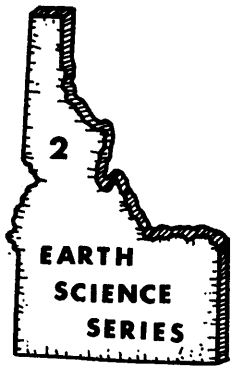

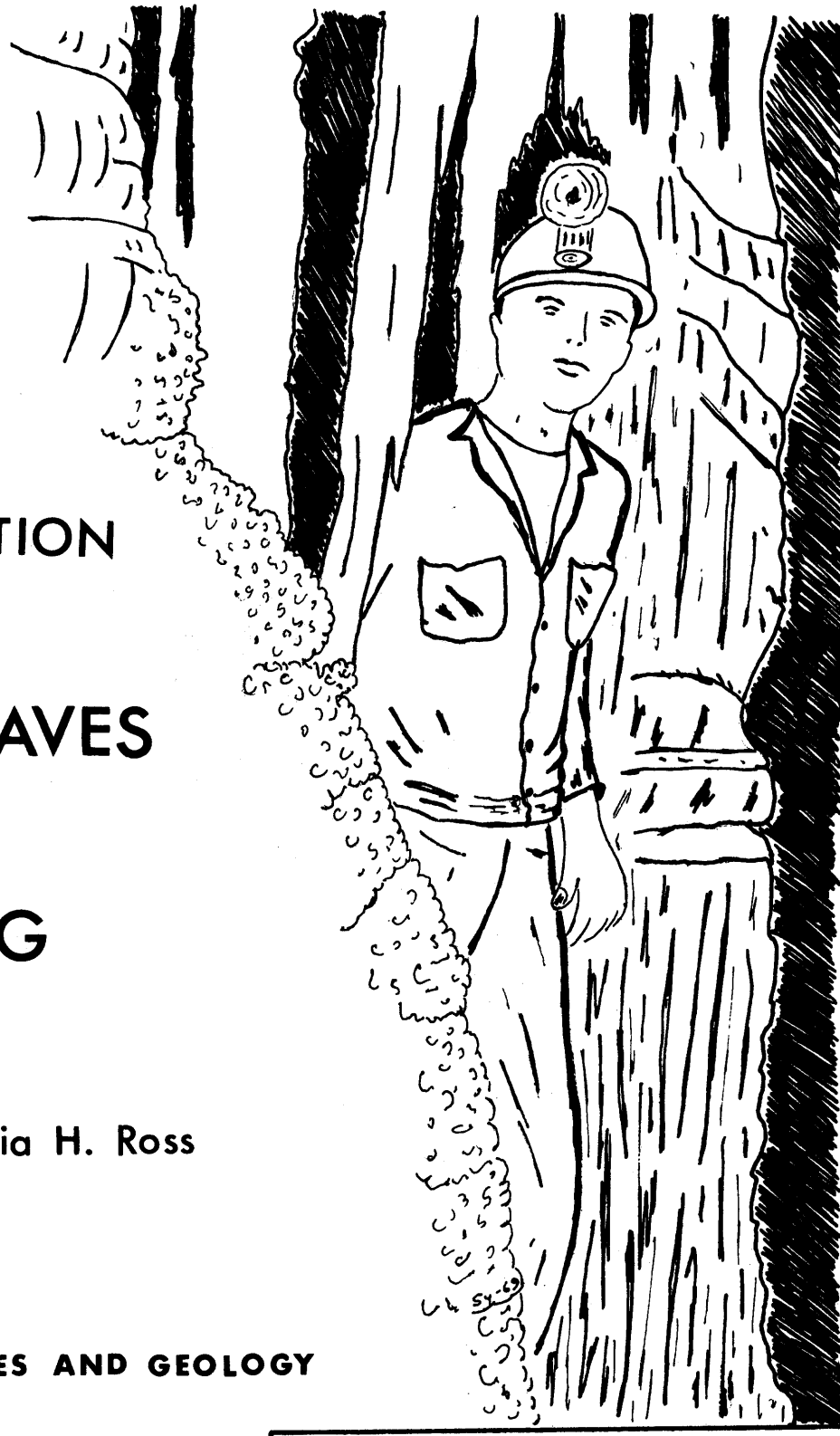

INTRODUCTION to IDAHO CAVES and CAVING

Sylvia H. Ross

IDAHO BUREAU OF MINES AND GEOLOGY
MOSCOW, IDAHO 83843
MAY 1969

State of Idaho
DON SAMUELSON, Governor

Idaho Bureau of Mines and Geology
R. R. REID, Director

Earth Science Series
No. 2

May 1969

INTRODUCTION

TO

IDAHO CAVES

AND

CAVING

by

SYLVIA H. ROSS

IDAHO BUREAU OF MINES AND GEOLOGY
Moscow, Idaho 83843

TABLE OF CONTENTS

FIGURES

INTRODUCTION TO IDAHO CAVES AND CAVING

by

Sylvia H. Ross

ABSTRACT

Caves are of interest to many persons for diverse reasons; perhaps the two most common are recreation and scientific study. Records of more than 200 Idaho caves are on file; and the list is continually growing. Four Idaho caves have been commercialized.

Most of these caves are lava tubes, lava blisters, or fissure caves in the basalts of the Snake River Plain. Concentrattions of known lava caves are near Mountain Home, north of Bliss, in the Black Butte lava flow north of Shoshone, in the southern end of the Great Rift Zone northwest of American Falls, at Craters of the Moon National Monument, and in the northeastern corner of the Plain.

Only a relatively few solution-formed limestone caves occur in the State. Most are in southeastern Idaho, but the largest solution cavern, Papoose Cave, is near Riggins in the west-central part of the State.

Idaho caves and rockshelters are especially important to archeological studies. More than a dozen shelters have been excavated and studied in the search for man's past; perhaps as many as a hundred additional shelters could yield information.

The "golden age" of cave exploration in Idaho is just beginning. New caverns and pits are being explored every year, yet there are many interesting, but relatively easy-to-explore caves for the novice. The practices of safety and courtesy, the wearing of proper clothing, and the use of adequate equipment make cave exploration fun, safe, and rewarding, instead of frustrating, tiring, and dangerous.

THIS PAGE INTENTIONALLY LEFT BLANK

INTRODUCTION

Caves — the fascinating world of the underground. You are not alone in wanting to know more the beneath-ground world. Caves have been of interest to man since before historic times. Today caves still fascinate people, but for a greater variety of reasons than in the distant past when caves were used primarily as home and shelter. Perhaps one of the most important reasons for interest in caves is their scientific value. The general term for this scientific exploration of caves is "speleology", a word that is derived from the Greek "spelaion" (cave) and "ology" (study).

Archeologists have found that caves contain some of the world's best-preserved records of man's prehistory; paleontologists are interested in the remains of prehistoric animals. Geologists study the history of cave formation and what it can tell about the more general geologic and geomorphic (landform development) history of a region. Biologists are interested in the special adaptions of animals that live underground in perpetual darkness.

Other presons are interested in the utilitarian aspects of caverns. Caves have been used for such diverse purposes as housing, for growing mushrooms, as a commercial source of niter (saltpeter), and for various types of storage. Deep caves and man-made caverns have been proposed as locations for storage of radioactive wastes. Civil Defense specialists have considered caverns as natural fallout shelters and as food-storage centers.

Most persons, however, are only interested incidentally in the scientific and utilitarian aspects of caverns. Exploration, the challange of the unknown, weird and beautiful cave formations, or even wild tales of treasure lure "spelunkers" (cavers-for-fun) into the underground world.

Much has been written on caves and cavers, especially in the United States and Europe. Many states have published comprehensive reports on the known caves within their boundaries, and these journals are interesting reading for both the experienced and the amateur spelunker. Although caves of various sizes and shapes occur throughout Idaho, relatively few have been explored. More caverns are being discovered and explored every year in the State.

Some of these caves are shown on road maps or on U. S. Geological Survey topographic quadrangle maps; many other caves are known only to local residents. More than 200 caves are listed in the files of caving organizations active within the State, and the list is growing continuously.

It is the intent of this report to describe some of the better known and some of the largest and most important Idaho caves. This publication is not meant as a comprehensive list of all Idaho caves; hopefully, some future publication will provide a more complete description of each of the known caves within the State. Included here also is a short section of basic information that will be useful to the neophyte caver and a list of reading material for those who want more information on caves and cave exploration in general.

ACKNOWLEDGEMENTS

Many persons have contributed to this work on Idaho caves: William Carleton, while a student at the University of Idaho, searched the literature for information on Idaho caves; his resulting paper served as the catalyst for this report. Much of the information in this publication and many of the maps and photographs are from the files of the Gem State Grotto of the National Speleological Society, or are the personal work of Jerry Thornton of those organizations. George Huppert compiled the list of additional reading material at the end of this publication.

Dr. William R. Halliday of the Western Speleological Society and the National Speleological Society also generously contributed information on Idaho caves from his files. Cave owners and operators gave information about their individual caves. Jim Papadakis of Crystal Ice Caves was especially helpful, not only with information about his own cave system, but with details about caves and geology in the entire area northwest of American Falls.

MAJOR CAVE AREAS OF IDAHO

Most of Idaho's caves, as is true of almost all caves, occur in one of two types of rock — limestone or basalt. The areas of the State underlain by these rocks are shown in Figure 1. At least 20 of the 44 counties in Idaho contain some sort of "hole-in-the-ground".

When most persons think of a cave, they think first of a large limestone solution cavern, complete with stalactites, stalagmites, or other cave decorations. However, only a few of Idaho's known caves are of this sort. Instead, by far the greatest number are lava tubes or some other kind of cave associated with volcanic rocks. Some limestone caverns do occur, primarily in the southeastern and west-central parts of the State.

Caves in basalt

In many parts of the world, volcanic rock caves are relatively uncommon. Only around the edges of volcanos or in areas where large plateaus of lava have been built up do these caves occur. Even some basaltic (lava) plateaus, such as the Columbia Plateau of eastern Washington, northeastern Oregon, and parts of western Idaho (fig. 1), contain few, if any, caves.

Most of Idaho's lava caves are in the area of the Snake River Plain (fig. 2). Concentrations of known caves occur near Mountain Home, north of Bliss, near Shoshone, northwest of American Falls, and at Craters of the Moon National Monument. Often a group of caves will be centered around a single flow or a single fissure.

Although parts of western Idaho are underlain by basalt of the Columbia River Group (fig. 1), this lava is older than that of the Snake River Plain and has a different texture and chemical composition. Only a few small caves are known to exist in this western area.

Lava tubes, blisters, and fissure caves

Caves in basalt generally are lava tubes, lava blisters, or fissure caves. Uncollapsed portions of lava tubes are by far the most common type of cave. Lava tubes are formed by gentle, river-like flows of hot, ropy lava. As the flow extends itself farther and farther from the source, the outside of the flow has a tendency to cool and harden, leaving a crust or shell outside the general molten mass. Because a lava flow may take months or years to cool, the inside of the flow, still in a plastic state and protected by the outer crust, can continue to flow, leaving the hardened outer layer still standing.

Lava tunnel interiors often have miniature lava benches along the walls that mark temporary surface levels of the subsiding lava at a time when the supply was no longer sufficient to keep the tube full. Crusts along the walls are common, and some seem to have peeled off partially when still plastic. Some tunnel walls are in a "glazed" condition, probably resulting from remelting of the rock in a blast-furnace atmosphere. Lava tubes may contain lava stalactites hanging from the

