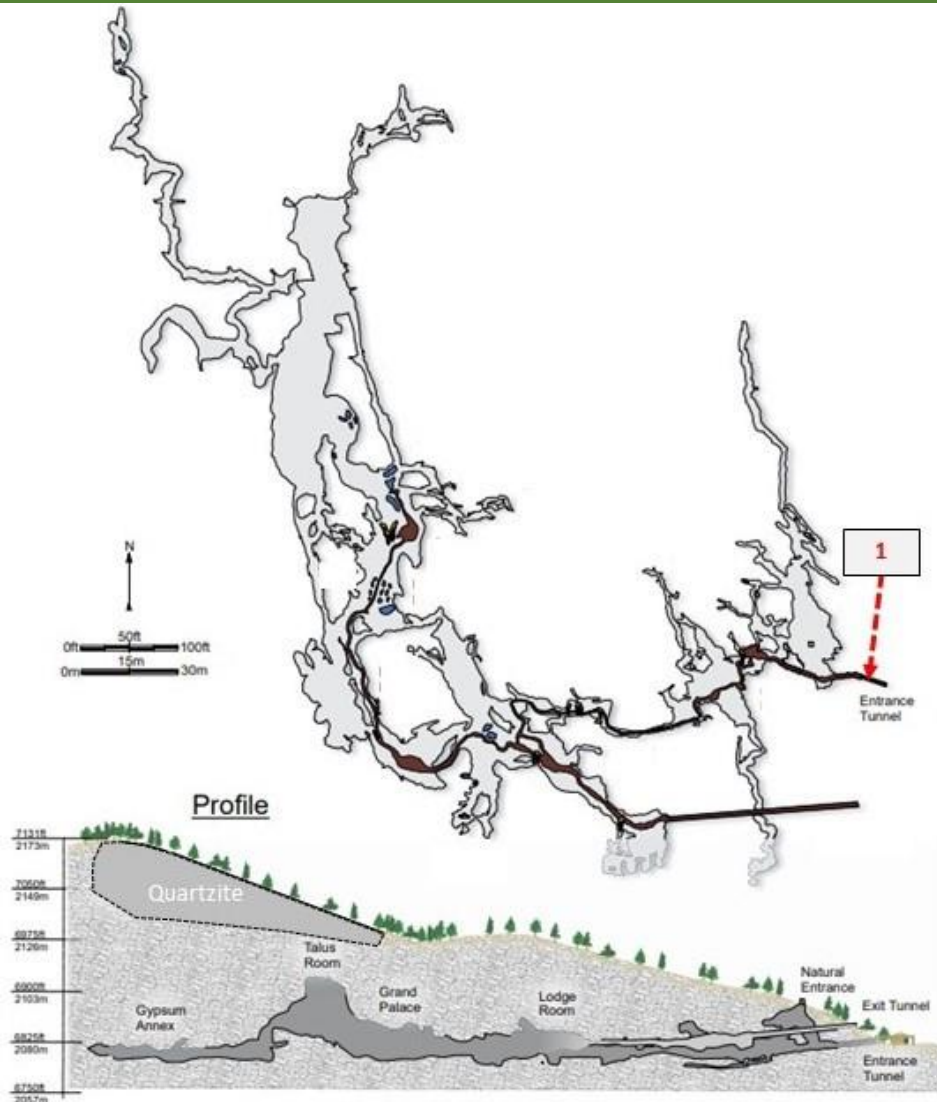


*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.1

Lehman Caves Virtual Tour (part 1):  
<https://www.youtube.com/watch?v=FOXLYpJilTE>



Plan view

Great Basin National Park Lehman Caves Research



*Hypogenic Caves of the Great Basin: Lehman Caves*



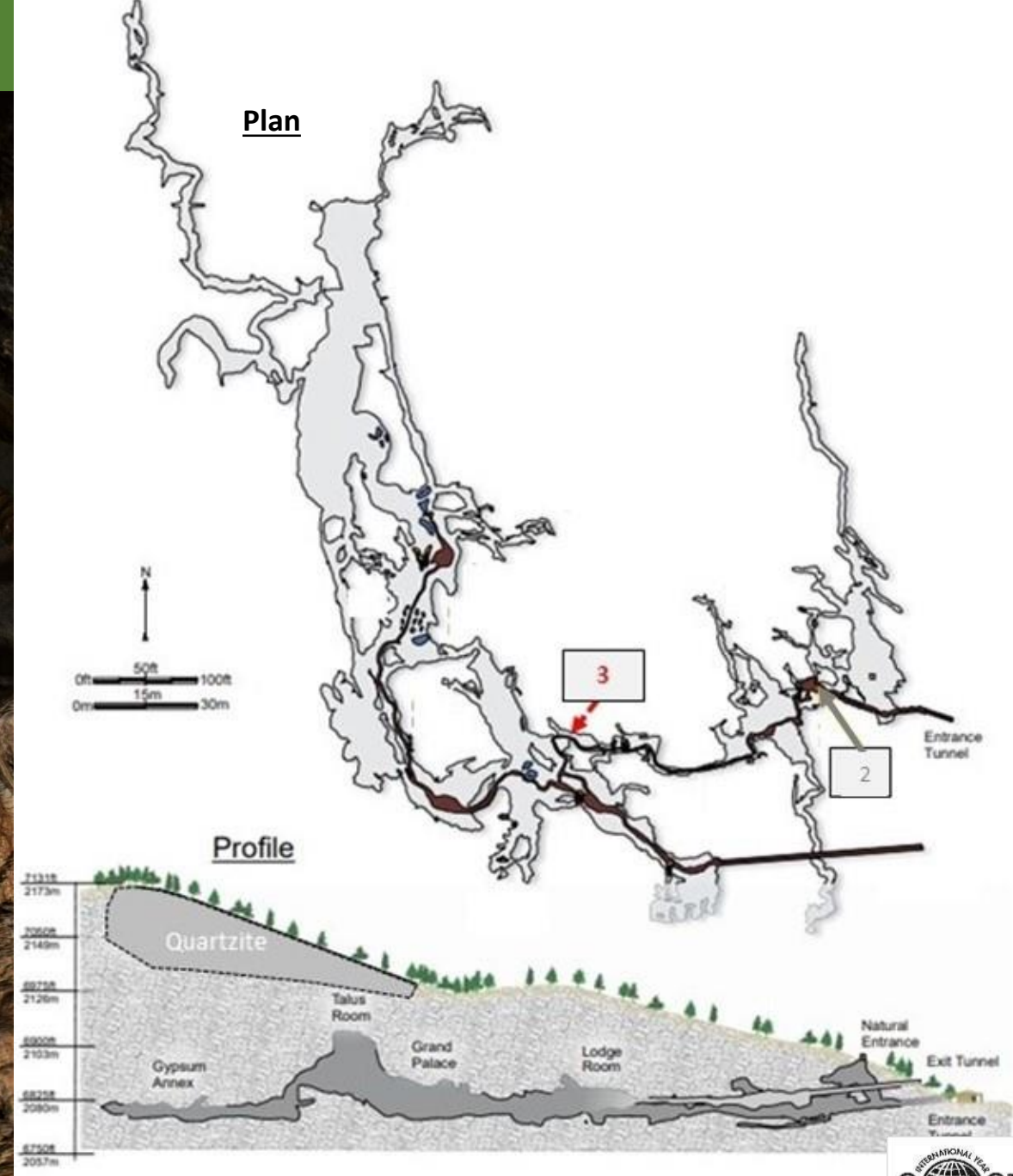
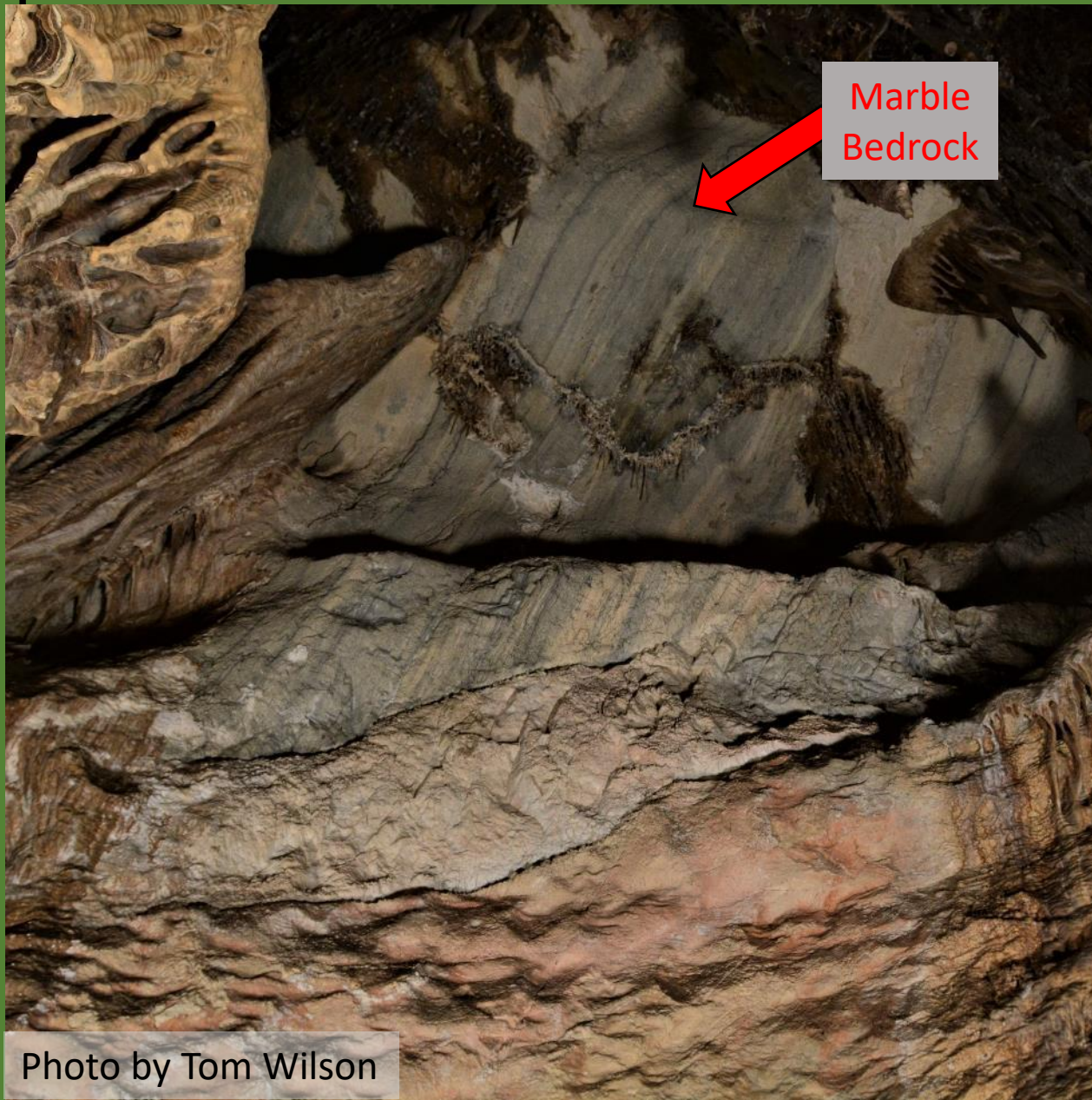
# Stop 6.1 Entrance Tunnel & Stop 6.2 Gothic Palace through Tom Tom Room



*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.3



*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.3

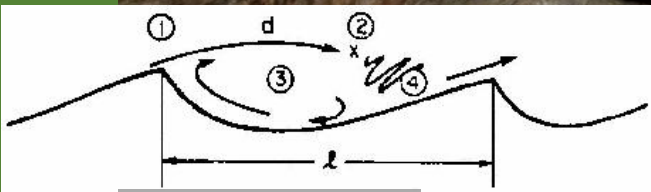


Image above  
from Curl (1974).

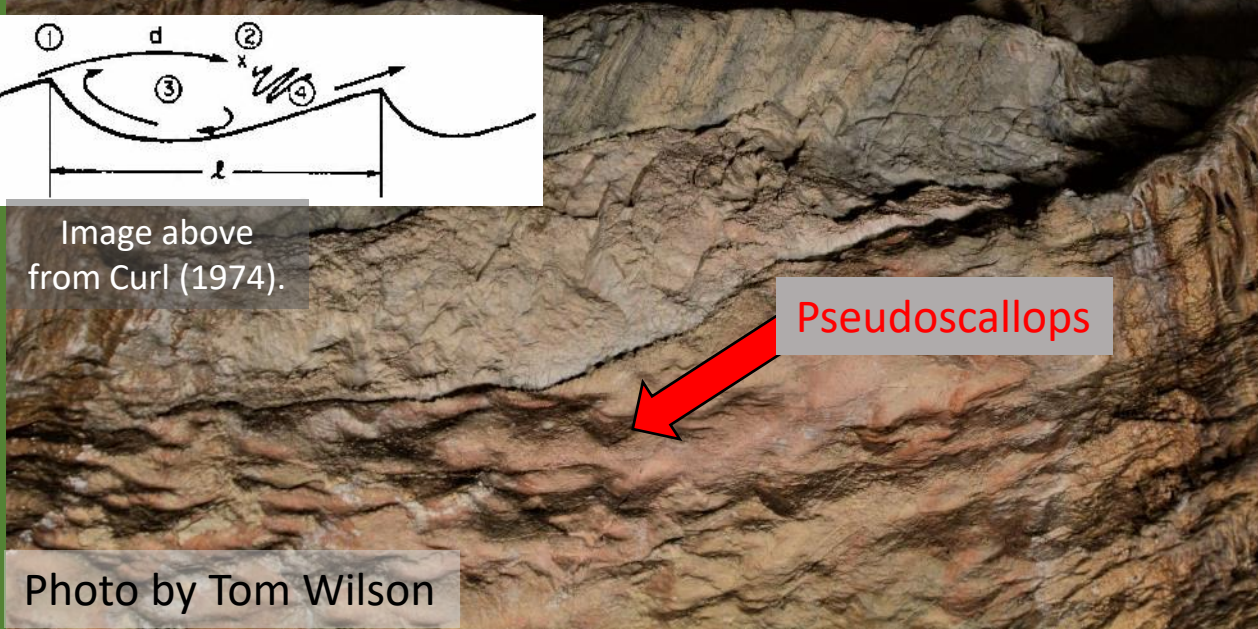
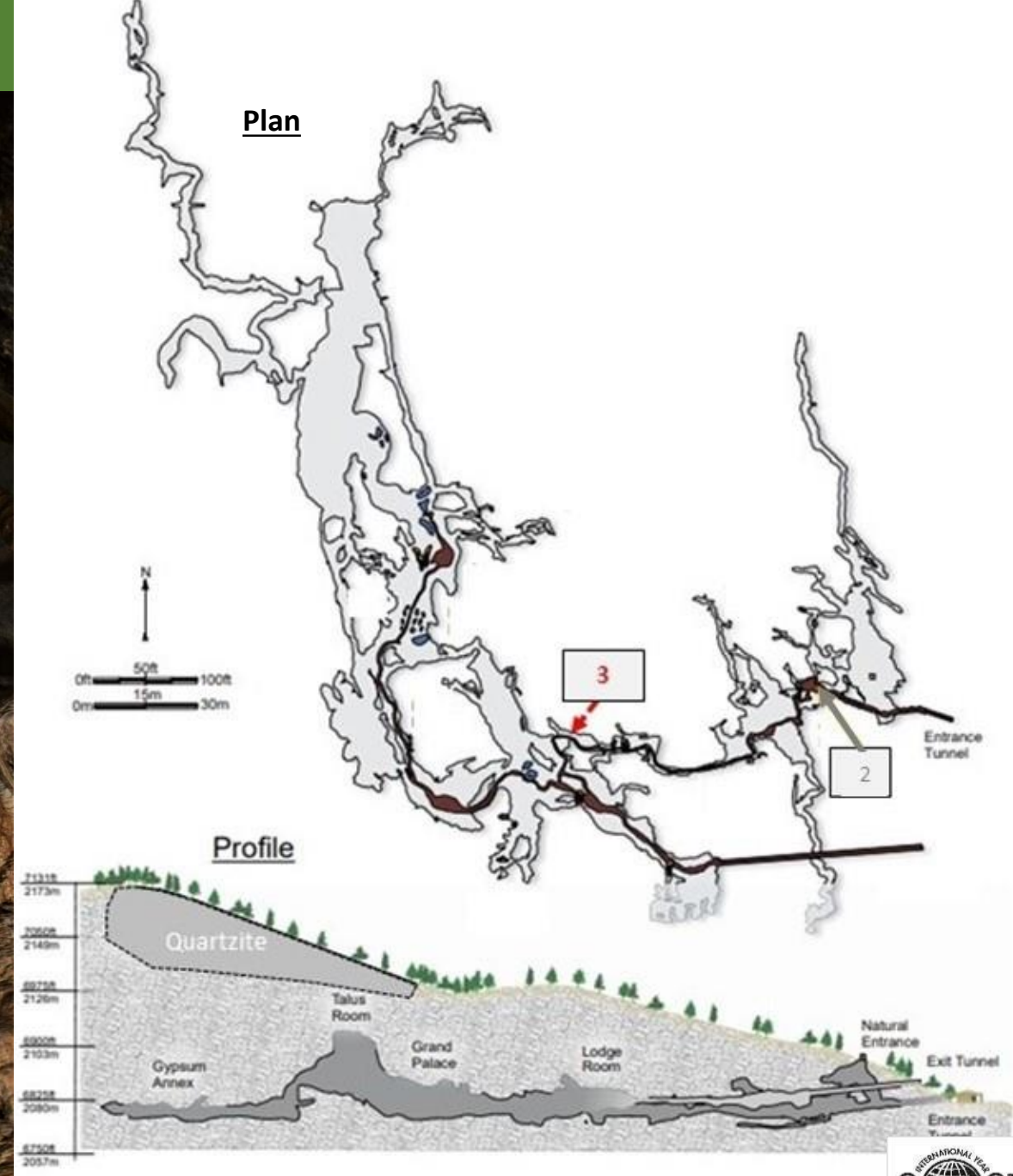


Photo by Tom Wilson



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.3



Pseudoscallops



Punk Rock



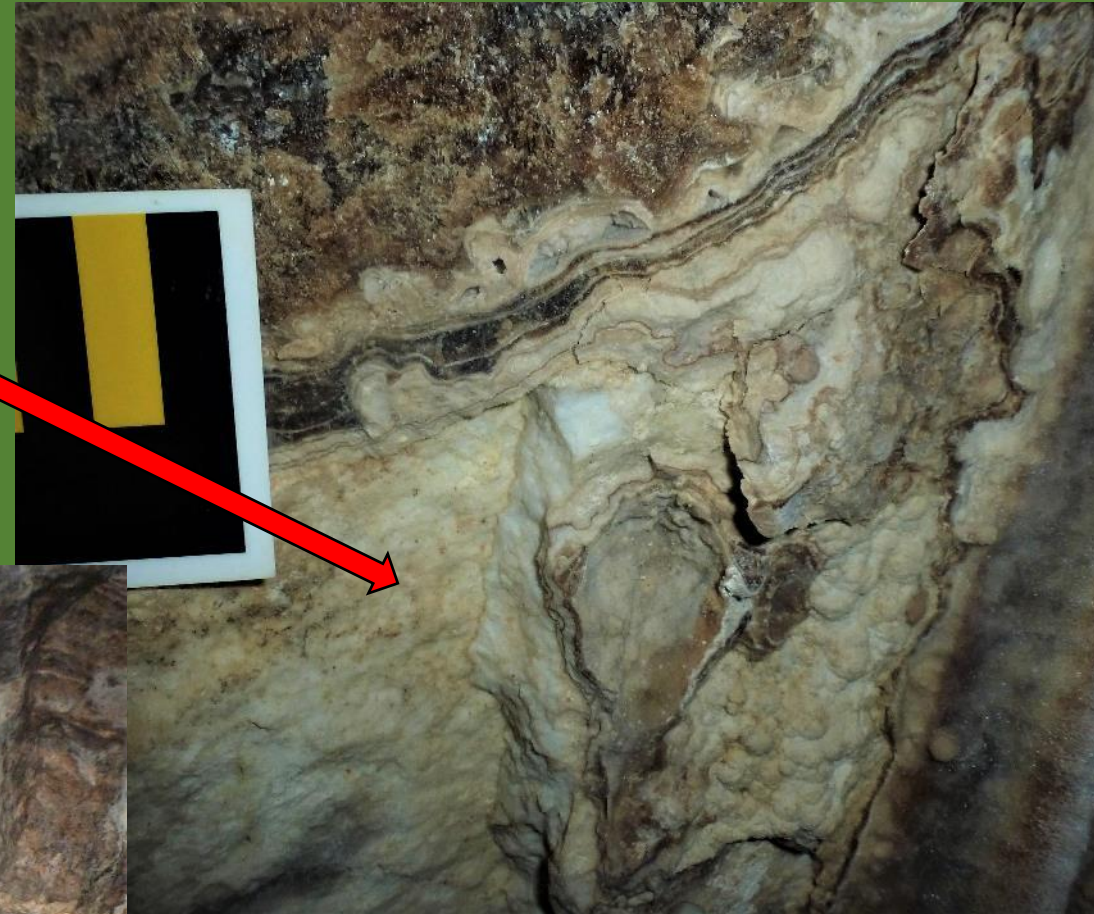
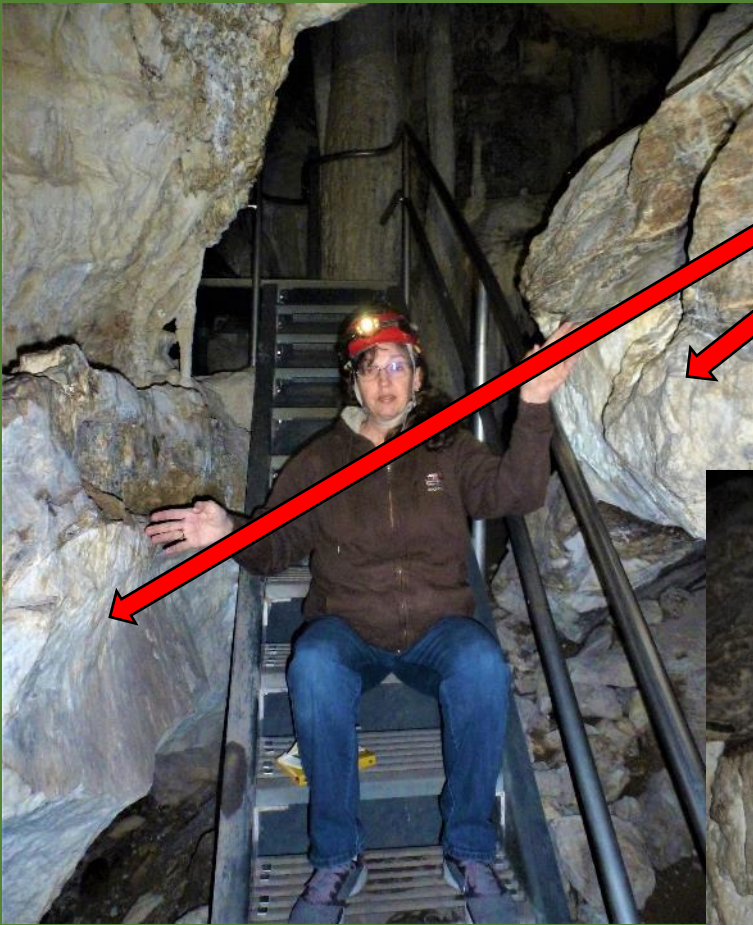
Photos by Tom Wilson

*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.3

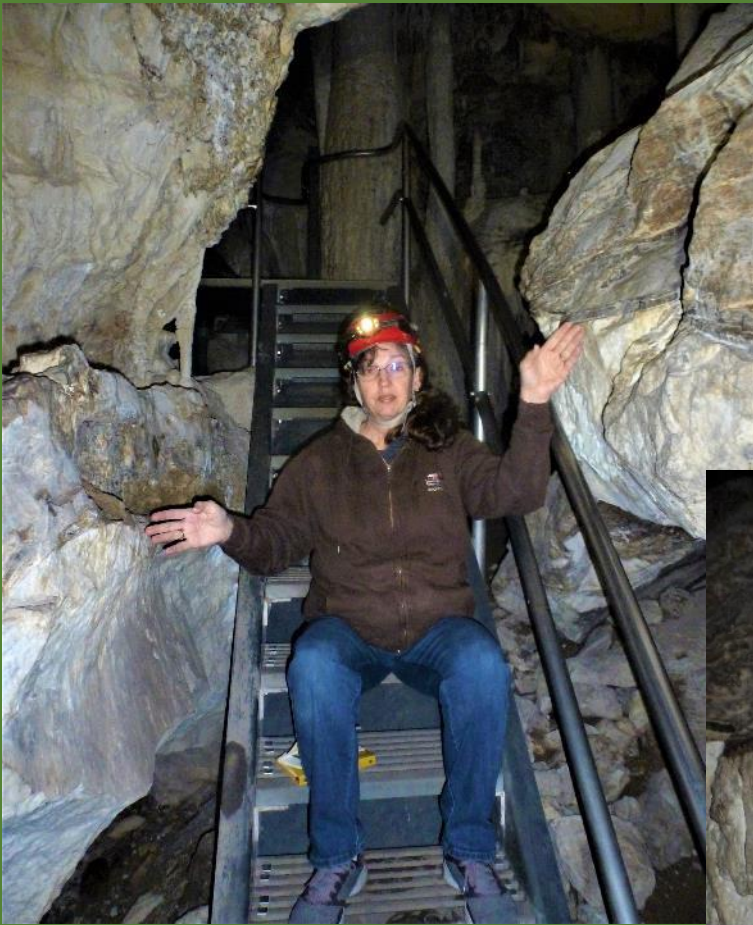
Massive  
white  
calcite  
under  
flowstone



