CAVES of WYOMING

Bulletin 59

By
Chris Hill
Wayne Sutherland
Lee Tierney


STATE OF WYOMING
1933
GEOLOGICAL SURVEY

The Geological Survey of Wyoming

Dan Miller, State Geologist

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UNIVERSITY of WYOMING
Laramie, Wyoming
March, 1976

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The Candelabra

The caves of Wyoming contain some beautiful speleothems, but they are usually small and very fragile. Although nature takes many years to create these intriguing forms, their growth may be disrupted or the features broken, by the slight touch of a hand. Several once beautiful Wyoming caves are now barren holes; their speleothems have been destroyed and their walls defaced by smoke writing and spray paint.

The five-inch helictite (pictured opposite in Pl. 1) once fascinated visitors to a Wyoming cave. The unique creation was destroyed and removed by vandals.

Your help and cooperation are essential if places of underground beauty are to be preserved. It is clear that there are often more visits to a cave than its environment can tolerate. Restricted access to caves seems inevitable.

If cavers choose their paths with care, the beauty and value of caves will be with us for years.

Photo By Wayne Sutherland

Preface & Acknowledgements

This bulletin is a collection of currently available information about Wyoming's caves. Hopefully, it will point to the need for considerate and conservative use of this fragile part of our world.

In Part I the processes that act on soluble rocks to form caves, cave features and related surface features are discussed. The cave environment, the relation of geologic history to cavern development and the ways in which caves interact with the surface environment are also described.

Part II contains descriptions and, in some cases, maps of 271 caves and related features in Wyoming. These descriptions include information of geological, geographical, archaeological and historical interest.

The reader should not infer that this bulletin is a comprehensive or final survey of Wyoming caves and karst areas. There are hundreds of square miles of cavernous geologic formations and many miles of passages yet to be discovered.

In an effort to make this work of both scientific and general interest, the correct scientific terms are used throughout the work. The italicized words found throughout the bulletin are defined in a glossary at the end of the work.

In the course of our field work, we contacted hundreds of people in Wyoming and many from out of state. We thank them all for their contributions and cooperation.

Much of our data came from work done by the Vedauwoo Student Grotto (Laramie Chapter of the National Speleological Society, NSS). Many persons from other grottos provided information and helped with the field work. Among the most helpful were the Windy City Grotto of Chicago, the Philadelphia Grotto, the Pittsburgh Grotto, the Shining Mountains Grotto of Montana, the Colorado Grotto of Denver, the Colorado State University Grotto of Fort Collins, the Pahasapa Grotto of Rapid City, the Salt Lake Grotto, and the Boston Grotto.

Federal agencies that provided assistance include the Bureau of Land Management, the National Forest Service, the National Park Service and the United States Geological Survey.

The Jackson Hole Ski Corporation generously provided services.

Some of the many individuals who gave willingly of their time, ideas, information and help were: Rich and Margaret Baldwin, Carol Banzhaf, Dr. Dwight Deal, Robin Dufford, Jerry Elkins, Dr. George Frison, Gayle Hill, Dwight Hoxie, Becky and Geoff Hunt, Dr. Peter Huntoon, Colleen Kelly, Lynne Lake, Dr. J. D. Love, Robert Monteith, Dr. B. Mears, Jr., Doug Medville, Dr. Daniel N. Miller, Jr., George Monsson, Donna Mrockzowski, Sally Petersen, Rob Stitt, Mr. and Mrs. R. L. Sutherland, Vickie Sutherland, Pete Uhl, Phyllis Wenger, and Eberhard Werner.

We also want to thank the many landowners and other Wyoming residents who graciously provided access and information. The bulletin would not have been possible without the help, cooperation and funding of the Wyoming Geological Survey and the patient assistance and encouragement of Dr. Forrest K. Root.

Chris Hill
Wayne Sutherland
Lee Tierney
Laramie, Wyoming
May, 1975

Introduction

Caverns have intrigued man from his beginnings. They have provided him with home, protection and have been sources for mystical and religious experiences. In Wyoming, Indians used caves for religious purposes until very recent times.

People today who enjoy exploring caves are called spelunkers. Those with a more scientific interest are termed *speleologists*.

Caves are naturally occurring, underground, air-filled voids. They are accessible from the surface and are large enough for men to enter to a point of total darkness. A cavity that does not extend to total darkness is called a rock shelter.

Caves in Wyoming exhibit a wide variety of forms. Some Wyoming caves are tight crawlways only a few feet long, while others consist of large hallways and many miles of passages. The cavern environments within the state are also diverse. There are dry caves, wet caves, ice caves, hot caves and cold caves.

Although their forms and environments may differ, most caves are the products of interaction between the atmosphere, ground water and layers of soluble rock (limestone, dolomite, gypsum, and anhydrite). These processes have been occurring for hundreds of millions of years, yet most of Wyoming's caves have formed in the last seventy million years.

The study of caves and their contents can yield much evidence about climatic, geologic and biologic evolution. Man's long use of caves for protection and habitation makes them an excellent source of archaeological materials. The cave environment frequently preserves materials that could not long survive exposure to the outside climate.

The formation of caves is intimately related to the chemistry and movement of ground water. An understanding of cave systems and cave-forming processes is important, therefore, to the *hydrologist* and others interested in ground water resources.

Ancient cavern systems can be important sites of mineral deposition. An example of this in Wyoming is found in the Little Mountain uranium deposits east of Lovell in Big Horn County. The economic geologist exploring or developing such deposits must understand the genesis and structure of the caves and related features where mineral deposits are localized.

The importance of cave conservation cannot be over-emphasized. Too many of Wyoming's larger and better known caves have been virtually destroyed by thoughtless visitors. Such destruction and defacement is deplorable and unnecessary.

Caves should be respected as an important scientific record and for their aesthetic value. Cavers should take care not to disrupt the nevironment of the cave or damage irreplaceable features. Wyoming State Law 6-229 prohibits cave vandalism.

> "Whosoever shall willfully and unlawfully deface, break off, cut, carve, print, paint, mark or engrave upon or in any manner injure or deface any natural cave, cavern, geyser, or tunnel, or who shall willfully and unlawfully injure, break, or destroy any formation of any natural mineral spring or hot spring, their minerals and chemicals, shall be fined in any

sum of not less than one hundred dollars, to which fine may be added imprisonment in the county jail of the proper county of not more than sixty days."

Caves under federal lands are protected by the Federal Antiquities Act in a similar manner.

The motto of the National Speleological Society sums up proper conduct when visiting a cave: "Take nothing but pictures, leave nothing but footprints, kill nothing but time".

Safety is another facet of caving that is often ignored. Caves are dangerous because they are a separate, different kind of world. Caving should always be done with a small party of people. Each member of a caving group should carry three light sources — a carbide lamp, a flashlight and candles with waterproof matches, for example.

In some Wyoming caves, flooding can be a fatal problem so weather conditions should always be considered before entering a cave. Vertical entrances or pits within caves should not be crossed or entered without the proper climbing equipment, and then only when the equipment and its proper use is completely understood.

Cave safety, conservation and the study of caverns are the chief concerns of the National Speleological Society. The major organization of cavers and speleologists in the United States. Those interested in caves or caving are urged to contact Wyoming members or the national office:

Vedauwoo Student Grotto
University of Wyoming
Box 3262 University Station
Laramie, Wyoming 82071

National Speleological Society
1 Cave Avenue
Huntsville, Alabama 35810

Karst Processes and Topography

Karst refers to "terrain with distinctive characteristics of relief and drainage" resulting from the solution of soluble rocks (Jennings, 1971). Many caves are found with a variety of other solution-produced features in karst terrain.

The principal rock types susceptible to karst development are *limestone*, composed mostly of calcium carbonate; *dolomite*, composed mainly of calcium magnesium carbonate; *gypsum*, composed of hydrous calcium sulphate; and *anhydrite*, composed of calcium sulphate.

Gypsum and anhydrite are the most readily dissolved and, as they tend to be structurally weak and easily eroded, caves in both are generally small and short-lived. Most caves form in limestone and dolomite.

Various processes act on susceptible rock types to form karst features. The effects of these processes vary in different areas, and depend on the type and distribution of soils and vegetation, water and rock chemistry, geologic setting and climate.

CORROSION

The most important karst forming process is *solution*, or *corrosion*. Through this process soluble rocks are chemically removed by reaction with water or gases dissolved in water. The most common type of solution leading to the development of caves involves a series of chemical reactions and ionic dissociations between water, carbon dioxide (CO_2) dissolved in the water and the calcium carbonate of the limestone.

Natural waters are usually agressive (have a high CO_2 content and therefore a high potential for solution). The CO_2 in the water is derived from the atmosphere and from the decay of organic materials. The amount of limestone taken into solution is lessened by an increase in temperature.

A less common solutional process, called *replacement-solution* (Egemeier, 1973), has apparently been active in the formation of several Wyoming caves (see Kane Caves, Des. 103 and 104). This process occurs in limestone caves that have hydrogen sulfide bearing thermal waters flowing through them. Hydrogen sulfide released into the air is dissolved in water droplets on the cave walls and forms sulfuric acid.

The acid reacts with limestone of the wall to form gypsum crusts. These crusts then fall off and are quickly dissolved in the cave waters.

OTHER KARST PROCESS

Although most caves are the direct result of solution, there are other important karst processes that form and modify caverns.

Corrasion is the abrasion or mechanical erosion of rock by water, ice or wind. Moving water in cave streams is the most important agent of

corrasion although some rock shelters and caves have been formed to a great extent by the action of wind. Corrasion by ice may play an important role in the modification of caves, particularly near their entrances.

Subsidence, the gradual downward movement of surface material, and *collapse*, the sudden mass-movement of material into an underlying void, are processes involved in the development of many caves and surface karst features.

Precipitation of minerals from water is the reverse of the solution process. The deposition of calcium carbonate or other minerals from cave waters is the mechanism by which caves are "decorated" with speleothems.

OTHER KARST FEATURES

Although caves are the principal karst feature described in Part II of this bulletin, the karst processes produce many other geomorphic forms. These other features often occur in the immediate vicinity of caves and some are directly related to caves (Fig. 2).

Dolines or *sinkholes* (Pl. 25, 28, 30 and others) are circular to eliptical depressions, ranging from a few feet to several hundred feet in depth and diameter. Any water entering them is diverted underground. Two major types of dolines may be differentiated by their different modes of formation.

Solutional dolines (Pl. 16) are formed during the early development of subterranean drainage. The solution process works along zones of

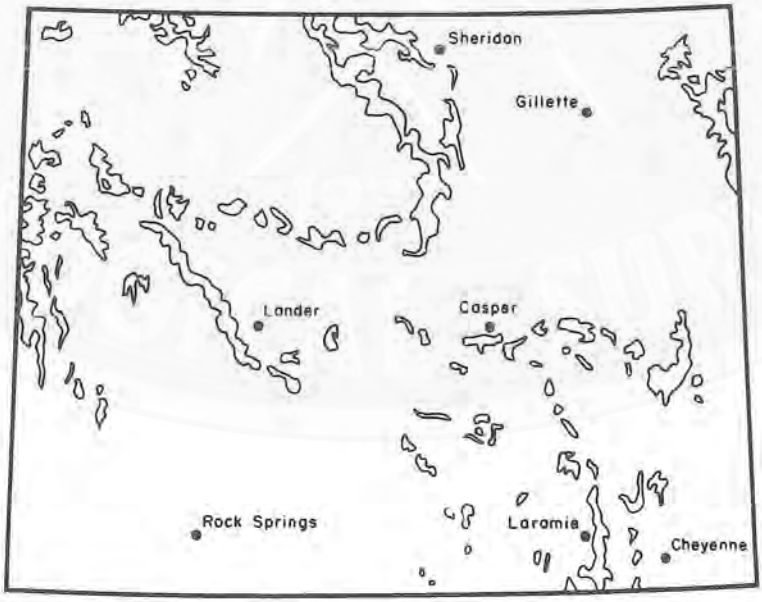


FIGURE 1 — This map shows the occurrence of soluble rock outcrops in the state. These outcrops are important because of their close relationship to cave formation.

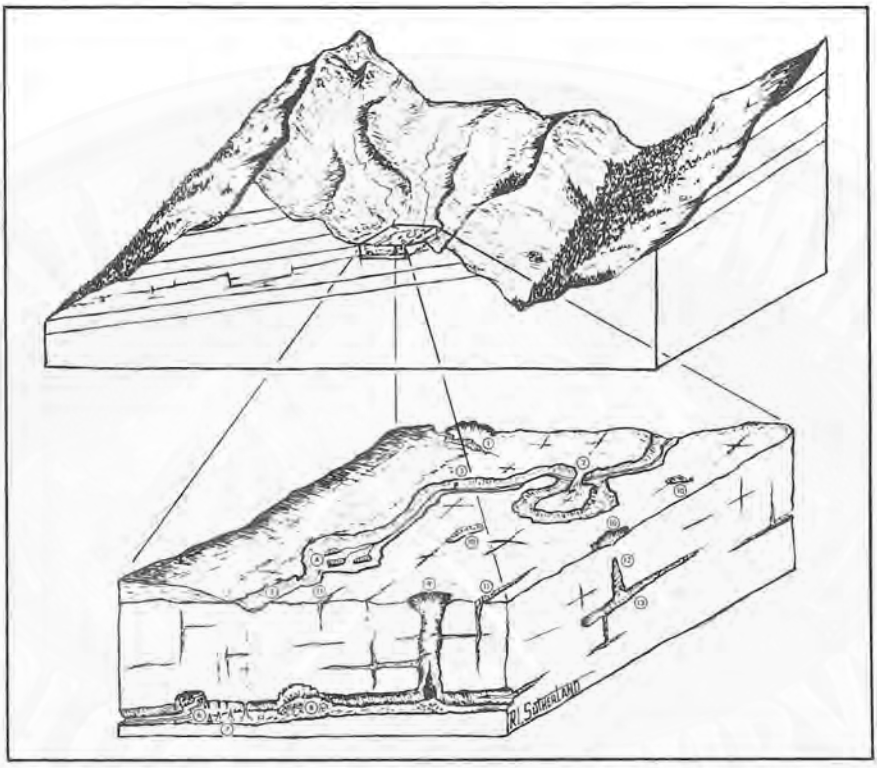


FIGURE 2 — This idealized karst area combines typical features of temperate and alpine karst: 1-blind valley, 2-natural bridge, 3-spring (rise), 4-ulva with three ponors (semi-blind valley), 5-dry bed, 6-underground stream, 7-speleotherms, 8-breakdown, 9-pit entrance, 10-doline, 11-fissure pit, 12-dome and 13-solution pocket or non-integrated passage. (Drawn by Robert L. Sutherland)

PLATE 2 — The stream in the foreground sinks into a collapse doline on the Death Canyon Shelf, Teton Range. (Photo by Wayne Sutherland)

weakness such as *faults* or *joints* (fractures in rock) and *bedding planes* (planes between rock layers), enlarging the zones so that the water flow into them increases. The descending water carries surface material underground and the doline forms.

Collapse dolines (Pl. 2, 14, 17) usually form later in the development of karst areas by the collapse of the roof of an existing cave chamber or passage.

Uvalas are *compound dolines* which result from the unification of several dolines or the development of several different sinking points, *ponors*, within a doline. A stream which sinks completely into a ponor leaves a *blind valley* and the stream bed downstream from the ponor is dry. An example of a blind valley is the sink of Austin Creek (Des. 35) in the Shirley Mountains.

When a ponor takes only part of a stream's flow, as in times of flood, it is a *semi-blind valley*. An example is the sink on Dry Medicine Lodge Creek (Des. 119) in the Bighorn Mountains.

The points where sinking streams re-emerge are called *rises*. Several sinking creeks in the Tetons have been traced by means of dyes to their rises. When the source is unknown an emergence is called a *karst spring*. The Periodic Spring (Des. 240) near Afton is an example of a karst spring

and also of a *steephead*. Steepheads are the upstream ends of short, deep valleys where a karst spring rises.

Natural bridges are erosional tunnels or cave remnants, open at both ends, which span existing or former stream courses or former cave passages. They may form by the partial collapse of a cavern roof or by the self-capture of a stream through a *meander spur* (Fig. 3). Ayers Natural Bridge (Pl. 10), west of Douglas, is the result of such a capture.

In addition to the large solutional features, many smaller karst features called *karren* (Pl. 3) occur in Wyoming. These vary from large, solutionally enlarged cracks and joints to small solution grooves, approximately an inch wide. The interested reader should refer to the work of Pluhar and Ford (1970).

PLATE 3 — These angular blocks are karren forms developed in the Madison Limestone, Gros Ventre Range. (Photo by Lee Tierney)

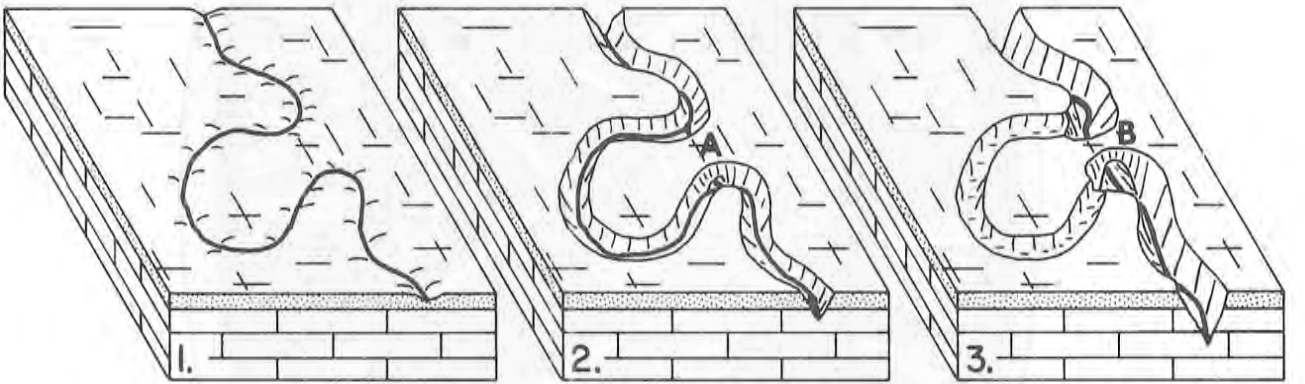


FIGURE 3 — The development of a natural bridge by meander cutoff. A stream meander (1) is developed on insoluble rock. The stream and meander is incised (2) into the underlying soluble unit. The cutoff is initiated by solution along a joint passing through the spur. With further erosion and enlargement (3), the meander is abandoned and all the stream's flow is through the natural bridge.

Cavern Development

All theories of cavern development involve ground water movement in soluble bedrock. The movement of ground water in bedrock is dependent on the porosity and permeability of the rock.

Porosity is the property of rocks with small spaces between their particles. It is expressed as the percentage of pore space in a specific volume of rock; it varies with the size, shape, arrangement, and variety of particles composing the rock.

Permeability is the capacity of a rock to allow movement of water through it. If a rock type allows relatively free movement of water it is permeable; if it halts water movement it is *impermeable*. A bed of rock with a high water content and good permeability is an *aquifer*.

Ground water moves downward in permeable rock under the force of gravity, passing through the *zone of aeration* to the *zone of saturation*. In the zone of aeration only some pore spaces are filled with water, while in the zone of saturation all available spaces are filled.

Within the zone of aeration, there may be relatively impermeable beds of rock which inhibit or stop the downward movement of water. These impermeable beds may result in the development of a *perched* body of ground water saturation above the true zone of saturation.

A less permeable overlying bed may also confine water in an underlying permeable layer. Where the water in a confined aquifer is under *hydrostatic pressure* and tends to rise toward the surface in wells penetrating through the overlying impermeable rock layer, the aquifer is called *artesian*.

Movement of water in artesian aquifers is theorized by Deal (1962) and Howard (1964) to have been responsible for the development of large cavern systems in the Black Hills of South Dakota.

In Wyoming, artesian systems are common because the structural and *geomorphic* relationships of mountain uplifts and basins favor their development.

HOW CAVES ARE FORMED

How the karst processes operate to create caves is the subject of a long debate. Older theories of cavern development can be grouped into two categories. The first attributes cave creation to the action of water moving above the water table in the zone of aeration. The second argues that most development took place below the water table in the zone of saturation.

Currently, there is a widespread belief that all cavern development begins in the saturated zone by solution along fractures and other planes of weakness. Development may then proceed in a number of ways, depending on the geological setting and changing conditions.

Older theories use the word "phreatic" to mean below the water table, and "vadose" to mean above the water table. The survey uses the phrases, zone of saturation and zone of aeration for these concepts.

Although there is seldom a well-defined water table in karst rocks it seems useful to distinguish between filled or partially filled conditions. *Phreatic* is used to describe both the condition of caves filled with water (usually moving at very low velocities) and the forms or features created under such conditions. *Vadose* is used to describe caves *partially* filled by

water (usually moving with appreciable velocities) and the features created under such conditions.

The complex evolution of a cavern may consist of several simultaneous processes of construction and destruction. For example, draining the cave may be accompanied by the collapse of walls and ceilings and the constructive deposition of speleothems. Water refilling the cave may renew cavern enlargement by solution, destroy speleothems or fill the cave with sediments or precipitated mineral deposits.

Climatic change may cause a change in ground water movement, levels and chemistry, all of which can affect cave development.

Cavern development and evolution is further influenced by regional geologic history. Structure, lithology, topography and drainage patterns all influence the particular expression of karst development in an area.

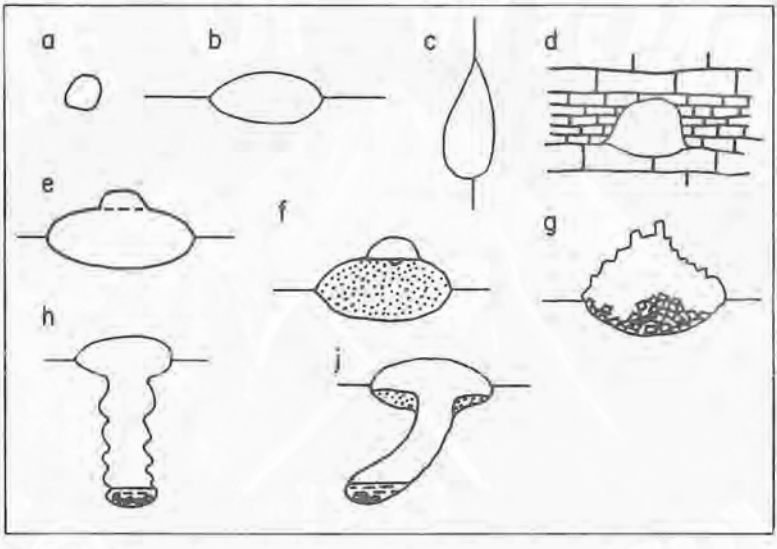


FIGURE 4 — Types of passage cross-section. After Renault 1958, Bogli 1956, Ollier and Tratman 1969.

(a) Phreatic tube in massive rock.
(b) Elliptical phreatic passage in horizontal bedding plane.
(c) Phreatic passage in vertical joint plane.
(d) Phreatic passage in group of more soluble beds.
(e) Phreatic passage with ceiling half-tube due to air entrainment along roofline.
(f) Phreatic passage aggraded to roof with development of ceiling half-tube.
(g) Elliptical phreatic passage modified by breakdown.
(h) Vadose canyon with horizontal channel grooves incised in floor of phreatic passage.
(j) Vadose canyon with inward meandering. Some aggradation of primary phreatic passage before incision.

(Taken from Jennings-1971)

CAVE MAPS

One of the most important tools for understanding the evolution of caverns is the cave map. The map provides information about passage forms and patterns (Fig. 4) and may indicate water flow, occurrence of breakdown and mineral deposits and the existence of various cavern levels. The cave map may also show the relationship of passages to the *strike* and *dip* of the geologic formation in which the cave occurs.

A cave map usually shows one of two types of passage patterns: the *dendritic* pattern, which resembles the branching of a surface stream (La Caverna de los Tres Charros Des. 120) or the *network* pattern, which resembles a map of city streets (Horsethief Cave Des. 101).

Dendritic patterns may indicate relatively rapid water flow. They also indicate that the cave was formed primarily in the zone of aeration. A network pattern may indicate slower flow of water and that the cave was formed in the zone of saturation. Multiple passage levels in a cave system may indicate a shifting of water levels.

Cave maps become even more informative when they are used in conjunction with surface topographic and geologic maps.

They can show the relationship of surface drainage and cave streams, other caves and reasons for passage termination, and a host of other things.

Part II of this bulletin contains 81 cave maps which are intended to supplement the cave descriptions and, hopefully, to provide information to speleologists unable to visit Wyoming caves.

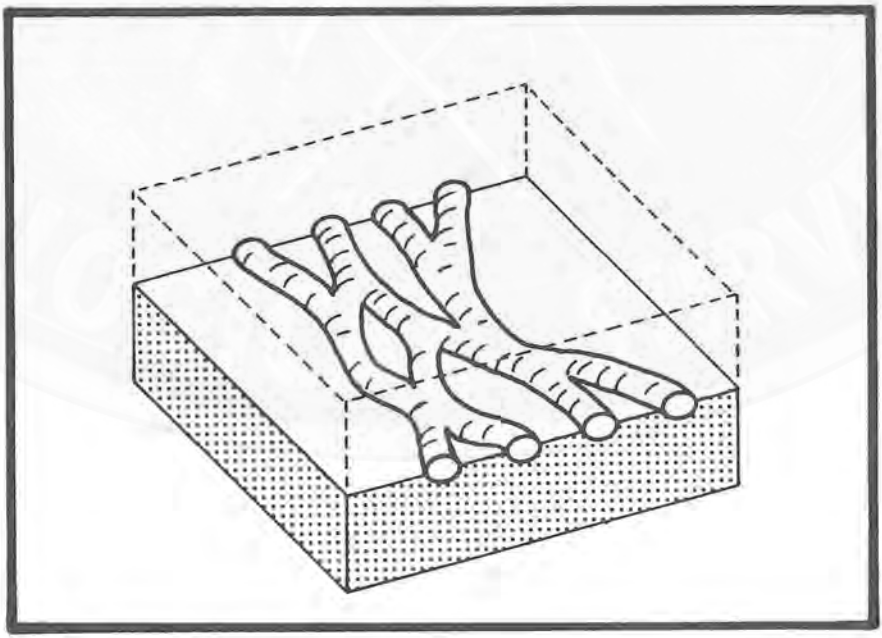


FIGURE 5 — Bedding Plane anastomoses.

Erosional Features

The solutional development of caverns creates distinctive erosional features. Although their origin is sometimes unclear, most caves can be classified on the basis of their origins in the *vadose* or *phreatic zones*. In the following discussion phreatic is used to mean saturated or water filled and vadose means partially saturated. The following discussion is from J. H. Bretz (1956).

PHREATIC FEATURES

Spongework, interconnected holes in the walls and ceilings of a cavern, forms when solution has dissolved much of the rock, leaving small networks that look much like a sponge.

This pattern forms on a cave ceiling only when the cavity is completely filed with water over a long period of time. Because of this, spongework is attributed to phreatic formation.

Wall and *ceiling pockets* are much like spongework, but their length and depth generally exceeds their width. They are believed to be developed by *eddy currents*. For an eddy to maintain a stable position long enough to form the pockets, a constant phreatic condition is the most likely explanation.

Bedding and *joint plane anastomoses* (Fig. 5) are linear networks of small tubes which occur in a plane and develop in gently dipping layers (*strata*). If their development continues, low-ceilinged horizontal passageways result.

The connection and enlargement of joint plane anastomoses may result in high arching cave ceilings. These features are known as joint controlled *domes*. Other structures, known as *slots*, are formed by this process. Slots are similar to domes but elongated along joints. They can also be formed by water moving upward along the joints.

Natural bridges and *pillars* (not to be confused with depositional columns) probably form under phreatic conditions, according to Bretz. However, it may be as logical to assign a vadose origin to some of these features.

Rock pendants, another erosional remnant frequently assigned a vadose origin, could also form by solution in phreatic conditions. These are projections of bedrock "hanging" from the ceiling or from under rock ledges.

VADOSE FEATURES

Development or modification of a cave under vadose conditions is usually accompanied by both corrosion and corrasion. As a vadose stream cuts through materials deposited in a passage it can erode *channel grooves* in the bedrock floor or migrate laterally to cut *incised meanders* in the bedrock walls.

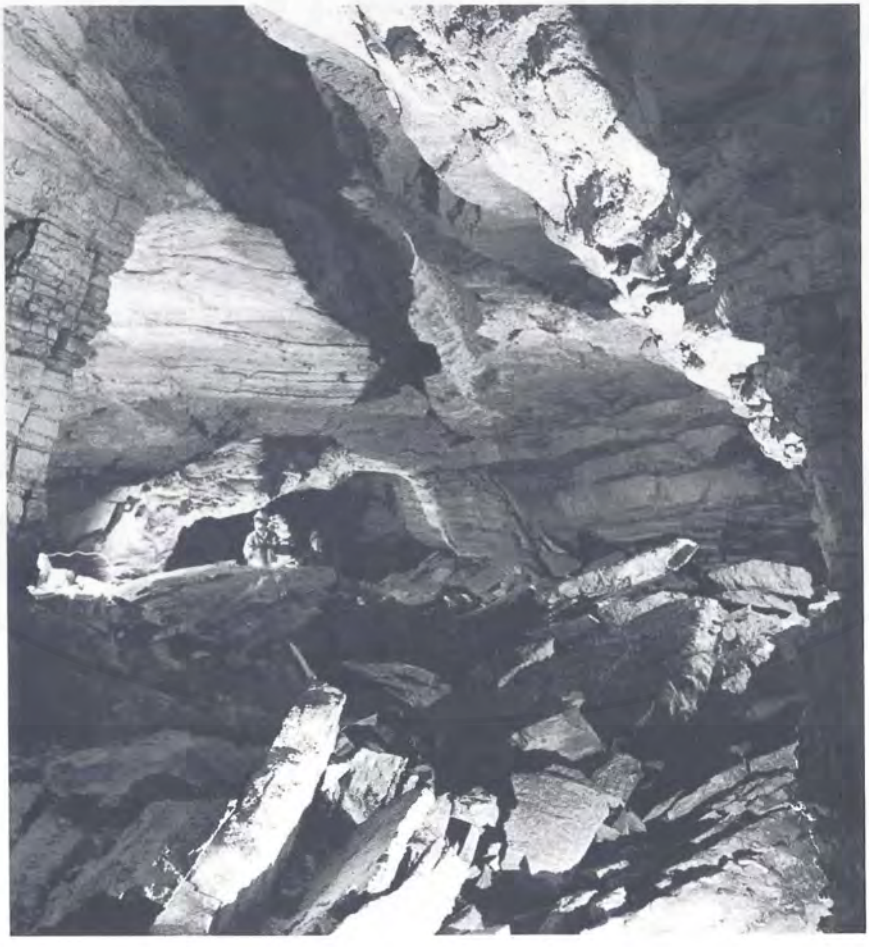
If a cave passage is nearly filled with clay, a slow moving vadose

stream may cut a *ceiling channel* in the overlying bedrock. *Vertical flutes* on the walls of pits indicate solution by water descending in a vadose environment.

Scallops, scale-like asymmetrical indentations on rock surfaces, usually indicate turbulent vadose flow. Larger scallops are developed by slower water movement.

All of the features assigned a phreatic origin have been observed in Horsethief Cave (Des. 101). Many of the features of vadose development have been recognized in Tongue River Cave (Des. 147) and La Caverna de los Tres Charros (Des. 120).

PLATE 4 — In the background, two cavers approach this large breakdown floored passage in Horsethief-Bighorn Cave System. (Photo by Wayne Sutherland)



Depositional Features

The Karst processes of corrosion and corrasion are the primary processes responsible for development and enlargement of caves. Collapse and precipitation, on the other hand, act principally to modify existing caverns and, eventually, destroy them. All four processes may be active at the same time and all may directly or indirectly produce depositional features in a cave.

Because all soluble rocks contain minor amounts of insoluble grains or *inclusions* (clay, quartz sand and silt, or *chert*) corrosion of such rocks inevitably results in the production of a clay-like insoluble residue which accumulates on the cavern floor.

Under vadose conditions, insoluble residues may be picked up by moving cave stream waters and transported far from their original source. Cave streams may also carry surface-derived sediments, brought into the cave system through the sinks of surface streams.

If the velocity of the cave stream decreases, the material it carries will be deposited. Larger materials are deposited first. And, if the water slows enough, even clay sized particles settle. The deposits will tend to be *horizontally graded* and well sorted.

BREAKDOWN

The most common depositional cave feature is *breakdown* (Pl. 4). It consists of angular pieces of bedrock broken from cave walls and ceilings. White and White (1969) list three types of breakdown, based on their layering patterns: block breakdown (composed of several layers or beds), slab breakdown (composed of single layers or beds) and chip breakdown (composed of fragmented beds).

The drainage of phreatic cavities, renewed cavern development, removal of supporting material near shafts, removal of supporting material from cave walls by vadose steams, renewed attack by flood waters, attack of percolating surface waters on ceilings, *crystal wedging* and *frost wedging* are all responsible for breakdown, according to White and White (1969).

OTHER FEATURES

The process of mineral precipitation often results in large, beautiful cavern deposits or speleothems. Although in Wyoming the most commonly occurring speleothems are composed of calcium carbonate and gypsum, other minerals form these features.

The mineral materials in cave waters are derived, primarily, from previous cave deposits, local bedrock and ground water. Deposition is usually caused by the loss of CO_2 from water, evaporation, or chemical reaction. Speleothem deposition may occur at the rock-air interface, at the air-water interface and underwater.

Calcite (calcium carbonate) speleothems deposited in the rock-air interface include *stalactites, stalagmites, columns, cave bacon, helictites,* and *cave palettes* or *shields.*

PLATE 5 — A large column, stalactites, flowstone and other speleothems provide intriguing decorations in some Wyoming caves. (Photo by Chris Hill)

PLATE 6 — These two large stalagmites have, thus far, escaped vandalism deep within a Wyoming cave. (Photo by Jerry Dick)

Calcitic *shelfstone* and *rimstone* form at the air-water interface, usually at the edges of pools of standing water. Rimstone forms dams as the result of precipitation at turbulent points under flowing water.

Dogtooth and *nailhead spar* are calcite crystals formed under standing water. They may grow perpendicularly from any submerged passage walls or fill and can attain considerable size.

Cave pearls, a rare cave feature, form by the precipitation of a thin calcite laminae around small nuclei in pools. Agitation by dripping or falling water keeps them from adhering to the floor and accounts for their spherical shape.

Gypsum speleothems, present in many Wyoming caves, include gypsum needles (Pl. 7), *gypsum flowers*, gypsum crusts, and large gypsum crystals. The occurrence of gypsum in Coon Odor Cave (Des. 102), the Kane Caves (Des. 103, 104) and Spence Cave (Des. 105) is cited by Egemeier (1973) to be primary evidence for the development of these caves by replacement-solution.

Several other minerals form speleothems and many minerals are deposited in caves. A forthcoming National Speleological Society Publication (Special Publication #2, *Cave Minerals*, by Carol Hill) covers this subject in much greater depth.

Many speleothems are easily damaged and none are common in Wyoming caves. Collecting or touching such features causes irreparable damage and visitors to caves should take care not to tread on or brush against these forms.

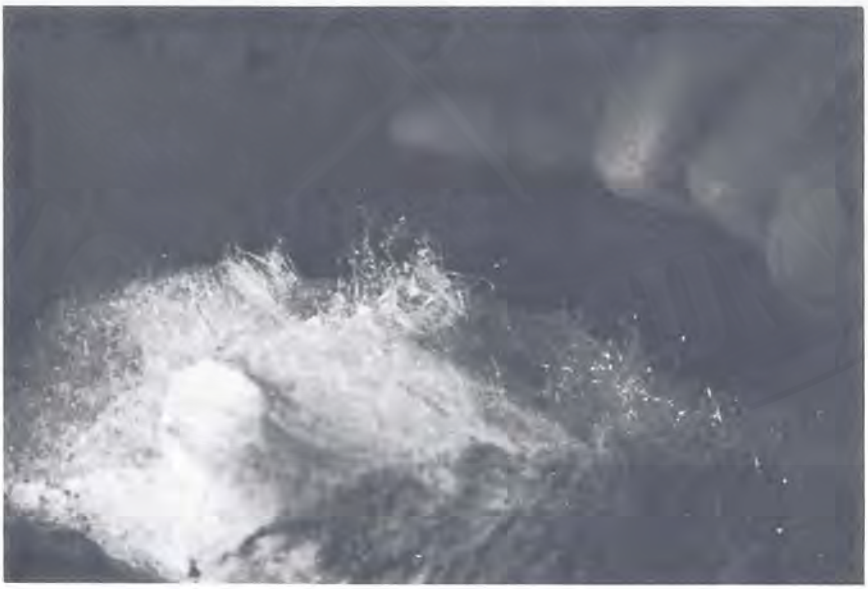


PLATE 7 — A caver's hand, upper right, dwarfs these delicate gypsum needles. (Photo by Wayne Sutherland)

The Cave Environment

The environs of a cave are the walls, floors and ceilings of bedrock which insulate and isolate the cave from daily and seasonal changes of above-ground climate. A cave can generally be considered a closed system. The cave climate is nearly constant throughout the year.

Visitors to a cave in the summer might notice a slight breeze blowing into the cave and, once inside, observe that the temperature is cooler than outside. If they return to the cave during the winter, they may find that the temperature is much warmer than outside.

Differences in temperature and barometric pressure result in the movement of air between a cave and the surface, and within the cave itself. Convection from temperature differences is not noticeable in most Wyoming caves, with the exception of Upper and Lower Kane Caves (Des. 103, 104).

In larger caves barometric pressure differences may be great because of the slow adjustment to outside pressure changes. Air movement can also be very noticeable. New sections have been discovered by tracing air movements to apparent "dead-ends". By digging through the breakdown, additional passageways have been found.

CAVE TEMPERATURE

Temperatures may vary greatly near cave entrances, but little or not at all deep within the cave. In Wyoming, most caves have temperatures between 30° and 50°F and occur at altitudes between 4,000 and 11,000 feet. Since cave humidity is usually high and expected temperatures low, Wyoming caves are damp and very chilly.

Local influences can vastly alter expected cave temperatures. The Kane Caves (Des. 103, 104) would be expected, because of their location to have temperatures around 49°, but actually have temperatures near 80°. This inconsistency is because thermal water flows through the lower cave. The water loses heat to the cave air and the warm air circulates by convection through both the lower and upper caves. This plesaant phenomenon is very rare — the opposite is more common in Wyoming.

Cold, heavy air tends to move to lower places where it may be trapped. In smaller caves, the mean annual air temperature is sometimes not maintained; very cold air can be trapped and remain year around. Ground water penetrating the caves freezes if the air temperature is at or near 32°. Some Wyoming caves contain speleothems of ice and some larger *ice caves* in Wyoming are probably relics of former glacial climates.

If large amounts of surface water flow into a cave, cave temperatures may be greatly affected. Temperatures in La Caverna de los Tres Charros (Des. 120) vary six degrees or more because of seasonal changes in the temperature of water entering the cave.

MAN AND CAVE ENVIRONMENT

Man may change cave environments by restricting or increasing water and air flow within the cave. Sealing entrances, digging artificial entrances and minor diversions of surface and subterranean water affect cave humidity and moisture.

Ground water projects, especially those involving the Madison Formation in the Powder River Basin, should be cautiously approached. Reduced water levels in wells, springs, and streams could result from improperly planned water development.

Cave visits may greatly influence a cave's climate and ecology. In Wyoming, ice caves in particular are sensitive to minor temperature changes. The use of electric lights, which radiate a minimum of heat, will reduce the damage from a visit to an ice cave. However, since body temperature alone can injure such caves, visits should be kept to a minimum.

FAUNA

Animals inhabiting caves are an integral part of many cave environments. They can generally be placed into three categories: *trogloxenes* — those animals which occasionally or seasonally use caves; *troglophiles* — those animals that choose caves as their habitat; and *troglobites* — those animals adapted to and dependent on the cavern environment.

In Wyoming, trogloxenes include bats, bears, cats, coyotes, foxes, rabbits, muskrats, skunks, porcupines, raccoons, mice, pack rats, mosquitos, crickets, beetles and, at less than 7,000 feet, rattlesnakes and other snakes.

Troxgloxenes usually remain near the cave entrance.

Bats observed in caves should not be disturbed. During the winter they hibernate and their metabolism slows to a very low rate. When disturbed, a bat raises his metabolic rate so he can move and avoid danger. This action may deplete the reserves necessary for survival through spring.

The presence of troglophiles in Wyoming is not confirmed; however, several observed kinds of cave life may belong to this group. In this category are several types of beetles, crickets, small trout and carnivorous mice.

Troglobites are the rarest type of cave life; none have been positively identified in Wyoming.

Specimens of cave life should not be haphazardly collected because populations are generally small. It is important to remember that most cave animals live in a precarious balance with their environment. A minor change caused by the visit of man may endanger cave species and perhaps cause their extinction.

Wyoming Geologic History and Origins of Caves

A brief examination of the cave descriptions in Part II of this bulletin proves that Wyoming caves are found in widely scattered localities. Each cave exhibits unique passage, depositional and erosional history.

This variety results from the lengthy interaction of karst processes with controlling factors (geology, climate, soils, vegetation, and so forth) at different times. To understand the development of a cavern the geologic history of the area where it occurs must be understood.

It is helpful to refer to the geologic time scale (Fig. 6) to place events from the following discussion in the proper time perspective.

LIMESTONE DEPOSITION

Nearly six hundred million years ago, Wyoming was part of a continental shelf covered by shallow seas. For hundreds of millions of years these seas advanced and retreated across the region, depositing coarse sediments derived from adjoining landmasses to the east. In the less agitated water of a subsiding trough to the west, thousands of feet of soluble limestones and dolomites were deposited.

During the Cambrian period, the Gallatin and Death Canyon Limestones were deposited. Both of the limestones crop out today in the northwestern part of the state. The Death Canyon Limestone has extensive karst development.

In the Ordovician Period, massive beds of the dolomitic Bighorn Formation were laid down. The deposits are now exposed in the northern and western part of Wyoming and contain several large caves, many smaller caves and a number of fissures.

In the Mississippian Period, Madison Limestones were deposited. These limestones overlie the Darby Formation in northwestern Wyoming, the Bighorn Dolomite in north-central areas, pinch out to the southeast, and correlate with the cavernous Pahasapa Formation of the Black Hills. Several of Wyoming's larger caves and extensive surface karst features are in the Madison Limestone.

PALEOKARST

Approximately three hundred million years ago, at the end of the Mississippian Period, the continental shelf was gently uplifted to form a low coastal plain, very similar to present-day Florida. An extensive karst system developed and was filled during the Pennsylvanian Period.

Filled former karst systems like this are called *paleokarst,* and usually consist of *breccias* composed of angular rock fragments, clays, sands, and gravels, all cemented together by calcite.

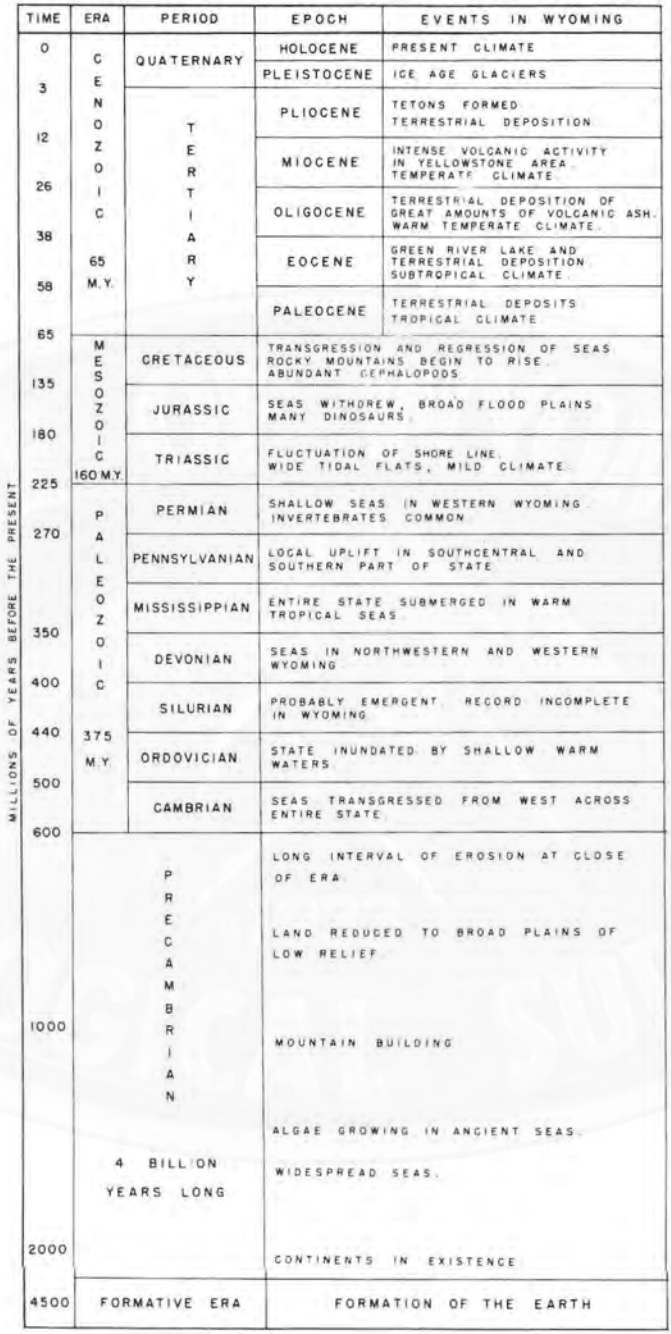


FIGURE 6 — Geologic time scale.

Following development of the paleokarst and its filling during the Pennsylvanian Period, the area was generally below sea level for another two hundred million years. During this time and into the Permian Period, the Casper Formation was deposited in southeastern Wyoming. Some small caves occur in limestone layers of this formation.

Following the development of paleokarst during the Pennsylvanian Period, some local uplift occured, sometimes isolating large shallow areas of the marine shelf. Evaporation of sea water in these shallows left behind deposits of gypsum and anhydrite.

In the Black Hills of northeast Wyoming and western South Dakota, extensive karst has developed in some of these gypsum deposits. Caves developed in gypsum tend to be of relatively short duration due to the high solubility and low strength of the rock, and also generally occur near the surface since plastic rock flow is likely to close any sizable cavities at depth.

LARAMID OROGENY

Approximately seventy million years ago, in the Late Cretaceous Period, Wyoming's seaside history ended. The *Laramide Orogeny* began. During this episode the state's present structural pattern of basins and mountain ranges was created.

Older carbonates and sedimentary rocks that formed beneath ancient seas were raised as the Rocky Mountains formed. Before this uplift some cavern development may have taken place. The immense pressure, stress, and deformation that accompanied the mountain building probably destroyed most of the early cavities.

Joints and faults from Laramide and earlier mountain building episodes permitted ground water to flow into the karst region as overlying rocks were eroded. Solution began to enlarge and integrate some of these fractures into caves. The influence of joint systems in Wyoming caves is apparent from a glance at the Horsethief Cave map (Des. 101).

Faulting sometimes creates *striated* and polished surfaces (*slickensides*) along the planes of movement. Slickensides have been observed in Spence Cave (Des. 105), Sinks of Lander Cave (Des. 148) and others.

Faults can serve either to localize solution processes or to form a barrier which interrupts passage development. The actual relationship of faults to particular Wyoming caves has not been studied in detail.

FISSURE PITS

One type of cave, which has developed along Laramide or later joint systems, is of uncertain origin. The caves, called *fissure pits* by Wyoming cavers, are vertical cracks along joints with little or no horizontal passage.

Fissure pits in the Bighorn Dolomite of the Bighorn Mountains are particularly puzzling. The pits are often widest near the top but may vary in width throughout. Paper-thin joints with no apparent displacement and an absence of crosscutting joints are found in the upper portions of many of these pits, but such indications of solution are usually lacking in

deeper reaches of the caves. These fissure pits seem to occur at high elevations, especially where forest cover is lacking.

In the Tetons, many fissure pits occur in Death Canyon Limestone. They have a solutional character with karren forms throughout and frequently drained at the bottom by siphons.

ALPINE KARST

Many of the terraces along existing rivers have been correlated to glacial stages which occurred during the Pleistocene Epoch beginning three million years ago. Four major glacial stages or advances have been recognized; present evidence suggests that each stage was composed of several major and minor advances. The study of cave fills and histories may help unravel glacial chronologies.

Glaciers and snow fields retain a large amount of water which is released as they retreat or melt. When this water flows across soluble rocks, *alpine karst* (characteristic terrain which results from solution and *periglacial* processes acting on soluble rocks at high elevations and latitudes) may develop.

Lower temperature water holds more dissolved carbon dioxide, making solution more efficient. With plentiful bedrock fractures available for attack by *aggressive water*, many sinking points develop in alpine karst terrain.

Most alpine karst caves in Wyoming exhibit predominently vertical passages. This may be because very aggressive melt water becomes quickly saturated.

The lack of speleothems in alpine karst areas in the state may be due to the lower rate of evaporation at lower temperatures or to the aggressive character of the cold water.

Wyoming exhibits some classic alpine karst on the Madison Limestone in the Gros Ventre Range, on the Death Canyon Limstone in the Teton Range and at other high elevations.

As the surface forms of alpine karst cannot form beneath a glacier, the conclusion is that, with the possible exception of large cave systems like Rendezvous Peak Cave, the alpine karst in Wyoming has developed since the last major glaciation.

THERMAL WATERS

In the Early and Middle Tertiary Period and in the Quaternary Period Wyoming was the site of extensive volcanic activity. During these times thick layers of lava and volcanic ash were deposited in the northwestern part of the state. This activity is still reflected in the many thermal springs in the area.

Thermal waters have played a very important developmental role in several caves, including the Hot Holes (Des. 156, 157) in Wind River Canyon and the Kane Caves (Des. 103, 104). There are many karst features in Yellowstone National Park related to the action of thermal water.

PSEUDOKARST

Features similar to those of karst topography but occurring in nonsoluble rocks are classified as *pseudokarst*. In Wyoming, many basin areas contain fine-grained rocks deposited during filling in the Tertiary

Period. Such basins abound with pseudokarst features and contain caves formed by the process of *piping*, in which cavities initially form by the action of certain clays which swell and contract with the presence or absence of water.

OVERVIEW

Cavern development in Wyoming has occurred throughout a number of eras. Some caves are quite old while others are relatively young. In most intances though, detailed developmental histories have not been compiled for individual caves. Ample opportunity remains for the study of individual caves and systems in all parts of the state.

Perspective

Man's cave-dwelling ancestors seem to have set a trend for modern man — when they finished with bones, tools, clothing, or other objects they just threw them outside. It is, unfortunately, in mans nature to pollute.

Graffiti, trash and other junk now marks man's prsence in many caves. Perhaps even more important than this, though, are the less apparent aspects of karst topography which play a part in our ever more polluted environment.

One aspect, the purification of ground water, is greatly influenced by karst features. Under normal circumstances, polluted surface water will be purified as it sinks through the various rock layers on its way to the aquifer.

In areas of karst topography this process is subverted. Because of the many cracks, caves and sinks in this type of topography, the polluted water passes, relatively unpurified, to the aquifer. This can result in either the pollution of the ground water system or of streams far from the site of pollution.

Thus far in Wyoming, this has resulted in relatively few problems. However, in the eastern United States, pollution through karst systems has ruined ground water quality in several areas.

With the increasing recreational development of mountainous areas, some pollution is certain to occur unless intelligent planning is strictly implemented.

Part II
Cave Descriptions

The second part of this bulletin describes the known caves within Wyoming. For convenience of discussion, the state has been separated into seven districts on the basis of geomorphology.

At the beginning of each chapter, a map with the approximate location of known karst features is included. Each symbol is numbered to correspond to the sequential numbering of the cave descriptions. Where the location of a feature is uncertain only a question mark appears.

For some chapters, a stratigraphic column depicts the interrelationship of the cavernous and non-cavernous geologic formations. The columns are followed by a generalized discussion of the geomorphic setting, topography and geologic context of cavern development in the district.

Information given in each cave description includes: the cave name and map number, its location by topographic quadrangle, its elevation, geologic formation, the owner of the land (when known), the total surveyed length (TSL) if known and other pertinent information.

Through the text, cave locations are given only to the proper quadrangle. This was done in an effort to discourage haphazard visitation to the caves. More precise locations can be supplied by the Wyoming Geological Survey or the Vedauwoo Student Grotto in Laramie.

In the descriptions an attempt is made to indicate the relationships of the various cave passages. The descriptions also include information on the archaeology, geology, history and development of the cave, when known.

Much of the information on cavern development is conjectural but is included in the belief that a start must be made. Many of our conclusions may be proven erroneous with in-depth studies of individual caves, but our primary concern is to stimulate such studies.

The importance of obtaining an owner's permission when crossing deeded or leased land cannot be overemphasized. Most land owners will allow cavers to visit their caves; however, they may have stock in the area or people hunting near the cave and may suggest that the visit be made at a later date.

Many caves on public lands are gated and access to these is strictly controlled. Again, it is recommended that requirements and procedures be obtained from the controlling agency prior to a planned visit.

The Wind River Indian Reservation incorporates a large area in the center of Wyoming and includes lands in the Wind River and Owl Creek Mountains where some cavern development has certainly occurred.

In many cases the caves have a religious significance for the Indians who live there and it has been the policy of the members of this cave survey not to trespass on Indian lands. We do not wish our shrines defiled and we urge a similar respect for the shrines of other people.

Chapter 1
Southeastern Wyoming

This district includes the Laramie Range, the Shirley Mountains, the Hartville Uplift and several other scattered cave locations in southeastern Wyoming.

The Laramie Range

The Laramie Range is a granite-cored, *anticlinal uplift* of the Laramide Age, extending from the Wyoming-Colorado border north and west to Casper. The lack of large cavern systems in this area is probably due to the absence of the Bighorn Dolomite and the thinness of the Madison Limestone in the southeastern part of the state.

GENERALIZED PARTIAL STRATIGRAPHIC COLUMN
FOR SOUTHEASTERN WYOMING

AGE	*FORMATION NAME*	*DESCRIPTION*	*APPROXIMATE THICKNESS (FT.)*
PERMIAN	Goose Egg Formation: Little Medicine Anhydrite and Limestone; Freezeout Redbeds; Ervay Limestone; Difficulty Redbeds; Forelle Limestone; Sataka Formation: Glendo Redbeds, Minnekahta Limestone, Opeche Redbeds	Interbedded red shales, siltstones, thin limestones, gypsum and limestone breccias. Goose Egg is equal to the Phosphoria and Dinwoody Formations to the west. Subdivisions of formations do not occur in all areas.	300-400
PENNSYLVANIAN-PERMIAN	Casper Formation: Tensleep Sandstone	Tan cross-bedded sandstone and some gray limestone; interfingers with Casper Formation in southern Laramie Range	700
	Casper Formation: Amsden Formation	White to red shale, sandstone and gray limestone; interfingers with lower Casper Formation in southern Laramie Range	200
			600 to 1400
	Fountain Formation	Red arkose, sandstone, siltstone and shale; absent to the north	0-500
MISSISSIPPIAN	Madison Limestone (Guernsey Limestone)	Gray to buff, massive, crystalline, dolomitic limestone; upper portions are pink to lavender with chert layers; absent to the south	0-300
CAMBRIAN	Flathead Formation	Pink to brown quartzitic sandstone and arkose; equals the Deadwood Formation in the north; absent to the south	0-60
PRECAMBRIAN	Granite, schist and gneiss		

In the southern part of the range, several small caves occur in the limestones of the Casper Formation. To the north, the Madison Limestone (Guernsey Formation) is the important cavernous formation.

Paleokarst exposures in the Madison Limestone, in the Boxelder-Mormon Canyon area south of Glenrock, have been reported by Drwenski (1952). Small caves and karren forms are prevalent on the west flank of the Laramie Range.

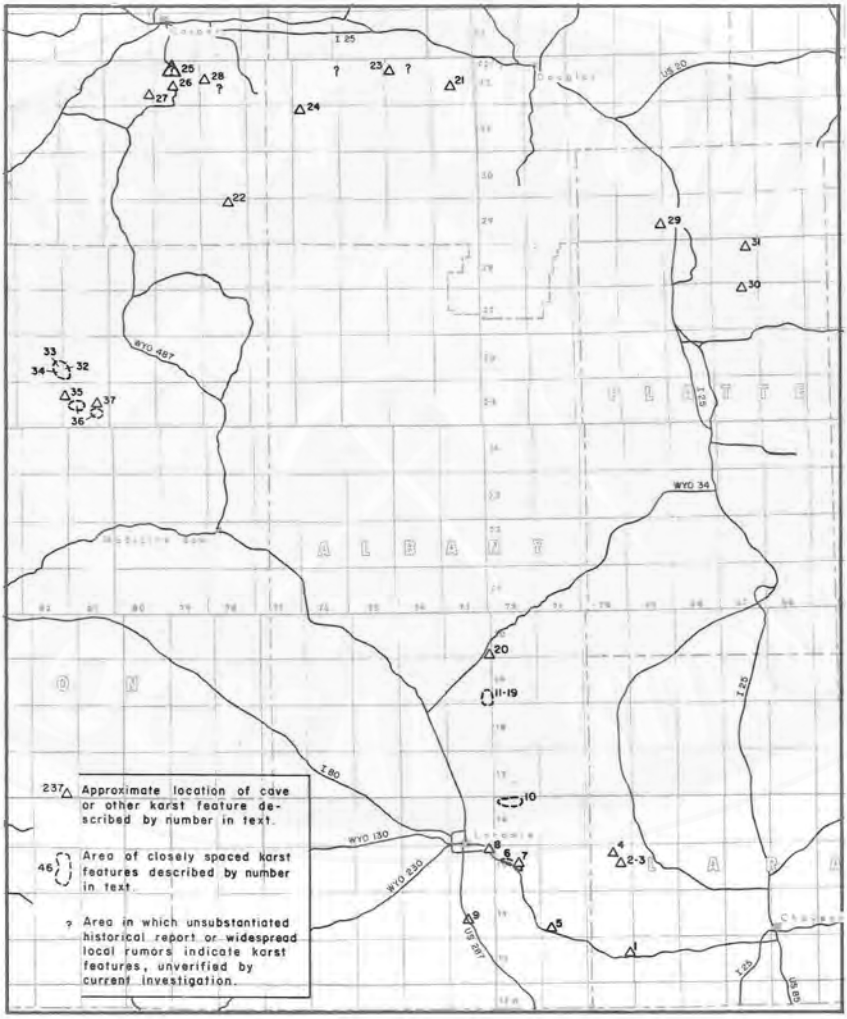


FIGURE 8 — Index map of Southeastern Wyoming.

COAL CHUTE CAVE — 1*

LOCATION: Granite Quad.
ELEVATION: 7380 feet, (2251 meters)
FORMATION: Casper Formation
OWNER: Private
TOTAL SURVEYED LENGTH: 102 feet, (31 meters)
DESCRIPTION: The following description is after N. J. Kunianski from the Aglarond, v. I, no. 1, 1972:

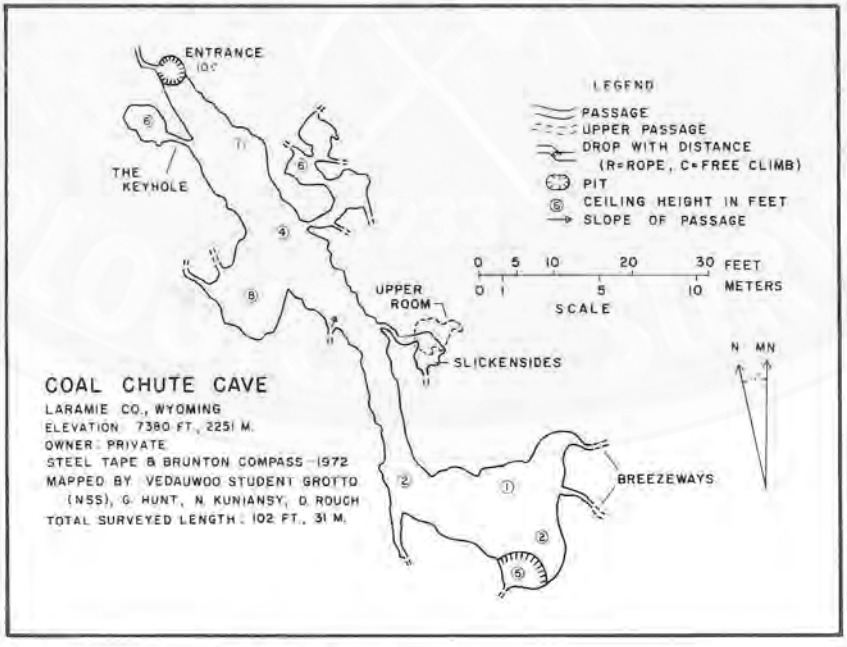
"This cave is located in a sink in the extreme southern end of a limestone quarry, about 100 yards north of Interstate 80. The entrance to the cave is a small, smooth-walled pit, about ten feet deep.

"From here, a scalloped, vadose passage leads down into the cave; the cave continues descending at an average inclination of 25 degrees until stream rubble chokes are encountered.

"The cave pinches down at several rubble chokes from which air currents blow, indicating perhaps more cave."