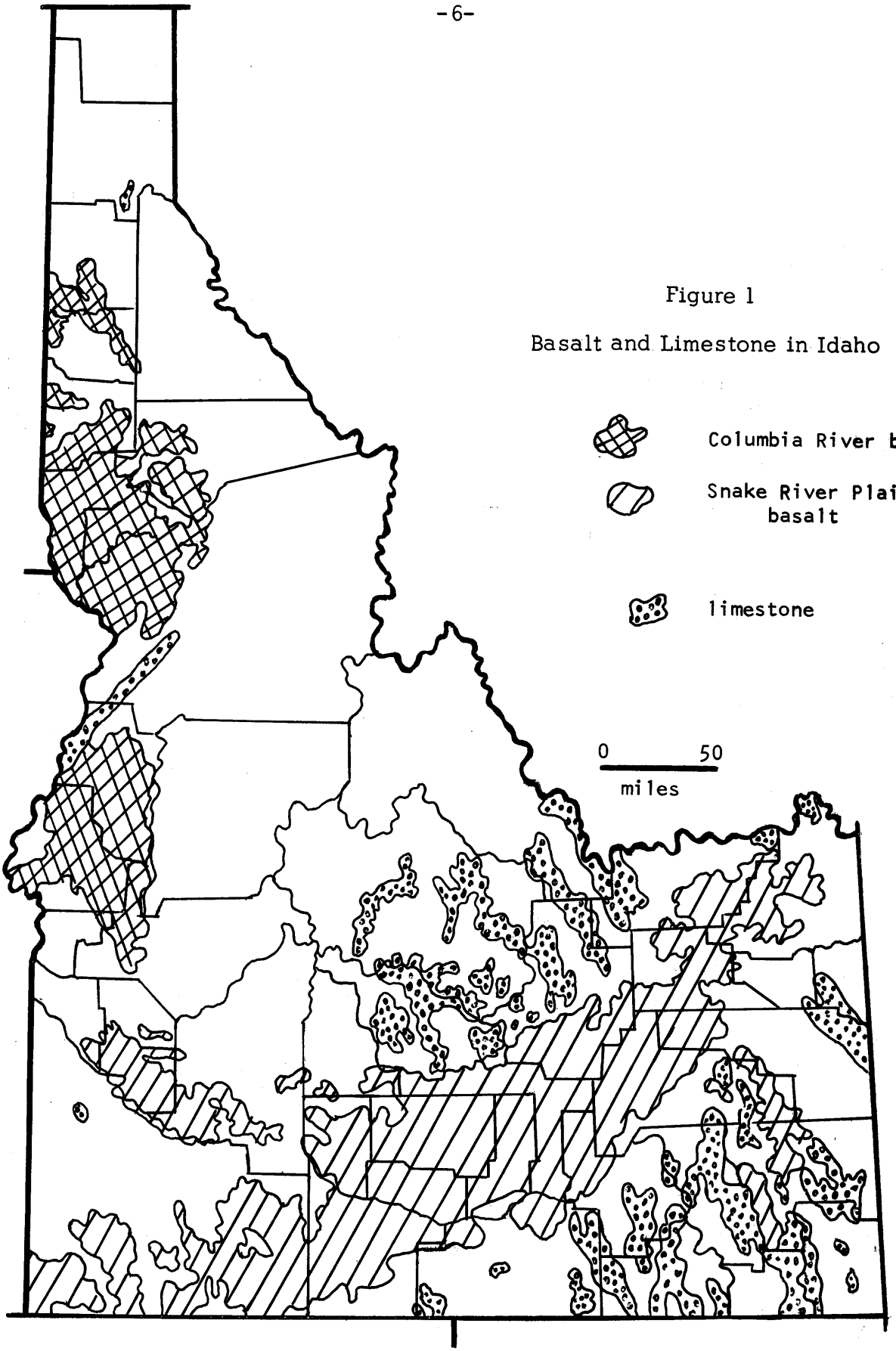

Figure 1

Basalt and Limestone in Idaho

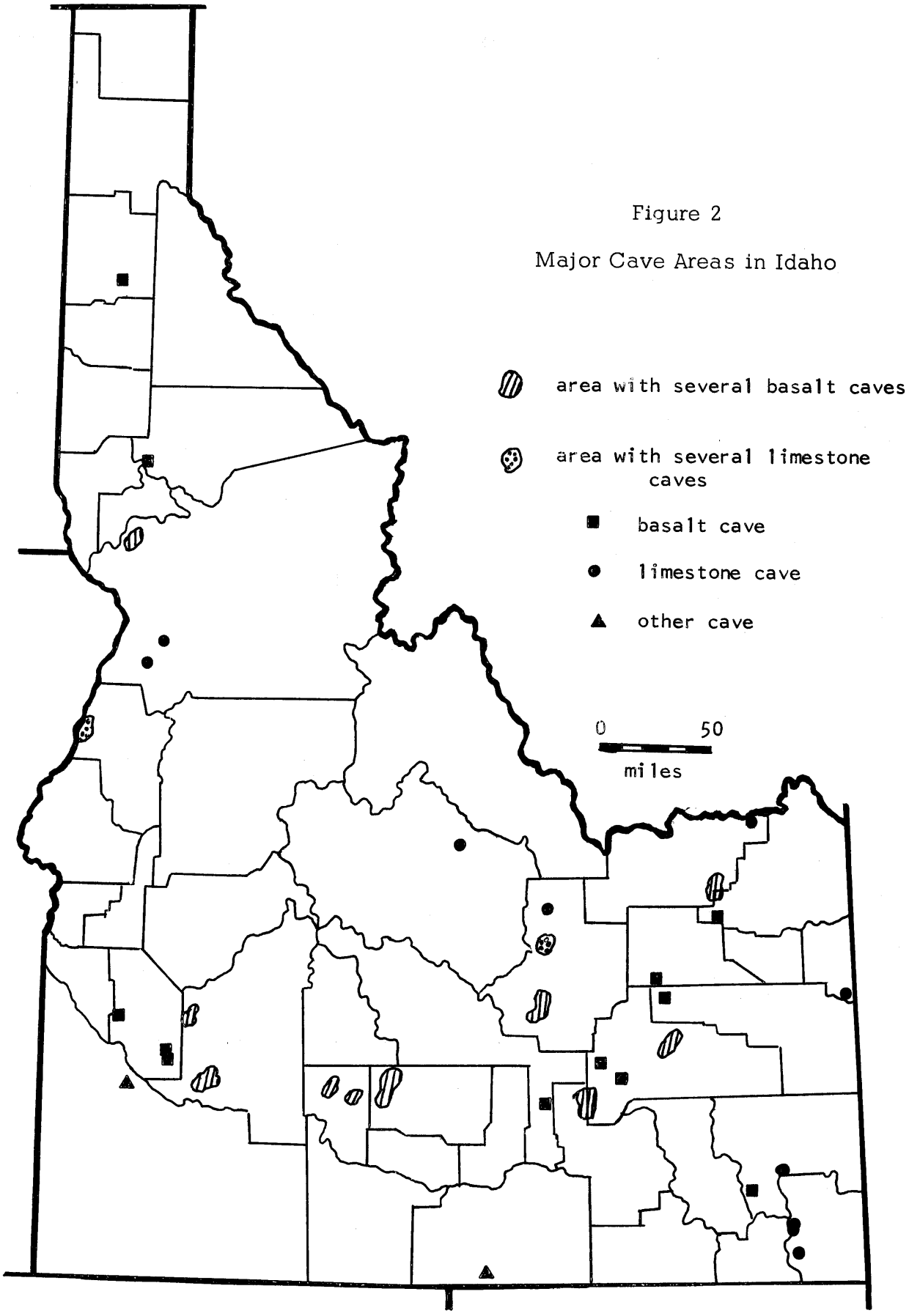

Figure 2

Major Cave Areas in Idaho

ceiling, and lava stalagmites built up on the floor from dripping lava. Other formations may be deposited later in the history of the cave.

Lava blisters are flat-bottomed, domed-shaped caves that probably developed from a true blister-like lifting of a thin lava sheet by pockets of steam or other gases trapped within the lava flow. A few "lava blisters" are not true blisters, but are formed instead as molten lava was squeezed into a dome.

Fissures are linear features through which lava has moved up to the surface. Most fissures show up only as lines from the air, although small cinder cones may be aligned along them. In a very few places in the world, open fissures occur in basalt fields. Most of these narrow cracks are only a few feet wide, but they may be miles long. Depths of more than 600 feet are rare, but are known both in south-central Idaho and in Iceland. One of the greatest fissure systems in the world extends across the central Snake River Plain from Craters of the Moon National Monument to north-west to American Falls (fig. 3). This rift was the source of much of the basalt in the central Snake River Plain.

"Ice caves"

One feature of some Idaho volcanic caves (and at least one limestone cave), which is far from unique but is interesting to note, is the presence of perpetual ice. Such "ice caves" occur because water that collects in them is frozen by the passage of cold air through the cavern. The freezing process generally lasts for about seven months or more; then during the remainder of the year the ice gradually melts. Because the lava (or other rock) acts as an insulator, the temperature of an ice cave rarely rises above 35°F; thus it is not unusual to find an "ice cave" in the middle of a scorching desert.

Caves in limestone

The most common kinds of caves in most parts of the world are those that have been dissolved from limestone, marble, or similar rocks. Limestone is composed predominantly of the mineral calcite (calcium carbonate), which over a period of time will dissolve when in contact with water. The most active zone of solution has been found to be just below the water table. Most of the decorative cave formations ("speleothems") are formed above the water table after the cave has been opened to the atmosphere.

Stalactites form as water containing dissolved minerals drips slowly from the ceiling; part of the water evaporates and the minerals in solution are deposited. If the drip of water hits the floor of the cave before it completely evaporates, more mineral is deposited, and the resulting deposition is a stalagmite. Whole cascades or "frozen waterfalls" form where large amounts of water evaporate along a wall or from a crack or joint. Impurities, such as iron, may streak some of these cave formations red, orange, or brown. Many excellent articles have been written describing the processes of solution and deposition that form limestone caverns; some of these papers are listed at the end of this publication.

Solution caves occur in southeastern Idaho and in a belt of limestone in the west-central part of the State (figs. 1 & 2). Although large amounts of limestone

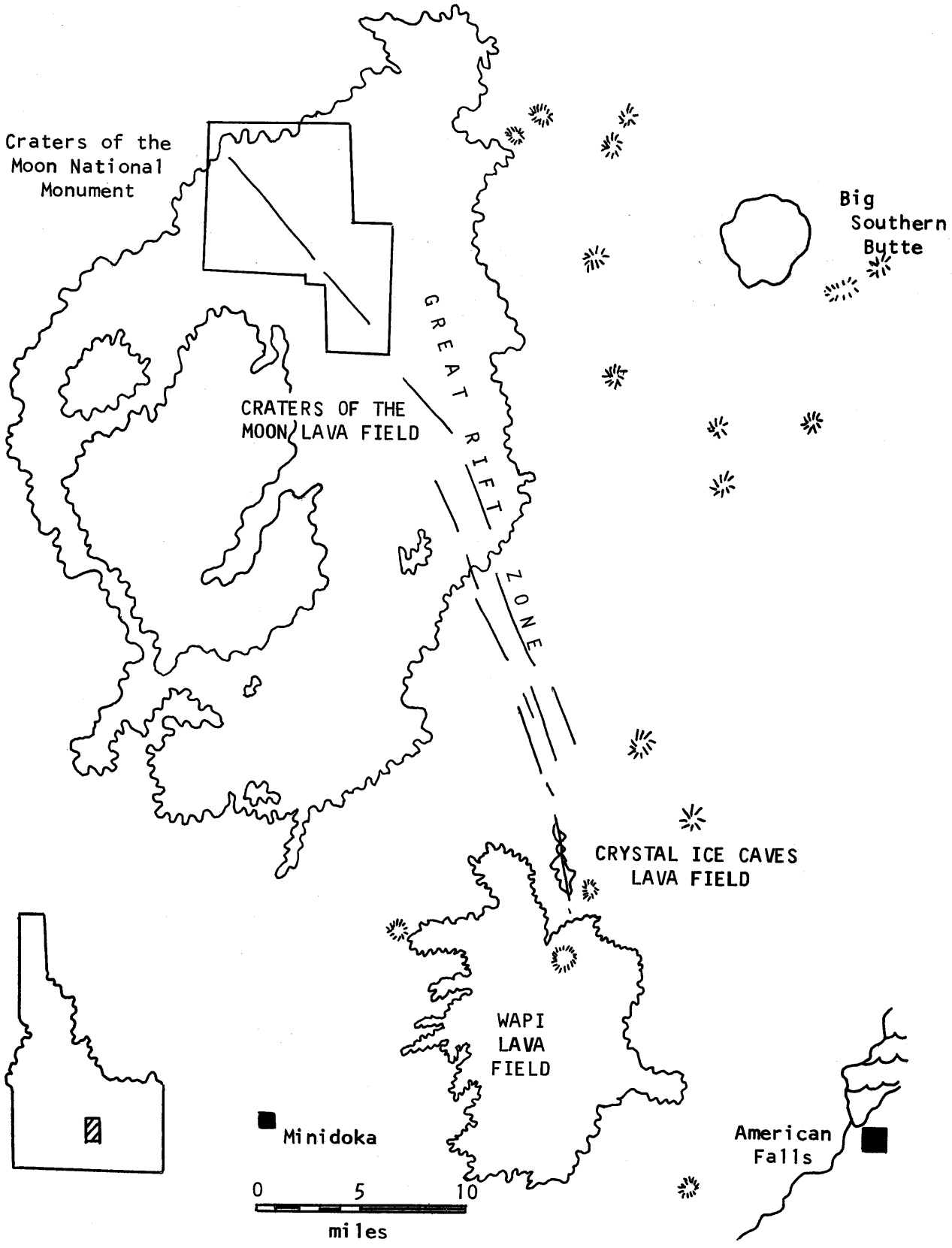

Figure 3. The Great Rift Zone, Snake River Plain, Idaho. (Modified from a map by Jim Papadakis.)

exist in other parts of the State (fig. 1), only a few caves have been recorded from these regions. Many more limestone caves exist and undoubtedly will be reported as these areas are explored in more detail.

Caves in materials other than basalt or limestone

In a few places in Idaho, caves occur in sandstone (such as those near Oreana in Owyhee County), or in jumbled blocks of granite or other rocks (as at Cassia City of Rocks). A few small caves have been reported from the rhyolite rocks in Owyhee County and other areas. Most of these caves are small, shelter-type ones. Although of little interest to the spelunker, some of these shelters are important as archeological sites.

EXAMPLES OF IDAHO CAVES

Four types of caves exist in Idaho — commercial, semi-developed, and undeveloped (wild caves), and rockshelters. Commercial caves are those with guided tours along good paths or stairs and with adequate lighting. Semi-developed caves are open to the general public, and usually have easy access. They may contain paths or ladders, but do not have guides or lighting systems.

Undeveloped caves require lights, outdoor clothing and shoes, and commonly call for special equipment such as ropes and ladders. Rockshelters are a somewhat special class of relatively small semi-developed or undeveloped cave.

In the following sections, examples of typical Idaho caves will be described. In order to understand the maps included with some of the cave descriptions, standard symbols (fig. 4) have been used throughout this publication. The scale on each map should be noted as the maps are printed at various scales.

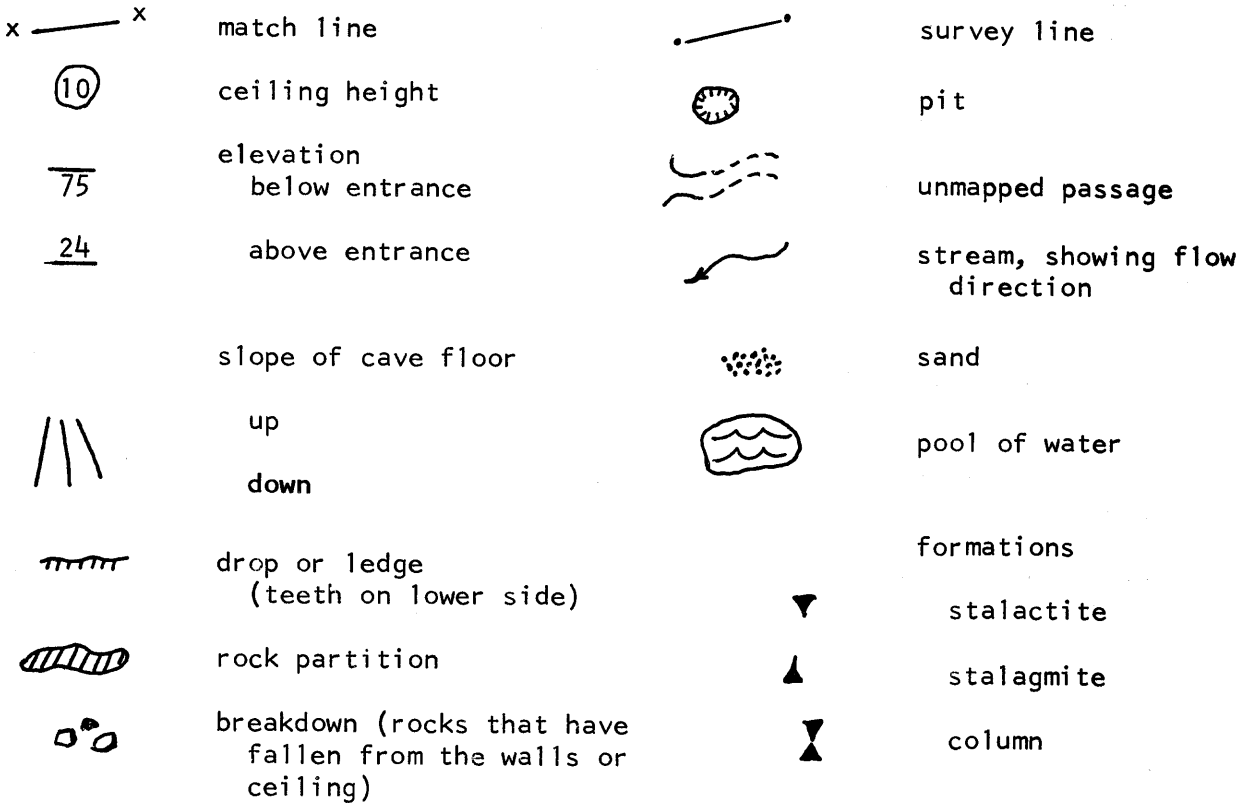

Figure 4. Standard symbols used on cave maps in this report.

Commercial caves

Idaho has four commercial caverns within its boundaries: one is a fissure cave, two are lava tubes, and the fourth is a solution cavern in limestone.