*Hypogenic Caves of the Great Basin: Lehman Caves*



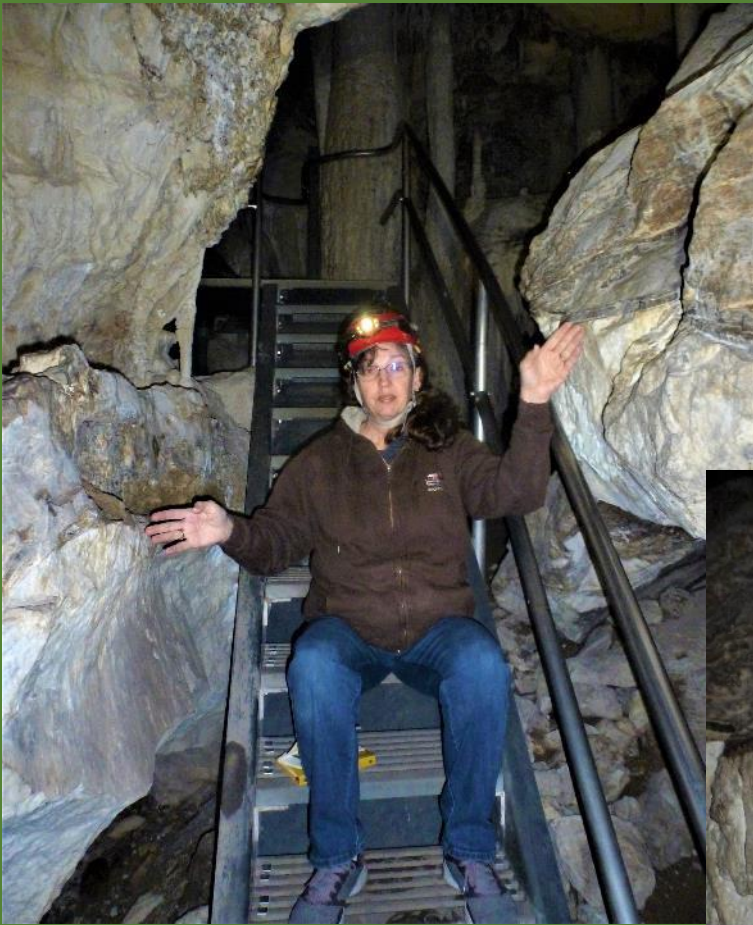
## Stop 6.3



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.3

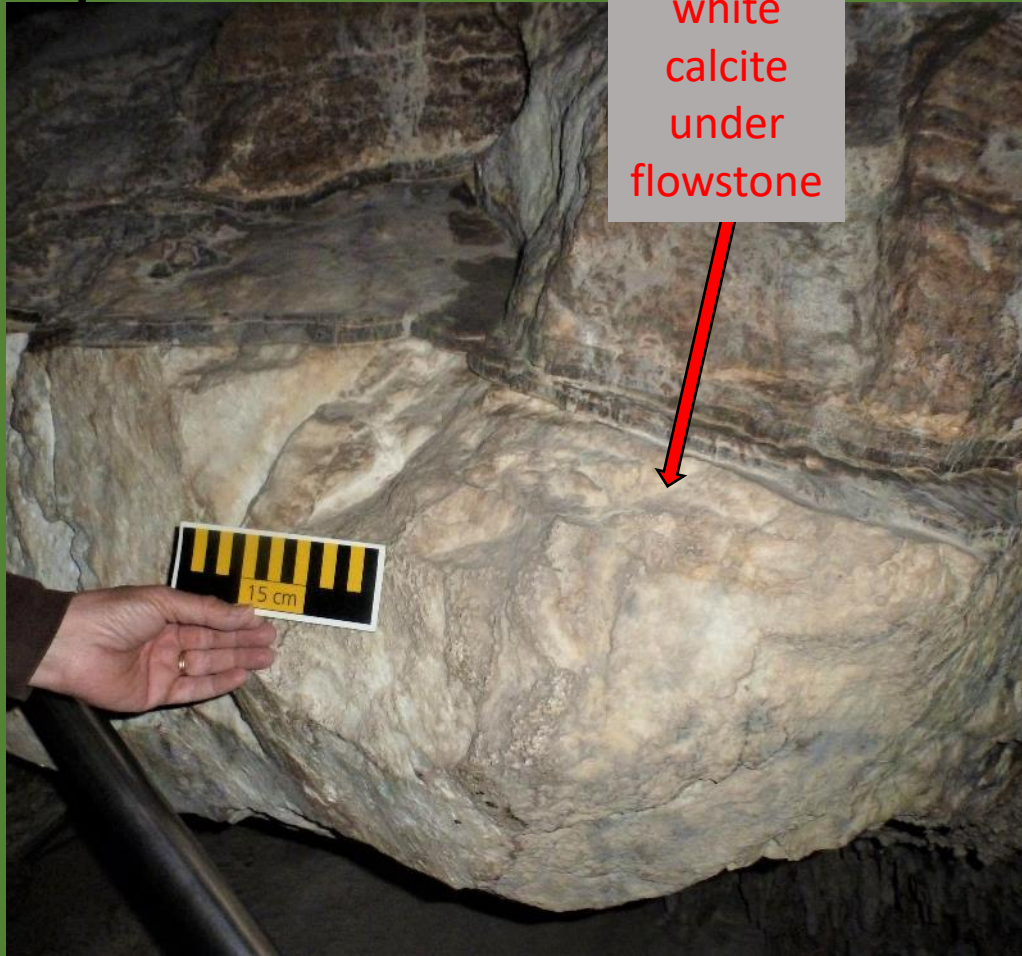


*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.3

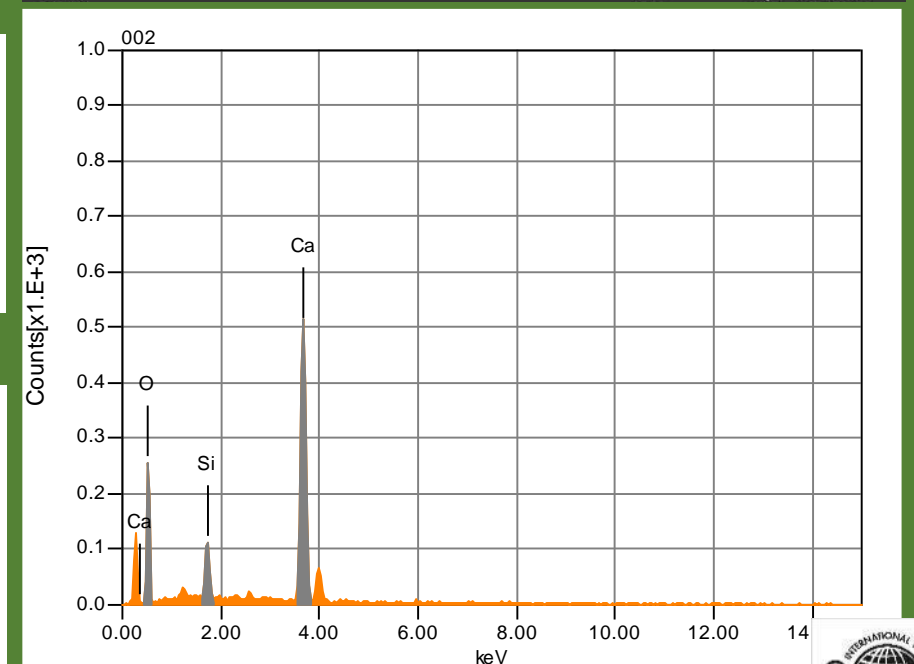
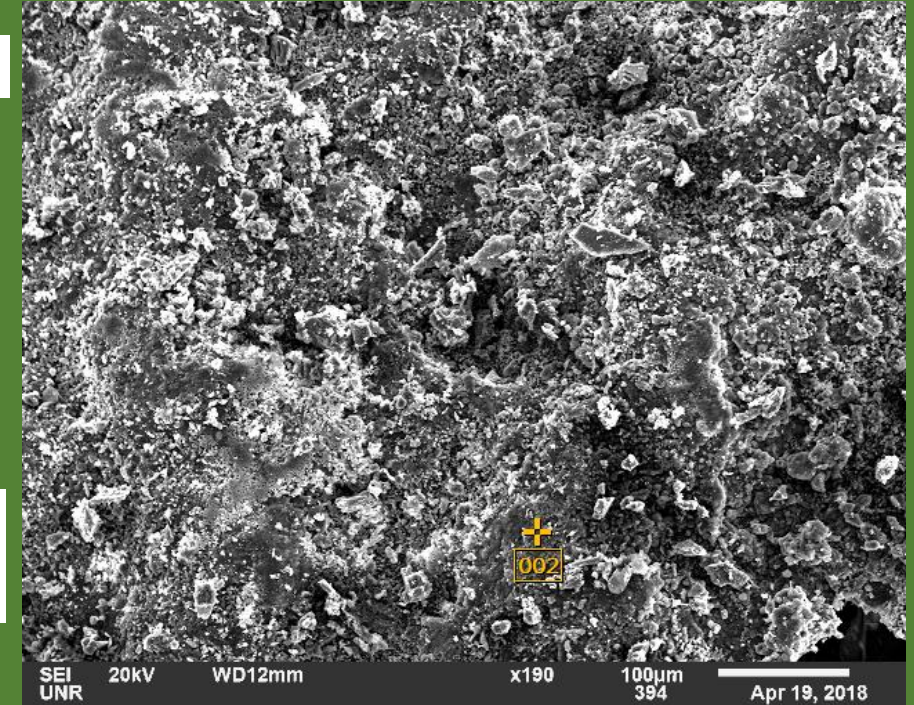
Massive  
white  
calcite  
under  
flowstone



Sample 3-grain 2-002

Volt : 20.00 kV  
Mag. : x 190  
Date : 2018/04/19  
Pixel : 1280 x 960

Acquisition Condition  
Instrument : 6510(LA)  
Volt : 20.00 kV  
Current : ---  
Process Time : T4  
Live time : 14.75 sec.  
Real Time : 15.00 sec.  
DeadTime : 2.00 %  
Count Rate : 982.00 CPS



Chemical formula	mass%	Atom%	Sigma	Net	K ratio	Line
O	61.25	78.95	0.50	5715	0.0323676	K
Si	5.04	3.70	0.15	4047	0.0082336	K
Ca	33.71	17.35	0.31	25333	0.0809111	K
Total	100.00	100.00				

*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.3

Coralloidal-  
encrusted  
driptubes



Deepest hole:  
42 cm deep

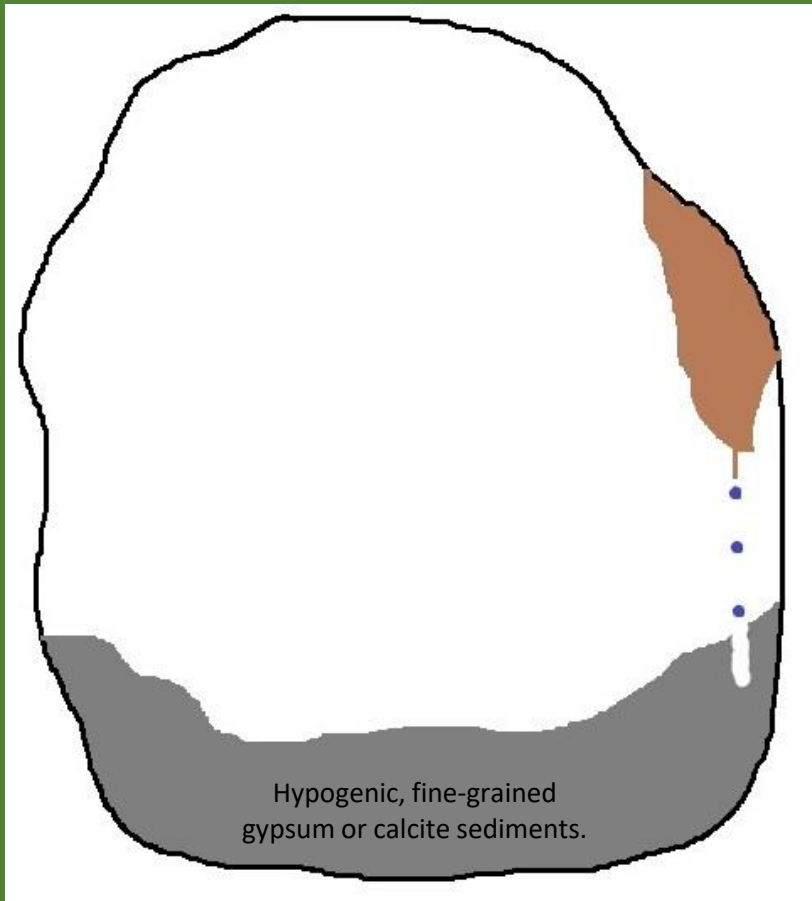


Coralloidal-  
encrusted  
driptubes

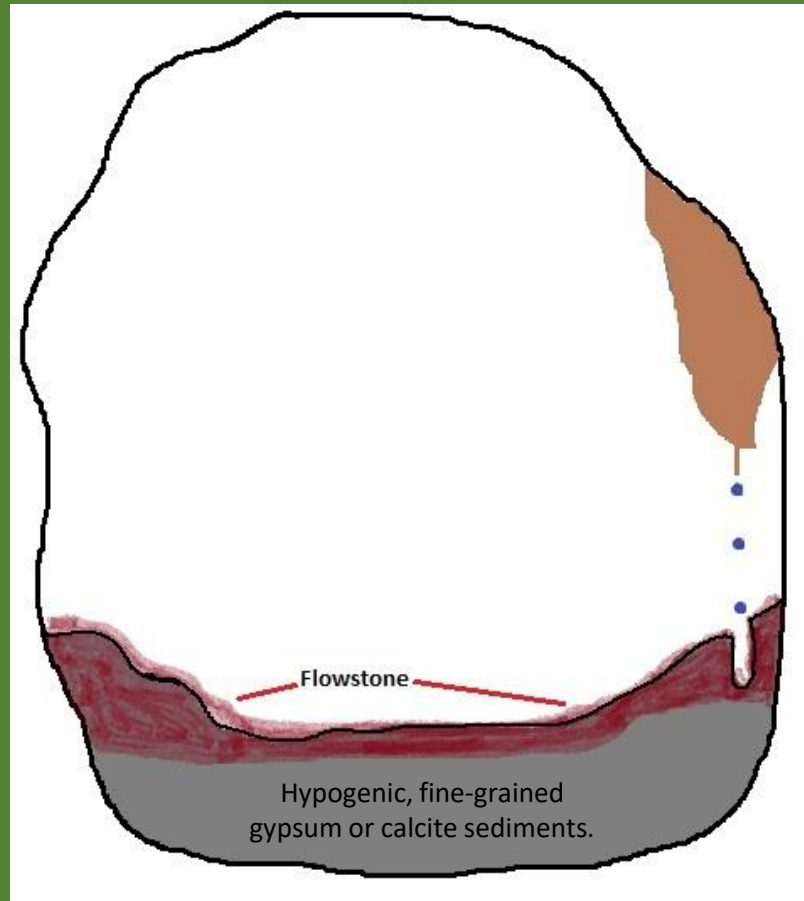


# Stop 6.3

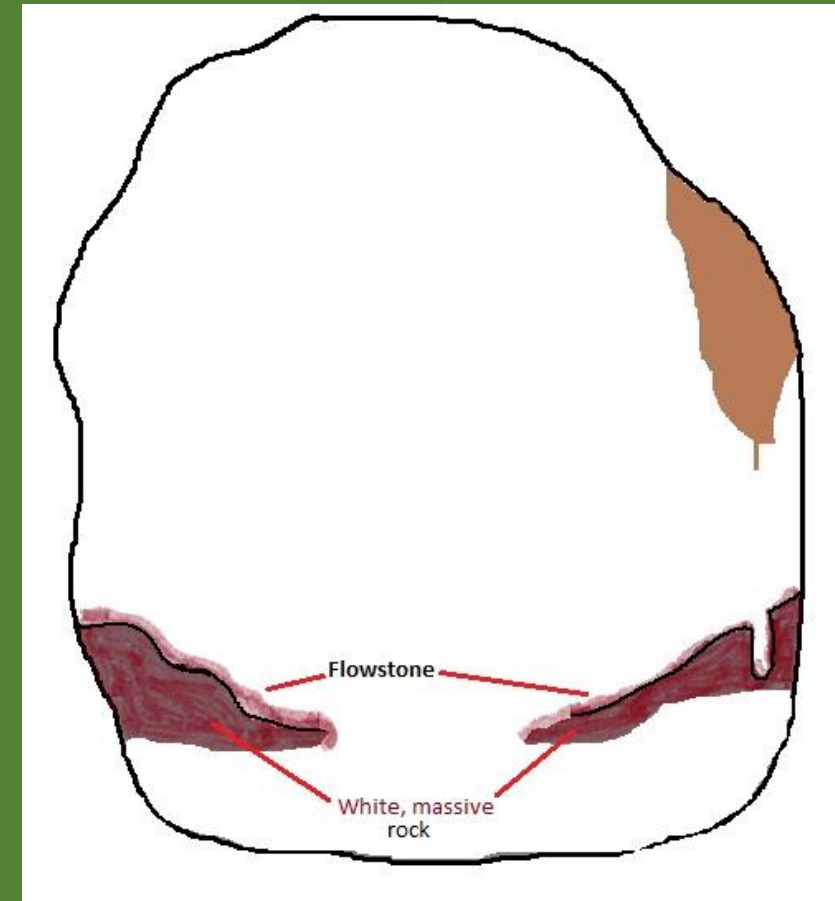
## HYPOTHESIS



Stage 1



Stage 1



Today



# Stop 6.3



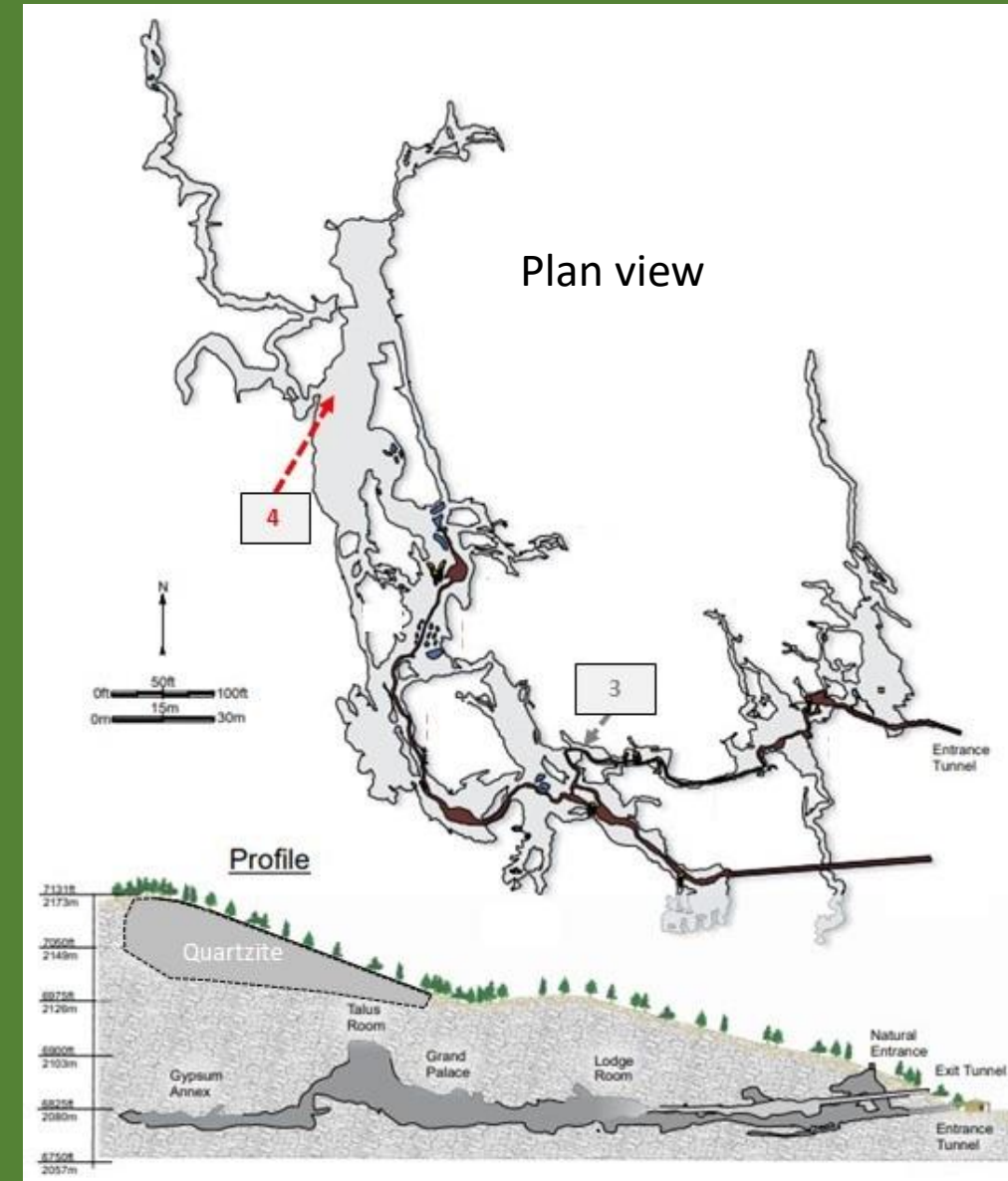
Coralloidal-encrusted driptubes

Photos by Tom Wilson

*Hypogenic Caves of the Great Basin: Lehman Caves*

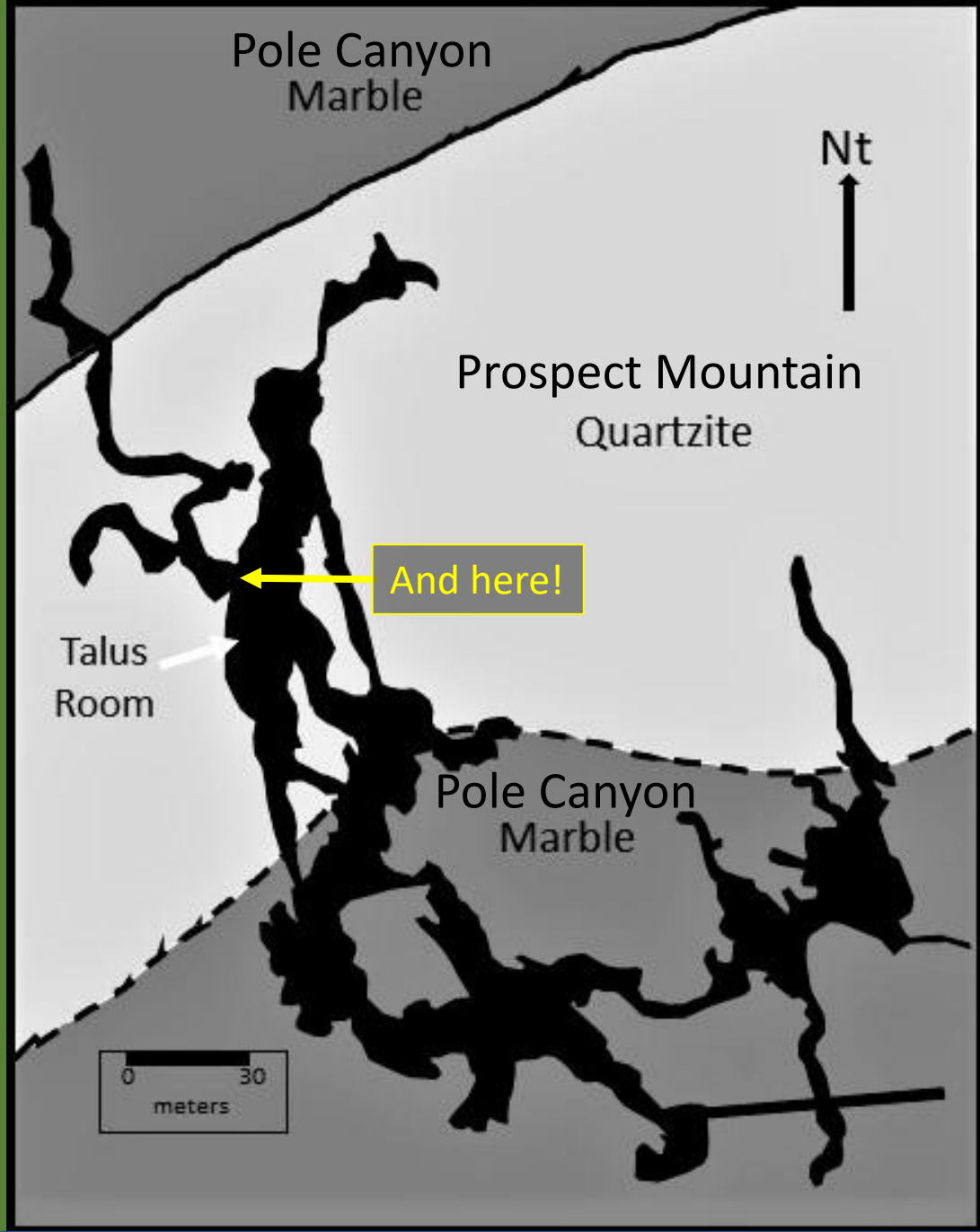


# Stop 6.4 – Talus Room





Stop 6.4



Stratigraphic section, north end of southern Snake Range

Age	Stratigraphic unit (thickness, meters) <sup>1</sup>
CENOZOIC	Younger and older alluvial, fluvial and glacial deposits (<150 m)
	Miocene conglomerate, with megabreccia blocks and lacustrine deposits (1,500 m)

Middle Cambrian and Ordovician carbonate rocks occur as local faulted blocks. Ordovician through Permian rocks have been removed by faulting and are not exposed, but are possibly present in subsurface

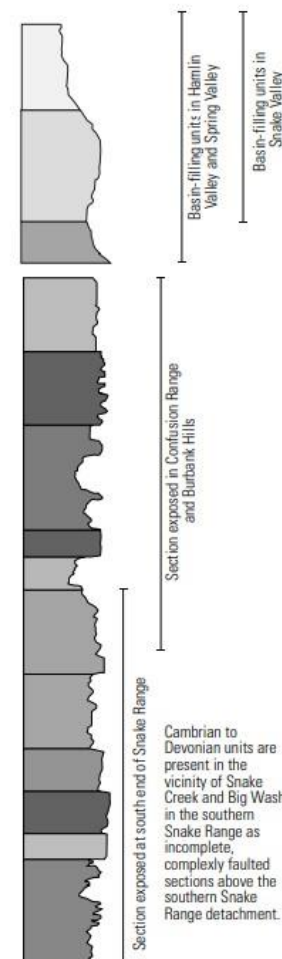
CAMBRIAN	Pole Canyon Limestone (500 m)
	Pioche Shale (100 m)
PRECAMBRIAN	Prospect Mountain Quartzite (1,500 m)
	McCoy Creek Group
Jurassic (Jgr), Cretaceous (Kgr) and Tertiary (Tgr) plutonic rocks	

<sup>1</sup> Generalized unit thickness after National Park Service, 2007

Stratigraphic section, southern Snake Range and nearby ranges

Age	Stratigraphic unit (thickness, meters) <sup>2</sup>
CENOZOIC	Younger and older alluvial and fluvial deposits (<150 m)
	Miocene and Pliocene basin-fill deposits (1,750 m)
	Oligocene volcanic rocks
PERM.	Arcturus Formation (750 m)
PENN.	Ely Limestone (800 m)
MISSISSIPPIAN	Chainman Shale (600 m)
	Joanna Limestone (150 m)
	Pilot Shale (150 m)
DEVONIAN	Guilmette Formation (1,250 m)
	Simonson Dolomite (200 m)
	Sevy Dolomite (400 m)
	Laketown Dolomite (400 m)
SIL.	Ely Springs Dolomite (100 m)
	Eureka Quartzite (125 m)
	Pogonip Group (500 m)

<sup>2</sup> Generalized unit thickness after Hintze and Davis, 2003  
SIL., Silurian; PENN., Pennsylvanian; PERM., Permian



Precambrian and Cambrian units are not exposed in Confusion Range but inferred to exist at depth.