TABLE MOUNTAIN CAVE — 2*

LOCATION: Islay Quad.
ELEVATION: 7,520 ft. (2,294 m.)
FORMATION: Casper Formation
OWNER: Frank Bonham
TOTAL SURVEYED LENGTH: 600 ft. (183 m.)
DESCRIPTION: The entrance to this small cave is a 45 foot fissure developed along a joint on Mesa or Table Mountain. The entrance is ap-



*—denotes map included in text

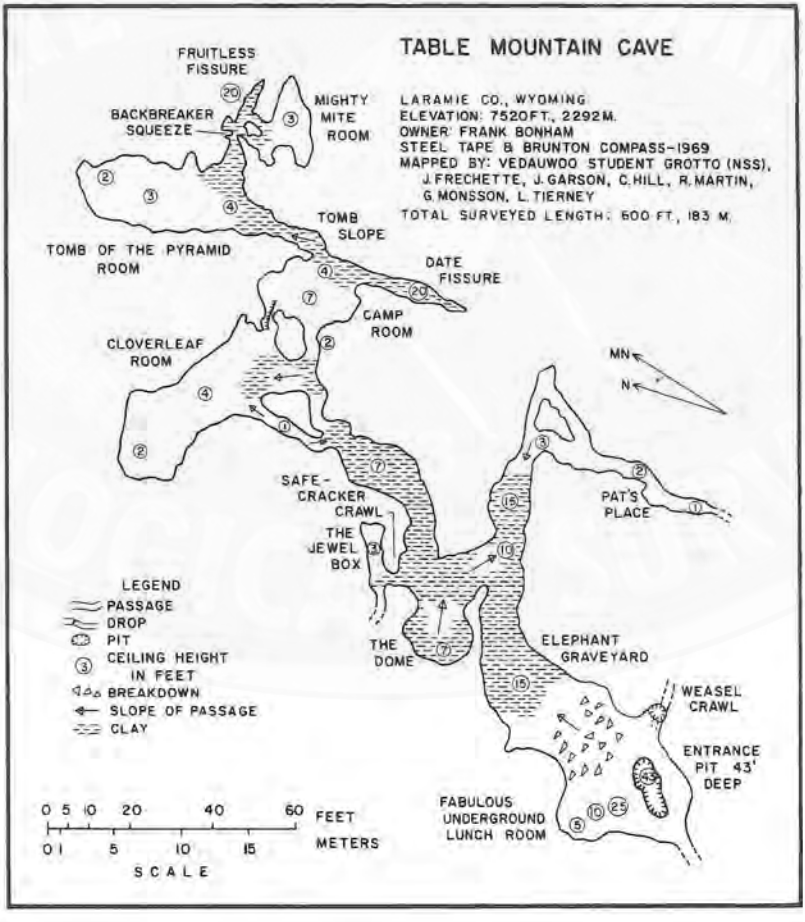
parently formed by collapse and is 3' x 15' at the surface. It is covered with steel plates to prevent stock from falling in.

Beneath the surface the pit bells out to 25 feet in diameter. The cave has several small rooms interconnected by small crawlways. There is over 600 feet of passage, developed in relatively flat-lying limestone. Apparently this passage is unrelated to any present surface drainage. This and the network passage pattern suggests that the cave was developed phreatically.

The cave has been vandalized heavily, so many of the delicate soda straws and more sturdy speleothems have been destroyed.

Near the back of the cave is a high fissure passage and, on its walls, many past visitors have carved their names. The oldest date observed was 1841, followed by 1864 and then many recorded visits in the 1870's, 80's and 90's.

Permission to visit this cave must be obtained in advance from Frank Bonham of Federal, Wyoming. The entrance pit requires vertical equipment.

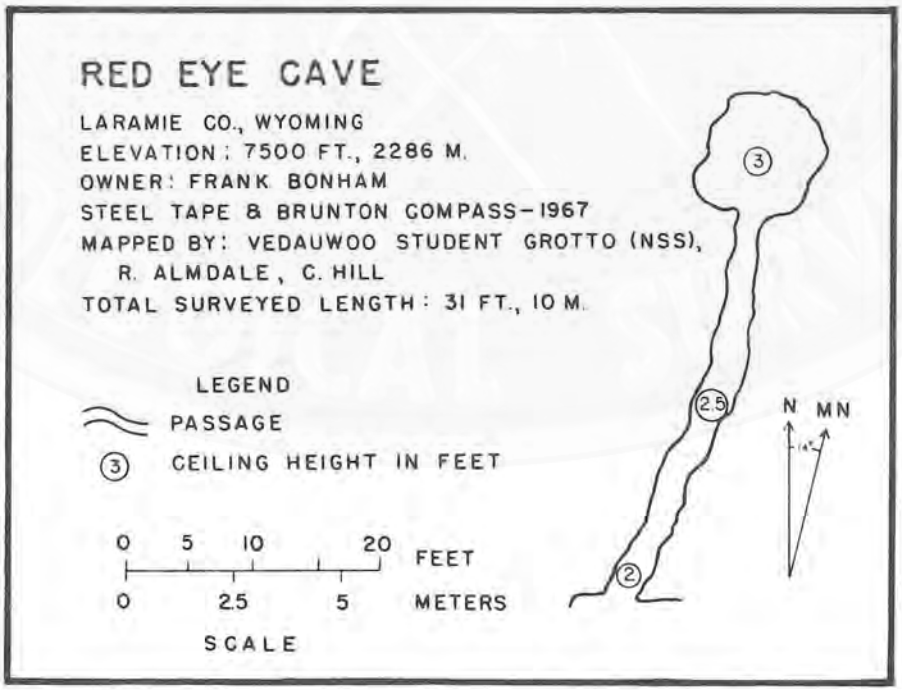


RED EYE CAVE — 3*

LOCATION: Islay Quad.
ELEVATION: 7,500 ft. (2,288 m.)
FORMATION: Casper Limestone
OWNER: Lorenz Ranch
TOTAL SURVEYED LENGTH: 31 ft. (10 m.)
DESCRIPTION: The entrance to this cave is in a low limestone outcrop in a gully 200 feet south of Table Mountain Cave (2). The entrance is a hole 1.5 feet in diameter. A crawlway leads 25 feet into the outcrop to a small room eight feet in diameter.

CACTUS RABBIT CAVE — 4

LOCATION: Isaly Quad.
ELEVATION: 7,400 ft. (2,257 m.)
FORMATION: Casper Formation
OWNER: Lorenz Ranch
DESCRIPTION: This small, dry cave is located on the southeast end of a hill overlooking Lodgepole Creek. The cave is about 5' x 4' at the entrance, but pinches down after 30 feet to about 3' x 3'. The cave ends where a dirt fill blocks the passage, but it appears that digging could extend the length of the cave.



GRAND VEDAUWOO CAVERNS — 5*

LOCATION: Sherman Mountains Quad.
ELEVATION: 8,240 ft. (2,513 m.)
FORMATION: Sherman Granite
OWNER: U. S. Forest Service (USFS)
TOTAL SURVEYED LENGTH: 43 ft. (13 m.)

DESCRIPTION: This is a small granite cave, about 40 feet long, on the south edge of the Vedauwoo Recreation Area. The cave is formed along weathered joints and does contain some popcorn-like speleothems, probably composed of silica. Animals of various sorts appear to have inhabited the cave.

TELEPHONE CANYON ROCK SHELTERS — 6

LOCATION: Ragged Top Mountain Quad.
ELEVATION: 7,700-8,600 ft. (2,349-2,623 m.)
FORMATION: Casper Formation
OWNER: USFS

DESCRIPTION: Interstate 80 winds from the Laramie Range through Telephone Canyon into the Laramie Basin. On the north side of this canyon are several rock shelters. The largest of these is 75 feet wide, 30 feet deep and three feet high. Small popcorn, other small speleothems and large animal bones have been observed in this shelter.

BUCK SULLIVAN CAVE — 7

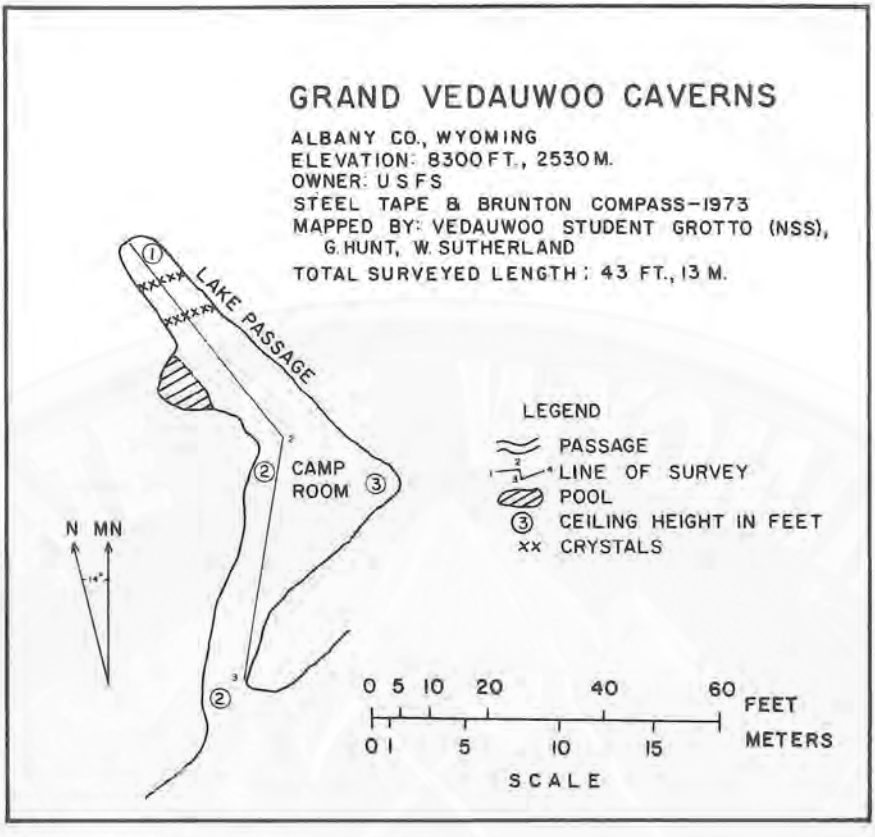
LOCATION: Ragged Top Mountain Quad.
ELEVATION: 8,480 ft. (2,586 m.)
FORMATION: Casper Formation
OWNER: USFS

DESCRIPTION: This small rock shelter is six miles east of Laramie. The shelter is 15 feet wide, 15 feet deep and four to five feet high. One small side passage leads west for about 15 feet. The cave appears to be a phreatically formed *solution pocket.*

YOU'RE THE GEOLOGIST, YOU TELL ME CAVE — 8

LOCATION: Laramie Quad.
ELEVATION: 7,390 ft. (2,254 m.)
FORMATION: Casper Limestone
OWNER: ?

DESCRIPTION: This small cave is developed on the fold of the City Springs anticline, 100 feet west of the limestone quarry road. The cave is seven feet wide, four feet high and 15 feet deep. Further penetration is blocked by a dirt fill at the back. A collapse feature on the surface above, 30 feet from the entrance, appears to be associated with the cave.



HUGH'S HOLE OR "I CAN'T BELIEVE I DUG THE WHOLE THING" — 9*

LOCATION: Red Buttes Quad.
ELEVATION: 7,330 ft. (2,236 m.)
FORMATION: Unknown (gypsum)
OWNER: Flagg Ranch
TOTAL SURVEYED LENGTH: 38 ft. (11.6 m.)

DESCRIPTION: The following description is after Carol Banzhaf from the Aglarond, v. II, no. 1, 1972:

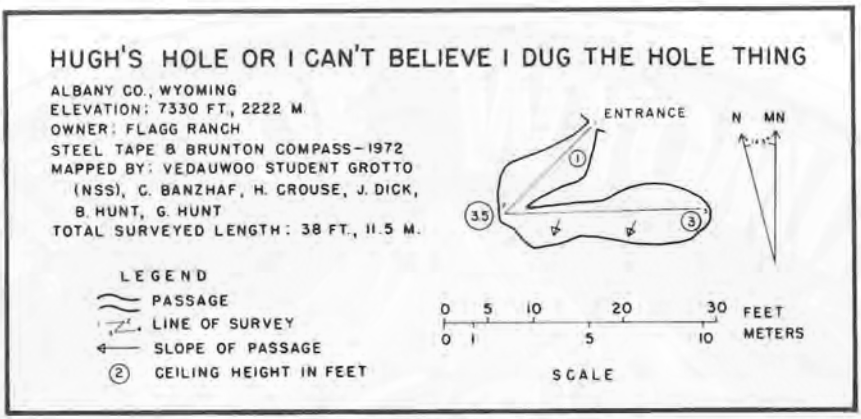
"This cave is located on the Flagg Ranch, (south of Laramie) and is associated with some old gypsum mining operations. It was pointed out by Hugh Crouse of the plant pathology greenhouse, University of Wyoming.

"This cave was entered by approaching a 20 foot mud bank with digging implements to a point where Crouse said the entrance used to be. The cave was totally excavated and mapped in one hour."

ROGER'S CANYON ROCK SHELTERS AND CAVES — 10

LOCATION: Ragged Top Mountain Quad.
ELEVATION: 7,500-8,200 ft. (2,288-2,501 m.)
FORMATION: Casper Formation
OWNERS: Aluminum Corp. of America, U.S. Bureau of Land Management (BLM), Pilot Peak Land and Livestock Co.

DESCRIPTION: Ten miles north of Laramie on 9th street, in Roger's Canyon, are many rock shelters and small solution pocket caves. Several of the larger shelters are over 50 feet wide and as much as 30 feet deep. Several of the larger solution pockets extend to total darkness.



HORNED OWL CAVE — 11*

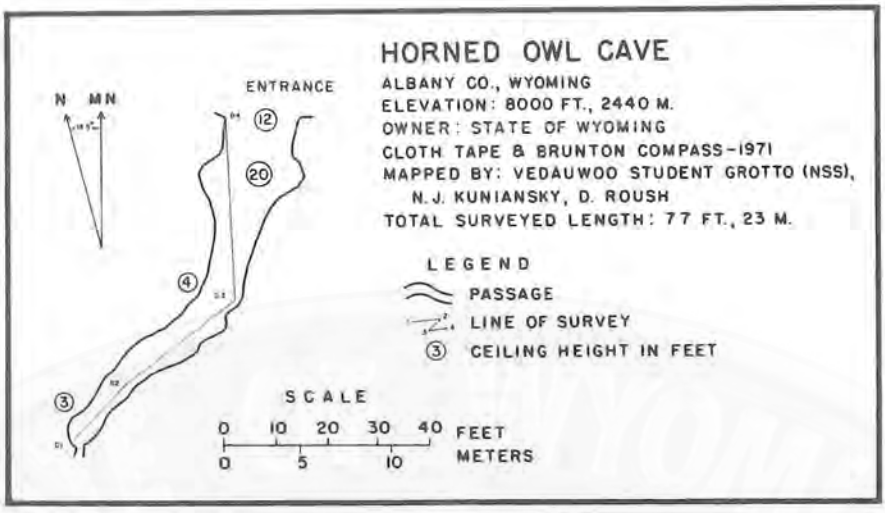
LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: State of Wyoming
TOTAL SURVEYED LENGTH: 77 ft. (23 m.)

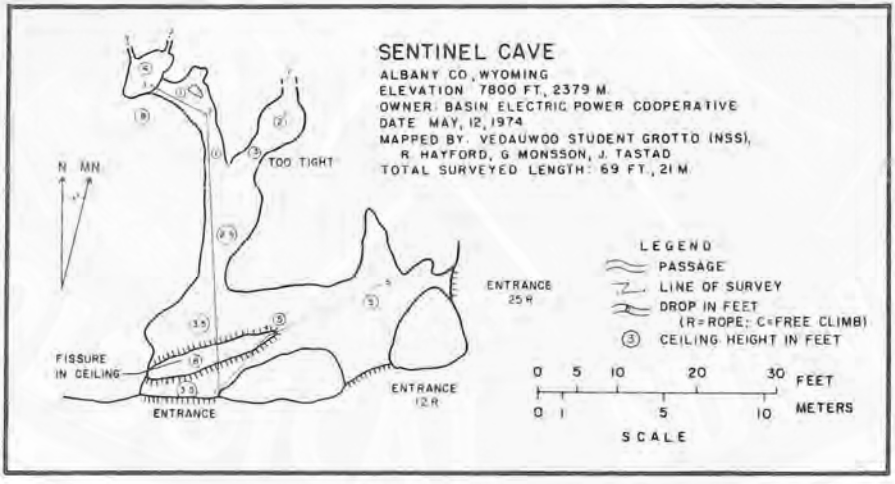
DESCRIPTION: This small cave, 100 feet below the south rim of Wallrock Canyon, is the site of the excavation of Late Pleistocene animal remains (Guilday, Hamilton and Adam, 1967). The cave is 15 feet wide and 12 feet high at the entrance and leads for about 70 feet before pinching down and ending in a dirt fill.

This cave and others in the area (12-19) are well developed solutional cavities in the upper part of the Casper Formation. Also in the vicinity, are numerous rock shelters and openings in the limestone that are blocked after a short distance by clay fills.

SENTINEL CAVE — 12*

LOCATION: Bosler SE Quad.
ELEVATION: 7,800 ft. (2,379 m.)
FORMATION: Casper Formation
OWNER: Basin Electric Power Cooperative
TOTAL SURVEYED LENGTH: 69 ft. (21 m.)



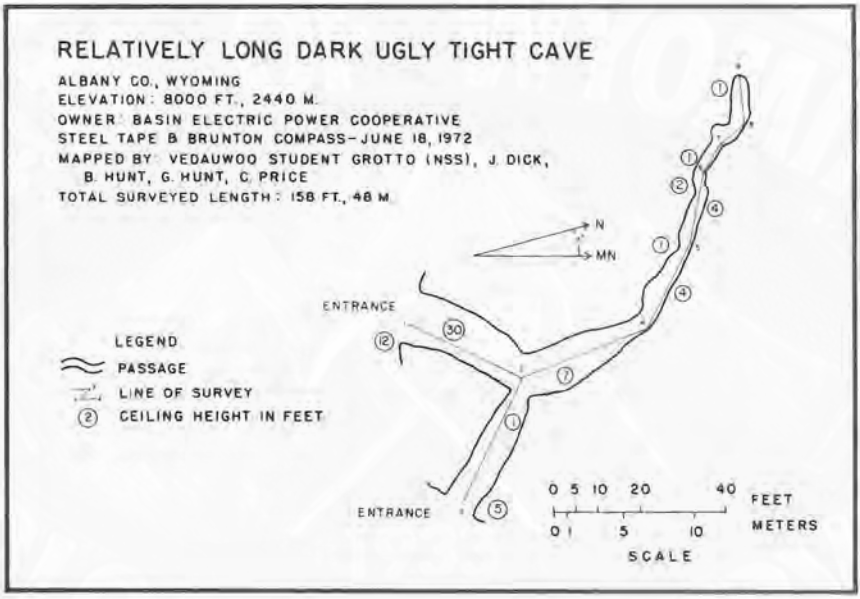


DESCRIPTION: This cave, located on the west side of a small canyon at the base of a limestone cliff, looks like two large eyes when viewed from the south. The left 'eye' is an entrance 4' x 3'. A passage leads from this entrance to the east for 20 feet to a small room behind the right 'eye.' Across this room to the east, a tight crack leads out to the cliff face.

A second passage, a low crawl, leads north from the left 'eye' for about 20 feet before pinching out. About halfway through this passage a tight crawl leads left about 30 feet to a small round room. A tight crawl near this round room may continue with some digging.

RELATIVELY LONG DARK UGLY TIGHT CAVE — 13*

LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: Basin Electric Power Cooperative
TOTAL SURVEYED LENGTH: 158 ft. (48 m.)
DESCRIPTION: This cave begins at the back of a large rock shelter as a walking height passage. After a bend to the left, the passage squeezes to one foot high, then opens to four feet high. After a short distance the passage is a crawlway to its end.



P. S. CAVE — 14*

LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: Basin Electric Power Cooperative
TOTAL SURVEYED LENGTH: 142 ft. (43 m.)
DESCRIPTION: This cave begins as a large rock shelter. At the right hand side of the shelter, a low feces-filled crawl is passable for about 40 feet.

JANINE'S CAVE — 15*

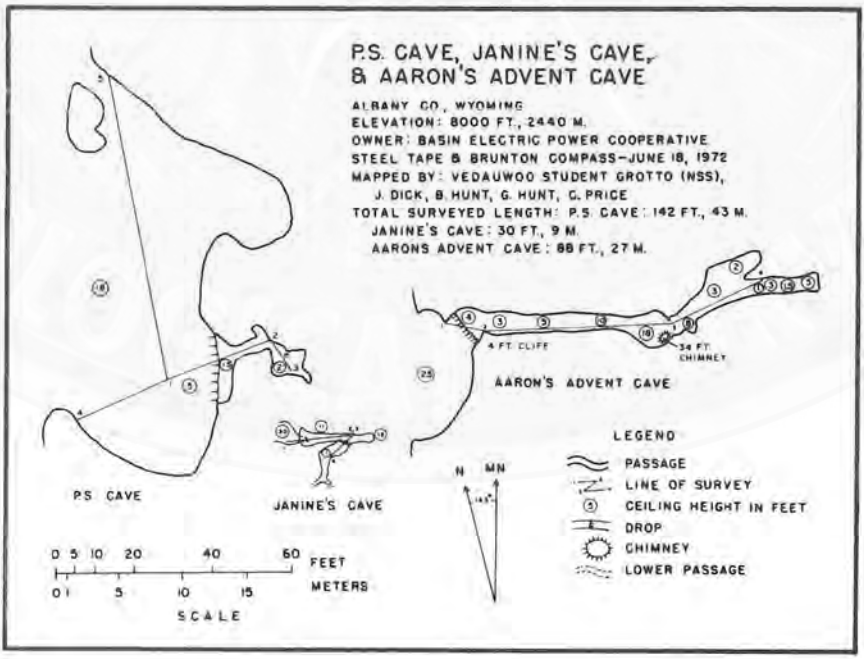
LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: Basin Electric Power Cooperative
TOTAL SURVEYED LENGTH: 30 ft. (9 m.)

DESCRIPTION: This cave has a 30' x 5' entrance which squeezes to a crawl and leads to about 20 feet of larger passage. Just past the crawl, on the right wall, another crawl extends south for about ten feet where it splits and becomes too small to follow.

AARON'S ADVENT CAVE — 16*

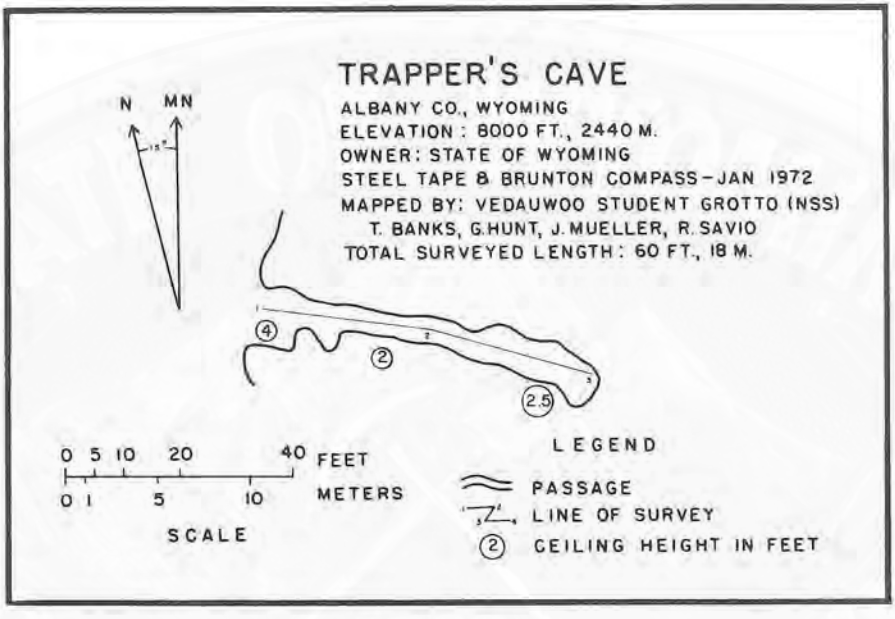
LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: Basin Electric Power Cooperative
TOTAL SURVEYED LENGTH: 88 ft. (27 m.)

DESCRIPTION: This cave begins as a 36' by 25' rock shelter. At the back of the rock shelter, a four foot climb to the left leads to a passage which continues 90 feet to the back of the cave. This passage varies in height, and a 34 foot chimney occurs in the ceiling, about 50 feet into the cave.



TRAPPERS CAVE — 17*

LOCATION: Bosler SE Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Casper Formation
OWNER: State of Wyoming
TOTAL SURVEYED LENGTH: 60 ft. (18 m.)
DESCRIPTION: This dusty crawlway is named for a small rusty trap found halfway into the cave.



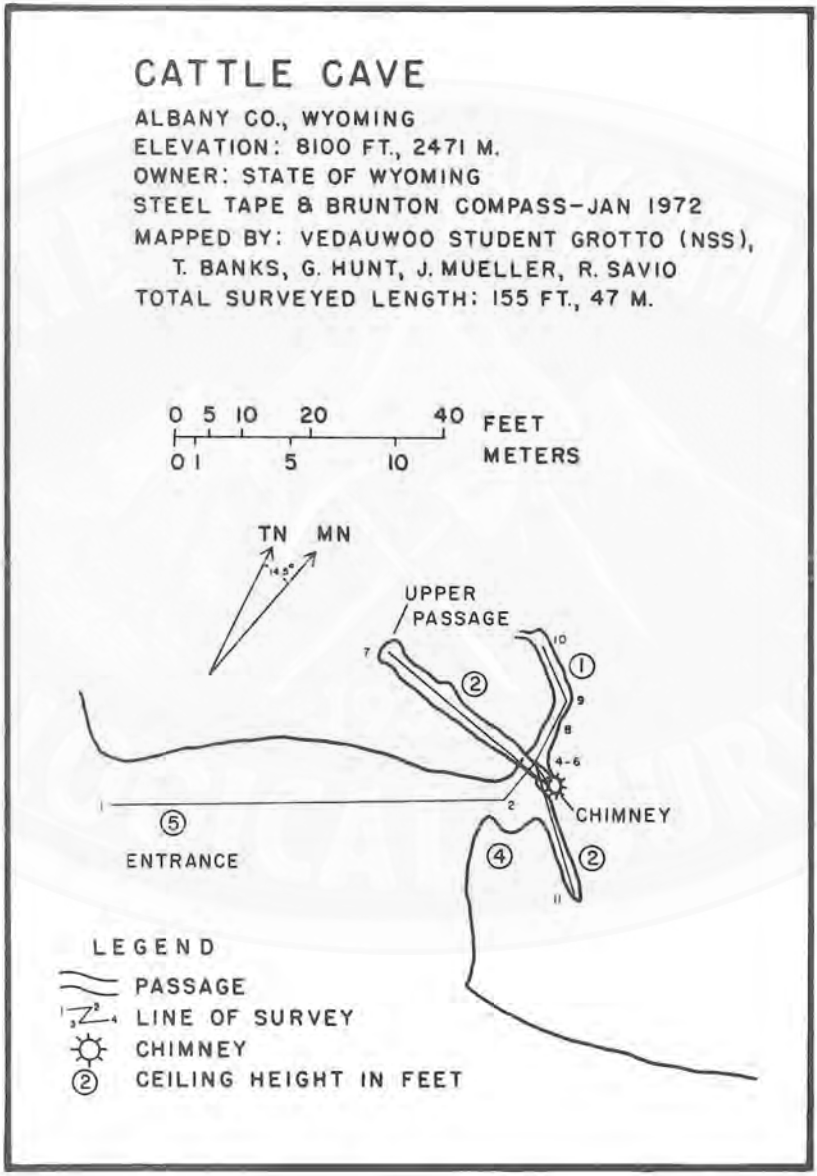
CATTLE CAVE — 18*

LOCATION: Bosler SE Quad.
ELEVATION: 8,100 ft. (2471 m.)
FORMATION: Casper Formation
OWNER: State of Wyoming
TOTAL SURVEYED LENGTH: 155 ft. (47 m.)
DESCRIPTION: This cave is 5' x 60' at the entrance, but narrows to 5' x 4' within 50 feet. The cave then splits and a 20-foot crawl leads to the right. A similar crawl bends to the left, soon becoming too small to follow. A chimney ascends about 20 feet from the divergence of the two crawlways and a crawl near the top soon ends.

ICICLE CAVE — 19*

LOCATION: Bosler SE Quad.
ELEVATION: 8,100 ft. (2,471 m.)

FORMATION: Casper Formation
OWNER: State of Wyoming
TOTAL SURVEYED LENGTH: 40 ft. (12 m.)
DESCRIPTION: The entrance to this cave is in a 4' x 80' rock shelter. A ten foot wide opening in the right wall leads into a low wide room that contains large icicles during part of the year. Some *flowetone* is present on the far wall of this room.



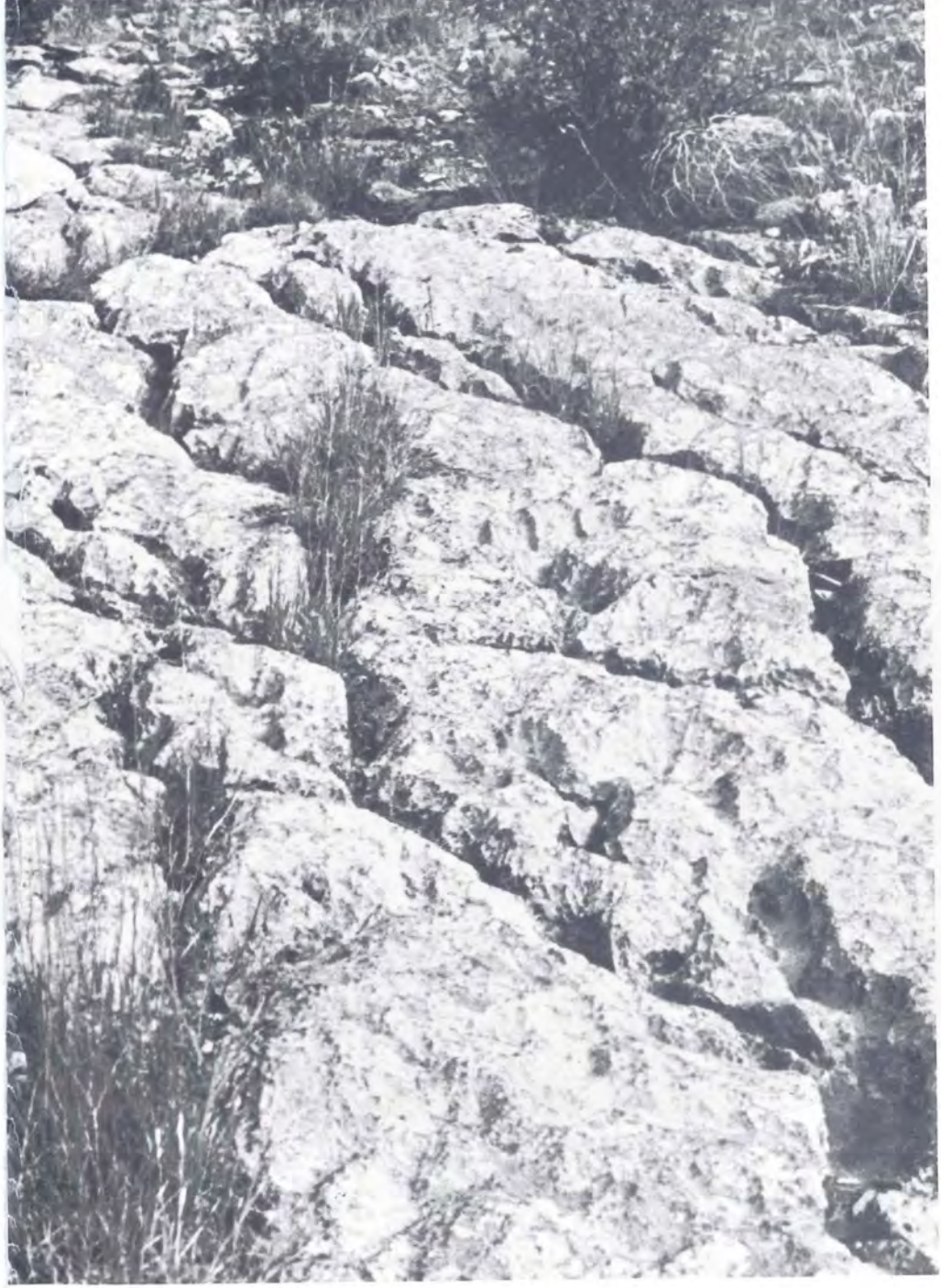
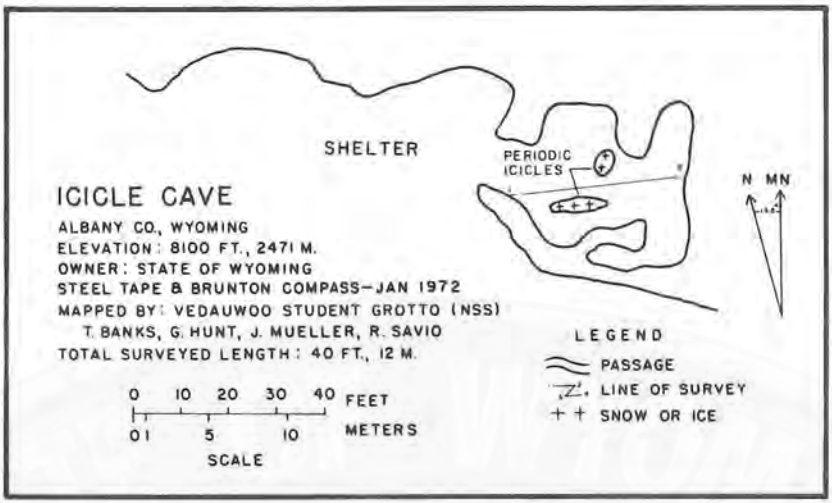


PLATE 8 — These karren forms occur on the west flank of the Laramie Range. (Photo by Wayne Sutherland)



DEAD MAN'S CAVE — 20

LOCATION: — Sybille Springs Quad.
ELEVATION: 7,220 ft. (2,202 m.)
FORMATION: Casper Formation
OWNER: NGTH: State of Wyoming

DESCRIPTION: This is a small cave, just east of Wyoming Highway 34, on the east side of a small creek. It is rumored that, in 1900, a miner walking to Laramie from the Iconoclas Mine was caught in a March blizzard and sought refuge in the cave. The storm lasted longer than he did and he is now buried across the creek from the cave.

AYERS NATURAL BRIDGE — 21

LOCATION: La Prele Reservoir Quad.
ELEVATION: 5,263 ft. (1,609 m.)
FORMATION: Madison Limestone
OWNER: State of Wyoming

DESCRIPTION: Ayers Natural Bridge (Pl. 9) is a classic meander-cutoff natural bridge. La Prele Creek at one time flowed in a curved path to the east of the natural bridge. Erosion on the upstream and downstream side of the spur, the inside of the meander, cut through the spur. The present course of the creek is through the natural bridge, while its former course to the east is dry.

In the vicinity of Ayers Natural Bridge there are many springs and several sinking creeks. This area has not been studied and it may have karst features.

BATES CREEK ICE CAVE — 22

LOCATION: Ice Cave Mountain Quad.
ELEVATION: 7,680 ft. (2,342 m.)
FORMATION: Madison Limestone
OWNER: Private
TOTAL SURVEYED LENGTH: 238 ft. (72.6 m.)

DESCRIPTION: The entrance to this small but intriguing cave is a collapse doline, about 80 feet in diameter and 20 feet deep. Most of the cave passage is through breakdown in this doline or between the breakdown cone and the walls of the sink.

Seemingly permanent ice accumulates close to the surface, around the western edge of the sink. From this area crawlways lead both north and south to deeper portions of the cave, where the ice accumulations are definitely permanent. The delicate frost crystals and thick ice deposits in these deeper areas suggest the possibility that the climate there is a *fossil Pleistocene climate,* but it is not known if the cave's physical setting could have allowed such a fossil climate to persist for so long.

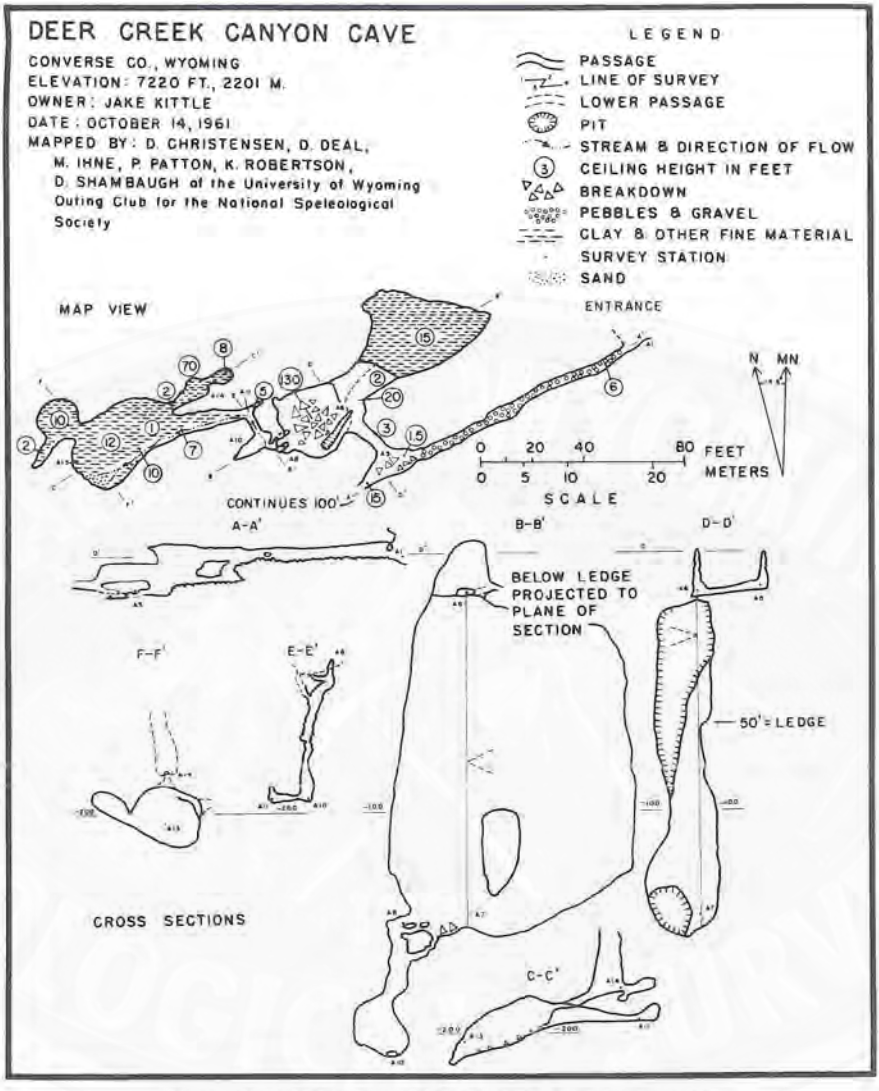
The cave occurs in a relatively recently exhumed portion of the Madison Limestone along the edge of the Shirley Basin and may have been developed a long time ago. This feature also gives the impression that it is the filled upper portion of a much larger feature, since the walls of the sink recede considerably in its deeper areas.

BRIGHTON CAVE — 23

LOCATION: Glenrock Quad.
ELEVATION: 5,600 ft. (1,708 m.)
FORMATION: Unknown
OWNER: Private

DESCRIPTION: This cave occurs near the bottom of the west wall of Brighton Canyon and is marked on the Glenrock Quad.

PLATE 9 — Years of wear from the stream below cut Ayer's Natural Bridge near Douglas. (Photo by the Wyoming Travel Commission)



DEER CREEK CANYON CAVE — 24*

LOCATION: Protsman Knob Quad.
ELEVATION: 7,225 ft. (2,204 m.)
FORMATION: Madison Limestone and Casper Formation
OWNER: Jake Kittle

DESCRIPTION: Advance communication with the owner stating qualifications and previous experience is required to gain access to this cave. The pits are very dangerous, especially so because they are in the cave's zone of total darkness. The descent of this cave should be attempted only by cavers who have a vast amount of previous experience

and are absolutely competent in the use of their technical caving equipment.

Deer Creek Canyon Cave was tracked down by Ken Robertson of the University of Wyoming Outing Club from an article in *Male Magazine* entitled "Descent into Wyoming's Cave of Terror". The writers of this story left a hand winch with which they made their 1953 descent.

An earlier descent, believed to have been the first, was made in the 1930's.

The entrance to this deep, vertical cave is in the western wall of the westernmost of two dolines in the area. A small fissure crawlway leads approximately 120 feet and dead ends, but a low tight crawl near the end leads about 20 feet to a small room. This room is about six feet high, 20 feet long and five feet wide and has a winch at one end. A crack in the floor drops 128 feet through a bell-shaped pit to a breakdown strewn floor.

From here, a second drop of 50 feet leads to a small crawlway and into a second large room. The lowest point in the cave is 212 feet beneath the surface and the lower sections of the cave are mud choked.

BEARTRAP MEADOWS SINKS — 25

LOCATION: Crimson Dawn Quad.
ELEVATION: 7,860 ft. (2,397 m.)
FORMATION: Madison Limestone
OWNER: Natrona County

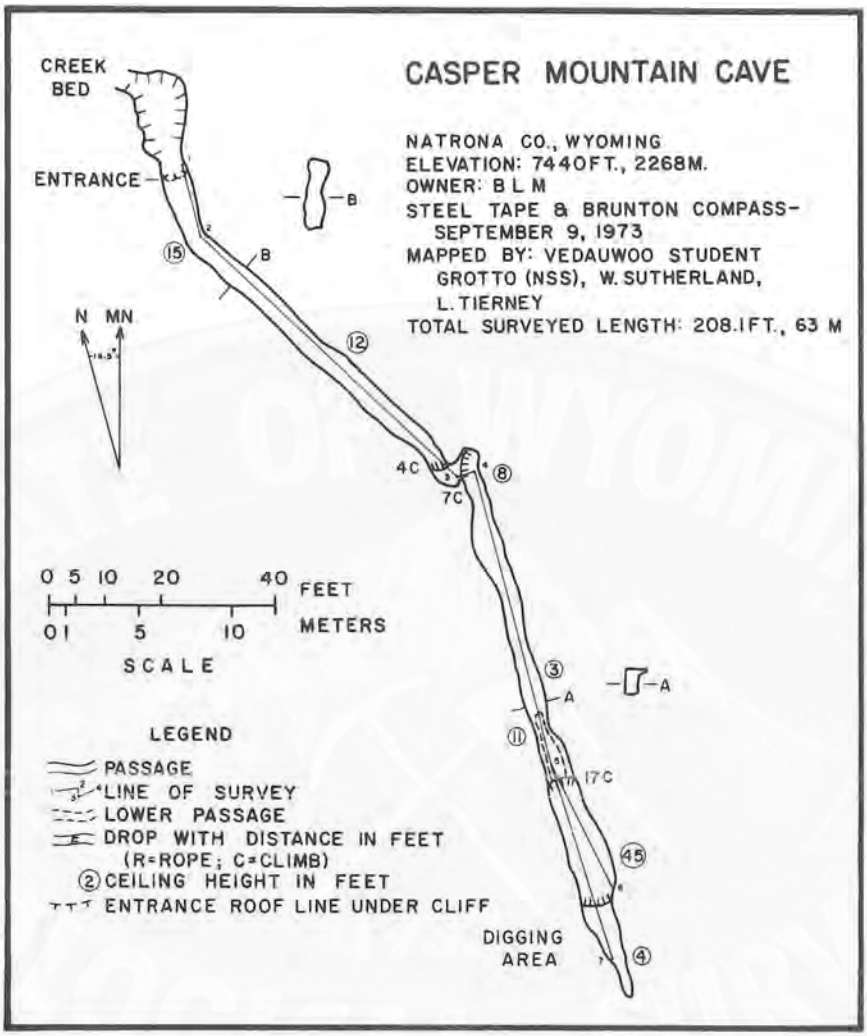
DESCRIPTION: A small stream flowing through Beartrap Meadows County Park sinks in a shallow blind valley at the top of the Madison Limestone. In addition to the streamsink, several small dolines are located in the meadow. None of these features are at present enterable, but at one time a large cave was reportedly located at the sinking point. It has been reported that, during drilling at a shallow depth downstream from the sinking point, the bit dropped about nine feet.

CASPER MOUNTAIN CAVE — 26*

LOCATION: Crimson Dawn Quad.
ELEVATION: 7,860 ft. (2,397 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 208 ft. (63 m.)

DESCRIPTION: This cave begins as a 15 foot high, six foot wide entrance at the end of a blind valley. A joint-controlled passage of uniform size leads for 75 feet to a point where it pinches upward and then drops to the left. A straight, three to eight foot high passage continues from here for 60 feet to a 17 foot drop. Twenty-five feet beyond this drop, a low spot in the floor is a likely place to dig to find more cave. The passage continues about 20 feet beyond this low spot and ends.

Casper Mountain Cave has numerous tales of large crystal-filled rooms associated with it. There is a good possibility that these rumors of more cave are true. The low spot appears to be a mud and wood choke and it is here that stories tell of a small crawl leading to a 500 foot long room. Only digging in the mud will verify or refute these stories.



GOD AWFUL CRACK — 27

LOCATION: — Otter Creek Quad.
ELEVATION: 7,300 ft. (2,227 m.)
FORMATION: Madison Limestone
OWNER: Private or BLM

DESCRIPTION: On the west side of a road is a 6' x 15' crack in the ground. About ten feet down, the crack lengthens and narrows to one foot or less. Rocks dropped into the crack rattle for a long time, indicating great depth. Smaller holes are also found south of God Awful Crack.

CASPER MOUNTAIN CRACKS AND CAVES — 28

LOCATION: — Casper Quad.
ELEVATION: 7,600 ft. (2,318 m.)
FORMATION: Madison Limestone
OWNER: Private
DESCRIPTION: On the north edge of Casper Mountain, numerous cracks have developed. Some of these cracks, up to three feet wide and 30 feet deep, contain small caves. Some dolines are also reported in the area.

The Hartville Uplift

The Hartville Uplift is an anticlinal uplift east of the Laramie Range. The oldest sedimentary unit exposed on the surface is the Guernsey Limestone, which is equivalent to the Madison Limestone. This limestone contains several small caves, and displays remnants of Late Mississippian and Early Pennsylvanian karst (Henbest, 1958). Caves also occur in several gypsum units in this area.

"Here and there in the limestone of the Hartville Formation are found small caves or cavities formed by solution. In these, coating the walls or as rude stalactitic or stalagmitic growths, are secondary deposits of a banded limestone of a variety known as onyx marble." (Smith, 1903) These growths are probably not limestone but siliceous in composition. Most of these siliceous speleothems have been vandalized or removed by rock-collectors.

Dr. J. D. Love relates that the silica is from the Oligocene White River Formation, which, in places, still overlies the Madison Limestone.

DENRUB EGABRAG CAVE — 29

LOCATION: Sibley Peak Quad.
ELEVATION: 4,740 ft. (1,446 m.)
FORMATION: Goose Egg?
OWNER: Wilson
DESCRIPTION: This feature is a 40 foot diameter, 20 foot deep conical doline that is lined with burned garbage. A small hole in the bottom of this doline leads to a small gypsum tube which branches after 20 feet. There are other similar sinks and small gypsum tubes in the area.

MILLHOUSE CAVE — 30

LOCATION: Guernsey Reservoir Quad.
ELEVATION: About 4,600 ft. (1,403 m.)
FORMATION: Guernsey?
OWNER: Private
TOTAL SURVEYED LENGTH: 169 ft. (52 m.)

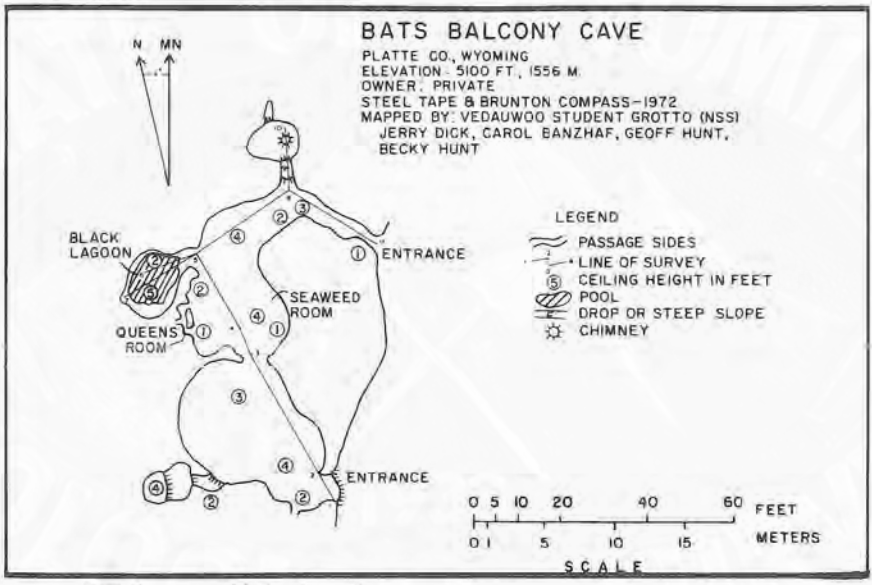
DESCRIPTION: This cave is in a small canyon in the bluff along the north bank of the North Platte River. The cave consists of a low tight crawl ending in a small room. Several other small caves occur in the area; the most notable of these is Toilet Seat Cave.

BATS BALCONY CAVE — 31*

LOCATION: Haushar Ranch Quad.
ELEVATION: 5,000 ft. (1,556 m.)
FORMATION: Guernsey Limestone
OWNER: Private

DESCRIPTION: From an article by C. Banzhaf, in the Aglarond, v. II, no. 2, 1972:

"This cave is a mostly no-walking cave. It is very small but does have two entrances. Other points of interest include a stagnant pool, 'petrified seaweed' (of siliceous composition) and some silica formations in the back room."

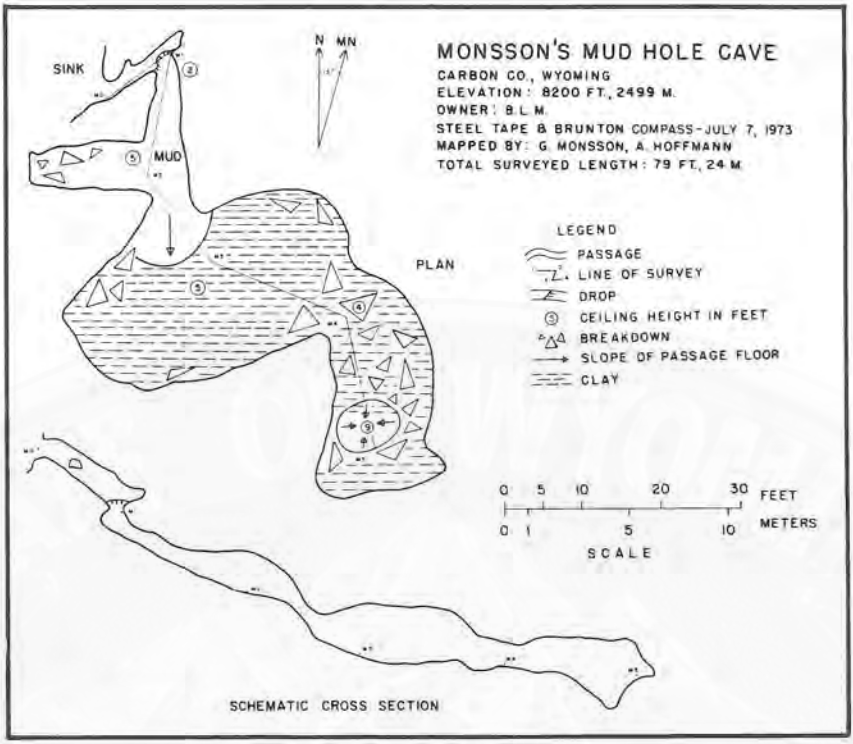


The Shirley Mountains

The Shirley Mountains are located northwest of Medicine Bow and south of Casper Mountain. These mountains are an anticlinal uplifts of Laramide age with Precambrian rocks exposed in the core.

Paleozoic and Mesozoic sediments flank the uplift on all sides, and faulting has resulted in more complex structural relationships in some areas. The Madison Limestone, which contains all of the Shirley Mountains caves and karst areas, occurs as prominent white hogbacks on the flanks and is exposed on some fault blocks in the center of the range.

Exposures of paleokarst in the Madison Limestone are present in this area. This small area is more representative of typical temperate zone karst than most other areas in the state.



MONSSON'S MUD HOLE CAVE — 32*

LOCATION: Q Ranch Quad.
ELEVATION: 8,250 ft. (2,516 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 79 ft. (24 m.)

DESCRIPTION: Monsson's Mud Hole Cave is named after one of Wyoming's first cavers, George Monsson, who found the large, 50 foot wide, 100 foot long and 25 foot deep, sinkhole in which the cave occurs. The entrance to the cave was dug open in September 1969.

A small crawlway jogs down and to the right, dropping into a large room. The walls pinch slightly to form a second room beyond the first. The floors and walls of both rooms are coated with mud, indicating that the cave has flooded periodically.

CAVE CREEK CAVE — 33

(See map on Sheet 4)

LOCATION: Q Ranch Quad.
ELEVATION: 8,190 ft. (2,493 m.)
FORMATION: Madison Limestone and Tensleep Sandstone

OWNER: USFS
TOTAL SURVEYED LENGTH: 2,048 ft. (625 m.)
DESCRIPTION: The main entrance to Cave Creek Cave is in a blind valley. The stream which once flowed into this entrance has been blocked off so that most water now flows past the cave. Except during the spring runoff most of the water in Cave Creek sinks upstream in a series of small sinks. On the south side of the valley, near the cave, there are several large dolines; one of these is the entrance to Monsson's Mud Hole Cave (32).

Cave Creek Cave is rigorously controlled by jointing and by the approximate 8° southwest dip of the geologic formations. The overlying Tensleep Sandstone forms the gently dipping roof of the cave throughout most of its length. The entrance passages are joint-controlled, stream-enlarged tubes and fissures (Pl. 10) that jog sharply along the trends of the jointing system. In the rock above the entrance, several names and dates are scratched, dating back to the late 1800's.

Within 400 feet of the entrance, the main passage enters History Hall, a large room 30 feet wide, 15 feet high and 300 feet long, which may have had a phreatic origin and which has been modified by breakdown. The cave continues past History Hall through stream-cut fissure passageways (Pl. 11) with several stagnant pools.

The passage widens, lowering as it enters the Tokyo Philosopher's Room. A sandy clay fill blocks the back of this room, but a small crawlway on the right, near the end of the room, leads to further passage.

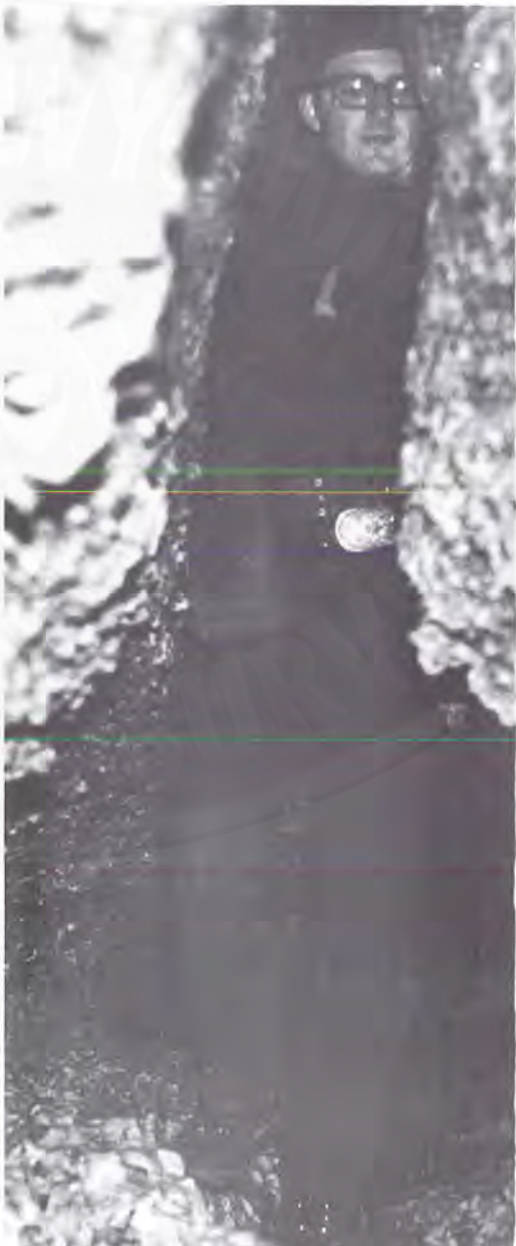


PLATE 10 — Keyhole passages like this one in Cave Creek Cave are probably the result of water flowing along a fracture or on the intersection of two fractures. (Photo by Chris Hill)

In the spring or summer of 1973 this crawlway was blocked by flood waters which covered the floor. Reportedly, this point was also the end of the cave previous to 1968 or 1969. Between 1969 and 1973 the crawl was open and led for about 75 feet to the Big Fissure where the cave continues to the southwest.

Only the lower few feet of the cave in this fissure are developed in Madison Limestone; the rest is in the overlying fine-grained, cross-bedded Tensleep Sandstone. This part of the cave is probably developed along a fault.

After several hundred feet the cave re-enters the limestone, leading to the cave's second large room, 15 feet high, 25 feet wide and 150 feet long. The passage continues past this room for several hundred feet to two small pits which drop about ten feet to the Sewer Pipe. This passage leads about 100 feet before pinching out. Above the two pits a crawl leads to the edge of a breakdown-filled room. This room may be the bottom of Slave Sink (34).

The second entrance to the cave is in the bottom of a small doline, 200 feet northwest of the main entrance. At one time this may have been a sinking point for Cave Creek, but it appears now to take water only from the immediate area. A small, tight, joint-controlled passage from the doline connects with the main passage about halfway between the main entrance and History Hall. This passage is occasionally blocked by sands and clays.

PLATE 11 — This narrow fissure passage is in Cave Creek Cave in the Shirley Mountains. (Photo by Wayne Sutherland)

SLAVE SINK — 34

LOCATION: Q Ranch Quad.
ELEVATION: 8,000 ft. (2,440 m.)
FORMATION: Tensleep Sandstone near Madison Limestone contact
OWNER: Bureau of Land Management (BLM)

DESCRIPTION: This sink is on Sage Creek, several hundred feet downstream from a small spring. During the spring runoff, the creek sinks in Slave Sink. During the dry part of the year, the stream sinks in gravels above this point. Topographic alignments can be seen on the Q Ranch Quad. that form a direct line between this sink and Cave Creek Cave (33).

SINKS OF AUSTIN CREEK — 35

LOCATION: Q Ranch Quad.
ELEVATION: 8,630 ft. (2,632 m.)
FORMATION: Madison Limestone
OWNER: BLM

DESCRIPTION: Austin Creek originates on the Precambrian core of the Shirley Mountains. It flows onto the Madison Limestone, where it sinks in a blind valley 30 feet deep and 100 feet wide. During the summer, the creek sinks in three places, but, during spring runoff, a small pond forms in this feature. The nearest possible rise for this creek is 1½ miles downstream, but the relationship has not been established by dye tests.

Above the blind valley to the south is a small subsidence doline. Three-quarters of a mile downstream from the sink and 90 feet lower is a 15 foot deep doline in the dry bed of Austin Creek. With the excavation of several large blocks of breakdown, the sink may lead to a cave.

OTHER SINKING CREEKS ON Q RANCH QUAD —36

Sinking creeks shown on the Q Ranch Quad. include Troublesome Creek, Cottonwood Creek and the creek below Withrow Spring. No sinking point was apparent on Troublesome Creek when visited, although the creek may disappear in gravels during times of low flow. Cottonwood Creek did not visibly sink, but some paleokarst and related rock shelters are present. Withrow Spring sinks in alluvium with no associated karst features.

HEEUUAH CAVE — 37

LOCATION: Q Ranch Quad.
ELEVATION: 8,760 ft. (2,672 m.)
FORMATION: Madison Limestone
OWNER: Private

DESCRIPTION: An entrance four feet in diameter, on a northwest-facing cliff, opens into a room 15 feet long, eight feet wide and ten feet high. About one-half mile east of this small cave, several small sinks occur in a shallow, wooded, east-sloping drainage.

Chapter 2

The Black Hills

The Black Hills uplift, occurring primarily in South Dakota, is an elliptical anticlinal uplift with Precambrian *schists* and granites exposed in the center. The major cavernous formation on the flanks of the uplift is the Pahasapa Limestone. Jewel Cave National Park and Wind Cave National Monument, two of this country's largest caves, are located in this formation.

The sedimentary units dip more gently west than east, but, in Wyoming, the Pahasapa crops out in only limited areas. The Minnelusa Formation, higher in the sedimentary sequence, contains thick gypsum deposits and exhibits some karst development, but has no known caves. The Minnekahta Limestone locally exhibits sinkholes. Several gypsum caves occur in the Spearfish Formation and the possibilities for more caves are numerous.