Crystal Ice Caves

Crystal Ice Caves, 28 miles northwest of American Falls, are unique in that they are the only commercialized fissure caves in the world. The caves are in the Crystal Ice Caves Lava Field (fig. 5) at the southern end of the Great Rift Zone (fig. 3). The width of the rift at the cave area is approximately 6 feet.

The caves are open daily until sunset from May 25 to November 1 each year. Visitors descend to a depth of more than 150 feet along a trail and a series of stairless tunnels that have been excavated parallel to the rift zone. Windows allow visitors to view the interior of the caves and the ice formations (fig. 6). Three spectacular ice formations, one 25 feet tall, decorate the walls of the cave.

A layer of ancient, buried soil beneath the first lava flow can be seen just inside the entrance of the main cave. Carbonaceous matter from this layer has been used to determine that the maximum possible age of the overlying basalt flow is about 2,000 years old.

Another feature of the rift that is part of the Crystal Ice Caves tour is the large pit known as the King's Bowl. It was probably formed by an explosion of molten rock and steam that scattered rock from the pit over a large area.

The rift zone and the ice cave area have been designated a natural landmark by the U. S. Department of the Interior. As such, the area will be preserved in its natural state in order to illustrate the geologic processes that have molded the surface of the region.

Shoshone Indian Ice Caves

Shoshone Indian Ice Caves (fig 7), in Lincoln County, are perhaps the best-known of Idaho caverns, The caves, about 16 miles north of the town of Shoshone along U. S. Highway 93, are open during the summer months.

When the main ice cave was first discovered, about 1880, it was almost completely filled with ice. Until about 1900 the cave was used as a permanent ice source for the town of Shoshone. During the early 1900's, as the ice was slowly quarried or melted, more rooms were discovered behind the ice-filled portion of the cave. However, because ice was continually reforming at the entrance, it was artificially enlarged. This larger opening allowed a change in the air circulation pattern, which caused the ice to melt faster than it formed.

Beginning in 1930, the Federal Government administered the cave area, and by 1936 a road, trails, and walkways were completed. However, during this time, valdals blasted a second entrance, which allowed the hot desert wind to blow completely through the cave; the ice was gone in less than 5 years. The government abandoned the cave project in 1939.

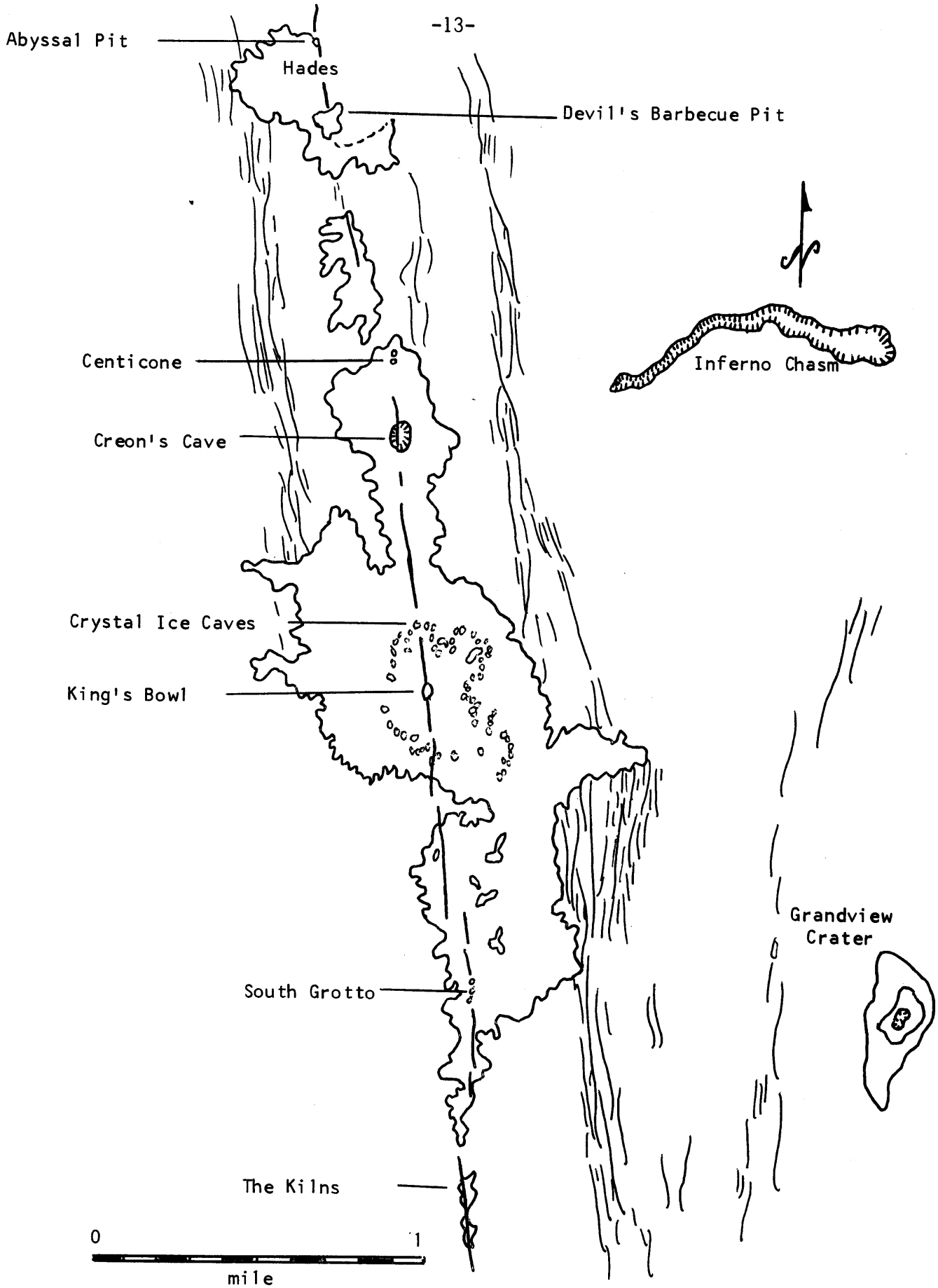

Figure 5. The Crystal Ice Caves Lava Field. (Modified from a map by Jim Papadakis.)

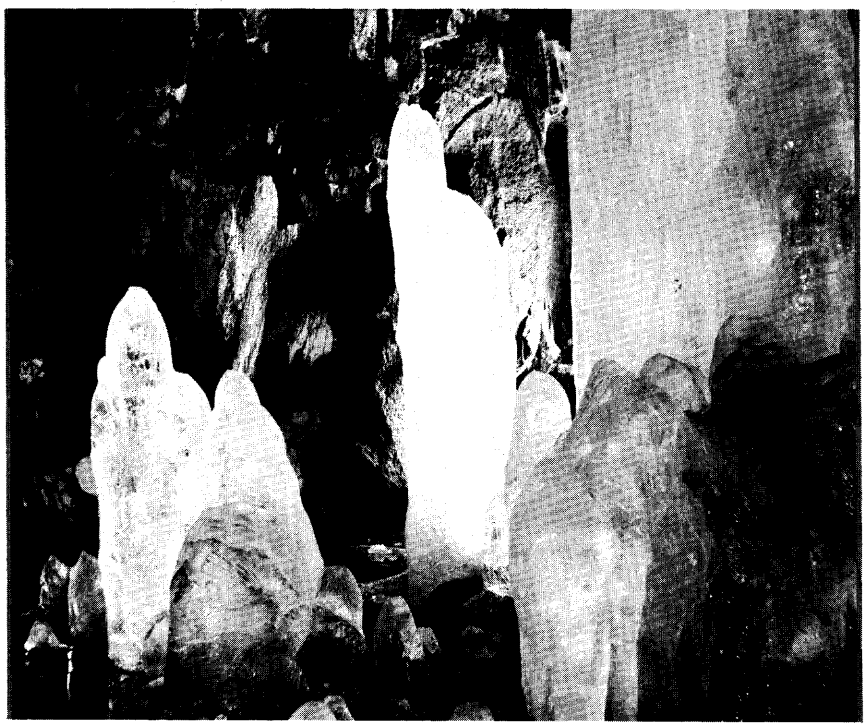

Figure 6. The Nativity. Ice formations in Crystal Ice Caves. Photo by Jim Papadakis.

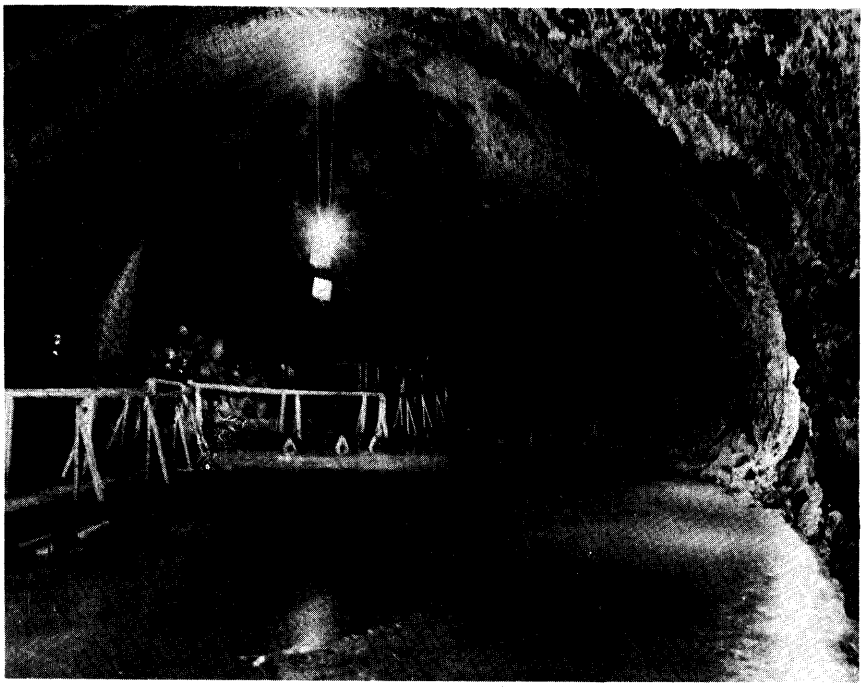

Figure 7. The main room of Shoshone Indian Ice Caves. Photo courtesy of Russell Robinson.

Until 1954 the cave was left unprotected. Since that time, Russell Robinson has managed the ice cavern. As part of his restoration program, he has experimented with the air flow patterns within the cave until, at the present time, the ice is reforming at a fairly rapid rate.

The cave is a lava tube just south of Black Butte and is one of many in the Black Butte lava flow (fig. 8). The ice caves and other caves in the area have yilded bones of many types of prehistoric mammals including bears, horses, and camels. Many of these fossilized bones, as well as local Indian artifacts, are on display at the cave museum.

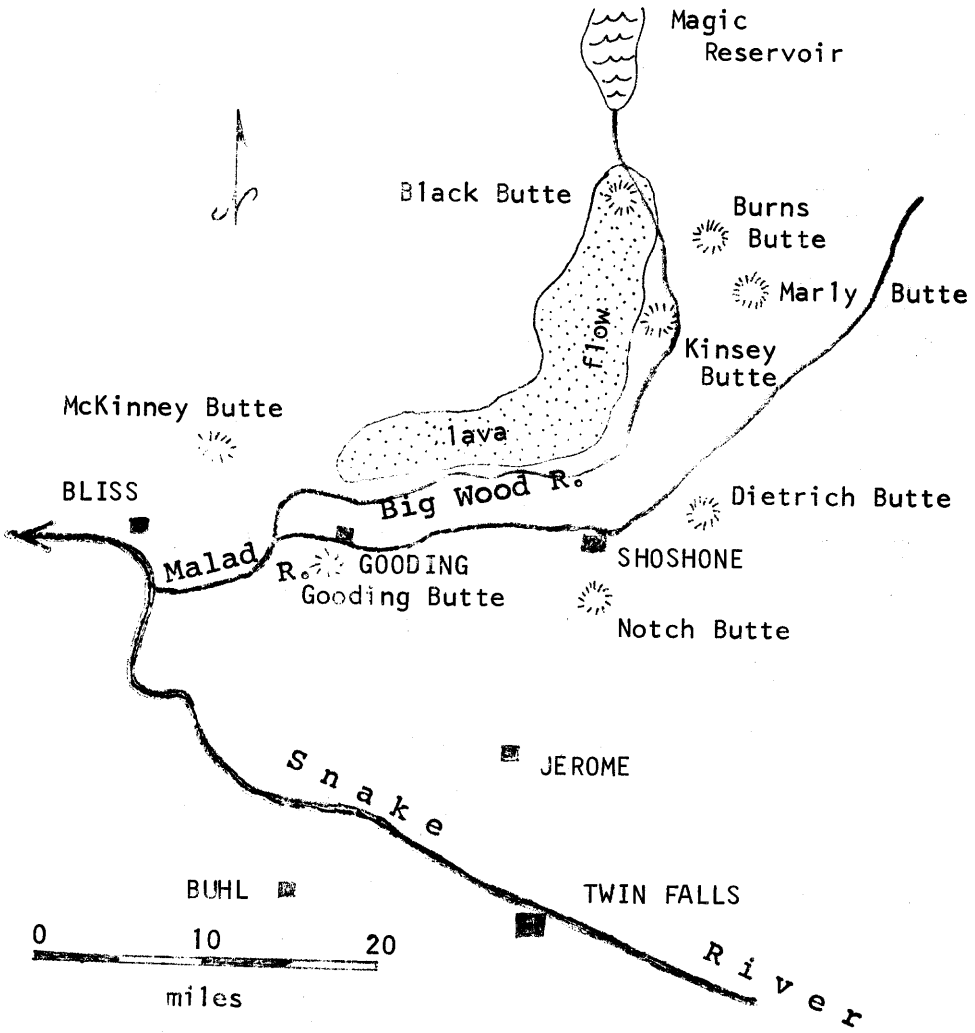

Figure 8. Map of Black Butte and its lava flow. (Modified from a map by Russell Robinson.)