## Stop 6.4



Stretching and prep to go in

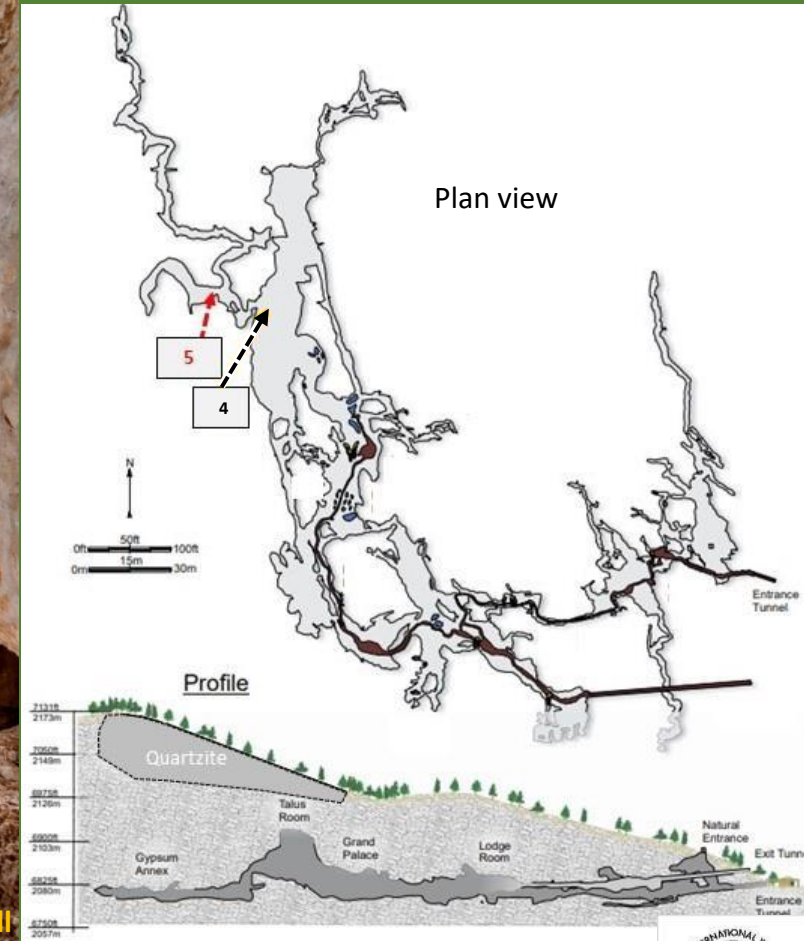




## Stop 6.5 Gypsum Annex: Acid pool basin

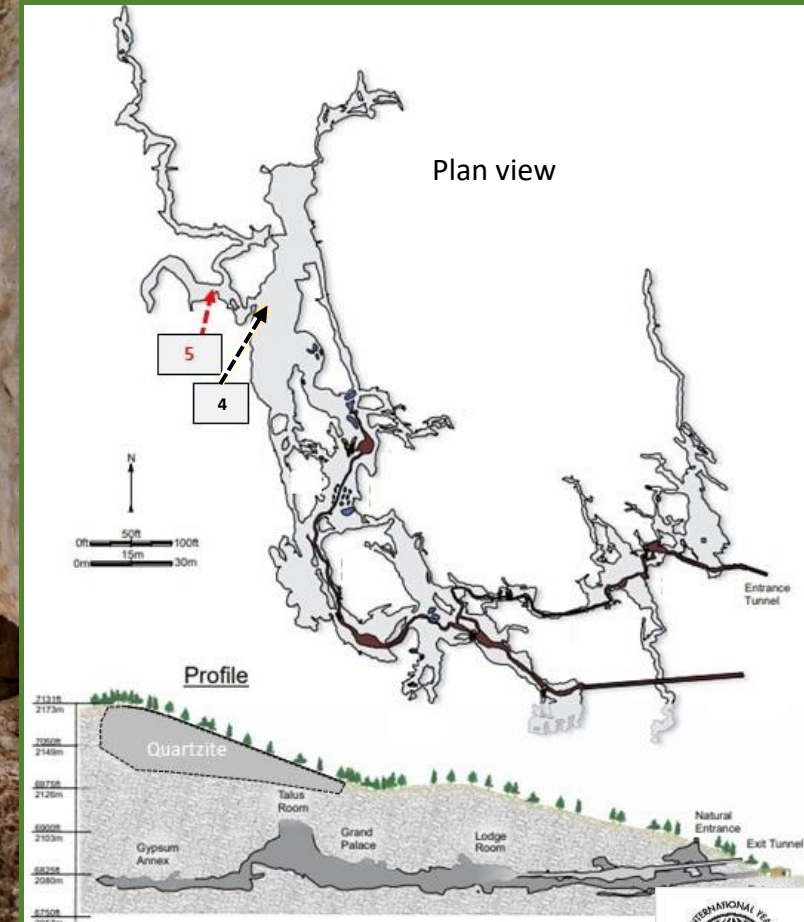
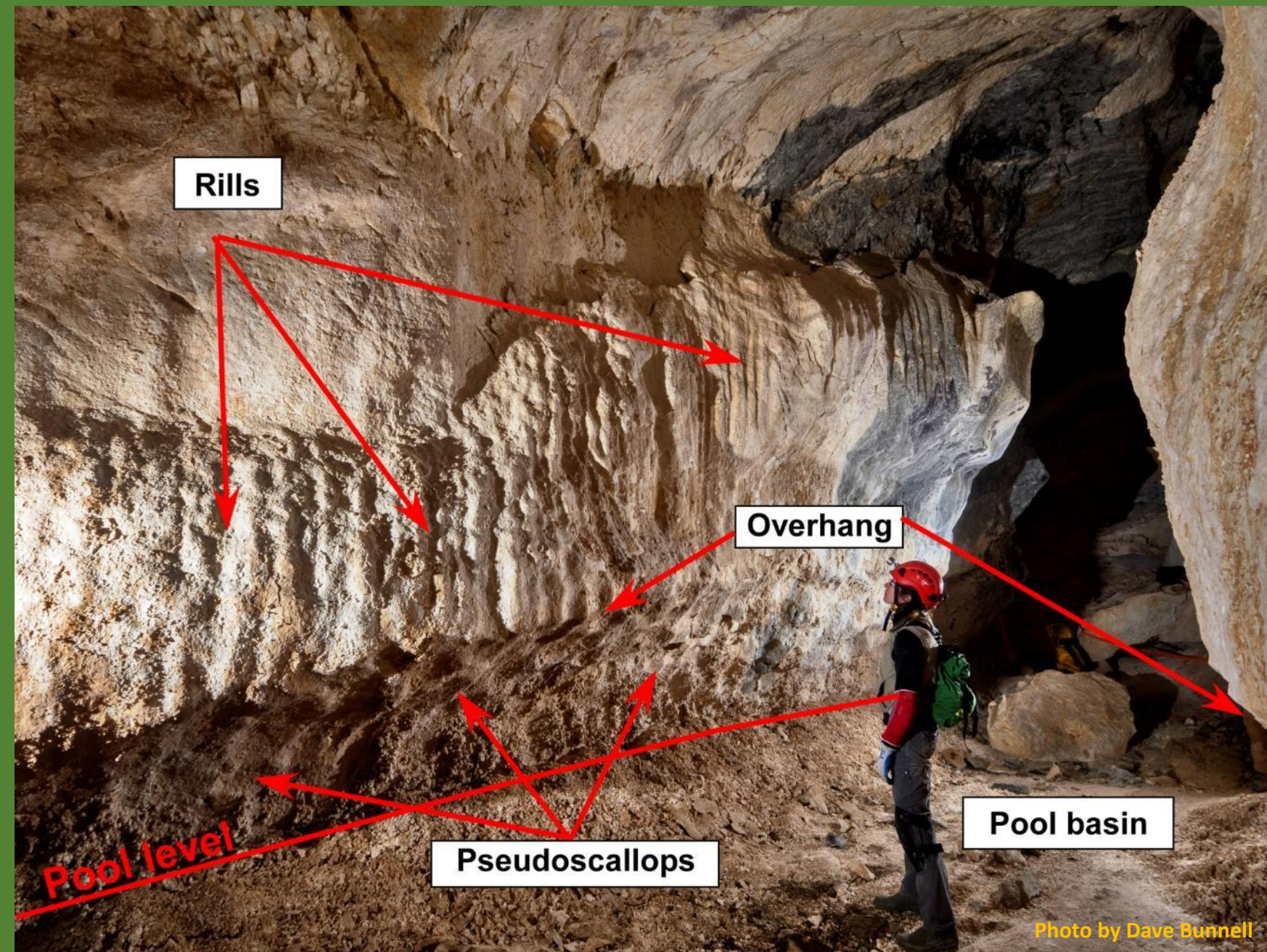


Photo by Dave Bunnell





## Stop 6.5 Gypsum Annex: Acid pool basin



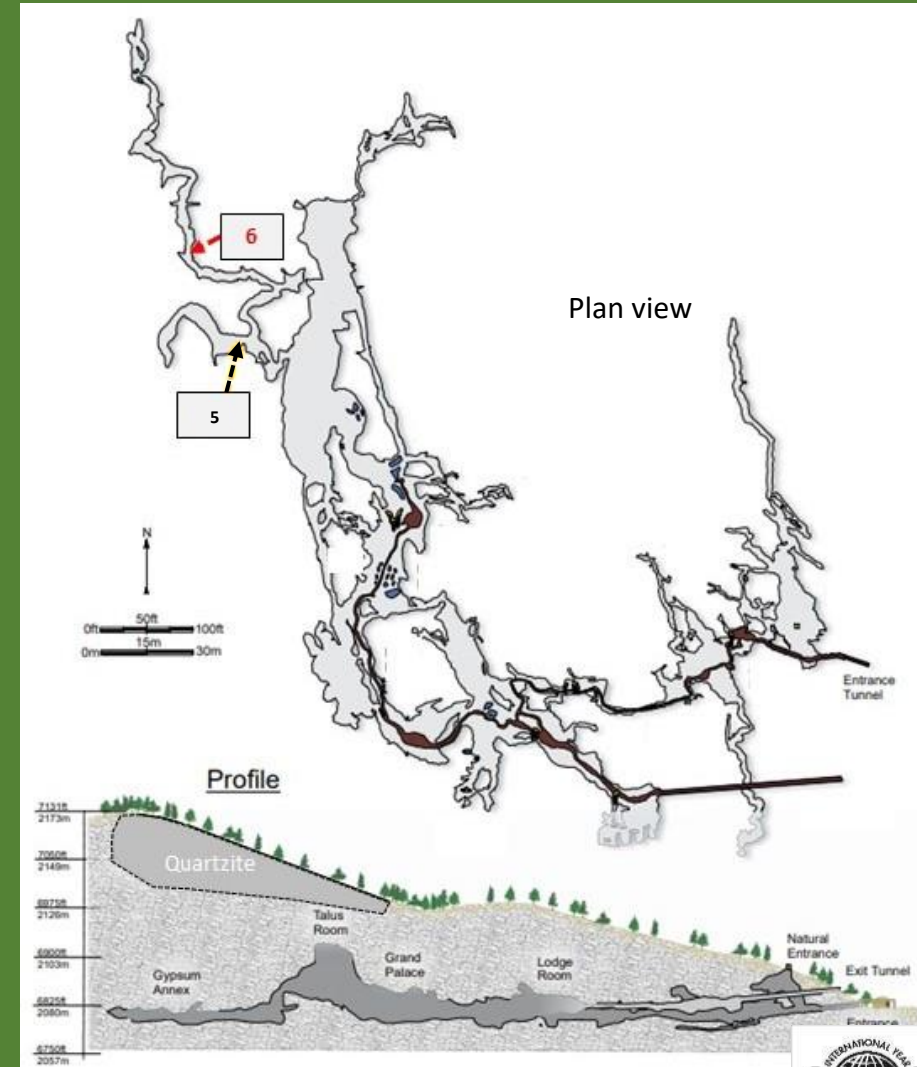


## Stop 6.6

### Gypsum Annex: Constriction in passage:



Photo by Gretchen Baker





## Stop 6.6

### Gypsum Annex: Constriction in passage:

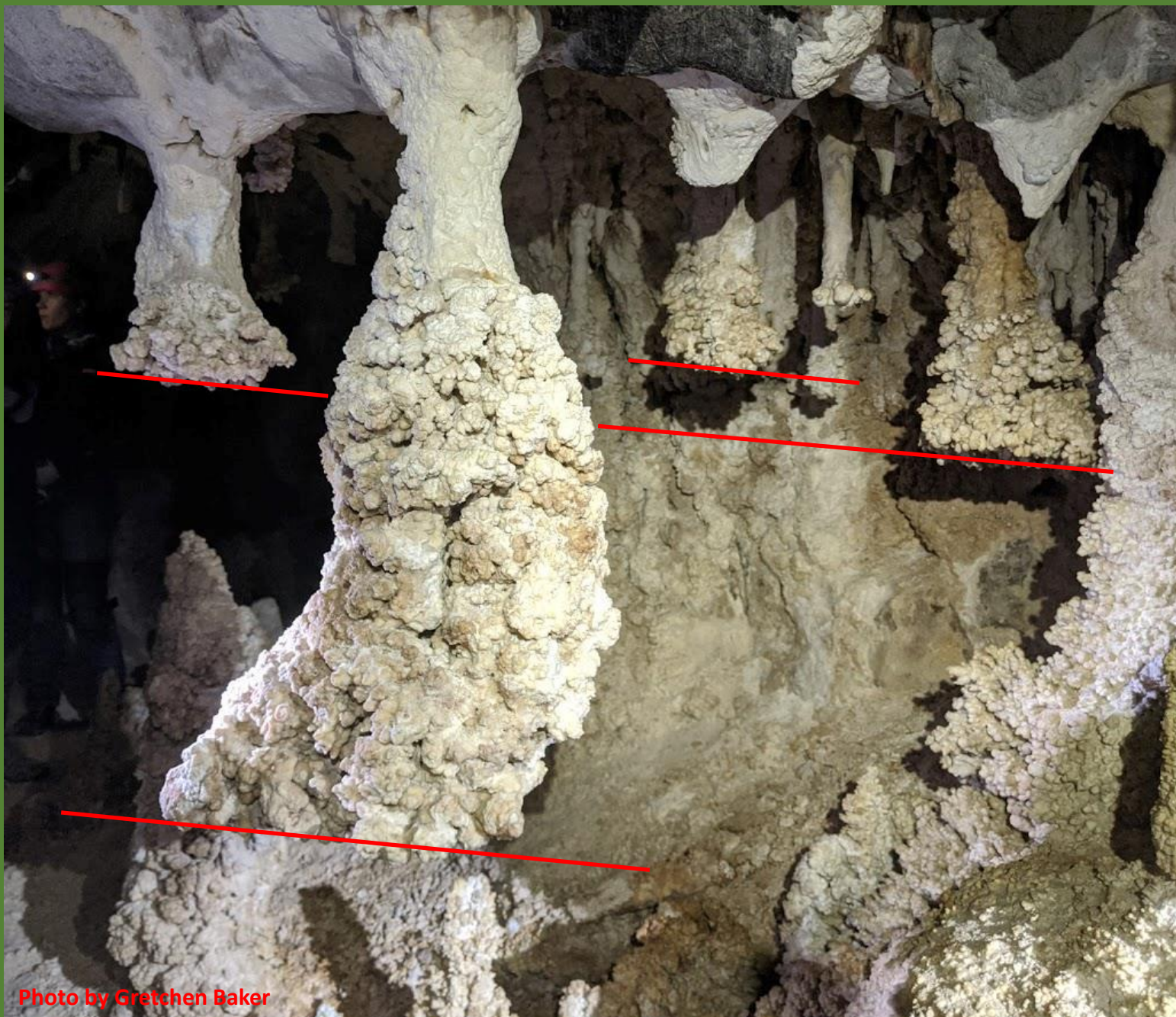
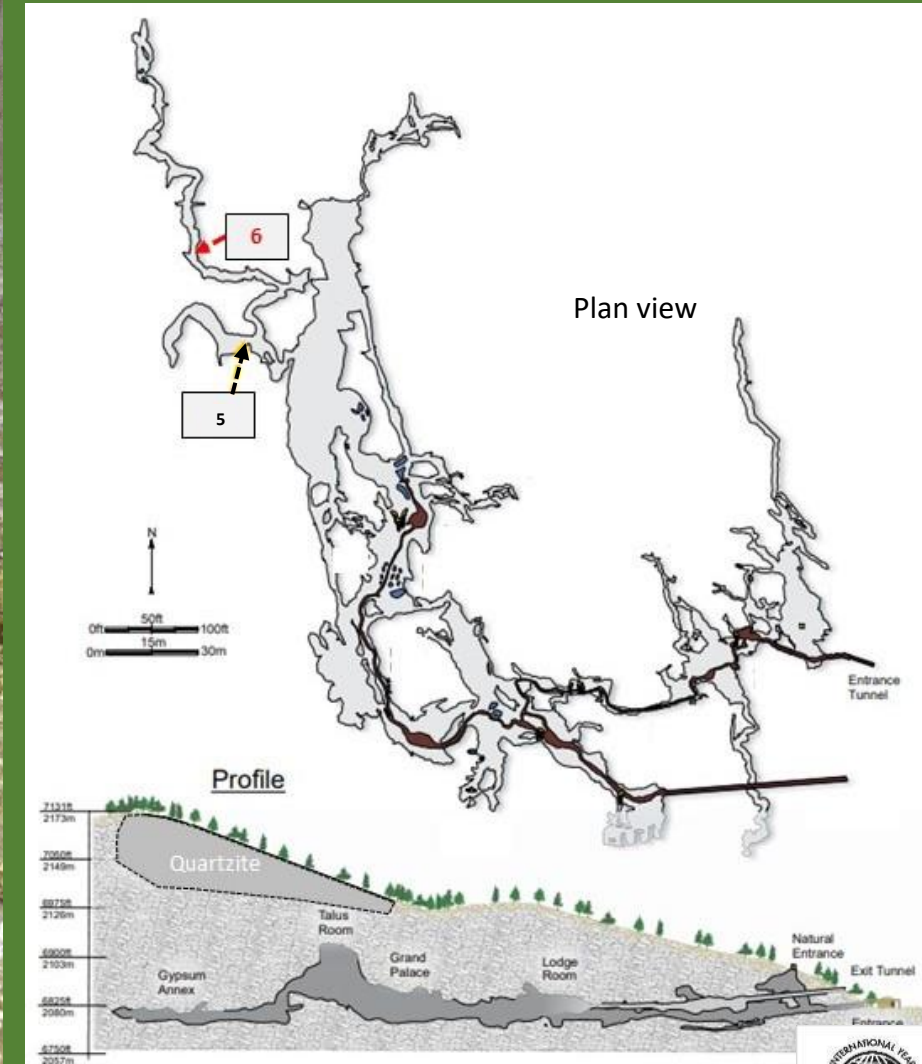


Photo by Gretchen Baker



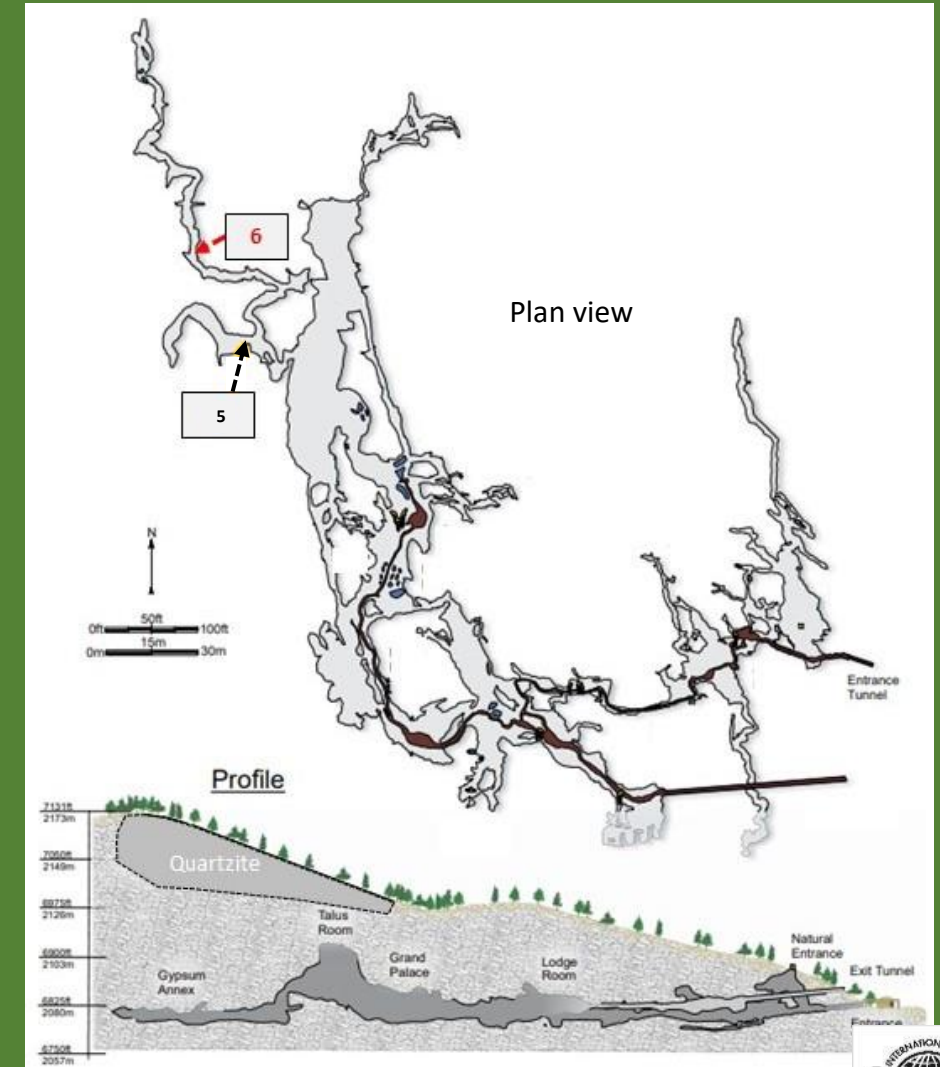


## Stop 6.6

### Gypsum Annex: Trays on wall



Photo by Gretchen Baker



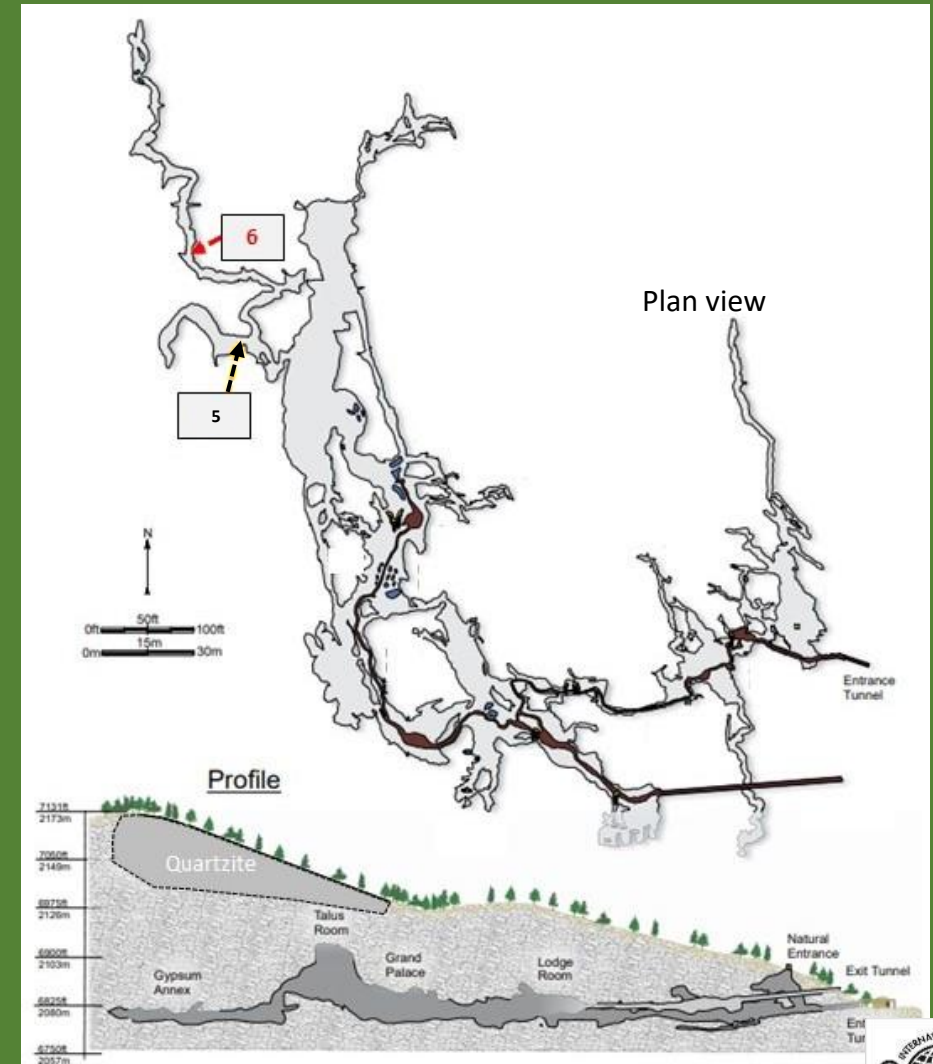


## Stop 6.6

### Gypsum Annex: Trays on wall



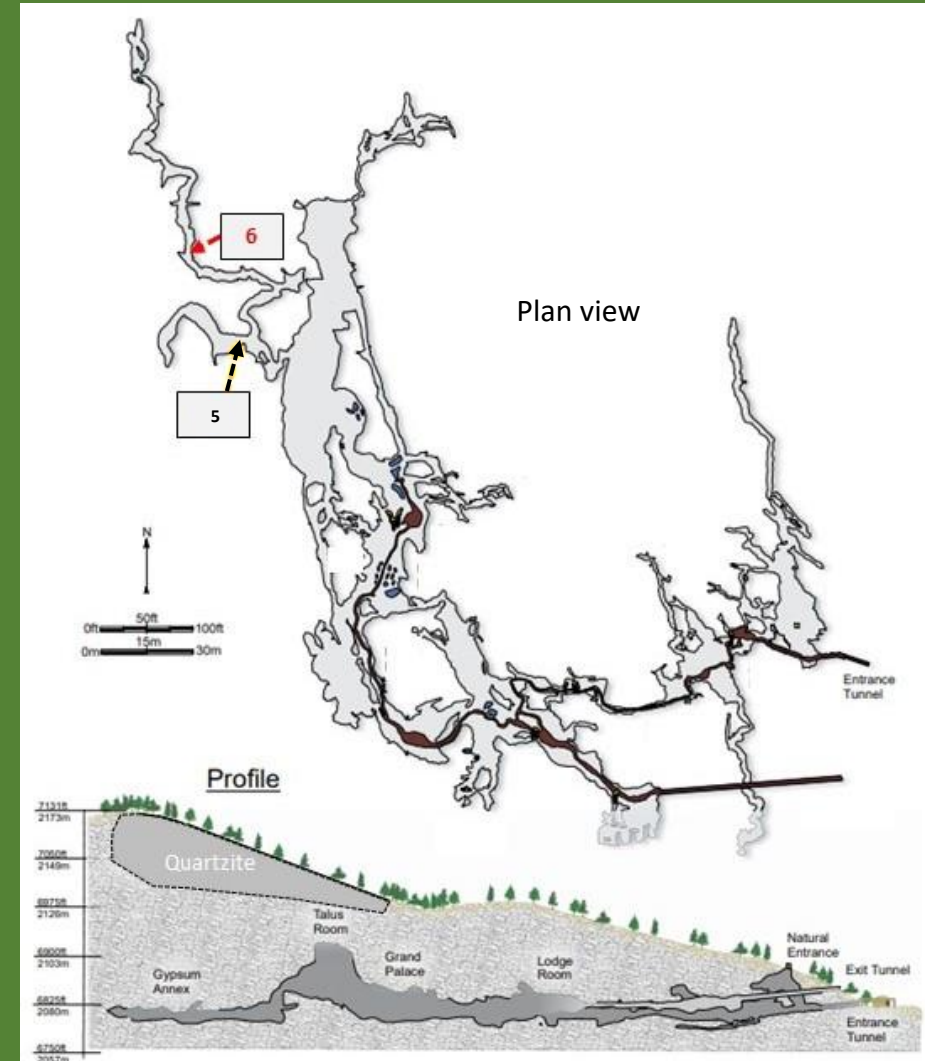
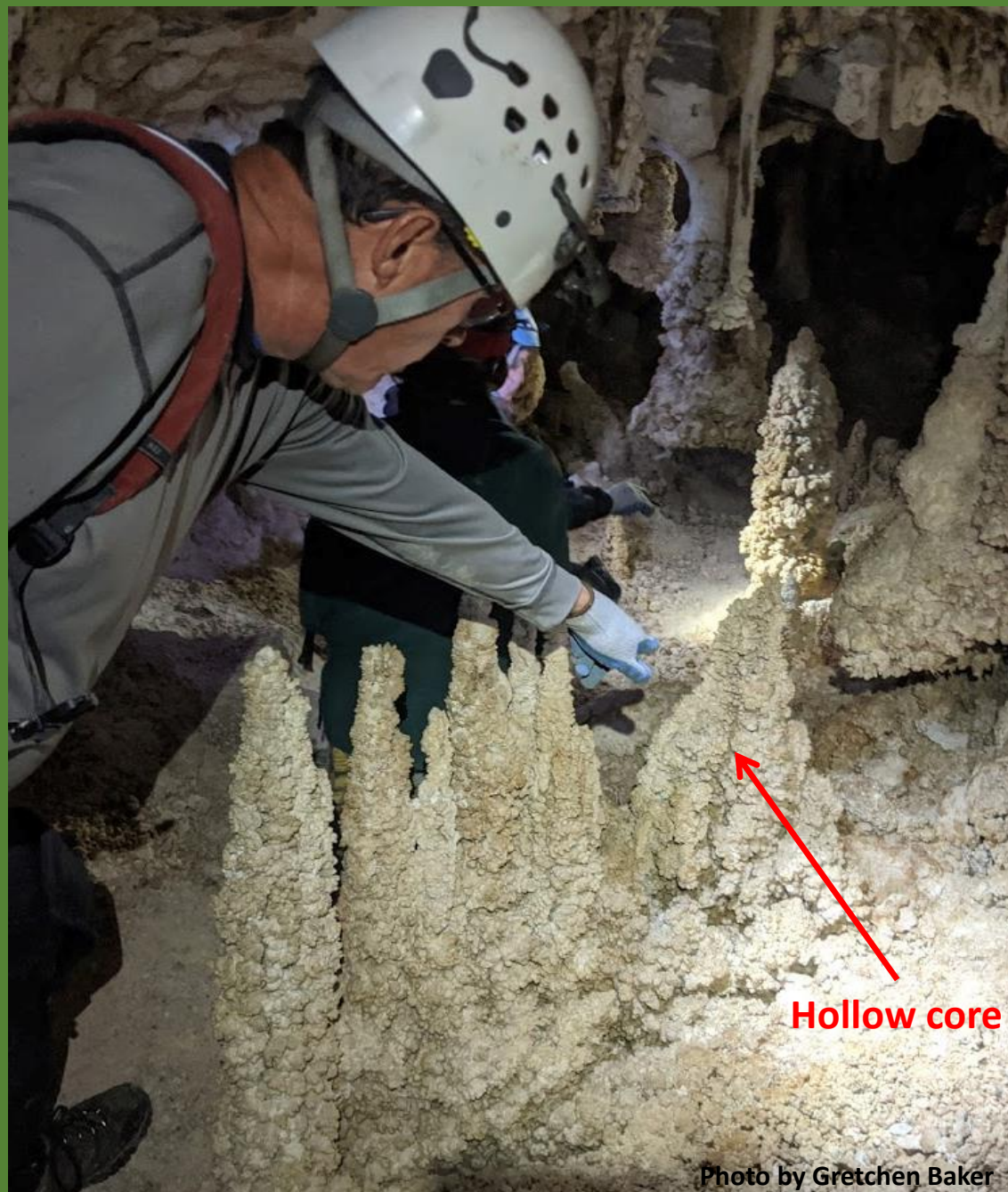
Photo by Gretchen Baker