GENERALIZED PARTIAL STRATIGRAPHIC COLUMN
FOR THE BLACK HILLS AREA IN NORTHEASTERN WYOMING

AGE	*FORMATION NAME*	*DESCRIPTION*	*APPROXIMATE THICKNESS (FT.)*
JURASSIC	Sundance Formation	Green shale and thin-bedded sandstone	250-300
	Gypsum Springs Formation	White massive gypsum with some interbedded red shale and siltstone	0-40
PERMO-TRIASSIC	Spearfish Formation	Red shale, siltstone and fine grained sandstone; gypsum beds near bottom	300-500
PERMIAN	Minnekahta Limestone	Gray to purple, laminated, coarsely crystalline limestone	25-50
	Opeche Formation	Red shale, siltstone and fine grained sandstone, and gypsum lenses	70-110
PENNSYLVANIAN-PERMIAN	Minnelusa Formation	Interbedded red shale, sandstone, limestone, breccia, and white gypsum and anhydrite; 250 feet of anhydrite in subsurface	600-800
MISSISSIPPIAN	Pahasapa Limestone	Gray, tan, brown and white, massive limestone with some dolomite	300-750
	Englewood Limestone	Pink to maroon, thin-bedded limestone	0-60
CAMBRIAN	Deadwood Formation	Upper is red brown to white limestone and dolomite; basal is brown and white sandstone	10-400
PRECAMBRIAN	Metamorphic and igneous complex		

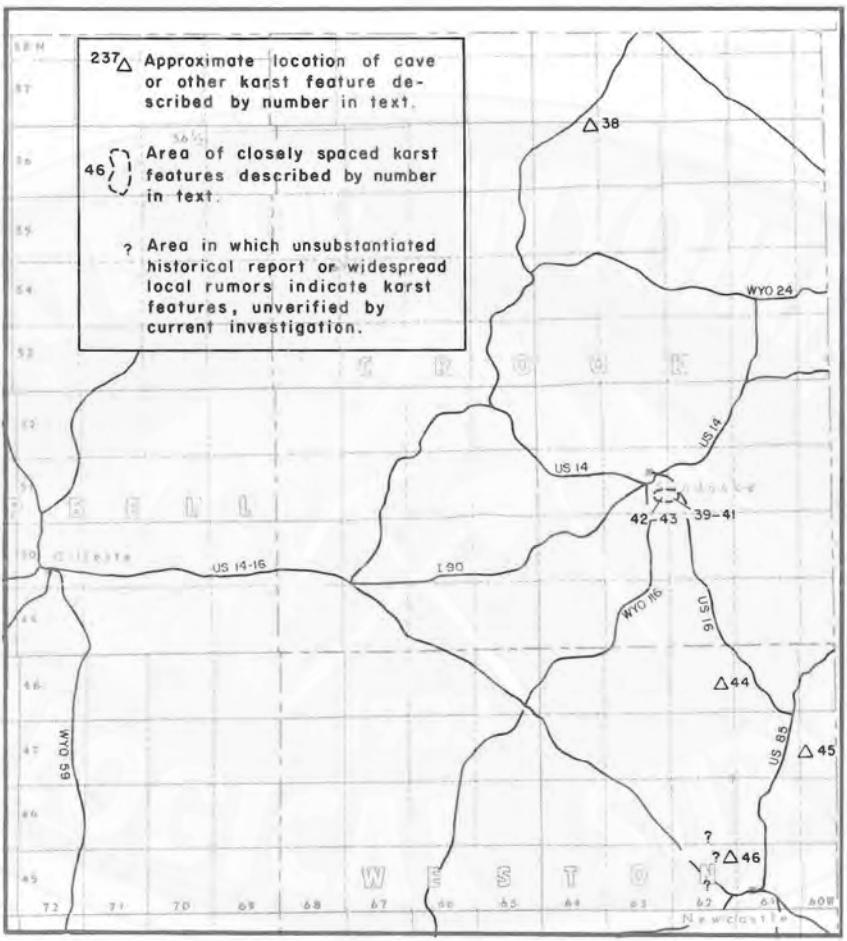


FIGURE 10 — Index map of the Black Hills.

OLD INDIAN CAVE — 38

LOCATION: Mona Quad.
ELEVATION: 4,000 ft. (1,220 m.)
FORMATION: Unknown
OWNER: Private
DESCRIPTION: This cave is marked on the Mona Quad. but has not been visited by this survey.

DARTON'S CAVE — 39*

LOCATION: Sundance Quad.
ELEVATION: 4,840 ft. (1,476 m.)
FORMATION: Spearfish Formation
OWNER: George Summers
TOTAL SURVEYED LENGTH: 456 ft. (139 m.)
DESCRIPTION: To cross the land and to enter this cave, permission must be obtained from Mr. Summers in Sundance, Wyoming.

The cave begins as a small hole in the bottom of a 25 foot doline. A stream enters the main passage thirty feet inside the cave. The main passage is of walking size from here to 50 feet from the siphon at the end. About 80 feet beyond where the stream enters, it leaves the main passage and siphons in a side passage after 30 feet.

The Graffiti Crawl, west of and roughly parallel to the main passage, exhibits numerous names and graffiti on its walls. It re-enters the main passage after about 100 feet.

This cave has been known for about 80 years. Comparison (Pl. 12 and 13) of the photos of a small cave waterfall shows this is the same cave that N. H. Darton photographed about 1900. Darton's photo appears in a USGS Professional Paper 65 with the caption: "gypsum cave near Sundance".

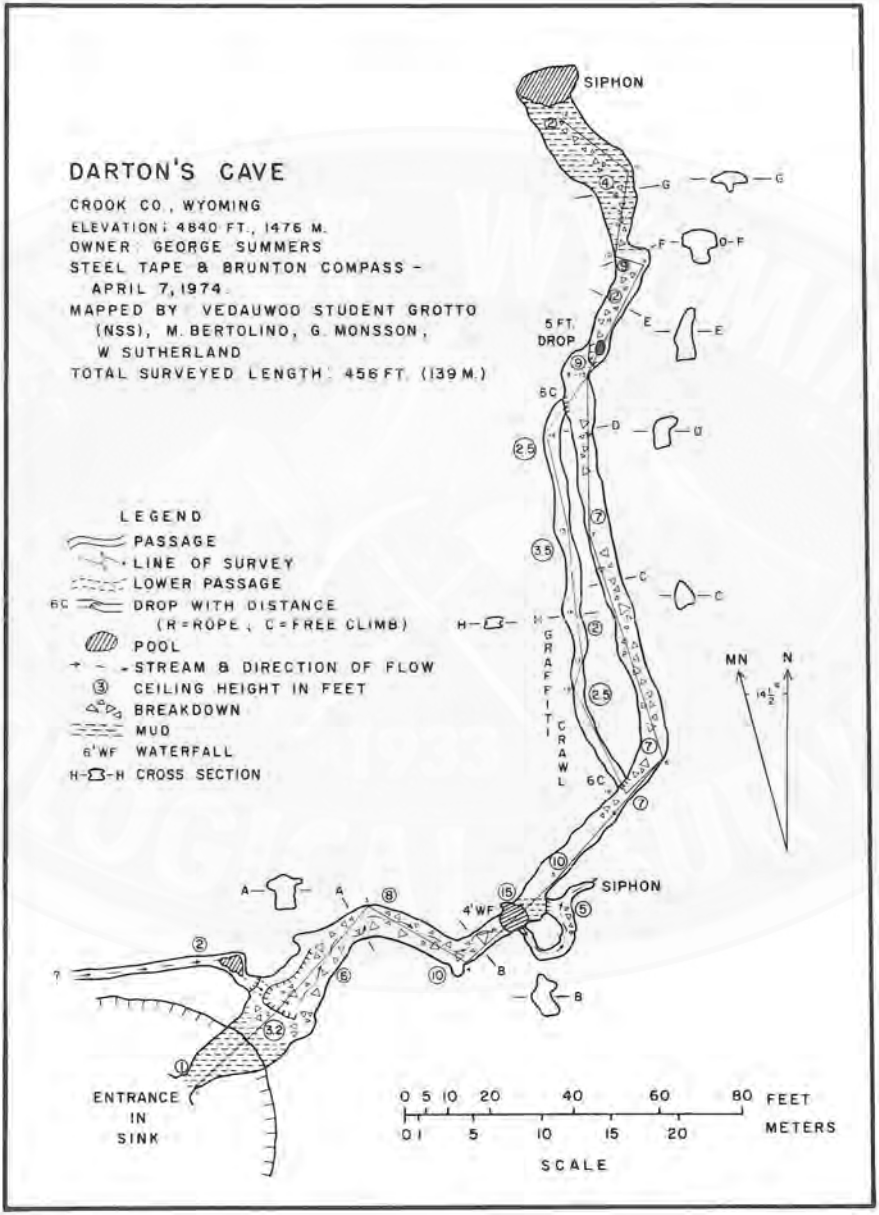
TERRY'S MUD CAVE — 40

LOCATION: Sundance Quad.
ELEGATION: 4,840 ft. (1,476 m.)
FORMATION: Spearfish Formation
OWNER: George Summers
DESCRIPTION: About 200 yards northwest of Darton's Cave (39), at the head of a short valley, a low crawl leads into a slippery, muddy passage about four feet high. This gooey passage curves southwest for about 150 feet where it ends in a pool of water.

STOCK'S SPRING CAVE — 41

LOCATION: Sundance Quad.
ELEVATION: 4,840 ft. (1,476 m.)
FORMATION: Spearfish Formation
OWNER: George Summers

DESCRIPTION: Just south of Terry's Mud Cave (40), a stream issues from the mouth of Stock's Spring Cave. This stream is probably the resurgence of the stream in Darton's Cave (39). The cave is about 50 feet long. It consists of a low, muddy crawl in the stream bed that eventually pinches down to the level of the stream.



PLATES 12 and 13 — These two photos, one taken in 1898 and one 1974, compare the waterfall in Darton's Cave over a period of 76 years. (Photo 12 courtesy of Wyoming State Archives and Historical Department; photo 13 by Wayne Sutherland)

SHORT LITTLE WET CAVE — 42

LOCATION: Sundance Quad.
ELEVATION: 4,880 ft. (1,488 m.)
FORMATION: Spearfish Formation
OWNER: George Summers
DESCRIPTION: A few hundred yards west of Darton's Cave (39), a small stream enters a clean, wet gypsum cave about 90 feet long. The 4' x 2' passage bends sharply left after a few feet, then decreases in height and increases in width where a small pool is encountered. The passage continues about 50 feet and ends at a siphon.

BONE CAVE — 43

LOCATION: Sundance Quad.
ELEVATION: 4,900 ft. (1,495 m.)
FORMATION: Spearfish Formation
OWNER: George Summers
DESCRIPTION: This cave is located several hundred yards west of Short Little Wet Cave (42). The 50 foot cave was named for a large number of bones found within it.

THE PETERSON RANCH CAVE SYSTEM — 44

(See Map on Sheet 4)

LOCATION: Inyan Kara Mountain Quad.
ELEVATION: 5,280 ft. (610 m.)
FORMATION: Spearfish Formation
OWNER: David J. Peterson
TOTAL SURVEYED LENGTH: Live Porcupine Cave 233 ft. (71 m.)
Dead Muskrat Cave 210 ft. (64 m.)

DESCRIPTION: The Peterson Ranch Cave System is developed in gypsum and shale, in the Spearfish Formation. In addition to Live Porcupine and Dead Muskrat Cave, several karst features in the area suggest the presence of a cave system with a minimum of 1500 feet of passage.

The stream that siphons in Dead Muskrat Cave rises 600 feet downvalley, in its former surface channel. About 300 feet upvalley from Live Porcupine Cave, another doline contains the entrances to two caves; water flows from one, across the doline bottom and sinks into the second entrance. Farther upvalley, there are several large dolines that may also contain cave entrances. Animals observed in this cave system include spiders, small flies and a porcupine.

Live Porcupine Cave has two crawlway entrances on the northeast side of a 30 foot deep doline. One crawlway, about five feet above the bottom of the doline, meanders about 70 feet as a hands and knees crawl to a small hole above the lower stream passage. Between this point and the next junction, a large porcupine was found living in the crawl.

A four foot drop from the crawl leads into the lower stream passage. To the right, a four foot high passage winds upstream for 60 feet, to where the cave pinches down and ends in a siphon.

PLATE 14 — This 1899 photo shows Darton's Sinkhole, much as it appears today. (Photo by N. H. Darton, U.S.G.S.)

The downstream passage varies from three feet high to a belly crawl with only a few inches of air space above the water. The stream passage meanders under the upper crawlway and emerges at the bottom of the doline as a second entrance.

The stream emerging from this entrance flows across the bottom of the doline and enters Dead Muskrat Cave. This cave begins as a low crawl across a shallow pool and continues as a winding vadose stream passage for about 150 feet, where it drops ten feet over a cataract. Fifty feet beyond the waterfall, the passage becomes a low crawl which ends in a siphon within another 50 feet.

DARTON'S SINKHOLE — 45

LOCATION: Four Corners Quad.
ELEVATION: 5,800 ft. (1,769 m.)
FORMATION: Minnekahta Limestone
OWNER: LAK Ranch

DESCRIPTION: This is a 25 foot deep, vertical walled doline (Pl. 15) in the Minnekahta Limestone. The doline is partially filled with a large garbage pile and contains no leads in its bottom.

Several large dolines occur in the Minnekahta Limestone in this area, but no caves are known.

Chapter 3
Bighorn Mountains

The Bighorns are a north-south trending, granite cored, anticlinal uplift of Laramide age. Sedimentary rocks cover the northern and southern thirds of the range, while the Precambrian basement complex is exposed in the center. Madison Limestone is the prime cavernous unit of this section, although the Bighorn Dolomite contains several major caves.

Episodes of erosion during the Tertiary Period, as well as mountain glaciation several times during the Pleistocene Age, probably influenced cavern development in this area. Most caves are apparently isolated occurrences, although some local areas show extensive interrelated cavern development.

Sheep Mountain and Little Sheep Mountain in the Bighorn Basin exhibit the same stratigraphy as the flanks of the Bighorn Range. Several caves are located in these anticlines.

GENERALIZED PARTIAL STRATIGRAPHIC COLUMN
FOR THE BIGHORN MOUNTAINS

AGE	FORMATION NAME		DESCRIPTION	APPROXIMATE THICKNESS (FT.)	
TRIASSIC	Chugwater Formation		Red sandstone and shale with some interbedded gypsum	600	
PERMIAN	Phosphoria Formation (Embar Formation)		Limestone and dolomite in upper; gypsum and red shale in middle; red shale, sandstone, dolomite in lower	0-150	
PENNSYLVANIAN	Tensleep Formation		Tan, cross-bedded, medium grained sandstone	0-90 north 500 south	
	Amsden Formation		Red hematitic shale with thin beds of sandstone, limestone, and dolomite	140-250	
MISSISSIPPIAN	Madison Group	Charles Formation	Fossiliferous, cherty, thick-bedded, clastic and marine limestone	90	700 to 800
		Mission Canyon Formation	Thin-bedded, often brecciated limestone	250	
		Lodgepole Formation	Thin-bedded, gray, granular limestone; often ripple marked	350	
DEVONIAN	Three Forks Formation		Limestone, dolomite and some thin shale	100	
	Jefferson Formation		Limestone and dolomite	150	
ORDOVICIAN	Bighorn Dolomite		Upper is fine grained, white, thin-bedded dolomite; lower is massive mottled light colored limestone and dolomite; base is sandstone	300-570	
CAMBRIAN	Gallatin Limestone		Limestone and shale	250-310	
	Gros Ventre Shale		Shale, limestone and limestone conglomerate	300-500	
	Flathead Sandstone		Sandstone, quartzite	100-250	
PRECAMBRIAN	Granites and schists				

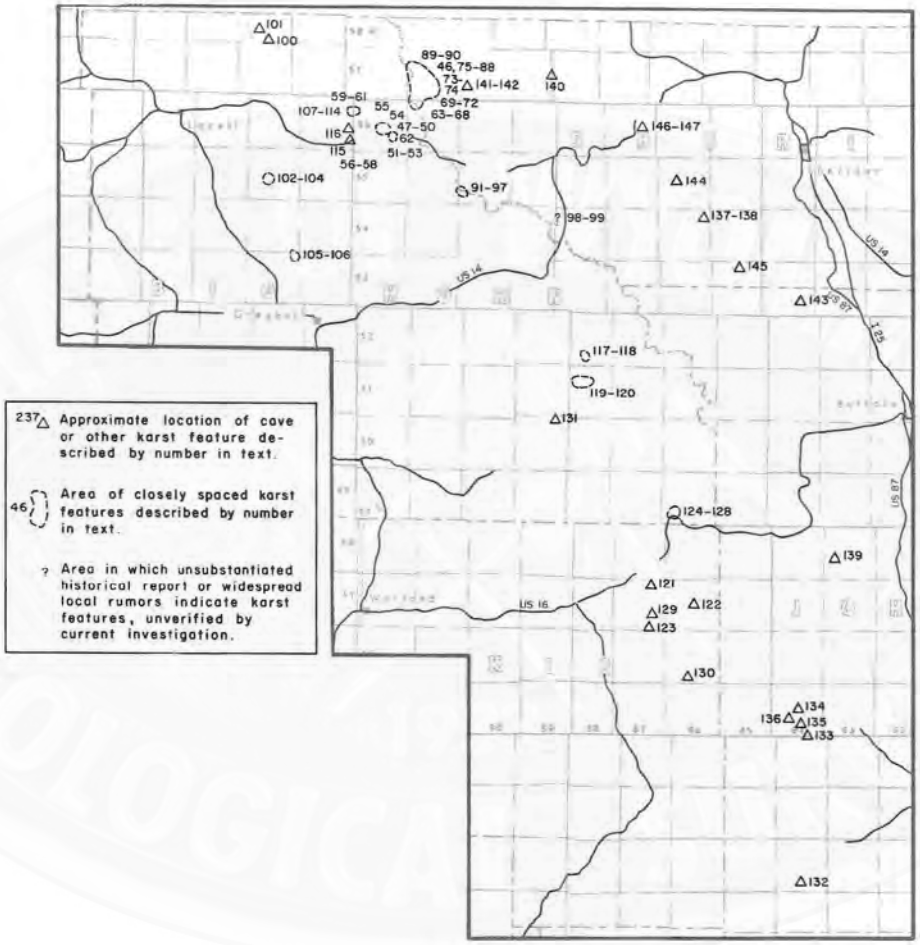


FIGURE 12 — Index map of the Bighorn Mountains.

STOCK SLOT PIT — 46

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit was discovered and first descended by Mark Stock in August 1973. The east-west trending fissure is 23' x 15'. The pit, at its bottom, is only two feet wide. Stock descended to the 35 foot level where further downward movement was impossible. Depth of the pit was estimated to be at least 60 feet. Technical equipment should be used in this pit.

Mac CASKEY BOTTOMLESS PIT CAVE — 47*

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,580 ft. (2,922 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 234 ft. (71 m.)

DESCRIPTION: An eight foot wide, north-south trending, fissure pit drops 25 to 30 feet to a breakdown floor. A short passage leads south. Midway down the north wall of the pit, a passage leads through large breakdown to a second pit developed on the same fissure. This pit drops 65 feet to a breakdown floor, where a passage leading south soon turns west and corkscrews down and under itself to a 66 foot pit. At the bottom of this pit, a narrow fissure, too tight for exploration, continues downward. The lowest mapped point is 178 feet beneath the surface.

TODDLERS TRAP CAVE — 48

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,580 ft. (2,922 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This small cave is developed in the southern extension of the MacCaskey Bottomless Pit Cave fissure (47). The fissure is about eight feet wide and six feet deep.

A passage leads down from the western wall of the fissure to the west for about ten feet and pinches out. A joint cuts across this passage parallel to the entrance fissure. A passage developed along it leads five feet to another joint, parallel to the entrance passage.

SLIMY SLIT PIT — 49

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,620 ft. (2934 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

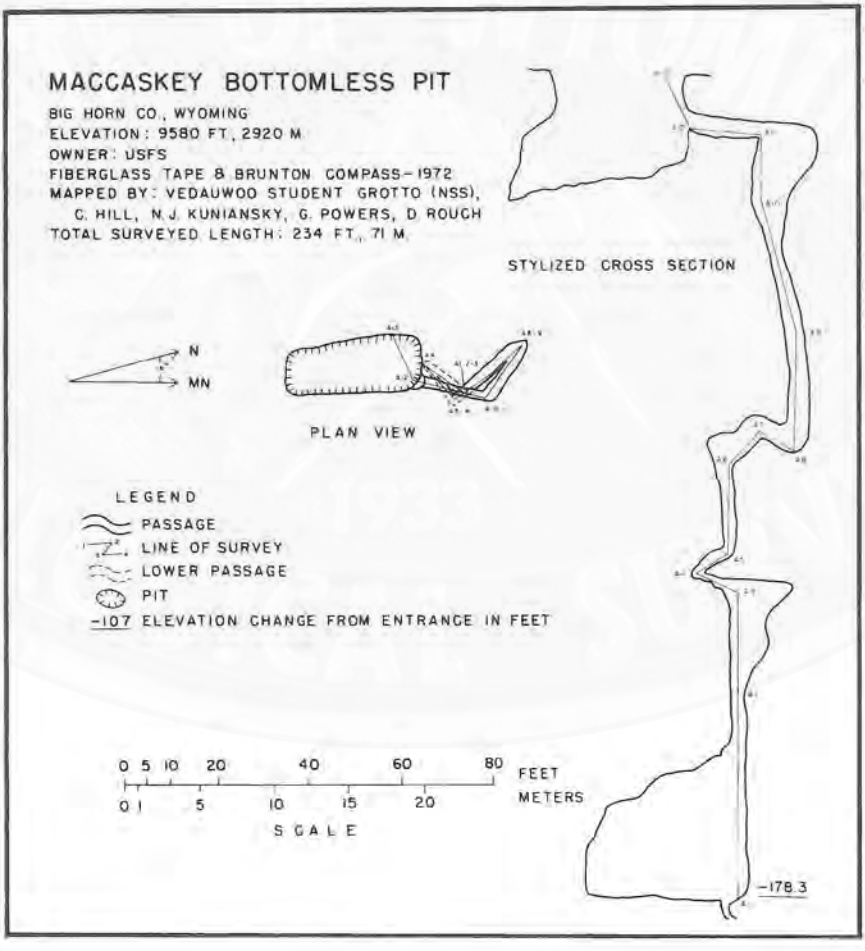
DESCRIPTION: This cave is about 50 feet southwest of the Medicine Wheel archaeological site. A depression three feet wide and 25 feet long has a narrow slit at its west end. The slit drops 143 feet to a breakdown floor. The walls are coated with a thin layer of mud.

This fissure is widest at the bottom, which would suggest that *slumping*, instead of simple pulling apart, was responsible for its development. The trend of the fissure is parallel to the cliff face, 200 feet south.

The pit is treacherous and should only be entered by experienced cavers.

SCHELTENS PIT — 50

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,610 ft. (2,931 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS



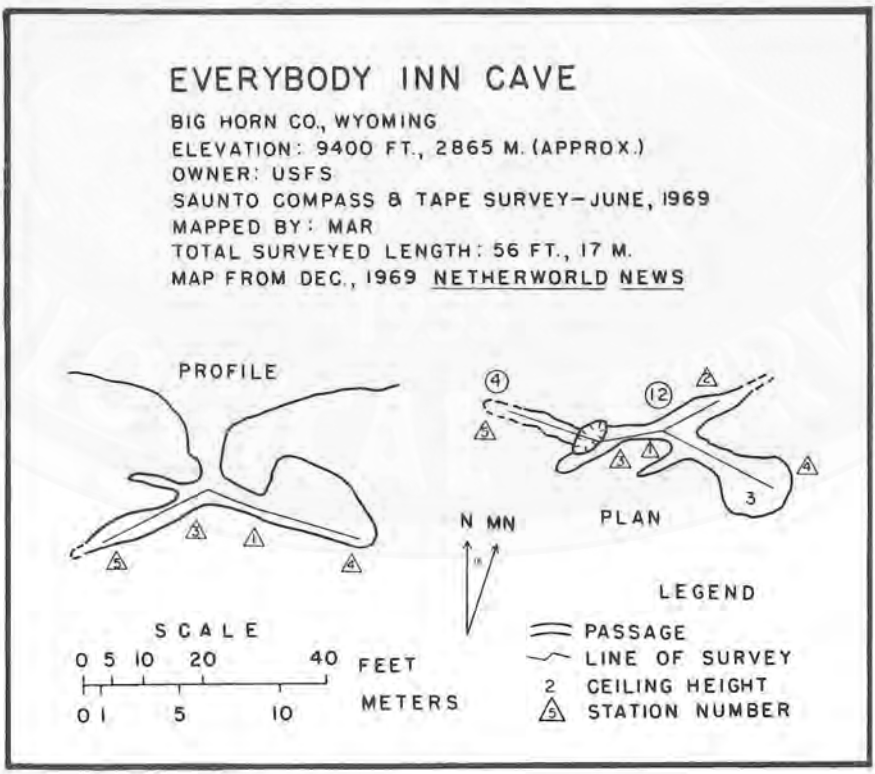
DESCRIPTION: This 90 foot pit, discovered by John Scheltens in 1970, is approximately 5' x 30'. The fissure along which it developed can be traced as a depression for over 100 feet. The pit is roughly parallel to a cliff, 300 feet northeast. The pit requires ropes and technical equipment.

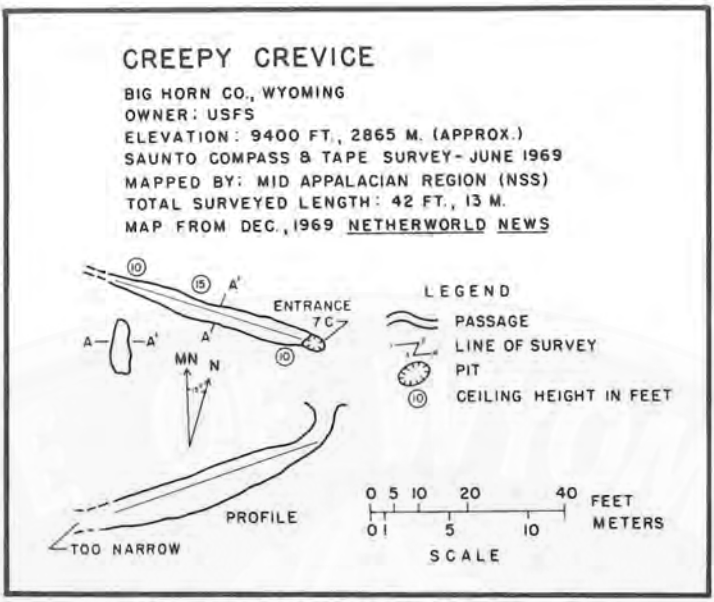
EVERYBODY INN CAVE — 51*

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave is located about one mile west of the Medicine Wheel. The following description is from the December, 1969 *Netherworld News* — "An Effort of the Mid-Appalachian Region (MAR)" by Doug and Hazel Medville, et al.:

"Everybody Inn received its name from the obvious fact that it was large enough to get everybody in. The entrance was at the base of the steep side of a large sink and is at the base of a ten foot climbable drop. At the base of the drop, there are 56 feet of measured passage. We gained access to another room by kicking out a few rocks near the entrance. It was floored with animal debris, but there was no present occupant."





CREEPY CREVICE CAVE — 52*

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,400 feet (2,867 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 42 feet (2,867 m.)
DESCRIPTION: The following is also from the Medville article:

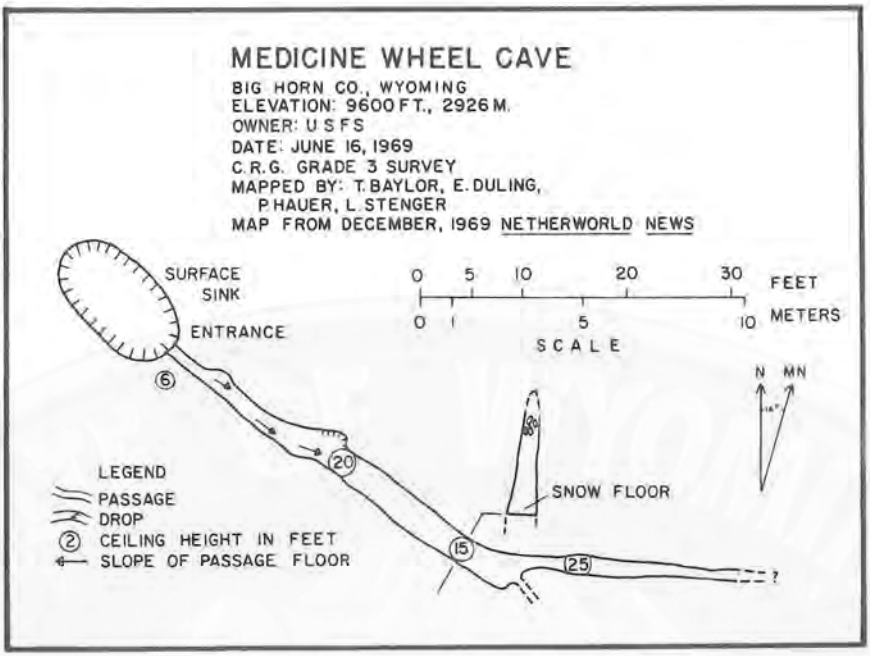
"Creepy Crevice is located about one-fourth mile from Everybody Inn Cave (51). To its greatest penetration, the cave consists of a single fissure dropping steadily over its surveyed 42 foot length. At this point, the fissure is too narrow to be explored."

MEDICINE WHEEL CAVE — 53*

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,600 ft. (2,928 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This description is from an article in the *Netherworld News*, December, 1969, by Peter M. Hauer:

"Medicine Wheel Cave's entrance is in a shallow sink 15' x 10'. Starting as a small hole leading down into a fissure passage, the passage descends rapidly and is largest near the end, reaching up to 20 feet in height.

"At the end of this fissure, an impassable fissure extends to the right and a short, passable one extends to the left for an additional 20 feet. The cave is about 300 feet west of the fence surrounding the wheel."



FRANCIK BOTTOMLESS PIT CAVE — 54

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,600 ft. (2,928 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave was discovered by Mike Francik in July, 1970. It is situated amid large, but generally shallow, fissures and pits paralleling a north trending cliff face. The entrance is a small hole with very little surface depression.

It is approximately 75 feet deep, two feet wide and about 35 feet long. At its bottom, a very narrow fissure crosses it perpendicular to the main fissure; rocks dropped into this crack rattle for some time.

BREAKDOWN PIT — 55

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,530 ft. (2,907 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: The entrance to this small pit was dug in the bottom of a shallow depression on Radio Tower Ridge. The pit drops 15 feet and has about 15 feet of horizontal passage.

COW SKULL CAVERNS — 56*

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 101 ft. (31 m.)
DESCRIPTION: This cave was discovered by Gayle Powers in July, 1973. The entrance is a shallow circular sink that drops 15 feet into a north-south trending fissure. At this point, the fissure is five feet wide and, to the south, intersects a roughly east-west trending fissure that has 30 feet of passage developed along it.

To the north, at the bottom of the entrance pit, is another 15 foot pit. The passage at the bottom of this drop pinches out about 35 feet to the north; lying across its width is a cow skull and other bones (Pl. 16).

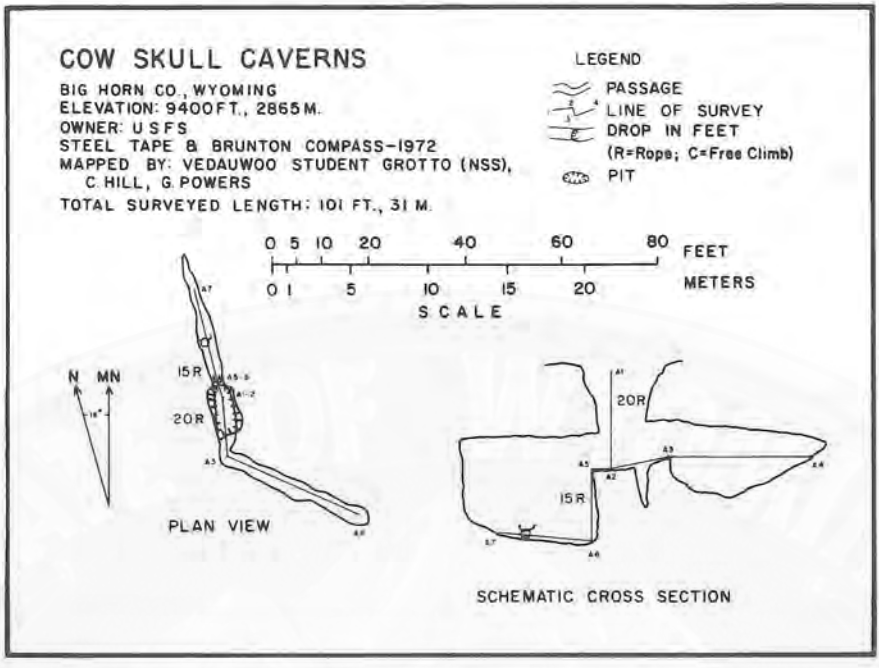
Both pits in this cave require ropes.

DINKEY DIVE CAVE — 57

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,320 ft. (2,843 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: The entrance to this cave is in a shallow, circular sink west of Cow Skull Caverns (56). A fissure-developed passage leads down and to the west for 15 to 20 feet. A large block of breakdown nearly blocks the passage, but the cave doubles back under itself and soon pinches out.

In the lower passage, some moist *anthodite* speleothems are developed; this cave should be entered only for study of these formations.

PLATE 15 — This cow skull formed the inspiration for the naming of Cow Skull Caverns in the Bighorn Mountains. (Photo by Chris Hill)



HOLE-IN-THE-GROUND CAVE — 58

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: Two caves occur in an elongated doline developed on a northwest-southeast trending fissure, east of Cow Skull Caverns (56). Both remain unexplored.

SACAJAWEA'S REVENGE PIT — 59

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,170 ft. (2,797 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit, northwest of Cow Skull Caverns (56), is developed on an east-west trending fissure. Although it has not been descended, its depth is estimated to be at least 35 feet. A large chunk of breakdown wedges in the fissure about ten feet below the surface.

The pit is located on the slope of a deep canyon and may be one of the deepest pits in the area. It appears that passage is developed along the fissure's bottom.

Ropes and technical equipment will be necessary to explore this pit.

SADDLE RIDGE FISSURES, PITS AND CAVES — 60

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,150 ft. (2,791 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: Fissures, small pits and caves surround Sacajawea's Revenge Pit (59). With digging this area could yield several pits of considerable depth.

RADIO RIDGE FISSURES, PITS AND CAVES — 61

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: To the north, east and west of Breakdown Pit (55), there are many large fissures, some small pits and several small caves. This area offers a high potential for uncovering pits and caves by digging. Breakdown Pit was discovered in this manner.

RADAR RIDGE FISSURES — 62

LOCATION: Medicine Wheel Quad.
ELEVATION: 9,700-9,900 ft. (2,959-3,020 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: Extensive fissure development occurs on and around the ridge to the southeast of the Federal Aviation Administration's radar complex on Medicine Mountain. Near the radar dome, the fissures are as deep as 15 feet. On the ridge to the southeast, the fissures are narrower and much shallower. This area may yield pits with digging.

TORECH UNGOL PIT CAVE — 63

(See Map on Sheet 3)

LOCATION: Bald Mountain Quad.
ELEVATION: 9,800 ft. (2,989 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: Torech Ungol (the spider's lair) was discovered in July 1972 by R. Banning, A. Harman, C. Hempel, and D. Regan. This pit is truly the queen of the Bighorn fissure pits, and, without using the proper technical equipment, Torech Ungol could provide horrors beyond any imaginable.

The cave is developed on an east-west trending fissure and its surface expression is very slight. The entrance is near the top of a small peak (Torech Ungol Peak) to the west of Duncum Mountain. The fissure drops about ten feet below the surface where a low crawl jogs five feet south to the main drop. This drop is a nearly free rappel of 220 feet.

Halfway down the drop, a passage leads east along the fissure for about 150 feet. At the bottom of the 220 foot drop, the fissure is about three

to four feet wide and 40 feet long. At the eastern extremity of the fissure, a narrow vertical crack leads south for five feet to a fissure that nearly parallels the main fissure.

A series of pits drop another 30 feet to the lowest point in the cave; -259.5 feet.

This pit cave and most of the other fissure pits should not be entered without nylon ropes, rappel gear and ascending gear such as Jumar or Gibbs ascenders.

SAMURAI PIT CAVE — 64

LOCATION: Bald Mountain Quad.
ELEVATION: 9,680 ft. (2,952 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: The entrance to Samurai Pit Cave is an east-west trending fissure, southeast of Torech Ungol Pit Cave (63). The pit drops 30 feet and has a breakdown *chockstone* across it, 15 feet below the surface. A narrow fissure slopes down another 30 feet and continues horizontally for 150 feet. There are several small pits, at least 20 feet deep, on the floor of the passage. These pits were not explored and the cave has not been mapped, although it may prove to be one of the deepest in the area.

ANGLE RIGHT FISSURE PIT — 65

LOCATION: Bald Mountain Quad.
ELEVATION: 9,650 ft. (2,943 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is developed along a joint on the north side of the saddle between Duncum Mountain and Torech Ungol Peak. A circular doline dissolved along an east-west trending fissure drops seven feet to the breakdown floor. A passage leads down to the east and is very narrow for 30 feet. At its end, the passage is intersected by a north-south trending joint which is negotiable for about 20 feet before it pinches out.

U-TUBE CAVE — 66

LOCATION: Bald Mountain Quad.
ELEVATION: 9,650 ft. (2,943 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave has three small entrances along an east-west trending fissure, east of Angle Right Fissure Pit (65). Roughly U-shaped in cross-section, the cave is approximately ten feet deep.

SMALL ROOM CAVE — 67

LOCATION: Bald Mountain Quad.
ELEVATION: 9,650 ft. (2,943 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: The entrance to this cave is west of Angle Right Fissure Pit (65) in a doline about 15 feet deep and 15 feet in diameter. A small passage at the bottom leads south into a room 20 feet long and ten feet wide.

TWO SECOND PIT — 68

LOCATION: Bald Mountain Quad.
ELEVATION: 9,720 ft. (2,965 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This newly opened pit exposes soil on the sides of its collapse doline. It is south of Torech Ungol Pit Cave (63) and west of Samurai Pit Cave (64).

Rocks dropped into the pit hit bottom in two seconds.

This would indicate a depth of about 60 feet; however, after the rocks hit they rattled and crashed for an additional ten seconds into the depths. The pit was not explored because it required ropes and elaborate rigging.

CRACK-IN-THE-TREES-CAVE — 69

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,360 ft. (2,855 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave has two entrances. It is in an east-west trending, four foot wide fissure which is partially filled with dirt and rock. The entrances are about eight feet apart in shallow depressions and are connected by a two to three foot high crawl. Another crawl halfway between the entrances, extends northeast for about ten feet, then west for about seven feet.

TIN CAN CAVE — 70

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,440 ft. (2,879 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave occurs in a long, shallow, east-west trending fissure, just west of the Boyd VABM. It derives its name from a unique iron-rich deposit (old cans) near the entrance. The three foot wide entrance opens into an 8' x 10' room which is two feet high.

HILL'S BELOW PIT CAVE — 71

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,360 ft. (2,855 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: The entrance to this cave was dug open by A. Harmen, C. Hempel, N. Kuniansky, G. Powers, D. Regan, and D. Roush. The removal of several chockstones exposed a gaping abyss of blackness. Hempel estimated a depth of at least 300 feet. The entrance is in a narrow, shallow doline; under the surface the fissure widens to about ten feet.

A free rappel of about 130 feet drops to a breakdown floor. The floor slopes east to another drop of at least 50 feet which narrows to less than seven inches at the bottom. The total depth of this cave was estimated at about 200 feet. The pit is very dangerous and requires technical equipment.

BANNING BANSHEE PIT CAVE — 72

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,360 ft. (2,855 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This cave was discovered and mapped by Rick Banning in July 1972. It is an east-west trending fissure averaging two feet wide throughout its 150 foot length and 98 foot depth.

STORAGE BIN CAVE — 73

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,520 ft. (2,904 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: The entrance to this cave is a small hole through breakdown in a shallow doline. A short crawl leads to a west-sloping room 8' x 15'. From the corner of this room, a smaller room slopes down to the east to a breakdown chute. Small animals have brought grass and other food into this room.

Some removal of small breakdown may yield more passage. Two unchecked pits are immediately southeast of this cave.

ANOTHER DEAD END PIT CAVE — 74

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,530 ft. (2,907 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: A northwest-southeast trending fissure pit, 3½' x 10', drops 15 feet to breakdown. A three foot high passage extends five feet to the northwest and a passage of similar size reaches seven feet to the southeast.

BIG HOLE SINK — 75

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,485 ft. (2,893 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: One of the largest fissure pit dolines in the area, Big Hole Sink appears to have been modified by collapse and some solution. The sink is 30 feet long, 20 feet wide and 25 feet deep. There is some passage development at its southern end.

POWER WAGON PIT CAVE — 76

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: At the surface, this northeast-southwest trending fissure is 25' x 20'. The pit drops 30 feet to a passage leading southwest to a second pit which drops about 75 feet to a lower level.

The second pit was not dropped, but a passage may continue back under the entrance pit to the north. The second pit requires ropes.

UNDISTINGUISHED PIT — 77

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,420 ft. (2,873 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This fissure pit trends northeast-southwest and is one to seven feet wide over its 40 foot length. The deepest point is 30 feet.

GARBAGE BONE PIT — 78

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,425 ft. (2,875 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit parallels Undistinguished Pit (77). It is one to three feet wide, 30 feet long, and 70 feet deep. Sheepherders have, unfortunately, used it as a garbage disposal. This fissure pit requires ropes.

BISON SKULL PIT — 79

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,430 ft. (2,876 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This fissure pit is developed on a joint parallel to Undistinguished Pit (77). It is 20 feet long, one to two feet wide and 35 feet deep. A bison skull was found on the bottom of the pit.

LUCKY SEVEN PIT — 80

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,435 ft. (2,878 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is only a foot wide over its 40 foot length and its deepest point is only about 20 feet beneath the surface. It is developed on a joint parallel to Undistinguished Pit (77).

EIGHT BALL PIT — 81

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,440 ft. (2,897 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is shaped like a dog leg with one fissure parallel to Undistinguished Pit (77) and the other trending north. Both sections are about 15 feet long and four to six feet wide. The deepest point is about 35 feet below the surface.

DIRTY DOZEN PIT CAVE — 82

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,460 ft. (2,885 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

PLATE 16 — To some, this may be only a hole in the ground but it is the entrance to Dirty Dozen Pit. (Photo by Chris Hill)

DESCRIPTION: This pit appears to be newly opened because erosion has not removed the soft soil surrounding the entrance (Pl. 21). The pit was discovered by the cave survey in 1972 but was not explored until 1973 when John Scheltens made the first descent.

The entrance is seven feet in diameter at the surface and is on a northwest-southeast trending joint. The pit averages two feet wide and is 111 feet deep.

It is a dangerous pit and should be explored by experienced cavers only.

TEN LITTLE INDIANS PIT — 83

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,445 ft. (2,881 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is developed on a north-south trending joint. The fissure is five to seven feet wide throughout its 50 foot length. Its deepest point is 35 feet beneath the surface.

LUCKY ELEVEN PIT — 84

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,450 ft. (2,882 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This small fissure pit is aligned with Undistinguished Pit (77). The pit is only six feet long and one foot wide but it is at least 40 feet deep.

THREE-HOLED-FOUR-SKELETONED-SLOT PIT — 85

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,350 ft. (2,852 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This it is the deepest of three pits developed in the bottom of a 200 foot long, meandering fissure. The pit is three to four feet wide and drops 30 feet to a breakdown floor where at least four animal skeletons lie.

UNLUCKY PIT — 86

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,340 ft. (2,849 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is an elongated fissure doline about ten feet long and ten feet deep. At its bottom, a two foot wide passage leads southwest and perpendicular to the surface fissure.

Descent into this passage may require a lot of wall modification; the fissure appears to be very tight. The fissure trends downdip into a valley, so this cave might prove to be the deepest and longest in the area.

YOU-CAN-HAVE-IT PIT — 87

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,450 ft. (2,882 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This pit is developed along a joint trending northwest-southeast. Its deepest point is about 30 feet below the surface. The fissure is about 100 feet long and about two to four feet wide throughout its length.

ICE CREVICE PIT — 88

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This pit is 40 feet long, two to three feet wide and, at its deepest point, 30 feet beneath the surface.

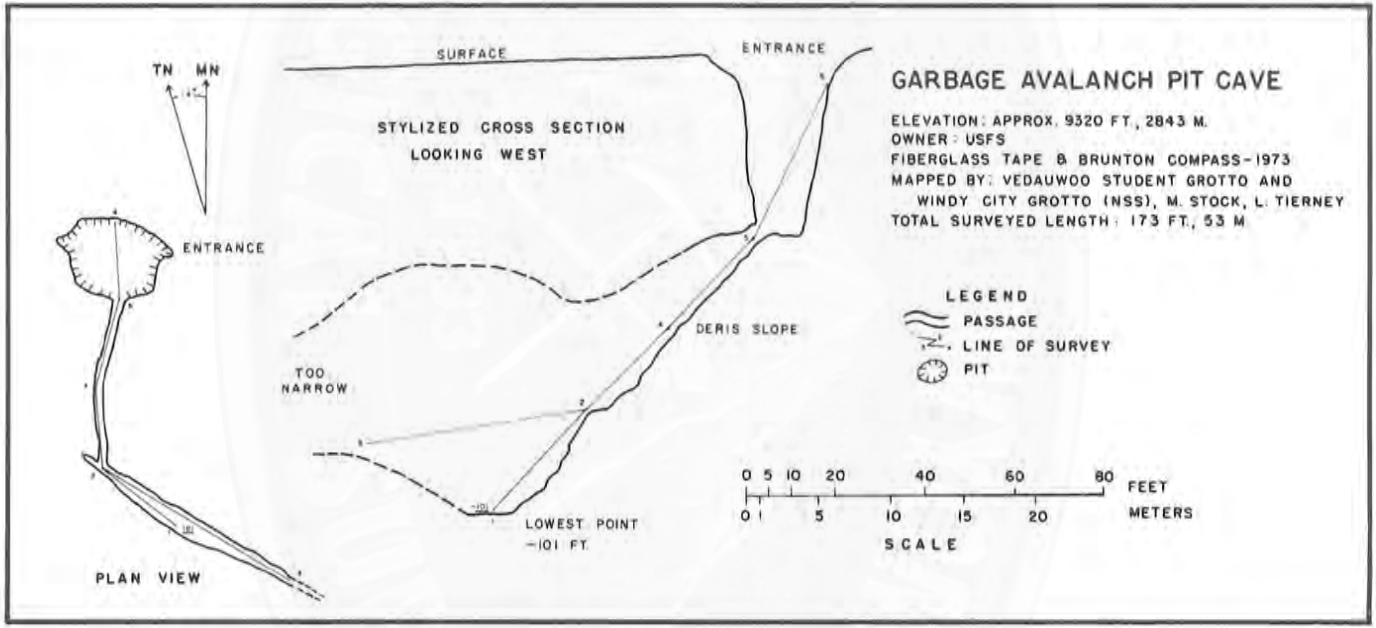
GARBAGE AVALANCHE PIT CAVE — 89*

LOCATION: Boyd Ridge Quad.
ELEVATION: about 9,320 ft. (2,843 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 173 ft. (53 m.)
DESCRIPTION: The large doline entrance to this cave is on the saddle between Crater Ridge and Sheep Mountain. The doline is about 25 feet long and 20 feet wide. A garbage-strewn passage leads south from the bottom of the 25 foot deep doline. Within 40 feet this passage intersects another fissure which continues southeast for 50 feet. The deepest point in the cave is 101 feet beneath the surface.

The cave derives its name from a near-disaster which befell the mapping team. While mapping the entrance fissure, the team was nearly buried under an avalanche of garbage.

LOST BUFFALO PIT — 90

LOCATION: Boyd Ridge Quad.
ELEVATION: about 9,350 ft. (2,852 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: Northwest of Garbage Avalanche Pit Cave (89) is a large doline about 25 feet in diameter and 20 feet deep. Digging in this pit could open a cave comparable to Garbage Avalanche.


TN MN
ENTRANCE
PLAN VIEW
SURFACE
ENTRANCE
STYLIZED CROSS SECTION
LOOKING WEST
DERIS SLOPE
TOO NARROW
LOWEST POINT
-101 FT.
GARBAGE AVALANCH PIT CAVE
ELEVATION: APPROX. 9320 FT., 2843 M.
OWNER: USFS
FIBERGLASS TAPE & BRUNTON COMPASS-1973
MAPPED BY: VEDAUWOO STUDENT GROTTO AND
WINDY CITY GROTTO (NSS), M. STOCK, L. TIERNEY
TOTAL SURVEYED LENGTH: 173 FT., 53 M
LEGEND
PASSAGE
LINE OF SURVEY
PIT
0 5 10 20 40 60 80 FEET
0 1 5 10 15 20 METERS
SCALE

GOLLUM SLIT PIT — 91

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,090 ft (3,077 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This one foot wide, jagged-walled pit is developed on an east-west trending fissure. The top of a debris cone in the center of the fissure is 15 feet below the surface but the pit is at least 25 feet deep. There may be passages developed along the fissure in both directions, but this pit was not dropped.

DEAD MARSHES CRACK— 92

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,080 ft. (3,074 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This large fissure is seven feet wide, 18 feet deep, 60 feet long and is parallel to Gollum Slit Pit (91).

MORDOR PIT — 92

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,075 ft. (3,073 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This fissure pit, parallel to Gollum Slit Pit (91), is 30 feet long and drops 35 feet beneath the surface. On the surface, it is five feet wide and narrows to one to two feet farther in.

SHADOWFAX PIT CAVE — 94

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,090 ft. (3,077 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: The entrance to this cave is a frost-fractured fissure about 10' x 7'. At its bottom a passage parallel to Gollum Slit Pit (91) leads to the west. Total depth of the cave is about 40 feet.

GALDOLF'S GOLD MINE PIT CAVE — 95

LOCATION: Hidden tepee Creek Quad.
ELEVATION: 10,100 ft. (3,081 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit, the best developed in the immediate area, follows an east-west trending fissure. The fissure's surface expression is several hundred feet long. Several pits are developed along this fissure (Pl. 21), the deepest being Gandolf's Gold Mine Pit Cave, 82 feet deep and one to two feet wide. There are several large blocks of breakdown across the entrance, to act as good anchor points for climbing ropes. The passage at the bottom of the pit is very tight but extends in both directions along the fissure.

This pit is for experienced cavers only.

JULY ICE CAVE — 96

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,000 ft. (3,050 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This cave is developed along a joint set trending roughly north-south and east-west. The walls, even in July, were covered with small, delicate ice crystals and icicles hung from ledges and the ceiling. The depth of the cave is about 40 feet; the average width is three to five feet. The total length of the cave may approach 100 feet.

BALROG PIT — 97

LOCATION: Hidden Tepee Creek Quad.
ELEVATION: 10,100 ft. (3,050 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: A fissure perpendicular to a cliff face trends east towards Balrog Pit, which is parallel to the cliff. The pit jogs downward, towards the cliff, for about 20 feet before it becomes too tight for exploration.

FOURTH OF JULY PIT CAVE — 98

LOCATION: Granite Pass Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: The entrance to this cave was dug in a shallow, elongated doline on July 4, 1972. The narrow opening drops into a tight fissure, which slopes steeply down for 40 feet, before dropping five feet to continue descending under the entrance passage for another 25 feet.

The total depth of the cave was estimated by rope length at 80 feet. Passages developed at several levels lead along the fissure in both directions.

Loose rock and uncompacted dirt makes this a dangerous pit.

TOO TIGHT FISSURE PIT — 99

LOCATION: Granite Pass Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This fissure is several hundred feet east of Fourth of July Pit Cave (98). The fissure is 15 to 20 feet long, eight inches wide and is at least 15 feet deep. Wall modification may extend the known limits of this fissure.

NATURAL TRAP CAVE — 100*

LOCATION: Natural Trap Cave Quad.
ELEVATION: 4,960 ft., (1,513 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 1,363 ft. (416 m.)

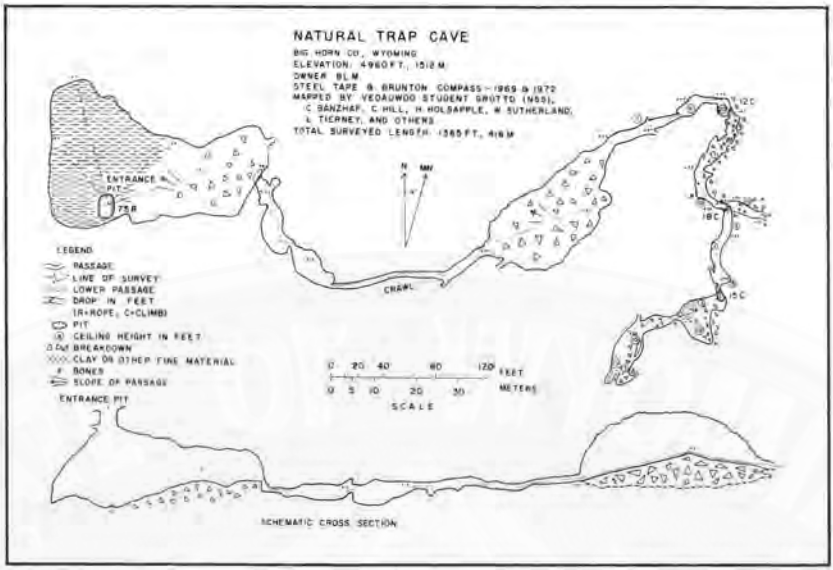
DESCRIPTION: The entrance to this cave is a solutional doline, 15 feet in diameter, which bells out to form a large room, 100 feet wide and 150 feet long (Pl. 17). The room, at the bottom of the 75 foot free rappel, is floored with sandy clay and large blocks of breakdown. The lowest point in this room is the deepest point in the cave.

On the room's east side, a crawlway leads to a series of small rooms and more crawlways which eventually lead to a second large room. Floored by a massive amount of breakdown, this room is 150 feet long and 75 feet wide. At its north end, a passage leads through breakdown for several hundred feet to several small rooms. Some digging and shifting of breakdown, in several places, might open large new areas in this cave.

The cave appears to have developed phreatically, possibly in relation with an artesian aquifer.

The entrance to Natural Trap Cave was gated in 1973 by the BLM. To enter it, keys and entry permits must be obtained from either the BLM office in Worland or from the Bighorn Canyon National Recreational Area of the U. S. Park Service in Lovell.

PLATE 17 — A caver rappels into Natural Trap Cave. This photo is no longer possible because the cave has been gated since it was taken. (Photo by Wayne Sutherland)



HORSETHIEF BIGHORN CAVE SYSTEM — 101

(See map on Sheet 2)

LOCATION: Hillsboro Quad. (Wyo-Mont) & Natural Trap Cave Quad.
ELEVATION: 4,680 ft. (1,427 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: Horsethief Cave; 21,400 ft. (6,527 m.)
Bighorn Caverns; 21,754 ft. (6,635 m.)

DESCRIPTION: Bighorn Caverns (Pl. 18), just north of the Wyoming-Montana border, was discovered in 1961. Horsethief Cave (Pl. 18), just south of the border, had been known for many years. In about 1968, a connection linking the two caves was found, but it remained a closely guarded secret for several years during which it was impassably clogged with concrete.

Both caves were gated in 1972; qualified cavers must obtain keys and permission to enter from either the BLM office in Worland or the Bighorn Canyon National Recreation Area office in Lovell.

Before October 1970, Horsethief Cave was considered insignificant when compared with Bighorn Caverns. At that time, Denise's Crawl was discovered by a group of cavers from Laramie. This led to bursts of discovery and mapping. The first real indication that Horsethief comprised a major part of the system came when a caver from Montana became lost for several days. Neither cave has been completely explored or mapped. The possibility of another connection between the two caves still exists.

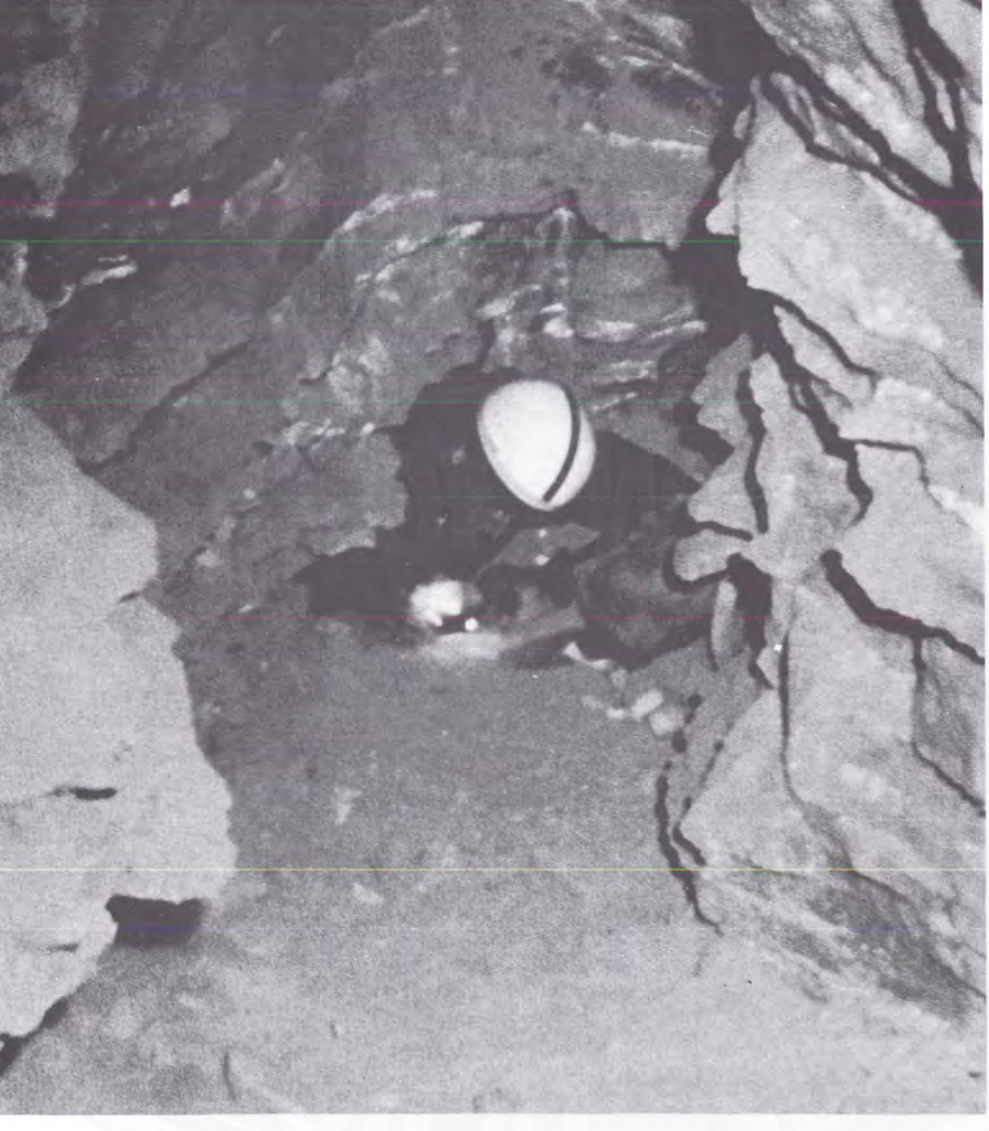


PLATE 18 — Cave crawls are often tight, as illustrated here by this tight squeeze in the Horsethief-Bighorn Cave System. (Photo by Wayne Sutherland)

This cave system contains almost eight miles of mapped passage occurring in the upper portion of the Madison Limestone. It appears to have formed by phreatic processes and to be controlled by a series of subparallel joints. The major passages trend east-west. Minor passages trend northeast-southwest and north-south. However, in the far eastern portions of the cave, the northeast-southwest trend is the major passage orientation.

The major east west passages are interconnected by a north-south trending zone of smaller passages, mazes, and breakdown piles. Study of

these passage trends has played an important part in the discovery of new passages.

Breakdown modification is prominent in most large passages, while evidence of vadose modification of passages is generally lacking. In several places (including the Carpet Room), passage fills indicate stream modification, suggesting these areas are near former entrances. Numerous bones of foxes and larger animals in these areas lend further support to this idea.

Elevations within the cave essentially conform to the shallow southwest dip of the Madison Limestone. The deepest part of Horsethief Cave lies in its southwestern extremity, almost 120 feet below the entrance. The highest part of Horsethief is at its eastern end, about 40 feet above the entrance.

Spot temperatures measured in the cave have ranged from 40 degrees to 50 degrees Fahrenheit throughout the year. Winds, believed to be of a barometric nature, have led cavers, in a few cases, to new, large passages. This was the case with the Tight Place Where the Water Comes Down. Denise's Crawl is usually windy.

Large semi-conical piles composed mainly of red clays are the subject of much speculation. These features are termed "buddhas" by the local cavers and seem to be related to overlying paleokarst dolines. These paleokarst dolines (having a slight surface expression indicated by vegetation changes), may act as permeable zones through which surface water enters the cave. One of the largest "buddhas" (the Delta Buddha) shows evidence of water flowing down it in several places.