Idaho's Mammoth Cave

The newest of the State's commercialized caves, Idaho's Mammoth Cave is a quarter-mile long lave tube (fig. 9) about 8 miles north of Shoshone west of U. S. Highway 93. This cave is also in the Black Butte lava flow. The main attractions

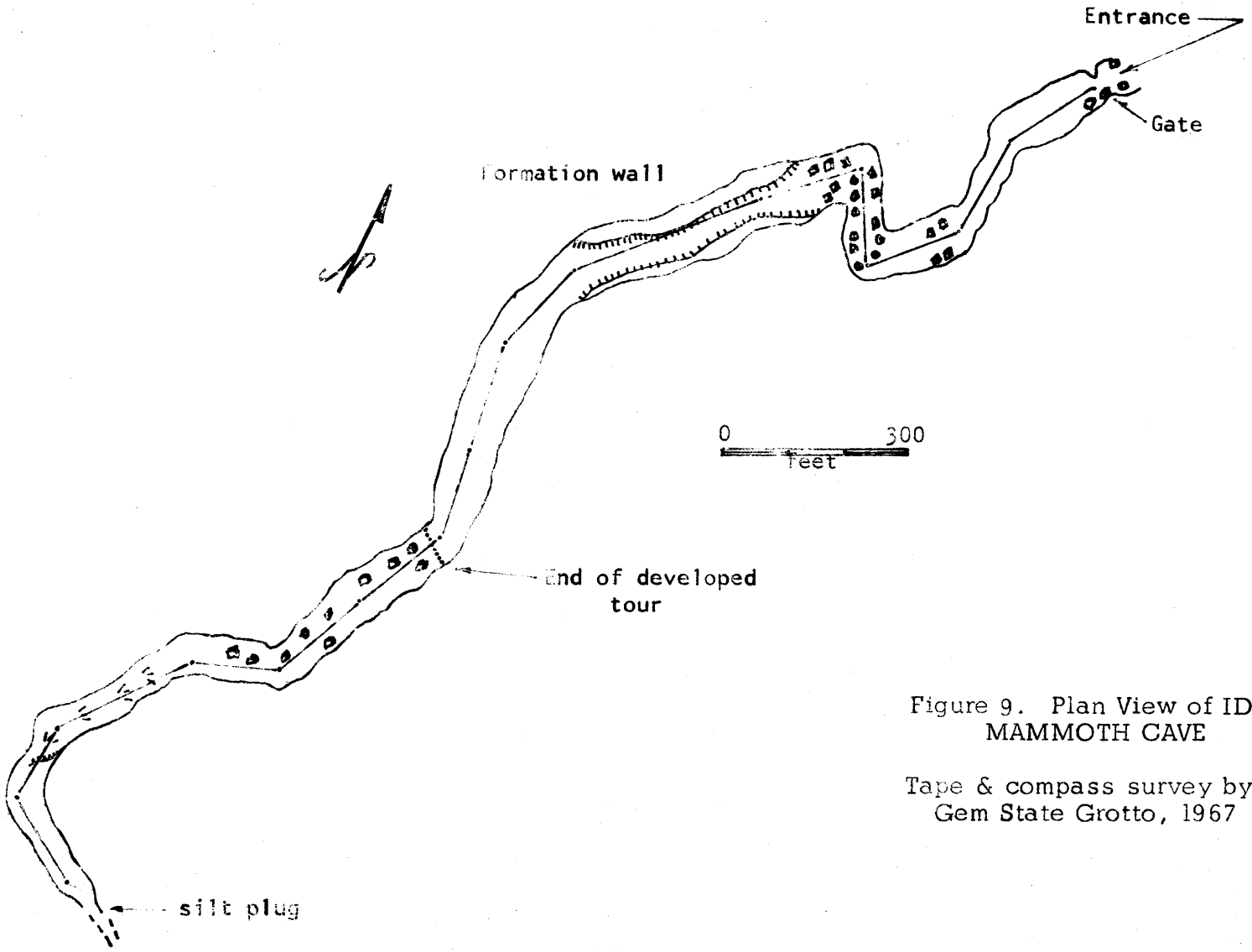

Figure 9. Plan View of IDAHO MAMMOTH CAVE

Tape & compass survey by the Gem State Grotto, 1967

of the cave are the outstanding secondary formations of calcite and silica. It is reported that prehistoric cave bears used the cave as a den.

The cave has improved paths and good lighting; there is a small museum at the cavern entrance. In addition to being developed commercially, the cave, owned by Richard Olson of Jerome, has been designated as a civil defense fallout shelter.

Minnetonka Cave

Minnetonka Cave, Idaho's only commercial limestone cavern, is in the southeastern part of the State, 8 miles east of St. Charles. The cave, which is in the Cache National Forest, is administered by the U. S. Forest Service and is open daily from the middle of June until Labor Day.

The cave was dissolved out of limestone of Mississippian age (about 325 million years old) and is well over a half-mile long (fig. 10). The cave contains stalactites, stalagmites, helectites (special forms of stalactites that grow in fish-hook or corkscrew-like shapes), flowstone curtains (fig. 11), and banded travertine. Layered sands, clays, and rounded pebbles occur on the floor of several passages, indicating that stream action has modified the cave after the initial solution occurred.

Many of the formations were vandalized during the early 1900's (The cave was discovered about 1906 or 1907), and a protection effort was begun in 1938 by the Federal Government. Paths, steps, and metal railings were installed as part of the project; electric lights have been added within the past few years. From 1949 until 1963, the Paris Lions Club operated the cave under a special permit. Since 1964 the Forest Service has managed the cavern.

Deadhorse Cave

Although technically not a commercial cave, Deadhorse Cave, a well-known lava tube northwest of Gooding in the McKinney Butte lava flow, has been developed and protected — for private use only. The cave is owned by the State Odd Fellows organization and is used as a convention hall. The I.O.O.F. reportedly has installed a door, electrical lighting system, and seating for 1200 persons.

Semi-developed caves

Semi-developed caves are, for the most part, within the boundaries of Craters of the Moon National Monument; only a few other truly semi-developed caves exist in widely-scattered parts of the State. However, even without improvements, many lava tubes that have easy access and are near populated areas are heavily used and might be considered as semi-developed — if only because they have been modified by vandalism. Most of these caves, however, will be discussed in a later section.

Craters of the Moon National Monument

Idaho's largest single cave protection effort is at Craters of the Moon National Monument. Within the Monument boundaries are more than 20 caves (fig. 12); many of them are partially developed for the visiting tourist or caver. For the most part,

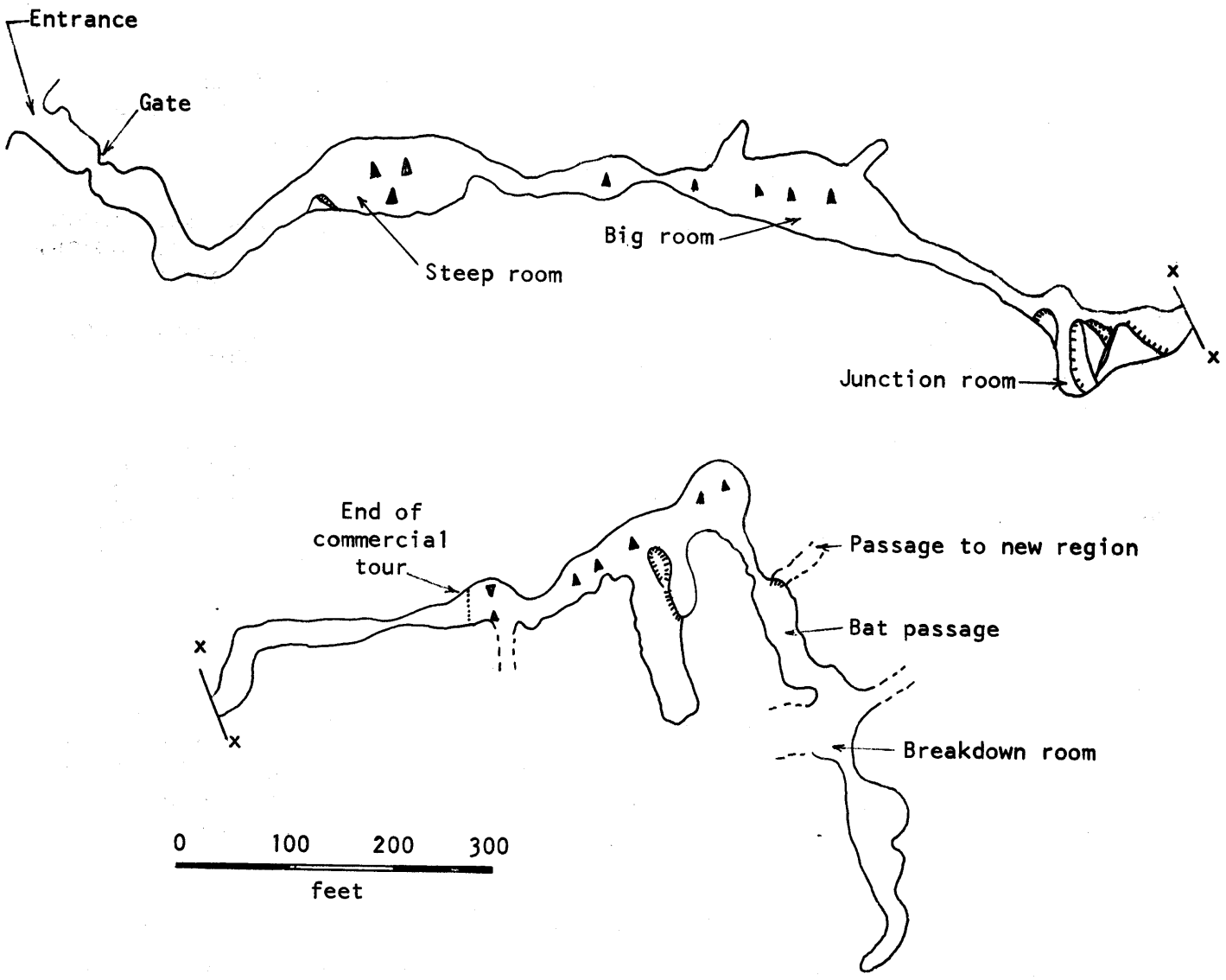

Figure 10. Plan view of Minnetonka Cave. Tape & compass survey by W. R. Halliday and R. Hodgson, September 1952.

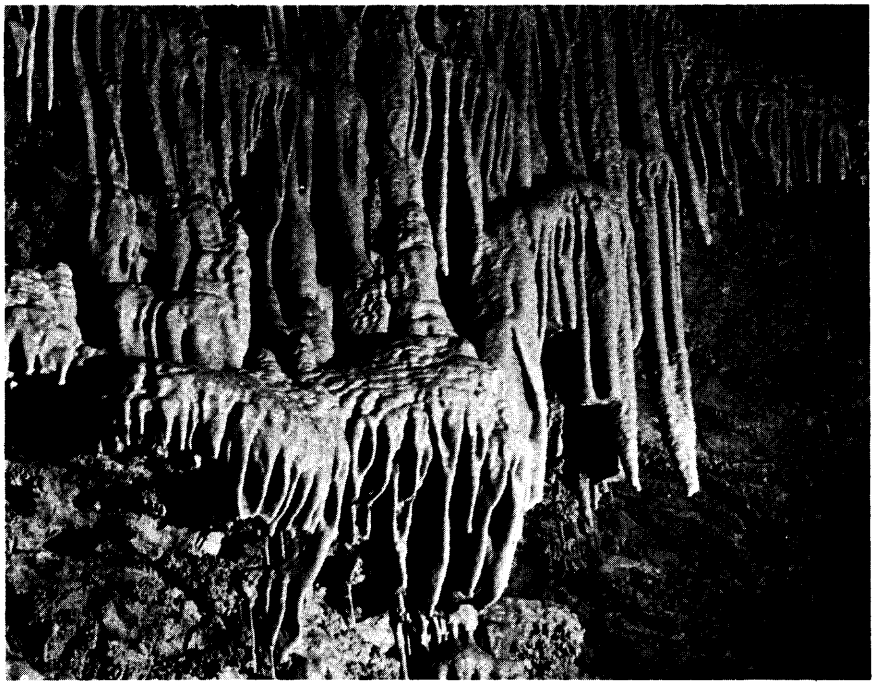

Figure 11. Flowstone curtains, columns, and stalactites decorate the walls of Minnetonka Cave. Photo by Jerry Thornton.

these caves are lava tubes, several in a near-perfect state of preservation. Among those open to the public and with well-marked paths leading to their entrances are Great Owl Cavern (fig. 13), Lava River Cave, Last Chance Cave, Horseshoe Cave, Tom Thumb Tunnel, Needles Cave, Natural Bridge Cave, Indian Tunnel, Boy Scout Cave, Surprise Cave, and others. These caves are not lighted and the visitor must take his own source of light.

Two of the Monument's caves have been closed to the general public for the purposes of conservation and study. The first of these closed caves, Crystal Pit, is a cavity in one of the many spatter cones. A descent of about one hundred feet places the caver on the floor of a room 110 feet long and 20 feet wide. One of the outstanding features of this small, vertical-fissure cave is the presence of gypsum and other crystals.

The second cave, Arco Tunnel, is an unusual lava tube. It is a complex passage system and, in addition, is nearly devoid of the usual collapsed blocks of lava from the walls and ceiling, silt, and vandalism. The floor is ropy lava (pahoehoe), and ice formations occur in several parts of the cave.

Kuna Cave

Kuna Cave (fig. 14), in Ada County, is perhaps Idaho's best-known semi-developed cave. A sign points out the direction of the cave from the community of Kuna, but a topographic map is needed to find the exact location. A steel ladder in the cave entrance, about 35 feet to the floor, allows the explorer to descend to

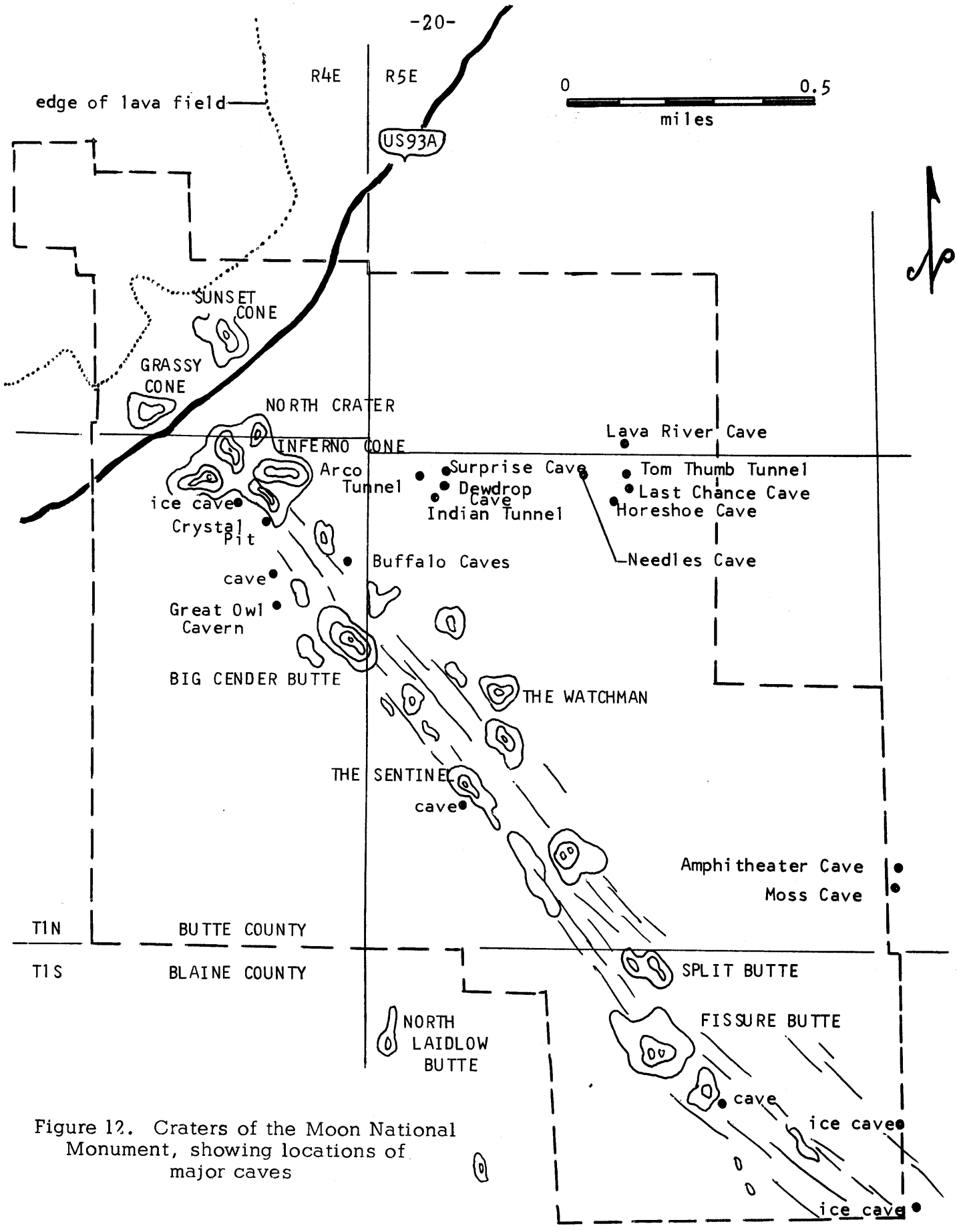

Figure 12. Craters of the Moon National Monument, showing locations of major caves

Figure 13. Entrance to Great Owl Cavern, one of the lava tubes in Craters of the Moon National Monument. Note ladder in entrance at left. Photo by Sylvia Ross.