## Stop 6.6

### Gypsum Annex: Hollow coralloid “stalagmites”

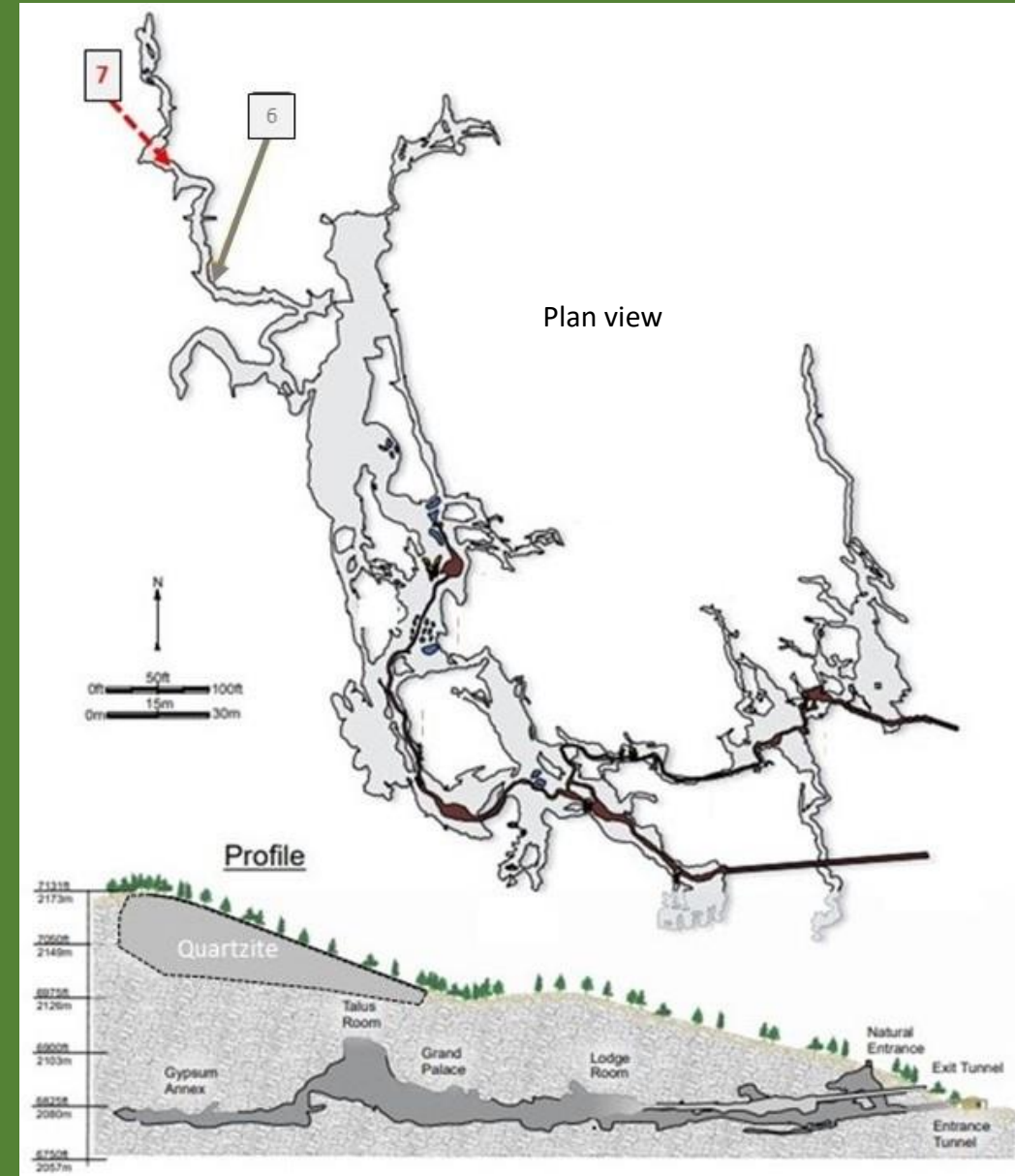




## Stop 6.7 – Gypsum Annex Passage



Photo by Dave Bunnell





## Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



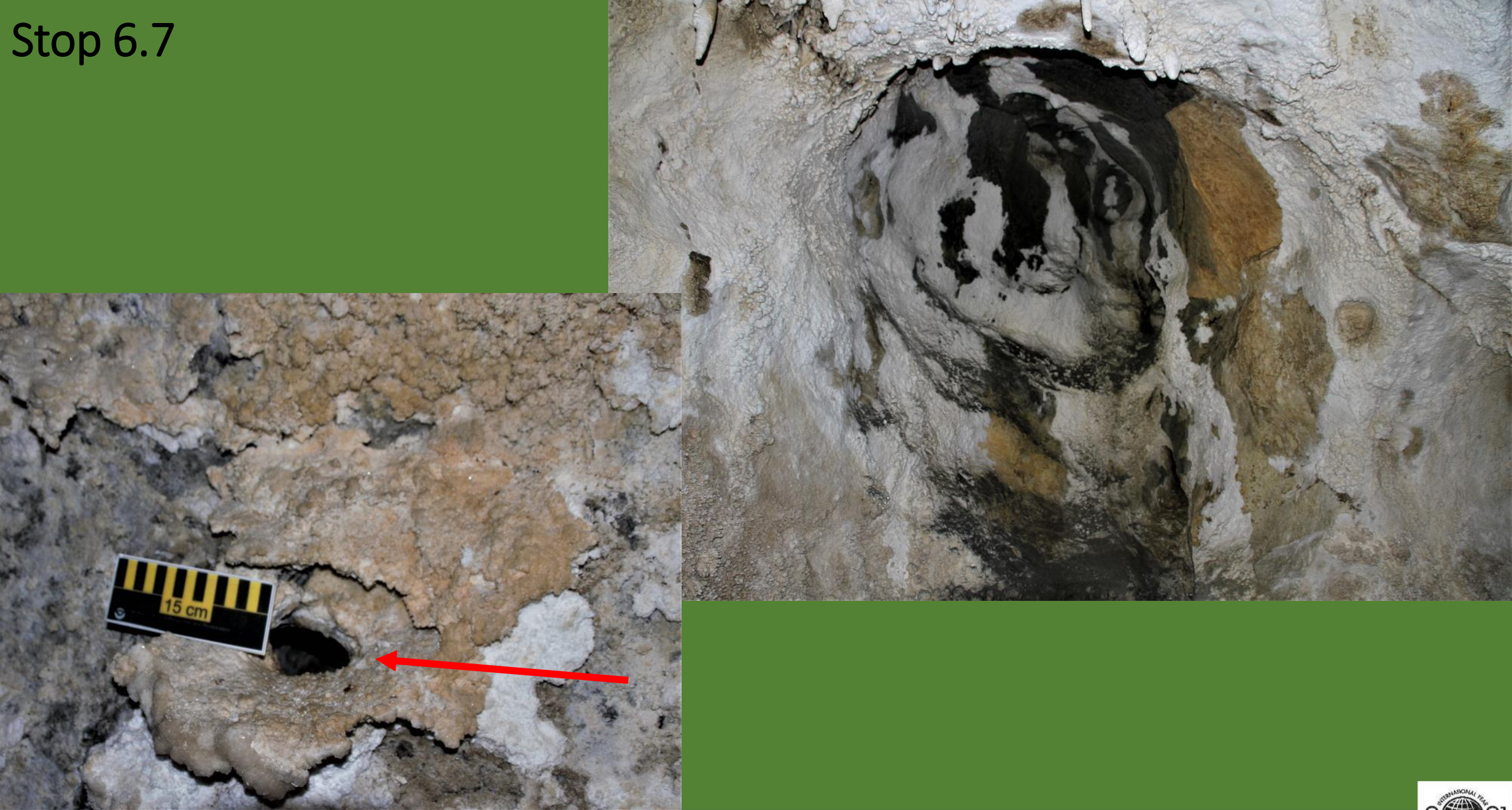
## Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



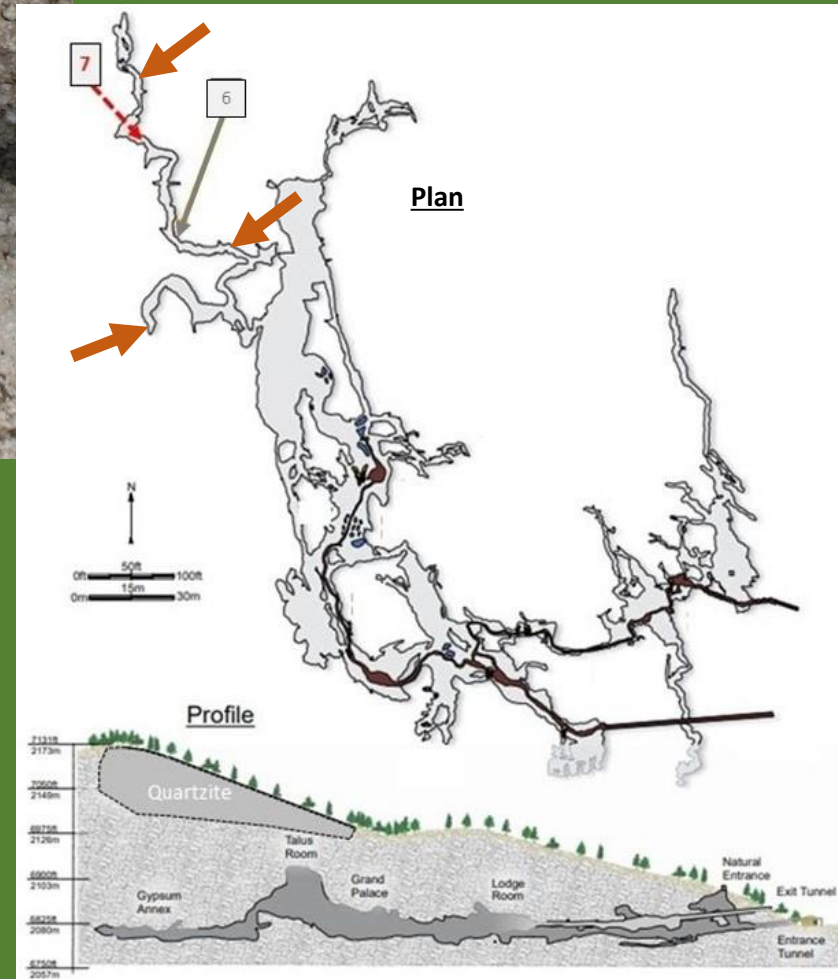
## Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



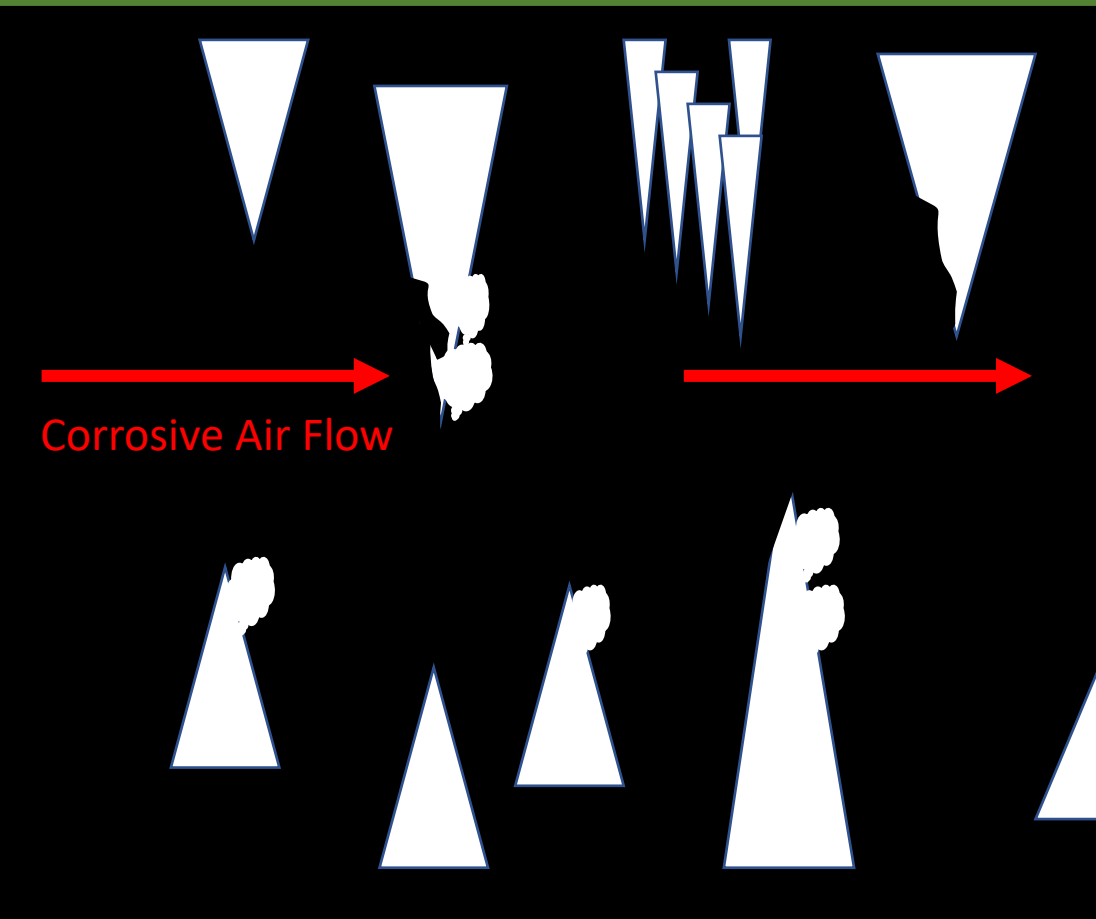
# Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



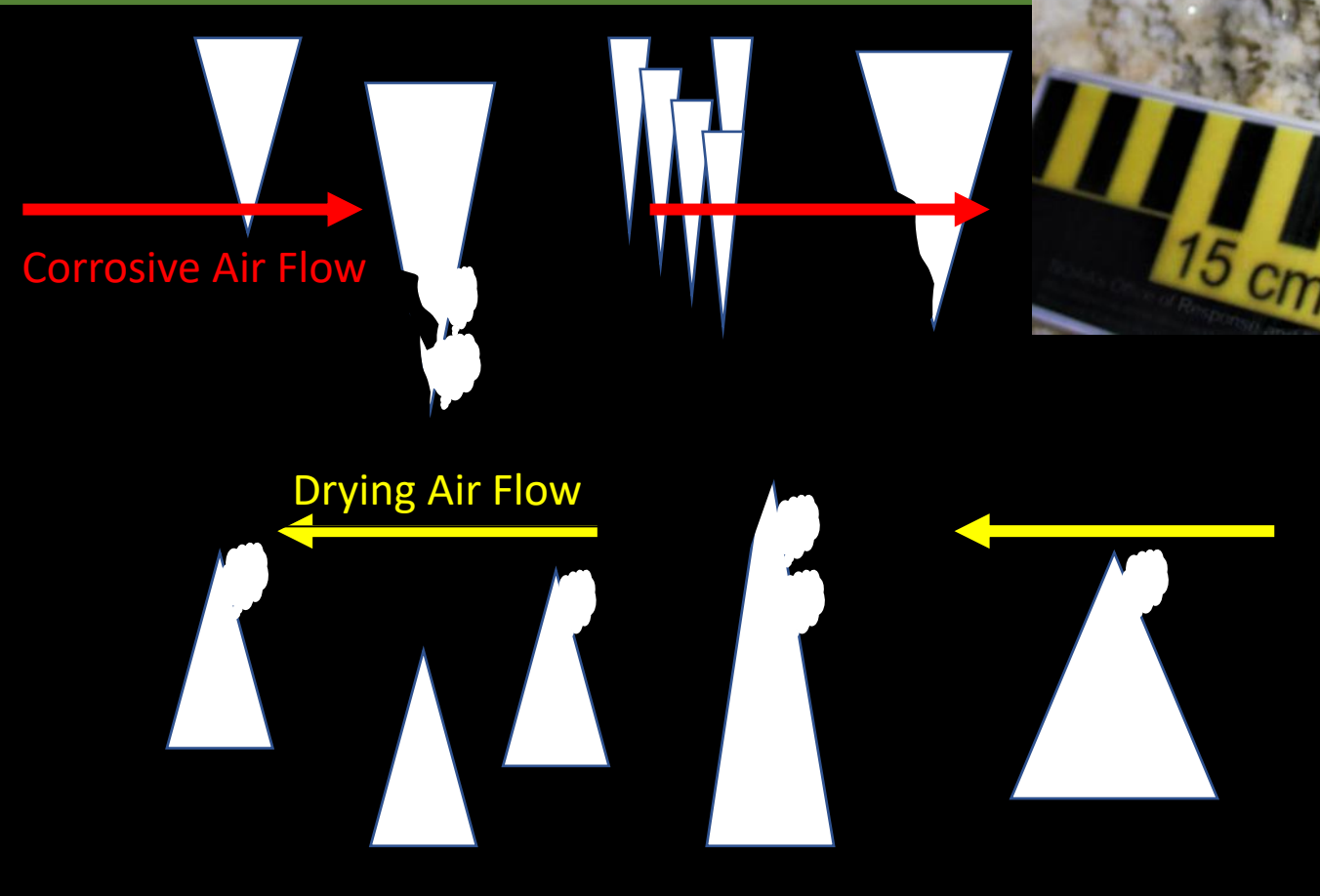
# Stop 6.7



*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.7



Aragonite



Punk rock



Cave popcorn

Photo by Dave Bunnell



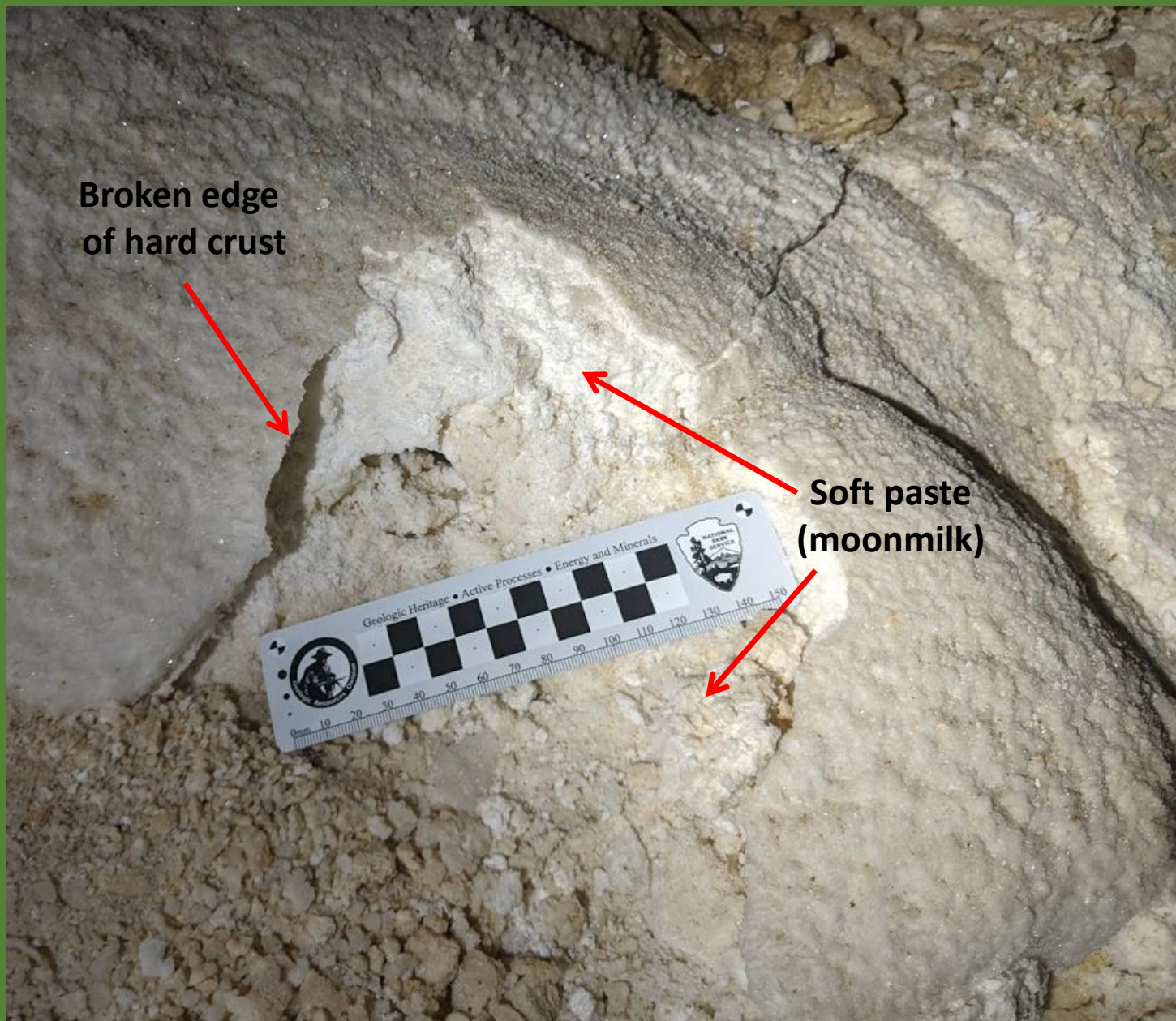
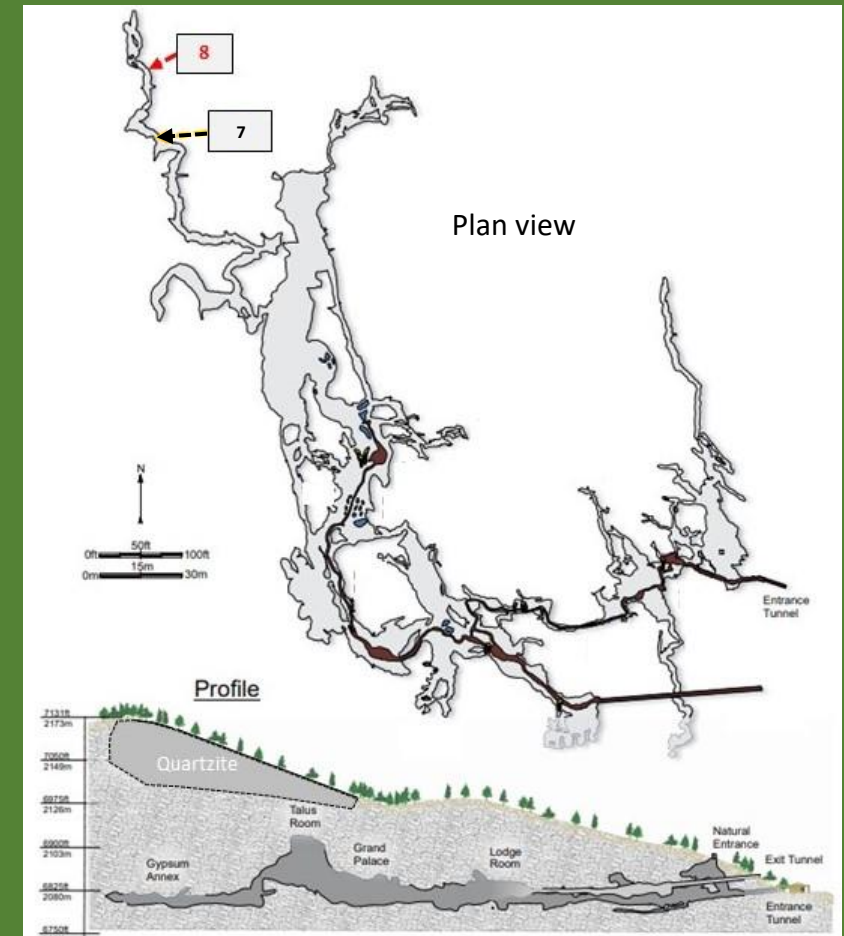