Some phreatic development of the system may have taken place during the Tertiary Period, prior to the removal of Tertiary rocks from the Bighorn Basin. Animal bones, within the cave, may help to determine its age. The possibility of artesian flow from the mountains to the east may relate to the cave's development.

Paleokarst of late Mississippian age is exposed at places in the cave and on the surface. This is expressed usuallyas breccias of angular limestone fragments in a red or light tan fine-grained *matrix*, sometimes containing speleothem fragments.

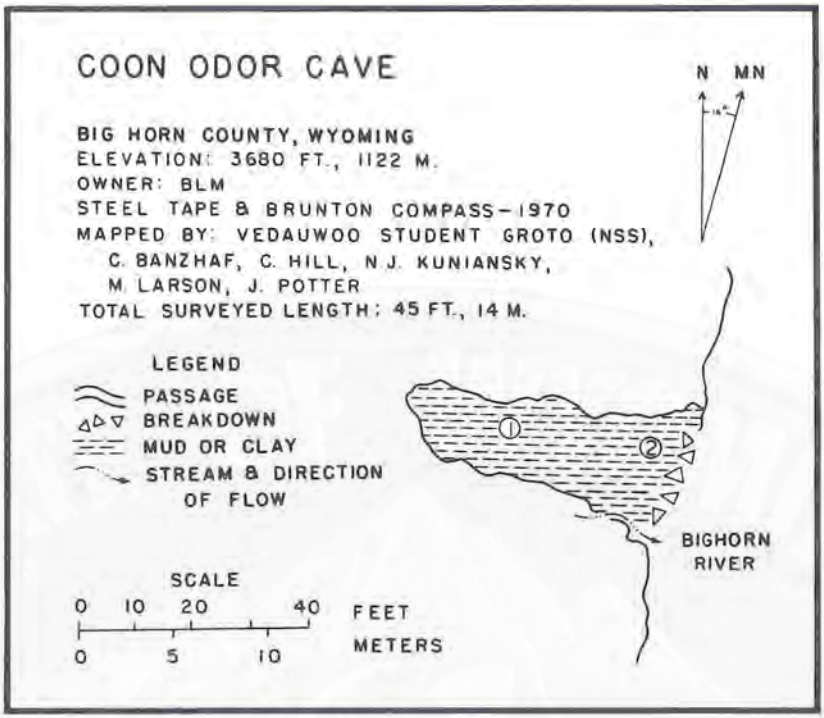
COON ODOR CAVE — 102*

LOCATION: Kane Quad.
ELEVATION: 3,675 ft. (1,121 m.)
FORMATION: Madison Limestone
OWNER: Burlington Northern Railroad
TOTAL SURVEYED LENGTH: 45 ft. (14 m.)

DESCRIPTION: Coon Odor Cave has a small, sulferous thermal spring discharging into the Bighorn River at the cave entrance. The entrance is north of the entrance to Lower Kane Cave (103). A muddy crawl leads west for 45 feet, terminating in breakdown. The development of this cave is probably intricately tied to the thermal waters that flow through it.

LOWER KANE CAVE — 103*

LOCATION: Kane Quad.
ELEVATION: 3675 ft. (1,121 m.)



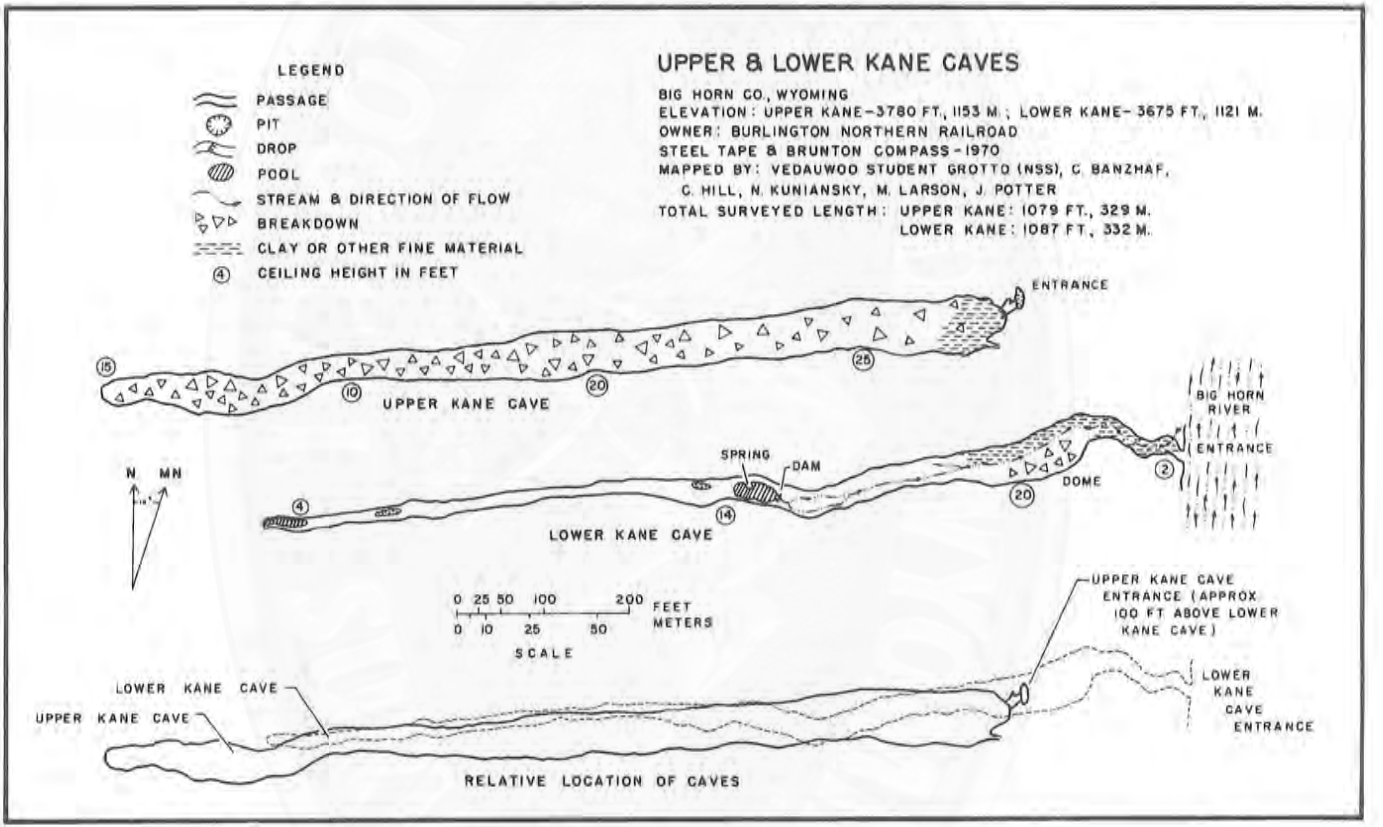
FORMATION: Madison Limestone
OWNER: Burlington Northern Railroad
TOTAL SURVEYED LENGTH: 1,087 ft. (332 m.)

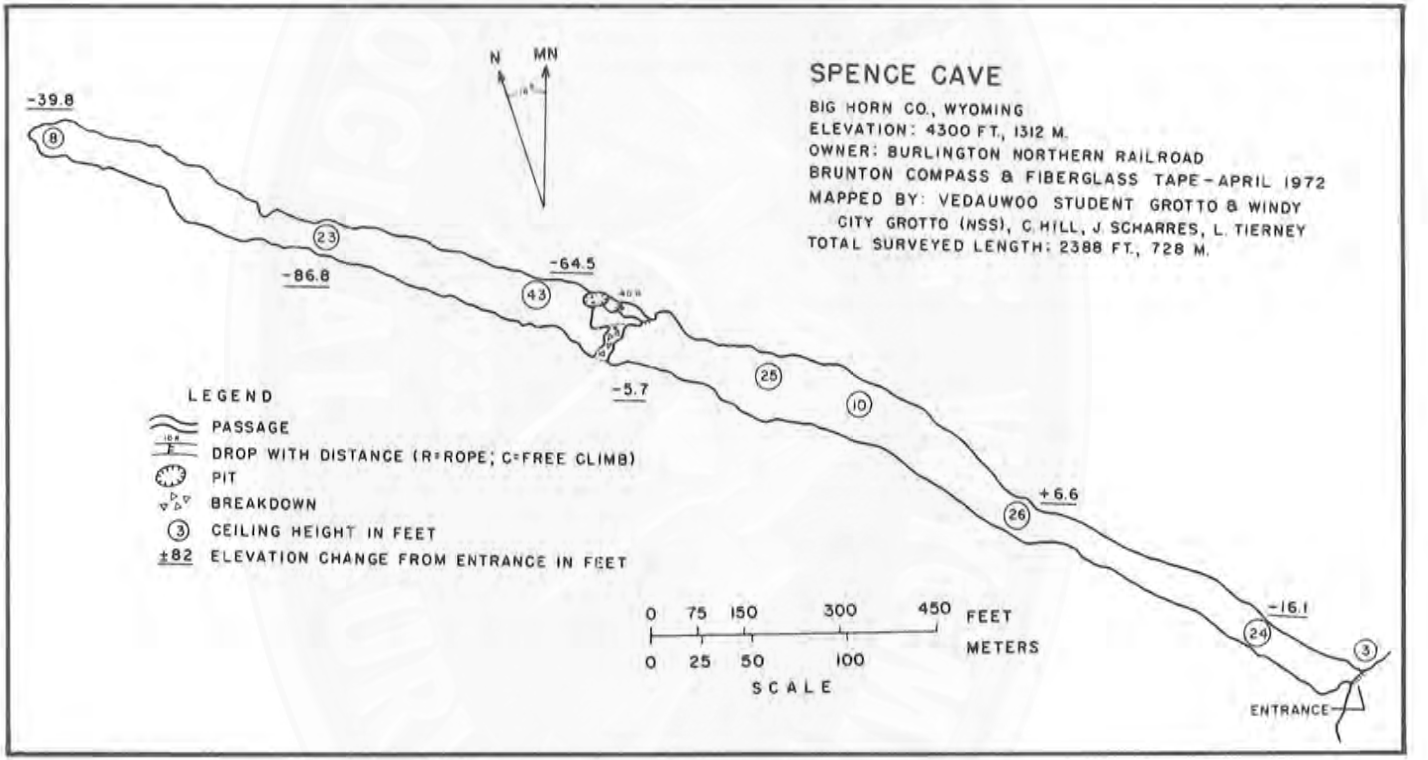
DESCRIPTION: The entrance to this cave, between the Bighorn River and the Burlington Northern Railroad tracks, is a low arch about five feet above the level of the river, in the crest of Little Sheep Mountain anticline. Just inside the cave, a thermal stream smelling of sulfur flows into the river through a separate, waterfilled entrance. The stream meanders from a spring about 450 feet inside the cave, flowing through mud banks which were probably deposited by flooding from the river. We observed small trout and some sort of tiny stalked creatures living in the stream. About 1,100 feet from the entrance, the cave pinches out. At this point, there are some waterfilled trenches from which thermal water may have issued and a small hole into which air flows, sometimes making a roaring noise. There are some massive deposits of *moonmilk* in the back of the cave.

The origins of Upper and Lower Kane Caves are probably related to the thermal waters (replacement-solution) that still flow through the lower cave.

UPPER KANE CAVE — 104*

LOCATION: Spence Quad.
ELEVATION: 3,780 ft. (1,153 m.)
FORMATION: Madison Limestone
OWNER: Burlington Northern Railroad


LEGEND
PASSAGE
PIT
DROP
POOL
STREAM & DIRECTION OF FLOW
BREAKDOWN
CLAY OR OTHER FINE MATERIAL
④ CEILING HEIGHT IN FEET
UPPER & LOWER KANE CAVES
BIG HORN CO., WYOMING
ELEVATION: UPPER KANE-3780 FT., 1153 M.; LOWER KANE- 3675 FT., 1121 M.
OWNER: BURLINGTON NORTHERN RAILROAD
STEEL TAPE & BRUNTON COMPASS - 1970
MAPPED BY: VEDAUWOO STUDENT GROTTO (NSS), C. BANZHAF, C. HILL, N. KUNIANSKY, M. LARSON, J. POTTER
TOTAL SURVEYED LENGTH: UPPER KANE: 1079 FT., 329 M.
LOWER KANE: 1087 FT., 332 M.
ENTRANCE
UPPER KANE CAVE
BIG HORN RIVER
ENTRANCE
SPRING
DAM
DOME
LOWER KANE CAVE
N MN
0 25 50 100 200 FEET
0 10 25 50 METERS
SCALE
UPPER KANE CAVE ENTRANCE (APPROX 100 FT ABOVE LOWER KANE CAVE)
LOWER KANE CAVE
UPPER KANE CAVE
LOWER KANE CAVE ENTRANCE
RELATIVE LOCATION OF CAVES


SPENCE CAVE
BIG HORN CO., WYOMING
ELEVATION: 4300 FT., 1312 M.
OWNER: BURLINGTON NORTHERN RAILROAD
BRUNTON COMPASS & FIBERGLASS TAPE - APRIL 1972
MAPPED BY: VEDAUWOO STUDENT GROTTO & WINDY CITY GROTTO (NSS), C. HILL, J. SCHARRES, L. TIERNEY
TOTAL SURVEYED LENGTH: 2388 FT., 728 M.
N
MN
-39.8
8
23
-86.8
-64.5
43
-5.7
25
10
+6.6
26
-16.1
24
3
ENTRANCE
LEGEND
PASSAGE
DROP WITH DISTANCE (R=ROPE; C=FREE CLIMB)
PIT
BREAKDOWN
3 CEILING HEIGHT IN FEET
±82 ELEVATION CHANGE FROM ENTRANCE IN FEET
0 75 150 300 450 FEET
0 25 50 100 METERS
SCALE

TOTAL SURVEYED LENGTH: 1,079 ft. (329 m.)

DESCRIPTION: The entrance to Upper Kane Cave is a 2' x 5' slot in a small amphitheater, 112 feet above Lower Kane Cave (103). The entrance drops to a mud slope that leads down into a breakdown-floored room averaging 30 feet wide, 20 feet high and 1,100 feet long. The cave terminates at the end of this room where the passage bends abruptly downward but is blocked by breakdown. Upper and Lower Kane Caves probably have a closely related development.

There are some small gypsum crystals developed on the walls and floors of the cave. Slickensides have been noted in the ceiling. Like Lower Kane Cave, this cave is warm (usually around 80°F) and humid, and is in the crest of the same anticline. During very cold weather, the cave breathes out while Lower Kane Cave breathes in; momentary reversals interrupted the flow in both caves, suggesting a connection.

SPENCE CAVE — 105*

LOCATION: Sheep Canyon Quad.
ELEVATION: 4,300 ft. (1,312 m.)
FORMATION: Madison Limestone
OWNER: Burlington Northern Railroad
TOTAL SURVEYED LENGTH: 2,388 ft. (728 m.)

DESCRIPTION: The entrance to Spence Cave is high above the Burlington Northern Railroad tracks in the canyon cut by the Bighorn River through the Sheep Mountain anticline. Immediately past the low arched entrance, the cave enlarges to 75' x 50'. Dust-covered breakdown slopes from near the ceiling on the left side of the passage to the floor of the right side. This large, nearly straight passage leads for 1,300 feet until it becomes blocked by breakdown.

At the upper right side of what appears to be the end, a small crawl leads to a pit. This pit slopes very steeply for 45 feet then drops free for 20 feet into another large passage, parallel to the entrance passage. It continues for another 1,000 feet until it terminates in breakdown.

The entire cave is developed along the axis of the Sheep Mountain anticline. In the back of the cave there are slickensides on the ceilings and walls, attesting to the stresses and strains accompanying the uplift. Deposits of gypsum are also common in the back of the cave.

The cave was probably developed by phreatic processes along zones of weakness established during the uplift of the anticline. It was later modified by breakdown. Sheep Mountain anticline is a structural feature similar to Little Sheep Mountain anticline to the north, in which the Kane Caves (103, 104) are developed. The association of thermal waters with the Kane Caves and the similarities of the uplifts and the caves, suggests that thermal waters may also have played a role in the development of Spence Cave. This idea is supported by the work of Egemeier (1973).

During the 1950's, Spence Cave was designated a Big Horn County fallout shelter. The Civil Defense sign is still in place below the cave along the railroad tracks.

CAVE OF THE PROUD EAGLE — 106*

LOCATION: Sheep Canyon Quad.
ELEVATION: about 4,250 ft. (1,296 m.)
FORMATION: Madison Limestone
OWNER: Burlington Northern Railroad
TOTAL SURVEYED LENGTH: 350 ft. (107 m.)
DESCRIPTION: The entrance to this cave is high in the canyon cut by the Bighorn River and is several hundred feet above the Burlington Northern Railroad tracks. It is about one-half mile west of Spence Cave (110) and on the same side of the river. The floor of the fissure entrance slopes up into a flat-ceilinged room 10' x 35'. Past this room, the floor slopes down into a large breakdown floored room 150 feet wide, 150 feet long and, at its highest, 40 feet high. The clay-covered breakdown floor slopes up at the back of this room to the end of the cave.

DEAD MAN CAVE — 107*

LOCATION: Cottonwood Canyon Quad.
ELEVATION: 7,560 ft. (2,306 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 289 ft. (88 m.)
DESCRIPTION: The entrance to this cave is a pit ten feet in diameter. It drops steeply, 30 feet, into a large room. To the west, at the bottom of the pit, is a room with large ice speleothems while, to the east, is a large flat-floored room. A large snow cone juts up in the entrance pit. South of the main entrance, a second entrance leads to a 25 foot drop into the flat-floored room.

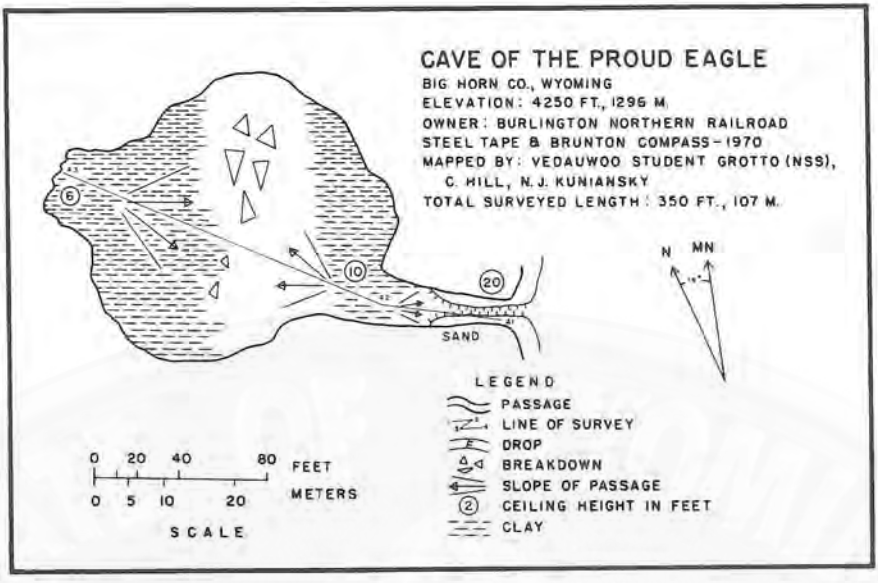
It is rumored that, in the 1920's or 30's, a sheepherder fell into the cave and broke his leg. He was unable to extricate himself from the cave and met an untimely death. His body was later found and removed from the cave. Needless to say, the cave requires rope and technical equipment.

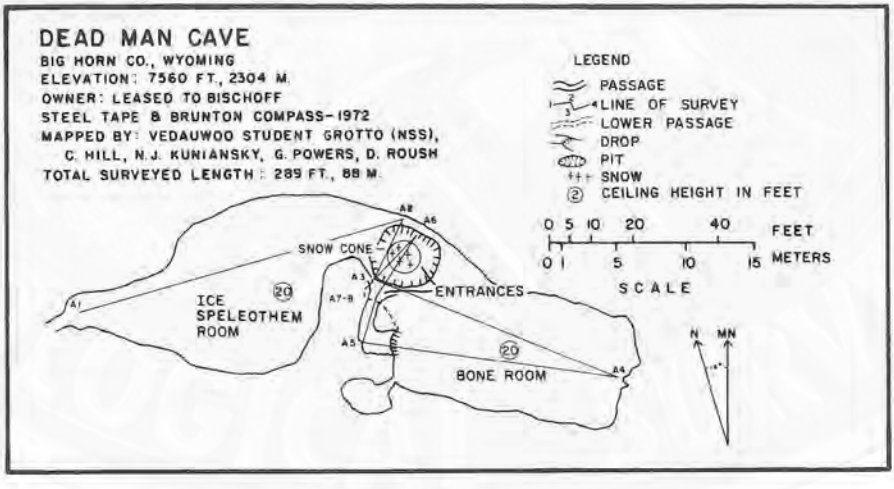
Many caves and rock shelters occur in the vicinity of upper Cottonwood Creek Canyon and, although most of these are small, at some time in the geologic past they may have been a part of an extensive aquifer. All of the caves appear to be developed in the Mission Canyon Member of the Madion Limestone, which locally dips eastward at eight to ten degrees.

The most notable fact about these caves is that several of them are *glacieres* (caves containing permanent ice). The ice in two of these caves, Dead Man Cave and South Fork Ice Cave (109) may be neo-glacial relics.

CHURCH CAVE — 108*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,500 ft. (2,288 m.)
FORMATION: Madison Limestone
OWNER: USFS

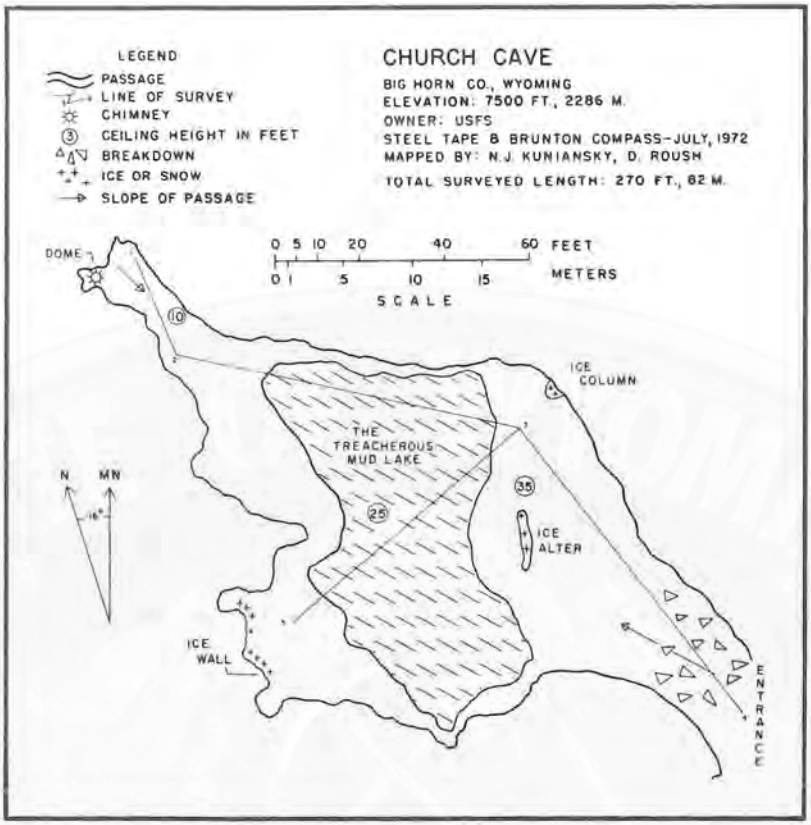




TOTAL SURVEYED LENGTH: 270 ft. (82 m.)

DESCRIPTION: This cave consists primarily of a single large room, 160 feet long and 40 feet high. A large portion of the room is a mud flat indicating that, at times, the cave has small amounts of standing water. At several places, there are large ice speleothems. The cave may be a true glaciere.

The cave name was derived from a splendid display of colors on the ice speleothems as the sun sets and from the cathedral-like effect of its high vaulted ceiling.



SOUTH FORK ICE CAVE (POACHER'S CAVE) — 109

(See Map on Sheet 2)

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,490 ft. (2,284 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 474 ft. (145 m.)

DESCRIPTION: This is the largest and most interesting cave in the area. It contains some massive permanent ice speleothems. The 50' x 25' entrance at the base of a small cliff is very impressive.

The floor of the large entrance room is strewn with breakdown and has several mud flats and pools, which appear to be the result of water melting from the ice. Also, in this room are two large ice stalagmites, a large block of ice resembling a boat and an ice wall-cascade descending from the 50 foot ceiling to the floor.

Dave's room and another smaller room occur beyond the large entrance room, both end within 60 feet. Just inside the entrance, on the north wall, is a high domed ceiling and, near the center of the room, is a massive, 75 foot high ice column.

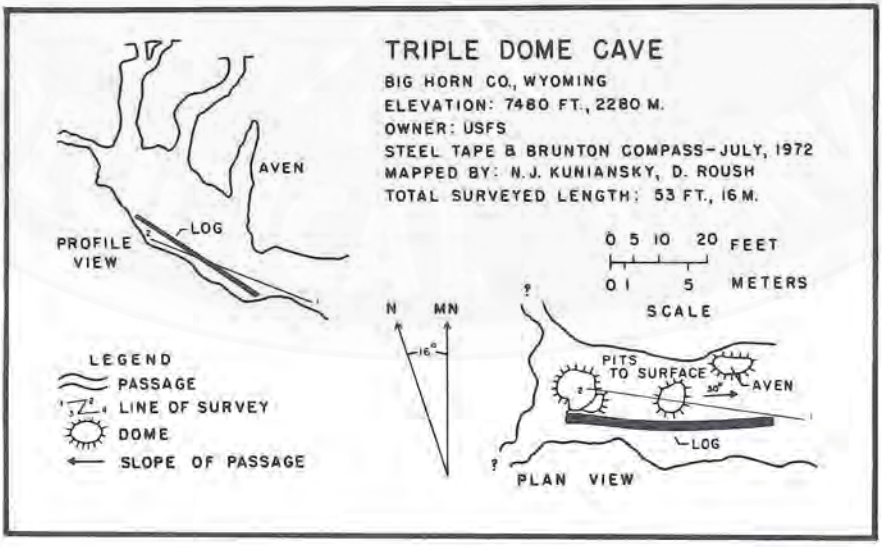
Many glacieres and ice caves in the west have been used as natural freezers for the storage of meat. South Fork Ice Cave has been used in this manner, as has Bates Creek Ice Cave (22), south of Casper.

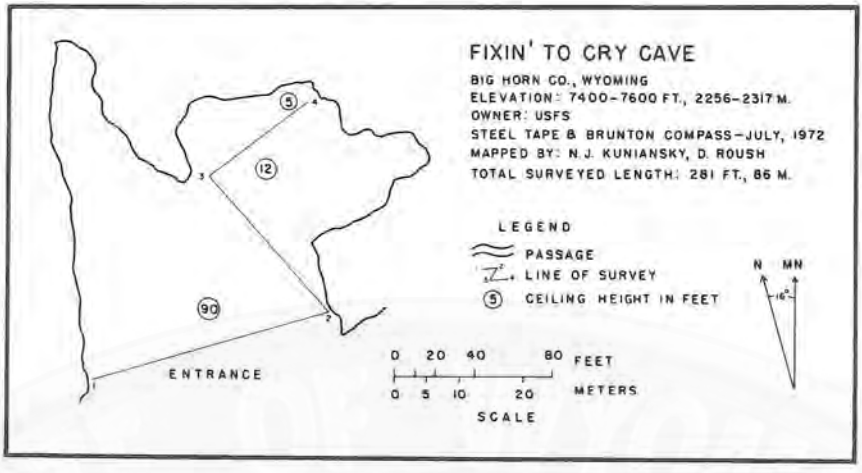
TRIPLE DOME CAVE — 110*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,480 ft. (2,281 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 53 ft. (16 m.)
DESCRIPTION: This cave is in the upper reaches of Cottonwood Canyon, on its south wall. It is vertically developed and has four entrances (three vertical pits and a large horizontal entrance). The three pits and the dome are all aligned along the single, controlling joint. The floor slopes steeply up from the cliff-side entrance to a sheer wall at the back of the cave. At the top of this wall, an inaccessible passage may lead to more cave.

FIXING-TO-CRY CAVE — 111*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,400-7,600 ft. (2,257-2,318 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 281 ft. (86 m.)
DESCRIPTION: Either a large rock shelter or a small cave, this impressive 100' x 100' cave mouth leaves one "fixing-to-cry" when he discovers that the entrance does not lead to much further cave passage.



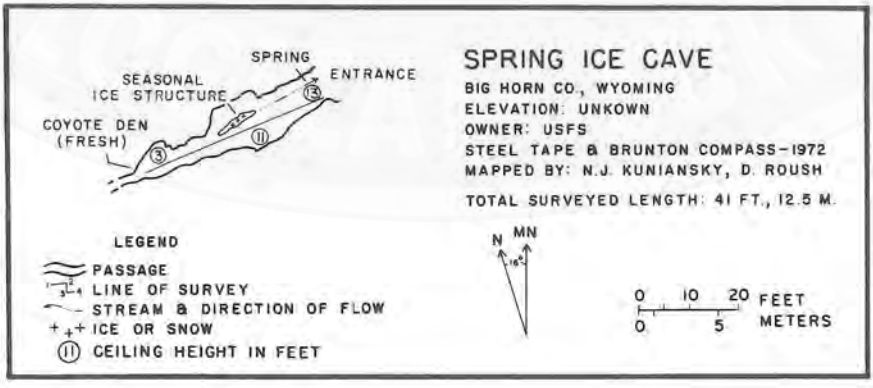


SPRING ICE CAVE — 112*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,400 ft. (2,257 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 41 ft. (12.5 m.)

DESCRIPTION: This 40 foot long cave is located on the south wall of Cottonwood Canyon. In early July, a small stream issues from the cave, the source probably being melting ice speleothems within the cave.

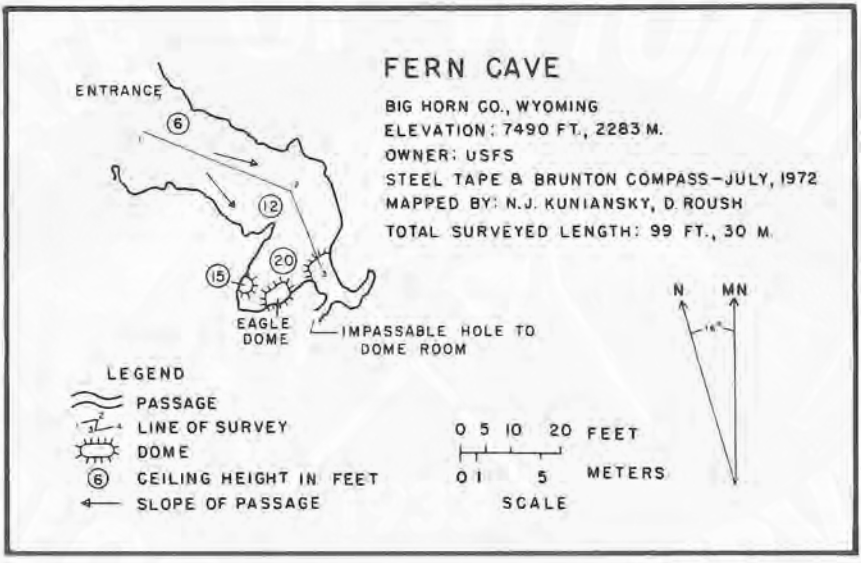
A coyote den at the back of the cave indicates the probable existence of a second entrance, because the main entrance is in the middle of a vertical cliff.



FERN CAVE — 113*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,490 ft. (2,284 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 99 ft. (30 m.)
DESCRIPTION: This small cave is developmentally related to its larger neighbor to the north, South Fork Ice Cave (109). The cave slopes gently up from its fern-decorated entrance for about 60 feet, to the back of the cave. Near the end of the main room, at the top of a ten foot high wall, a short passage leads to a breakdown barrier.

Another room can be seen through a small hole in the breakdown. This room may have once connected with Dave's Room in South Fork Ice Cave. Several small domes occur within Fern Cave.

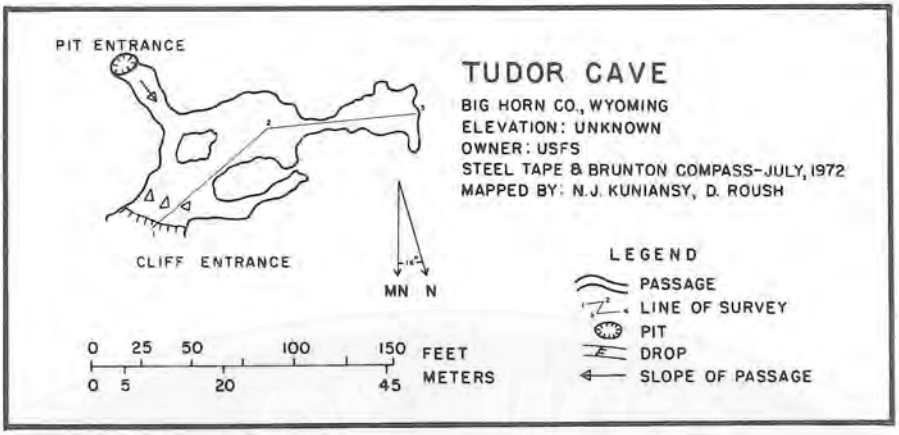


TUDOR CAVE — 114*

LOCATION: Medicine Wheel Quad.
ELEVATION: 7,400 ft. (2,257 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This small cave has about 200 feet of passage. It can be entered through a pit or from a cliff entrance.

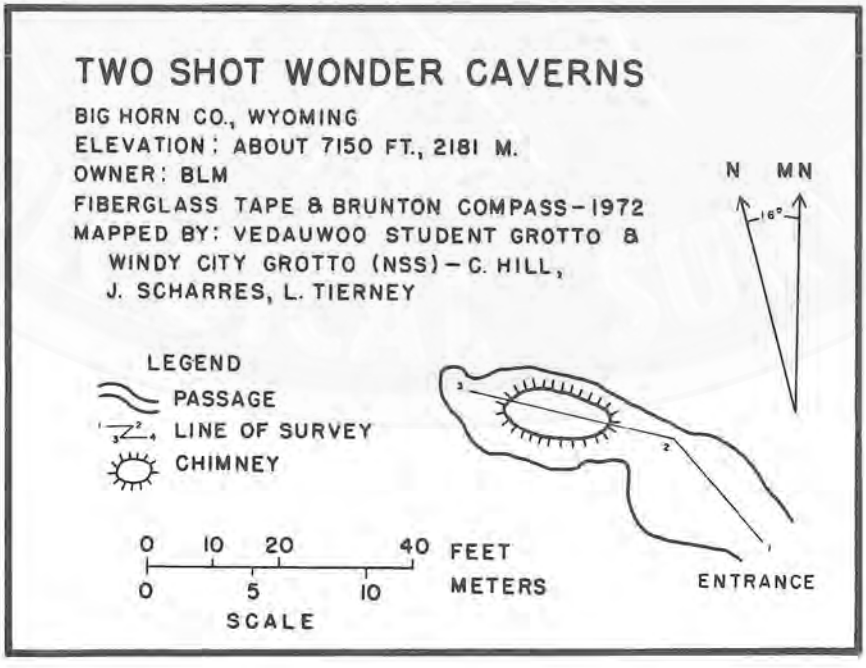
BIRDS CLAW NATURAL BRIDGE — 115

LOCATION: Cottonwood Canyon Quad.
ELEVATION: about 6,000-6,200 ft. (1,830-1,891 m.)



FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 161 ft. (49 m.)
DESCRIPTION: This natural bridge perches halfway up the steep, western flank of the Bighorn Mountains. There are four entrances to the natural bridge: the lower, the upper, the side and the pit entrances. The pit entrance would provide a rappel of about 25 feet. The feature is probably an erosional remnant of a cave.

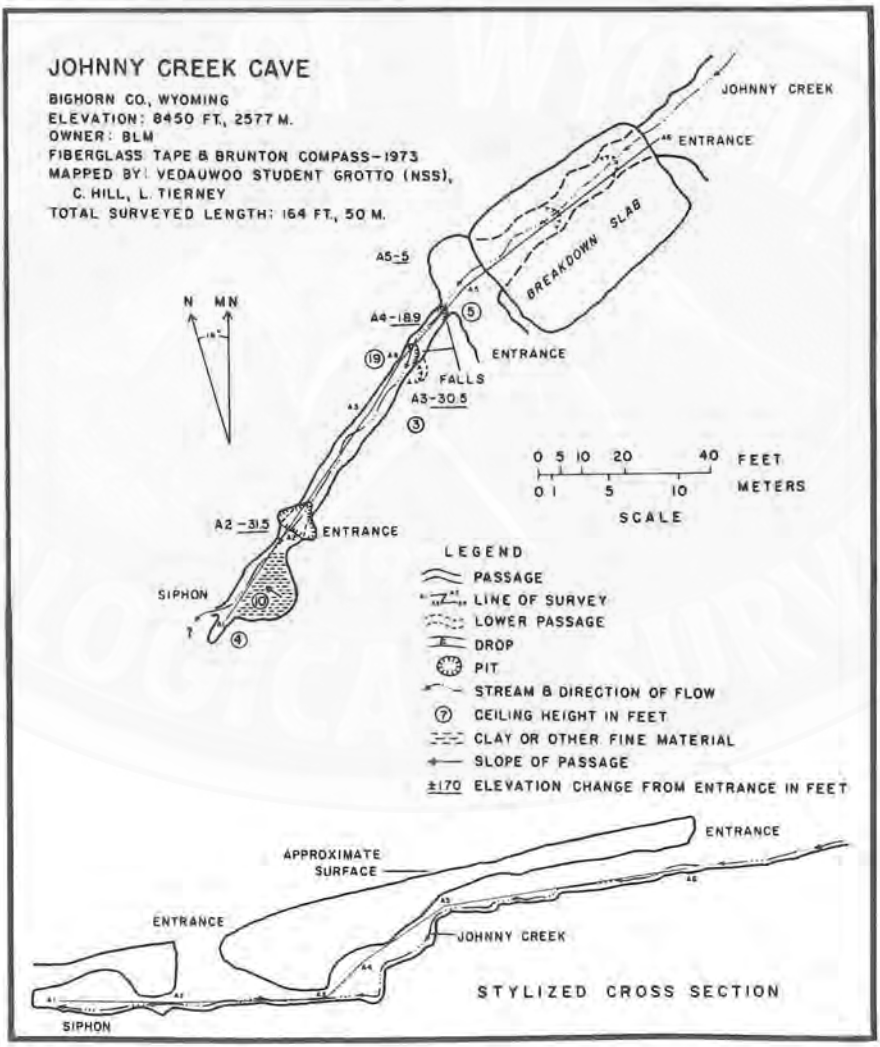
The bridge has the look od a phreatic cave, but it is developed on the steep mountain flank and there is not enough of it left to draw any definite conclusions.



TWO SHOT WONDER CAVERNS — 116*

LOCATION: Cottonwood Canyon Quad.
ELEVATION: about 7,150 ft. (2,181 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 52 ft. (16 m.)

DESCRIPTION: This small cave appears to be phreatic. Its walls are well rounded and it has several other features that would indicate such an origin. The ceiling dome is well developed and rounded along a joint. The cave is probably a remnant of a larger cave that was destroyed by the downcutting of the adjacent surface valley. The cave is now several hundred feet above the present canyon floor.



SINKS OF JOHNNY CREEK CAVE — 117*

LOCATION: Spanish Point Quad.
ELEVATION: 8,450 ft. (2,577 m.)
FORMATION: Bighorn Dolomite
OWNER: BLM
TOTAL SURVEYED LENGTH: 164 ft. (50 m.)

DESCRIPTION: Johnny Creek sinks into a cave at the bottom of a low cliff, about one-fifth mile down valley from the Sinks of Trapper Creek Cave (118). The creek cascades down a series of waterfalls under large blocks of breakdown and sinks at the back of the short entrance passage.

The cave is probably developed on a joint or a small fault. In the late summer, when the creek is dry, digging in the cave could open several hundred feet of passage. The probability is very great that this cave and Sinks of Trapper Creek Cave form an interconnected and extensive system.

Parts of this cave probably flood during periods of heavy runoff.

SINKS OF TRAPPER CREEK CAVE — 118*

LOCATION: Spanish Point Quad.
ELEVATION: 8,500 ft. (2,593 m.)
FORMATION: Bighorn Dolomite
OWNER: BLM
TOTAL SURVEYED LENGTH: 140 ft. (43 m.)

DESCRIPTION: Trapper Creek flows off the Precambrian core of the Bighorn Mountains onto the Bighorn Dolomite where the creek forms several pools at the base of a large cliff. This classic blind valley has a well developed downstream valley about 20 feet above the stream sink pools at the base of the breakdown-littered cliff. Eddies form in the pools as the water is "sucked" under the breakdown into the cave which must exist behind the debris. The only part of this cave which is now accessible is a large meander cave carved beneath the cliff. It appears that the easiest access to the cave would be through Sinks of Johnny Creek Cave (117). When this system is opened, it should only be entered during dry weather when the streams are low.

DRY MEDICINE LODGE CREEK CAVE — 119

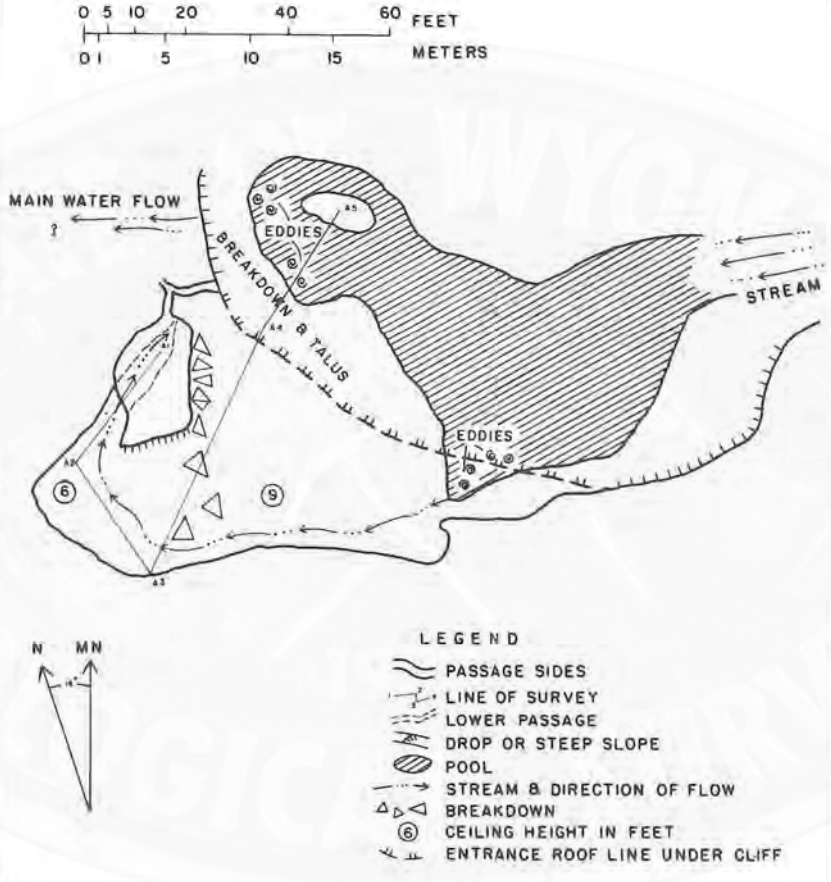
(See Map on Sheet 1)

LOCATION: Spanish Point Quad.
ELEVATION: 7,920 ft. (2,416 m.)
FORMATION: Bighorn Dolomite
OWNER: BLM
TOTAL SURVEYED LENGTH: 205 ft. (63 m.)

DESCRIPTION: Dry Medicine Lodge Creek enters the cave through breakdown in a semi-blind valley. To one side of the entrance is a short muddy low crawl. On the opposite side, another entrance is partially blocked by a large chunk of dolomite. Just inside the entrance, to the left through large breakdown, lies a low crawl that increases in size for about 30 feet before ending at what appears to be a dry, mud-filled siphon. This passage is located just below the north edge of a large surface depression (the Slot) that seems to be the result of collapse.

SINKS OF TRAPPER CREEK CAVE

BIG HORN CO., WYOMING
ELEVATION: 8500 FT., 2593 M.
OWNER: BLM
FIBERGLASS TAPE & BRUNTON COMPASS–1972
MAPPED BY: VEDAUWOO STUDENT GROTTO (NSS)
CHRIS HILL, GAYLE POWERS
TOTAL SURVEYED LENGTH: 140 FT., 43 M.



A passage to the right of the entrance proceeds downstream, through mud, to a pool about 20 feet across under a one foot high ceiling. The water appears to leave through a siphon to the right of the pond.

High water blocked entry to the cave, during the 1973 spring runoff. Another sinking point a few hundred feet downstream was taking even more water (La Caverna de los Tres Charros - 120). The caves were entered and mapped during late September.

LA CAVERNA DE LOS TRES CHARROS — 120

LOCATION: Spanish Point Quad.
ELEVATION: 7,920 ft. (2,416 m.)
FORMATION: Bighorn Dolomite
OWNER: BLM
TOTAL SURVEYED LENGTH: 2,277 ft. (695 m.)

DESCRIPTION: This cave's entrance coincides with the south edge of the surface depression mentioned in the Dry Medicine Lodge Creek Cave description (119). Exploration and mapping began on the same day that Dry Medicine Lodge Creek Cave was found.

La Caverna de los Tres Charros should only be entered during the dry season when no water is flowing into the cave because it takes most of the water from the creek. Most of the cave is subject to flooding, as indicated by jammed logs and scoured walls. The temperature within the cave was measured at 40°F above Bat Veil Falls and 38°F in the Cataract Room. The humidity is also very high, so warm clothing is necessary.

Vertical gear is required for the 40 foot free rappel near Bat Veil Falls. A 30 foot handline is needed for the drop just below the Clothes Chute. The deepest point in the cave is at several pools, 281 feet below the entrance.

The cave is entered through a two foot wide crack just above a pile of driftwood. A short crawl through breakdown leads to an eight foot high room. Beyond this room, a small hole drops into a larger passage that slopes downward for several hundred feet. From here, a series of small chutes and fissures lead to a drop which requires a 30 foot handline. A short downclimb from there (The Flint Wall) leads to a room containing several streams. At the lowest point in this room, a pool of water blocks further downward exploration.

From the large passage, a few hundred feet from the entrance, water can be heard from a crawlway that leads to Bat Veil Falls. A 40 foot, dry, free rappel and a short downclimb over the stream leads to the Cataract Room. The stream from Bat Veil Falls and another small one fall into this room and then flow out through a crawlway.

Beyond the Cataract Room, there are more rooms containing streams and a series of passage intersections that eventually lead to Hayford Canyon. Several leads, including several upper passages, are found in Hayford Canyon (a classic vadose passage). From the end of Hayford Canyon, the passage (now a phreatic tube) winds down to a pool of water and mud.

The cave is strongly joint-controlled; occasional slickensides on the walls indicate faulting control of some passages. Tubular passages, evidence of the cave's phreatic origins can be observed in several places, particularly near the South Pond. However, vadose modification of the early phreatic passages is evidenced by passage cross-sections. The Hayford Canyon area, in particular, is a classic vadose canyon incised in the floor of an earlier phreatic passage; wall grooves and passage meanders are common, as well as potholes in the floor. A few sections of the cave have been modified by breakdown; gravel and *cobble* deposits are found at several locations.

In addition, two more sinking points are noted on Dry Medicine Lodge Creek. One is about one-tenth mile upstream from the two caves. The other is upstream one-tenth mile on the southern branch of the creek.

Dye tracing with *Rhodamine* dye demonstrated that Dry Medicine Lodge Creek is the source for the streams in La Caverna de los Tres Charros. However, the hydrology of the cave is very complex; the South Pond may have a source other than Dry Medicine Lodge Creek. Further mapping and dye testing are needed before the hydrologic relationships become clear.

BLUE MOOSE CAVE — 121*

LOCATION: Old Maid Gulch Quad.
ELEVATION: about 6,000 ft. (1,830 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 59 ft. (18 m.)

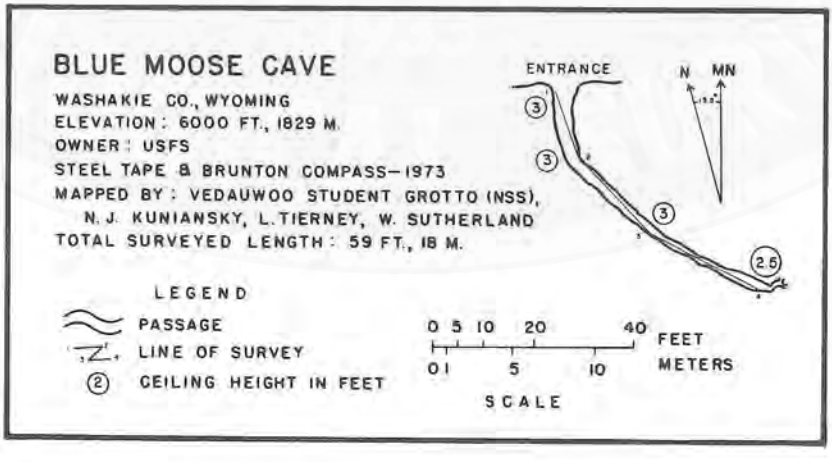
DESCRIPTION: This small cave is developed in a massive Bighorn Dolomite outcrop above a *talus* slope on the south wall of Tensleep Canyon. The cave meanders into the cliff for about 50 feet, from a two and a half foot high entrance, before pinching out.

A strong breeze blows from the cave and may be caused by a cold air settling effect through cracks in the cliff face that intersect the cave passage, or it could be an indication of a major cavern system.

CANYON CREEK SINKS CAVE — 122*

LOCATION: Onion Gulch Quad.
ELEVATION: 7,350 ft. (2,242 m.)
FORMATION: Madison Limestone
OWNER: Girl Scout Center West Reservation
TOTAL SURVEYED LENGTH: 553 ft. (168.5 m.)

DESCRIPTION: Canyon Creek disappears into a walk-in entrance and flows for 400 feet underground to a pool at the back of the cave. Near this pool, a small side passage leads south about 80 feet. A small crawlway branching off this passage extends southward for another 150 feet.



The cave is predominantly controlled by jointing. A dye trace of Canyon Creek shows that it rises a short way downvalley to flow a short distance on the surface before sinking again.

The cave floods during periods of heavy runoff.

INDIAN POW-WOW CAVERNS — 123

LOCATION: Old Maid Gulch Quad.
ELEVATION: 5,040 ft. (1,537 m.)
FORMATION: Tensleep Sandstone
OWNER: Girl Scout Center West Reservation
DESCRIPTION: This feature is not really a cave but a large rock shelter eroded in a red sandstone cliff on Canyon Creek. It is 50 feet high at the entrance, 900 feet wide and 300 feet deep. It has offered shelter for up to 500 head of cattle during bad storms. This and other smaller rock shelters on the reservation have been studied as archaeological sites.

GROADY HOLLOW CAVE — 124

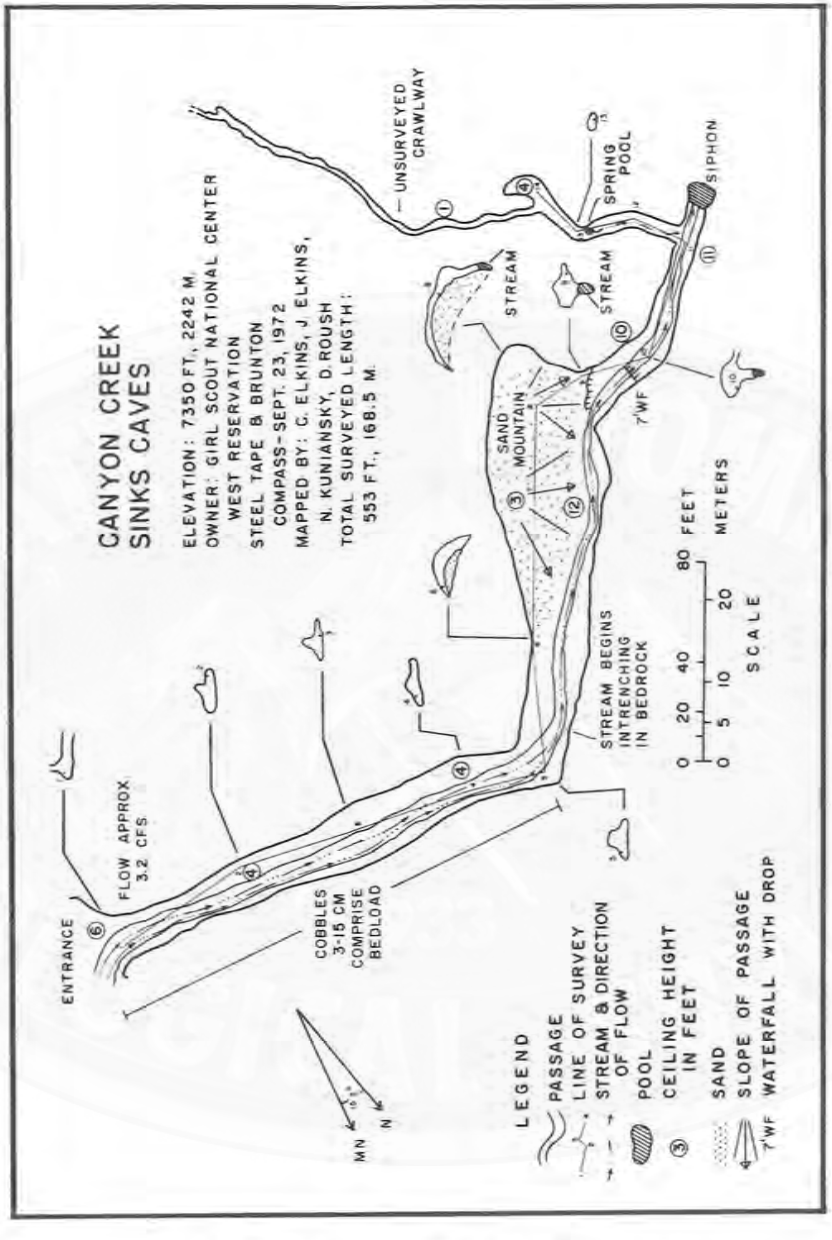
LOCATION: Brokenback Narrows Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This is a narrow, joint-controlled cave at the base of a cliff. The passage extends into the cliff along a bearing of 259° for about 20 feet, where a room, slightly wider than the passage, has been formed.

RM 222 CAVE — 125

LOCATION: Brokenback Narrows Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: The entrance to this cave is a two foot wide crack in the base of a Bighorn dolomite cliff, southwest of a large blade of rock separated from the cliff. The crack trends 222° from magnetic north for 32 feet where it widens slightly, forming a small room.

SOUTH OF RM 222 BY ABOUT 100 FEET CAVE — 126

LOCATION: Brokenback Narrows Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
DESCRIPTION: This cave, located about 100 feet south of RM 222 Cave (125), begins as a narrow crack at the base of a cliff. The crack extends into the cliff for about 25 feet before becoming too narrow to follow. Ten feet from the entrance, another joint intersects the first one at 90°, creating an alcove on the right.



RIDICULOUS ICE CAVE — 127*

LOCATION: Brokenback Narrows Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Bighorn Dolomite

OWNER: USFS
TOTAL SURVEYED LENGTH: 239 ft. (73 m.)

DESCRIPTION: This cave is formed by solutional enlargement of joints and cliff parallel fractures. The entrance is a 70 foot high, ten foot wide fissure in a gully cut in a cliff. About 50 feet inside the entrance, the crack narrows near a breakdown block. Past this squeeze, a ten foot drop is encountered. To the left of the drop, a small passage extends out to the cliff face where there is an easy 12 foot climb to the ground. Sixty feet above the ten foot drop is a small skylight in the ceiling.

Below the ten foot drop, the passage continues downslope for about 60 feet. This slope is seasonally covered with ice which gets thicker downslope. To the left, a small crawl goes down and out to the base of the cliff. At the bottom of the slope, an icy, ten foot crawl leads to a room. This crawl can be avoided by climbing up an icy chimney and dropping back in at the opposite end. The ice ends halfway across this room and a stoop crawl leads to another 15 foot long room which is the end of the cave.

Several small caves are located in the cliff south of this cave.

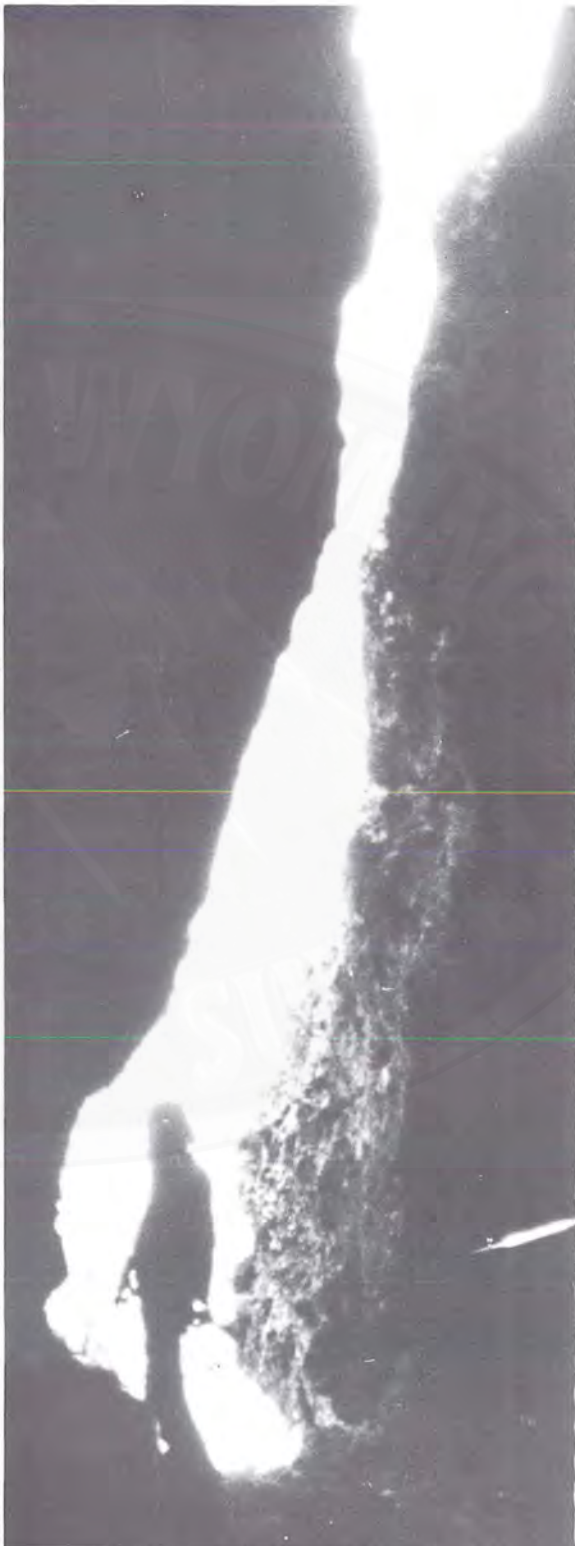
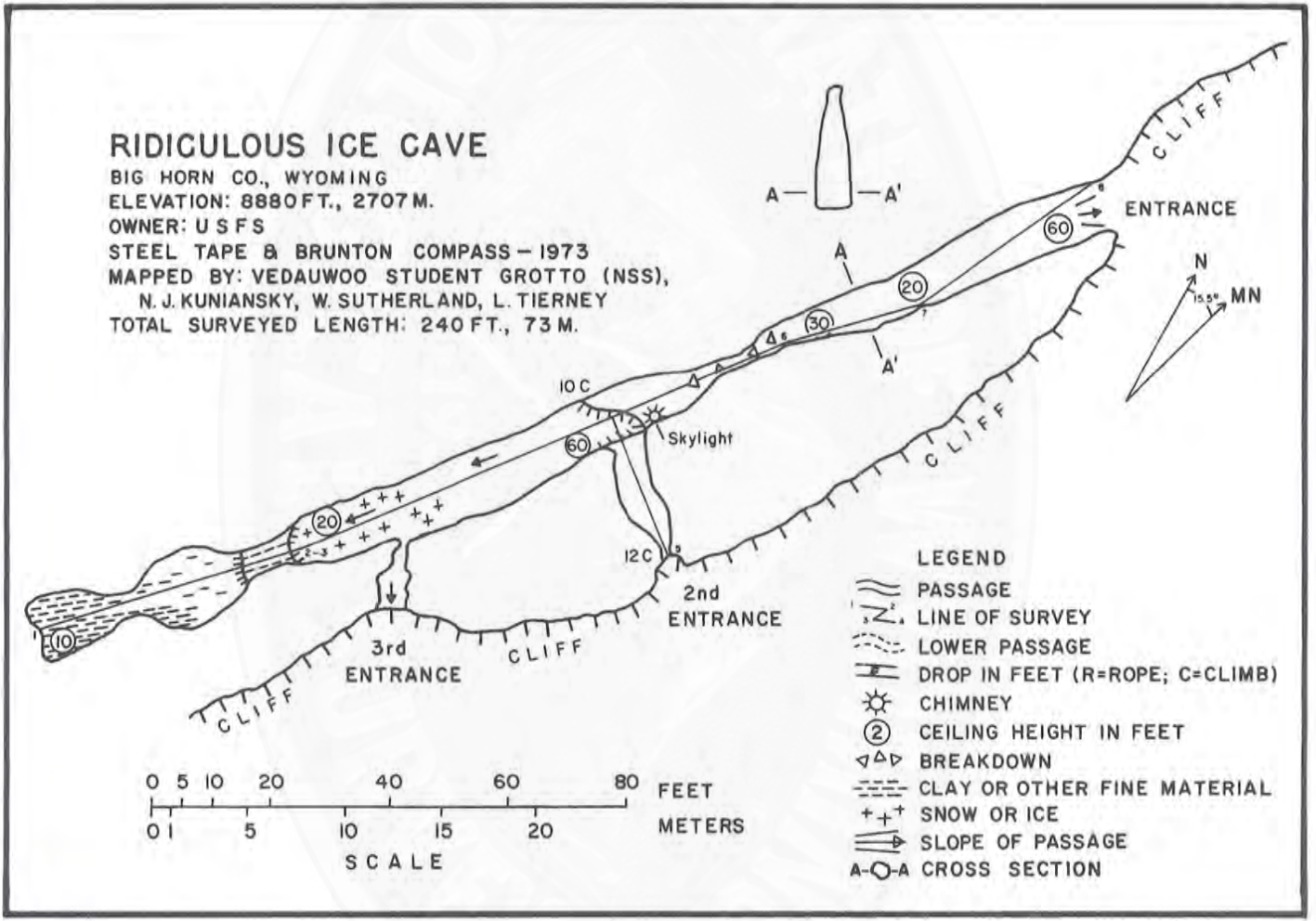
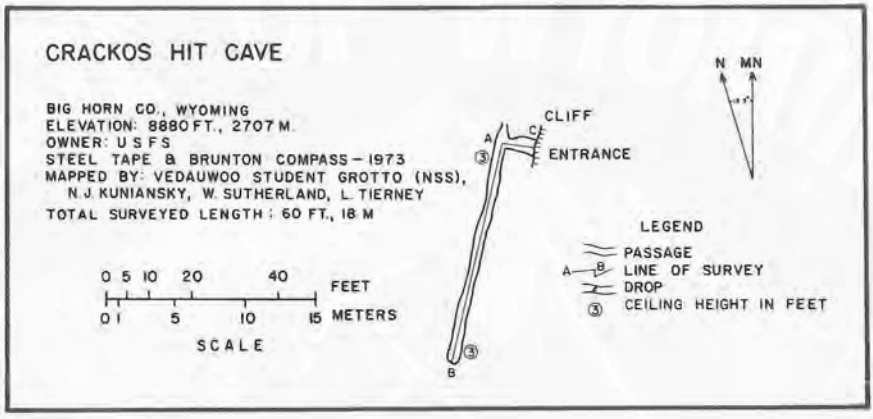


PLATE 19 — The entrance to Ridiculous Ice Cave (above) is an almost classic fault cave mouth. (Photo by Wayne Sutherland)


RIDICULOUS ICE CAVE
BIG HORN CO., WYOMING
ELEVATION: 8880 FT., 2707 M.
OWNER: U S F S
STEEL TAPE & BRUNTON COMPASS – 1973
MAPPED BY: VEDAUWOO STUDENT GROTTO (NSS),
N. J. KUNIANSKY, W. SUTHERLAND, L. TIERNEY
TOTAL SURVEYED LENGTH: 240 FT., 73 M.
A
A'
ENTRANCE
CLIFF
N
15.5° MN
10C
Skylight
12C
2nd ENTRANCE
3rd ENTRANCE
LEGEND
PASSAGE
LINE OF SURVEY
LOWER PASSAGE
DROP IN FEET (R=ROPE; C=CLIMB)
CHIMNEY
CEILING HEIGHT IN FEET
BREAKDOWN
CLAY OR OTHER FINE MATERIAL
SNOW OR ICE
SLOPE OF PASSAGE
A-A CROSS SECTION
0 5 10 20 40 60 80 FEET
0 1 5 10 15 20 METERS
SCALE

CRACKOS HIT CAVE — 128*

LOCATION: Brokenback Narrows Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 60 ft. (18 m.)
DESCRIPTION: The intersection of horizontal and vertical joints, 12 feet up a cliff south of Ridiculous Ice Cave (127), forms the entrance to this cave. About three feet high and filled with guano, the entrance leads eight feet directly into the cliff where it intersects another guano-filled joint at 90°. To the left, this joint increases in height to about ten feet then pinches down to about four feet becoming too narrow to follow after 50 feet.