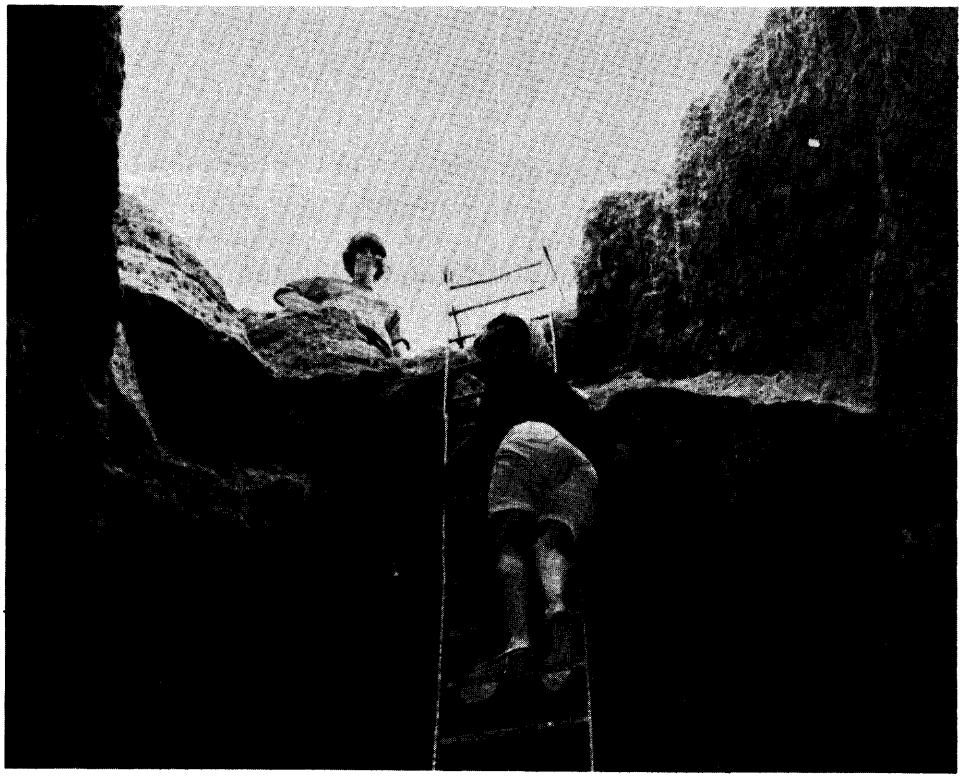

Figure 14. Entrance to Kuna Cave. Photo by Mel Lee.

the bottom of the lava tube. The cave contains slightly more than a thousand feet of passage, about half of which has been vandalized with paint and smoke.

Kuna Cave has a long history of use beginning when it was first explored in the 1890's. Stories are told of hidden loot from a robbery; that the cave is miles long and has several entrances; and that the moon controls the changes in direction of the air blowing in and out of the cave. However, no indication of hidden money has been found; the true length of the cave has been shown by mapping (fig. 15); and the air reversal is easily explained by changes in air pressure. When the barometric pressure is low outside the cave, the air blows outward; when the pressure is high, air moves into the cave.

Paris Ice Cave

Paris Ice Cave (fig. 16) is a small solution cave in the canyon east of the community of Paris, Idaho. Signs note the milage to the cave, but the entrance sign has been removed. A well-worn trail leads to the entrance. Much of the "cave" is actually a large chimney open to the sky; but a small, flat crawlway leads into a low-ceilinged room containing an icy floor and a few ice formations.

Undeveloped caves in basalt

Although there are innumberable lava tubes and fissures in Idaho, only some of the larger, better-known caves or groups of caves will be discussed in this report. In order to follow some sort of logical sequence, the discussion will begin with basalt caves in the southwestern part of the State and work progressively eastward.

Higby Cave

Higby Cave (fig. 17), a 1,100-foot long lava tube between Boise and Mountain Home, Idaho, has been known to the general public for many years and has been heavily vandalized and littered. Rumors that gold from several holdups in the late 1880's is buried in the cave has caused extensive digging in the cave and in the general area.

A smaller, but similar lava tube about 3 1/2 miles south of Higby Cave is called The Tank.

Cleft Caves

Some of the best-used, but generally little-known, caves in Idaho are a group of some 14 caves or more near Mountain Home in Elmore County; they are known collectively as Cleft Caves (fig. 18). At least six of the caves are along fault zones associated with Crater Rings, two volcanic explosion pits, each a half-mile in diameter. The other caves in the area are lava tubes.

Two of the fissure caves, Smith's Crack and Helluvatime Cavern, have been used by the Gem State Grotto, the local cave exploring organization, for training

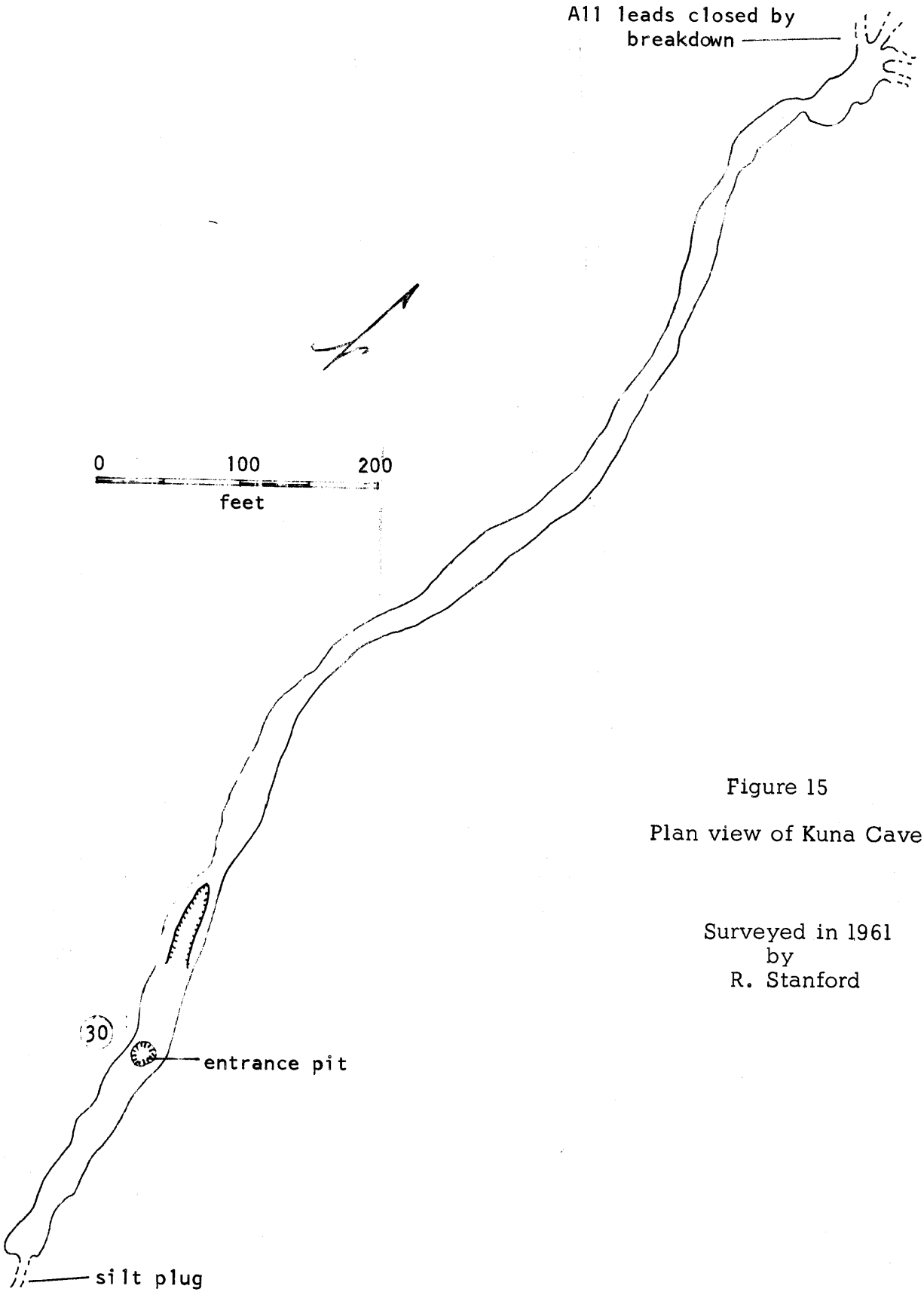

Figure 15

Plan view of Kuna Cave

Surveyed in 1961
by
R. Stanford

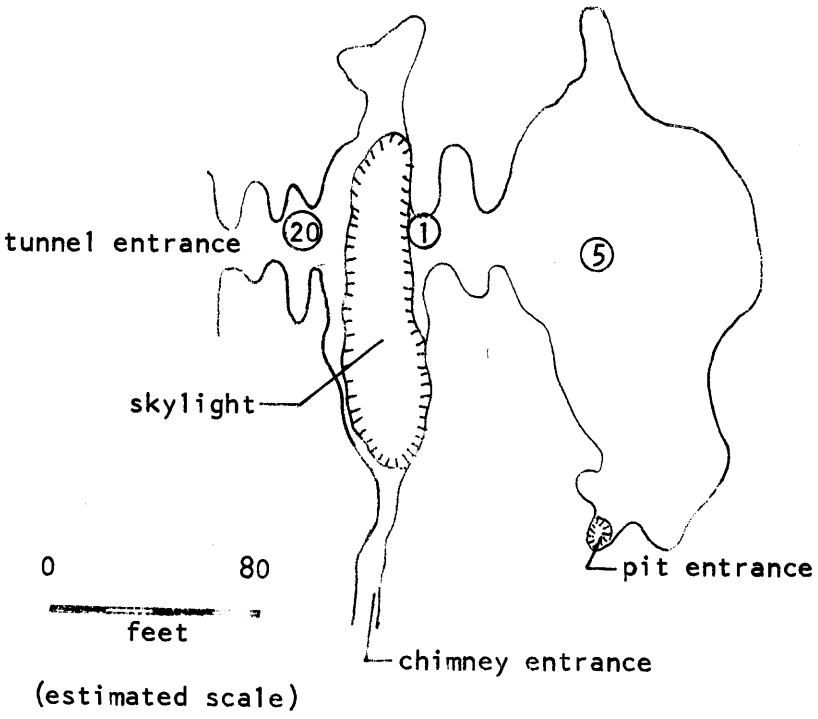

Figure 16. Plan view of Paris Ice Cave.

exercises. Helluvatime, with less than 300 feet of passage, requires a minimum of two hours to complete the round trip. Its 100-foot depth calls for 300 feet of vertical equipment. The cave offers a complete range of situations from a 13-inch high vertical crawlway to a 35-foot chimney and a 65-foot free drop. The cave is a challange to newcomers, provided that they have the proper equipment and that experienced cavers help them learn proper caving-climbing techniques.

Smith's Crack (fig. 19) is 375 feet long and has a depth of 128 feet. This cave exhibits two distinct soil layers between basalt flows. Periodically the cave contains water in its lower levels.

Other area caves have entrance-pit drops ranging from 10 feet to 55 feet. Some of the caves, however, can be entered without vertical equipment.

Smith's Prairie Caves

Several relatively unspoiled lava tubes exist in the area of Smith's Prairie, Elmore County, about 25 airline miles north of Mountain Home. One of the more interesting of these caves is Devils Hole, which has a 15-foot entrance drop into a lava tube. Prairie Ice Cave, in the same area, contains ice throughout most of the year.