Photo by Gretchen Baker

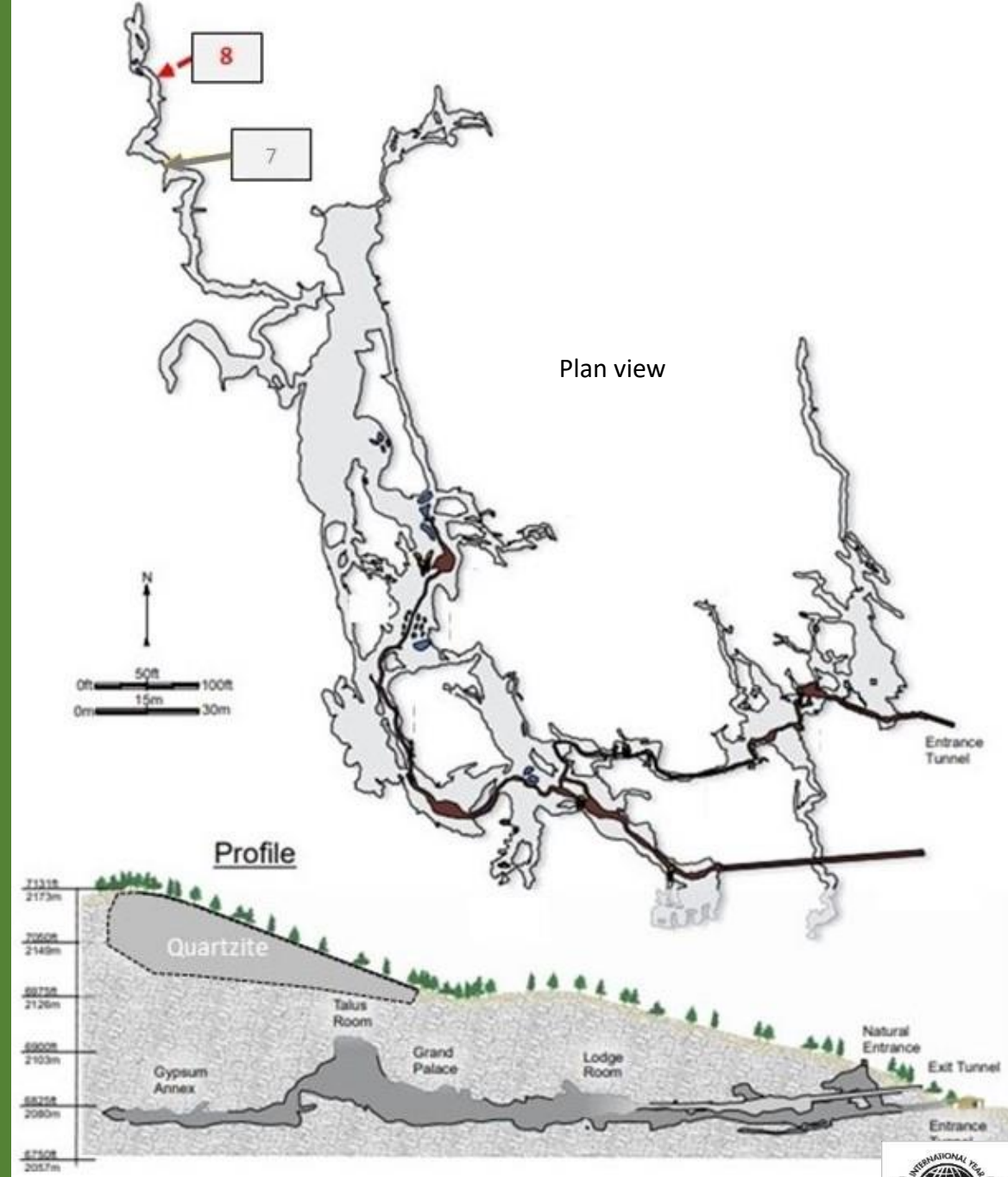
## Stop 6.8

### Gypsum Annex, north end: Moonmilk with hard crust





# Stop 6.8 –N end of Gypsum Annex Passage



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.8



Black and brown corrosion residues coating speleothem surfaces

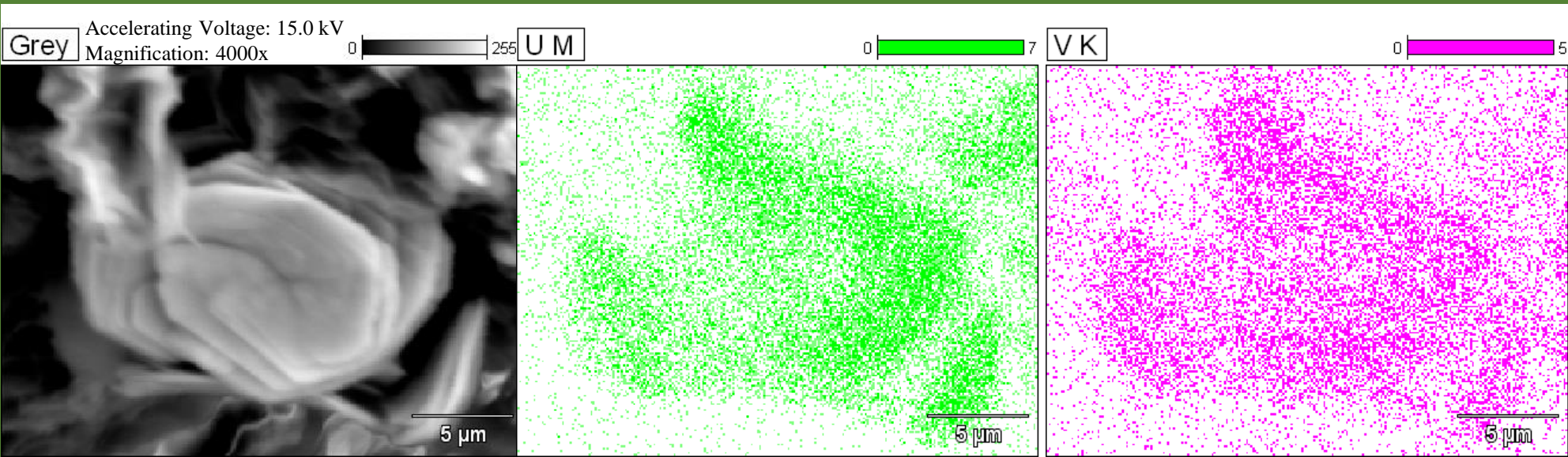


# Stop 6.8

Small areas of yellow mineral in white floor crusts lining passage



SEM-EDS indicates crystal structure and U-V composition consistent with metatyuyamunite

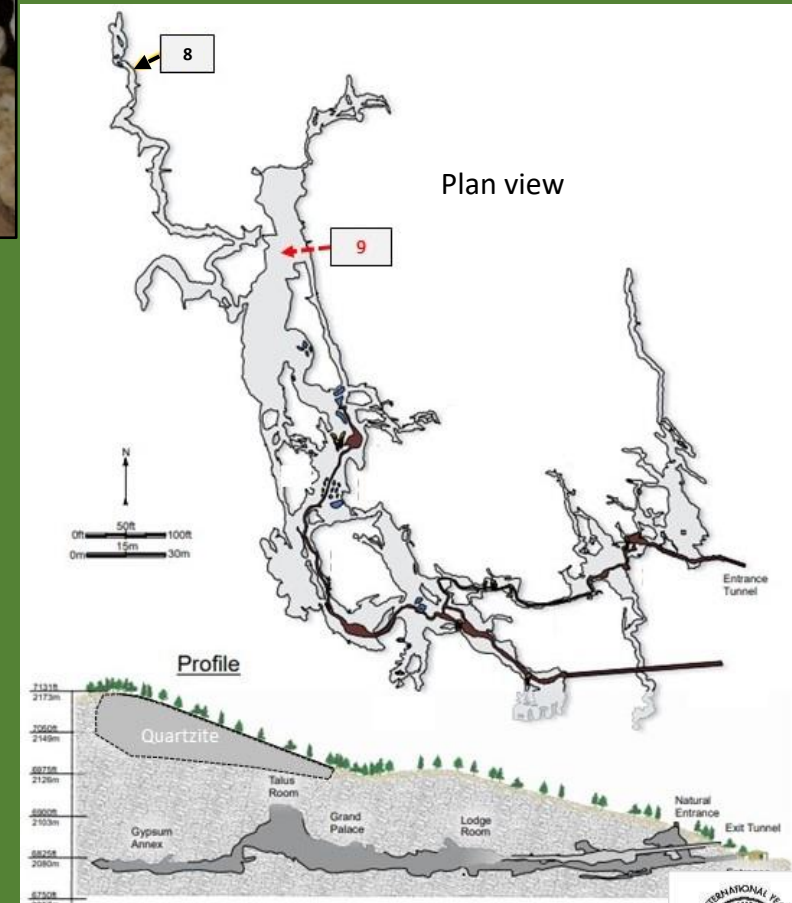


	mean	n=7		
Element	wt. %	stdev	atomic %	stdev
O	17.1	5.2	53.6	8.0
Mg	4.6	2.9	9.0	4.3
Al	0.0	0.0	0.0	0.0
Si	7.2	3.2	12.5	3.3
Cl	0.1	0.1	0.2	0.2
K	0.4	0.5	0.5	0.7
Ca	4.2	0.8	5.7	2.3
V	3.5	3.4	3.8	4.1
Fe	0.2	0.4	0.1	0.3
Sr	0.0	0.0	0.0	0.0
U	62.8	9.9	14.5	5.4





## Stop 6.9 Talus Room, north end: “Stalagmites” with drip holes

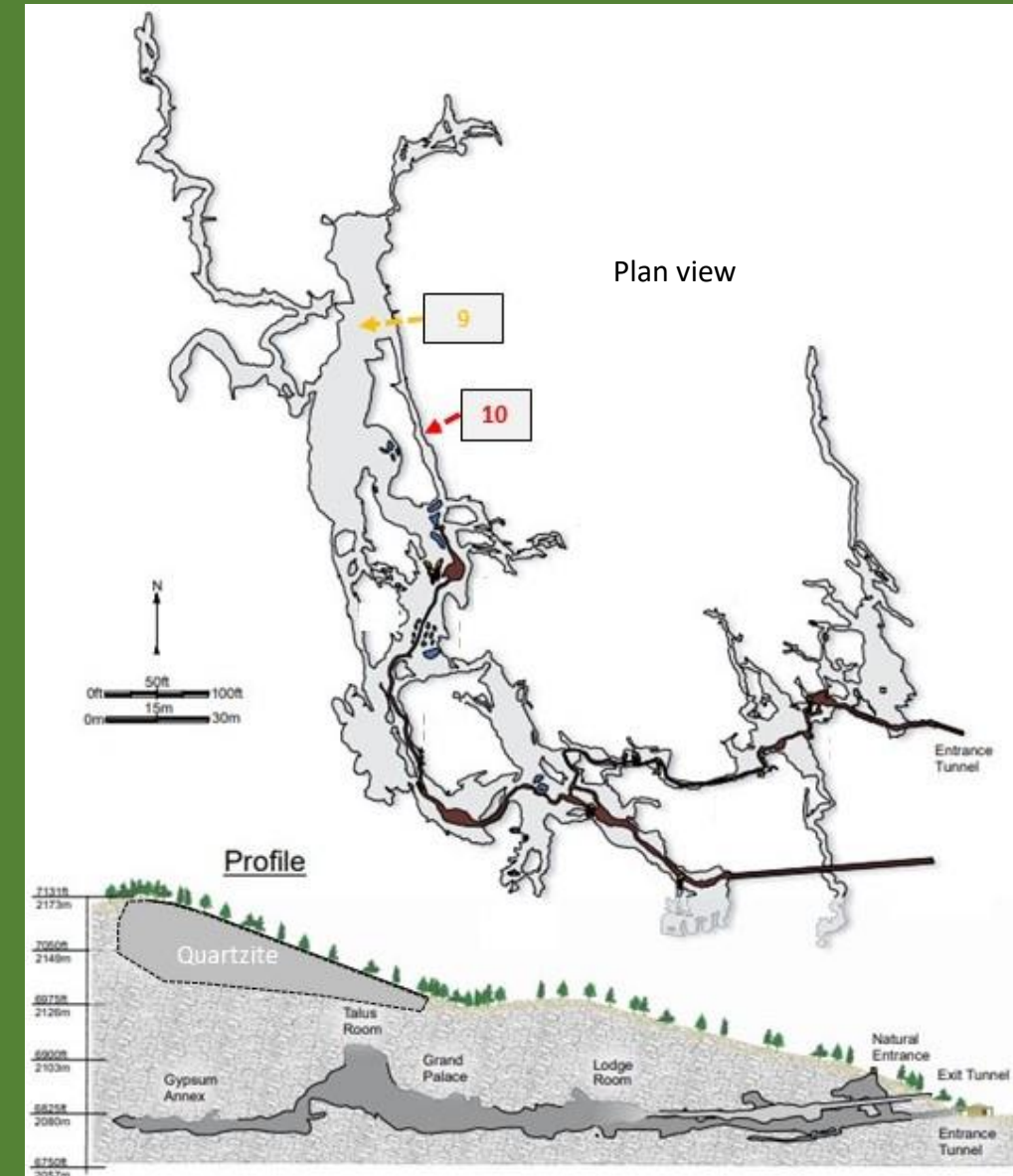




## Stop 6.10 – Royal Gorge



Photo by Tom Wilson



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



Photo by Tom Wilson

*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



Photo by Tom Wilson

*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



Photo by Tom Wilson

*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



Photos by Tom Wilson



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



Wall vent

Bubble trail

Photo by Tom Wilson

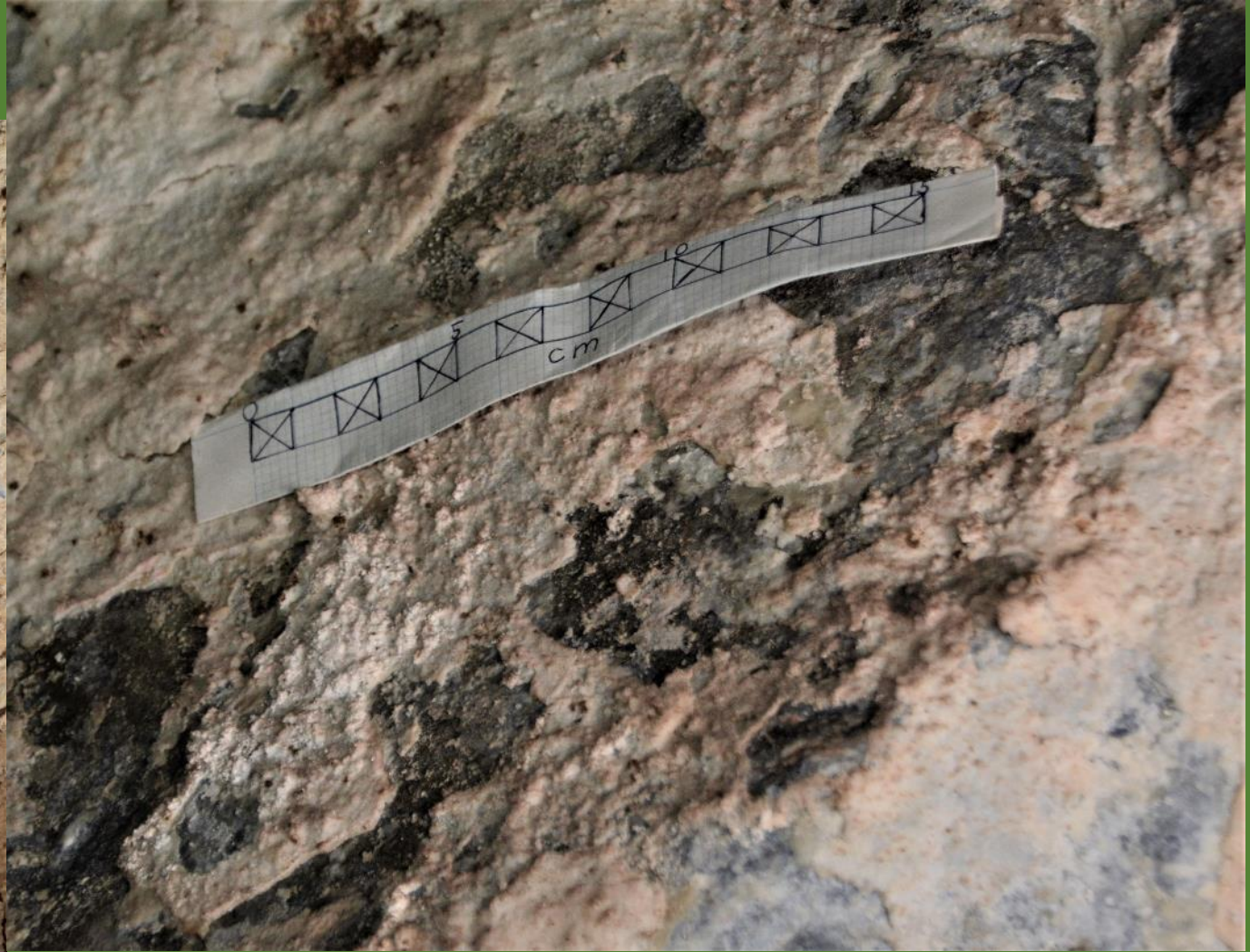
*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.10