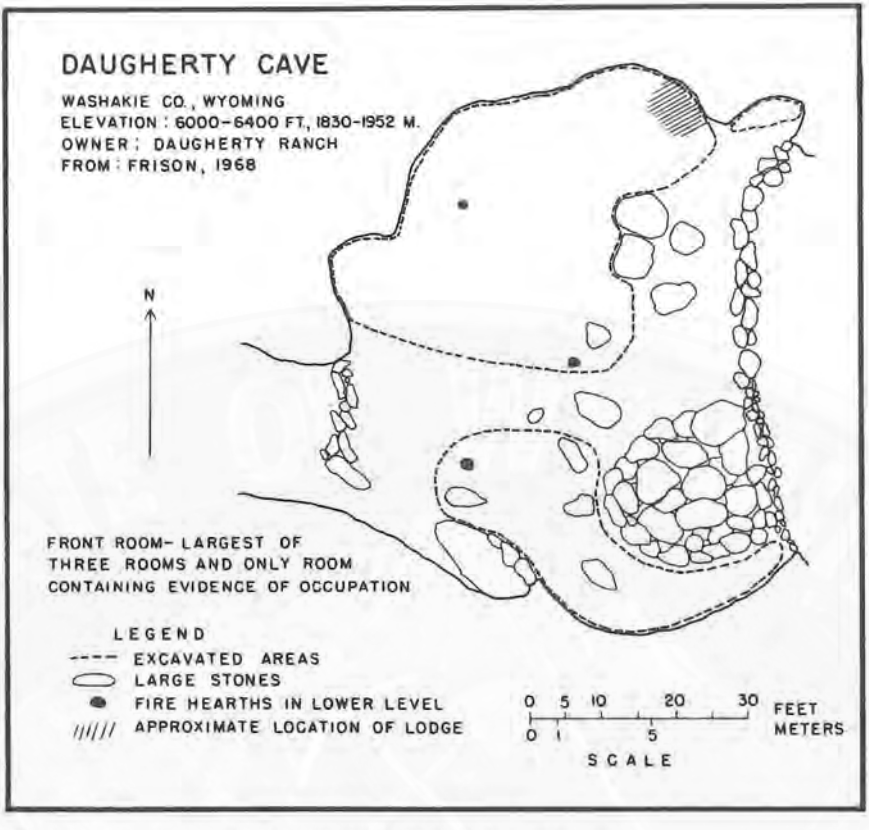


DAUGHERTY CAVE — 129*

LOCATION: Old Maid Gulch Quad.
ELEVATION: 6,000-6,400 ft. (1,830-1,952 m.)
FORMATION: Madison Limestone
OWNER: Daugherty Ranch
DESCRIPTION: Daugherty Cave is a large cave, about eight miles east of Tensleep on the west flank of the Bighorn Mountains. The cave consists of three rooms; the first room is the largest, 80 feet wide and 60 feet long. The upper surface level of the room shows evidence of occupation by Late Prehistoric Period Crow Indians. The older, lower levels of the cave have provided evidence of occupation by Late Middle Prehistoric Period peoples (Frison, 1968). The dry cave environment preserved artifacts such as baskets and wooden tools.

"Old Maid Gulch has exposed a number of caverns in the Mississippian Madison Limestone" (Frison, 1968). These caverns are, reportedly, smaller than Daugherty Cave.

Access to this area is through the Daugherty Ranch lands. Advance communication, stating intentions, is suggested to obtain permission.



SPRING CREEK CAVE — 130*

LOCATION: Monument Hill Quad.
ELEVATION: 5,900 ft. (1,800 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 150 ft. (46 m.)

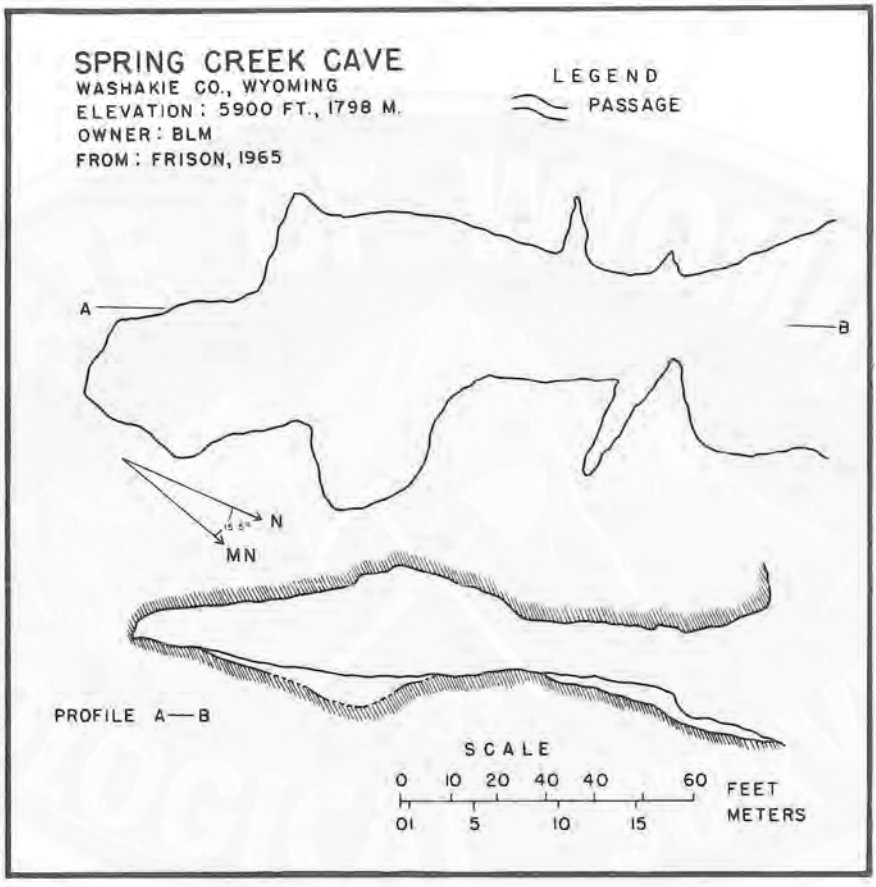
DESCRIPTION: This small cave is high on the south wall of Spring Creek Canyon, southeast of Tensleep. The cave is 600 feet above the stream and 150 feet beneath the rim. It was dug as an archaeology site by Dr. George Frison of the University of Wyoming Anthropology Department (Frison, 1965). A radiocarbon date obtained from a charcoal specimen found within the cave was AD 225 ± 200 years. This date and other material found in the cave indicates that the cave was occupied during the Late Middle Prehistoric Period.

DRY MEDICINE LODGE ARCH — 131

LOCATION: Hyatt Ranch Quad.
ELEVATION: 5,600 ft. (1,706 m.)
FORMATION: Madison Limestone

OWNER: BLM

DESCRIPTION: Marked on the Hyatt Ranch Quad., the arch occurs high on the north wall of Dry Medicine Lodge Canyon. This canyon has not been explored for caves. It is one possible area for the resurgence of waters sinking in the Spanish Point area (117-120).



OUTLAW CAVE — 132

LOCATION: Barnum Quad.
ELEVATION: 5,240 ft. (1,598 m.)
FORMATION: probably Madison Limestone
OWNER: BLM

DESCRIPTION: This cave, reported by John Scheltens to be a 30 foot long rock shelter with a lot of cow bones on the floor, is marked on the Barnum Quad. along the Middle Fork of the Powder River.

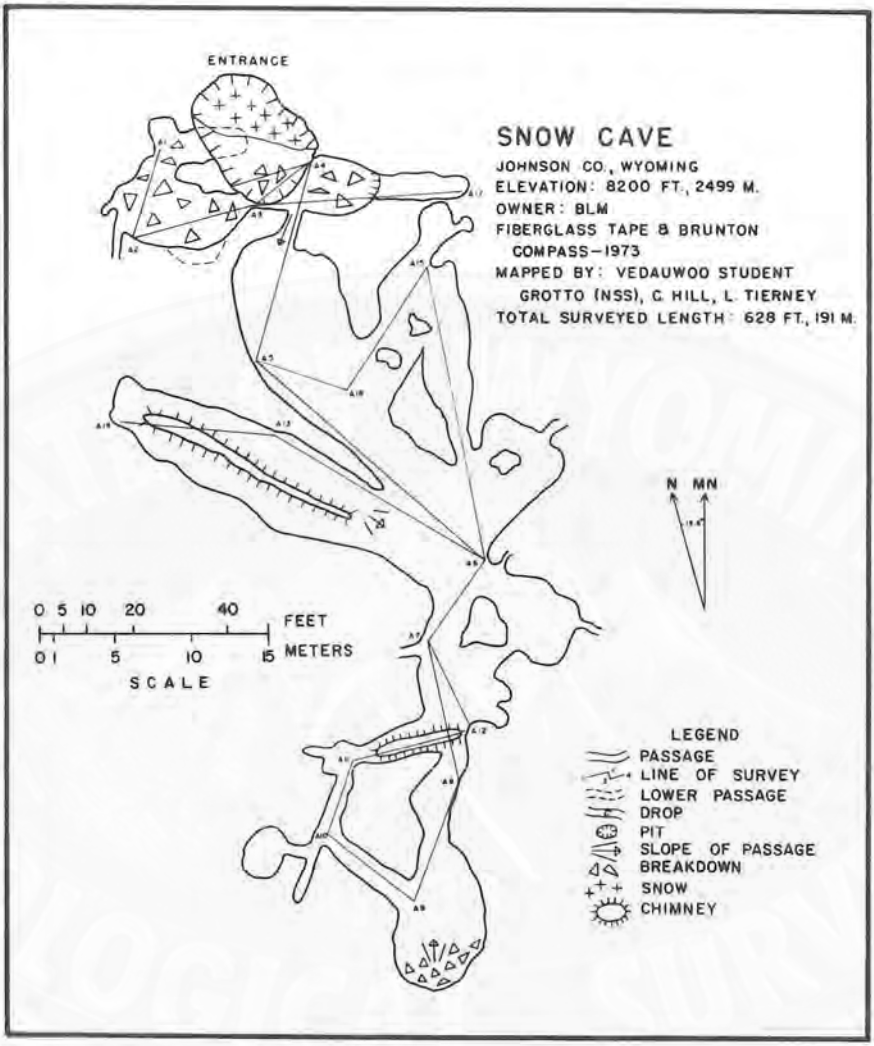
SNOW CAVE (ICE CAVE) — 133*

LOCATION: Mayoworth Quad.
ELEVATION: 8,200 ft. (2,501 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 627 ft. (191 m.)

DESCRIPTION: The pit entrance to this cave (Pl. 20) is hidden in the trees and fenced off by the BLM to prevent stock from falling in. The pit, ten feet in diameter, is developed on a north-south trending joint. It drops 35 feet into a room 40 feet long and 20 feet wide that has a snowbank, even during the summer. From this room, a low passage leads east into another large room. Many passages lead from this room giving the cave a total length of over 600 feet.

The cave appears to have been developed in phreatic conditions, increasing the suspicion that there should be a lot more cave than meets the eye. Breakdown is largely absent, except at the cave's blocked eastern end. Digging may extend the cave considerably.

PLATE 20 — This gaping hole is actually the collapse doline entrance to Snow Cave in the Bighorn Mounains. (Photo by Lee Tierney)



ICE CAVES — 134

LOCATION: Mayoworth Quad.
ELEVATION: 8,300 ft. (2,532 m.)
FORMATION: Madison Limestone
OWNER: Smith
DESCRIPTION: The word "caves" and two cave symbols appear on the Mayoworth Quad. They are, supposedly, pits with possible passage development. Access to these caves was denied by their owner.

DALLAS CAVE — 135

LOCATION: Mayoworth Quad.
ELEVATION: 7,760 ft. (2,367 m.)
FORMATION: Madison Limestone
OWNER: Dallas

DESCRIPTION: This cave is a small, 75 foot long, meandering fissure. At its back, it becomes too small for exploration. A good breeze was felt throughout its length.

Near the entrance, there is a well developed ceiling channel; this, along with the meandering fissure passage, suggests a vadose development. The cave occurs in the steeply-dipping strata of a large limestone block which may be a slump block from an adjacent fault.

The cave is named after the rancher who owns it. He provided a vast amount of information and help to the survey.

ARCH CREEK CAVES — 136

LOCATION: Mayoworth Quad.
ELEVATION: 7,680 ft. (2,342 m.)
FORMATION: Madison Limestone
OWNER: State of Wyoming and BLM

DESCRIPTION: There are several large rock shelters, two small fissure caves and one meander cut-off cave developed in the walls of a shallow canyon cut in the Madison Limestone. One of the fissure caves is blocked by sticky guano and, although the passage continues, it was not explored.

BIG GOOSE CREEK CANYON CAVE — 137

LOCATION: Beckton Quad.
ELEVATION: 5,360 ft. (1,635 m.)
FORMATION: Madison Limestone
OWNER: Private

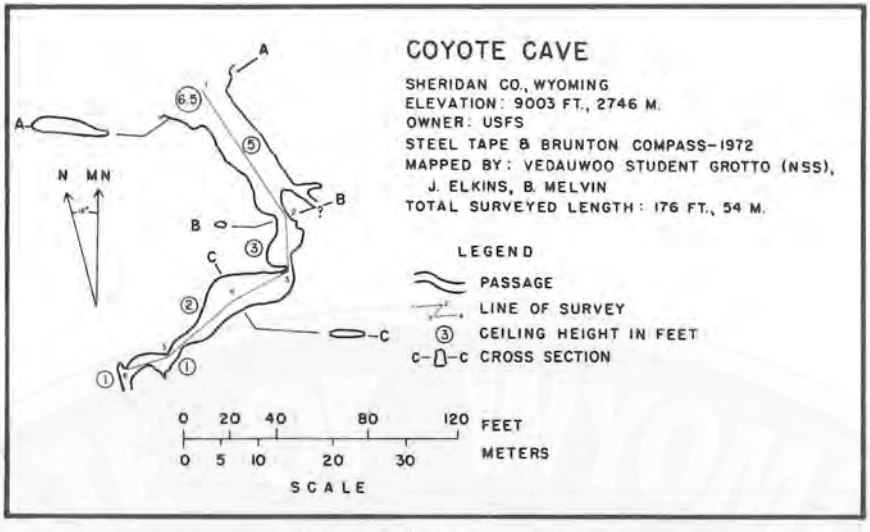
DESCRIPTION: This cave is located on the south side of the canyon, about eight feet above the base of an outcrop of Madison Limestone. It is one-half mile from a filtration plant at the lower end of the canyon. Permission to cross the land should be obtained at the ranch below the filtration plant.

Two passages enter the cliff from the entrance ledge. The left passage contains the remains of a log wall, past which is a room ten feet long and five feet wide. A bed is built into an alcove on the right wall. A small hole at the back of this room goes into a three by three foot room. The passage on the right leads up about 15 feet, turns left for 20 feet and ends.

SUPER HOLE CAVE — 138

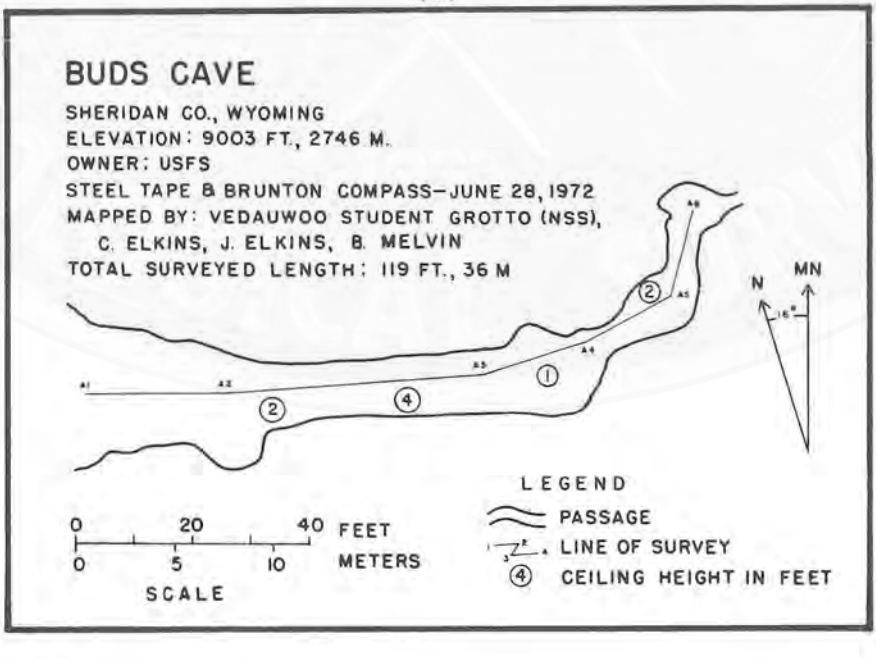
LOCATION: Beckton Quad.
ELEVATION: 5,360 ft. (1,635 m.)
FORMATION: Madison Limestone
OWNER: Private

DESCRIPTION: The cave is really a rock shelter, about 100 feet uphill to the west of Big Goose Creek Canyon Cave (137) in the base of the same



BUD'S CAVE — 142*

LOCATION: Boyd Ridge Quad.
ELEVATION: 9,003 ft. (2,746 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 119 ft. (36 m.)
DESCRIPTION: This cave is at approximately the same elevation as

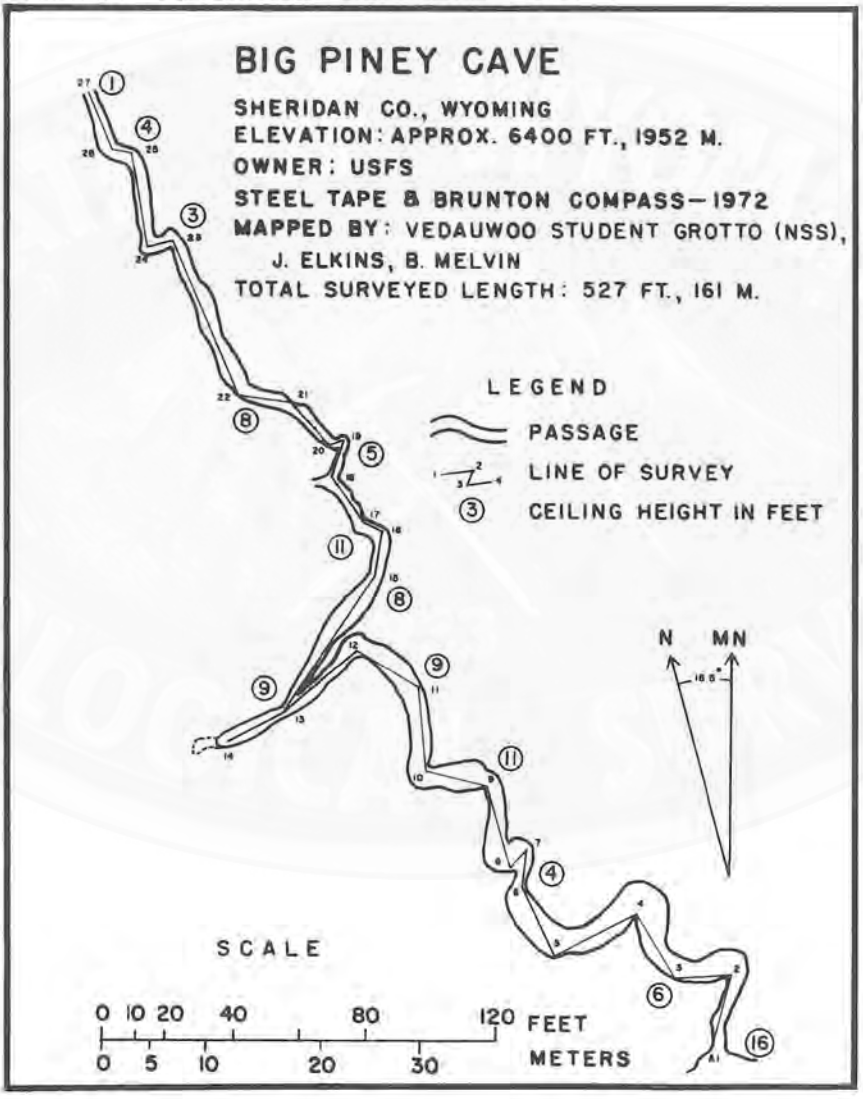


Coyote Cave (141), on the opposite side of the cliff. The cave has noticeable air movement, probably related to the air movement in Coyote Cave. Digging is required to further explore this cave.

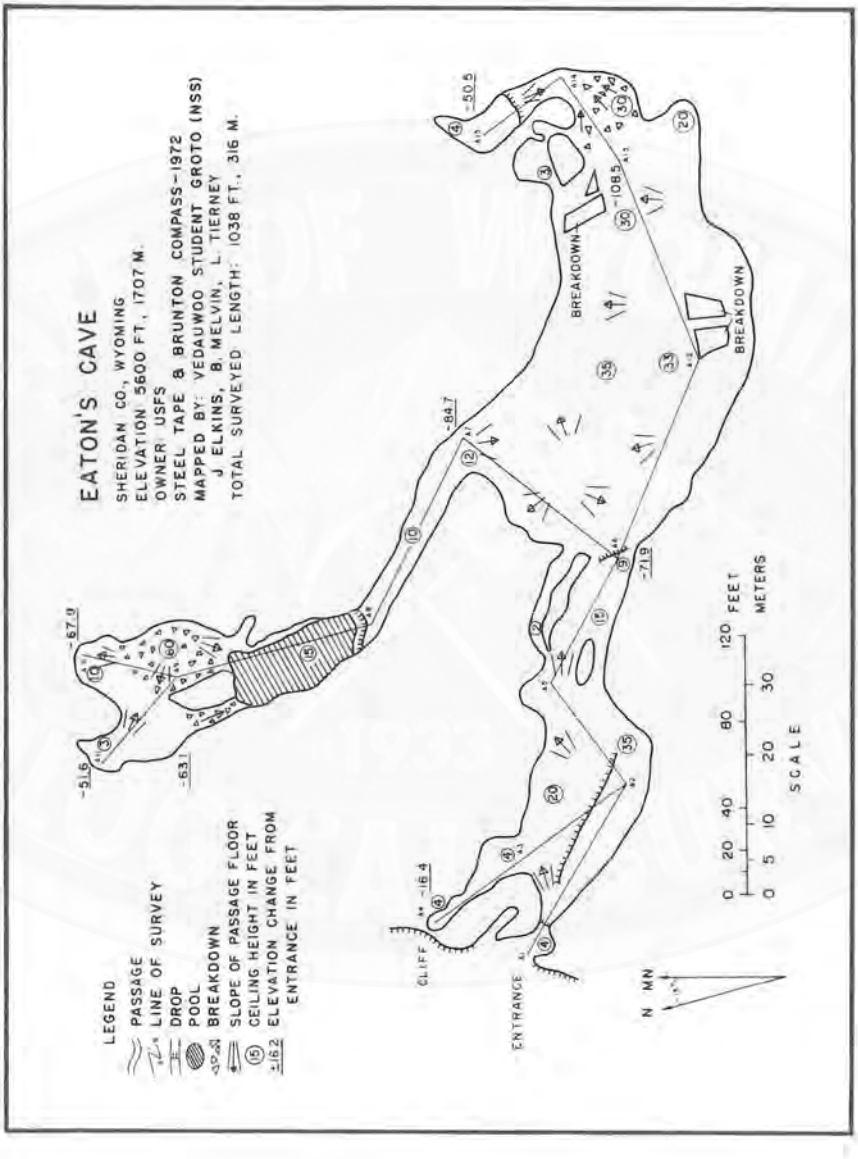
Also near here are two small caves, Wrong Cave and Lizard Ice Shelter.

BIG PINEY CAVE — 143*

LOCATION: Story Quad.
ELEVATION: about 6,400 ft. (1,952 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 527 ft. (161 m.)



DESCRIPTION: This horizontal cave is located about 15 feet up a large Bighorn Dolomite cliff. The passage zig-zags a lot but is basically developed perpendicular to the cliff face. At the back of the cave there are small speleothems, some of which are still growing. This section of the cave abounds in mud and moisture. All passages are of walking height.



EATON'S CAVE — 144*

LOCATION: Beckton Quad.
ELEVATION: 6,200 ft. (1,894 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 1,038 ft. (317 m.)

DESCRIPTION: Access to this cave passes through Eaton's Dude Ranch, Wolf, Wyoming. Permission must be obtained to cross the land, so advance correspondence, stating intentions and qualifications, is recommended.

The entrance to Eaton's Cave is a roughly square, four foot hole in a cliff *embayment*. A short, slippery drop and a rapidly widening joint-developed passage, approximately parallel to the cliff face, leads into a large room. The floors slope ahead to the left at about the dip of the limestone. Most of the lower portions of this room and all of the next larger room are lined with mud-covered spar.

From the second large room, a passage leads to a pool and a room floored with a breakdown cone. Spar is largely absent in this area, but there is evidence that water has flowed across the passage floor. The second large room is floored with huge blocks of cemented, spar-covered breakdown. Several blocks without spar probably represent more recent breakdown. This room's lower end has a mud floor and leads to a short steep passage with a breakdown floor.

Many features, especially the passage shapes and distributions, indicate a phreatic origin. The spar and its mud cover indicate a complex history, including at least one refilling by waters with a high concentration of dissolved calcite.

LITTLE TEPEE CAVE — 145*

LOCATION: Little Goose Peak Quad.
ELEVATION: 6,900 ft. (2,105 m.)
FORMATION: Madison Limestone
OWNER: Private
TOTAL SURVEYED LENGTH: 245 ft. (75 m.)

DESCRIPTION: This small cave is developed in moderately dipping (27°) limestone on the east flank of the Bighorn Mountains. A small entrance, three feet high, leads from the shallow embayment of a cliff face into a zig-zagging, canyon-like 80 foot passage. At this point there is a dirt-plugged hole on the left. A low arched passage at the right leads to a room which has developed along a joint or a minor fault. A small "window" on the far wall of this room allows a determined person to exit the cave via a low cliff.

The cave apparently developed by phreatic solution along a joint system, however, several features in the canyon-like passage suggest a period of vadose modification.

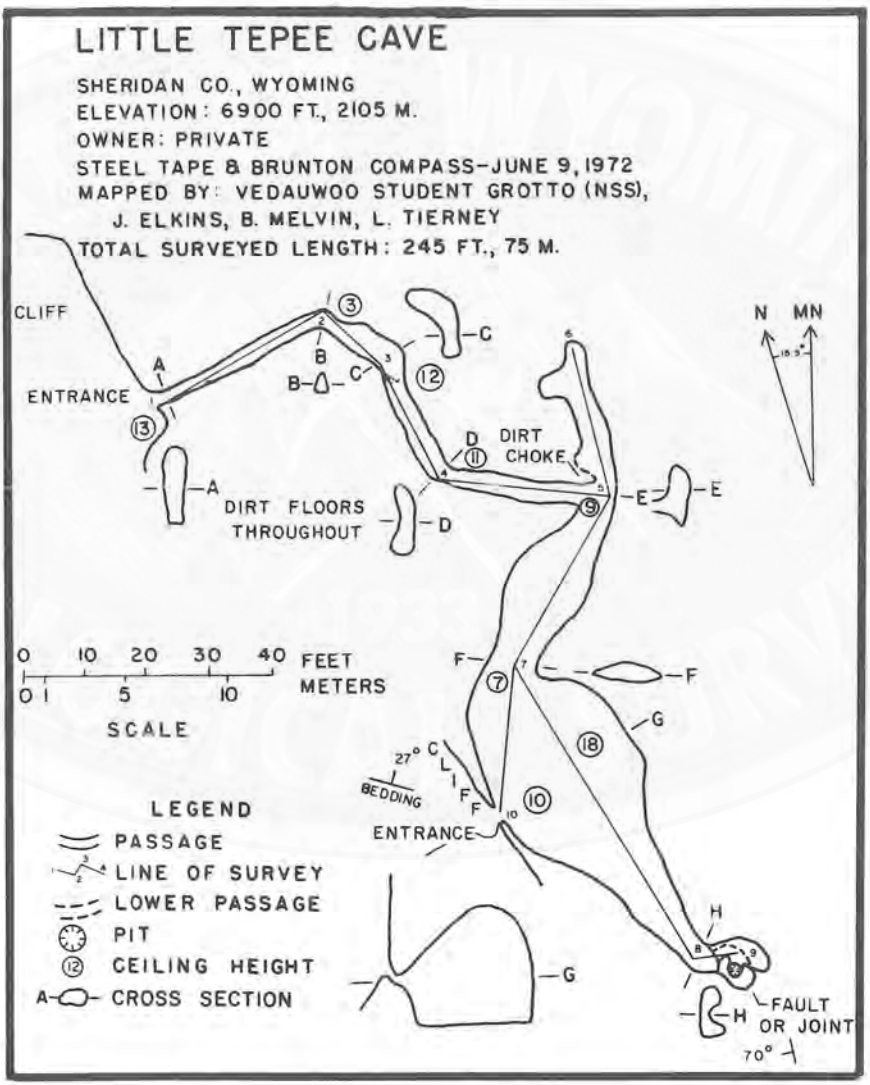
CLIFF DWELLER'S CAVE — 146

(See map on Sheet 2)

LOCATION: Dayton South Quad.
ELEVATION: 4,560 ft. (1,391 m.)
FORMATION: Madison Limestone

DESCRIPTION: The entrance to Cliff Dweller's Cave is a huge rock shelter high on the south wall of Tongue River Canyon (east of Tongue River Cave 147). Nearly square in cross section, the shelter is 50 feet high, 50 feet wide and 75 feet long. A small crawl at the back of this shelter twists and turns for 65 feet to a perpendicular intersection with a passage of standing height.

The entrance crawl is very tight, floored with dry guano which creates dust clouds when disturbed. The survey learned that a sample of this guano was found to contain *Histoplasmosis* fungi. These fungi cause a serious lung disease that is very similar to lung cancer, thus this cave should not be entered without gas masks or respirators of some type.



At the end of the entrance crawl the north passage goes 25 feet, turns southwest for 175 feet, then jogs north to a pit that drops 50 feet into a fissure passage. This fissure passage trends southwest, terminating at a small pit 150 feet from the 35 foot drop.

The south passage leads to the larger portion of the cave. It has no side passage and is tightly joint controlled. The passage appears to have had a stream flowing through it once. Several other features, including meanders, natural bridges and gravels, indicate a probable vadose origin. This section of the cave consists of crawls and several small rooms.

The cave terminates in a crawl having a loose dirt and rock-ceiling where roots hang into the passage. This could probably be dug out, opening a second entrance to the cave and thereby alleviating danger from histoplasmosis.

The closest points in Cliff Dwellers Cave and Tongue River Cave (147) are only 500 feet apart. Both caves appear to be of largely vadose origin, and both occur at nearly the same elevation. These facts suggest that both caves may have had a common, inter-related origin. The roots at the end of the Cliff Dwellers Cave indicate that surface erosion has cut into the cave. It seems very likely that the cave formed before the present canyon was cut below it. If the two caves were once connected, the downcutting of Tongue River Canyon may have eroded this passage away.

TONGUE RIVER CAVE — 147

(See map on Sheet 2)

LOCATION: Dayton South Quad.
ELEVATION: 4,640 ft. (1,415 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS
TOTAL SURVEYED LENGTH: 6,500 ft. (1,903 m.)

DESCRIPTION: Tongue River Cave is one of the most visited and explored caves in the state. Unfortunately, it is also one of the most vandalized. Garbage is strewn throughout the cave, many once beautiful formations have been stolen or destroyed and corroded batteries pollute the once clear stream.

The entrance to the cave is a five foot diameter hole high on the south wall of Tongue River Canyon. The entrance, which has been gated by the Forest Service, leads to a small room containing a pit. The passage continues to the right at the back of this room and leads down to the Rain Room No. 1, so named because it always has water dripping into it. The cave continues from the back of this room as a winding fissure until reaching the Camp Room. This large, dry room has a sandy flat floor. Solutionally enlarged joints crosscut at several points; such features are common throughout the cave.

The cave continues past the Camp Room through sandy crawls and sandy rooms. At the smallest constriction in this section a very strong wind can be felt, thus this crawl is called the Wind Tunnel. The sandy crawls and small rooms continue beyond the Wind Tunnel until they reach a high room, the Sled Room. From a balcony overlooking it, a torturous series of crawlways goes for several hundred feet and returns to the Balcony. Along this circular route is a pit-like feature called the Sand Trap.

The main passage leaves the Sled Room, under the Balcony, and grades into a high fissure passage, which leads into a small room with a passage, the Corkscrew, that twists down into the Boulder Room. Above the Corkscrew an upper passage leads over the Boulder Room to the Sand Rooms.

The Boulder Room is a large room floored with mammoth chunks of breakdown. The bottom of this room acts as a flood route for the cave stream, or it may be its former course. A passage leads south from the Boulder Room about 100 feet to the stream. This upstream section of the cave contains a waterfall and beautiful stream passage. The cave ends at a siphon where the stream enters. This siphon has been dived and more passage is reported beyond it. Diving this siphon should only be attempted by expert divers with the proper equipment.

A passage also leads north from the Boulder Room to the downstream sections of the cave, where the stream flows through meandering canyons at high velocity, creating a small, three foot, waterfall and a roaring 23 foot cascade. At the bottom of the falls the water pools and flows down a crawlway that becomes too small for exploration.

The main passage continues over the top of the large falls to the Dynamo Room. The deafening noise of the falls comes from a crack in the floor.

Past the Dynamo Room the passage is a very high narrow fissure until Rain Room No. II. Above this room are the blue-green Zeus Pools. The cave terminates shortly beyond Rain Room No. II, where the passage iis very near the canyon, east of the cave entrance.

An upper passage in the downstream sections of the cave roughly overlies the stream passage. This upper passage includes several very large rooms floored with large breakdown.

Tongue River Cave appears to be largely joint-controlled, but the influence of bedding planes may have been important in some places. The present cave system seems to have had some phreatic development that was later integrated and greatly modified by vadose stream action.

The source of the present cave stream is unknown but one of two sources seem possible. Perhaps the most likely source is the Tongue River itself. This water would have to sink high in the canyon, an area which has not been investigated for sinking points. A second possible surface source for the cave stream is a stream sink along Little Tongue River. This sink is 2.3 miles from the upper siphon in the cave. Between the sink and the siphon is one major surface canyon, Steam Shovel, but its lowest point between the sink and siphon is only about 5400 feet.

The sink occurs at 5550 feet and the stream enters the cave at 4590 feet with an intervening gradient of about 420 feet per mile. The stream in the cave has an average gradient of 220 feet per mile, with much of the drop occurring within 150 feet, suggesting that the sink of Little Tongue River could indeed be a major source for the cave stream. This was confirmed by USGS dye testing in late 1974.

Tongue River Cave appears to be two caves superimposed upon each other. The origins of the two caves are probably related. The upper and older cave is developed from the sand rooms out to the entrance. This section of the cave drops 70 feet in approximately 2,000 feet, a gradient of about 200 feet per mile. The second, younger cave contains the present stream passage. This has a gradient of 220 feet per mile, as mentioned before.

The order of events in the formation of Tongue River Cave may have been something like this: deep underground phreatic solution occurred opening joints and bedding planes and perhaps forming some large unrelated rooms. Surface erosion cut down to a level that allowed surface waters to sink. This vadose water, moving at or near the level of surface erosion, integrated the earlier phreatic cavities and moved through the cave to exists in Tongue River Canyon. The cave stream cut its bed deeper into the limestone and, over long periods of time, stream captures occurred that eventually formed the new lower cave and diverted all of the streams flow into it. Cliff Dweller's Cave (146) is probably an old section of either the higher or the lower cave.

Chapter 4
The Wind River and Owl Creek Mountains

These two mountain ranges are lumped together on the basis of their similar stratigraphy and structures. Cambrian units are thicker here than in the Bighorns, while Ordovician, Devonian, and Mississippian rock units are thinner.

The Phosphoria Formation contains caves or related karst features in both ranges. The part of the Wind River Mountains within the Wind River Indian Reservation was not investigated for caves. It is known, however, that some caves do exist there.

The Wind River Mountains

The Wind River Mountains are a northwest-southeast trending, asymmetrical, anticlinal uplift of Laramide age. Sedimentary rocks have been eroded from the top of the uplift, exposing a Precambrian core. Paleozoic and Mesozoic strata form dipslopes and hogbacks on the northeast flank of the range, but these sedimentary units are not exposed on the southwest flank. For this reason, most caves are developed on the northeast flank of the range.

The Wind River Mountains were severely glaciated during the Pleistocene but very little work has been done to correlate these glaciations and Tertiary erosional episodes with the development of the caves in the area.

GENERALIZED PARTIAL STRATIGRAPHIC COLUMN

FOR THE OWL CREEK MOUNTAINS AND WIND RIVER MOUNTAINS

AGE	*FORMATION NAME*	*DESCRIPTION*	*APPROXIMATE THICKNESS (FT.)*
TRIASSIC	Chugwater Formation	Red interbedded sandstone, siltstone, shale and several limestone beds	1000-1300
	Dinwoody Formation	Dark brown to tan interbedded shale, siltstone, limestone and sandstone	100
PERMIAN	Phosphoria Formation	Interbedded fossiliferous, cherty limestone, dolomite and shale with 3-foot bed of phosphate rock near middle of formation	200-300
PENNSYLVANIAN	Tensleep Sandstone	White to tan, fine to medium grained, well sorted, cross-bedded sandstone	250-350
	Amsden Formation	Interbedded light colored dolomite, limestone, sandstone and red shales; base is cream to red, cross-bedded Darwin Sandstone Member	200-250
MISSISSIPPIAN	Madison Limestone	Blue-gray, crystalline, massive to thin-bedded limestone; locally cherty; marine	400-700
DEVONIAN	Darby Formation	Light colored calcareous sandstone near top; pink, yellow and brown sandstone and limestone; basal fetid, dark brown dolomite	80-160
ORDOVICIAN	Bighorn Dolomite	Tan to gray, crystalline, thick-bedded, cherty dolomite	200
CAMBRIAN	Gallatin Formation	Blue-gray to dark gray limestone and dolomite with some gray shale in middle	260-340
	Gros Ventre Formation: upper shale	Green, limy, glauconitic micaceous shales and sandstones	360
	Gros Ventre Formation: Death Canyon Limestone	Dark gray, mottled tan, thin-bedded crystalline limestone	120
	Gros Ventre Formation: lower shale	Green to yellow shales and fine to medium grained sandstone	175
			550 to 650
	Flathead Sandstone	Red to yellow, fine to coarse, cross-bedded sandstone and orthoquartzite	180
PRECAMBRIAN	Granites and schists		

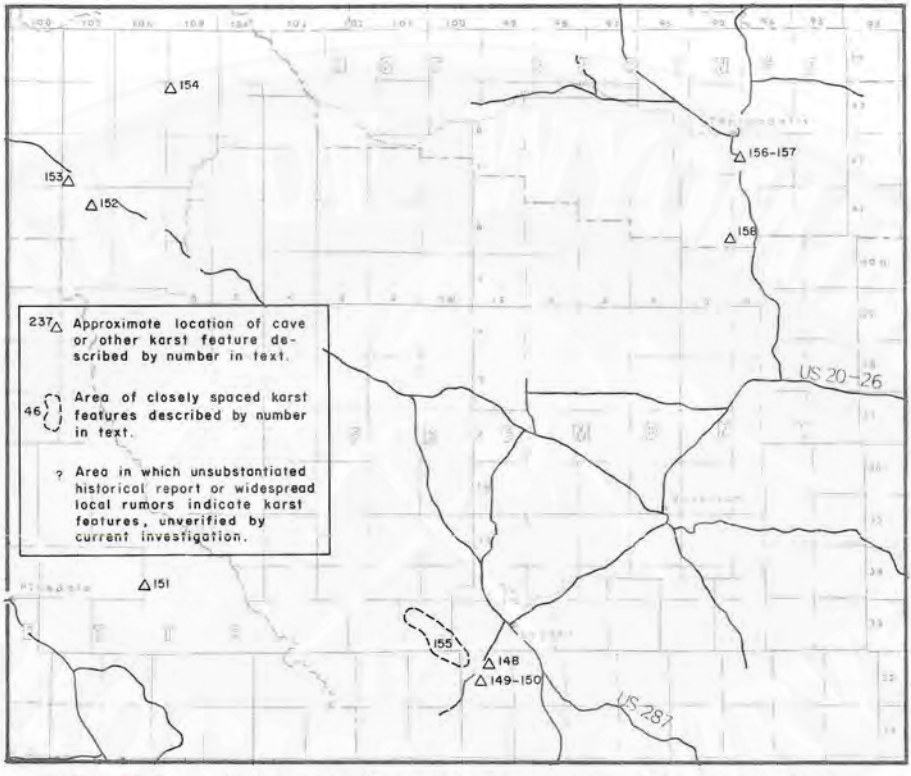


FIGURE 14 — Index map of the Wind River and Owl Creek Mountains.

SINKS OF LANDER CAVE — 148

(See map on Sheet 2)

LOCATION: Fossil Hill Quad.
Rise in Mount Arter Quad
ELEVATION: 6,450 ft. (1,967 m.)
Rise: 6,240 ft. (1,903 m.)
FORMATION: Madison Limestone
OWNER: State of Wyoming (Parks)
TOTAL SURVEYED LENGTH: 566 ft. (173 m.)

DESCRIPTION: The Popo Agie River cascades through a deep canyon cut into the Wind River Mountains, west of Lander. Soon after the river cuts into the Madison Limestone, it nearly turns back on its course and plunges into a cave (Pl. 21, 22). The turbulent river flowing into the confined canyon cavern passage precludes exploration in that direction. However, on the south side of the stream passage, there is a dry upper passage leading to the dry sections of the cave. The dry passages are vadose-modified joints; at least one of these passages, the largest, exhibits slickensides so it most likely developed along a fault.

The deepest mapped point is -90 feet. This small room is accessible only during times of low water and, even then, contains a pool of water. Waterfalls plunge into the pool from above the room.

There has been speculation that the rise, which occurs about one-half mile downvalley from the sink, is not the resurgence of this cave's waters. The rise, however, is 210 feet lower than the sink and the deepest mapped point in the cave is only 90 feet beneath the surface. Although not yet dye tested, the sink and rise appear to have a normal karst relationship.

SAWMILL CAVE (or GAYLORD CAVE) — 149*

LOCATION: Fossil Hill Quad.
ELEVATION: 7,300 ft. (2,227 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 325 ft. (99 m.)

DESCRIPTION: The cave entrance is in the valley cut by Sawmill Creek. Above the entrance, a brass plaque reads "GAYLORD CAVE". Spring flood waters briefly inundate the cave annually but, during most times, the water in Sawmill Creek sinks before reaching the cave. The tight entrance crawlway, often choked with stream debris, leads into a large room 35 feet high, 40 feet wide and about 100 feet long. Several crawlways lead from this room one of the longest continues for 200 feet to a small fissure passage room ten feet high and four feet wide.

The lowest point in this fissure, -28 feet, is choked with breakdown. Digging here and at other places in the cave could extend its known length.

WRITHING CAVE — 150*

LOCATION: Fossil Hill Quad.
ELEVATION: Unknown

PLATES 21 and 22 — Low and high water makes quite a difference at the Sinks of Lander. Above, the sink is fully exposed as the Popo Agie River enters it in a period of low water. Below, high water fills the entire entrance. (Top photo by Wayne Sutherland; bottom photo by the Wyoming Travel Commission.)

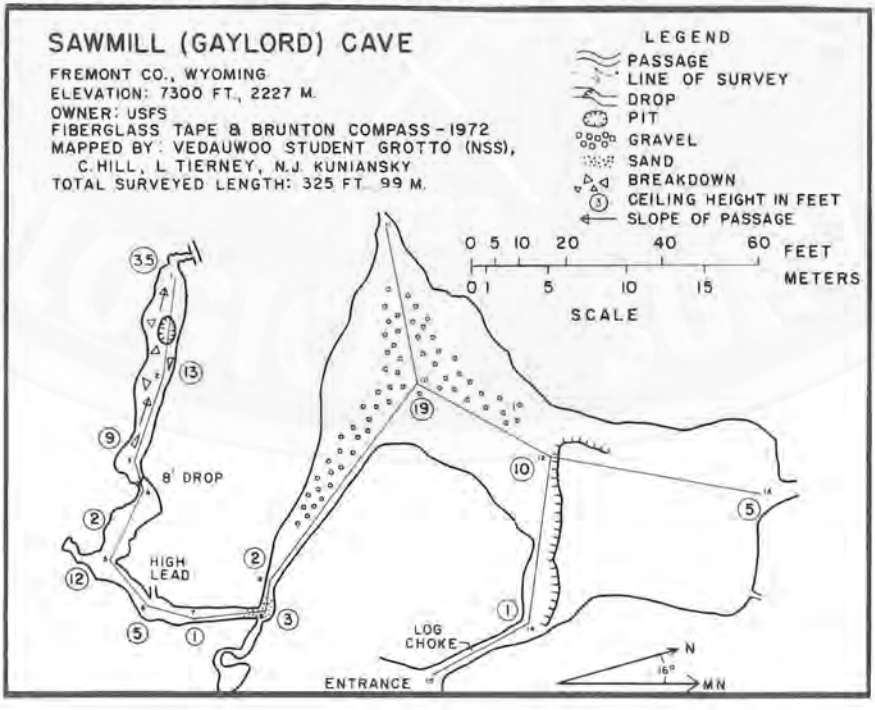
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This small cave, developed in Madison Limestone, consists of about 200 feet of passage. The cave begins as a walking-sized passage, diminishes to a crawl and soon becomes too small to follow.

CAVE — 151

LOCATION: Horseshoe Lake Quad.
ELEVATION: 9,450 feet (2,882 m.)
FORMATION: Madison Limestone?
OWNER: USFS
DESCRIPTION: This cave is located one-eighth to one-fourth mile upstream from the inlet to Lovatt Lake. Bob Stevenson reported this cave, saying that it "contains animals as I remember, so no idea what's inside".

SPOOKY CAVE — 152*

LOCATION: Dubois Quad.
ELEVATION: 7,750 ft. (2,364 m.)
FORMATION: Madison Limestone
OWNER: Clay Allison
TOTAL SURVEYED LENGTH: 428 ft. (131 m.)

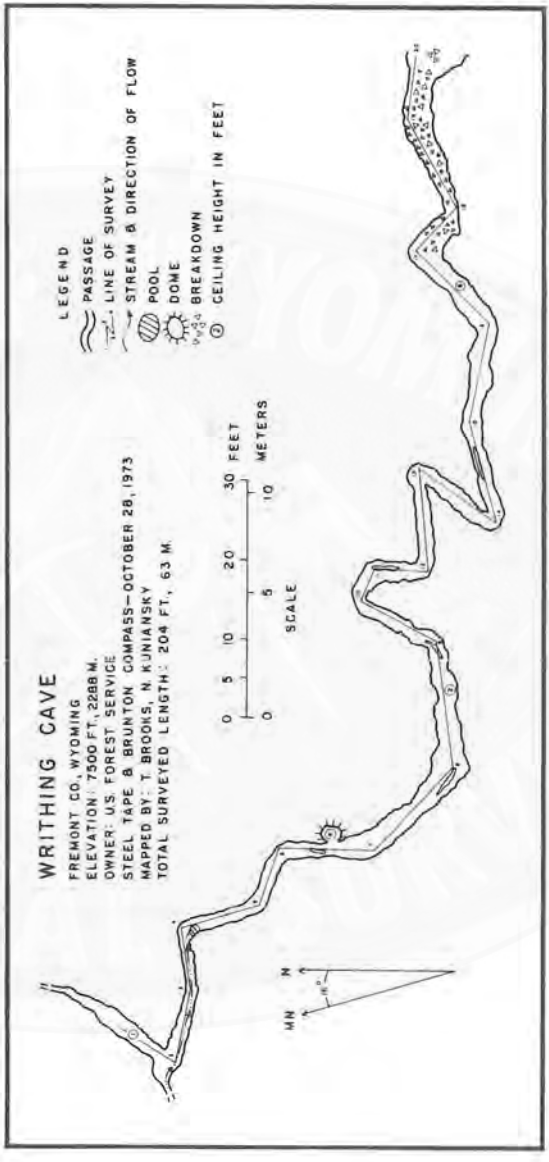


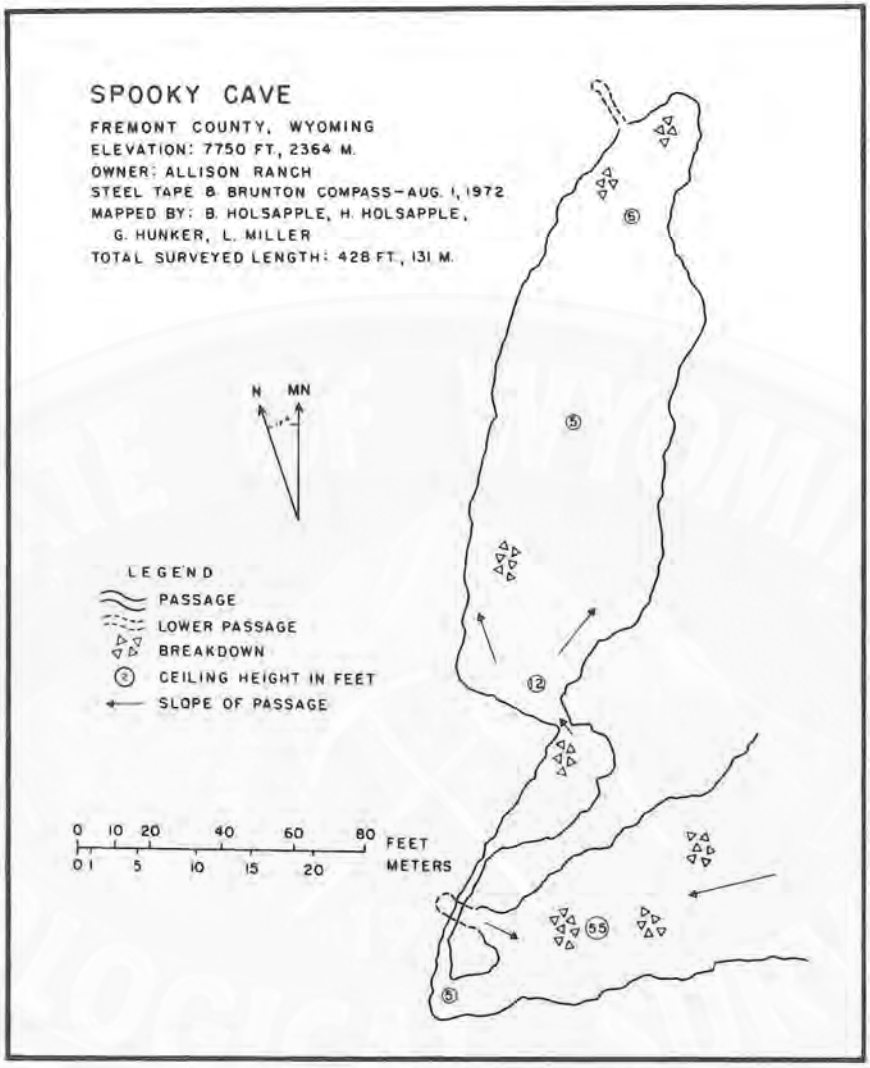
DESCRIPTION: The entrance to this cave is high on the south wall of Little Warm Springs Canyon, west of Dubois. Permission to visit this area should be requested from the Allison Ranch prior to a planned visit.

A large entrance passage leads down into the cave, while the relatively flat roof remains at about the same level. At the bottom of the entrance passage a passage leads right, into a large room. This passage continues for 200 feet, terminating in breakdown which appears to be a collapsed dome. Concerted digging could extend the known limits of this cave.

Smooth solution sculpturing near the back of the cave exposes numerous Mississippian fossils.

Roughly straight across the canyon from Spooky Cave are two large dolines which might yield passages with digging. The development of Spooky Cave probably occurred during a glacial period when Little Warm Spring Canyon was at approximately the same level as the present cave entrance.





WARM SPRINGS CANYON NATURAL BRIDGE — 153

LOCATION: Dubois Quad.
ELEVATION: 7,320 ft. (2,233 m.)
FORMATION: Madison Limestone
OWNER: BLM

DESCRIPTION: This feature is a 400 foot long natural bridge which spans Warm Spring Canyon, west of Dubois. Whether this is a long natural bridge or a short cave is open for debate. Members of the cave survey have not visited the area or checked it for caves but it offers a high potential for cavern development.

CAVE DRAW — 154

LOCATION: Castle Rock Quad.
ELEVATION: 8,450 ft. (2,577 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: Cave Draw, north of Dubois, contains several shelter caves. These features, reported by Dr. J. D. Love, were used by the Sheepeaters, ancestors of the Shoshoni Indians.

OTHER KARST FEATURES IN THE LANDER AREA — 155

Many other karst features in the Lander area have been noted. A few of these that we did not check are listed below, with their locations.

SINKS OF BALDWIN CREEK
LOCATION: Mount Arter Quad.
ELEVATION: 7,215 ft. (2,201 m.)

MORMON SPRING
LOCATION: Mount Arter Quad.
ELEVATION: 7,725 ft. (2,356 m.)

SPRING
LOCATION: Mount Arter Quad.
ELEVATION: 8,350 ft. (2,547 m.)

COLE SPRING:
LOCATION: Mount Arter Quad.
ELEVATION: 8,580 ft. (2,617 m.)

STREAM SINK
LOCATION: Mount Arter Quad.
ELEVATION: 8,260 ft. (2,519 m.)

SPRINGS ON SHEEP CREEK
LOCATION: Mount Arter SE Quad.
ELEVATION: 7,640 ft. (2,330 m.)

BROWN'S CANYON SPRINGS
LOCATION: Fossil Hill Quad.
ELEVATION: 8,000-8,400 ft. (2,440-2,562 m.)

The Owl Creek Mountains

The east-west trending Owl Creek Mountains are sharply faulted on the south side, with the sedimentary sequence dipping into the Bighorn Basin, to the north. The Owl Creek Mountains show no evidence of glaciation, with the possible exception of their western end.

The Wind River Canyon, south of Thermopolis, cuts the range on a north-south axis, exposing rocks from Precambrian through Triassic ages. This canyon is the result of late Tertiary downcutting across Laramide structures by the Wind River as earlier Tertiary basin fills

were removed. The exact relationship of this superposition to cavern development in the Owl Creek Mountains is not known, but it undoubtedly was important.

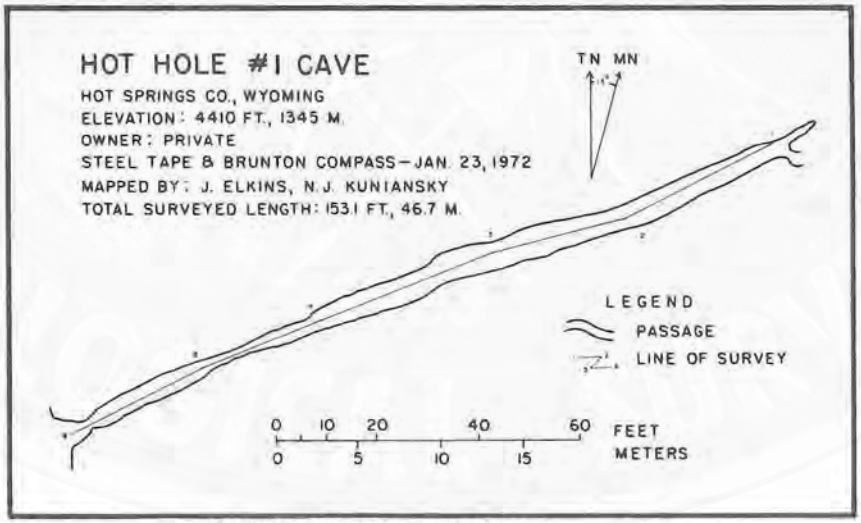
Some of the caves listed in this chapter are on the Wind River Indian Reservation. Cavers should remember that no one is allowed to go off the road into the reservation, for any reason, without a permit from the Tribal Council at Fort Washakie.

HOT HOLE NUMBER I — 156*

LOCATION: Wedding of the Waters Quad.
ELEVATION: 4,410 ft. (1,345 m.)
FORMATION: Phosphoria Formation
OWNER: Private
TOTAL SURVEYED LENGTH: 153 ft. (47 m.)

DESCRIPTION: This small cave consists of a crawlway, 153 feet long, which pinches out just after it branches. It is partially filled with dirt and debris, but very little breakdown is present. The cave's temperature is about 70° to 75°F, not as warm as Hot Hole Number II (157), to the south.

The cave is developed in the Phosphoria Formation, its developmental history is probably related to thermal waters. A small hot spring is still active just below the cave and other hot springs occur on the opposite side of the river.



HOT HOLE NUMBER II — 157

(See map on Sheet 4)

LOCATION: Wedding of the Waters Quad.
ELEVATION: 4,410 ft. (1,345 m.)
FORMATION: Phosphoria Formation
OWNER: Private
TOTAL SURVEYED LENGTH: 354 ft. (108 m.)