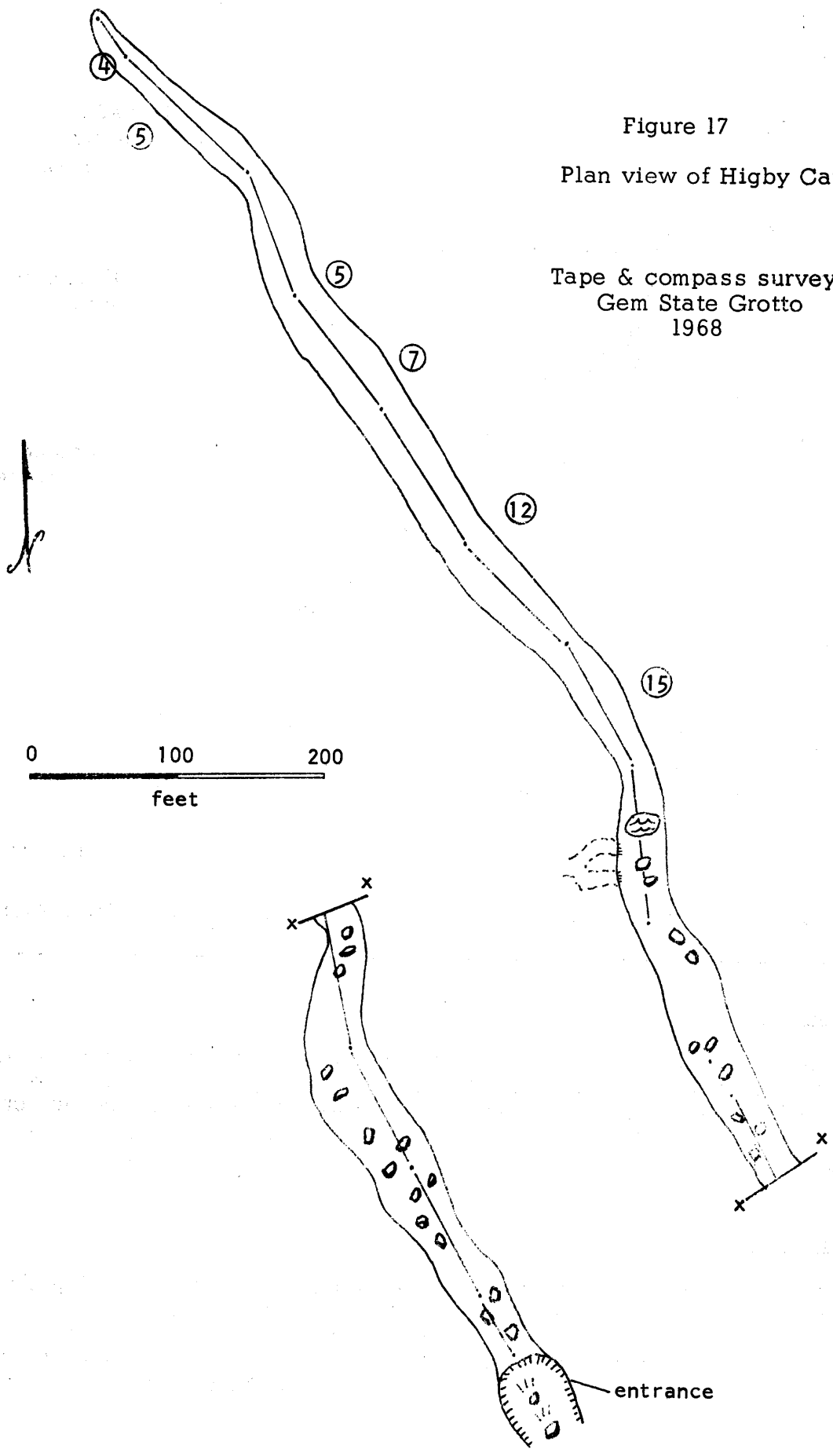

Figure 17

Plan view of Higby Cave

Tape & compass survey by
Gem State Grotto
1968

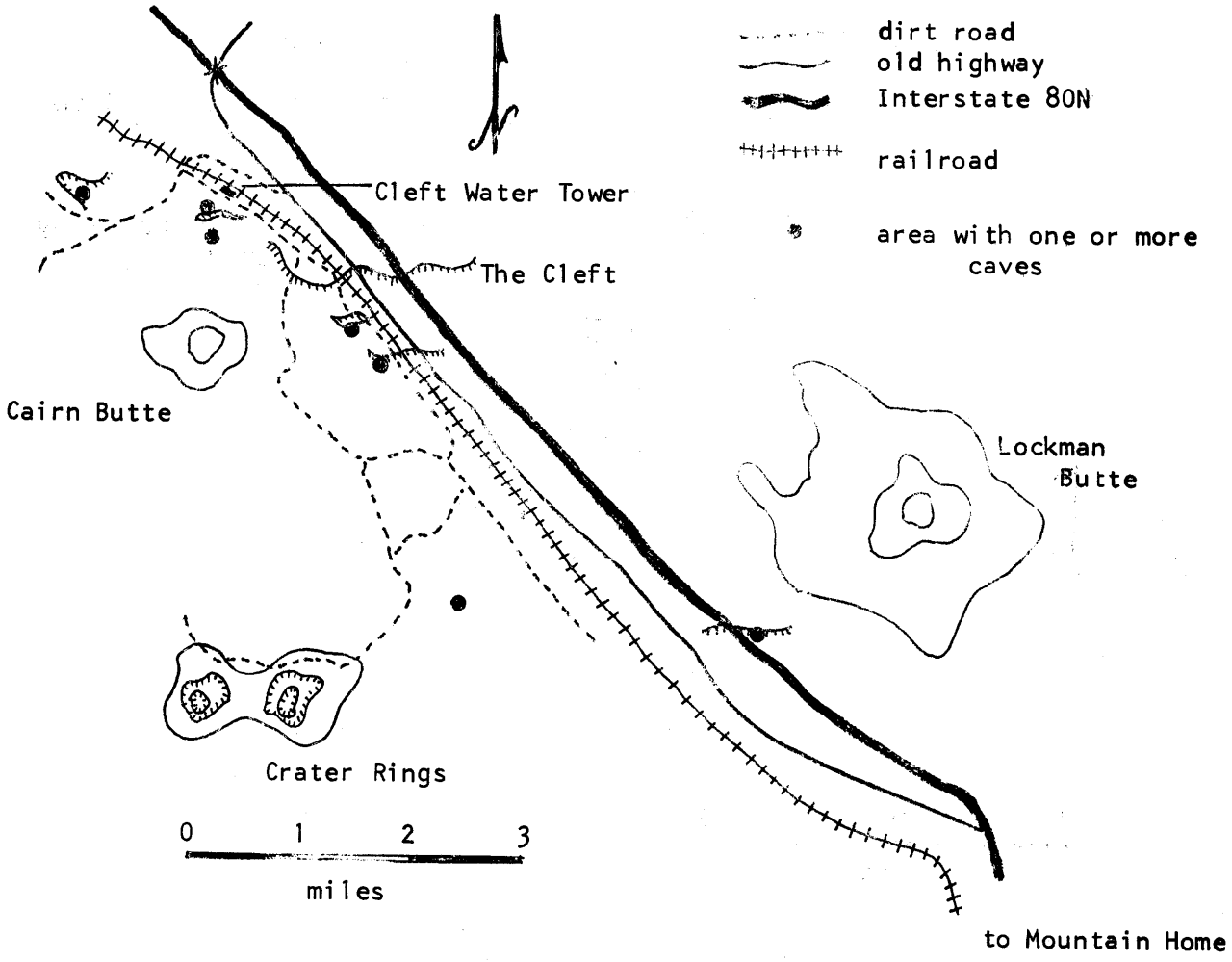

Figure 18. Sketch map of the Cleft Caves area. Redrawn from a map by Jerry Thornton.

Hot Sulphur Lake Caves

A great number of small, uncollapsed portions of lava tubes can be explored near White Arrow Hot Springs and Hot Sulphur Lake in Gooding County, about 10 miles north of Bliss. All of the caves are in a small lava flow whose origin was the cone which now contains the warm lake. Some of the caves are reported to have contained Indian artifacts, but almost none can be found at the present time.

McKinney Butte Caves

About 15 caves occur on the southwest flank of McKinney Butte in Gooding County. The best-known one is the previously-described Deadhorse Cave. Several other nearby caves seem to be uncollapsed portions of the same lava tube (fig. 20). Although most of the other caves are small and scattered, one other lava tube, Survey Point Cave (fig. 21), three-fourths of a mile due east of Bliss Point and about six miles

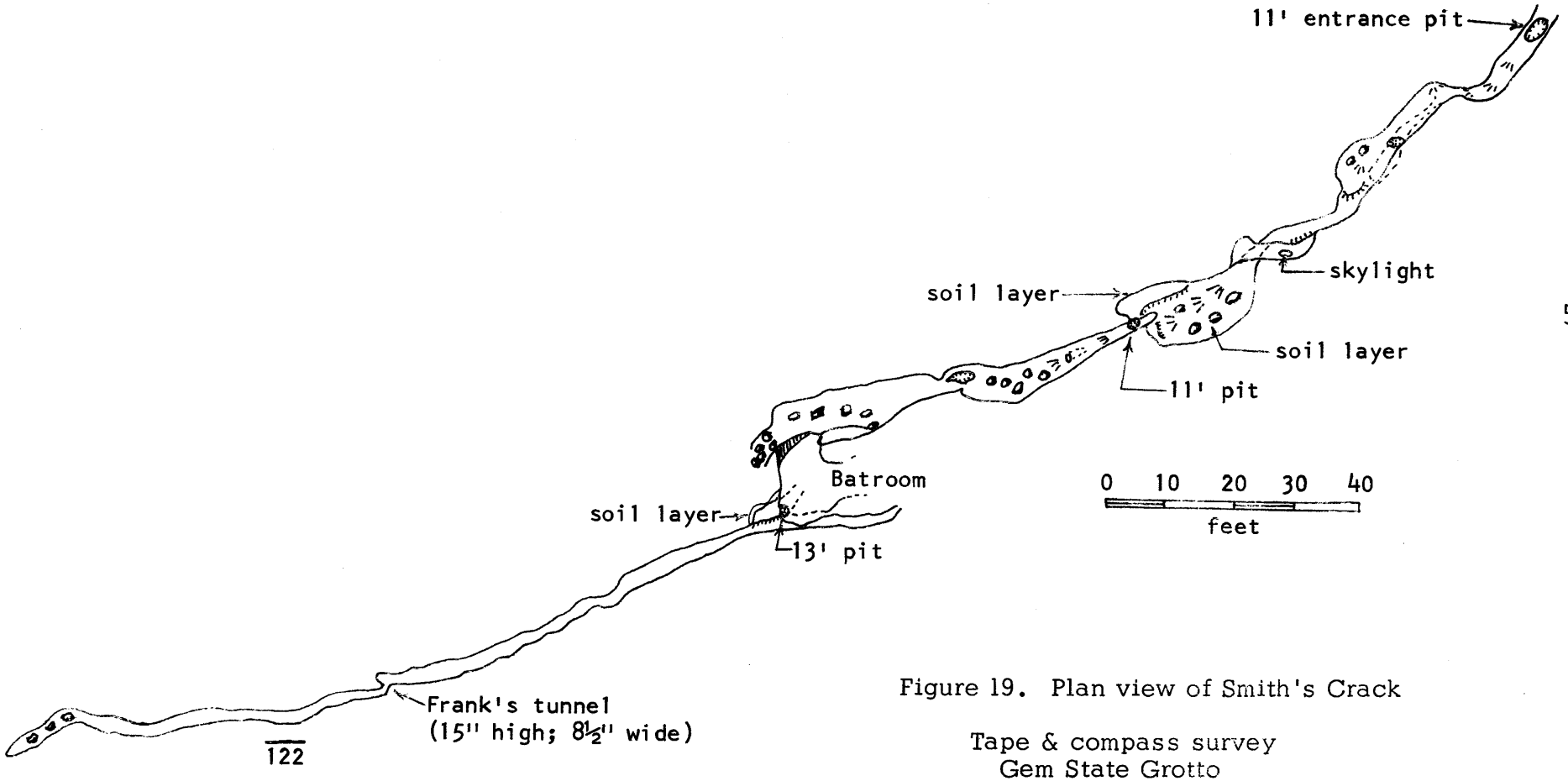

Figure 19. Plan view of Smith's Crack

Tape & compass survey
Gem State Grotto
1967

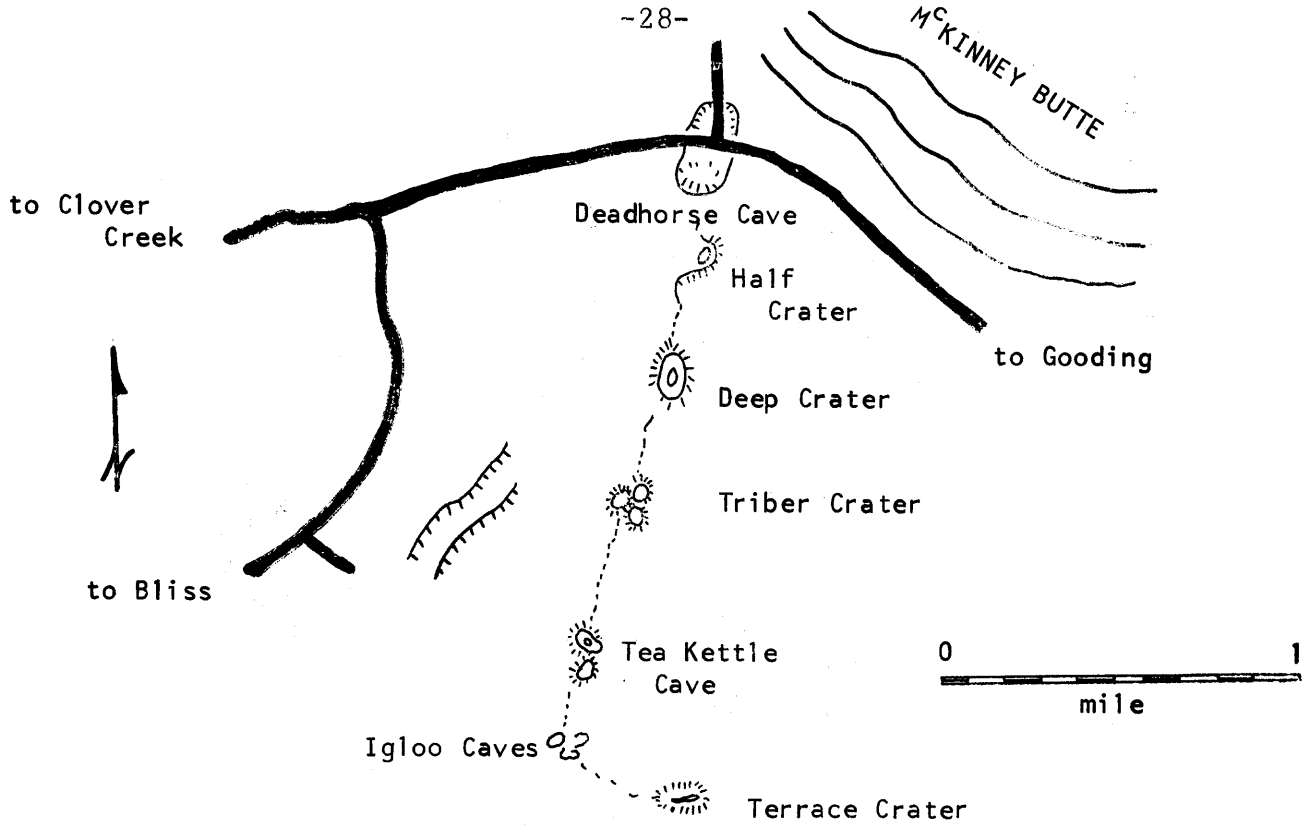

Figure 20. Sketch map of the cave area on the southeast flank of McKinney Butte. Modified from a map by E. F. Rhodenbaugh.