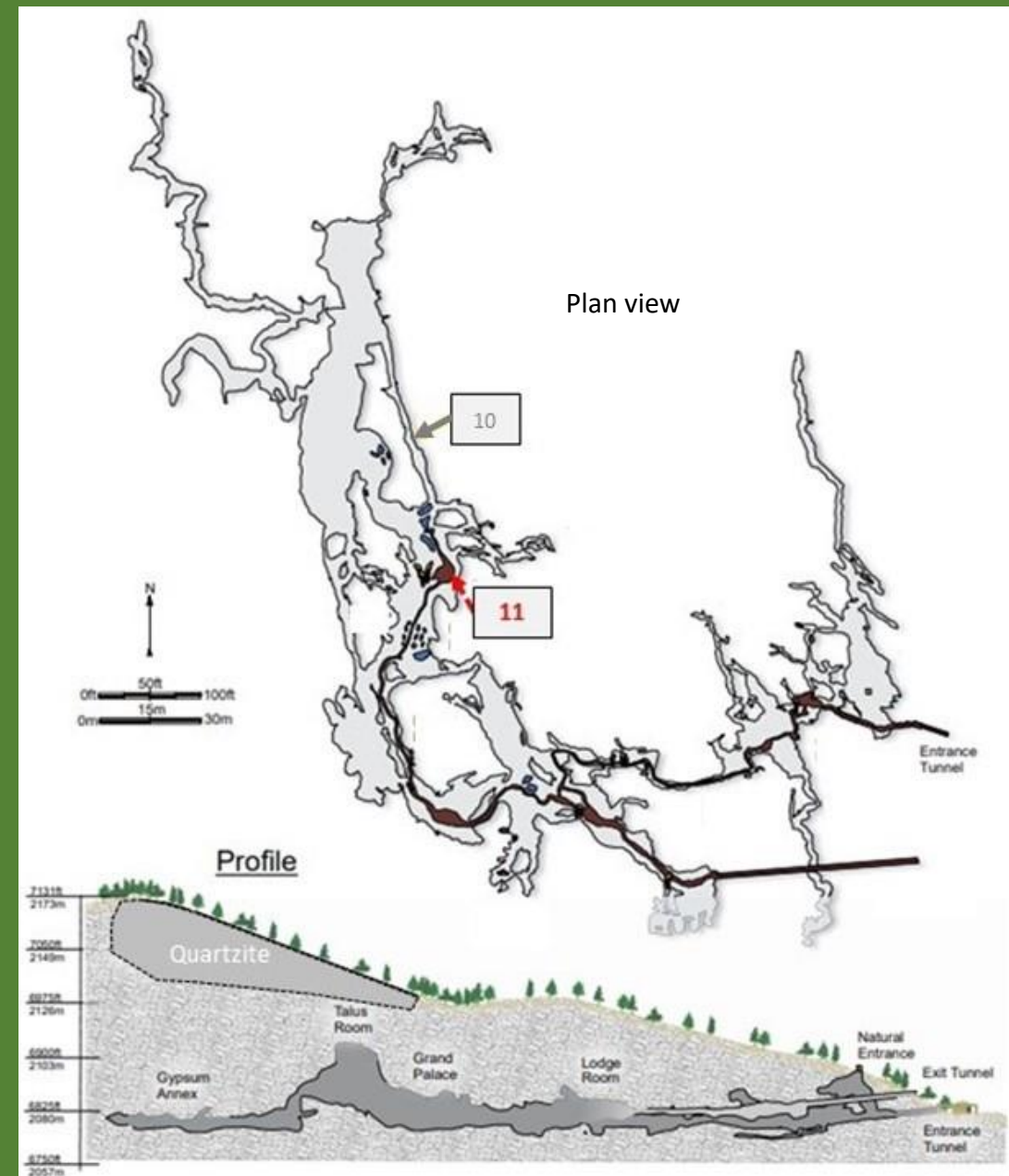
Photos by Tom Wilson



*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.11 Grand Palace



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.11 Grand Palace



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.11

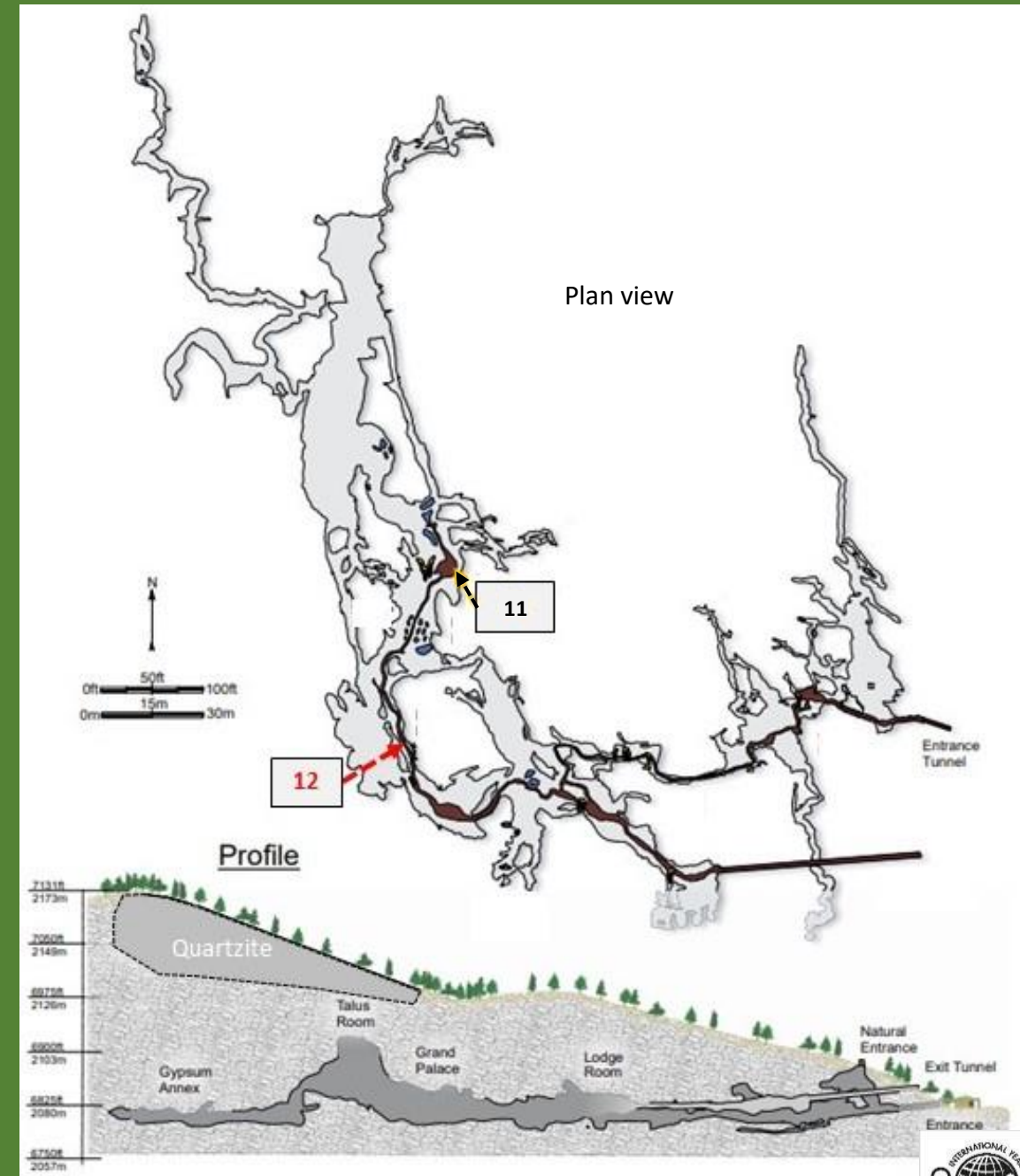


Turnip stalactites





# Stop 6.12 - Rocky Road: Bubble trail



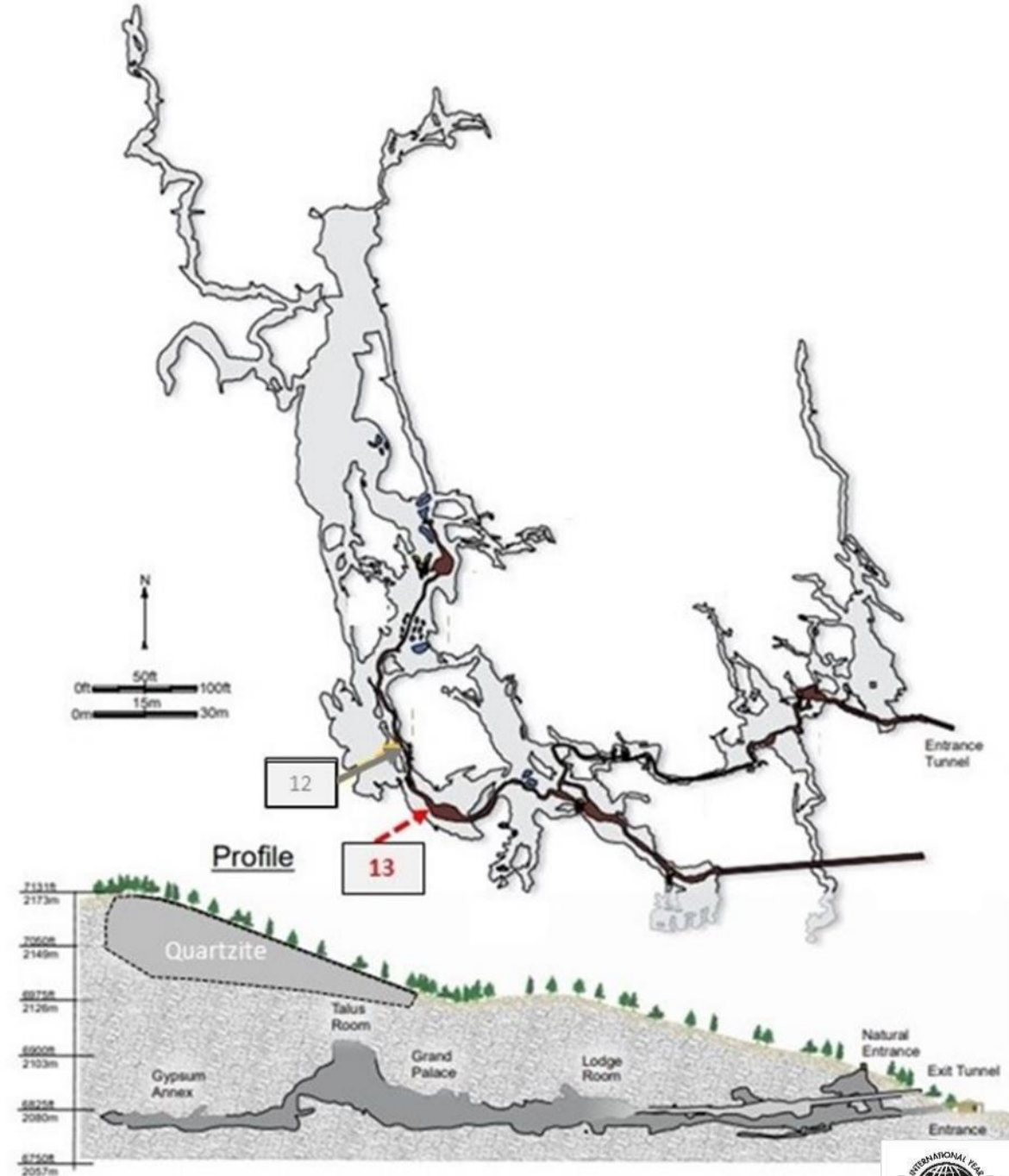


## Stop 6.12 - Rocky Road: Bubble trail





## Stop 6.13 Inscription Room



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.13 Inscription Room





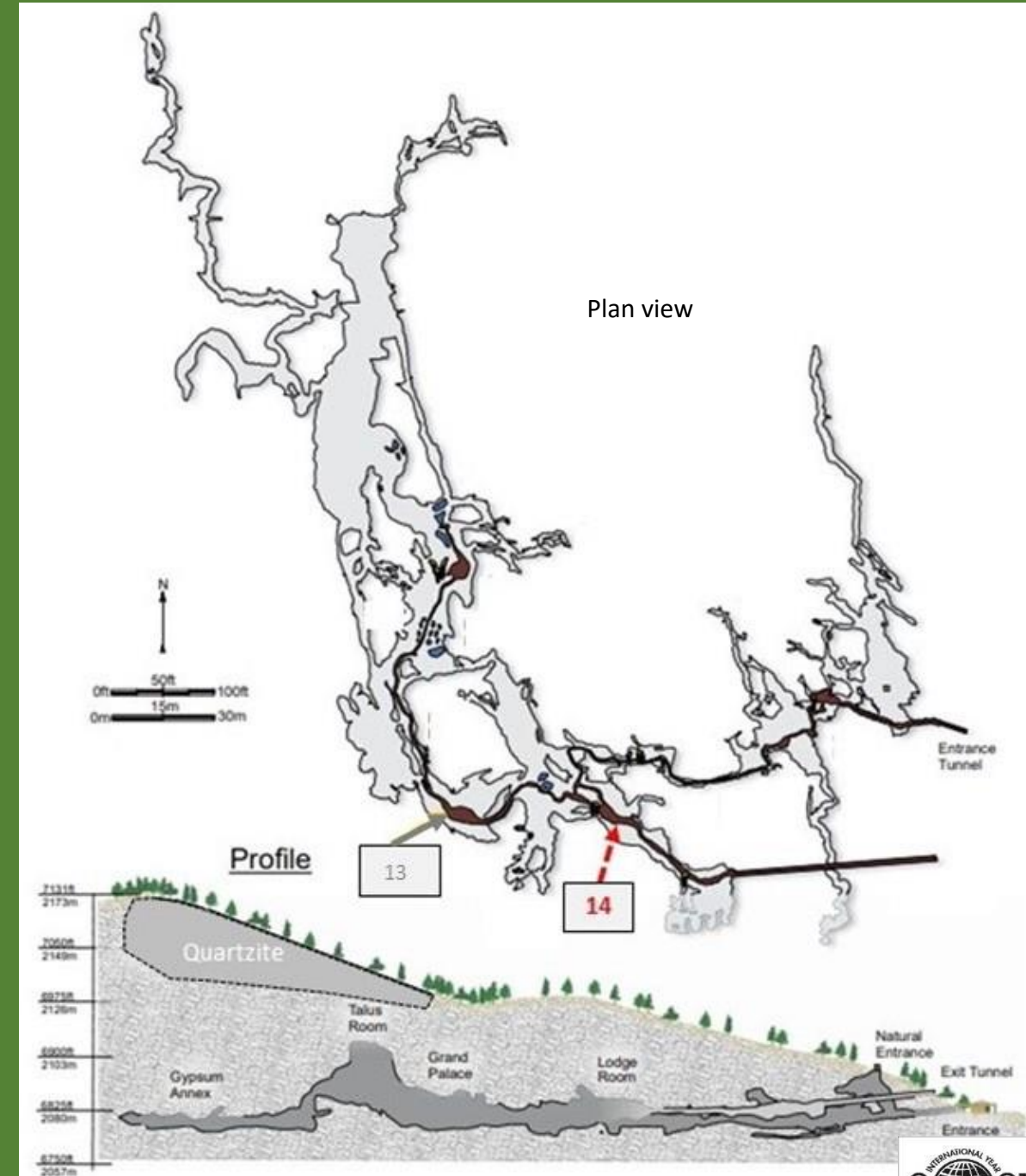
## Stop 6.13 – Inscription Room



Orange and  
pink  
discoloration  
coating ceiling



## Stop 6.14 – Lodge Room



*Hypogenic Caves of the Great Basin: Lehman Caves*



## Stop 6.14 – Lodge Room





## Stop 6.14 Lodge Room



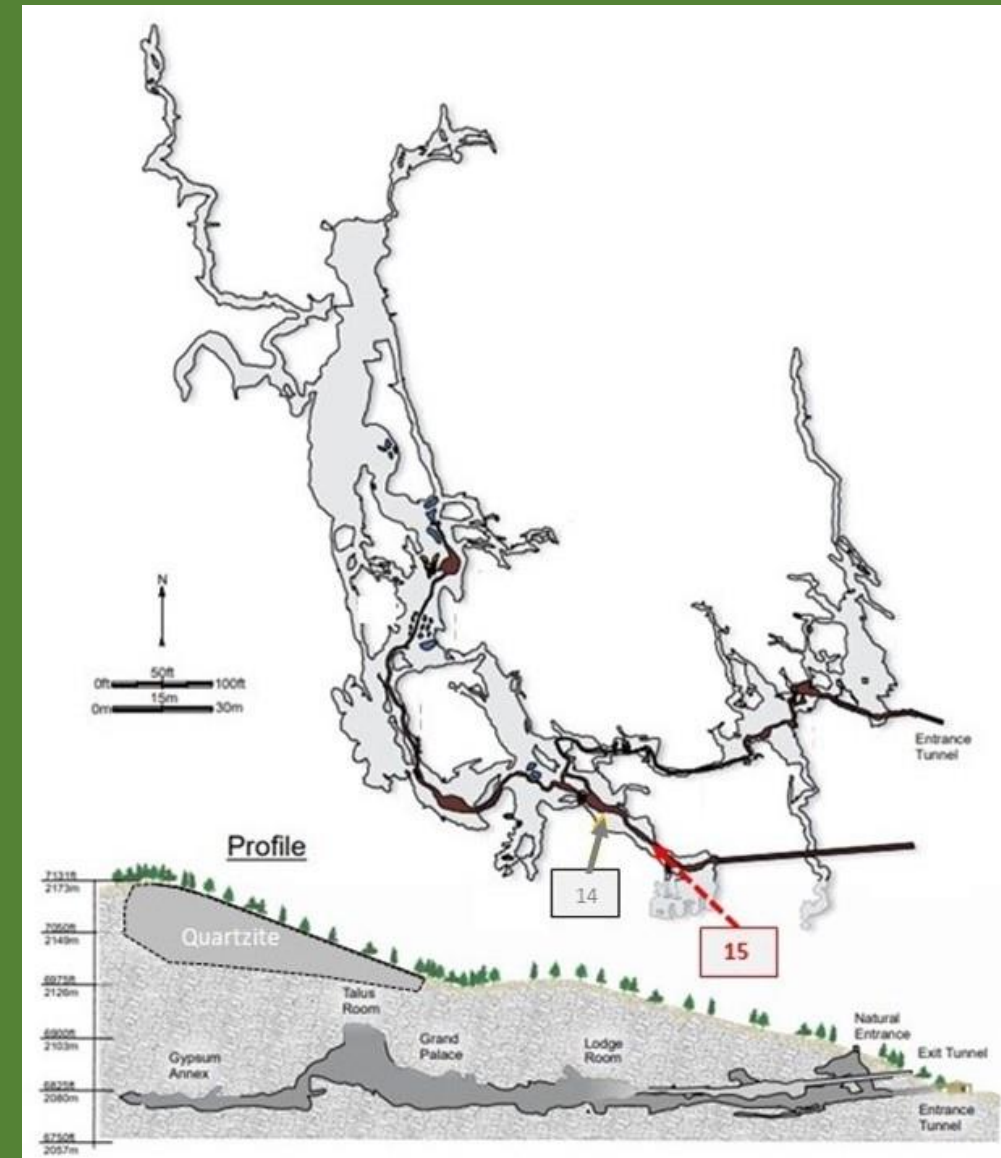
*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.15 – Lodge Room to Exit Tunnel



Photo by Tom Wilson





## Stop 6.15

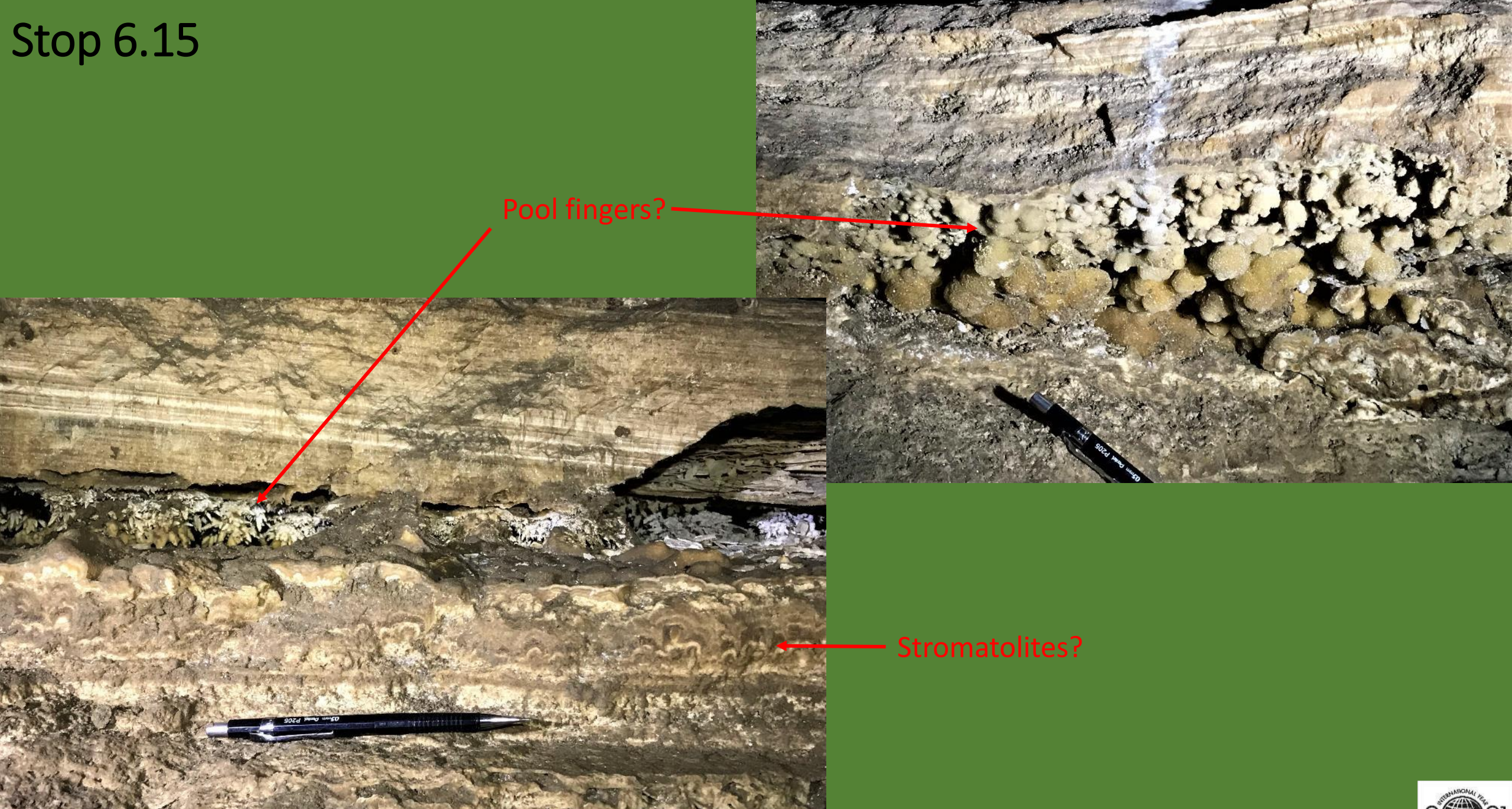
Stromatolites? →



*Hypogenic Caves of the Great Basin: Lehman Caves*



# Stop 6.15



Pool fingers?

Stromatolites?

*Hypogenic Caves of the Great Basin: Lehman Caves*



# Conclusions

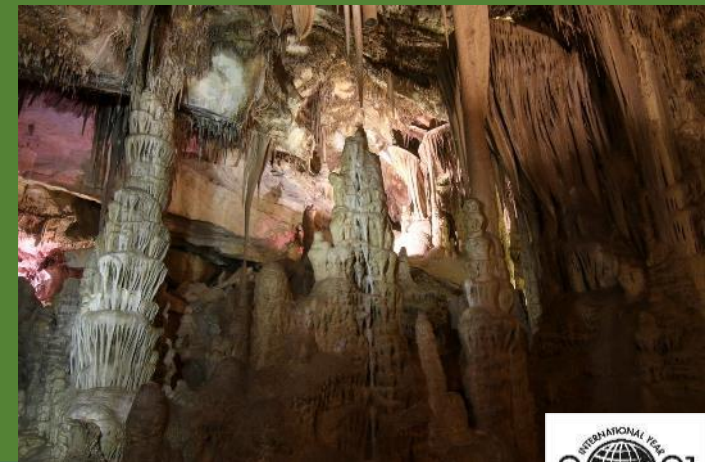


*Hypogenic Caves of the Great Basin: Lehman Caves*



# Conclusions

- Hypogenic speleogenesis created a maze of passageways
  - Evidence in Lehman Caves includes bubble trails, cupolas, and metatyuyamunite
  - Sulfuric acid speleogenesis resulted in hollow coralloid stalagmites, trays, gypsum crust, pseudoscallops, rills, and acid pool notches
- Wet climate during the late Neogene and Pleistocene = abundant speleothems that concealed hypogenic stage
- Low-permeability capstone protected about half the cave from this “cave decoration”





# QUESTIONS THAT WE CONTINUE TO PONDER

1. Where did the sulfide come from that formed the gypsum crusts?
2. Were the extensive calcite crusts originally gypsum crusts? Was the “massive white stuff” originally gypsum paste? Calcite moonmilk? Other?
3. Can speleogenesis of these hypogenic caves inform us about mineralization in the Great Basin? In particular, is there a tie to the Carlin Trend?
4. How can we more precisely pin down the age (and mechanisms) of speleogenesis?
5. What insights into climate change might the meter-thick sequence of travertine near the Exit Tunnel provide?
6. What was the role of biomediation in the development of that travertine, its apparent stromatolites and pool fingers, and other speleothems in the cave?





Thanks for listening!



*Hypogenic Caves of the Great Basin: Lehman Caves*



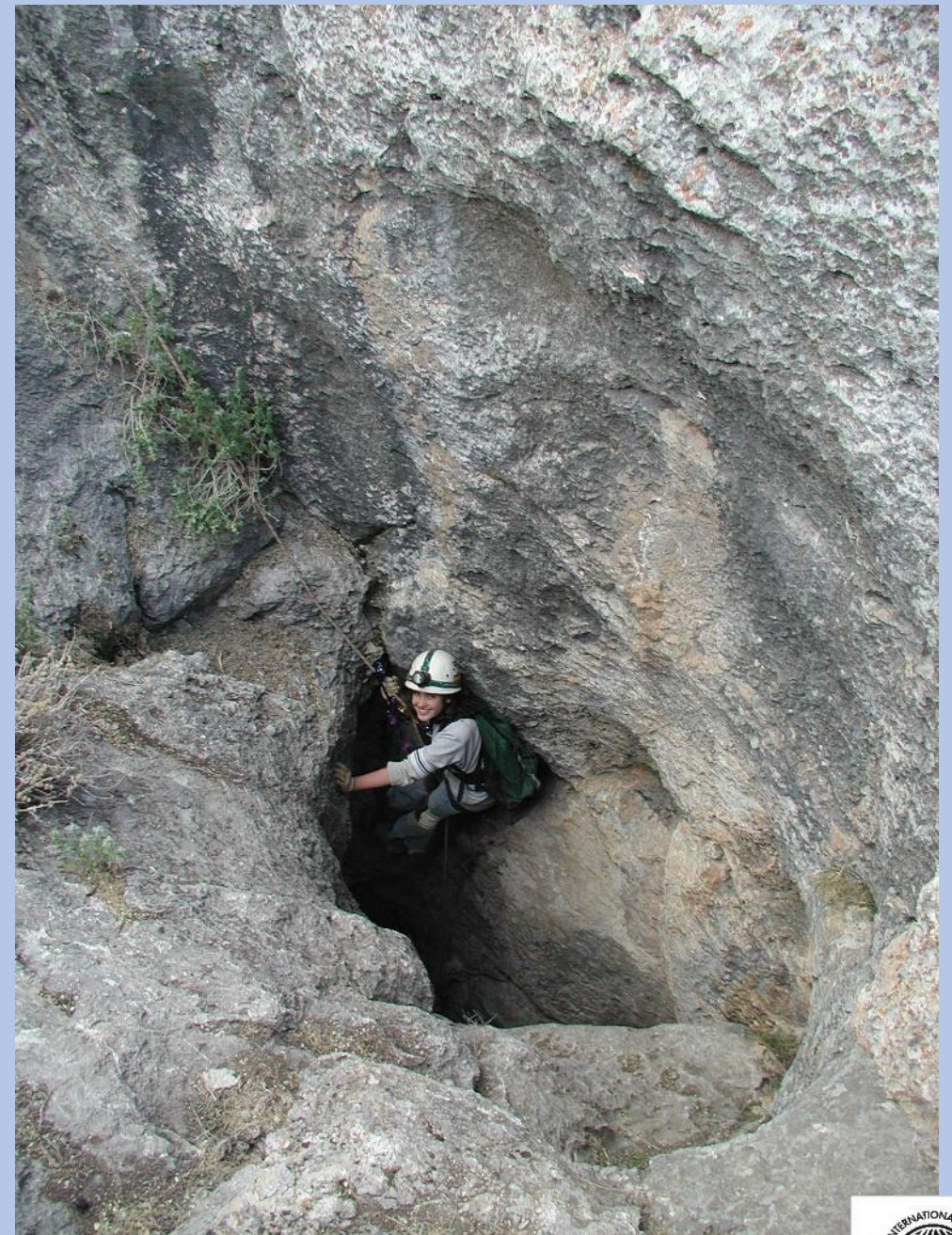
# Stop VII. Burial (Indian Burial) Cave, Nevada

- |   |                 |
|---|-----------------|
| ➤ Introduction  | 0900 PDT        |
| ➤ Stop 1 – Cueva de Villa Luz                                       | 0905 PDT        |
| ➤ Stop 2 – Frasassi Caves   | 0930 PDT        |
| ➤ Stop 3 – Carlsbad Cavern  | 0955 PDT        |
| ➤ Stop 4 – Lechuguilla Cave   | 1015 PDT        |
| ➤ Stop 5 – Sacramento Pass  | 1035 PDT        |
| ➤ Break/Intermission  | 1055 PDT        |
| ➤ Stop 6 – Lehman Caves   | 1105 PDT        |
| ➤ Break/Intermission  | 1245 PDT        |
| ➤ <b>Stop 7 – Burial Cave</b><br><b>Louise Hose, Gretchen Baker</b> | <b>1255 PDT</b> |
| ➤ Stop 8 – Crystal Ball Cave  | 1305 PDT        |
| ➤ Stop 9 - Pescio Cave  | 1315 PDT        |
| ➤ Stop 10 – Discovery Cave  | 1325 PDT        |
| ➤ Stop 11 – Old Mans Cave   | 1335 PDT        |
| ➤ Summary and questions   | 1345 PDT        |





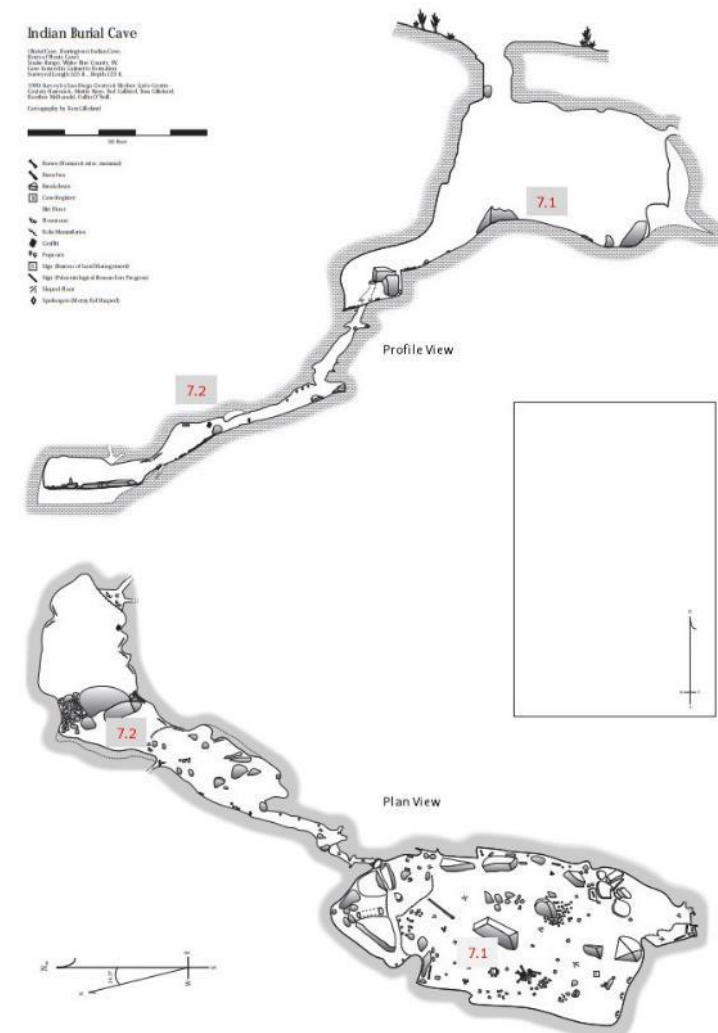
# Stop 7.1



*Hypogenic Caves of the Great Basin: Burial Cave*



# Stop 7.1



*Hypogenic Caves of the Great Basin: Burial Cave*



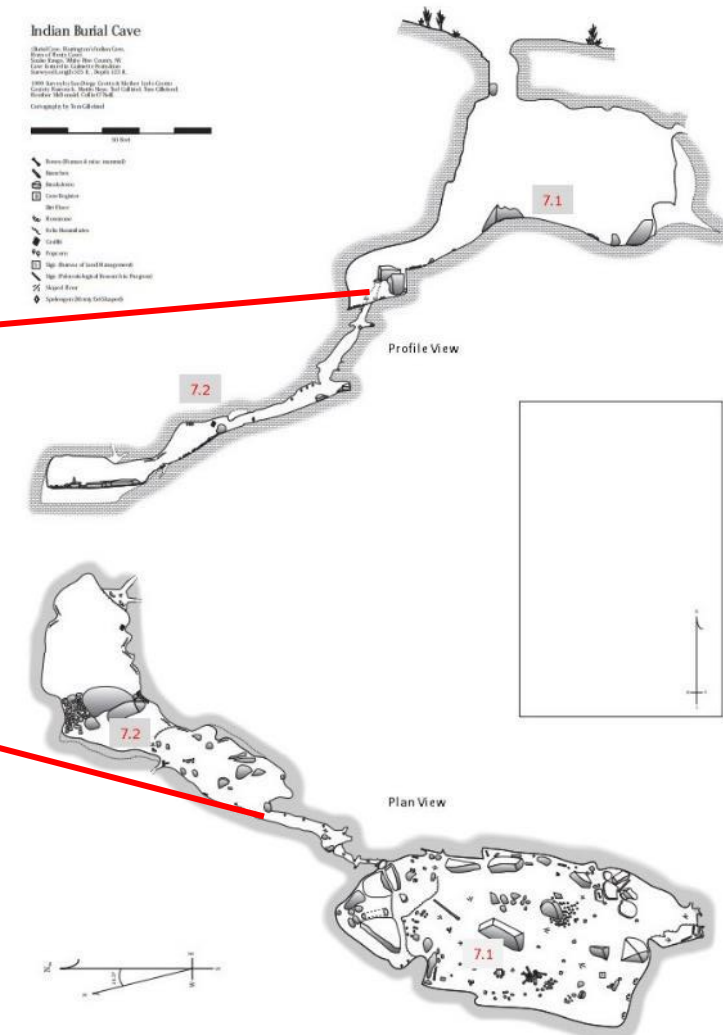
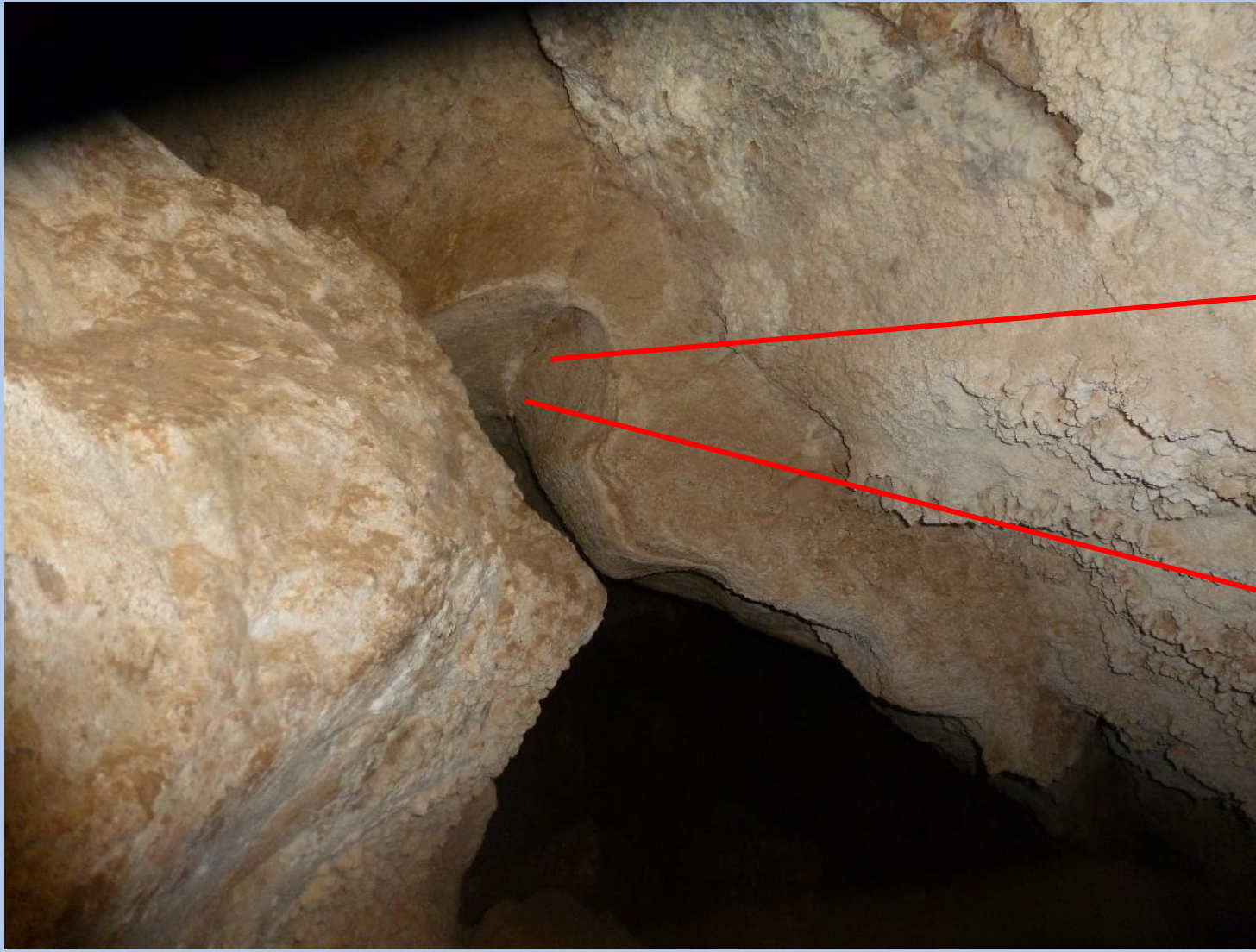
# Burial Cave



*Hypogenic Caves of the Great Basin: Burial Cave*



# Burial Cave

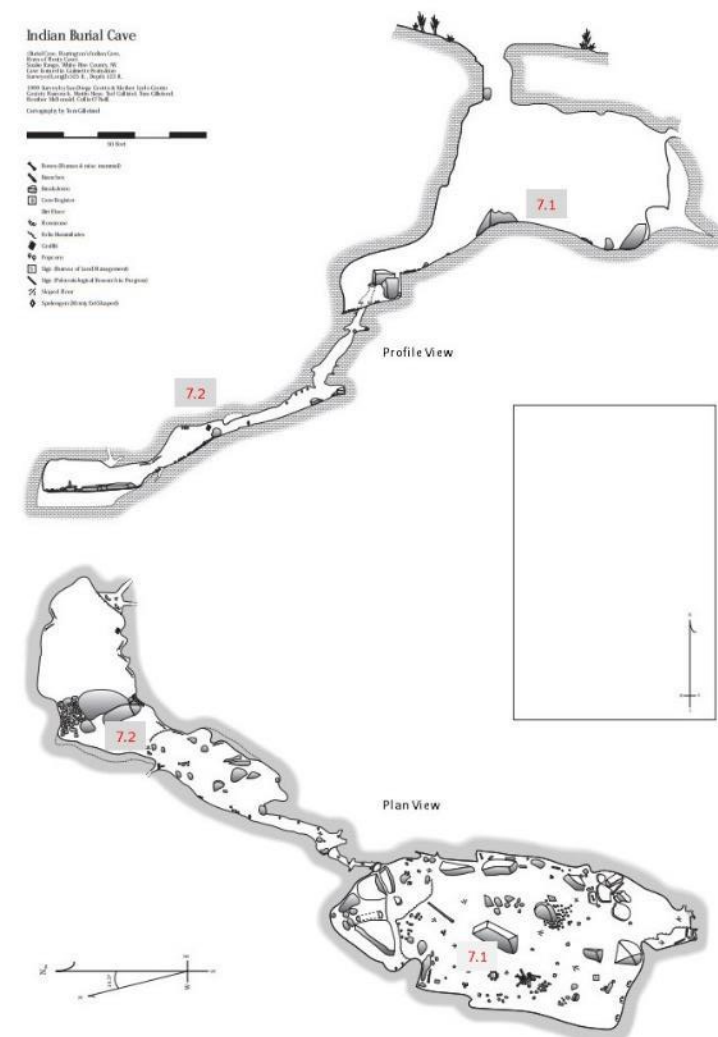




# Burial Cave



Photo by Dave Bunnell





# Burial Cave



*Hypogenic Caves of the Great Basin: Burial Cave*



# Burial Cave

Rimmed vent

Mammalaries

Folia



*Hypogenic Caves of the Great Basin: Burial Cave*



# Burial Cave



Limestone bedrock

Folia

Mammalaries

Photomicrographs by Art and Peg Palmer

*Hypogenic Caves of the Great Basin: Burial Cave*



# Crystal Ball Cave, Nevada

- Introduction 0900 PDT
- Stop 1 – Cueva de Villa Luz 0905 PDT
- Stop 2 – Frasassi Caves 0930 PDT
- Stop 3 – Carlsbad Cavern 0955 PDT
- Stop 4 – Lechuguilla Cave 1015 PDT
- Stop 5 – Sacramento Pass 1035 PDT
- Break/Intermission 1055 PDT
- Stop 6 – Lehman Caves 1105 PDT
- Break/Intermission 1245 PDT
- Stop 7 – Burial Cave 1255 PDT
- **Stop 8 – Crystal Ball Cave 1305 PDT**  
**Gretchen Baker, Doug Powell**
- Stop 9 - Pescio Cave 1315 PDT
- Stop 10 – Discovery Cave 1325 PDT
- Stop 11 – Old Mans Cave 1335 PDT
- Summary and questions 1345 PDT