DESCRIPTION: This cave appears to have had a similar, related

development to Hot Hole Number I (156). The entrance is a small hole, three feet high and two feet wide, located east of the Bighorn River at the northern end of Wind River Canyon. The 40 foot entrance passage soon widens to an eight foot high, seven foot wide passage with a breakdown floor. At the far end of this room, the cave narrows and its floor rises blocking the passage with dirt and organic debris. The cave is humid with a temperature of about 80°F. A small natural bridge and ceiling domes suggest a phreatic origin.

BIRDSHEAD CAVE — 158

LOCATION: Mexican Pass or Morrison Canyon Quad.
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Wind River Indian Reservation
DESCRIPTION: "Birdshead Cave lies in a fault scarp on the south side of the Owl Creek Mountains, about five miles west of the entrance to Wind River Canyon... one mile north of the old Burgess Ranch buildings." (Bliss, 1950).

This cave is on the Wind River Indian Reservation and was excavated in 1947. The evidence showed that the 25 foot wide by 30 foot deep rock shelter had been occupied at perhaps eight or nine different periods in the past. None of the levels were dated, as the excavation took place before the radio-carbon dating method was developed. However, several of the lower levels were believed to have dated from about 3,000 to 5,000 years ago.

Chapter 5
CODY AND VICINITY

This area includes the vicinity west and northwest of Cody, extending to the Montana border. Included here are the eastern portions of the Absaroka Mountains where Paleozoic strata are exposed, and the Paleozoic exposures on the southern flanks of the Beartooth Mountains. No stratigraphic column has been included for this chapter as this area's stratigraphy is similar to that of the Tetons and the Bighorn Mountains.

Eocene and Oligocene volcanics cover much of this area, but, where Paleozoic carbonate sediments were not covered or where extensive Pleistocene glaciation has exposed these sediments, several caverns are known. Although Cedar and Rattlesnake Mountains are not covered by volcanics, they appear to have undergone extensive karst modification by thermal waters associated with the volcanics. Only a few caves are known in this area, but there is a very high potential for discovery of numerous caves and, perhaps, several long systems.

FINE SINKHOLE — 159

LOCATION: Devil's Tooth Quad.
ELEVATION: 6,580 ft (2,007 m.)
FORMATION: Madison Limestone
OWNER: Private

DESCRIPTION: The cave survey was led to this large collapse doline by Mark Larson of Cody, who heard of its existence from a friend. The doline is one of the largest surface karst features in the state, 200 feet in diameter and 150 feet deep beneath its highest edge. Its origin may be from a collapse into an existing void, and may be related to the action of thermal waters acting on the Madison Limestone.

DEAD MOUSE CAVE — 160

LOCATION: Devil's Tooth Quad.
ELEVATION: 6,500 ft. (1,983 m.)
FORMATION: Madison Limestone
OWNER: Private

DESCRIPTION: This small cave is developed on a joint or a fault between the steeply dipping southern flank and the more gently dipping higher portions of Cedar Mountain. A solutionally rounded pit drops 10 feet along the joint to a passage developed along the bottom. It pinches out to the west but can be followed east for 15 feet before pinching out. The cave is developed on the same fracture as Fault Cave (161).

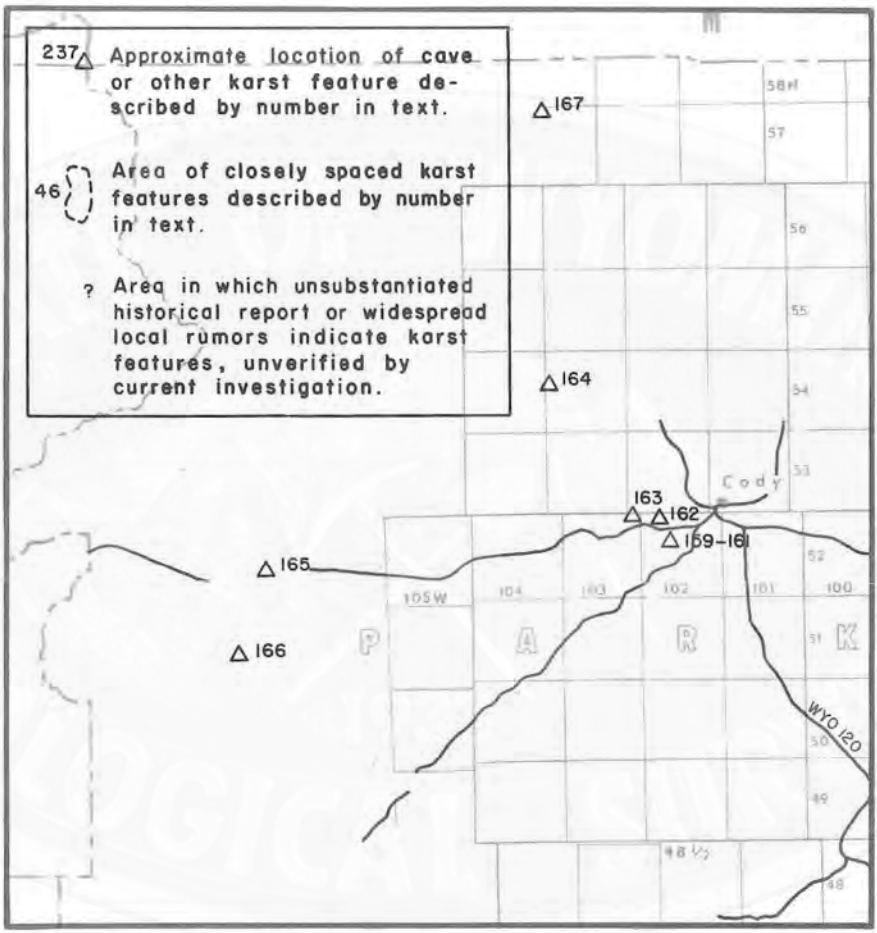


FIGURE 15 — Index map of Cody and vicinity.

FAULT CAVE — 161

LOCATION: Devil's Tooth Quad.
ELEVATION: 6,500 ft. (1,983 m.)
FORMATION: Madison Limestone
OWNER: Private

DESCRIPTION: Fault Cave is developed 100 feet east of Dead Mouse Cave (160), on the same fracture. The feature is 25 feet deep. Several small crawls are developed in the bottom but they all end shortly in breakdown.

SPIRIT MOUNTAIN CAVERNS (SHOSHONI CAVERNS NATIONAL MONUMENT, FROST CAVE) — 162

(See map on Sheet 3)

LOCATION: Cody Quad.
ELEVATION: 6,300 ft. (1,922 m.)
FORMATION: Madison Limestone
OWNER: City of Cody; leased to Hal Oldham
TOTAL SURVEYED LENGTH: 4,044 ft.; 1,233 m.

DESCRIPTION: This cave was first discovered by Ned Frost in November, 1908, and thus acquired the first of its three names: Frost Cave. The fame of the caverns spread quickly, and on September 21, 1909, President William A. Taft proclaimed, "A cavern in the state of Wyoming, of unknown extent but of many windings and ramifications and containing chambers of large size, magnificently decorated with sparkling crystals and beautiful stalactites, containing impenetrable pits of unknown depths is of great scientific interest and value to the people of the United States." From that time, into the 1940's the cave was designated a National Monument. During this time it received its second name: Shoshoni Caverns National Monument. In 1909, a group of prominent Cody citizens, including Buffalo Bill Cody, were photographed at the entrance to the cave (Pl. 23). From approximately 1955 until 1966, the cave was operated by Claude Brown as a commercial cave under its third name: Spirit Mountain Caverns. This name was derived from the Indian name for Cedar Mountain, which until 100 years ago was reported to have active geysers and hot springs.

The cave has two known entrances; the main entrance and the cliff-side entrance. The main entrance, now gated, was at one time a high fissure, but during commercialization it was modified to a "classic" arch-like entrance. The main entrance leads into a large room 300 feet long, 100 feet wide and 40 feet high.

The cliff-side entrance lies west of the main entrance, 75 feet below the top of the cliff and 100 feet above its base. Ropes, technical equipment, and climbing and caving experience are necessary for this entrance. The entrance leads through a series of small rooms and very small crawlways and joins the main passage at the back of the large entrance room.

The main passage (Pl. 24) continues from the entrance room to a small pit at the right. This pit drops into the Bypass which leads through small rooms and crawlways to the cave's lower level. The Bypass avoids the very dangerous 50 and 60 foot pits at the back of the upper level.

The lower level is slightly offset from the upper level but is basically the same length. The deepest point in the second level is roughly beneath the entrance near where the Bypass enters. A third level, composed of crawlways and small rooms, occurs beneath the second level.

A rough sketch map of the cave, drawn by Francis Nelson of Billings, depicts 8 levels and indicates that the cave may be the deepest in the United States, descending over 1100 feet to the level of the Shoshoni River. If this map is reliable, it is believed that any entrance to these lower levels within the cave must have become inexorably blocked during the modifications made when the cave was commercialized. The Heart Mountain Project water diversion tunnel which lies nearly beneath Spirit Mountain Caverns, encountered many solution cavities, some containing noxious sulfur gases. Some of these may be the lower levels of Spirit Mountain Caverns.

The deepest point mapped beneath the main entrance is -199 feet and the highest point above the surface station is +89 feet, giving the cave a total vertical extent of 288 feet. Most of the passages are high fissure passages. This would seem to indicate a development near a rapidly dropping water level. However, in this instance it may indicate development above a thermal water source.

With fluctuations in the pressure beneath these waters, high fissure passaages may have been cut from below. As these waters rose high enough through weaknesses in the limestone, they exited to the surface, thus forming the slopes observed in several of the passages.

Another possible origin could have involved water sinking from the Shoshoni River as the river downcut its canyon. At present, there is no evidence to support either of these possibilities but the existence of several "natural bridges" and other residual features within the cave suggest a phreatic origin. Mineral deposits on the walls also suggest that the cave was filled for a long period by mineral-rich waters after its initial development.

PLATE 23 — Buffalo Bill (center) and a party of his friends visited Frost Cave (Spirit Mountain Cave) near Cody in 1909. Here the early "explorers" pose for the ever present camera. (Photo courtesy of the Wyoming State Archives and Historical Department)

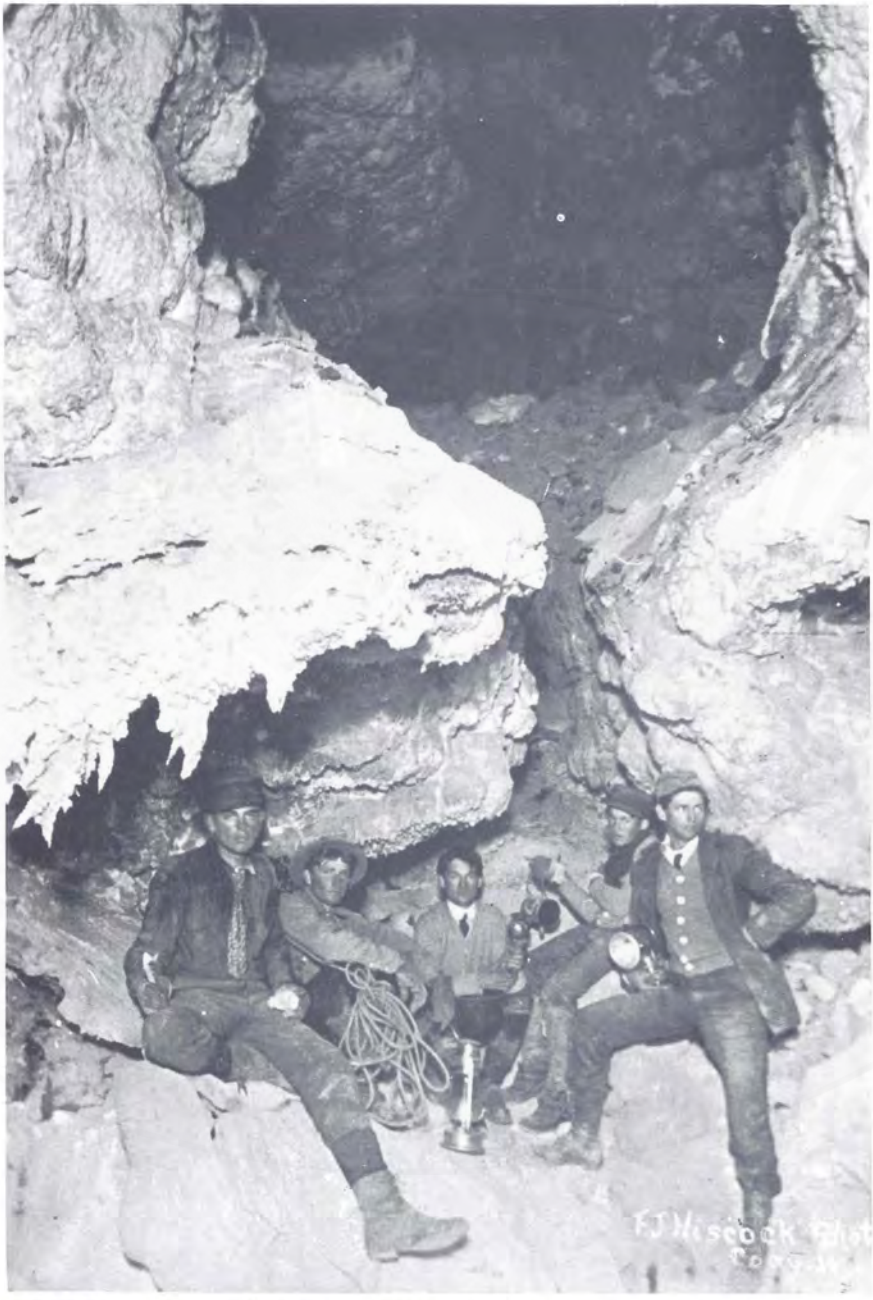


PLATE 24 — These early cave explorers pause in the main passage of Frost Cave. The passage extends back into the background. (Photo courtesy of the Wyoming State Archives and Historical Department)

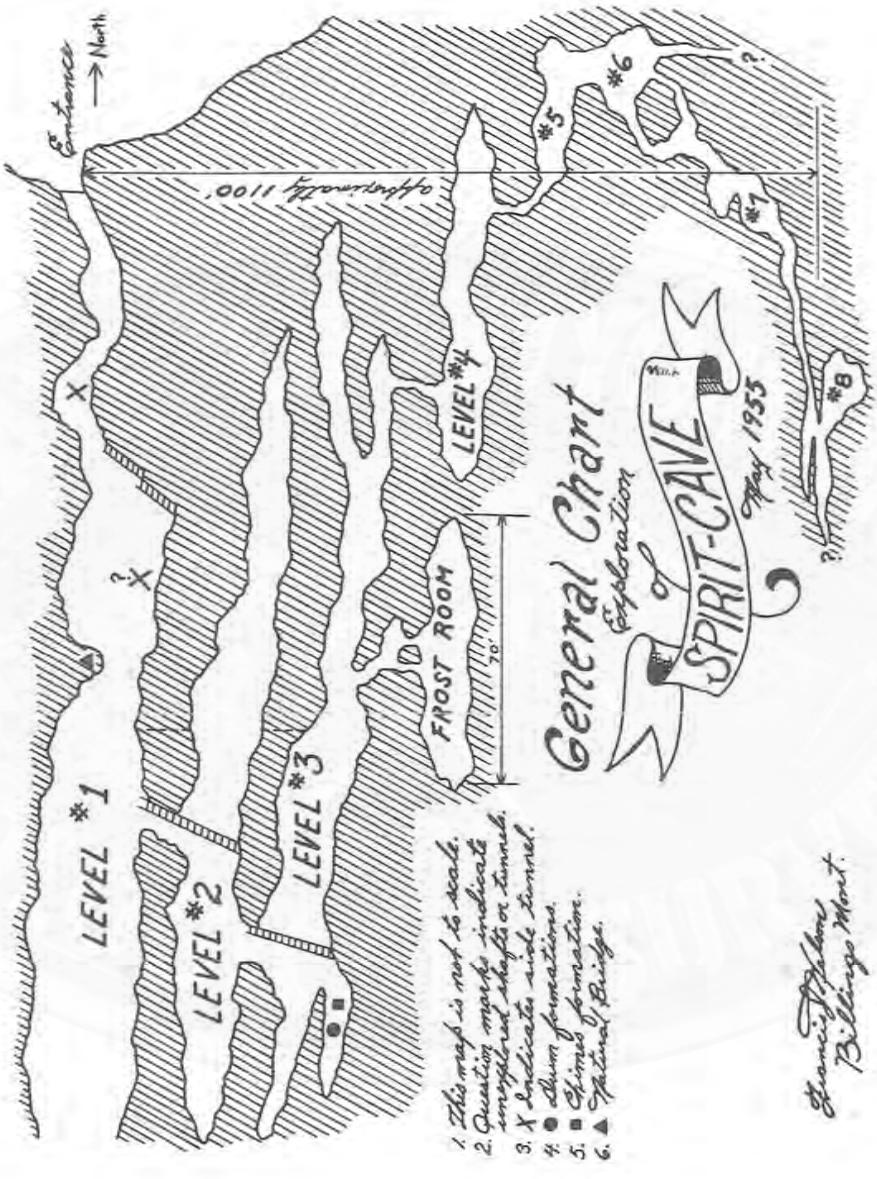


FIGURE 16 — Francis Nelson's 1955 sketch map shows the eight levels of the Spirit Mountain Caverns.

RATTLESNAKE PIT CAVE — 163*

LOCATION: Cody Quad.
ELEVATION: 8,550 ft. (2,208 m.)
FORMATION: Madison Limestone
OWNER: BLM
TOTAL SURVEYED LENGTH: 265 ft., 81 m.

DESCRIPTION: This cave is developed on the southern end of Rattlesnake Mountain. A circular doline (Pl. 25) 40 feet in diameter, is developed along a joint. It has a small crack in its bottom which drops 28 feet into a large room. A snow and debris cone beneath the entrance rises almost to the surface, however, the cave should not be attempted without ropes and technical equipment. The room has several small crawlways leading from it and some small speleothems and dogtooth spar are present. The Madison Limestone dips northeast in this area. There are several other shallow dolines developed in the immediate vicinity.

PAT O'HARA MOUNTAIN CAVES — 164

LOCATION: Pat O'Hara Mountain Quad.
ELEVATION: 7,800-8,800 ft. (2,379-2,684 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: On the south flank of Pat o'Mountain are a number of black holes. Not all of these holes have been checked. One very small cave was found, Kuppacum Cave. The northern flank of the mountain also has several very large, dark, unchecked holes.

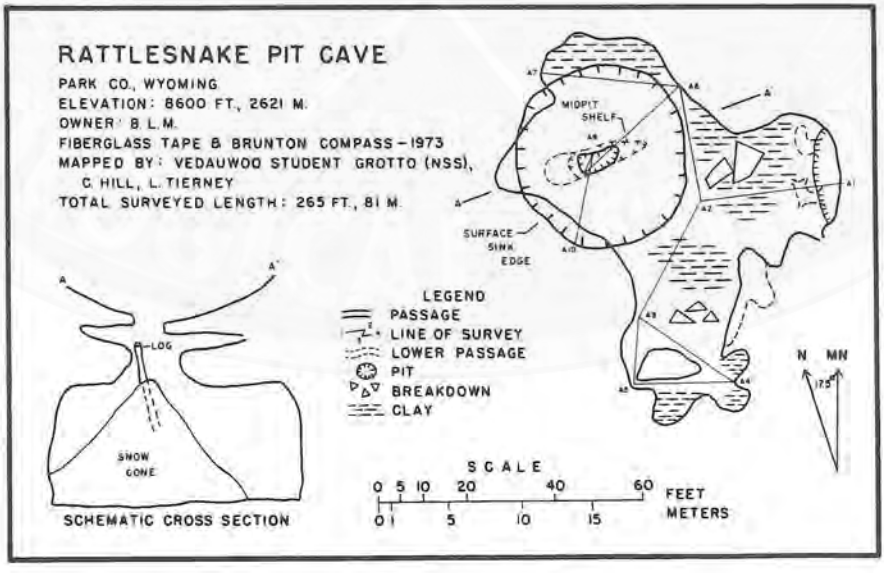


PLATE 25 — This caver prepares to enter the solutional doline entrance to Rattlesnake Pit Cave on Rattlesnake Mountain. (Photo by Chris Hill)

MUMMY CAVE — 165

LOCATION: Clayton Mountain Quad.
ELEVATION: 6,200 ft. (1,891 m.)
FORMATION: Tertiary volcanics
OWNER: USFS

DESCRIPTION: This feature is, in reality, a rock shelter along the Cody-Yellowstone highway. Its significance is archaeological and its fame is due to its 1300-year old dead Indian, Mummy Joe.

Mummy Cave was excavated by the Whitney Gallery of Western Art in Cody under the supervision of the museum director, Dr. Harold McCraken. The excavation was financed by the National Geographic Society, the National Science Foundation and private donations. The excavations demonstrated that the cave had been an almost continuous site of occupation by Indians from 7280 B.C. until around 1580 A.D. The excavations, conducted by trained archaeologists, provided a wealth of information about the Prehistoric cultures of the Rocky Mountain Region (Wedel, W.R., et. al.).

Mummy Joe and many of the artifacts can be seen in an excellent display in the Whitney Gallery of Western Art in Cody. Mummy Joe now rests in a specially constructed, air-tight case.

BLACKWATER NATURAL BRIDGE — 166

LOCATION: Sheep Mountain Quad.
ELEVATION: 10,800 ft, (3,294 m.)
FORMATION: Tertiary volcanics
OWNER: USFS

DESCRIPTION: This feature, six miles south of Blackwater Lodge, is one of many similar non-karst erosional remnants in the area. The soft volcanics in this area also exhibit some rock shelters and numerous pinnacles.

HOLE-IN-THE-WALL CAVE — 167

LOCATION: Deep Lake Quad.
ELEVATION: 6,800 ft. (2,074 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: This cave is marked on the Deep Lake USGS topographic quadrangle on the southern flank of the Beartooth Mountains. The cave was not checked by the members of this cave survey.

Chapter 6
The Teton, Gros Ventre, and Wyomide Ranges

The Teton and Gros Ventre Mountains are both discussed in this chapter because of similarities in their stratigraphy and cavern occurrence. The Wyomide ranges are included because of their proximity and partially similar stratigraphy.

In this region, especially, there were many areas with a high potential for caves that the cave survey was unable to visit. Several individuals have graciously provided much of the information included on this area. Doug Medville and Charlie Plantz have made considerable investigations of karst phenomena in the Tetons and Gros Ventres and many of the following descriptions are drawn directly from their work. Dick Guilmette, a ranger permanently stationed in Grand Teton National Park, has spent long periods of time in the northern Tetons, much of the information on this area has come from him. Dr. J. D. Love, of the United States Geological Survey in Laramie, was very helpful to the survey in providing a variety of information about the Tetons and other areas.

THE TETONS

The Tetons are the youngest mountain range in Wyoming. Since they are only about 10 million years old, their relief has not been reduced as much as the older ranges. The Tetons are faulted up sharply on the west side of Jackson Hole, exposing high granite peaks. Paleozoic sedimentary rocks dip westward into Idaho on the west flank.

The two most significant rock units exhibiting cavern development are the Cambrian Death Canyon Limestone and the Mississippian Madison Limestone. Glacial advances during the Pleistocene and accompanying erosion have modified the topography spectacularly.

The climates of the glacial and present times have resulted in the development of alpine karst on the west side of the range. Most known caves in the Tetons are vertical, but a few large horizontal caves are present.

GENERALIZED PARTIAL STRATIGRAPHIC COLUMN

FOR THE TETON AND GROS VENTRE RANGES

AGE	FORMATION NAME		DESCRIPTION	APPROXIMATE THICKNESS (FT.)	
PERMIAN	Phosphoria Formation		Gray cherty dolomite with sandy black shale and phosphate beds; marine	0–250	
PENNSYLVANIAN	Tensleep Formation		Light gray, hard sandstone	0–1500	
	Amsden Formation		Red shale with basal red sandstone; marine		
MISSISSIPPIAN	Sacajawea Formation		Gray cherts and limestones interbedded with red shales	0–60	
	Madison Group	Upper Madison Limestone	Finely crystalline, gray to brownish or pink massive limestone	250	700 to 1200
		Mission Canyon Formation	Light colored, thick-bedded, cliff-forming dolomitic limestone	275	
		Lodgepole Formation	Steel blue to dark gray and brownish limestone; some dark gray chert nodules and layered chert stringers	250	
DEVONIAN	Darby Formation		Black to brown, weathering tan to gray, petroliferous dolomites and thin limestones, interbedded with cream, yellow, and green shales	200–500	
ORDOVICIAN	Bighorn Dolomite	Leigh Member	Very fine grained, dense, cream to white, thin-bedded dolomite	300–500	
		Bighorn Member	Light gray, very hard, siliceous dolomite		
CAMBRIAN	Gallatin Limestone	Open Door Member	Hard, dark gray to black, thin- to thick-bedded limestone; weathers brown	180–300	
		Dry Creek Shale	Shaley limestone		
		Du Noir Member	Hard, dark gray to black limestone; weathers brown		
	Gros Ventre Fm.	Park Member	Green, thin-bedded shale	600 to 800	
		Death Canyon Member: Upper Death Canyon Limestone	Blue-gray mottled with tan to cream, thin-bedded, sharp limestone with shale member in the middle	200	
		Death Canyon Member: Middle Death Canyon Shale		30	
		Death Canyon Member: Lower Death Canyon Limestone		100	
		Wolsey Shale	Green, micaceous shale		
	Flathead Formation		Medium grained, red to tan, very hard quartzitic sandstone with some conglomerate stringers	175–300	
PRECAMBRIAN	Igneous and metamorphic basement complex				

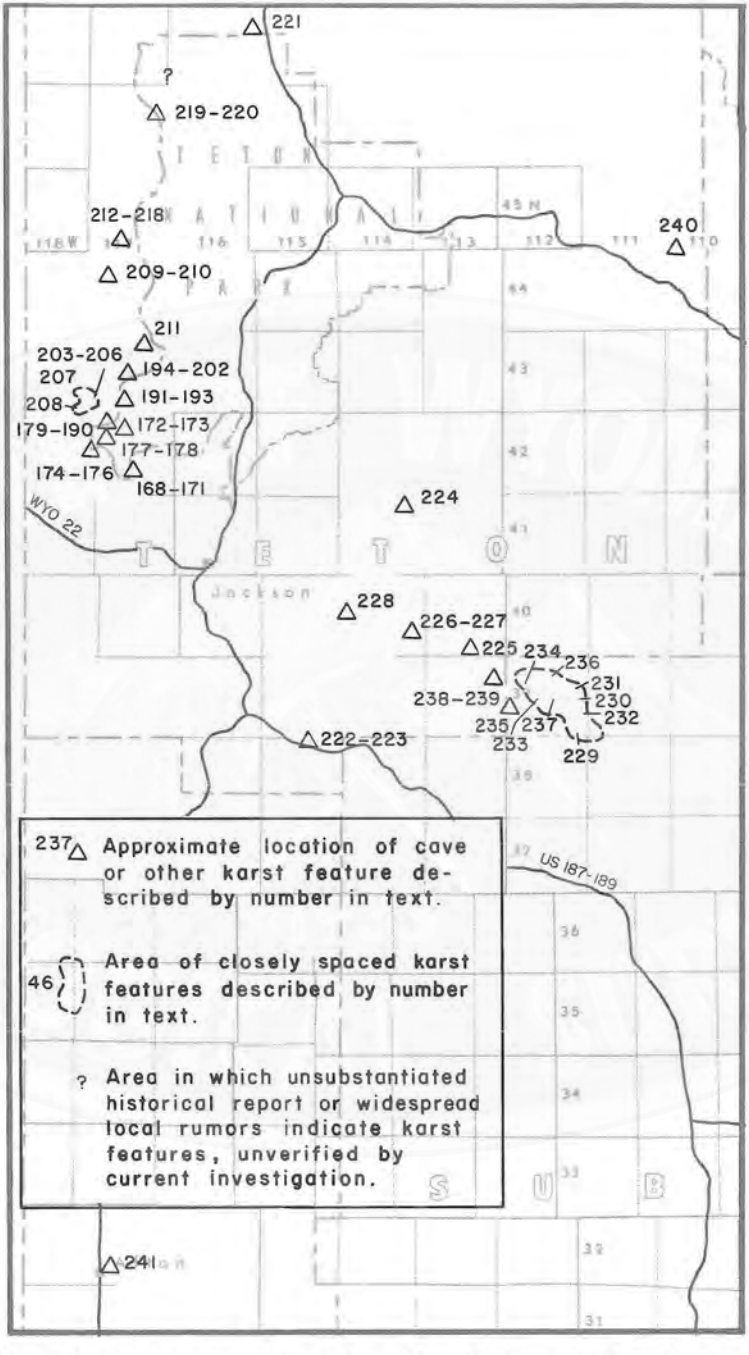


FIGURE 18 — Index map of the Tetons, Gros Ventre and Wyomide Ranges.

PLANTZ PIT (RENDEZVOUS PEAK PIT) — 168

(See map on sheet 2)

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 811 ft. (247 m.)

DESCRIPTION: This and the next three cave descriptions (169-171) are paraphrased from information supplied by Doug Medville in 1972.

The Rendezvous Peak Basin caves are on the eastern side of the Tetons, in the southern part of the range. The Jackson Hole Aerial Tram rises 4100 feet from Teton Village to the top of Rendezvous Mountain. About 600 vertical feet below the top of the tram to the southwest are four large basins, each approximately 1500 feet across. These are represented on the eastern edge of the Rendezvous Peak Quadrangle. The basins contain large sinks formed on the westward dipping Cambrian Death Canyon Limestone. Streams flowing from the snowfields above the basins sink into the limestone, forming caves.

Plantz Pit has two entrances, about 20 feet apart. Both are joints parallel to the strike of the limestone. The wider, southern entrance drops 20 feet, narrowing to one to one and a half feet halfway down and widening to four to six feet at a point beneath the northern entrance. From this point the cave drops 54 feet vertically to a series of short downclimbs, totalling 20 feet.

A narrow squeeze connects with the top of a 66 foot shaft. This shaft drops 170 feet below the entrance and into a fairly large stream passage which trends north-northeast along the strike of the limestone.

The total depth of the cave is 201 feet. Although the drops are dry, the air temperature (37°) and the high elevation makes hypothermia a real danger. This cave should be entered only by experienced cavers with proper technical equipment.

RENDEZVOUS PEAK PIT 2 — 169

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: Two hundred and fifty feet south of Rendezvous Peak Cave (168) a stream sinks into a climbable pit, twenty feet deep, ten feet long and six feet across. The bottom of this pit is choked with breakdown. The stream entering it is probably that seen in the bottom of Rendezvous Peak Cave. Before entering the pit the stream flows across the basin, deeply entrenching itself into the basin fill.

RENDEZVOUS PEAK CAVE — 170

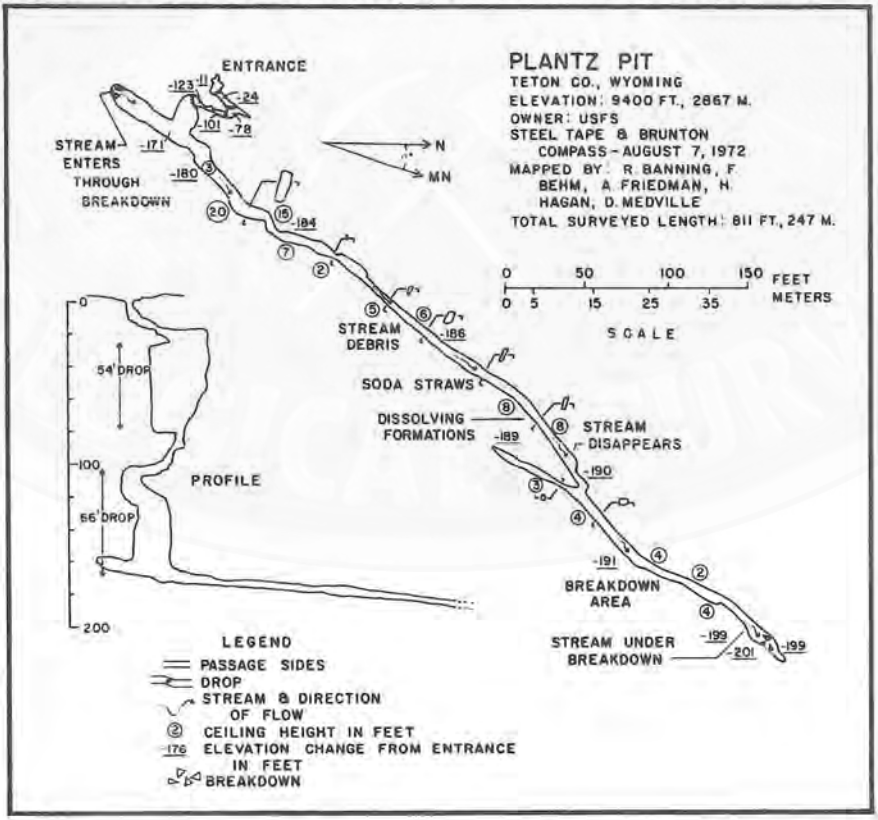
LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,480 ft. (2,891 m.)
FORMATION: Death Canyon Limestone

OWNER: USFS
TOTAL SURVEYED LENGTH: 1,360 ft. (415 m.)
DESCRIPTION: This is the deepest known vertical cave in Wyoming. The cave is in a shallow sink into which a stream flows. The entrance, triangular in shape, is 4' x 6' at the base. The cave slopes downward at 30° into a room eight feet high and over twenty feet wide. Beyond this, the passage narrows to a width of three to six feet and a height of three to five feet, still sloping downward at 20° to 30°.

The main passage trends north-northwest for the first 100 feet, where a side passage, also containing a stream, joins it. This side passage has several smaller side passages and can be followed upstream for 200 feet to a breakdown choke.

From the junction the combined streams flow north for another 150 feet to a point 94 feet below the entrance where a pit drops 84 feet. The pit is about 20 feet across, belling out near the bottom. The stream flowing into the pit *cannot* be avoided when climbing down. At the base of the pit is a second drop of 25 feet.

Beyond this point about 50 feet of wet passage leads to the top of the third pit, which drops 109 feet. The passage loops beneath itself dropping 18 feet and then another 10 feet into the main trunk passage. The trunk passage continues northeast for 800 feet to the cave's lowest point, at a pool 511 feet below the entrance. From the bottom of the pit the trunk



passage continues upstream to the southeast but has not been explored.

Rhodamine-B dye placed in the stream flowing into the cave was not recovered, but the cave waters may rise 2.5 miles to the west, 1600 feet lower. Air and water temperatures in the cave were measured at 37°F in early August. The entrance elevation is 9,480 feet.

This cave should be attempted only by experienced people in good condition, having adequate exposure gear and a fairly fast ascending system. Any party entering the cave should be prepared for rescue procedures as local rescue organizations are not experienced in cave rescue. This dangerous cave would tax the skill and endurance of even the most experienced cavers.

THIRD BASIN PIT — 171

LOCATION: Rendezvous Pit Quad.
ELEVATION: 9,680 ft. (2,952 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This pit is in the third basin south of the tram and is 30 feet deep with no passage at its bottom.

INDIAN LAKE SINK — 172

LOCATION: Mount Bannon Quad.
ELEVATION: 8,960 ft. (2,733 m.)
FORMATION: Darby Formation
OWNER: USNPS

DESCRIPTION: This feature, a 125 foot wide, 160 foot long, 35 foot deep doline containing two sinking points, takes all the water in the stream flowing from Indian Lake. The larger ponor contained a five foot deep pool in early July, but it seems that the smaller sinking point could be entered in late fall. Most of the water leaves the sink through small cracks by the pool.

Three smaller dolines (also unenterable) were found just downstream from the main sink. Springs and several types of karren were also noted in the area, along with aligned, elongated dolines indicating strong linear control.

OPEN CANYON SPRINGS — 173

LOCATION: Rendezvous Peak Quad.
ELEVATION: 8,500 ft. (2,593 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: Three springs, issuing from between limestone blocks 200 feet below the Open Canyon Trail, can be heard from the trail in early summer. Another spring, which seems to flow only during times of high water, was noted six feet above the three springs. The springs are 500 feet below and about 2,000 feet south of Indian Lake Sink (172) and may be its rise; dye testing could confirm this supposition.

PLATE 26 — The Spearhead Peak karst area, stretching to the horizon, exhibits typical alpine karst topography. (Photo by Wayne Sutherland)

WATERGATE KARST AREA — 174

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,450 ft. (2,882 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: Numerous dolines were observed in the Watergate Basin, including one called Thunder Hole located several hundred feet northeast of Watergate Cave. Water could be heard through a fissure in the bottom of Thunder Hole; however, the crack is too small for entry. Several types of karren were observed in the area.

For over a year Watergate Cave evaded any attempt to investigate it and remained unentered until July 7, 1974. The cave is located one-fourth mile south of Moose Lake in a large, closed depression shown on the Rendezvous Peak Quad. The quadrangle misrepresents the existing relationships in showing only two of the three streams that actually drain into Watergate Cave from the basin. The dip of the limestone is shallow and to the west. No large springs in the valley to the east have been noted on the topographic map.

The cave entrance (Pl. 27) is a pit half filled with a waterfall, effectively discouraging entry. Frank Binney, Medville and others explored the pit with very elaborate rigging and a clever coverup (a plastic tarp over the waterfall) to protect them from exposure.

The following description is provided by Medville through personal communication.

The entrance is a 15-foot drop, developed along a joint trending N17°W, most of which can be chimneyed. The passage below trends along the joint for 50 feet. At this point the remainder of the surface stream joins the main passage from a waterfall along the east wall. The stream falls over an eight foot and then a ten foot drop. The water pools below this last drop and apparently exits through a low, water filled bedding

plane passage. At a time of lower water this probably could be entered.

The total cave length is about 75 feet, the total depth, about 40 feet. The water volume entering the cave was estimated to be three to four cubic feet per second in August 1974. The cave still has potential for great depth.

GOLDEN GATE CAVE
(MOOSE LAKE NATURAL BRIDGE CAVE) — 175

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,250 ft. (2,821 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 90 ft. (27 m.)

DESCRIPTION: This cave's entrance is located under a small natural bridge in a doline found in a dry creek bed. The entrance passage is three and a half feet wide, ten feet high and slopes downward along a fissure trending at 175°. Twenty feet down this passage a 12 foot drop leads to a parallel, dead-end passage containing a small trickle of water that enters and leaves the passage through breakdown. Beyond the drop, the main passage drops five feet, becoming a crawl within 25 feet. The crawl tightens in about twenty feet, after 30 feet it becomes too small to follow.

PLATE 27 — This breakdown-choked entrance leads into Watergate Cave in the Tetons. (Photo by Wayne Sutherland)

UPPER WATERGATE SHELF AND GRANITE CANYON SHELF — 176

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,620-9,800 ft. (2,934-2,989 m.)
FORMATION: Bighorn Dolomite and Darby Formation
OWNER: USFS and USNPS

DESCRIPTION: These shelves, developed on the Darby and Bighorn Formations, extend from northwest of Watergate Cave (173) to the upper end of Granite Canyon. The area exhibits classic alpine karst with many dolines, sinking creeks, springs and karren forms. Fissure pits occur in the Bighorn Dolomite. Some exploration remains to be done in this area, preferably in the late summer when the snow cover is slight.

BLACK HOLE OF GRANITE CANYON — 177

LOCATION: Rendezvous Peak Quad.
ELEVATION: 8,750 ft. (2,669 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS

DESCRIPTION: This is an unchecked black hole, 600 feet up the southwall of Granite Canyon, near the intersection of the Open Canyon and Granite Canyon Trails.

MARION LAKE GUANO HOLES — 178

LOCATION: Rendezvous Peak Quad.
ELEVATION: 9,080 ft. (2,769 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS

DESCRIPTION: These three small caves are located at the bottom of a small cliff west of the stream flowing from Marion Lake. Guano Hole #1 (the most eastern) is a three foot wide fissure, ten feet above the base of the cliff. The cave extends 20 feet to a ten foot drop near its end.

Guano Hole #2, about 100 feet west of #1, has a two foot high, rounded entrance into a low, round, guano-filled room. From this room, a small feces-filled crawlextends upward to the south toward the cliff face. Guano Hole #3, just a few feet to the west, is similar to #2, minus the room.

UPPER FOX CREEK KARST AREA — 179

LOCATION: Mount Bannon Quad.
ELEVATION: 9,400-9,600 ft. (2,867-2,928 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This karst area of the Death Canyon Limestone has a hummocky, moon-like appearance. Several narrow, shallow, solutionally enlarged cracks and many large, shallow, solutional dolines are developed in this area. Digging would be required to reach any caves occurring beneath these features.

Other experience with the Death Canyon Limestone suggests that only tight, narrow caves and pits will be found here. Large horizontal cave entrances are reported to occur lower in Fox Creek Canyon. Medville reports that someone, several years ago, mapped a cave with over 800 feet of passage in this area.

PIZZA PIT — 180

LOCATION: Mount Bannon Quad.
ELEVATION: 9,650 ft. (2,943 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This is a narrow, down-climable pit about 20 feet deep. Weathering on the pit walls has produced such sharp surfaces that an unwary caver would look like a hamburger pizza if he fell in.

Several hundred feet west is a doline 100 feet in diameter; digging here could open related cavern passages.

M. S. PIT — 181

LOCATION: Mount Bannon Quad.
ELEVATION: 9,580 ft. (2,922 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This deep, narrow fissure pit is west of the Teton Crest Trail and northwest of Spearhead Peak. The slippery, smelly pit is only downclimbable for about 35 feet, although rocks dropped further in the narrow crack continued to rattle for a long time. Descent of the lower part of the cave requires ropes and other technical equipment.

Spearhead Peak Area

The basin northeast of Spearhead Peak (Pl. 26) has extensive alpine karst developed on the Death Canyon Limestone, exhibiting numerous pits, solutionally enlarged joints and sinking creeks. These features, including pits 182-190, occur along a series of roughly concentric bedrock "steps" around the northeast side of Spearhead Peak. It is estimated that an additional hundred pits have been developed in this basin. The pits range in width from a few inches to five feet. They are from five to 80 feet in depth. The meltwater from several permanent snowfields in the basin flows only a short distance before sinking. The north edge of the basin drops into the upper end of Death Canyon where numerous holes and springs (probably draining the basin) were noted in the cliff face. Subsurface drainage is developed beneath this basin and at least one large cave may occur.

DEAD MOOSE PIT — 182

LOCATION: Mount Bannon Quad.
ELEVATION: 9,860 ft. (3,007 m.)

FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This 15-foot, downclimbable pit was named for a complete moose skeleton, including large antlers, found on the snow at the bottom.

DAMP AND DIRTY PIT — 183

LOCATION: Mount Bannon Quad.
ELEVATION: 9,880 ft. (3,013 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This wet, 30 foot pit is downclimbable and has a small pool at its bottom. Another small pit requiring a rope was observed just south of here but was not entered although it seemed to open into a room.

SNOW PIT ATOLL — 184

LOCATION: Mount Bannon Quad.
ELEVATION: 9,880 ft. (3,013 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This pit is located just east of Dead Moose Pit (182). This small pit is partially filled with snow and has a short side passage.

30-FOOT PIT — 185

LOCATION: Mount Bannon Quad.
ELEVATION: 9,920 ft. (3,026 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This is a 30-foot deep pit partially covered with snow. The pit was not entered, as rope was required. There may be a passage at the bottom.

35 - FOOT PIT — 186

LOCATION: Mount Bannon Quad.
ELEVATION: 9,960 ft. (3,038 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This is a wet pit about 35 feet deep, requiring a rope. It was not entered but there may be passage at the bottom.

DOUBLE SINK PIT — 187

LOCATION: Mount Bannon Quad.
ELEVATION: 9,980 ft. (3,044 m.)

FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This is a partially snow-covered sink containing two pits, both requiring a rope to enter. Application of the gravity-driven geologic projectile and chronometer method (dropping a rock) suggested that the southern pit may be very deep.

SNOWATER PIT — 188

LOCATION: Mount Bannon Quad.
ELEVATION: 10,000 ft. (3,050 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS
DESCRIPTION: This is a 20-foot deep pit about 150 feet below the permanent snowfield indicated on the Mount Bannon Quad. southeast of Spearhead Peak. The snowfield supplies a large amount of water to the pit. Another 20 foot pit, located approximately 50 feet southwest, also takes water.

SPEARHEAD PEAK PIT — 189

LOCATION: Mount Bannon Quad.
ELEVATION: 9,960 ft. (3,038 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS
DESCRIPTION: Estimated at 70 to 100 feet deep, this pit is located in a low spot near the middle of the Spearhead Peak area, northeast of Spearhead Peak. The pit, requiring a rope, was not dropped.

JEWS HARP PIT — 190

LOCATION: Mount Bannon Quad.
ELEVATION: 9,920 ft. (3,026 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS
DESCRIPTION: This two foot wide, ten foot long pit developed along a fissure trending 203° is at least 70 feet deep. At the bottom of the 39 foot entrance rappel, the pit widens to three feet, and then drops through a narrow hole, widening to three and a half feet across. In the floor, a crack too narrow to explore drops about 40 feet. This crack was blowing cold air in August of 1974. The bedrock at the pit entrance strikes 203° and dips north at 8°.

Death Canyon Shelf

The Death Canyon Shelf extends from Fox Creek Pass northeast to Mount Meek; it was thoroughly checked for caves but few were found (caves and pits 191-193). Developed on the west-dipping Cambrian Death Canyon Limestone, this narrow (1000 feet wide) shelf exhibits numerous dolines, stream sinks and several pits. Most of these features are either

blocked by breakdown and debris or are too small for entry. Water sinking on the shelf often resurges below the shelf to the east. Springs below the shelf reportedly gush like fountains during the spring runoff. A few holes observed in the cliff of Bighorn Dolomite above the shelf remain unchecked.

FAT CHANCE CAVE — 191

LOCATION: Mount Bannon Quad.
ELEVATION: 9,500 ft. (2,898 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS
DESCRIPTION: The cave is entered in a stream sink just west of the Teton Crest Trail on the Death Canyon Shelf. It is a narrow fissure which can be followed only about 25 feet. Water can be heard in the bottom, about 35 feet below. Further exploration became possible after removing a few pieces of breakdown in a small hole, 30 feet south of the stream sink, but the cave was blocked by breakdown at its lowest point.

PIT UNDER THE BOULDER — 192

LOCATION: Mount Bannon Quad.
ELEVATION: 9,440 ft. (2,879 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS
DESCRIPTION: This 50 foot deep pit is in a doline under a large boulder, just west of the Teton Crest Trail. A rope is needed for the free rappel into this pit, which bells out to 6' x 25'. A small hole in the bottom at the south end continues downward, but is too tight to follow.

PIT BY THE TRAIL — 193

LOCATION: Mount Bannon Quad.
ELEVATION: 9,530 ft. (2,907 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS
DESCRIPTION: This pit is located on the north side of a low hill, just east of the Teton Crest Trail. The pit is 20 feet deep and extends about 30 feet south. Three large deep dolines are located immediately northeast of this pit.

Teton Canyon Shelf

This shelf is developed on the Death Canyon Limestone, extending to the northwest from Mount Meek. The limestone forms cliffs to the east, above Teton Canyon, with beds dipping to the west at about 5°. The shelf is one-third, to one-half mile wide and is bounded on the west by high cliffs of Bighorn Dolomite and the Darby Formation. Several caves, sinking creeks and other karst features occur on the shelf.

PLATE 28 — Elaborate rope rigging and technical equipment are necessary to enter this pit, the Pit Under the Boulder. (Photo by Chris Hill)

Most of the water that sinks on the Death Canyon Shelf resurges in the canyon to the east in springs immediately below the shelf. However, on the Teton Shelf, two sinking streams flow away from the canyon to the east and rise in springs several miles northwest. This relationship was demonstrated in 1973 and 1974 by Medville and others when they put fluorescein dye in the stream entering Devilish Pit (197) and into a sinking stream high on the shelf. The dye rose again four and six miles respectively to the northwest in the Eddington Canyon Spring. This spring is 1650 feet lower than Devilish pit and 2200 feet lower than the stream sink. The spring is still apparently in the Death Canyon Limestone which dips to the northwest.

The following caves and pits (194-200) were discovered by Charlie Plantz in 1971 and were explored by Fred Behm, Doug Medville, Frank Binney, Bill Stone, Chuck Hemple, Charlie Plantz and others from July 1972 through 1974.

STONY BOTTOM PIT — 194

LOCATION: Grand Teton Quad.
ELEVATION: 9,840 ft. (3,001 m.)
FORMATION: Death Canyon Limestone
OWNER: USNPS

DESCRIPTION: This pit, developed in the Death Canyon Limestone, is located at the outer end of the Teton Canyon Shelf, 500 feet east of the Teton Crest Trail just before the trail drops over the Sheep Stairs. The pit is one of many developed on this end of the shelf, not all of which have been explored. The pit trends along a joint (N20°E) and has an entrance drop of 60 feet. Below this drop, a second 90-foot drop leads back under the entrance pit. At the base of this drop a short horizontal passage loops around, rejoining the base of the pit. Another 30-foot drop leads down from the base of the 90-foot drop and a 2' x 3' passage leads from there. This passage serves as a drain for the entrance shafts. It can be followed for 150 feet to an end in clastic fill. This cave requires rope. Experience with rigging techniques and technical equipment is a must.

PIT — 195

LOCATION: Mount Bannon Quad.
ELEVATION: 9,040 ft. (2,757 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This pit is one mile southeast of the Devil's Stairs, about 400 feet from the escarpment to the east. It is just north of a canyon cut by a tributary of Teton Creek. The pit is dry, 30 feet deep and ends in rock choke.

About 1000 feet southeast of this pit, a third of the stream's water sinks into joints on the east side of the streambed. This water was traced by Medville in 1974 to the spring at the top of the Death Canyon Limestone in Eddington Canyon, 2200 feet lower than the sink and six miles downdip to the northwest.

DIABOLICAL PIT — 196*

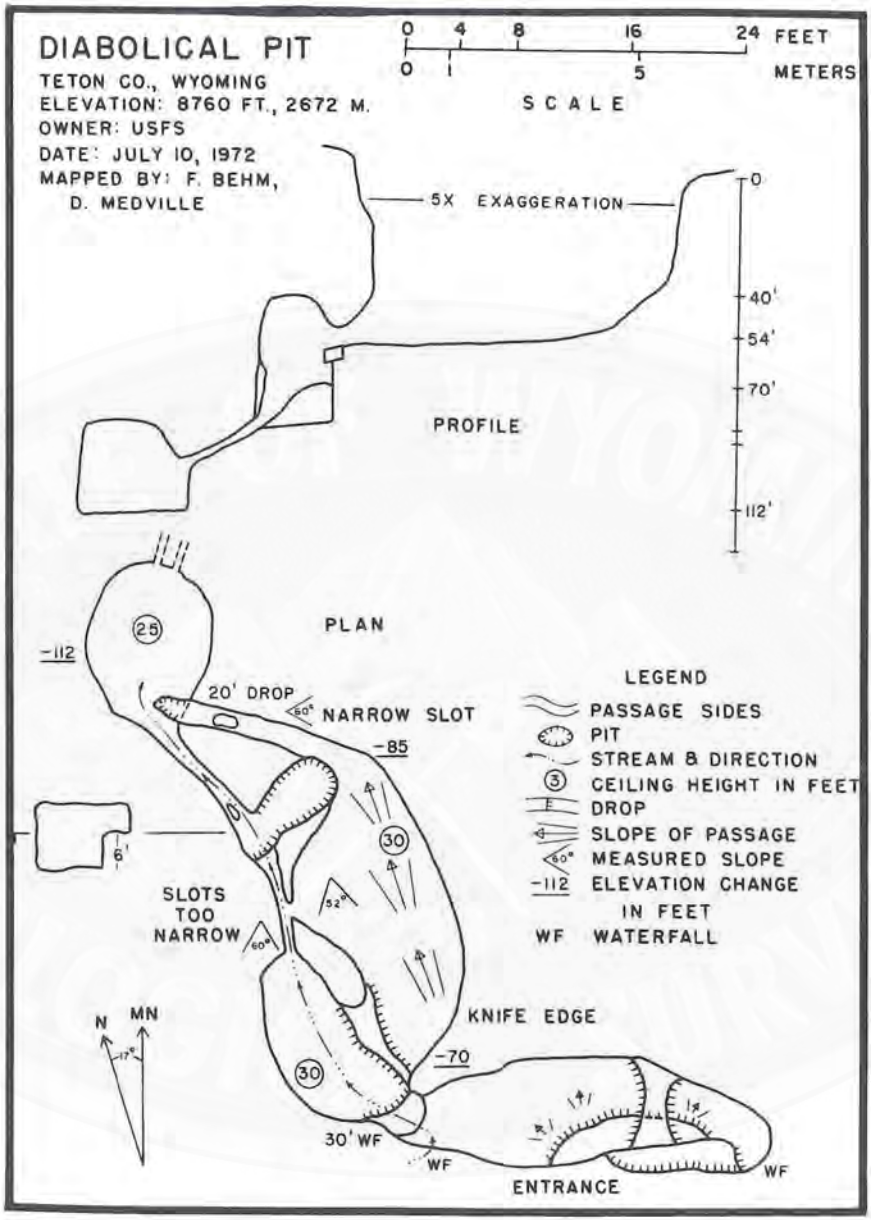
LOCATION: Mount Bannon Quad.
ELEVATION: 8,760 ft. (2,672 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: The largest in the Teton Canyon Shelf, this cave is located one-half mile south of the top of Devil's Stairs and about 400 feet west of the trail. The entrance is a pit 20 feet long, ten feet wide and 54 feet deep. Water enters from the surface and from various points along the west wall. Ten feet below the surface is a large ledge with two holes dropping to the base of the pit. From here, water flows north over the lip of a second pit, 30 feet deep.

Twenty feet down and a few feet to the right (facing the drop) a knife-edged projection cuts across the passage. The passage descend 40 feet, on a steep slope, to a saddle, under which the cave stream flows.

To the right of the saddle, a narrow squeeze descends to a third pit, 20 feet deep, terminating in a dome. The cave stream flows from the dome in narrow joints three inches wide.

The total depth of this dangerous cave is 112 feet, the water temperature was 36°, and the air temperature was 37°. Exposure gear (wet suits, wool clothing, etc.) is necessary because there is no way to avoid the water when making the second drop.



DEVILISH PIT — 197

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: The cave is 400 feet west of the top of the Devil's Stairs. On the Mount Bannon Quadrangle, a stream is indicated flowing along the shelf and down the Devil's Stairs. The stream actually sinks into a cave about 1000 feet from the edge of the shelf. It falls eight feet into an entrance 6' x 2'. A narrow passage goes for 40 feet to where it becomes wide enough to turn around in; the passage continues as a stream course one foot high and six inches wide.

Fluorescein dye placed in the cave stream emerged less than 72 hours later at Eddington Canyon Spring, 1650 feet lower and four miles northwest.

DRY HOLE — 198

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This is a small, dry pit 50 feet north of Devilish Pit (197) with no leads at its bottom.

T CAVE — 199

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This cave is 150 feet north of Devilish Pit (197). The entrance is a partially snow-filled pit, six feet long, two feet wide and 20 feet deep. A "T" intersection is 20 feet in. To the right, the passage ends at a pool, after ten feet. To the left, the passage continues downslope as a narrow slot. A stream was heard (probably the same stream as in Devilish Pit) but could not be reached because of the narrow passage.

SNOWFIRE PIT — 200

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: The pit is beneath a snow-filled sink, 180 feet north of Devilish Pit (197). It is 12 feet deep with no passage at its base.

Medville and others spent the better part of two days trying to get into it. They first tried building a fire on the snow above it in a futile effort to melt the snow. They then dug a 6 foot trench in the snow from the edge of the snow patch which was successful; but the pit wasn't.

PIT — 201

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone

OWNER: USFS

DESCRIPTION: The entance is a four foot long, six to eight inch wide joint in a sinkhole, 300 feet north of Devilish Pit (197). Three feet below the entrance, the joint widens to two or three feet and drops approximately 15 feet more. A stream enters a passage below. This passage soon becomes too small to follow.

PIT — 202

LOCATION: Mount Bannon Quad.
ELEVATION: 8,600 ft. (2,623 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: About 1000 feet north of this series of caves, another stream sinks into limestone blocks. An afternoon was spent excavating the joint into which the stream flows. This joint is 15 feet deep and one to two feet wide. It becomes very narrow at its base. Beyond this, the elevation of the shelf rises above the Death Canyon Limestone, narrowing and finally becoming a mere shadow of its former shelf.

FOSSIL MOUNTAIN ICE CAVE — 203* (IDAHO FALLS ICE CAVE, TETON ICE CAVE)

LOCATION: Mount Bannon Quad.
ELEVATION: 9,200 ft. (2,806 m.)
FORMATION: Madison Limestone
OWNER: USFS

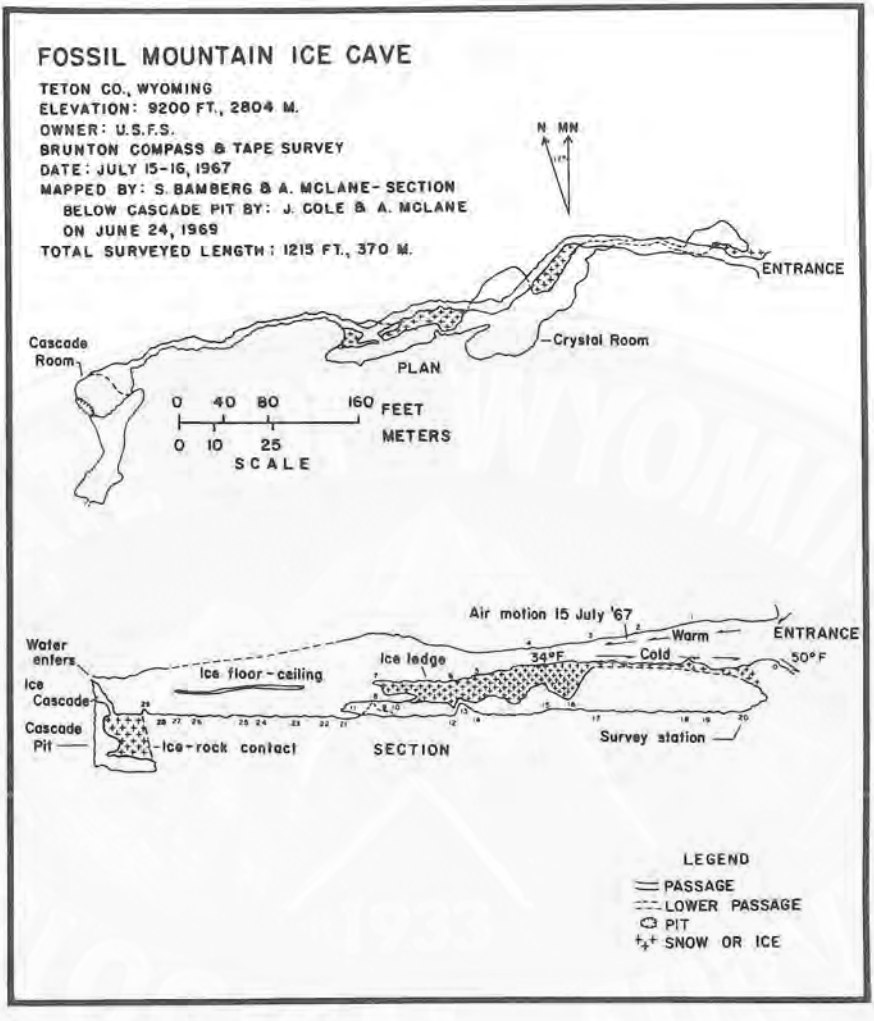
DESCRIPTION: The entrance to this cave is behind a large pinnacle of talus, on the southwest wall of Darby Canyon. The entrance is a wide fissure or canyon passage that leads into a small room with ice speleothems.

The canyon passage continues at the back of this room, floored with ice; the walls are coated with fine sparkling ice crystals. A pit is soon reached; it drops 15 feet to one passage and 25 feet to a lower passage. The upper passage leads downward over ice floors to a large room with a pit 40 to 80 feet deep. The lower passage leads to a series of rooms with ice crystals and speleothems. Ice deposits are developed and maintained by a delicate balance of temperature and moisture within the cave system. Electric lights should be used when visiting such caves because they do not produce as much heat as other types of light. A minor rise in temperature could destroy this delicate balance. Groups visiting caves like this shold be kept at a minimum. Proper climbing and ice equipment and warm clothing should be used in such caves.

NOTE: Extensive melting in the Frost Room due to visits by cavers was noted in July 1975, and suggests that traffic in the cave should be restricted. Please avoid visiting this cave.

BRAMBLE CAVE (TRIPLE C CAVE) — 204

LOCATION: Mount Bannon Quad.
ELEVATION: 9,200 ft. (2,806 m.)



FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: This cave, consisting mostly of crawlways, is on the southwest wall of Darby Canyon, between Fossil Mountain Ice Cave (203) and Wind Cave (206). The cave floor looks like it was a stream bed with the direction of flow into the cliff. This suggests a vadose origin for this 100-foot long cave. There is some development of popcorn on the walls.

RAINBOW ICE CAVE (DOME CAVE) — 205

LOCATION: Mount Bannon Quad.
ELEVATION: 9,000 ft. (2,745 m.)

FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This cave is on the southwest wall of Darby Canyon between Wind Cave (206) and Fossil Mountain Ice Cave (203). The 200-foot passage is of walking height. On the north side of the passage are two domes, one near the entrance and the other about 100 feet back. Small ice speleothems and some ice crystals were observed on the walls in July.

WIND CAVE — 206

LOCATION: Mount Bannon Quad.
ELEVATION: 8,800 ft. (2,684 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: The entrance to Wind Cave (Pl. 29) is one of the most impressive in Wyoming. It is a 75-foot high, 30-foot wide opening on the western wall of Darby Canyon. A stream issuing from the cave cascades down the cliff beneath the entrance. This stream enters the cave through breakdown a short distance into the cave. The cave is floored, through its 1000-foot length, with breakdown. The breakdown rises nearly to the flat ceiling 250 feet from the entrance. The remaining 750 feet of passage is large enough to walk upright through.

TERRACE CREEK CAVE — 207*

LOCATION: Mount bannon Quad.
ELEVATION: 7,800 ft. (2,379 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 300 ft. (92 m.)
DESCRIPTION: The following cave descriptions (207, 208) were provided by Doug Medville.

Terrace Creek flows into Darby Creek in the canyon immediately west of the canyon where Fossil Mountain Ice Cave (203) occurs. Terrace Creek Cave is three-fourths mile south of Darby Creek and nine-tenths mile southeast of the Darby Girls' Camp. A stream flows from the entrance, which is about 3' x 10'.

The cave passage can be followed 50 feet to a room on the west side of the passage. Twenty-five feet beyond this, on the east side, is a short drop into an adjoining room that contains part of the cave stream. The stream passage siphons upstream blocking further exploration. The cave was mapped in July 1972.

TERRACE PIT CAVE — 208

LOCATION: Mount Bannon Quad.
ELEVATION: 9,800 ft. (2,989 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This pit is in the southwest corner of the limestone pavement, near the head of Terrace Creek. The entrance is a large joint align-

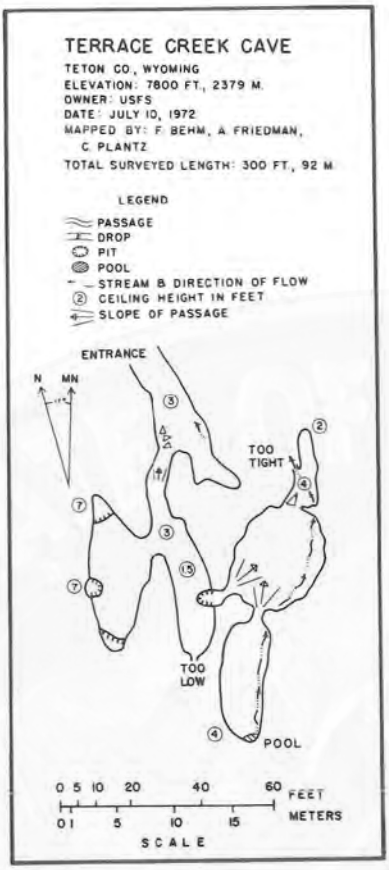


PLATE 29 — A beautiful panorama lies beyond this joint controlled fissure entrance to Wind Cave in the Tetons. (Photo by Wayne Sutherland)

ed along the strike (230°). The joint is five feet wide, 20 feet long and drops 63 feet, where it becomes ten feet wide and 64 feet long. At its western end, a downward sloping passage leads to a second drop. This drop leads to a room at least 50 feet wide whose floor slopes down to a large central shaft, 25 feet wide and 141 feet deep. The shaft has a waterfall in its lower portions. At the bottom of this drop, another drop of 20 feet leads to a breakdown blockade, preventing further exploration. The total depth of the cave is 233 feet.

This cave is very dangerous and should be attempted only by experienced cavers with the proper technical equipment. The cave was explored and mapped in 1974 by Frank Binney, Bill Stone, and Steve Ward.

FRED'S MOUNTAIN FISSURE PIT — 209

LOCATION: Granite Basin Quad.
ELEVATION: 9,150 ft. (2,791 m.)
FORMATION: Bighorn Dolomite
OWNER: USFS

DESCRIPTION: This pit is located on a shelf of Bighorn Dolomite on the east side of Fred's Mountain. It is a fissure, two feet wide and 15 feet long, that can be downclimbed for about 30 feet. At this point the fissure becomes narrower and further descent requires a rope. The total depth of this pit is estimated at 80 to 100 feet. Another pit about 25 feet deep is located 300 feet to the west.

BEARD'S WHEAT FIELD PIT — 210

LOCATION: Granite Basin Quad.
ELEVATION: 9,010 ft. (2,748 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This pit, located near the center of Beard's Wheat Field, is estimated to be at least 40 feet deep but was not dropped. The pit begins as a fissure. It becomes more rounded with depth, suggesting development by more water than was involved in the formation of the other pits and cracks in the area. A cairn was built near the pit.

Beard's Wheat Field is a west-facing slope formed on the Death Canyon Limestone (dipping 9° west). It is bordered on the northeast by South Leigh Creek Canyon and on the west by cliffs of Bighorn Dolomite and Darby Formation. A stream flows along the western edge of the area. Most of Beard's Wheat Field south of the pit has been checked for caves. The area north of the pit has not been checked but it looked like it might contain some good leads.

BATTLESHIP MOUNTAIN CAVE — 211

LOCATION: Grand Teton Quad.
ELEVATION: 9,760 ft. (2,977 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This description was provided by Doug Medville through personal communication. The entrance to this cave is at the base of a Death Canyon Limestone cliff, 2000 feet southeast of the Battleship Mountain summit. The entrance passage is six feet wide and 20 feet high and has a stream issuing from it. The stream volume in August 1974 was estimated at .5 cfs.

The cave consists of a single passage trending northeast through which the cave stream flows. This passage can be followed, occasionally through waist-deep pools, for 400 feet. At this point the ceiling is only 6 inches above the water so exploration could not be continued. A strong steady breeze blew from the passage and dripping water could be heard. Further exploration would require full wet suits because the water temperature was measured at 36°F. The recharge area for the cave is the limestone plateau west of Battleship Mountain. This area has not been investigated. The cave is probably one of the highest resurgences in the Rocky Mountains.

LOVE'S PIT — 212*

LOCATION: Granite Basin Quad.
ELEVATION: 9,080 ft. (2,769 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This feature is a spectacular collapse doline, 85 feet in diameter and 40 feet deep. The doline contains a small, permanent snowfield and is floored with breakdown. A small, tight, fissure passage winds eastward (updip) from the lowest part of the pit. No other passages were observed, however, the removal of several tons of breakdown might uncover a large passage.

Southeast of Love's Pit is a large bowl-shaped basin with a well developed limestone pavement on the Death Canyon Limestone. There are several large pits and many smaller ones in this area; the deepest is about 50 feet deep. None of these is known to have any more than a few feet of horizontal passage development. Two small streams near Love's Pit were observed to rise and sink within a few hundred feet.

MOSQUITO PIT — 213

LOCATION: Granite Basin Quad.
ELEVATION: 9,360 ft. (2,855 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This pit is developed along an east-west trending fissure, on the south end of Green Mountain. The pit is 50 feet deep and a 45 foot, free rappel drops to a snowfield at the bottom. A cairn was built near the eastern end of the pit.

34-FOOT PIT — 214

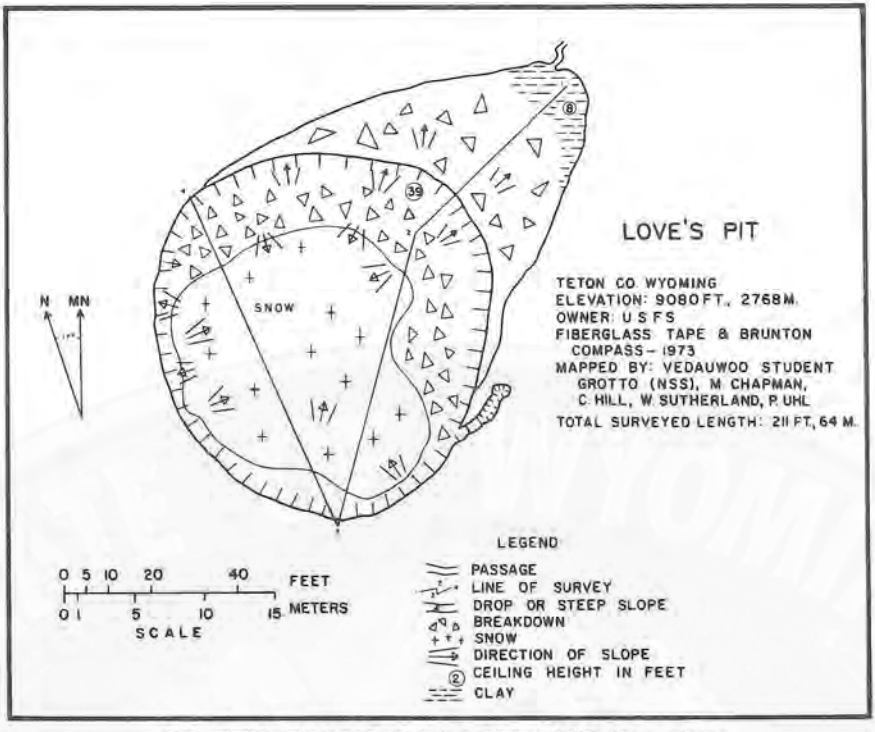
LOCATION: Granite Basin Quad.
ELEVATION: 9,400 ft. (2,867 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This is a 34 foot deep fissure pit several hundred feet east of Mosquito Pit (213).

GEOFF'S HOLE — 215

LOCATION: Granite Basin Quad.
ELEVATION: 9,420 ft. (2,873 m.)
OWNER: USFS

DESCRIPTION: This 32 foot deep pit is located in a large gulley several hundred feet northeast of Mosquito Pit (213). Although the pit appears to drain a large area and to take a considerable amount of water seasonally, no further passage development was observed. The walls are well rounded below the surface and the pit terminates at a gravel floor.



GREEN MOUNTAIN SNOW PIT — 216

LOCATION: Granite Basin Quad.
ELEVATION: 9,440 ft. (2,879 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This pit, located about 150 feet northeast of Geoff's Hole (215), has a 35-foot drop wihch can be downclimbed. The floor of the pit was covered with snow. No other passages were observed.

BUFFALO PIT — 217

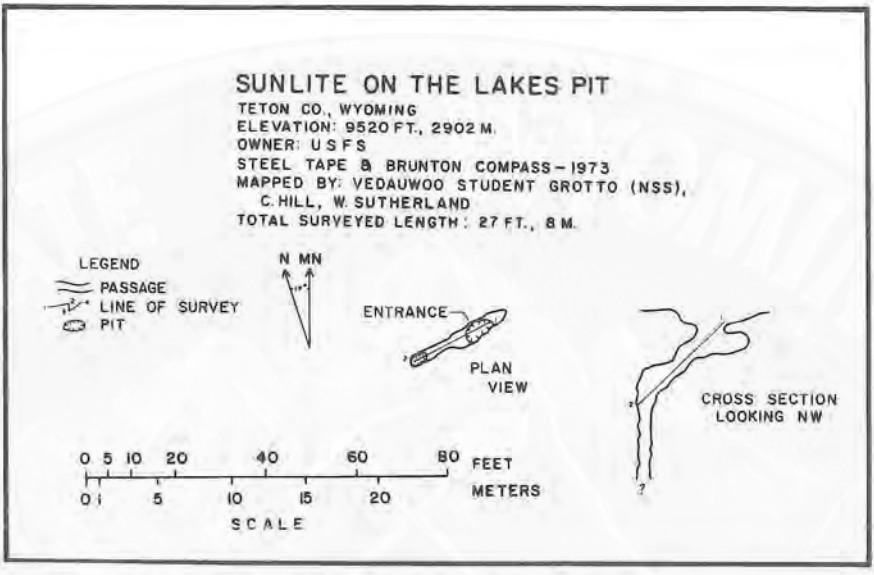
LOCATION: Granite Basin Quad.
ELEVATION: 9,440 ft. (2,879 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This is a small 40 foot pit located a hundred feet north of Green Mountain Snow Pit (216). Buffalo Pit is similar to Geoff's Hole (215) and was named for the buffalo skull found in it.

SUNLITE ON THE LAKES PIT CAVE — 218*

LOCATION: Granite Basin Quad.
ELEVATION: 9,530 ft. (2,907 m.)

FORMATION: Death Canyon Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 27 ft. (8 m.)
DESCRIPTION: This fissure pit is about 100 yards northeast of Buffalo Pit (217) and about 100 yards downslope from a large, round, snow-filled doline. The pit entrance is in a small doline floored with limestone blocks. It can be descended for 15 feet. A steeply sloping, breakdown floored passage leads down another 15 feet where the cave becomes too tight for further exploration.



TWO ENTRANCE CAVE — 219

LOCATION: Ranger Peak Quad.
ELEVATION: 10,080 ft, (3074 m.)
FORMATION: Madison Limestone
OWNER: USFS or USNPS
DESCRIPTION: This description and the two following originate with Dick Guilmette.

This cave is on a narrow ridge just east of peak, 10422 ft. It has two entrances, one on each side of the ridge. One entrance is 20' x 30', diminishing to a hands and knees crawl which can be followed for 50 feet where it emerges on the other side of the ridge. To the south of this cave are many sinks; however, no caves have been found in any of these.

SMALL CAVES — 220

LOCATION: Ranger Peak Quad.
ELEVATION: 10,080 ft. (3,074 m.)
FORMATION: Madison Limestone

OWNER: USFS or USNPS
DESCRIPTION: On the ridge to the north of peak 10,422, there are six or seven small caves, all of which end in breakdown.

STEAMBOAT MOUNTAIN VENT — 221

LOCATION: Huckleberry Mountain Quad. (15 minute)
ELEVATION: 7,800 ft. (2,379 m.)
FORMATION: Volcanics
OWNER: USFS
DESCRIPTION: The following information was provided by Dr. J. D. Love.

A hot air vent has been reported just west of the top of Steamboat Mountain in Grand Teton National Park. This vent may be the reason the mountain is named Steamboat. The vent was active several years ago (Dr. Love has a photograph showing a snow cave that was melted out by this feature) but recent attempts to locate it have failed. There may be a cave associated with this feature, or perhaps just a small crack.

The Gros Ventres

The Gros Ventre Range is older than the Tetons, dating from the Laramide Orogeny at the end of the Cretaceous Period. While it lacks the high sharp peaks of the Tetons, the relief within the range is considerable. These mountains are similar to many other ranges in Wyoming, having a Precambrian core and sediments on all sides. Considerable displacement has occurred along faults, notably along the southern flank.

The Madison Limestone is the most important cave former in this area, although the Death Canyon Limestone also exhibits many karst features. Development of alpine karst is extensive in some areas, following patterns similar to the Tetons, but large caves in the Gros Ventres are generally associated with sinking streams at lower elevations.

Enos Lake (on the east side of Jackson Hole) is an area of shattered, chaotic limestone and may be the result of collapse into a large cave or cavern system.

THE STINKPOT CAVE — 222*

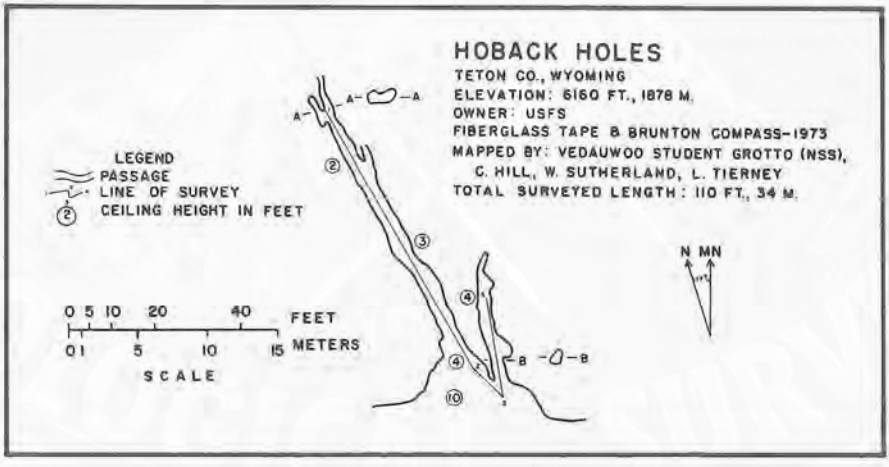
LOCATION: Camp Davis Quad.
ELEVATION: 6,140 ft. (1,873 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 150 ft. (46 m.)
DESCRIPTION: The following description was provided by Doug Medville through personal communication in 1972.

"In the process of widening US 189 through Hoback Canyon, the construction crew opened up a cave next to the roadbed. The entrance was located about 300 feet away from a large sulfur spring that flows into the Hoback River, on the north side of the road. The entrance was a climbable pit, about 10 feet deep, which led to about 150 feet of cave. A strong odor of sulfur was found in one part of the cave and it may be possible to

dig into it from above the sulfur spring. The cave was explored and mapped by Allen Friedman and Fred Behm before the road crew filled in the entrance with an enormous rock and lots of dirt. The possible existence of a bacteria colony living in the sulfurous water of the cave was reported by Behm."

HOBACK HOLES — 223*

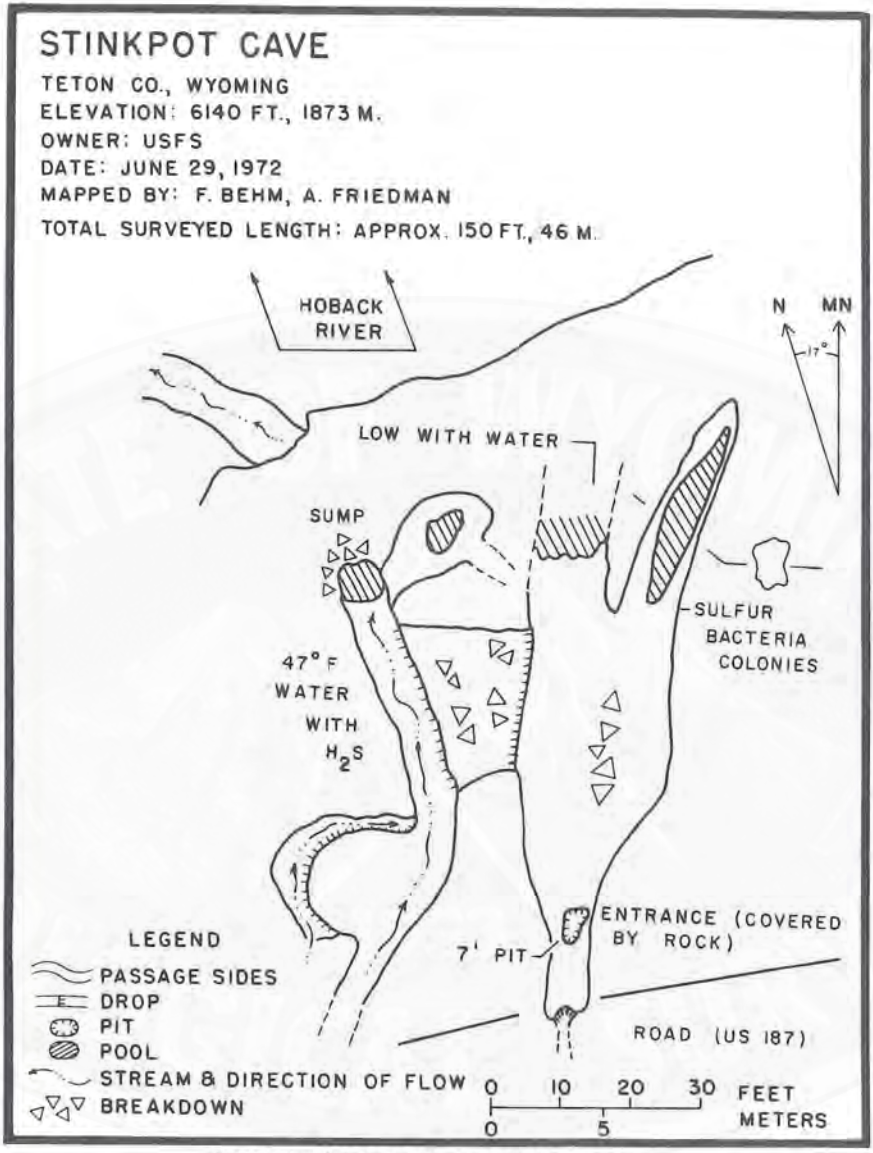
LOCATION: Camp Davis Quad.
ELEVATION: 6,160 ft. (1,879 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 110 ft. (34 m.)
DESCRIPTION: These two adjacent caves are located in the lower Hoback Canyon, north of the river along the old US Highway 287-189 roadbed. Several sulfur springs are active just below these caves on both sides of the river. Thermal water from these springs probably enlarged fractures or faults to form these caves and Stinkpot Cave (222).



BLUE MINER PITS — 224

LOCATION: Grizzly Lake Quad.
ELEVATION: 10,720 ft. (3,270 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This and the following descriptions, 224-228, are paraphrased from personal communication with Doug Medville in 1972.

Two pits occur on an eastern spur of Sheep Mountain, five miles southwest of the Red Hills campground. Investigation of these proved them to be 20 feet deep with no passage at the bottom.



SWIFT CREEK CAVES — 225*

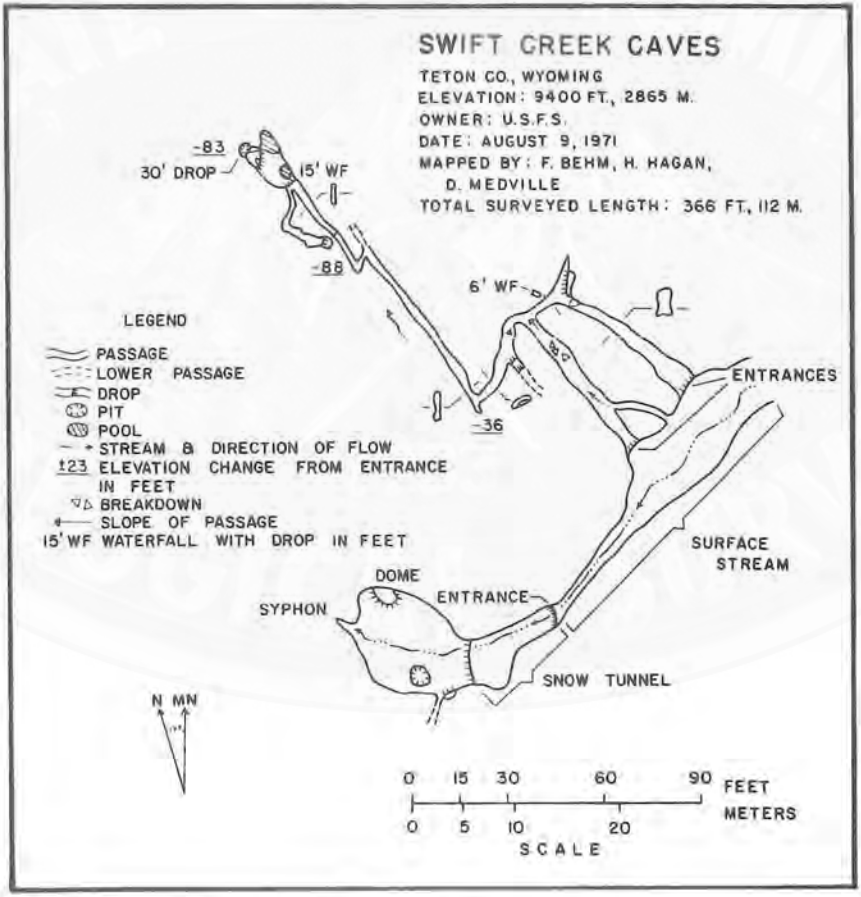
LOCATION: Crystal Peak Quad.
ELEVATION: 9,560 ft. (2,916 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 366 ft. (112 m.)

DESCRIPTION: Two caves are developed where the Pyramid Peak Fault crosses Swift Creek. The entrance to one, Lower Swift Creek Cave,

is beneath a snow tunnel in a vertical walled sink, 30 feet deep and 15 feet wide. Beyond the snow tunnel is a room 30 feet wide and high. A skylight in the middle of the room opens to the surface above. Several passages lead from this room, but they immediately terminate in frost-shattered limestone. The stream entering this cave sinks into these limestone blocks.

The three entrances to Upper Swift Creek Cave are 200 feet upstream from Lower Swift Creek Cave, in the western bank of the stream in vertically bedded Madison Limestone (strike 332 °). The lowest entrance, which takes part of the stream, is 3' x 4'. This drops into a passage 6' x 8'.

The second entrance is halfway between the other two, joining with the lower one within 20 feet of passage. The upper entrance, 30 feet upstream



from the lower, is one foot high and six feet wide. It leads to a passage 8' x 8', parallel to the lower passage. They join after 60 feet to lead north while passage dimensions alternate between high narrow passage and low tubular solution channels. Within 150 feet a side passage ascends a mud slope to a small room. The passage containing the cave stream continues north another 30 feet to a 15 foot pit which can be rigged using the small natural bridge over it. At the bottom of the drop, the stream sinks into breakdown at a dome 15 feet across and 20 feet high.

Two passages lead from this dome. One of them almost doubles back under the other. Three to four feet high and three feet wide, it slopes downward for 50 feet until ending in breakdown choke. The second,

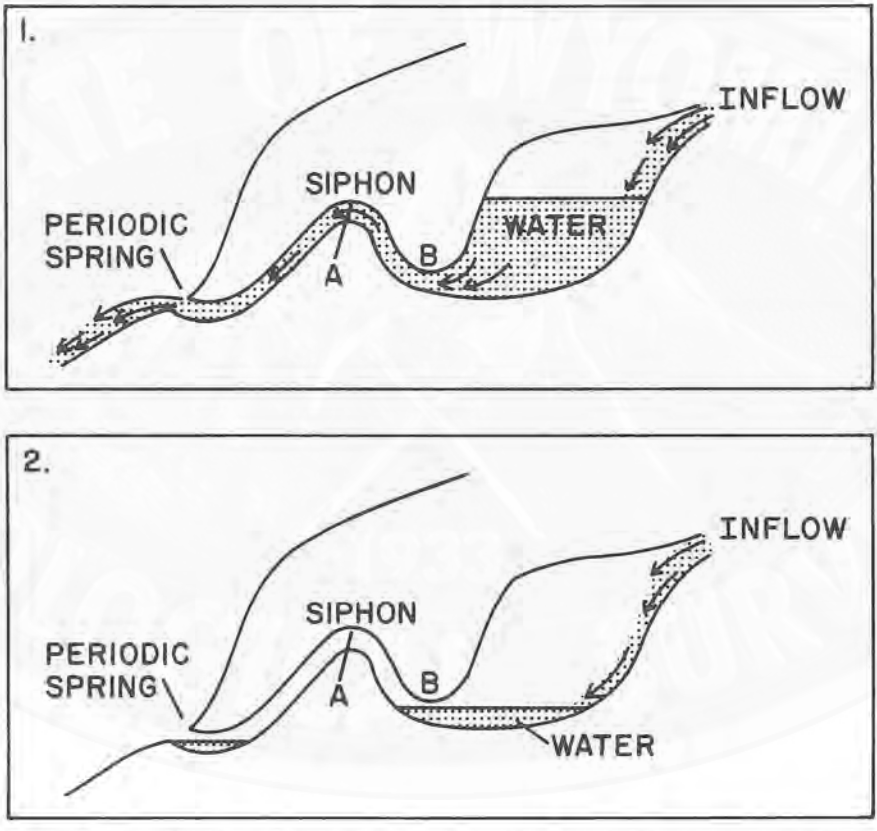


FIGURE 19 — The flow of periodic springs may be governed by a situation in which the inflow (1) causes the water level to rise above A, thus activating the spring. The flow through the siphon (2) ceases when the water level falls below B.

higher passage, on the far side of the dome six feet above the floor, is a very narrow slot sloping down at 80°. Eleven feet down is a ledge below which the slot widens, making a 20-foot free drop to the floor. This is the bottom of the cave; water falling over the upper waterfall emerges here and pools. The total change in elevation from the upper entrance to the lowest point in the cave is 94 feet.

The entrance is on the downthrown side of the Pyramid Peak Fault, where the branches of Swift Creek cut small gorges as they cross the fault. The cave is developed along joints paralleling the fault, trending 340° to 345°. No slickensides or other signs of slippage were observed in either cave. The cave stream apparently resurges about 1000 feet lower along Swift Creek, but it has not been dye traced.

GRANITE CREEK SHELTER CAVES — 226

LOCATION: Crystal Peak Quad.
ELEVATION: 7,800 ft. (2,379 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: These caves are at the bottom of the Madison Limestone cliffs on the west side of Granite Creek, about four miles upvalley from the Hot Springs swimming pool. One of the caves, directly below the Black Hole (227), is about 30 feet deep with an entrance 20 feet high and ten feet wide. The others have not been investigated but can easily be seen from the Granite Creek Trail.

THE BLACK HOLE OF GRANITE CREEK — 227

LOCATION: Crystal Peak Quad.
ELEVATION: 8,200 ft. (2,501 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: This large entrance, approximately 50 feet high and 20 feet wide, is located near the top of a cliff face high on the west side of Granite Creek. It is about five miles upvalley from the Granite Hot Springs swimming pool. The cliff below the cave is overhung, and the Madison Limestone is not suitable for climbing. To reach the entrance, a climb around the cliff and a rappel down to the entrance from above would be necessary and, as yet, the cave is unentered.

TURQUOISE LAKE CAVES — 228

LOCATION: Turquoise Lake Quad.
ELEVATION: 9,360 ft.; 2,855 m.
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: At the head of Granite Creek, about one-half mile north of Turquoise Lake, a branch of the creek flows into a small cave entrance. About 20 feet away is a pit, 20 to 30 feet deep. These caves were found by Charlie Plantz in 1971 and have not been entered.

TOSI CREEK BASIN CAVES — 229

LOCATION: Tosi Peak Quad.
ELEVATION: 9,160 ft. (2,794 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: The Tosi Creek Basin consists of several square miles of well-developed alpine karst on bare Madison Limestone. While there are hundreds of sinks in the basin and several pits up to 20 feet deep, no substantial caves have been found. A shelter cave at the lower end of the basin has an entrance six feet high and 20 feet wide with about 50 feet of passage inside. The basin is quite similar to the Mini Basin (230), although much larger. It is described in detail by W. R. Keefer (1963) and E. Werner (1974).

MINI BASIN SINKS AND CAVES — 230

LOCATION: Tosi Peak Quad.
ELEVATION: 9,850-10,200 feet; (3,004-3111 m.)
FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: This small karst basin, with abundant dolines and ponors, is developed in an area less than one mile square. The basin is closed downdip. The pre-karst drainage development was downdip to the east. Glaciation probably played an important part in eroding this slope to the Madison Limestone. The individual dolines and uvalas in this basin range from a few feet to several hundred feet in diameter. The deepest dolines are about 30 feet deep.

A small cave is developed in the eastern (downdip) end of one of the larger dolines. The cave slopes down steeply for about 40 feet into a fissure passage. Breakdown and clay block further exploration.

A large uvala, approximately in the center of the basin, is of special note. On its southeastern side there are a series of small fissure pits. The deepest of these drops 39 feet to a small stream. The stream passage is, perhaps, 15 feet long but too small to explore.

In the bottom of the uvala there are several ponors. One ponor, a small, round, beautifully formed pit three feet in diameter and eight feet deep, takes a small stream which flows east from there through a small, wet fissure. Despite its size, this stream passage could be explored by properly equipped cavers.

The Mini Basin shows well-developed paleokarst throughout, expressed by what seem to be steep-sided former dolines filled by the Amsden sandstones. These paleokarst dolines appear as circular patches on the basin surface, filled with cemented angular sandstone blocks. Several modern dolines may be developmentally related to these paleokarst dolines.

Karren forms are extensively developed throughout this basin. The classic alpine karst development here appears relatively recent and is still continuing. This compact karst area merits in-depth study, although it appears that no large integrated cavern systems have developed since glaciation.

DRY LAKES SINKS — 231

LOCATION: Tosi Peak Quad.
ELEVATION: 9,780 ft. (2,983 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: Two lakes shown on the Tosi Peak Quad. both occur in closed depressions. The lower, eastern lake should be marked as an intermittent lake because, when visited on July 17, 1973, it was only slightly swampy. There is evidence that, when filled, this lake has surface drainage east to Tepee Creek. However, the lake also has internal drainage through several ponors on the lake bed. Several of these ponors were taking small streams at the time.

The upper lake is probably a permanent lake but it also has internal drainage. The lake is fed by snowmelt from snowbanks along the cliff to the south. At times of high water the lake probably drains into the sinks upvalley to the west.

HODGES PEAK PIT — 232

LOCATION: Doubletop Peak Quad.
ELEVATION: 10,160 ft. (3,099 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: "This is a 25-foot deep, dead bottom pit one-half mile northwest of Hodges Peak. On the topographic map, a number of sinkholes are shown above the words Gros Ventre. These sinks are in talus on a shelf and are not of a solutional origin. The entire shelf was hiked in 1971." (personal communication, Doug Medville, 1972).

FOGGY MOUNTAIN BREAKDOWN CAVE — 233

LOCATION: Doubletop Peak Quad.
ELEVATION: 10,040 ft. (3,062 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This cave lies within a large, kidney-shapped uvala which contains two ponors. The upper one was taking a great deal of water when visited in mid-July. When dry, or with some entrance modification, a large cave might be discovered here.

The lower ponor was dry when visited and entrance modification opened a small cave. The narrow passage dropped for over 30 feet through a small pit, beyond which exploration was impossible. These ponors are 100 feet northwest of the Shoal Creek fault.

A small lake lies east of Foggy Mountain Breakdown Cave, in a deep closed depression, and appears to have only internal drainage. Soluble rocks are exposed on both sides of the Shoal Creek fault, just south of the lake. If an entrance could be found in this area, the possibility is great for a very deep cave. A small valley observed south of the fault was not investigated, although it was probably developed in the Madison Limestone.

WEST DELL CREEK SHELF DOLINES — 234

LOCATION: Doubletop Peak Quad.
ELEVATION: 10,500-10,680 ft. (3,203-3,257 m.)
FORMATION: Death Canyon Limestone
OWNER: USFS

DESCRIPTION: This area lies southwest of the main ridge of the Gros Ventres, high above the granitic Dell Creek Basin. The Death Canyon Formation dips under the ridge to the northeast. The shelf, approximately one-fourth mile wide, has a low relief of small, rounded hills and intermediate dolines. They range from several feet to several hundred feet in diameter. Most of the dolines are clay-choked but several have exposed bedrock in their bottoms. None of these would permit human entry but the area was not inspected closely.

Many of the smaller dolines showed curvilinear patterns of pebbles converging in the sinking point. Small streams flowed into several of the larger sinks.

DELL CREEK CAVES — 235

LOCATION: Doubletop Peak Quad.
ELEVATION: 9,000 ft. (2,745 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: A number of holes in a Madison Limestone cliff, one-half mile west of West Dell Falls, were reported by Dr. MacLeod at the Granite Creek Ranch.

CLEAR CREEK CAVE (DRY CREEK BLIND VALLEY) — 236

LOCATION: Doubletop Peak Quad.
ELEVATION: 10,000 ft. (3,050 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: A large tributary to Clear Creek flows east from between Triangle and Doubletop Peak, ending in a large blind valley at about 10,000 feet. Three major sinking points occur in this blind valley. The first two are large deep pools with eddies in them, the third is developed along a set of enlarged intersecting joints. This ponor, if not underwater, would be large enough for exploration. The ponor was visited in mid-July, but, by the end of August or early September, it might be dry. A large cave probably drains this blind valley.

About one-half mile northwest of the blind valley, near 10,250 feet, a lake is formed in a closed depression. Several small ponors lie east of the lake.

DOUBLETOP PEAK BASIN — 237

LOCATION: Doubletop Peak Quad.
ELEVATION: 10,000-10,600 ft. (3,050-3,233 m.)

FORMATION: Bighorn Dolomite and Darby Formation
OWNER: USFS
DESCRIPTION: This large basin lies southeast of Doubletop Peak. The area was only cursorily examined, but that was enough to determine that fissure pits abound. A stream flowing from snowfields at the base of Doubletop Peak has many sinking points along it. It finally disappears in a large uvala at about 10,000 feet elevation . The valley along the east side of this basin has many dolines and uvalas giving it the aspect of a lunar landscape.

SHOAL CREEK CAVE — 238

(See map on Sheet 1)

LOCATION: Doubletop Peak Quad.
ELEVATION: 9,360 ft. (2,855 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 875 ft. (267 m.)
DESCRIPTION: The following descriptions (238-240) were provided by Doug Medville.

From the north, a side branch of Shoal Creek enters a 30 foot deep, 40 foot wide sink and plunges into an entrance 15 feet in diameter. The entrance is partially covered by permanent snow. The first 20 feet of the cave passage is 15 to 20 feet wide and three to four feet high with a considerable amount of frost-shattered limestone on the floor.

Beyond this, the passage becomes high and narrow, ranging from 15 to 25 feet high and between one and four feet wide, for 800 feet. The passage follows a series of closely spaced parallel joints set to the south-southeast with occasional offsets to the east.

Two unclimbable waterfalls are encountered at the end of the passage. The first can be rigged using a rock flake on the right wall (facing into the cave). At the second, a bolt has been placed on the right wall, about six feet out from the top of the falls. At the bottom of the waterfalls, the nature of the cave changes. It continues as a room 50 to 60 feet high, 50 feet across and 80 feet long. At the far end of the room, the stream reappears in a passage 12 feet wide and eight feet high, which slopes down at a 20° angle for another 150 feet. At this point, 170 feet below the entrance, the stream can no longer be followed. Above the two waterfalls and the large room, a chimney leads to a large, muddy upper room, about the same size as the lower one. It ends in a breakdown choke.

This high altitude cave is dangerous because it is wet and has several pits in it. Proper technical equipment and clothing are required in the cave.

The cave is developed in the upper part of the Madison Limestone and is located on the Shoal Creek fault. Major passage development is along joints parallel to the fault. The resurgence of the cave stream is three-fourths mile southeast of and 720 feet lower than the entrance; this spring lies along the main axis of the cave.

SHOAL CREEK CAVE #2 — 239

LOCATION: Doubletop Peak Quad.
ELEVATION: 8,800 ft. (2,684 m.)

FORMATION: Madison Limestone
OWNER: USFS
DESCRIPTION: A cave is reported about one-half mile east-southeast of Shoal Creek Cave (238). This unentered cave is on the west bank of Shoal Creek where it crosses the fault onto the Madison Limestone. The three to four foot high entrance is above the stream level and takes water in the springtime.

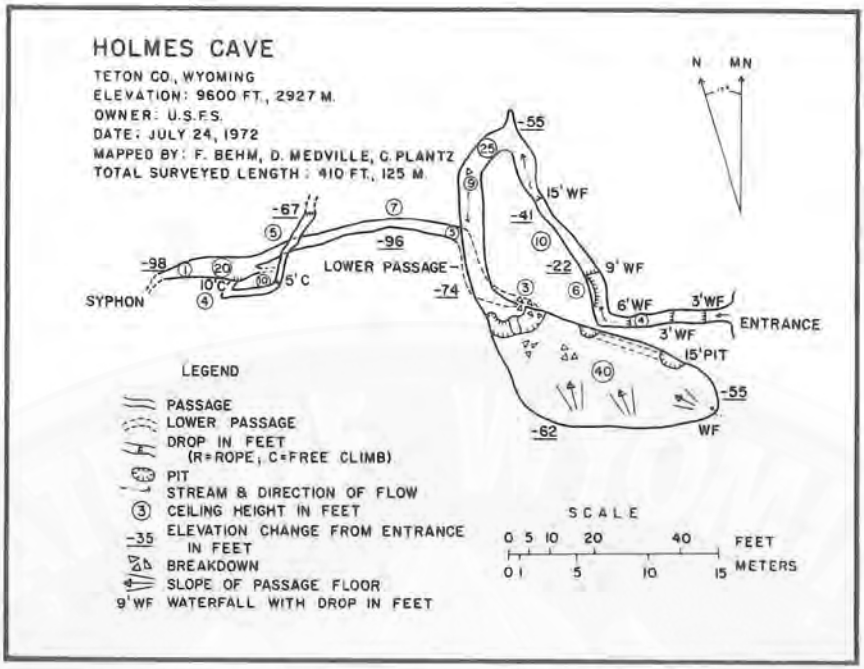
HOLMES CAVE — 240*

LOCATION: Togwotee Pass Quad.
ELEVATION: 9,600 ft. (2,928 m.)
FORMATION: Madison Limestone
OWNER: USFS
TOTAL SURVEYED LENGTH: 410 ft. (125 m.)
DESCRIPTION: This cave has been known since 1898 when it was discovered by E. B. Holmes and a group of friends. Holmes mapped the cave September 6th-9th, 1905. A photocopy of their map can be seen in the Jackson Hole Historical Museum in Jackson.

The cave is entered in an open ,grassy meadow which actually is a large sink, 1400 feet long and 800 feet wide. Several streams flow into the sink, joining near the entrance before flowing into the cave. The Madison Limestone strikes 282° and dips 30° to the south.

The cave entrance is at the base of the limestone exposed on the north side of the sink. The cave stream follows the four foot high, three foot wide entrance passage down a 20° slope for 30 feet along the strike, going over three small waterfalls. The cave passage then turns north, where the stream flows updip, cutting a deep canyon in the process. The stream

PLATE 30 — This photo of the frost shattered entrance to Holmes Cave was taken in the late 1800's. (Photo courtesy of Wyoming State Archives and Historical Department)



flows over a nine foot waterfall (negotiable by shinnying down a log) and then drops over a 16 foot waterfall.

At the bottom of the waterfall, the passage is about ten feet wide and over 30 feet high; it leads west and then south, where the stream flows downdip. After 50 feet, the passage widens into the only large room in the cave. The majority of people who have been in this cave in recent years (if not all of them) have probably stopped here, for the cave stream flows along the north wall into breakdown. Beyond the breakdown, the passage doubles back under itself as a narrow walkway for 80 feet to a dome. On the wall here, about six feet above the stream, Charlie Plantz found an old piece of wood with Holmes' name on it, dated in the late 1800's.

To the right of the dome, the cave stream flows for another 20 feet as a belly crawl, finally siphoning. To the left of the dome is a climb to a dry narrow passage. It continues upward and has not been followed to its end.

Dr. J. D. Love reports that tropical swamp debris, found almost at the mouth of the cave, was determined to be 50 million years old. Crater Lake to the north may have formed as a result of collapse of buried karst in the Madison Limestone underneath the volcanic rocks exposed on the surface.

The Wyomides

The Wyomides are a north-south trending group of sub-parallel folded mountain ranges. They are bounded on the east by west-dipping thrust faults.

The northern end of these ranges have stratigraphy similar to the

Tetons and the Gros Ventre. The stratigraphy changes gradually to the south and is very different in other parts of these ranges. The Wyomides are separated from the Tetons and Gros Ventres by thrust faults.

The tremendous thickness of carbonates in this area is broken by faults. It is possible that this faulting has shattered the carbonates to such a degree that extensive cavern development cannot occur; there have been very few reports of major caves or other karst features in this area. The cave survey was unable to investigate this large and interesting area.

PERIODIC SPRING — 241

LOCATION: NE of Afton
ELEVATION: Unknown
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: Information in this description includes material from Barrette, 1947.

During the dry summer months, this spring, located seven miles east of Afton, alternately flows for periods of 18 to 20 minutes. A definite sucking and blowing of air accompanies these changes. During times of high water, the intermittent flow can be observed by noting a slight increase or decrease in the volume of water flowing in Swift Creek.

The spring probably works through the action of a siphon. Water flows into an underground chamber until the water level is high enough to trigger flow through the siphon. Once flow begins it continues until the chamber is drained below the siphon level. The chamber must then refill and, until the water is again high enough, the siphon is inactive. This cave should not be entered as it floods every 18 minutes.

PLATE 31 — This photograph, from the late 1800's, was taken in the Holland Chamber of Holames Cave. (Photo courtesy of Wyoming State Archives and Historical Department)

Chapter 7
Miscellaneous

This chapter describes caves and other karst features located outside the boundaries established for the other regional divisions.

CAVE FALLS CAVE — 242

LOCATION: Grassy Lake Reservoir Quad.
ELEVATION: 6,240 ft. (1,903 m.)
FORMATION: Tertiary volcanics
OWNER: USNPS
DESCRIPTION: This cave is marked on many road maps as just inside the Yellowstone National Park boundary. It actually is a small rock shelter developed on the east bank of the Falls River just below Cave Falls. It appears to occur in volcanics.

DEVIL'S KITCHEN CAVE — 243

LOCATION: Mammoth Quad.
ELEVATION: 6,740 ft. (2,063 m.)
FORMATION: Quaternary or Recent tufa deposits
OWNER: USPS
DESCRIPTION: This cave lies west of Mammoth Hot Springs, developed in tufa deposited by the thermal waters. This tufa is probably $CaCO^3$ derived from the underlying Madison Limestone through solution, by the rising thermal waters. The cave is a fissure 20 feet long and 20-25 feet deep. At the bottom, the fissure is about 40 feet long and ten feet wide.

MacCARTNEY'S CAVE — 244

LOCATION: Mammoth Quad.
ELEVATION: 6,240 ft. (1,903 m.)
FORMATION: Tufa deposits
OWNER: USPS
DESCRIPTION: This cave may be one of six sinkholes in the former military parade grounds in Mammoth, Wyoming. The sinks may have a system of interconnected underground passages but this has not been established. Vapors rising from the sinks may be noxious.

Several other caves are reported to occur around the Mammoth Hot Springs area, including Cupid's Cave, the Grottoes, Poison Cave and the Stygian Caves. There are also two sinking creeks, Clematis and Primrose creeks, on the western side of town. An intermittent spring is reported five miles south of the Dragon's Mouth.

HORSETHIEF'S CAVE — 245

LOCATION: Green River Quad.
ELEVATION: 6,200 ft. (1,891 m.)
FORMATION: Green River Shales
OWNER: Private
TOTAL SURVEYED LENGTH: 200 ft. (61 m.)
DESCRIPTION: This cave is located two miles west of Green River. The entrance is a fissure in a cliff of shale or marl. The cave is about 200 feet long with no side passages.

Appendix A

Caving Techniques & Safety

After reading this bulletin many people may wish to go caving. The best way to learn is by contacting experienced cavers, such as members of the Vedauwoo Student Grotto in Laramie or the NSS national office. Members of these groups are well versed in the proper techniques of safe and conservational caving.

This appendix will briefly outline some aspects, techniques and considerations necessary for good and safe caving.

NEVER CAVE ALONE! Visits to any cave should be made with a group of about four people. A group this size is ideal from the standpont of safety and keeping the group together. In case of an accident, one person can stay with the injured person while the other two go for help. Groups larger than four are often hard to manage and, as a whole, tend to be more reckless.

ALWAYS CARRY THREE SOURCES OF LIGHT! Each member of a group should carry three light sources. A carbide lamp, a flashlight, and candles are the most commonly employed combination.

Throughout this bulletin *conservation* of the cave environment is stressed as an essential aspect of caving. Anything taken into the cave should be taken back out. Several caves in the state have had every square inch of their floors trampled. When trails exist, a conscious effort to stay on them will conserve the natural floor for other visitors.

NEVER REMOVE ANY NATURAL MATERIALS FROM THE CAVE! Speleothems, animals, fossils, bones, archeological materials or anything else that occurs naturally in the cave or has historical significance should remain in the cave.

CAVING IS DANGEROUS! In many caves flooding is a potential danger with possibly fatal consequences. Before entering a cave the weather conditions in the area should be checked. If rising water levels or a sudden increase in muddy water is noted, cavers should exit immediately! If escape is impossible cavers should go to the highest accessible area in the cave.

In large cavern systems fatigue may become an important factor. If any member of a party becomes fatigued, the entire party should leave the cave. No one who feels ill should enter a cave.

In cold, wet caves (many of which occur in Wyoming) hypothermia may become a deadly problem. This is the condition of sub-normal body temperature that results from extended exposure to the cold and damp. Persons suffering hypothermia should be kept warm and dry and, if possible, given warm liquids. Further information may be gained from standard first aid books.

Warm clothing should be worn into most Wyoming caves. Several caves further require specialized clothing such as wet suits.

Caves are strange and alien places and it is often easy to become lost. The best way to avoid this is to take enough time when entering the cave. Stop often and look back to see what the cave will look like on the way out. File away distinctive features of the cave in your mind so you can recall them on the way out. A slow, cautious and alert caver is a safe caver.

Leaving a trail of string or reflective tape makers is not recommended as it involves picking up the junk on the way out.

IF YOU DO GET LOST, DON'T PANIC! If you left word on the surface as to where you were going and when you expected to be back, help will be on its way. If you didn't then you deserve your predicament.

Look carefully around you to see if there are any recognizable features. Or, if you can, retrace your path back the way you came until you find familiar territory.

If, after a logical search of the immediate area, you are still lost and without hope, sit down and wait! If you have any food conserve it and your lights. Try calling out every few minutes, but don't panic; help will be on its way. A calm and cool caver will live to see the sun again.

TECHNICAL EQUIPMENT is a must in many caves! No one should ever attempt to use technical equipment without proper instruction in its correct, safe and proper use. Much of this equipment is borrowed from mountain climbing. Most Wyoming towns have a few climbers around and most of these people are glad to teach beginners. However, only experienced cavers are versed in the application of this equipment to caving. Some items of technical equipment used by cavers are nylon ropes and slings, hardhats with chin straps, high topped climbing boots with lug soles, carabiners of the locking type, pitons and nuts and ascenders (Prussiks, Jumars or Gibbs). Don't buy equipment until you know what is good and how to handle it.

THINK! When caving, think safety! Never attempt anything which is dangerous or beyond the capabilities of anyone in your group. Think conservation. Remember that every visit to a cave destroys it, and try to make your visit as unnoticeable as possible.

Appendix B

Cave Mapping

Many persons become confused or "turned aound" in caves. The constant zig-zagging or gradual turning of passageways often leads to erroneous conclusions about the diretion of travel and the relation of the cave to surface features. The only way to make a cave stay where it belongs is to make an accurate map of it.

Surveying a cave may be done with varying degrees of accuracy and, when done with care and attention to detail, can be most helpful to speleologists.

The basic tools for surveying a cave are an accurate compass, a good tape measure, a pencil and a notebook. The procedure is very simple. A starting point or station is established and is designated station 1. A second station is then established on a direct line of sight from the first. The distance and compass direction from the first station to the second is determined.

The increase or decrease in elevation between the two points is recorded by measuring the inclination in degrees. If there is no elevation change between stations the inclination will be 0 degrees.

The distances to the right and left walls from the first station, while facing the second, are also noted. All of this survey data is entered in the notebook and a cross-section of the passage at each station (and at other points, if necessary for a complete picture) is sketched. A survey book is used for this. It would show the numbered survey points and approximate the directional variance between successive lines of sight. It should also show, accurately, the contours of the walls, pits, domes, speleothems, side passages, streams, pools, type of floor (sand, clay, bedrock, breakdown) and any other prominent features. The station to station survey is continued throughout the cave system linking all stations by compass directions and distances.

There are many things that can go wrong during this simple process and several hints are offered which may help to alleviate some problems. Compass, inclination, and distance readings should always be double-checked. When each piece of data is called out to the notebook recorder, he should repeat it as a double-check before recording it.

The recorder must make his entries as clearly as possible. The form of the numbers recorded can later become a source of confusion. For instance, the numbers four and nine may be easily confused, if not written clearly. When distances are recorded in feet and inches it is better to separate them by a decimal than with tic marks (as 9'11"), because 9 feet 11 inches may later be confused as 91 feet 1 inch.

On any leg of a survey, one person should use the compass and one person record and sketch. These jobs should not be exchanged in mid-course.

Once a cave survey has been completed and all the necessary data recorded, a map must be compiled from this information. Today, many maps are made by feeding the raw data into a computer and letting it do the calculations and plotting. The following is a description of "the old

LIST OF CAVE MAP SYMBOLS


MAGNETIC NORTH (MN), TRUE NORTH (N), AND DEGREES OF DIFFERENCE (16°)


PASSAGE


LOWER PASSAGE OR UNDERLYING PASSAGE


LINE OF SURVEY WITH SURVEY STATION NUMBERS (A,1)

SURVEY STATION NUMBER

DROP OR VERTICAL SECTION OF PASSAGE, 15R DEPTH OF DROP REQUIRING ROPE, 10C DEPTH OF CLIMBABLE DROP (BOTH IN FEET)

PIT, CLOSED DEPRESSION OR VERTICAL ENTRANCE, C OR R SAME AS DROP

17WF WATERFALL (WF) WITH DEPTH OF DROP IN FEET

CEILING HEIGHT IN FEET

ELEVATION CHANGE FROM ENTRANCE


DOME OR CHIMNEY IN CEILING


ENTRANCE ROOF LINE UNDER CLIFF OR OVERHANG


SLOPE IN DIRECTION OF ARROW, DEGREE OF SLOPE (30°)


STREAM, INDICATING DIRECTION OF FLOW


INCISION CAUSED BY STREAM FLOW


POOL


ICE OR SNOW


ICE COLUMN


NATURAL BRIDGE OR ROCK SPAN


CRYSTALS OR VEIN


BREAKDOWN AND ROCK FRAGMENTS


PEBBLES AND GRAVEL


SAND


CLAY, MUD OR OTHER FINE-GRAINED MATERIAL

STRIKE AND DIP IN DEGREES

AREA OF ACCOMPANYING CROSS SECTION

BONES


APPROXIMATE LODGE LOCATION


EXCAVATED AREAS

FIRE HEARTHS

FIGURE 20 — Typical cave map symbols.

seat of the pants" method, as not everyone has access to a computer.

The materials needed for drawing a cave map are paper, a sharp pencil, a protractor, a ruler and straight edge, the survey data and at least one member of the survey team (preferably the one who made the sketches).

The first step is perhaps the most unpleasant but it must be done. The degrees of inclination and the measured distances must be converted to map distances by trigonometric methods. For inclinations of only a few degrees, the measured distance is little reduced to the true horizontal distance. However, when the inclination is of many degrees, the reduction may be very great.

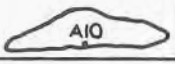
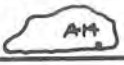
Once this arduous task is completed, a piece of paper should be taped securely down and a north line drawn, parallel to one edge of the paper. A quick scan of the compass azimuths in the notebook will indicate the general direction in which the cave will proceed. This foresight may help in keeping the map on just one sheet of paper.

The next step is to mark a point on the paper which represents station 1. The protractor is then used to determine the direction to the next station, relative to the north line, and the map distance is marked off along the ruler in whatever scale is being used. All the survey stations are plotted and thus connected in this manner.

The next step is to place the ruler through station 1 perpendicular to the line connecting station 2 and mark the distances to the right and left walls. This is done for all points of the survey. With the help of the survey book sketch and the survey team member, the walls of the cave are drawn in. Details from the sketch are added and the final copy is inked in.

The final copy bears the name of the cave, its location, the date of the survey, the magnetic declination, the scale, the names of the survey team members and an explanation of any uncommon symbols used.

One problem which continually haunts the minds of surveyors is that of closure. This occurs when a loop or circle is made in the survey reconnecting to a previous survey station. A minor mistake in the compass readings, the distances measured, or in the inclination readings may cause failure of the map's survey lines to connect at the common station. Errors of 3% to 5% of the total length of the surveyed loop must be resurveyed.

A1 A2	47.6	230°	+4°	10	5	5	1	
A2 A3	23.0	236°	+8°	4	7	4	2	
A3 A4	56.7	221°	+6°	6	8	2	2	
A4 A5	17.3	218°	0°	0	9	7	0	
A5 A6	12.4	—	+90°	7	0	20	5	
A6 A7	81.8	140°	-10°	8	3	1	1	
A6 A8	22.0	215°	+7°	9	8	7	3	
A8 A9	23.9	225°	-1°	15	25	15	1	
A9 A10	32.0	210°	+2°	20	20	10	2	
A10 A11	18.4	170°	0°	12	15	5	0	
A11 A12	36.5	165°	-6°	3	3	5	0	
A12 A13	79.4	140°	-10°	2	1	2	1	
A10 A14	90.8	230°	+15°	15	3	5	0	
								

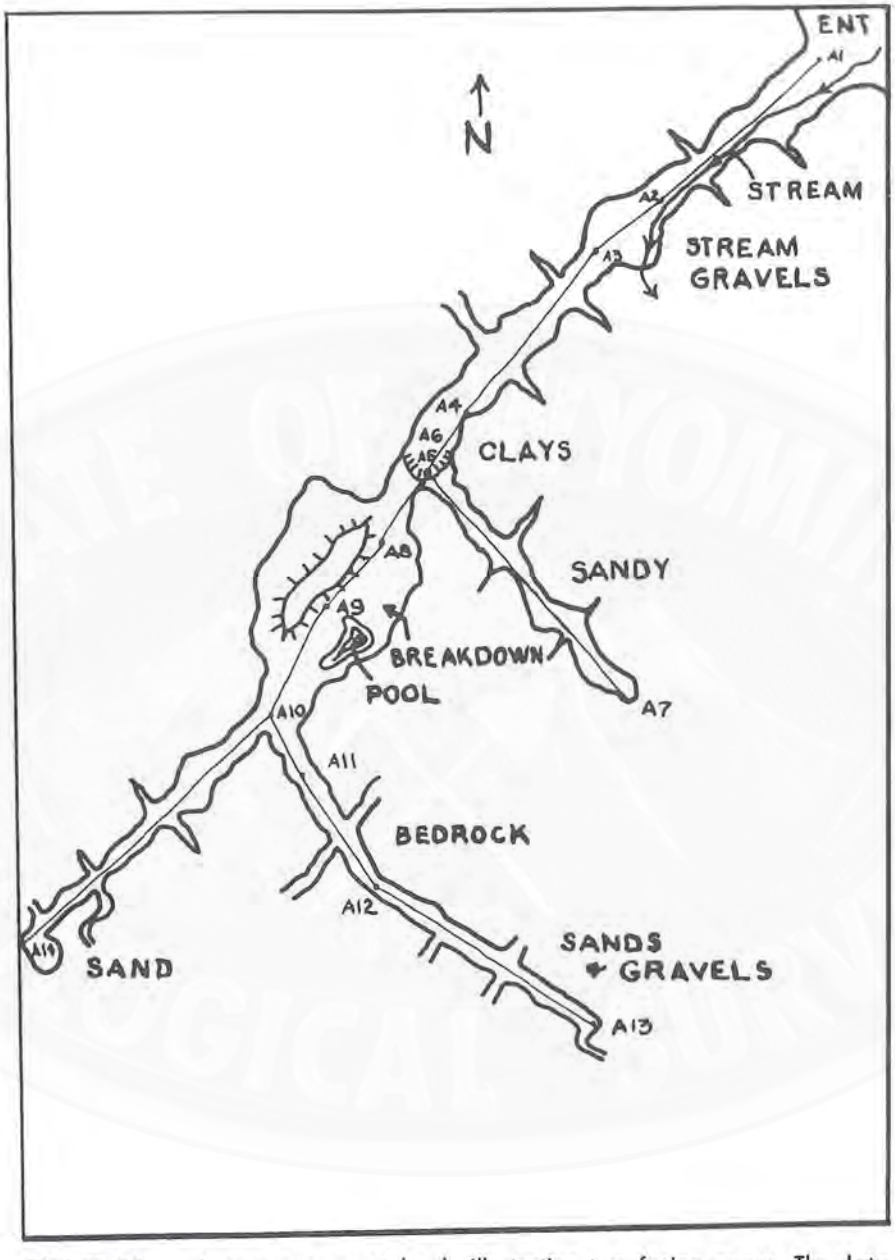


FIGURE 21 — A cave survey notebook, illustrating two facing pages. The data page lists, across the top, distance, compass direction or aximuth, inclination, distance to the left, right, floor and ceiling, and passage cross-sections. The sketch page contains a carefully drawn representation of the cave passage and features, indicating their relation to survey points and lines.

Appendix C
Cave Photography

Photography is an invaluable aid in the study of caves and may, at times, be an end in itself. Photographs make the study of speleothems and cave biota, without the damaging effects of collecting specimens, possible. In many caves, they surpass sketches in morphologic studies.

Successful cave photography presents unique problems because of lighting and the abuse a camera or its case is subjected to. In the cave, darkness reigns so, ideally, the photographer can control exactly all lighting used. Basically, lighting can be done in three different ways: with headlamps and flashlights, single flash lighting from a flash gun or strobe and multiple flash lighting.

Lighting from headlamps is very useful in taking close-up pictures where the light from one or several headlamps is sufficient for hand-held shutter speeds. The candelabra picture (frontispiece) was taken from a hand-held, carbide lamp-lit color slide. For shutter speeds slower than 1/60 second, balancing the camera on a solid base or a tripod is recommended.

The problems resulting from headlamp lighting are that carbide lamp flames give yellowish tones to color pictures. Also, pictures of larger passages and rooms require very long exposure times. In time exposures, moving head lamps result in bright streaks that may distract from the picture. However, large passages lit in this manner often produce satisfying results.

With a flash or strobe, color tones are closer to daylight colors and hand-held pictures up to a dozen feet away may be taken.