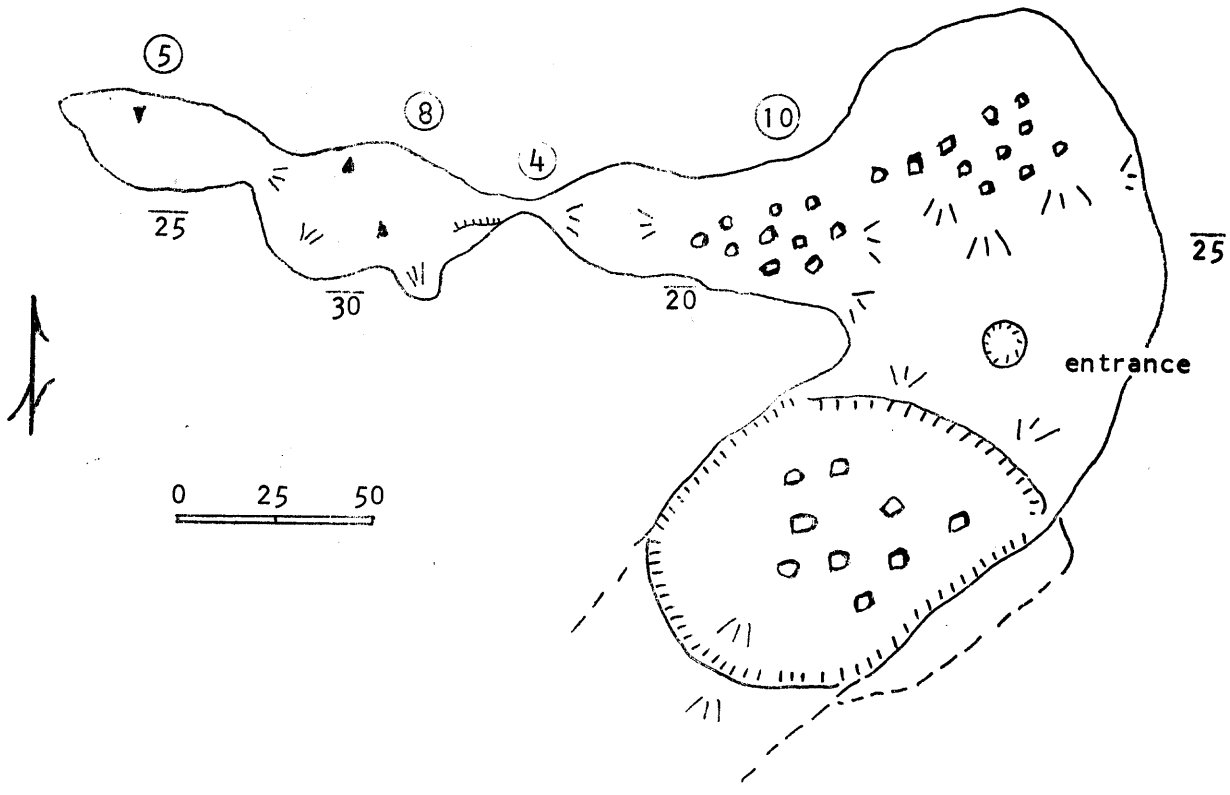

Figure 21. Plan view of Survey Point Cave. Tape & compass survey by the Gem State Grotto, 1967.

southwest of Deadhorse Cave, is several hundred feet long and contains both secondary (probably calcite) and lava speleothems.

Caves in the Black Butte lava flow

Within the same general area as the commercial Shoshone Indian Ice Caves and Idaho Mammoth Cave are a dozen or more other known lava tubes. All are within the Black Butte lava flow. Two of the most interesting of these lava tubes comprise the Tee and Maze Cave System.

Tee Cave is a 3,300-foot-long cave consisting of two joining lava tubes. One room, the Amphitheater, is 80 feet wide and 120 feet long. The 1,800-foot Maze Cave is a single tube with several passage levels. A 1967 survey shows that the two caves cross each other (fig. 22), but no connection exists between the two.

Power County Caves

All of the known caves in Power County are either in, along, or near the Great Rift System (fig. 3) northwest of American Falls. Almost all of the caves can be reached by taking the North Pleasant Valley Road and following the signs to Crystal Ice Caves.

The deepest and most spectacular undeveloped cave along the rift is South Grotto (figs. 5 & 23). The entrance is in the top of a large spatter cone. This completely vertical fissure cave has been explored to a depth of approximately 600 feet. The same soil layer that occurs in the commercial Crystal Ice Caves also can be seen in the wall of South Grotto. This cave is not as cold as Crystal Ice Caves, and ice is found only below about 200 feet. Nowhere is the cave much wider than about five feet.

Several small fissure caves also occur along the rift system both north and south of Crystal Ice Caves. In addition, Sullivan Cave, Lariat Cave, Pillar Butte Cave, and unnamed lava tubes occur in both the Crystal Falls lava field and the Wapi lava field. Some of these small lava tubes contain beautiful secondary speleotherms (fig. 24).

Crystal Falls and Waterfall Ice Caves

Crystal Falls Cave and Waterfall Ice Cave are spectacular lava tubes about 35 miles north of Rexburg just off the road known as the Red Road. The temperature of these caves remains below freezing all year round and ice is slowly filling them. Some passages are already completely filled with ice. As moist air moves through the caves, the water vapor contained in it crystallizes directly as the solid form, creating six-sided snowflake-like water crystals as much as one foot in diameter.

The caves can be dangerous because at least one hundred feet of rope is needed to reach the lower levels. Steps carved into the ice are slippery, so additional rope is needed for safety. During the summer months, water on the floor near the entrance may be as much as six inches deep and can create a hazard.

A third lava tube in the area, half-mile-long Civil Defense Cave, is about 25 miles north of Rexburg in the general area of the Idaho Sand Dunes near St. Anthony. Horizontal benches along the walls mark decreasing levels of standing lava, and lava stalactites and stalagmites are common throughout the cavern. Signs mark the way to the cave from the sand dune area.

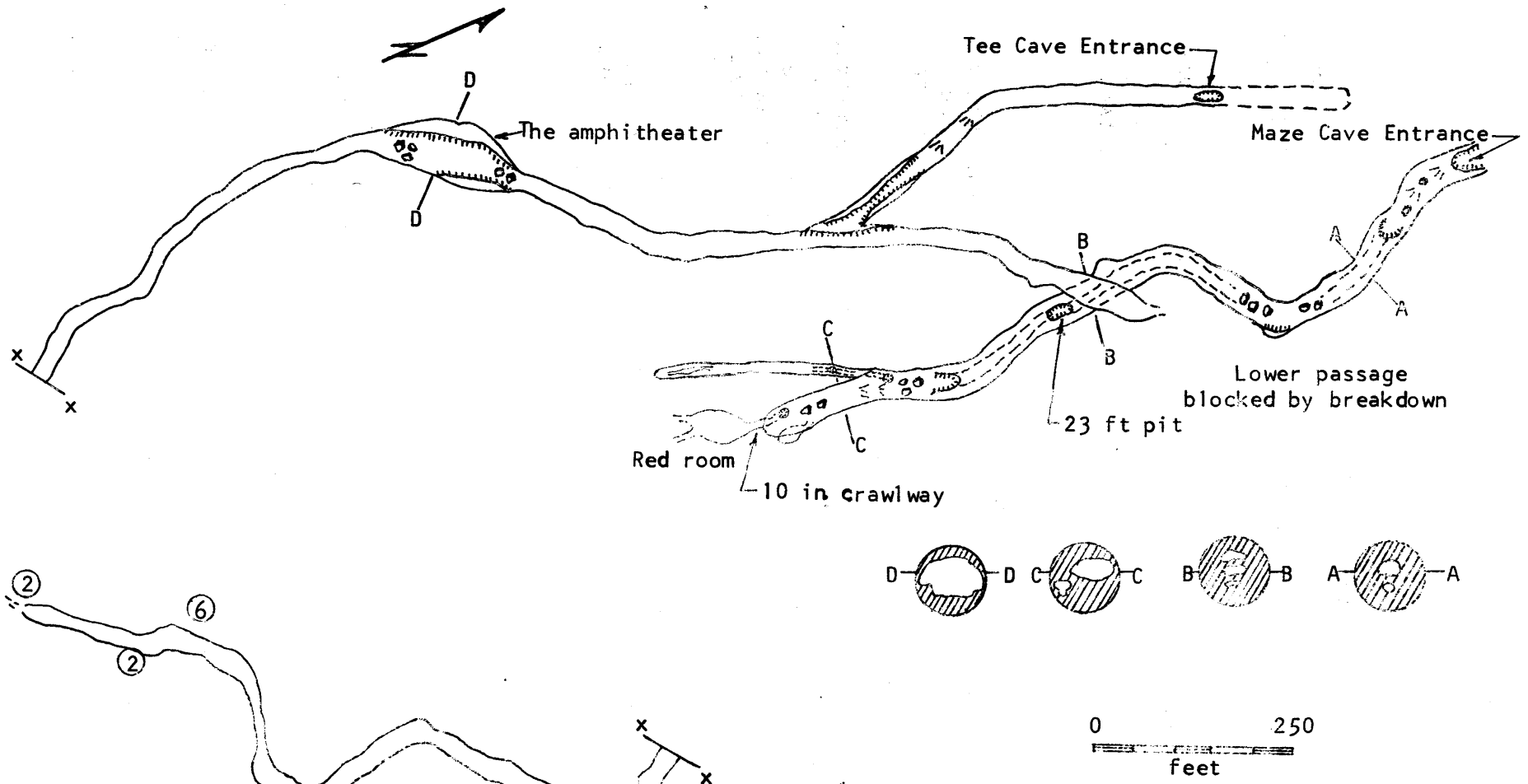

Figure 22. Tee & Maze Cave Systems

Tape & compass survey by the
Gem State Grotto, 1967

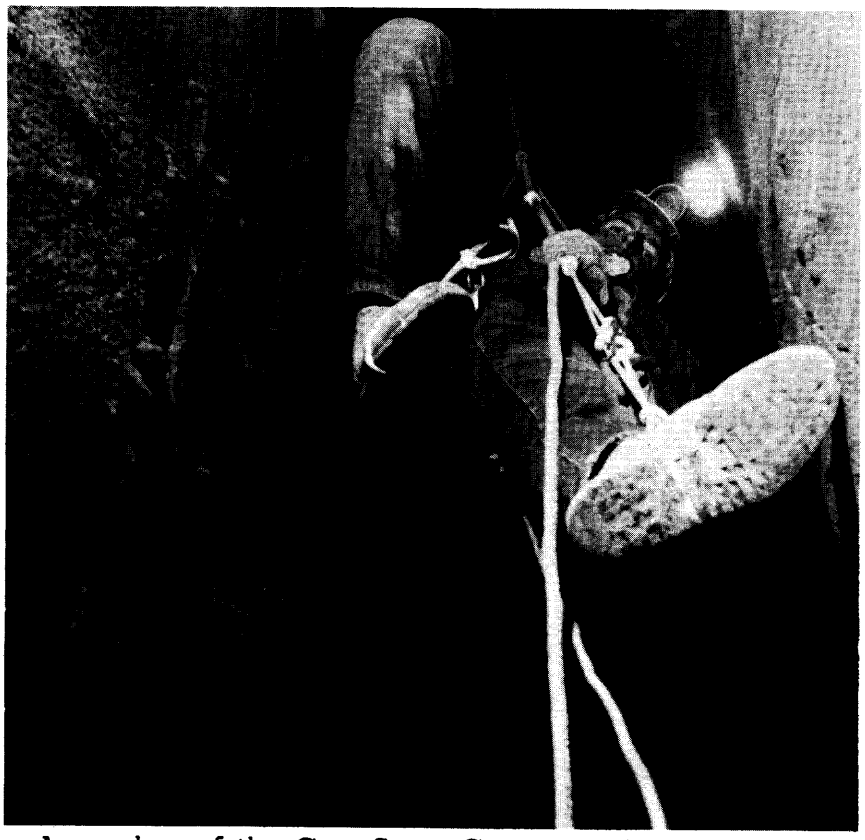

Figure 23. A member of the Gem State Grotto caving association ascends from the depths of South Grotto. Photo by Jerry Thornton.

Figure 24. Secondary speleothems in an unnamed cave in the Wapi lava field. Photo by Jim Papadakis.

Grace Ice Cave

Grace Ice Cave is a half-mile-long lava tube southwest of Grace, Idaho, in Caribou County. Although the temperature is well above freezing during much of the year, there is some ice in the cave. Unfortunately, the entrance sink has been used as a local trash dump.

Undeveloped caves in limestone

Some of the most spectacular caves in Idaho are dissolved out of limestone; however, the total number of these caves is minuscule when compared with the number of lava caves in the State.

Papoose Cave

Papoose Cave (fig. 25, in pocket) near Riggins in west-central Idaho is the largest limestone cave in Idaho and perhaps the largest in the Pacific Northwest. The cave, with more than a mile of passage, has been dissolved from limestone of the Martin Bridge Formation of Triassic Age (approximately 200 million years old). The cavern has been mapped to a depth of more than 600 feet, ranking it among the 10 deepest in the United States. Exploration with an altimeter beyond the surveyed area indicates that the total depth is approximately 945 feet.

The cave increasingly is becoming the center of attention for experienced cavers, novice cavers, and the curious public. Unfortunately, the cave is extremely hazardous to the untrained spelunker, as it is wet, cold (37°F), and contains vertical obstacles ranging from 15 to 65 feet. All of the vertical work requires ropes or ladders. One 40-foot climb through a large waterfall not only leaves a caver completely soaked, but almost always extinguishes his carbide lamp as well.

The Papoose system is one of the few in Idaho that contains a large stream and in which solution and redeposition are still occurring. Although the cave is not abundantly decorated with speleothems, specific areas do contain formations. Because the cave is still undergoing change, it is an excellent outdoor laboratory for geologists and hydrologists. Several projects to study the geology, hydrology, and climate of the cave are underway or are planned.

Lucile Cavern

Lucile Cavern (fig. 26), along U. S. Highway 95 in Idaho County consists of a single, low-ceilinged room about 40 feet by 100 feet. The entrance is behind a waterfall high on a cliff along the east side of the highway; this entrance can be seen from the road and is shown on the Lucile topographic quadrange map. The cave is in the same limestone, the Martin Bridge Formation, as Papoose Cavern.

Caves in the Hells Canyon area

Perhaps as many as 25 caves occur in a one-square-mile area in Adams County. All of the caves are in the Martin Bridge Formation on the Idaho side of Hells Canyon;

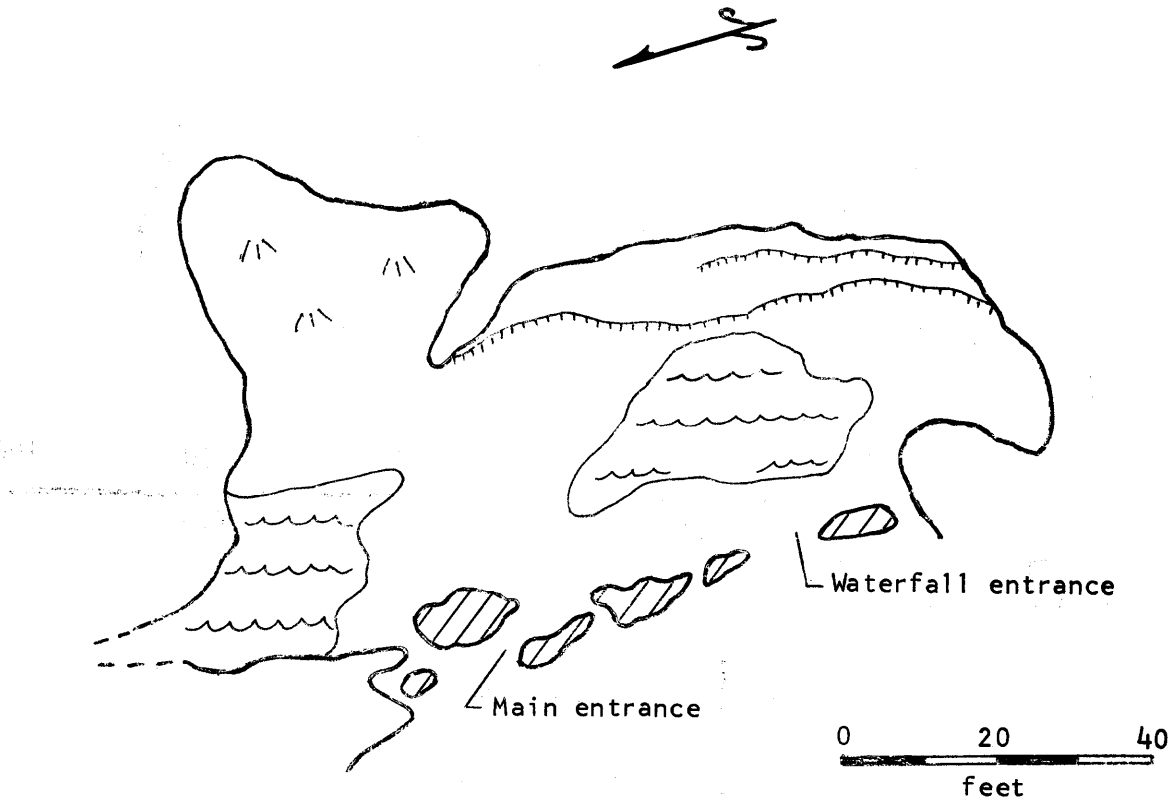

Figure 26. Plan view of Lucile Cavern. Tape & compass survey by the Cascade Grotto, 1968.

they can be reached by the road that parallels the reservoirs in the canyon. Redfish Cave (fig. 27), along Allison Creek, is the largest of these caves, with about 500 feet of passage. The cave was named for the pictograph just outside the entrance. Some of the formations are bordering on the spectacular (fig. 28).