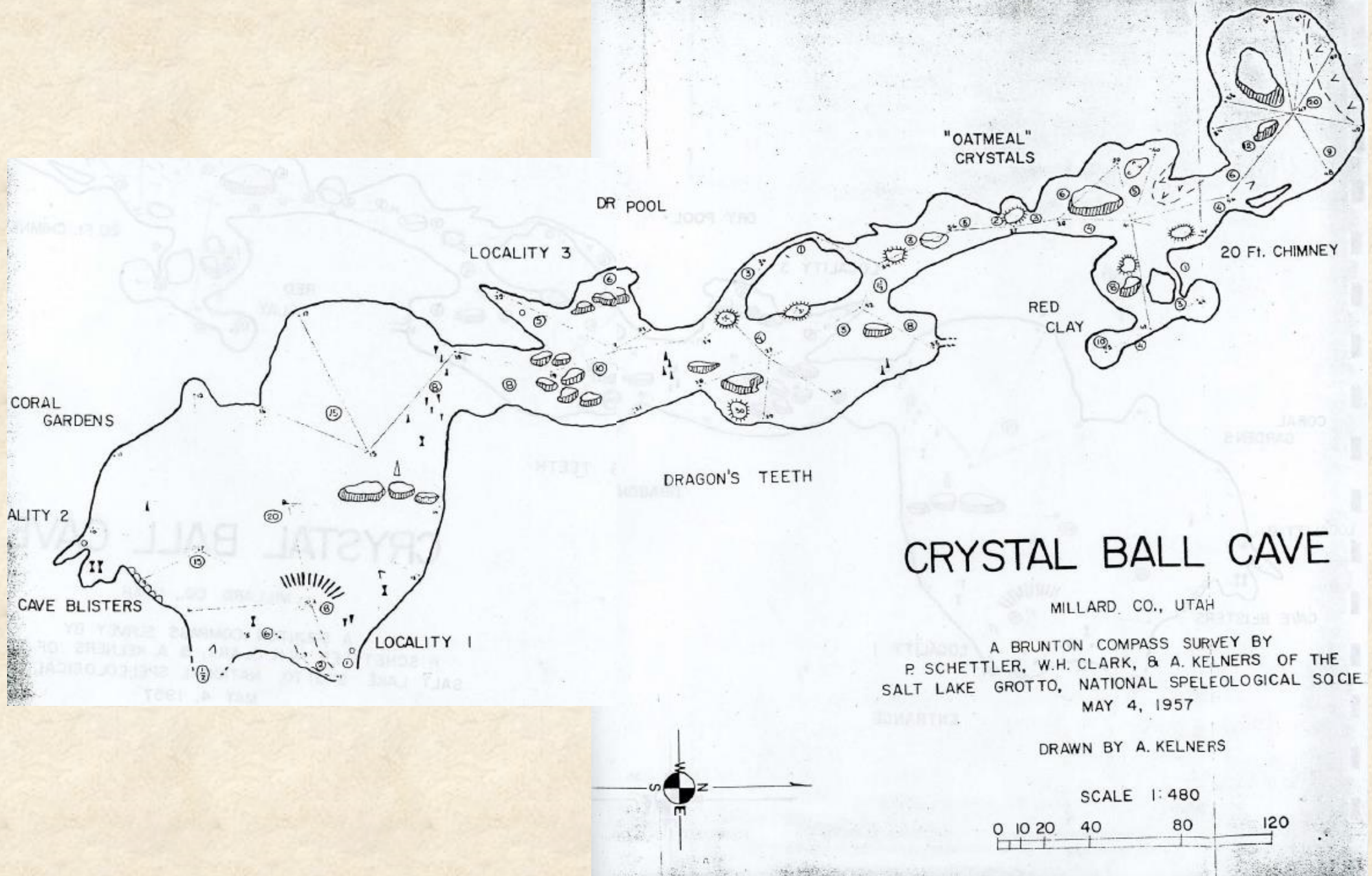
# Introduction



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*



# Map



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*

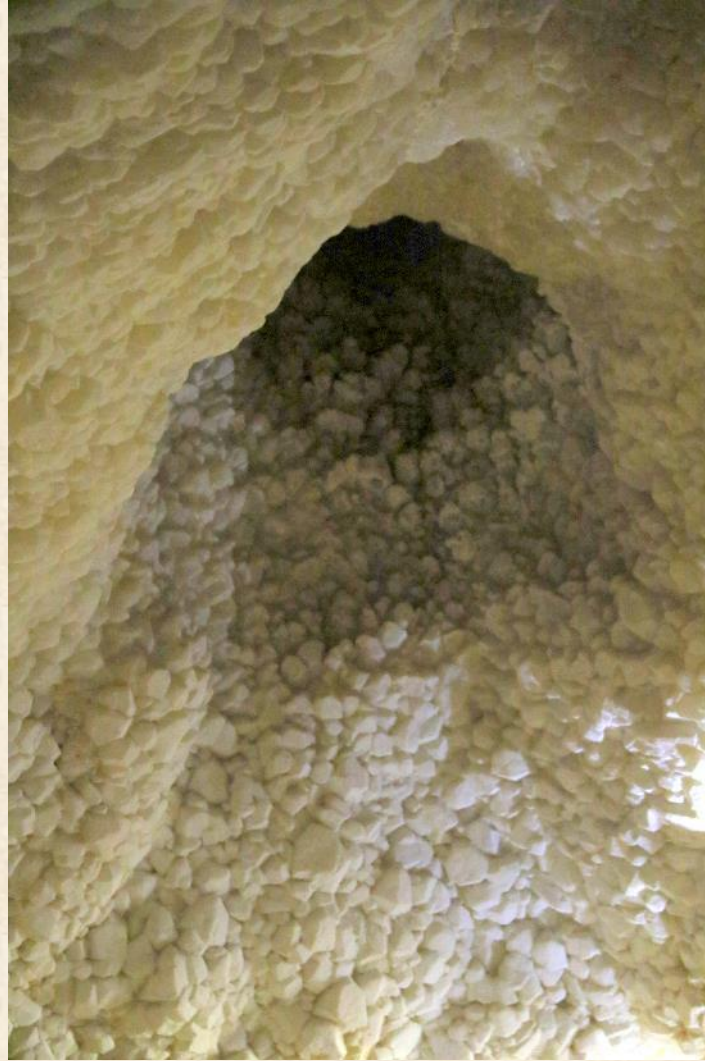




*Hypogenic Caves of the Great Basin: Crystal Ball Cave*



# Introduction



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*

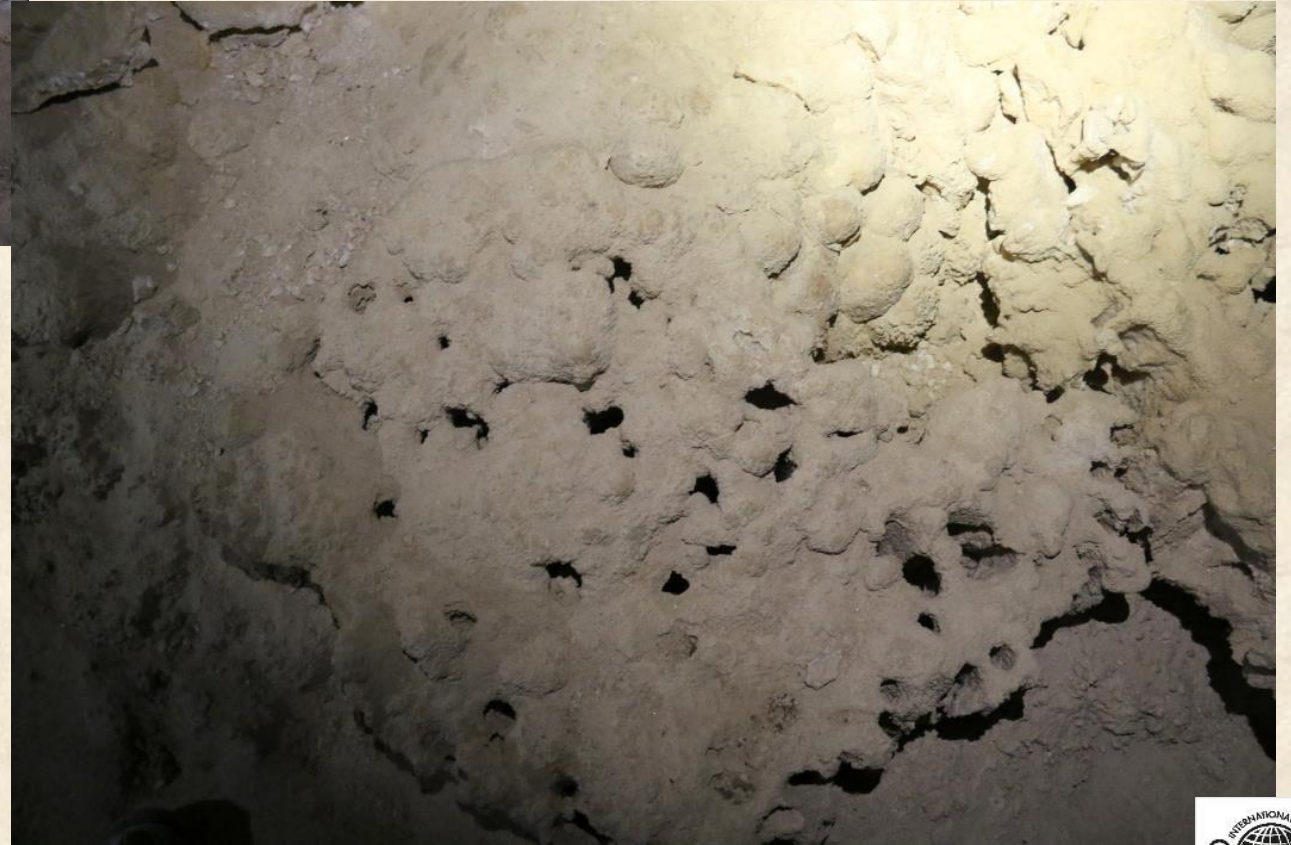


# Introduction





# Introduction



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*



# Introduction



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*



# Introduction



*Hypogenic Caves of the Great Basin: Crystal Ball Cave*



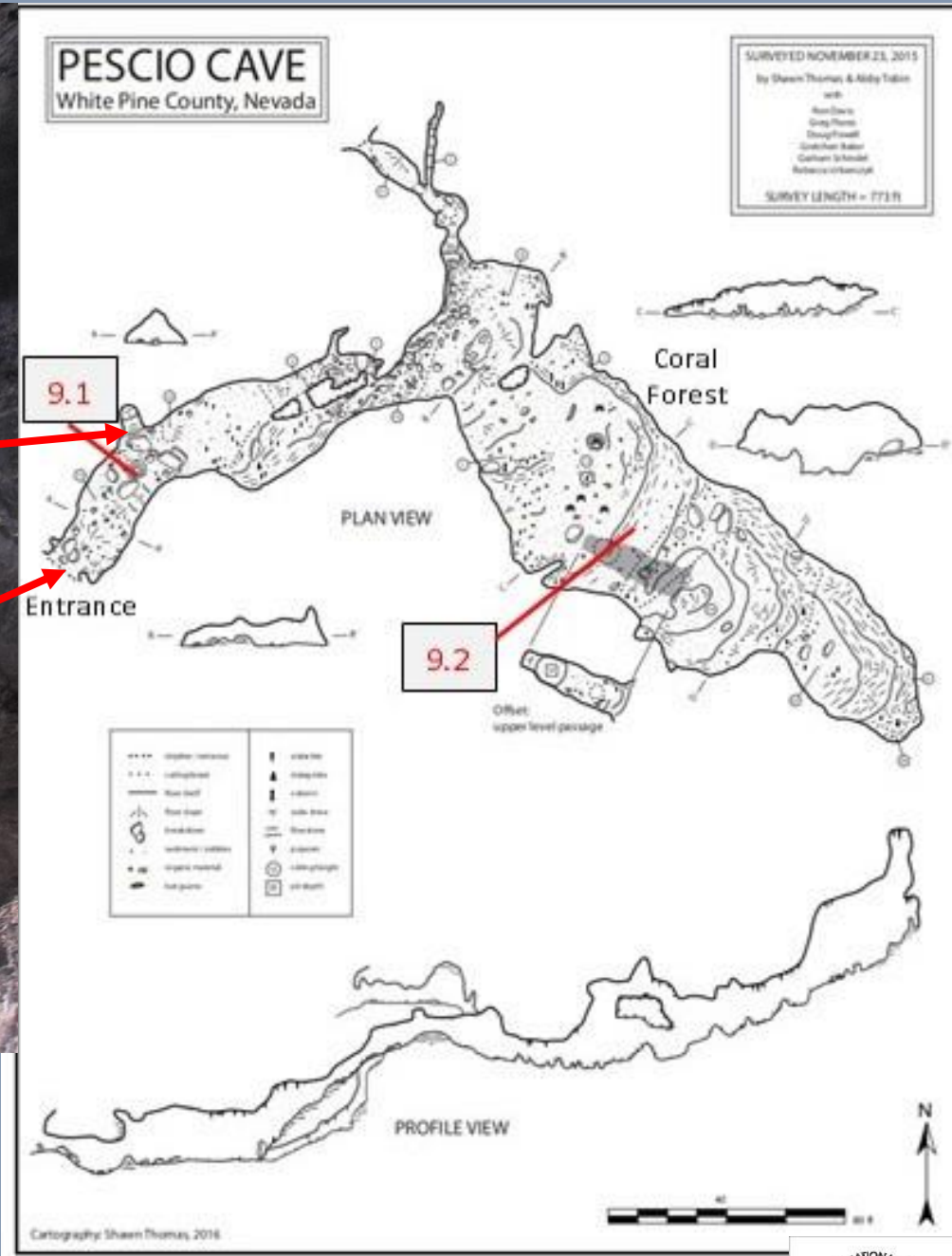
# Pescio Cave, Nevada

- |  |                 |
|--|-----------------|
| ➤ Introduction   | 0900 PDT        |
| ➤ Stop 1 – Cueva de Villa Luz                                    | 0905 PDT        |
| ➤ Stop 2 – Frasassi Caves  | 0930 PDT        |
| ➤ Stop 3 – Carlsbad Cavern                                       | 0955 PDT        |
| ➤ Stop 4 – Lechuguilla Cave                                      | 1015 PDT        |
| ➤ Stop 5 – Sacramento Pass                                       | 1035 PDT        |
| ➤ Break/Intermission   | 1055 PDT        |
| ➤ Stop 6 – Lehman Caves  | 1105 PDT        |
| ➤ Break/Intermission   | 1245 PDT        |
| ➤ Stop 7 – Burial Cave   | 1255 PDT        |
| ➤ Stop 8 – Crystal Ball Cave                                     | 1305 PDT        |
| ➤ <b>Stop 9 - Pescio Cave</b><br><b>Louise Hose, Doug Powell</b> | <b>1315 PDT</b> |
| ➤ Stop 10 – Discovery Cave                                       | 1325 PDT        |
| ➤ Stop 11 – Old Mans Cave  | 1335 PDT        |
| ➤ Summary and questions  | 1345 PDT        |





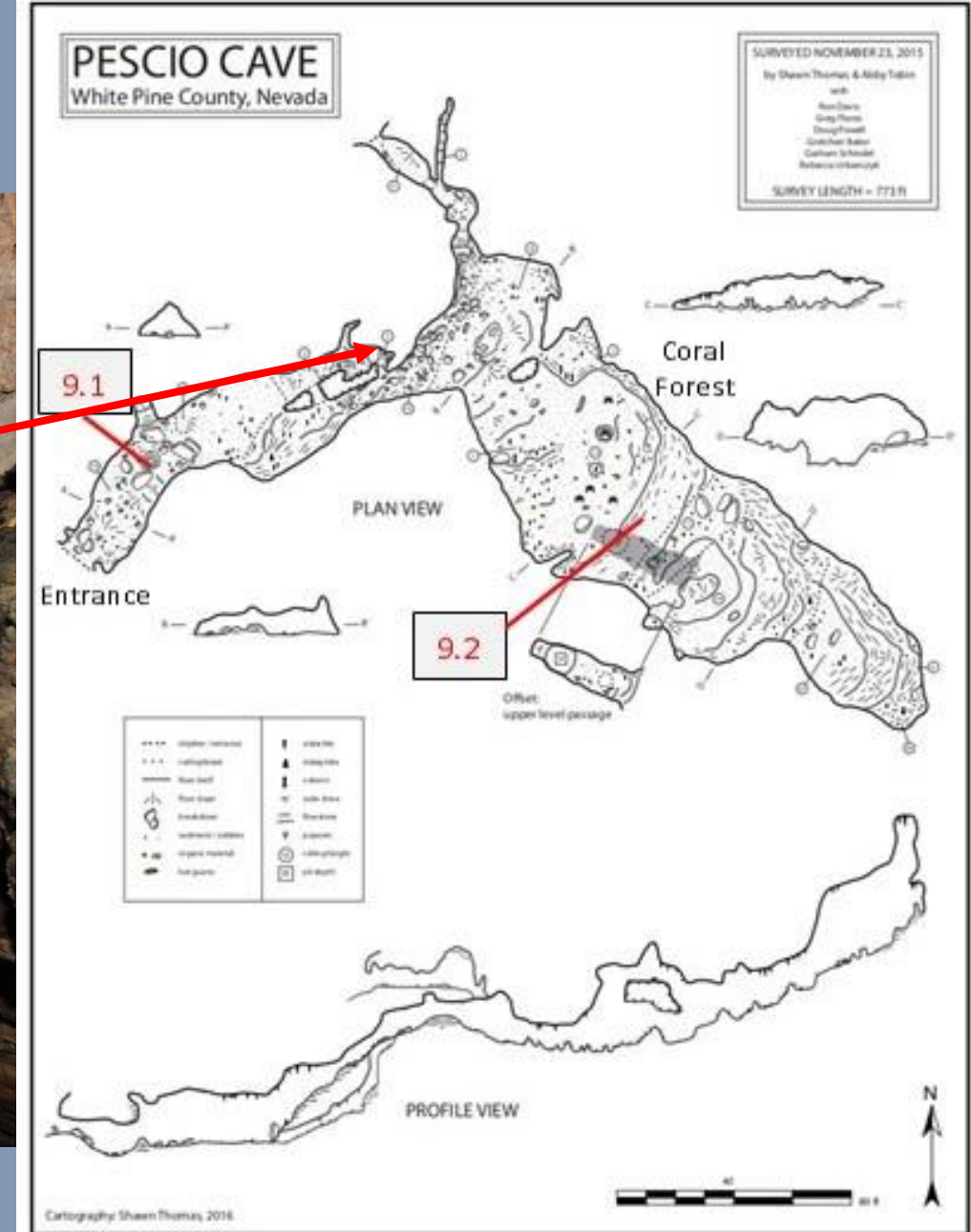
# Pescio Cave



*Hypogenic Caves of the Great Basin: Pescio Cave*



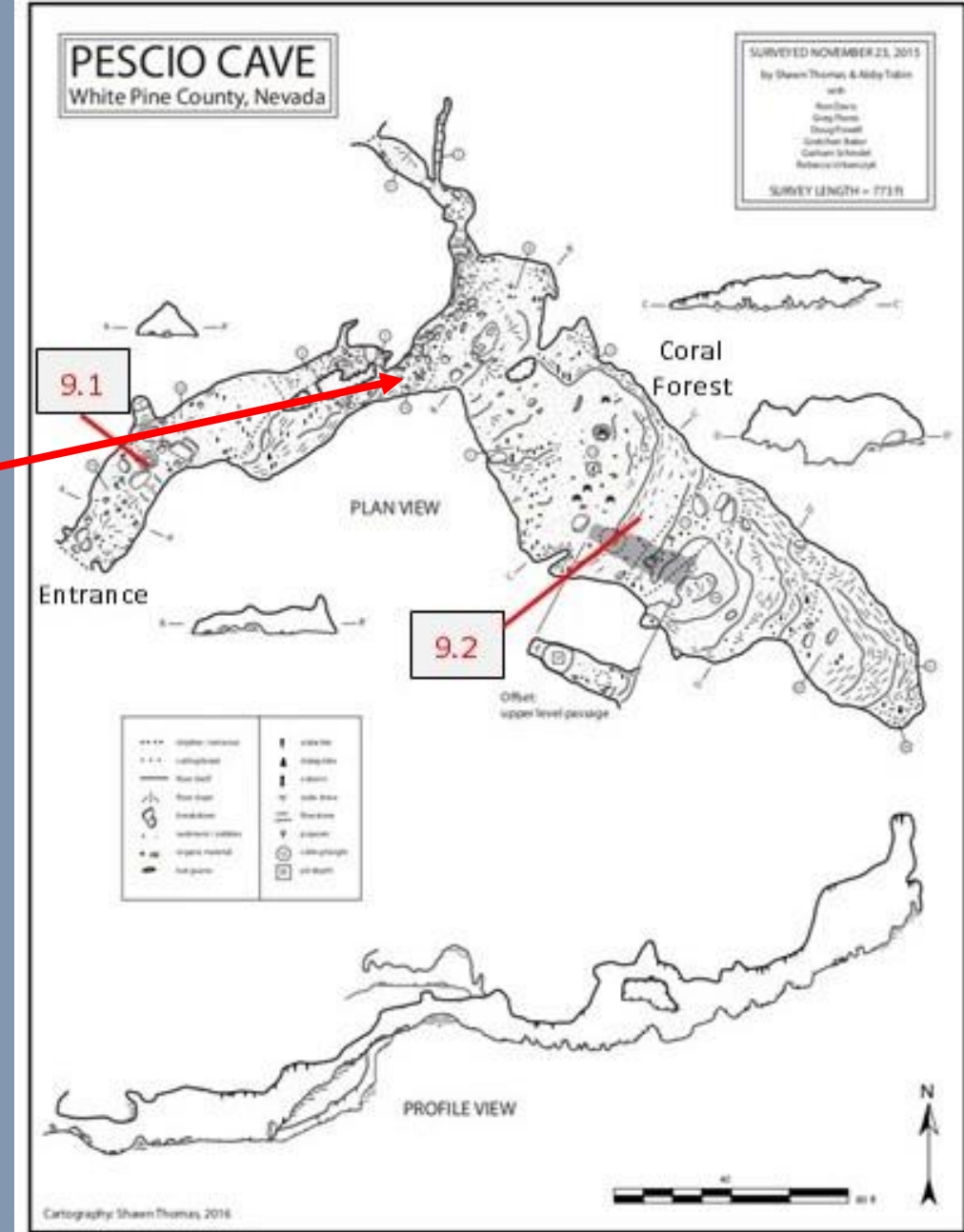
# Pescio Cave



*Hypogenic Caves of the Great Basin: Pescio Cave*



# Pescio Cave

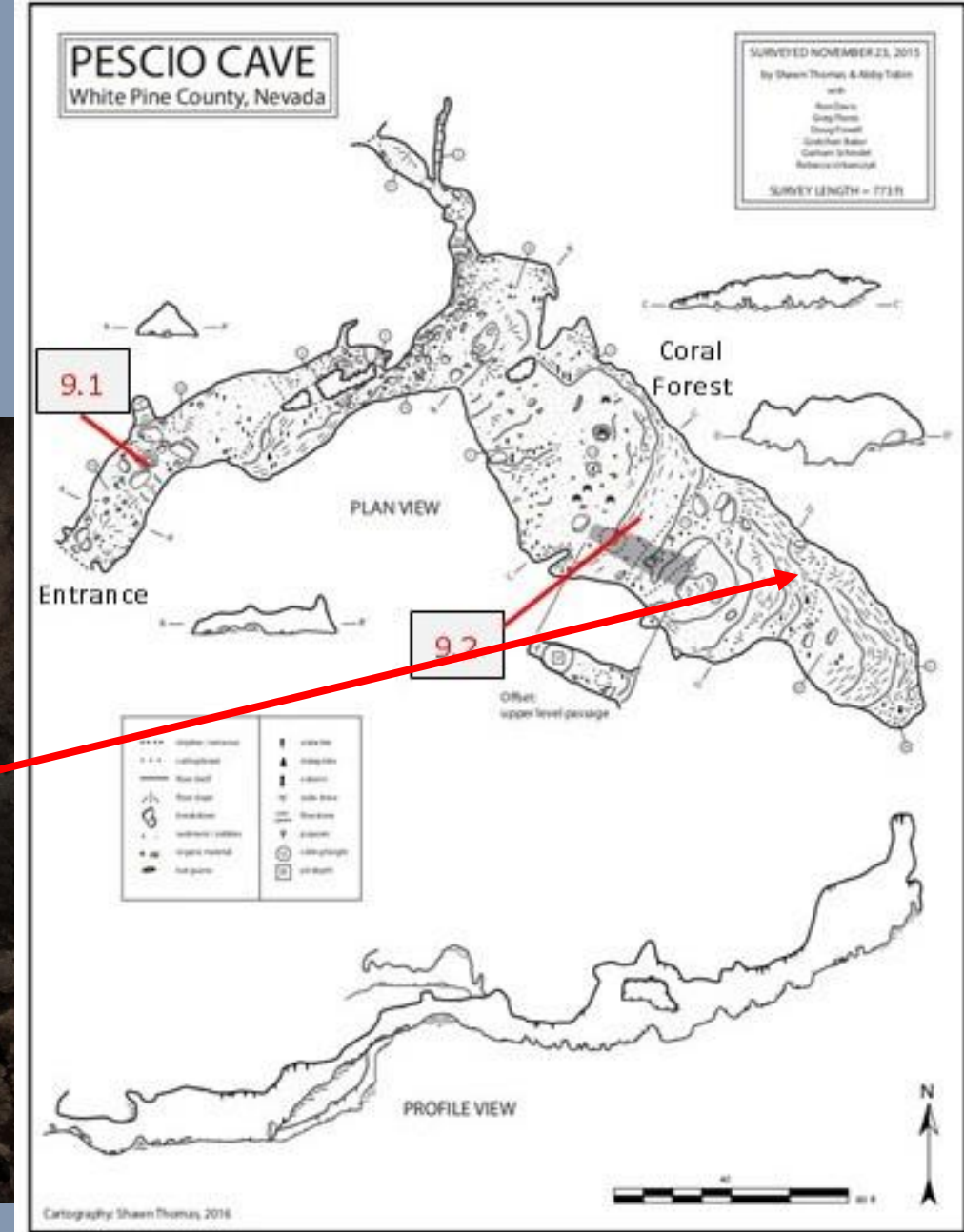
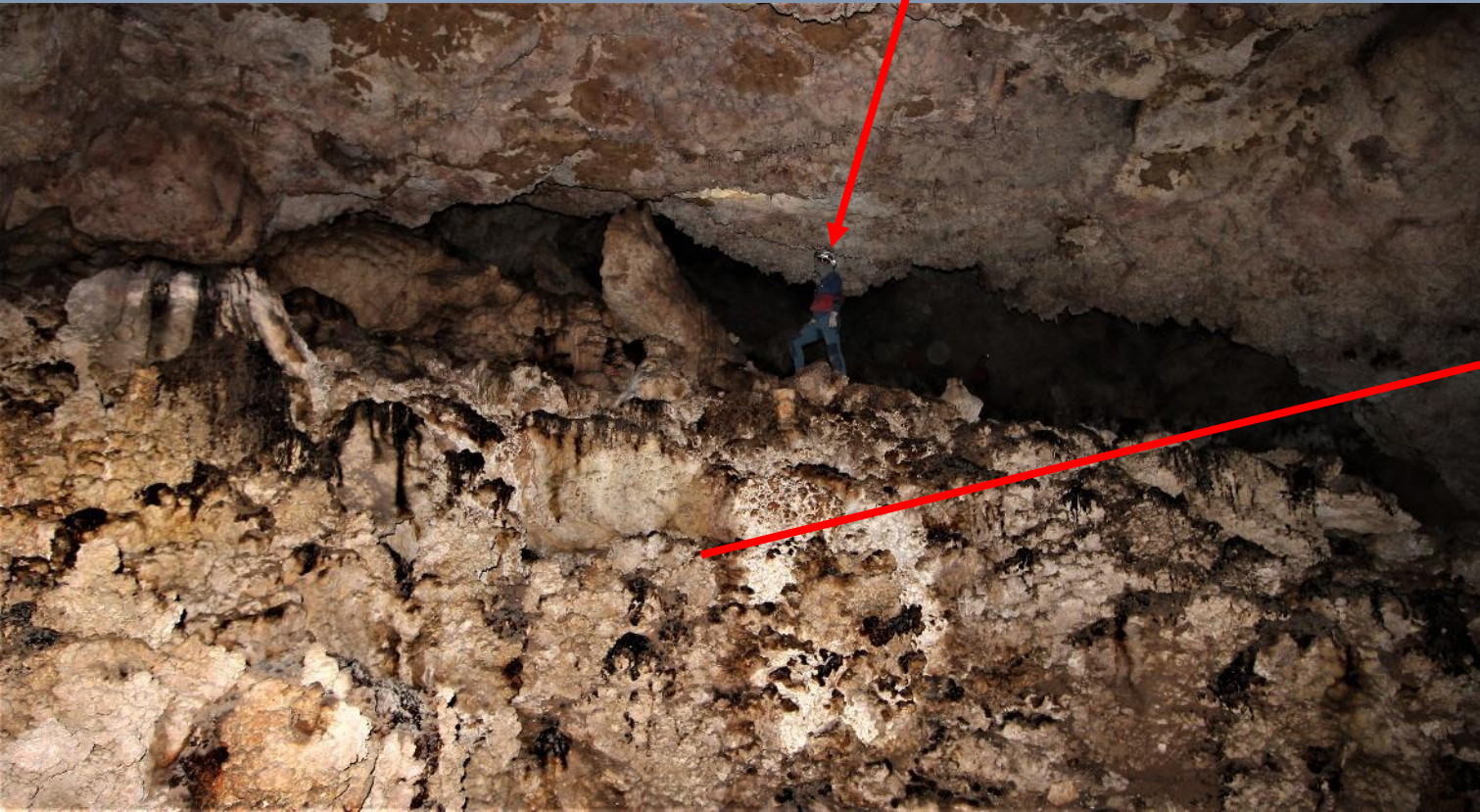