PLATE 33 — This photograph of a large passage was taken using the multiple flash technique. (Photo by Wayne Sutherland)

When setting exposures with a flashguide, be sure to account for the reflectivity of the subject and the background. This may change the camera setting as much as a full f-stop from that expected.

Pictures taken with a single flash attached to the camera may tend to be rather flat and lack depth. This flatness can be corrected by using a tripod or rock stand for the camera and opening the shutter with a cable release, until the flash has been set off in such a position to give the necessary shadows to add depth. In many instances such as this, an assistant to set off the flash or open the shutter is almost a necessity.

Single flashes will not light large rooms adequately. The solution is to leave the camera stationary with the shutter open and walk through the passage flashing at those areas that require lighting. Again, an assistant is invaluable. With this type of picture, head lamps pointing even partially toward the camera will produce light streaks in the picture. Ghost images of the person operating the flash may appear, if he stands between the flash of light and the camera.

Protecting a camera from the elements in a cave is extremely important. Not only can pictures be ruined, but cameras can become heavily damaged by exposure to grit and water.

Rising dust from various sources may tend to settle on the lens causing fuzzy pictures and may require expensive camera cleaning. It is strongly recommended that cameras in caves be carried in waterproof and dustproof bags or, even better, in a foam-lined, waterproof case.

Commercial cases are available at a high cost. Almost as good are surplus, 50 cal. ammunition boxes which can be padded to fit equipment needs. The cases may be awkward to carry but they are one of the most protective cases for photographic equipment.

Appendix D
Lost, Rumored and Unexplored Caves

The search for new caves in Wyoming is a never ending process. Almost as quickly as one cave is tracked down, several rumors spring up to take its place.

In the four years of work prior to the publication of this bulletin, a number of these "rumored" caves were tracked down. However, enough eluded the survey to provide several tales of wonders yet to come.

Some, like Bonneville's Marvelous Cave and Under the Crust, have eluded re-discovery for nearly a century while others, like the cave beneath Anchor Dam, have appeared only recently.

For convenience, the survey has compiled what is known about a number of these stubborn rumors. The material appears in the same regional order as presented in the foregoing descriptions.

LITTLE BOXELDER CAVE

LOCATION: Careyhurst Quad.
ELEVATION: 5,530 ft. (1,687 m.)
FORMATION: Unknown
OWNER: Unknown
DESCRIPTION: This is reported to be a rock shelter. The location of Box Elder Cave marked on the Careyhurst Quad. does not seem to tally with the following description: "Near Box Elder Boys' Ranch; rail to Little Box Elder Falls; cave one-half of way to falls on west side of canyon." (source unknown)

NEW WONDER CAVERNS

LOCATION: Parkerton Quad.
ELEVATION: 5,900-6,600 ft. (1,800-2,013 m.)
FORMATION: Unknown
OWNER: Unknown
DESCRIPTION: Rumors of the existence of this cave have been wafting through the air for years. One of these rumors describes the cave as "the Carlsbad Caverns of Wyoming", and claims that the cave has vast rooms and miles of passageways.

WIND CAVE

LOCATION: Otter Creek Quad.
ELEVATION: 6,600 ft. (2,013 m.)
FORMATION: Unknown
OWNER: BLM

DESCRIPTION: A small diameter hole blowing cold wind is reported just above a stream in a small canyon. The hole was found by hunters who had become stuck in the stream bottom at night. Attempts to relocate the hole have been unsuccessful.

CAVE SPRINGS CAVE

LOCATION: Newcastle Quad.
ELEVATION: 4,870 ft. (1,485 m.)
FORMATION: Unknown
OWNER: Private
DESCRIPTION: A small limestone cave is rumored to be three miles north of Newcastle at Cave Springs. This cave may also be known as Limestone Cave.

GOTHIC CAVE

LOCATION: Newcastle (30 minute) Quad.
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Private?
DESCRIPTION: This cave is rumored to be two miles west of Cave Springs Cave.

LISSOLO INDIAN CAVERNS

LOCATION: Newcastle (30 minute) Quad.
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Private?
DESCRIPTION: This cave is rumored to be six miles west of Newcastle and five miles north of the airport.

SPANISH POINT CAVE

LOCATION: Spanish Point Quad.
ELEVATION: about 8,750 ft. (2,699 m.)
FORMATION: possibly Madison Limestone
OWNER: USFS
DESCRIPTION: This cave has been reported by several sources to be on the east slope of Spanish Point near a dead tree. The entrance is behind a bush and the cave is reported to be of major extent. Several small rock shelters have been found in the outcrops on the hill but the cave eluded this investigation.

JOHN CAVE

LOCATION: Unknown
ELEVATION: Unknown

FORMATION: Unknown
OWNER: Unknown
DESCRIPTION: This cave is reportedly in eastern part of the Powder River Basin

OWL CREEK PITS AND CAVES

LOCATION: Willow Creek Quad.
ELEVATION: 9,240 ft. (2,818 m.)
FORMATION: Madison Limestone
OWNER: BLM
DESCRIPTION: Two pits have been reported in this area, at the top of a Madison Limestone ridge. Rocks dropped in these pits reportedly rattle for a long time. The pits have not been found. The area was visited in June 1970 but lingering snow prevented a thorough investigation. At the time, however, the survey noted a large horizontal entrance southwest of the pit area.

BONNEVILLE'S MARVELOUS CAVE

The following story by W. O. Owen appeared in the Nov. 2, 1890, Laramie Republican. The clipping was obtained from the W. O. Owen collection, Western History Research Center, University of Wyoming.

Numerous people have spent years searching for this cave and have found nothing. Researching into the problem has neither located the cave nor Captain Bonneville's original 1832 report. There have been recent rumors of a cave on the west flank of Wind River Mountains, however, no limestone outcrops are known in that area.

A MARVELOUS CAVE

A Trip Under The Wind River Mountains

By W. O. Owen

" A Truthful tale, surpassing strange I'll now set down for you to read."

"What songs the Sirens sang, or what name Achilles assumed when he hid himself away among women although puzzling questions, are not beyond all conjecture."

The report made by Capt. Bonneville to the War Department, covering his exploration in the then unkown northwest (1832), is a document of the most interesting description to American people in general and to residents of Wyoming in particular. A copy of that report is before me as I write, and on the 22nd page, following the account of a scramble among the Wind River peaks I find the following: "Descending this rugged slope it was our good fortune to make the discovery of a subterranean cave which, for extent and great natural curiosities is, in my opinion, unsurpassed by anything of the kind now known to the world."

Following this is a lengthy description of this examination of the cave in which I find the following: ."These are the most gigantic stalactites I

have ever seen, four of them, as we found by actual measure, exceeding 25 feet in length." Bonneville's examination, so says the report, was a cursory one, owing to limited time at his command and he expresses the belief that unheard of wonders are in store for the explorer who follows him.

This portion of his report closes with the location of the cave as astronomically determined by himself and is as follows: "Situated on west slope of Wind River chain, in latitude 42° - 46' - 00" N., long. 100° - 20' - 00" West with a possible error of 2 minutes in longitude due to imperfect rating of my chronometer."

I first read this report two years ago and determined then, if opportunity ever came, to find that cave or prove to the world that Capt. Bonneville was not a reliable personage.

THE GOLDEN OPPORTUNITY

In company with F. O. Sawin, well-known in this city, I set out one day to retrace a line of the Government surveys along the west slope of the Wind River Range; and stopping just before noon for a hasty lunch I found, by observation made with my solar instrument, that we were but a thousand feet south of the parallel that cuts Bonneville's cave. We immediately began the most thorough search and in one short hour found the mysterious cavern which the Captain and his men had entered nearly 60 years before!

Like nearly all caves of any note this one is in limestone formation but richly intermixed with a feldspathic granite in a manner similar to that found in the Black Hills just east of our city.

In a short time we had gathered a score of pitch-pine strips suitable for torches and binding them together with part of a small coil of rope which Sawin habitually carried, we lighted two others and stepped into the tunnel-like opening leading to the cave.

THE FIRST MYSTERY

Fifty feet from the entrance we emerged into what I judged to be a room of gigantic dimensions the light failing to reveal either sides or ceiling. The floor was perfectly smooth but seemed to have a gentle slope. A short distance in we passed a small lake whose shore line was as perfectly circular as the periphery of a silver dollar. The water was crystal-clear and ice-cold but seemed to be utterly devoid of life. Somewhat farther on the first mystery presented itself. Rising from the floor to which it was securely attached, stood a huge vertical shaft of stone about 7 feet high and tapering at the top to an extremely narrow edge on which rested, in a horizontal position, a second block of stone 20 feet long and weighing, as near as I could judge, fully ten tons. A more remarkable case of equilibrium I had never seen, for touching the horizontal stone with the end of a stick began gently to perform a series of oscillations like a gigantic see-saw.

By what mysterious power that block of stone had been placed in such an unusual position and so persistently maintained its delicate balance no denizen of earth will, in my opinion ever know; and as I watched the ponderous arm of stone performing its ghostly oscillations a feeling akin

to terror seemed to seize me. "That's too much like spooks and Sinbad, the sailor yarns to suit me," said Sawin, "let's move on." I gladly joined him and must confess that my breath came more freely when a few yards lay between me and that awful oscillating rock.

THE FAIRY FOREST

Since entering the cave we had moved uniformly eastward and had not as yet seen ceiling or walls, although we must surely have walked 400 or 500 yards. At this point a shout from Sawin, who was some distance ahead, arrested my attention, and, overtaking him, I soon discovered the cause. Immediately in front, reaching to right and left as far as could be seen stood a manificent forest of stalagmites, our torches lighting the scene up with royal splendor and compelling the idea of a highly illuminated theatre. Moving forward into this maze of beautiful crystals I was completely bewildered by the utter opulence of color and the apparently unlimited extent of a scene so glorious.

Hanging from the roof were myriads of stalactites some of them reaching the enormous length of 25 feet. Nor was this all, for casting my eyes to the north I beheld the most bewitching little fountain that eye of man ever rested on. Right in the midst of this princely forest of colors it stood and tossed a tiny stream upward to kiss the painted lips of a thousand fairy crystals. The origin of this fountain proved to be a greater enigma, if that were possible, than the oscillating rock, for the most diligent search failed to reveal whence the supply of liquid proceeded.

We now directed our steps northward through a wilderness of huge crystals and had walked perhaps an eighth of a mile when a noise as of falling water reached our ears. "Another mystery, I have no doubt," said Sawin. "If it isn't one then it's out of place in this cave," I replied.

THE MAGIC SPHERE

Louder and louder grew the sound; we hastened forward and, emerging from the forest of crystals the light fromour torches fell upon a sight that for a time riveted us to the floor.

In a circular receptacle some ten feet in diameter and filled to overflowing with water we beheld a huge, ball revolving on a horizontal axis with a velcoity I dare not even estimate. The diameter of this sphere was but little less than that of the basin in which it turned and about three fifths of it lay above the water. The rotary motion of the ball was imparted by a huge column of water which fell upon it from the top of a wall rising full fifty feet above the floor and striking the sphere kept it revolving just as it would a water wheel. Recovering sufficiently to speak Sawin broke the silence by exclaiming: "In the name of all that's good and true, how did that ball ever get into that basin?" And he might too have asked also "Whence came that sphere of stone?" "By what freak of nature came that column of water over the wall at just the proper point to strike the globe of pitch?" and a hundred other questions that urgently pressed for an answer. Examination of the sphere proved it to be of stone and hollow as a drum. This latter fact accounted for its great buoyancy, and I was gratified to find even this much that conformed to the laws of natural philosophy as taught in the outside world. However I had arrived at that point where wonder and "why" ceased and determined to accept what ever came whether in harmony with known forces or not. If by some oc-

cult power the beings of this mysterious realm had succeeded in subverting all laws of mechanics and gravitation I would mine Aenorian crown in humble acknowledgment of their erudition and say amen to all I should see.

THE CITY OF CRYSTALS

Continuing northward we encountered a large expanse of black soil out of which grew a forest of gigantic mushrooms from 5 to 8 feet high and having tops from two to four feet in diameter. There must have been fully two acres of them, and the idea of establishing a mushroom canning plant right in their midst at once suggested itself. Under many of them we walked in an upright posture and our heads were not even touched. We now emerged from the Crystal Fairyland and once again set foot on a smooth limestone floor. A few feet farther we reached the north limit of this part of the cave and turned west, in doing which we encountered a second City of Crystals.

Through the splendid streets and circuitous avenues we threaded our way for hundreds of yards coming at length to a wall of stone rising beyond the limits of vision; and being thus compelled to change our course turned squarely south. In a short distance we passed into what seemed to be a long hall having a width of about 25 feet, and on either side of which rose a wall of smoothest limestone.

A SPECTRAL LANDSCAPE

Our torches expiring at this point we drew two new ones from our bundles when an exclamation from Sawin almost froze the marrow in my bones.

"In heaven's name, what mystery have we now? Pinch me, Will, I believe I am growing crazy. Look at that wall!"

Casting my eyes in the direction indicated I beheld a sight that rooted me to the floor, for on that cold naked wall in an inverted position, was a perfect landscape - a picture compared with which man's greatest effort were merest boy's play. Were my eyes deceiving me? I did not wonder that Sawin had asked me to pinch him, and the vision I now saw almost compelled me to ask a similar favor of him.

The central figure in this fairy picture was a mighty pine seeming to grow out of a massive block of stone, and immediately behind it, forming a superb background, stood a cosy little cluster of firs. In the foreground was an open park gracefully fringed on either side by a long row of stately evergreen pines, and down the middle of which rushed a little brook in whose bed four tiny cataracts could be seen. For fully five minutes not a word was spoken, when the silence was broken by my companion, who said "Well, that settles it for me. I've got enough of this place right now. I've had my dollar's worth, anyway; and if the Lord'll forgive me this time I don't think I'll be in any hurry to repeat this experiment. Let's pull out!"

THE MICA LENS

I must admit my own feelings accorded fully with the sentiments expressed, but I intended before leaving, to make one attempt unsuccessful though it might be, to discover the origin of that picture.

Luckily for me it was inverted and this fact afforded what I considered a clue to the mystery. Stepping to one side I found that I had hit upon a key to the solution, for full across the hall I beheld a golden pencil of God's own sunshine piercing, like a long needle, the stygian gloom.

"The mystery is solved, Sawin, do you see that sunshine"?

"Indeed I do, Will; but what has that to do with it"?

"Everthing," I replied; and following the rays of light to the west wall we found that but a few feet intervened between ourselves and the outside world. The opening which admitted the light we found to be a small circular aperture which had by some unknown means been covered by a sheet of mica (quite common in the Wind River Mountains) and this was the solution we sought. The sun's rays, striking the little valley outside, had, by the merest, chance, encountered this mica lens and passing through had reproduced the landscape on the wall, but in an inverted position, as the laws of optics require.

"Well, I'm for pulling out," said Sawin.

A FRIGHTFUL CHASM

However, after considerable persuasion, he agreed to remain a half hour longer and we set out northward to see what lay in that direction. About 300 yards from the hall we entered a third forest of gigantic stalactites and a few feet farther came suddenly face to face with a chasm running east & west and of apparently interminable depth. This frightful rent in the stone floor was not less than 20 feet wide, and for a moment it seemed to be the limit of exploration in this direction. However, moving westward, we found a natural bridge in the way of a huge stalactite that had fallen across the gap and seemed to be perfectly solid for any weight likely to be put upon it. Cautiously I put one foot upon it and feeling no movement of any kind immediately advanced the other. It seemed to be perfectly secure and hastily taking a few steps more I landed on the far side safe and sound.

THE NATURAL BRIDGE COLLAPSES

Sawin now proceeded to cross and had covered somewhat more than half the distance when a crumbling sound was heard and I saw our bridge in the very act of collapsing. My heart grew sick, and with a convulsive shudder I turned my eyes that I might not see my friend hurled to his fate in that yawning depth.

With a crash that rent the awful darkness and echoed through the rocky cavern like reverberating peals of thunder I heard the treacherous bridge tearing madly down the abyss and seeking the bottom of that interminable gulf. For a moment my brain whirled and reason seemed to flee. I could not turn again to face the awful depth that had swallowed up my companion.

"That was a pretty close call, pardner, do you know it"?

In all my life I had heard no sweeter words than these, and turning round joyously grasped the hand I had never expected to see again. When the first sound of crumbling reached Sawin's ears he fully realized the situation and made a mad rush for the opposite bank, reaching it just as the last particle of the bridge gave way. Had he been slower I should have a different tale to tell.

SCHEMING TO ESCAPE

We thought no more of exploration but gave our wits to devising a means by which the chasm could be recrossed. Its length undoubtedly spanned the entire cavern and something must be done to bridge it at once. Unluckily there were no stalactites on this side as there were on the opposite, or the solution would have been easy indeed. "I have it," said Sawin. "Here's our rope and in it I see a means of escape."

A noose was tied in the end, the rope was coiled up like a riatta, and by a dexterous throw Sawin succeeded in dropping it over a large stalagmite that rose from the floor. "Our ferry is ready, and you shall be the first passenger," said Sawin.

Seizing the rope, one end of which Sawin held securely in his hand, I dropped my length into that unknown depth and soon reached the other side in safety. But how was Sawin to get across? Tying a large knot in the rope he rolled a huge block of stone over it which held it like a vise. Having thrown the strips of pine to the side where I stood, he grasped the rope, and lowering himself into the gulf soon gained the other side unharmed.

CAPT. BONNEVILLE'S RECORD

And now the question of our ability to return confronted us calling to mind the Sibyl's warning to Aeneus as he descended into the regions of the dead: "The descent of Avernus is easy; the gate of Pluto stands open night and day; but to retrace one's steps and return to the upper air, that is the toil, that the difficulty."

Having kept a careful log of our trip coming in, however, we had but little difficulty in returning and in a short time reached the tunnel through which we had entered. Near the door, cut in the rock, I noticed something that, strangely enough, had escaped observation as we went in. In large letters we read: "B. L. E. BONNEVILLE, 1832." Here was the link that connected the chain, and we now knew the Captain to be a man of his word. We passed into the outside world in time to see the last golden rays of sunlight kiss the giant snow capped peaks of the Wind River chain, and reached camp as the sable goddess of night threw her leaden mantle over the forest.

HARRIS CAVE

LOCATION: Unknown
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Wind River Indian Reservation
DESCRIPTION: ". . .caves such as the Harris Cave are common features of this (Madison) limestone." (Phillips, 1958) This is the total information on Harris Cave in the Owl Creek Mountains.

An educated guess places some caves, and perhaps Harris Cave, on Harris Ridge in the vicinity where Shotgun Creek crosses the Madison Limestone. This is located on the Wind River Indian Reservation.

ANCHOR DAM

LOCATION: Anchor Reservoir Quad.
ELEVATION: 6,440 ft. (1,964 m.)
FORMATION: Tensleep Formation
OWNER: Bureau of Reclamation
DESCRIPTION: The following was taken from: "Detailed Report — Owl Creek Unit, Wyoming, Missouri River Basin Project," U.S. Dept. of Interior, Bureau of Reclamation, Region 6, Billings, Montana, June, 1949.

"Anchor Dam site is in a canyon where the south fork of Owl Creek cuts through an anticline at nearly right angles. The dam site is in the upstream flank of the anticline where the bedding dips 30 to 35 degrees upstream. The most important and conspicuous formation present at the site is the Tensleep Sandstone which forms most of the upstream flank of the anticline. Some of the Phosphoria limestones and shales remain on the upstream surface. The Tensleep forms most of the foundation and abutments, but near the downstream toe at the dam the Amsden limestones and siltstones form the bedrock surface. With the exception of the siltstone, which is present only in very minor quantities, all the rock formations are hard and well-suited for a concrete dam foundation.

"Anchor Reservoir is lined for the most part with the Chugwater Formation which is largely shale. This practically assures an impervious reservoir. On the downstream end, the reservoir wall is the Tensleep Sandstone capped by remnants of the Phosphoria limestones and shales. Once the surface is saturated, seepage into or through the sandstones will be negligible. Because of the thickness of the reservoir walls, no leakage is expected along the strike or dip of the Tensleep sandstone. Some faults are exposed well above the water line in the shale formations. Even if they extend into the reservoir or other faults are present below the water line, leakage is not probable as faults in shale are usually tight.

Anchor Dam, built on the South Fork of Owl Creek (1957-1961), is a structure 660 feet long at the top with a maximum height of 208 feet. The area behind the dam has a storage capacity of 17,400 acre feet. The total original contract for the dam and facilities was $2,411,288.87. The total final cost was $5,257,488.00. A major portion of this additional cost was spent in trying to fill dolines and solution cavities.

During construction of the dam, solution cavities were encountered in dolomitic layers in the Tensleep Sandstone. The cavities ranged in size from short crawl spaces to seven foot high rubble-choked passages. "During April 1958 the entire flow of Owl Creek was diverted into the main cavity for a period of eight days. During this period there was no indication that the cavity was being filled or that the stream flow reappeared at any point on the stream below the dam." (Bureau of Reclamation, Technical Record of Design and Construction of Anchor Dam, 1962). These cavities were cleared of rubble and unsound rock and then backfilled with concrete.

In addition to the solution cavities at the damsite, large dolines, up to 60 feet in diameter, developed in the Chugwater Formation upstream from the dam during construction. These sinkholes were investigated to

determine their cause and to prevent possible loss of water into them. During these investigations it was noted that "the volume of stream flow entering the reservoir valley exceeded slightly the volume which passed the damsite." This loss was believed to occur in the downstream portions of the reservoir. It was also found that the water table in the reservoir valley was perched. Drilling in the shale near the sinkholes indicated the absence of gypsum layers, and it was suggested that a fluctuating water table caused piping which resulted in the development of the sinkholes.

This rather expensive dam has never been filled to capacity and usually holds no more than a small pond behind it. Cavern development has undoubtedly occurred in this area and should be more seriously considered when planning such projects.

BUFFALO BILL DAM CAVE

LOCATION: Cody Quad.
ELEVATION: about 5,300 ft. (1,617 m.)
FORMATION: Madison Limestone
OWNER: BLM

DESCRIPTION: Buffalo Bill Dam (originally called Shoshone Dam) was constructed during the period 1905 to 1910. "An outlet tunnel was constructed around the south end of the dam, then abandoned. Another outlet tunnel was then blasted at a lower elevation. This lower outlet tunnel was concrete lined and is still in use. The lower end of this tunnel has two branch tunnels which discharge water from the canyon wall." The original 10-foot diameter upper outlet tunnel was abandoned, then plugged with concrete in 1912. "Before this plug was placed, some water was permitted to flow into the tunnel on occasions while workers fed trash and debris into it.... It seems reasonable to believe that a major obstacle was encountered, such as a large cave, which caused the tunnel to be abandoned and a new one built." It is rumored that this may be one of the lost lower levels to Spirit Mountain Caverns (162). (Rich Wolfert, 1973).

Another tunnel, the Heart Mountain Project water diversion tunnel, intersected a large cave during its construction, about 1935. Because of the large size of the cave, a 10-foot high walled concrete flume was built across it. According to Dr. J. D. Love (USGS, Laramie, Wyoming), the intersected chamber was surveyed, and a map may still exist at the Bureau of Reclamation in Billings, Montana. Some sulphur stalactites and stalagmites that Dr. Love collected from the cave are presently on display in the geology museum at the University of Wyoming.

During the tunnel construction, three workers, overcome with sulphurous gas (sulphur dioxide?), passed out and were crushed by equipment. The tunnel reportedly is drained once a year for several days for airing and inspection. If repairs are needed, a later date is scheduled. A surface entrance, through which construction debris was ejected, is also reported.

22-SECOND PIT

LOCATION: Crystal Peak Quad.
ELEVATION: Unknown

FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: "This is the thinnest lead in the history of speleology," C. Plantz, August, 1972.

"A local prospector and character told us of a dry pit located on the Pyramid Peak fault. He said that it took 22 seconds for rocks to reach bottom falling free. He knows his geology, having prospected the area all his life, and told us some things about other local caves that turned out to be true.

"The fault scarp is 3,000 feet above Granite Creek with the Madison Limestone dipping away from the fault down to the creek. Consequently, a very deep pit is conceivable.

A search party, led by Chuck Hempel, went looking for the pit and, naturally, didn't find it. Maybe next year." — Doug Medville.

CAVE

LOCATION: Ferry Lake Quad.
ELEVATION: about 9,000 ft. (2,745 m.)
FORMATION: Madison Limestone
OWNER: USFS

DESCRIPTION: The following lead was provided by Bob Stevenson.

A cave entrance reportedly occurs in the canyon wall of a tributary canyon north of the Upper Yellowstone River. The horsepacker who reported this said that it was big and that it was visible from the river.

CAVE

LOCATION: Unknown
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Unknown

DESCRIPTION: A cave is rumored to exist near Little Buffalo Basin west of Meteetse. Nothing else is known about this possible cave.

OUTLAW CAVE

LOCATION: Unknown
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Unknown

DESCRIPTION: This cave, located somewhere in the Ferris Mountains, was used as a hideout by road agents in the late 1800's or early 1900's. Ruth Beebe in "Reminiscing Along the Sweetwater" (1973) related a tale concerning this cave and shows a 1912 photograph of persons at its entrance. We did not visit this cave.

UNDER THE CRUST

The following description of a large cave was related in *The Laramie Boomerang* sometime previous to Aug. 11, 1890.

"UNDER THE CRUST"

This cave is located 18 miles west of the north east corner of Carbon County on the county line.

County Surveyor, W. O. Owen, has in the course of the past few years probably obtained a more intimate knowledge of the natural wonders of Wyoming than almost any man alive. Not only has he been called upon to survey oil claims, gold placers, irrigation canals, and county roads but he has done an immense amount of work for the United States Government, and, being very observant always he is possessed of a fund of information which would be a veritable gold mine to a reporter who dealt in fiction but which, coming from him as frozen facts needs neither embellishment nor guarantee of reliability. One of Mr. Owen's most recent experiences was related to the Boomerang reporter today and is here given verbatim as it fell from his lips:

A SUBTERRANEAN CAVERN

A short time ago while engaged in surveying it so fell out that I visited the famous oil fields lying on and near the line between Johnson & Carbon Counties, this Territory, and on one occasion, accompanied by Mr. A. J. Bothwell, for whom I was locating oil claims. I by the merest chance, discovered a most remarkable cave extending far into the earth and whose floor, to all appearances, no mortal foot had ever trod.

My attention was drawn to the entrance by the issuance therefrom of a peculiar vapor or smoke, the nature of which, we did not, until some time after, fully understand. The opening to this cavern lies on the south slope of a rugged hill forming the north wall of a wild & mighty canyon, the hill being covered with pine & cedar timber, and a growth of Black Jack and juniper so dense that nothing much short of a miracle could have revealed the entrance to the cave to our eyes. The door we found to be some five feet high and perhaps three feet wide, the top being spanned by an arch of snowy white sandstone.

The vapor escaping from the cave did not indicate any great degree of internal heat, nor did it seem to be of a nature to destroy life, the one thing notable being its oily odor. In our examination of tunnels and shafts we had of course used candles and fortunately a few still remained in our possession, two of which we lighted preparatory to

EXPLORING THE CAVE

Thrusting my candle into the vapor I observed no change whatever in its combustion, and concluded from this that gas, at least in dangerous quantities, was absent. And although relieved from suspense on this point at least, I must confess to a feeling akin to fear when we crossed the threshold of that unkown cavern and planted our feet where no mortal eye ever rested.

The darkness within was profound and the light from our candles seemed unable at first to penetrate it. After a short time however the illumination seemed to increase, enabling us to make examination of that part of the cave immediately around us. Beneath our feet lay a floor of white sandstone in nature exactly similar to that composing the casing and arch of the door; and some five feet above our heads, sloping upward to the north-east, was a ceiling of the same material. To our right we noticed a wall of rock, as also behind us, but the most acute penetration of vision to left or in front failed to discover the slightest outline of form or figure. Before leaving the door of the cave we lighted a third candle and set it close by on the floor. We had traveled perhaps a hundred yards without making any new discovery when there came to our ears a roaring, tumbling sound as of foaming water leaping over massive boulders in the bed of

SOME MIGHTY RIVER

The sound seemed muffled and indistinct indicating considerable distance. And the odor of the oil was present in the air, coming, as we surmised, from the vapor encountered at the entrance to the cave. Looking back I beheld the tiny flickering of the candle we had left at the door. It looked like a star of the third magnitude, forcing its feeble scintillations through the inky blackness of that stygian depth. At this moment my attention was attracted by a shout from Bothwell. He had walked ahead some thirty feet and I hastened to ascertain the cause of the alarm. The sight that met my eyes riveted me for a moment to the stone floor. Not in all my experience have I seen anything comparable to it. A hollow semicyclindric wall of stone rising some thirty feet to meet the ceiling rose up before me. The wall was studded with stalactites of hues so various that the eye was dazed in beholding, while from the roof dependent hung myriads more akin to those, formed by percolation of a crystal fluid from an unknown stream. The semicircular floor was gemmed with stalagmites whose utter opulence of color bewildered us, and as I gazed the candle light, penetrating the forest of colors, illumined the mystic scene with a luster almost heavenly. Thousands upon thousands of those beautiful crystals, catching the candle light, threw it back in endless rays in which had been mingled every tint the mind can conceive.

HERE WAS A PALACE

in which the royal blood of the orient might deign to dwell, for neither has that artist appeared who could approach the marvelous blending of shade and color displayed, nor has the architect yet been born who could equal this matchless superstructure so beautifully hidden from the eye of man. The diameter of the floor is not less than 60 feet, the distance from front to back being about half that amount. But the end of our journey was not yet; for groping our way we discovered a passage to the right of the grotto and had not proceeded above three or four hundred feet when we encountered a nearly vertical wall of limestone about ten feet high which must be scaled if we wished to go on. By helping each other we soon reached the top. In front of us stretched out another floor of stone a gentle incline upward - a slope of perhaps five degrees. And now came that

sound of rushing stream again greatly heightened by the diminution of distance from it, and it appeared to me that not a hundred feet lay between that mysterious river and ourselves. The floor in places, as we proceeded, was damp caused no doubt by a spray which the river, in its tossings, had thrown over its banks. We had moved forward perhaps seventy five feet when the light of our candles flashed full upon the surface of

AN UNDERGROUND RIVER

"Where Alph, the sacred river ran through caverns measureless to man down to a sunless sea."

This stream flows south westerly, and is about seventy feet wide, it waters being of a beautiful olive-green tint. From our stand-point we could see the opposite bank from which rose a wall of rock whose summit was invisible. In the bed of the river were inumerable boulders of gigantic size over which the water dashed with wild impetuosity. Stooping down to drink I arose disgusted - the water was covered with oil. Here was a lubricator for the thousands of generations yet unborn. Endless barrels of the liquid must be carried away by this stream for the velocity of its current is not less than 8 miles per hour. It is my opinion that this river finds its terminus in the sands of the South Fork of Powder river many feet below the surface. The velocity of the water precluded the idea of fording so we set out down steram to explore in that direction. Within a few feet however the river makes a tremendous plunge, falling sheer down not less than forty feet, and thence rushing madly into a tunnel worn through the rock. From far below came the sound of the rushing flood, and, caught by the walls of the cavern, it came thundering back with

A GHOSTLY INTONATION

Being shut off in this direction we retraced our steps determined to try it up stream but were baffled by a wall of rock of apparently interminable altitude, and not a hundred feet above where we first struck the river.

It but remained to return, for evidently our exploration, in this direction at least, must end. Little difficulty was encountered in descending our wall, and in a short time we stood once more at the Grotto on whose beauty we again feasted our eyes.

While standing there the odor of that vapor came again and at Bothwell's suggestion we set out to ascertain, if possible, its source. It seemed to come from a point northwest of the grotto, and proceeding in that direction we soon found the odor growing stronger and more continuous whence we inferred that the right trail had been struck. About 250 yards from the grotto there yawned before us a chasm of frightful depth from whose recesses belched forth mountains of vapor and smoke. This gulf is probably 30 feet wide and crescent-shaped and extends as near as we could tell, in an east and west direction. The vapor, from its odor, must certainly come from burning oil, but from the abysmal depth of

THAT INTERMINABLE GULF

no ray of light brought the message of conflagration for it was dark as night. I noticed with much surprise that the vapor, after leaving the

chasm, seemed to be wafted by a current of air in an invariable direction instead of spreading around and filling the cave as would most naturally be expected.Certain it is I felt a draft now and then from the northeast, and I also noticed, as we had both observed before, that the ventilation of the cave was most excellent. We set out east to find, if possible, the end of the chasm, but at 200 yards were confronted with that same vertical wall which we encountered in exploring the river. At this point the gulf enters the wall and we could follow it no farther. A like fate awaited us when we set out west for we came abruptly against a stone barrier which completely shut us out. We now determined to make our way out and had not proceeded far when the dim light of our candle at the door shone through the darkness to guide us to the portal which we had entered some time before. In a short time we emerged into sunlight that almost blinded us and an hour later were in camp. It is hardly necessary to say that the section of land overlying this cave has been filed on by Mr. Bothwell and that gentleman is now applying for a U.S. patent for 640 acres under an oil placer location.

CAVE

LOCATION: Unknown
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Unknown

DESCRIPTION: A cave is reported to occur south of the Green River, just north of the Wyoming-Utah border. The Survey heard that the cave contains speleothems, that a stream issues from the entrance, and a loud roaring can be heard emanating from it.

BEAR CREEK ICE CAVE

LOCATION: Unknown
ELEVATION: Unknown
FORMATION: Unknown
OWNER: Unknown

DESCRIPTION: This cave, if it exists, is in the southwest corner of the state in Uinta County or across the border in Utah. It may be the same as the cave above.

Appendix E

Vandalism

The relatively small number of active cavers combined with the difficulty of getting to most Wyoming caves has kept vandalism to a minimum. However, the state has not escaped unscathed.

In New Mexico, mass removal of speleothems from caves by a few greedy rock hounds has left barren holes with only broken stubs to mark where former draperies and stalactites graced the beautiful caverns. In another cave, a mutilated forest of stalactites and stalagmites litter the cavern floor.

In Wyoming, the degree of destruction has been less, partly because there are few speleothems in most Wyoming caves. Yet, destruction can still be seen here.

The Candelabra frontispiece is a prime example, as is the broken piece of a stalagmite in plate. In one Wyoming cave, a collection bag full of gypsum flowers indicated further removal of spleothems.

Names and phrases scrawled, scratched, painted and blackened on cave walls and just plain littering are two forms of vandalism that Wyoming cavers have found in abundance. Pictures of Tongue River Cave (Plate 34) represent the efforts of thoughtless destructive persons who visited the caves. Tongue River Cave, in fact, is known to many people throughout the National Speleological Society as one of the most heavily vandalized, trash strewn caves in the western United States.

Numerous attempts by various groups to clean up Tongue River Cave have failed. Several garbage pickup trips by the Vedauwoo Student Grotto, the National Outdoor Leadership School, and others have left the cave cleaner for a couple of weeks at the most. After each clean-up, the garbage seems to increase more than before. Some cavers have tried scrubbing paint and smoke writing off of the walls; however, the clean places get repainted or smoked again within a few weeks.

The National Speleological Society has placed cave registers (Pl. 37) in many caves with the hope that visitors will sign registers rather than walls. In Tongue River Cave, the register was first vandalized and, then, stolen.

In the eastern United States, sewage and industrial wastes have polluted numerous caves. With the extensive development taking place in the Powder River Basin, this should be a consideration for all of us.

Wyoming has garbage filled-in sinkholes(Pl. 36), but this has occurred on a minor scale and results from a lack of understanding of karst processes and caves. It is hoped that this bulletin provides such an understanding and will prevent further intentional and unintentional destruction of cavern environments.

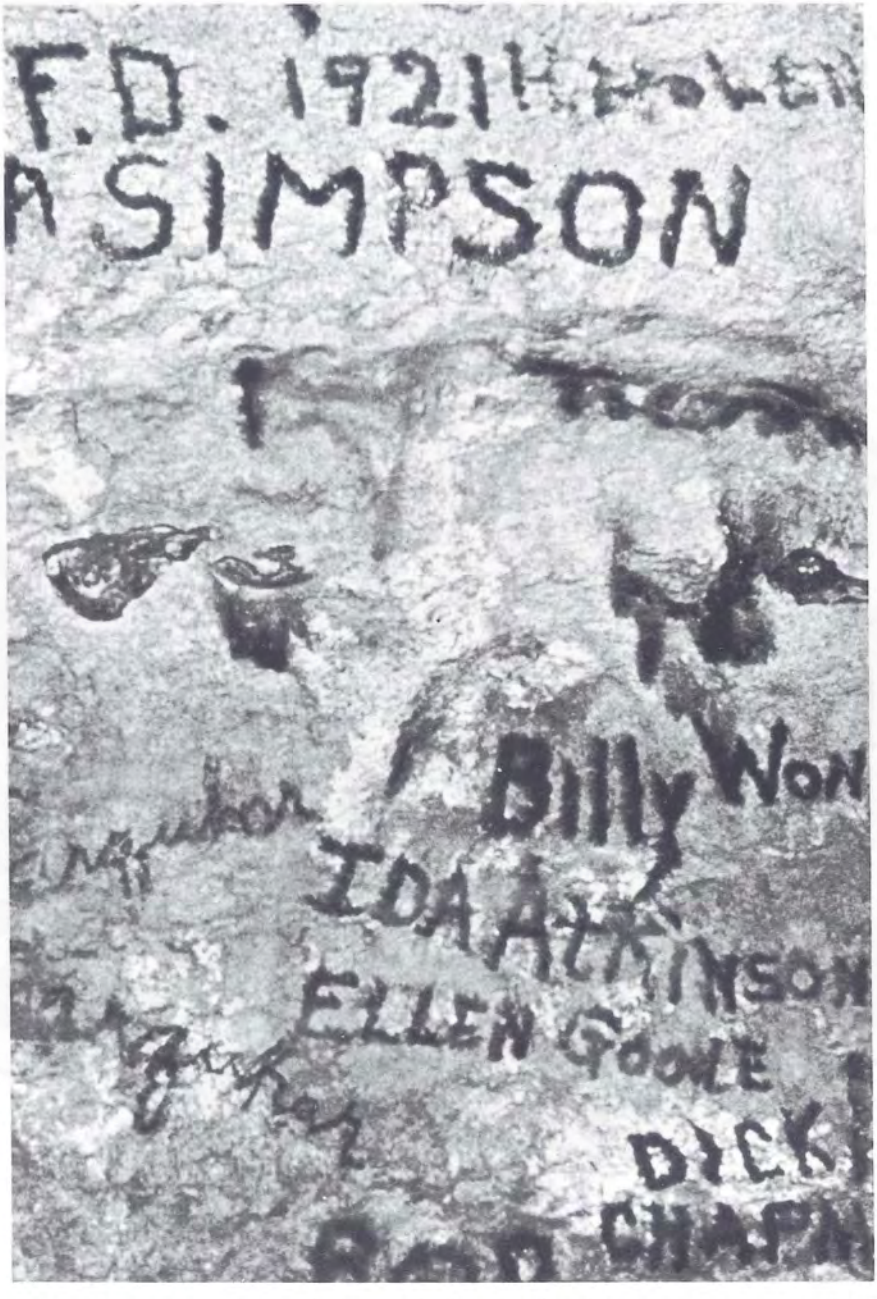


PLATE 34 — Spray painted and smoked names like those opposite have helped earn Tongue River Cave the reputation as one of the most vandalized in the western U.S. (Photo by Wayne Sutherland)

PLATES 35, 36 and 37 — At the left a caver examines the broken remains of a once beautiful speleothem. Above, a caver surveys the damage at the bottom of a garbage filled sinkhole while, below, a caver signs in at the register which was once in Tongue River Cave. (Photos by Jerry Dick)

GLOSSARY

AGGRESSIVE WATER — water having the ability to dissolve rocks; refers especially to water containing dissolved carbon dioxide.

ALLUVIUM — detrital deposits laid down by processes associated with water. The term usually applies to geologically recent deposits.

ALPINE KARST — see KARST

ANASTOMOSIS — a complex of many irregular and repeatedly connected passages.

ANHYDRITE — see SOLUBLE ROCKS

ANTHODITE — a general term for a speleothem composed of needlelike, radiating crystals.

ANTICLINE — folded rocks of the earth's crust which are convex upward. Used to refer to such folds: anticlinal.

AQUIFER — a ground water reservoir. Permeable rock that is completely saturated and will yield water to a well or spring.

ARGILLACEOUS — a term applied to all rocks which are composed, in part, of unconsolidated or consolidated clays.

ARTESIAN — applies to ground water which is confined below a less permeable layer and is under sufficient pressure to raise the water above the confining layer when such a layer is breached. Caves, springs and aquifers may be termed artesian when water is confined in them and is under the influence of hydrostatic pressure.

AZIMUTHS — compass directions or lines; a line in relation to north.

BACON — see CAVE BACON

BAROMETRIC PRESSURE — the pressure of the atmosphere, measured with a barometer, at a specific point.

BASIN — a topographic or structural depression which often acts as a place of deposition for sediments.

BEDDING PLANE ANASTOMOSIS — Anastomosis or branching passages developed along a bedding plane.

BEDDING PLANE — the plane or apparent line separating two rock layers of different character.

BEDROCK — the solid rock underlying soils and surface deposits. Bedrock is one of three types: sedimentary - derived from pre-existing rocks; metamorphic - rocks changed from their original state by temperature and pressure; and igneous - derived from molten rocks produced deep within the earth.

BLIND VALLEY — a valley that ends suddenly at the point where its stream disappears underground. The former downstream course may continue beyond the blind valley but no water flows in it. **SEMI-BLIND VALLEY** — a blind valley able to accept only part of a stream's flow; some water continues downsteam beyond the sinking point.

BOXWORK — a crystal deposit, usually of calcite or gypsum, that forms by the deposition of mineral material in microfractures. These deposits are more resistant to erosion that the surrounding bedrock and thus "standout" from the walls or ceilings.

BREAKDOWN — heaps of rock that have collapsed from the walls and ceilings of a cave.

BRECCIA — a deposit composed of coarse-grained rock fragments cemented together in a fine-grained matrix or cement.

CAIRN — a marker made by piling rocks.

CALCITE — a mineral composed of calcium carbonate, $CaCO_3$; the principal constituent of limestone.

CALCIUM CARBONATE $CaCO_3$ — a compound of calcium, carbon and oxygen of which calcite and aragonite are different crystal structures.

CAMBRIAN — a period in the history of the earth between 500 and 600 million years ago, also the corresponding system of rocks.

CAVE BACON — a thin, usually translucent, banded speleothem deposited on the walls and ceilings of caves. The banding, caused by impurities in the mineral, often resembles strips of bacon. Also called drapery.

CAVE FILL — any material that partially or completely fills a cave or cave passage; usually sand, silt, clay, gravel, breakdown or surface derived debris.

CAVE ICE — a calcite speleothem that forms on the surface of a cave pool as a calcite scum. With the addition of enough calcite, the weight of the flake causes it to sink to the bottom of the pool.

CAVE LILY PADS — a calcite speleothem resembling lily pads.

CAVE PALETTE — a more or less flat, protruding sheet of crystalline calcium carbonate formed on top of a clay bank. When the clay is removed by erosion the palette is left hanging above the floor. Also shield.

CAVE PEARL — a calcite speleothem resembling a pearl in shape and development.

CAVE POPCORN (GRAPES, CORAL) — speleothems resembling popcorn.

CAVE RIMSTONE — a speleothem formed on the rims of constrictions in a cave stream.

CAVE SHELFSTONE — a calcite speleothem deposited at the edge of a cave pool. It has a flat, shelf-like extension into the pool.

CEILING CHANNEL — a channel cut in the ceiling of the cave by flowing water, presumably when vadose conditions prevailed in the cave.

CEILING POCKET — a hollow or recess in the roof of a cave.

CHANNEL — a trench or stream bed cut by freely flowing wtaer. The term is also used to describe any conduit of water.

CHANNEL GROOVES — horizontal or sub-horizontal grooves cut in a passage wall by steam erosion.

CHERT — rocks composed mainly of silica, often seen as rounded nodules protruding from cave walls.

CHIMNEYING — a method of climbing fissures in which both walls are used for foot and hand holds.

CHOCKSTONE — a stone or stones jammed between the walls of a crack or fissure.

CHOKE — any type or combination of cave fills that block passageways.

COBBLE — a large, usually rounded, rock bigger than a pebble and smaller than a boulder.

COLLAPSE DEBRIS — material derived through the process of collapse.

COLLAPSE DOLINE — see DOLINE.

COLUMN — a speleothem formed by the joining of a stalagmite and a stalactite, or when a stalactite reaches the floor of a cave.

COMPOUND DOLINE — a doline formed by the coalescence of several dolines, or a doline with several ponars or sinking points developed within it.

CORRASION — abrasion or mechanical erosion of rock by water, ice, and wind.

CORROSION — the chemical or solutional erosion of rocks.

CRYPTOCRYSTALLINE — a very fine-grained material having crystals too small to be seen even with a low powered microscope.

CRYSTAL WEDGING — an erosional process in which the growth of crystals (water, gypsum, calcite, etc.) force apart and break up the rock in which they grow.

DENDRITIC — having a branching pattern similar to a tree.

DEPOSITION — the emplacement of material derived from elsewhere. The emplacement, or accumulation of any kind of loose material by any natural agent, such as settling of sediment or precipitation.

DETRITAL — broken or fragmental rock derived from pre-existing rocks.

DIP — the angle measured between the horizontal and the downward direction of the plane (bedding, fault, etc.). It is always measured perpendicular to the direction of the strike.

DISPLACEMENT — the amount of horizontal or vertical movement along a fault plane.

DOGTOOTH SPAR — sharply pointed calcite crystals resembling dogs' teeth.

DOLINE — a depression, usually circular to elliptical, in the earth's surface caused by collapse (collapse doline) or subsidence (subsidence doline) with internal drainage directing water underground. Also sink, sinkhole. Cave entrances often occur in dolines.

DOLOMITE — see SOLUBLE ROCKS.

DOME — high arching portion of a cave ceiling; usually its height is greater than its diameter.

DRAPERY — see CAVE BACON.

DROP — a vertical section of cave passage, often requiring the aid of a rope to negotiate safely. Used as a verb meaning to descend a pit.

DYE TEST — tracing the movement of underground waters with the aid of dyes.

EDDY CURRENT — a current at variance to the main current, often circular.

EMBAYMENT — a recess in the face of a cliff or cave wall.

EMERGENCE — the point where an underground stream flows back onto the surface.

FAULT — a fracture in the earth's surface along which the opposite sides have moved relative to each other.

FAULT BLOCK — a large block of bedrock bounded by faults.

FISSURE PIT — a pit formed along a vertical zone of weakness. Fissures are cracks, often associated with jointing systems, that may or may not result from solution along the walls of the crack.

FLANK — the sides of a mountain or other anticlinal uplift where upturned sedimentary rocks are often exposed.

FLOWSTONE — a speleothem deposited on the walls and floors of caves by slowly flowing water.

FLUORESCEIN DYE — a compound that imparts a fluorescent green color to water, in common use for tracing underground water.

FORMATION (geologic) — a lithologically distinct and uniform unit of rock extending over an appreciable area.

FOSSIL — any evidence of prehistoric life preserved by natural processes in the earth's crust.

FOSSIL PLEISTOCENE CLIMATE — a remnant of colder Pleistocene climates. This may occur in areas or situations that allowed the entrapment and holding of colder air from the Pleistocene through the present.

FROST WEDGING — a process of mechanical erosion in which water freezing in cracks splits rock apart.

GASH BRECCIA — a deposit formed by the collapse of walls and ceilings. Such deposits are usually found near entrances where collapse was caused by solution and frost wedging.

GEOMORPHOLOGY — the study of land forms, their development, and their relationships to underlying structures; "the queen of the earth sciences".

GLACIER — a large mass of ice, formed on land by the compaction and recrystallization of snow, moving downslope or outward due to the stress of its own weight.

GLACIERE — a cave, generally in lava or limestone, in which the average temperature is below O°C, and which contains perennial ice. Also ice cave.

GRADED BEDDING — a succession of beds ranging from coarsed-grained materials at the bottom to fine-grained materials at the top.

GRANITE — a coarse-grained igneous or metamorphic rock commonly present in the cores of anticlines in Wyoming.

GRAPES — see CAVE POPCORN.

GROTTO — a small cave, or a small room or chamber of a cave; the Spanish name for cave. Grotto: a member organization of the National Speleological Society.

GROUND WATER — all water in the zone of saturation and, as used in this bulletin, any water occurring underground.

GUANO — fecal material from bats and other animals.

GYPSUM — see SOLUBLE ROCKS.

GYPSUM CRUSTS — encrustations of gypsum on cave walls or ceilings.

GYPSUM FLOWER — a speleothem formed from gypsum, resembling a flower. Also oulopholite.

HELICITES — a contorted, twig-like projection of calcium carbonate, having a tiny central channel, found in caves.

HISTOPLASMOSIS — a lung disorder caused by fungi that inhabit dry caves.

HORIZONTAL GRADING — within a deposit, a decrease from larger particles to smaller particles in a horizontal direction caused by decreasing stream velocity.

HYDROLOGIC CYCLE — the recurring processes of condensation, precipitation, runoff, and evaporation.

HYDROLOGY — the study of all naturally occurring water and the processes and distribution of that water. It includes the study of groundwater.

HYDROSTATIC HEAD (PRESSURE) — in a confined groundwater system the water pressure caused by the force of gravity and by other factors.

HYPOTHERMIA — the lowering of the normal body temperature caused by exposure. This condition has resulted in the deaths of several cavers in the United States, and has been called the "killer of the unprepared".

ICE CAVE — see GLACIERE.

IGNEOUS — see BEDROCK.

IMPERMEABLE — tending to restrict the movement or transportation of water; impervious.

INCISED MEANDER — a meander cut into rock or other material by the process of erosion.

INCLUSIONS — distinctive and identifiable material included in a deposit such as a limestone or a residual clay.

JOINT — a fracture in bedrock caused by stress in the earth's crust. Solution often occurs along joints and joint systems forming caves.

JOINT PLANE ANASTOMOSIS — Anastomosis or branching passageways, developed along the plane of a joint.

KARREN — includes a wide variety of usually small solutional features. In modern usage, a general term describing the total complex of superficial solution forms occurring on limestone.

KARST — the strict definition applies to topography or terrain developd on soluble rocks by the process of solution. The term is commonly used in a looser sense to refer to the processes and features common to such terrains.

(ALPINE) — a distinctive type of karst developed at high altitudes or latitudes.

(AREAS) — areas where karst topography predominates.

(DEVELOPMENT) — the active formation of karst and as used in this bulletin, the processes and features developing and developed during the formation of a karst topography.

(FEATURES) — any of the many features developed during the formation of a karst topography.

(PROCESSES) — any of the many processes that combine to form a

karst topography or act to modify such a topography.

(ROCKS) — see SOLUBLE ROCKS.

(SPRING) — a spring draining part or all of a karst area.

LARAMIDE OROGENY — a time of deformation including the development of the eastern Rocky Mountains. This orogeny had several phases extending from the late Cretaceous (70 million years ago) through the Eocene (38 million years ago). Orogeny means mountain-building or formation.

LIMESTONE — see SOLUBLE ROCKS.

LITHOLOGY — the physical properties of rocks.

MAGNETIC DECLINATION — the angle, measured in degrees, between the magnetic and true north poles.

MATRIX — the smaller grains surrounding larger grains in a rock.

MEANDER — a bend in a stream course caused by faster erosion on one side of a stream channel than on the other.

(CUTOFF) — the erosion by a stream through a meander spur.

(SPUR) — the land mass within the confines of a stream meander.

METAMORPHIC — see BEDROCK.

MINERAL PRECIPITATION — the process of depositing mineral material from a solution. Most calcite speleothems are deposited by this process.

MISSISSIPPIAN — a geologic period in the earth's history lasting from 350 million years ago until about 310 million years ago. The Madison Limestone was deposited during this time.

MOONMILK — a speleothem usually composed of calcite, hemitite, or magnesite occuring on the walls of caves as a white, wet, putty-like deposit.

NAILHEAD SPAR — flat topped calcite crystals formed on walls of caves.

NATURAL BRIDGE (KARST BRIDGE) — a naturally occurring tunnel or cave remnant that is naturally lighted throughout its length.

NETWORK — a cave pattern resembling a map of city streets. Such caves are developed along joint systems by confined water.

ORDOVICIAN — the geologic period in the earth's history between 425 million and 500 million years ago.

OULOPHOLITE — see GYPSUM FLOWER.

PALEOKARST — an ancient karst area covered, buried, and filled by later deposits. Also used to describe cave fills in such a buried karst.

PEARLS — see CAVE PEARL.

PENNSYLVANIAN — a geologic period in the earth's history between 280 and 310 million years ago. The Casper Formation was deposited during this time.

PERCHED — a body of water "trapped" above an impermeable layer. Also called suspended.

PERIGLACIAL — refers to processes, deposits, and conditions in areas near glaciers. As used in this bulletin, it refers to conditions similar to those near glaciers.

PERMEABILITY — a measure of the ability of a material to allow the movement of water through it. High permeability means that the rock absorbs and transfers water readily.

PHREATIC — pertaining to the condition of caves or cavities filled with water (usually moving at very low velocities) and to the forms and features created under such conditions.

PILLARS — erosional remnants of bedrock formed by selective solution. Pillars are similar to columns but are composed of bedrock not calcite.

PIPING — an erosional process in which groundwater removes clay-sized particles forming caves. This process is active in Badland areas of Wyoming.

PIRACY — the capture or diversion of a stream into another channel, such as a cave passage.

PIT — a vertical shaft, usually circular, caused by solution along a vertical joint.

PLUCKING — an erosional process where bedrock is torn loose by streams.

PONOR — a steep-sided sink in a doline which takes surface water underground.

POROSITY — the percentage of pore space in a definite volumn of rock.

POTHOLE — a hole formed in a cave passage by the process of stream erosion.

PRECAMBRIAN — the geologic period in the earth's history before 600 million years ago.

PRECAMBRIAN CORE — the central area of many anticlinal uplifts in Wyoming, composed of rocks formed during the Precambrian Period

PRECIPITATION — see MINERAL PRECIPITATION.

PSEUDOKARST — topography or terrain similar to karst but formed by processes other than karst processes. Piping is one such process.

QUADRANGLE — a United States Geological Survey topographic map. These maps are published for 7.5, 15, and 30 minute wide (minute of longitude) areas.

RAPPEL — a safe method of descending pits incorporating the use of nylon ropes and slings and carabinners with breakbars. The term is also used to designate any drop requiring this method of descent.

RECHARGE POINT — a point on the surface where water is able to enter a permeable layer that is confined downdip by impermeable beds. The water eventually reaches the zone of saturation, thus replenishing the groundwater system.

REPLACEMENT-SOLUTION — a solution process where hydrogen sulfide carried in thermal waters diffuses into the cave air, condenses on cave walls, and reacts with oxygen to form sulfuric acid. This acid reacts with limestone to form gypsum crusts which eventually fall to the cave floor. The cave stream removes the crusts and the cave is enlarged.

RESURGENCE — a spring or seep where underground water returns to the surface. Also rise.

RHODAMINE DYE — a dye (red in water) commonly used to trace underground water.

RIG, RIGGED, RIGGING — these terms are used when technical equipment must be positioned to descend pits. Often it is used to mean the technical equipment.

RIMSTONE — see CAVE RIMSTONE.

RISE — a resurgence of water traced underground from its sinking point.

ROCK PENDANTS — stalactite-like blades of bedrock formed by selective erosion.

ROCK SHELTER — a naturally occurring overhang of rock penetrated by natural light.

SCALLOPS — a scale-like erosional feature created by the turbulent flow of a cave stream against cave walls.

SCHIST — a specific type of metamorphic rock.

SEDIMENTARY — composed of sediments, usually layered rock units deposited chemically, mechanically, or biologically. See BEDROCK.

SEEP — a spring with very low flow.

SHELFSTONE — see CAVE SHELFSTONE.

SHIELDS — see CAVE PALETTE.

SINK, SINKHOLE — see DOLINE.

SINKING CREEK — a stream that loses some or all of its water underground, usually through a blind or semi-blind valley.

SIPHON — as used in this bulletin, a point or section of cave passage completely filled with water. The cave stream may either "enter" or "leave" the cave at a siphon or the cave may continue on the other side of the siphon.

SLICKENSIDES — a polished and smoothly striated surface of rock caused by friction between the sides of a fault during faulting.

SLOTS — vertically high passages as developed along joints.

SLUMPING — a process where material (without breaking up or tumbling) slides downslope.

SODA STRAW — a speleothem composed of a thin tube of calcite.

SOLUBLE ROCKS —

(LIMESTONE) — calcium carbonate. Large caves of long duration are formed in this rock.

(DOLOMITE) — calcium magnesium carbonite. Dolomite is slightly more resistant to solution than limestone, but large caves of long duration also form in it.

(GYPSUM) — hydrous calcium sulfate. This mineral, deposited during evaporation, is highly soluble. Caves formed in this mineral are of short duration and usually shallow.

(ANHYDRITE) — anhydrous calcium sulfate. Caves developed in this mineral are very rare.

SOLUTION — see CORROSION. Also the dissolved material in a liquid.

SOLUTION DOLINE — see DOLINE.

SOLUTIONAL COLLAPSE — collapse into a solutional void or collapse with weakening by solution.

SOLUTION POCKET — any, usually small, void developed by the process of solution.

SPELEOLOGIST — a scientist who studies and explores caves, their environments and their biota.

SPELEOLOGY — the scientific study, exploration and description of caves and all matters pertaining to caves.

SPELEOTHEMS — any secondary mineral deposit that is formed in a cave by the action of water. Often restricted to deposits of calcite.

SPONGEWORK — many small interconnected voids like the interstices of a sponge.

SQUEEZE — a narrow body-sized constriction in a cave passage, traversable only with difficulty.

STALACTITE — a conical or cylindrical speleothem that hangs from the ceilings of caves, deposited by dripping water.

STALAGMITE — a speleothem "growing" up from the floor of a cave, developed by the action of dripping water.

STEEPHEAD — a nearly vertical, semicircular wall at the base of which springs emerge, the upstream end of a short, deeply cut valley.

STRATA — as used in this bulletin, layers of rock.

STRATIGRAPHY — the branch of geology that describes and interprets the succession, formation and correlation of rocks.

STRIATED — grooved; implies a parallel series of grooves.

STRIKE — the direction or trend of a structural surface or a bedding plane in relation to the horizontal; the bearing of a level surface along a dipping or inclined plane.

SUBSIDENCE — a relative low point on the ground surface. In karst areas this is often caused by subterranean solution or by the collapse of caves.

SUPERSATURATED — a solution containing more dissolved material than it could potentially dissolve under a given set of conditions; this imbalance usually results in mineral precipitation.

SYNCLINE — folded rocks of the earth's crust which are concave upward; the reverse of an anticline.

TALUS — broken rock at the base of a cliff or in the entrance of a cave; resting at or near the critical angle.

TECHNICAL EQUIPMENT — specialized equipment required in some caves. This equipment includes nylon ropes and slings, carabiners and pitons, breakbars, ascenders, and more.

TECTONIC — the deformation of the earth's crust; applied to features or structures resulting from such deformation.

TERRACES — long, narrow, relatively level step-like ledges, usually along streams, that mark the position of former erosional levels.

TERTIARY — a geologic period in the earth's history between 3 and 70 million years ago. During this time the Rocky Mountains were uplifted and eroded and some cavern development may have begun.

TOPOGRAPHY — the general configuration of a land surface, or any part of the earth's surface, including its relief and the position of its natural and man-made features.

TRAVERSE — a climb over the floor along a wall or the ceiling. A traverse is often necessary to bypass pits or delicate speleothems.

TROGLOBITES — animals completely adapted and dependent on the cave environment. They are often blind and have no skin pigment.

TROGLOPHILES — animals that habitually enter the dark zone of caves but necessarily spend part of their existence outside.

TROGLOXENES — animals that enter caves for various reasons but do not live there permanently.

TUFA — calcium carbonate deposited from a solution.

TUFA DAMS — see CAVE RIMSTONE.

TURBULENCE — the chaotic movement of air or water.

TURBULENT FLOW — chaotic, tumbling, eddying water flow, as opposed to laminar flow.

UPCLIMB — a change upward of a cave passage usually not requiring the use of technical equipment.

UVALA — see COMPOUND DOLINE.

VADOSE — pertaining to the condition of caves or cavities partially filled with water (usually moving with appreciable velocities) and to the forms and features created under such conditions.

VERTICAL CAVE — a cave that is predominantly vertical, such as a pit with little or no horizontal passage at its bottom.

VERTICAL FLUTES — a karren form occurring on the walls of shafts as sub-parallel vertical blades.

WALL POCKETS — recesses in the walls of a cave developed by erosional processes.

WATER TABLE — although not strictly applicable to karst hydrology, the upper boundary of the unconfined zone of saturation. This line fluctuates through time with the availability of ground water derived from the surface.

ZONE OF AERATION — a zone in permeable soil or rock where only some of the available pore space is water filled. Vadose conditions prevail in this zone. Water moves through this zone to the zone of saturation.

ZONE OF SATURATION — a zone in permeable soil or rock where all available pore space is filled with water. Phreatic conditions prevail in this zone.

ZONE OF WEAKNESS — areas in and through beds which allow the movement of water and provide space for solution to begin in soluble rocks. See BEDDING PLANE, JOINT, and FAULTS.

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