*Hypogenic Caves of the Great Basin: Pescio Cave*



# Pescio Cave

Person for scale





# Pescio Cave



*Hypogenic Caves of the Great Basin: Pescio Cave*



# Pescio Cave



*Hypogenic Caves of the Great Basin: Pescio Cave*





*Hypogenic Caves of the Great Basin: Pescio Cave*



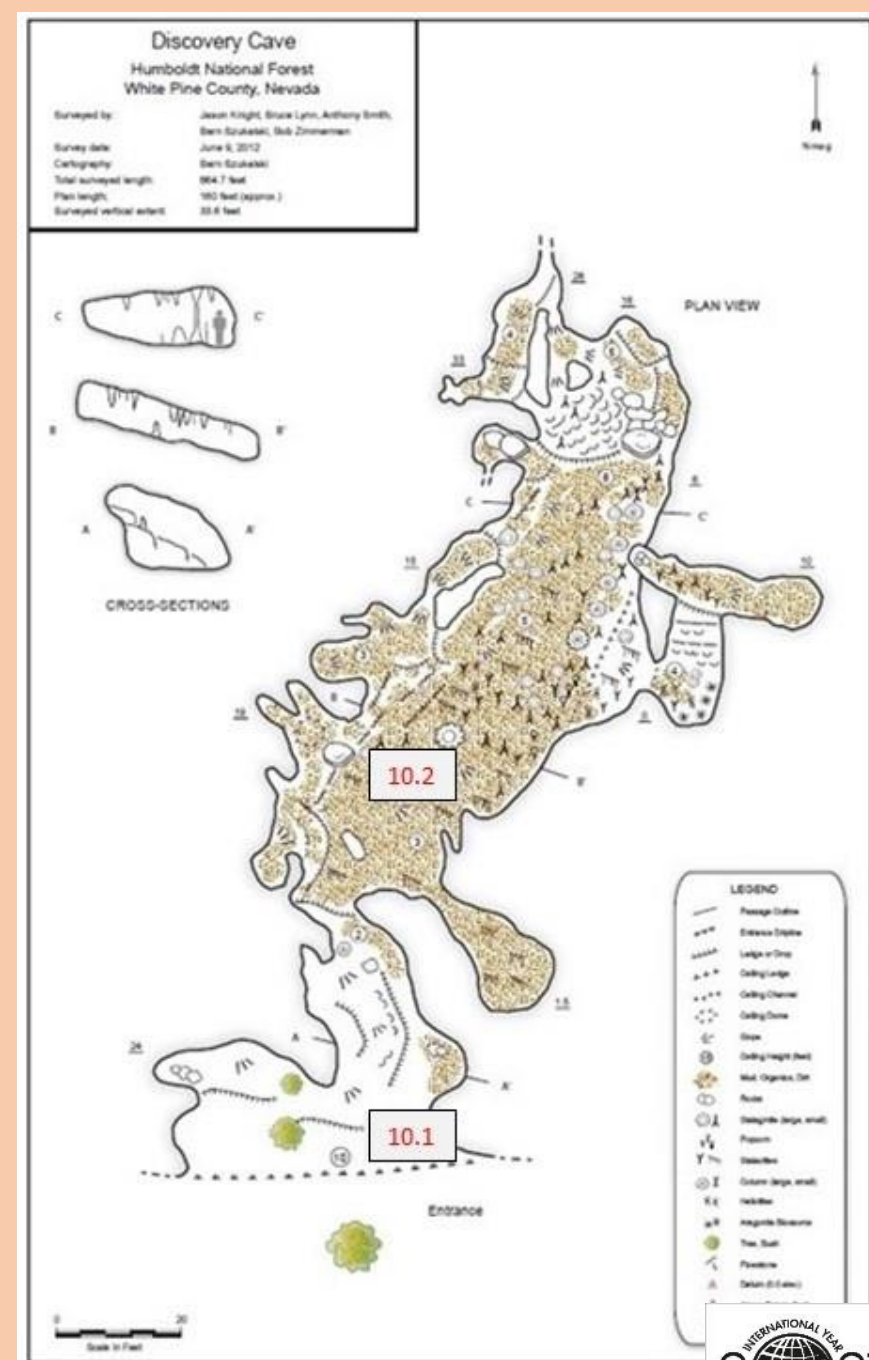
# Discovery Cave, Nevada

- Introduction 0900 PDT
- Stop 1 – Cueva de Villa Luz 0905 PDT
- Stop 2 – Frasassi Caves 0930 PDT
- Stop 3 – Carlsbad Cavern 0955 PDT
- Stop 4 – Lechuguilla Cave 1015 PDT
- Stop 5 – Sacramento Pass 1035 PDT
- Break/Intermission 1055 PDT
- Stop 6 – Lehman Caves 1105 PDT
- Break/Intermission 1245 PDT
- Stop 7 – Burial Cave 1255 PDT
- Stop 8 – Crystal Ball Cave 1305 PDT
- Stop 9 - Pescio Cave 1315 PDT
- **Stop 10 – Discovery Cave 1325 PDT**  
**Louise Hose, Doug Powell**
- Stop 11 – Old Mans Cave 1335 PDT
- Summary and questions 1345 PDT





# Stop 10.1



*Hypogenic Caves of the Great Basin: Discovery Cave*



# Stop 10.2



*Hypogenic Caves of the Great Basin: Discovery Cave*



## Stop 10.2



*Hypogenic Caves of the Great Basin: Discovery Cave*



# Old Mans Cave, Nevada

- Introduction 0900 PDT
- Stop 1 – Cueva de Villa Luz 0905 PDT
- Stop 2 – Frasassi Caves 0930 PDT
- Stop 3 – Carlsbad Cavern 0955 PDT
- Stop 4 – Lechuguilla Cave 1015 PDT
- Stop 5 – Sacramento Pass 1035 PDT
- Break/Intermission 1055 PDT
- Stop 6 – Lehman Caves 1105 PDT
- Break/Intermission 1245 PDT
- Stop 7 – Burial Cave 1255 PDT
- Stop 8 – Crystal Ball Cave 1305 PDT
- Stop 9 - Pescio Cave 1315 PDT
- Stop 10 – Discovery Cave 1325 PDT
- **Stop 11 – Old Mans Cave 1335 PDT**  
**Doug Powell, Gretchen Baker, Zoe Havlena, Louise Hose, Dan Jones**
- Summary and questions 1345 PDT





# GEOLOGIC MAP OF THE COVE QUADRANGLE, NEVADA AND UTAH

Elizabeth L. Miller and Phillip B. Gans  
1999



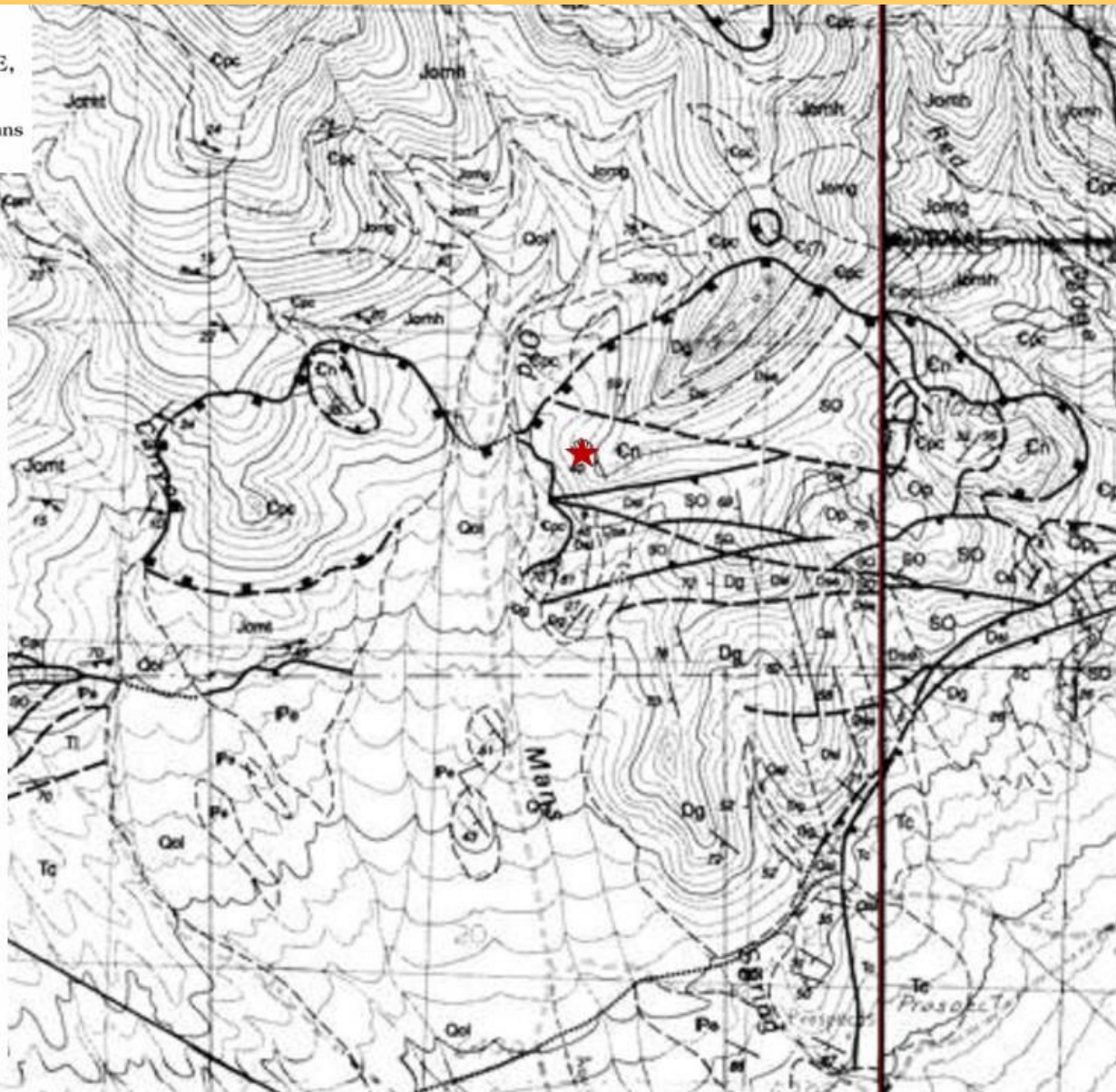
Jurassic Old Mans pluton

Intrusive rocks of Jurassic age occur in the southwestern most exposures of the lower plate in The Cove Quadrangle and underlie a large region of the adjacent Old Mans Canyon Quadrangle to the west. The eastern exposures of the Jurassic Old Mans pluton are exposed in The Cove Quadrangle. The Jurassic Old Mans pluton is a compositionally diverse suite of igneous rocks that ranges from diorite to granite. Most of the pluton is strongly gneissic, and mylonitic textures and fabrics are common. Strain is heterogeneous within the pluton; local zones of high strain are present, with true mylonites developed. Deformation occurred at greenschist facies conditions; chlorite and epidote are common retrograde minerals after biotite, hornblende, and plagioclase. Feldspars were deformed brittly, and the degree of gneissic fabric development is compositionally controlled, with plagioclase- and hornblende-rich diorites having undergone the least penetrative strain. The composite Old Mans pluton is one of several similar bodies of Jurassic granitoid rocks in the Snake Range. The other ones are located in the Strawberry-Weaver Creek, Willard Creek and Snake Creek regions of the southern Snake Range (Miller and others, 1993; McGrew and Miller, 1993). Several zircon fractions from three sites in the Old Mans pluton have been dated by the U/Pb method. The zircons have an older inherited Proterozoic component, have undergone lead loss since crystallization, and yield discordant ages. Collectively, the geochronologic data and field relations suggest intrusion of the Old Mans pluton at about 155±5 Ma (J. E. Wright, unpub. data).

**Jomg** Jurassic Old Mans granite Lesser biotite granite occurs within the composite Old Mans pluton as dikes, sills, and smaller bodies in the eastern end of the pluton. Based on crosscutting relations, it is inferred to be the youngest phase present.

**Jomh** Jurassic Old Mans hornblende-bearing diorite Hornblende-bearing tonalite and diorite are present in the eastern part of the plutonic complex. Hornblende-bearing phases of the Old Mans tonalite are gradational with biotite-bearing tonalite; more mafic hornblende diorite is often present as inclusions in tonalite, suggesting that it is the earliest phase of the pluton. Hornblende diorite is often coarse-grained and little deformed, contains variable amounts of plagioclase, hornblende, and lesser biotite with accessory epidote, sphene, allanite, apatite, and zircon.

**Jomt** Jurassic Old Mans tonalite Tonalite forms the main portion of the Old Mans pluton in the adjacent quadrangle to the west. It is a dark-brown-weathering rock that forms the dark slopes beneath the décollement along the southern flank of the range. The tonalite is coarse-grained, with a strongly gneissic to mylonitic fabric. It contains approximately 20 to 30% quartz, 40 to 50% plagioclase, 20 to 30% biotite, and little or no potassium-feldspar. Potassium-feldspar phenocrysts are present in patchy areas throughout the tonalite, however, where they are square to tabular in shape and several cm in size. Accessory minerals include abundant epidote, sphene, and allanite and lesser apatite and zircon.



**Dg** Devonian Guilmette Formation Regional thickness reported for the Guilmette is 760 m. The Guilmette Formation consists predominantly of interbedded limestones and dolomites. The base is generally light- to medium-gray, massive cliff-forming, micritic to very finely recrystallized, mottled, somewhat fossiliferous limestone. Fossils include gastropods, crinoids, and brachiopods. This part of the formation contains solution collapse breccias. The formation becomes better bedded upwards, where fine-grained gray limestone alternates with medium- to dark-brown, coarser-grained dolomite. Fossils are abundant and include stromatoporoids, brachiopods, crinoids, gastropods, and corals. The top of the formation is richer in limestone, and the uppermost portion is a highly burrowed, platy limestone.

**Dsl** Devonian Simonson Dolomite Regional thickness reported for this unit is 175 m. The Simonson Dolomite consists of light- to dark-brown, thin- to medium-bedded, laminated, microcrystalline to coarsely crystalline dolomite. Basal part is thicker bedded and uniformly light brown. The upper part is strikingly laminated with alternating light-brown and dark-chocolate-brown layers on a centimeter scale. Fossils include gastropods, crinoids, and brachiopods.

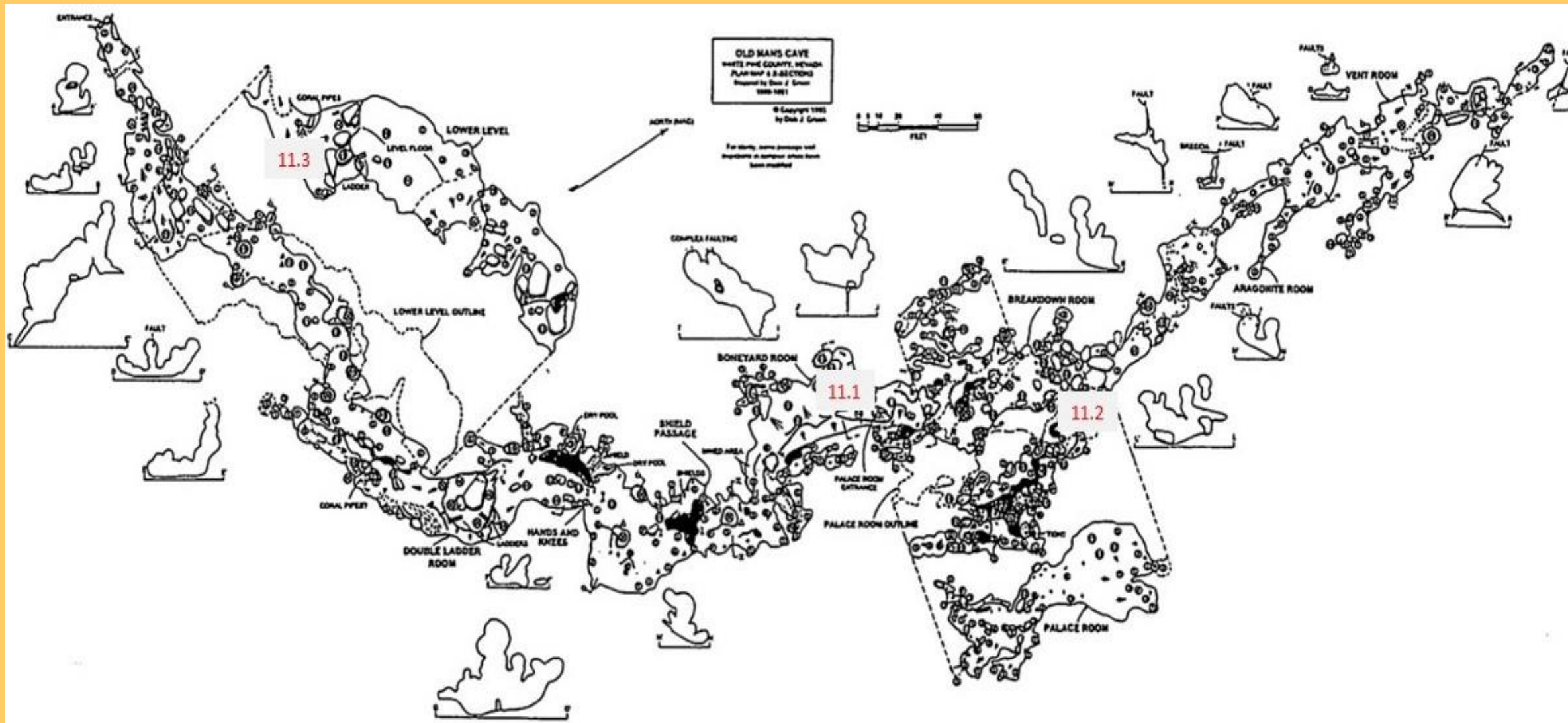
**Dse** Devonian Sevy Dolomite The regional thickness reported is 245 m. The Sevy consists of distinctive white-weathering, light-gray, thin- to medium-bedded, very fine-grained, nonfossiliferous, laminated dolomite. Diagnostic dark-brown-weathering stringers of well-rounded coarse- to medium-grained quartz sand occur in the Sevy. The Sevy Dolomite is noted for its lack of fossils.

**SO** Silurian and Ordovician Fish Haven and Laketown Dolomites, undifferentiated (SO dolomite) Regional reported thickness for the combined Fish Haven and Laketown Dolomites is about 460 m. The lower part is medium- to dark-brown dolomite with some stromatolitic, fossiliferous, and cherty intervals; the upper part is light-brown, coarse-grained dolomite. Fossils include colonial corals, rugose, tabulata, and stromatolites.

**Cn** Cambrian Notch Peak Limestone Regional reported thickness is about 485 to 550 m. The Notch Peak Limestone is medium-gray, fine- to medium-grained, cliff- to ledge-forming, bedded (typically 1-6 cm, and as much as 30 cm, thick) cherty limestone. Typically the limestone contains 1- to 2-cm-thick, rust-colored to brown chert nodules in beds 2 to 4 cm apart, but variations include 2- to 3-cm-thick nodular chert beds 2 to 3 cm apart, sporadic chert nodules in massive limestone, and massive to thinly bedded limestone without chert. Bedding, defined by silty interlayers, can be irregular to well developed. Brachiopods, gastropods, trilobites, crinoids, and stromatolites are common, and echinoids are scarce.

**Northern Snake Range décollement** Dashed where approximately located, dotted where concealed; squares on upper plate.







Boneyard Room



Dave Bunnell

## Stop 1.1 Boneyard Room

Secondary calcite formations developed in some areas of the cave after the cave primary speleogenesis had ended and the cave lie above the water table

Boneyard Room



Dave Bunnell





Classic boneyard (spongework) features found throughout Old Mans Cave.

Cupula and fin features are common hypogenic features.







Daniel Jones

Keyhole Passage with boneyard features (Stop 1.1 – Boneyard Room)

*Hypogenic Caves of the Great Basin: Old Mans Cave*

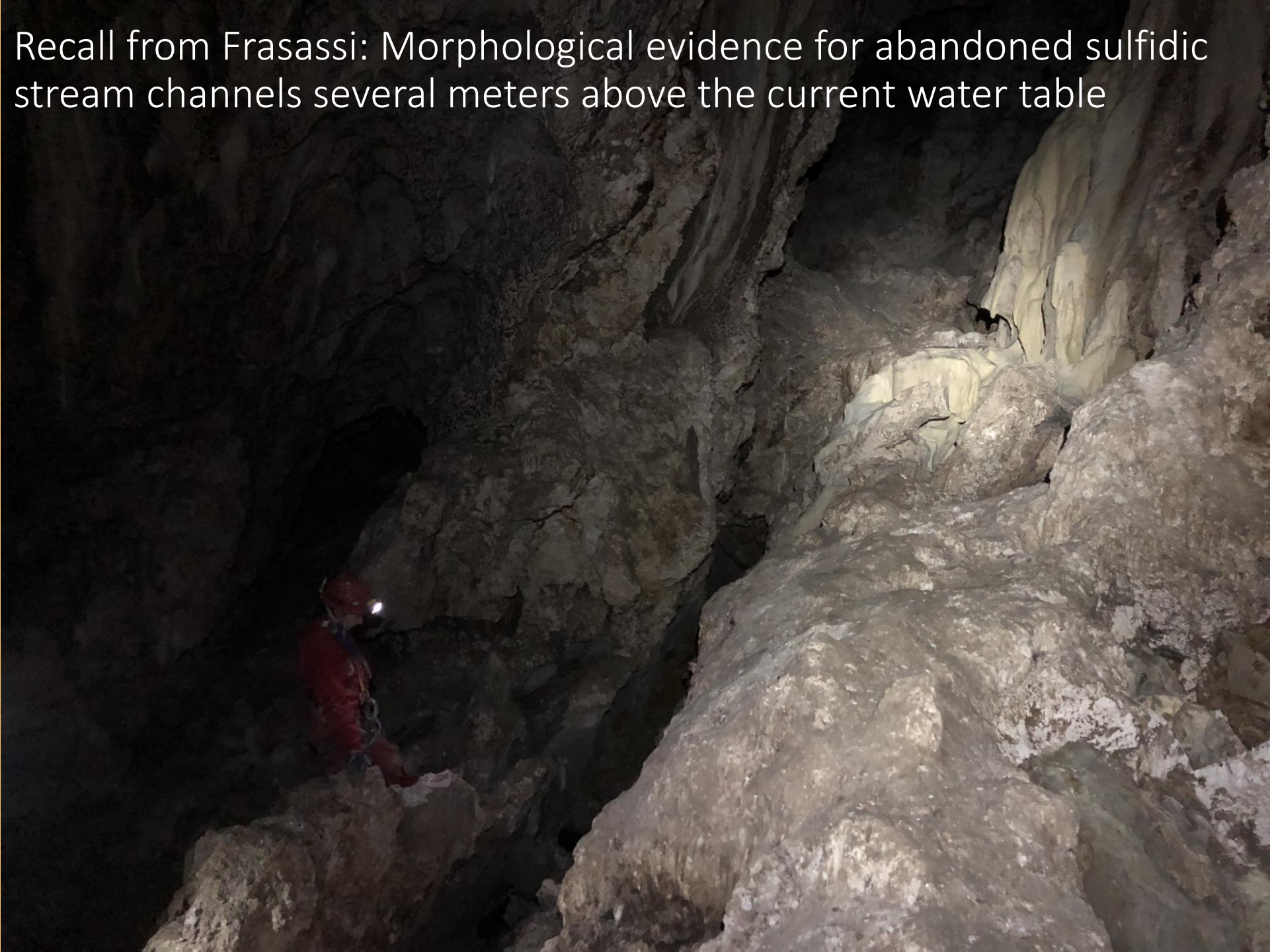


# Stop 1.2 Sample Analysis





Recall from Frasassi: Morphological evidence for abandoned sulfidic stream channels several meters above the current water table











Frasassi ("Bug" cave)





Daniel Jones

Keyhole Passage with boneyard features (Stop 1.1 – Boneyard Room)

*Hypogenic Caves of the Great Basin: Old Mans Cave*





Old Mans

*Hypogenic Caves of the Great Basin: Old Mans Cave*





## Stop 1.3 Coral Pipes



Type location for cave coral pipes (Hose and Strong, 1983) is displayed on the slope of a stalagmite in Old Mans Cave. Coral pipes form in a manner similar to hoodoos. An easily eroded sediment protected by a more resistant capstone eroded to form hoodoo-like pillars a few centimeters tall. Ultimately, splash from drips precipitate thin coats of calcite, thus lithifying the pillars. Sediments were initially interpreted as silt, but the geomorphology of the slope below the coral pipes suggests that the soft material may have instead been gypsum paste or moonmilk.