Big Bar Cave, along the Snake River, is only 40 feet long, but it contains a large variety of speleothems. Several other 40- to 60-foot caves are in the same area. One cave, Indian Shelter Cave, was excavated by a group from the Smithsonian Institute in 1956, but no artifacts were recovered.

Pass Creek Caves

Although the Lost River Range and several other mountain masses in the south-central part of the State are predominantly limestone, the only caves that have been explored so far are small ones. Many openings are visible on exposed rock faces in Pass Creek Canyon north of Arco, but the only cave of importance is Hidden Mouth Cave near the headwaters of the canyon. A Forest Service sign points toward the cave on the cliff. The cave itself has been greatly modified by vandalism, although several small formations are still intact.

Four unexplored pits

Since 1967, four widely separated limestone pits have been documented in eastern Idaho; as of now (spring 1969), none has been explored. The first pit, Baker's Cave,

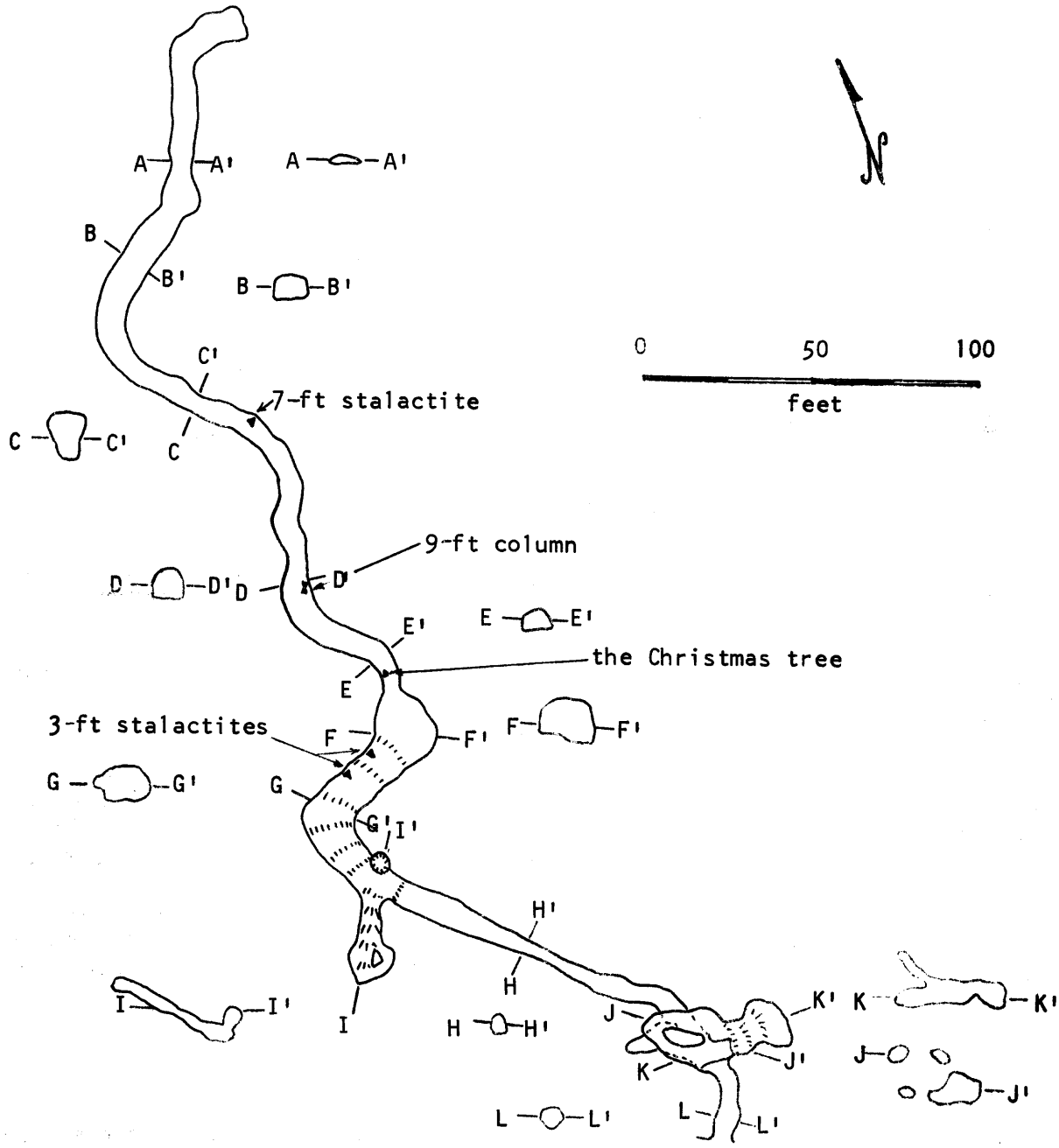

Figure 27. Redfish Cave. Tape & compass survey by the Oregon Grotto, 1962.

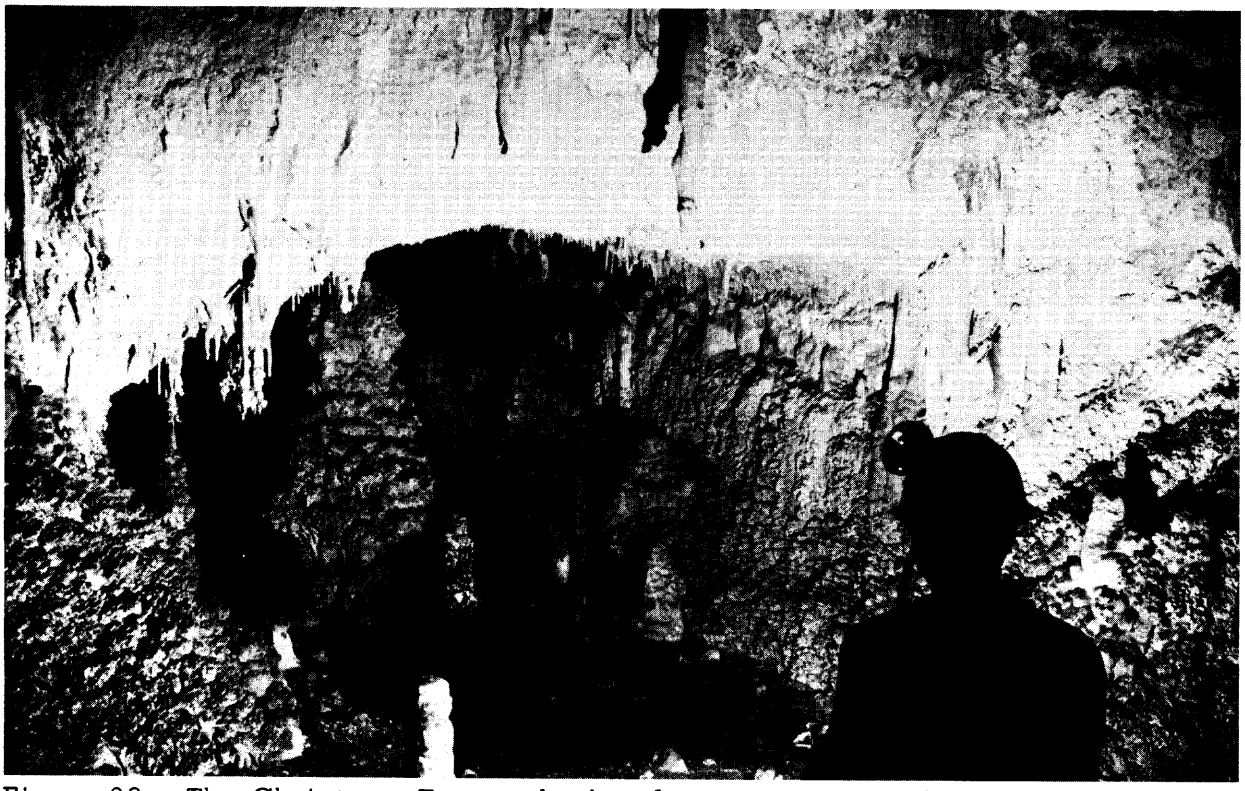

Figure 28. The Christmas Tree and other formations in Redfish Cave. Photo by Jerry Thornton.

is in Lemhi County on a ridge near the top of Poison Peak. The pit has also been called Poison Peak Cave, Warm Springs Cave, and Blow Hole Cave. It has been entered for an estimated 60 or 70 feet and has been plumbed to a depth of more than 200 feet.

Streamer Pit is a large solution cave near the bottom of a steep-sided sink hole on the south side of Paris Canyon. A 1968 visit by the Gem State Grotto showed that the pit was more than 70 feet deep, but lack of equipment and time prevented further exploration.

A third pit is reported to be located in a sink on Hawley Mountain west of the Little Lost River valley, and a fourth pit is in Clark County north of Dubois near the Montana border.

Formation Cave

Formation Cave, near Soda Springs in Caribou County, is one of the more unusual of Idaho's caves. The 330-foot long cavern (fig. 29) is in a mound of travertine built up of minerals deposited by spring water. At the present time, the cave is relatively free of vandalism, even though it is close to a populated area.

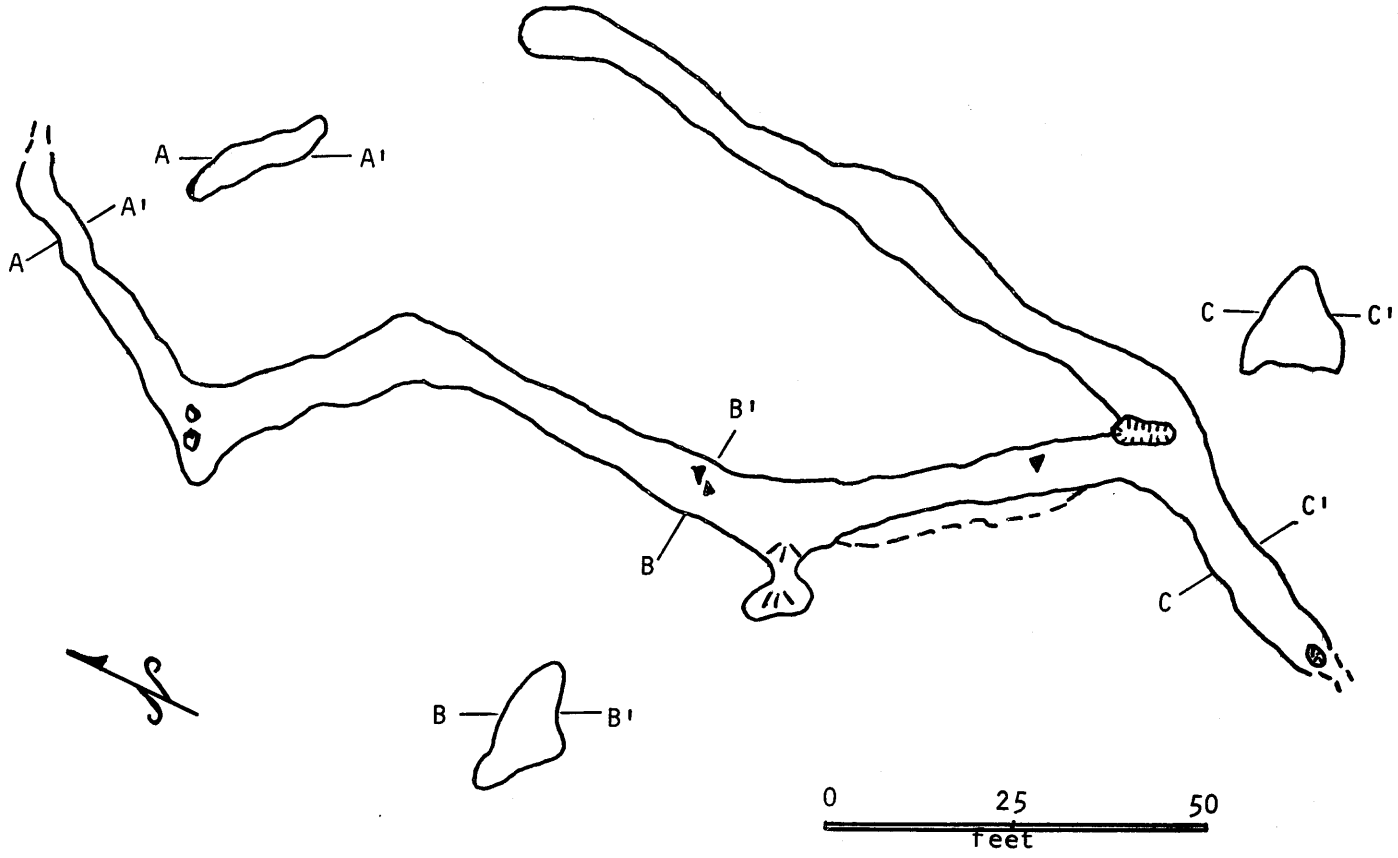

Figure 29. Plan view and cross sections of Formation Cave. Tape and compass survey by Jerry and Terry Thornton, 1968.

An undeveloped cave in sandstone

Two short caves, the Sand Hills Caves (fig. 30), which are about eight miles from Oreana, occur in a cemented sandstone layer near the base of the Idaho Formation. The caves seem to have been formed by piping: that is, by water cutting down along joints in the rock.

Rockshelter Caves

Rockshelter caves are innumerable in Idaho They occur in all types of rocks and in all parts of the State. Some are small solution caves or lava blisters or tunnels, but most are formed by the undercutting action of streams or by a combination of rockfall and stream action.

The Idaho StateUniversity Museum has inventoried a large number of these shelters as potential archeological sites, and some sites already have been investigated. Reports of the work have been published as Occasional Papers of the ISU Museum or in Tebewa, the Journal of the Museum. Figure 31, although not complete, gives the general indication of the locations of shelters that have been excavated.

It should be noted that any cave or rock-shelter (or any open-ground site) with evidence of human habitation should be reported to trained archeologists.

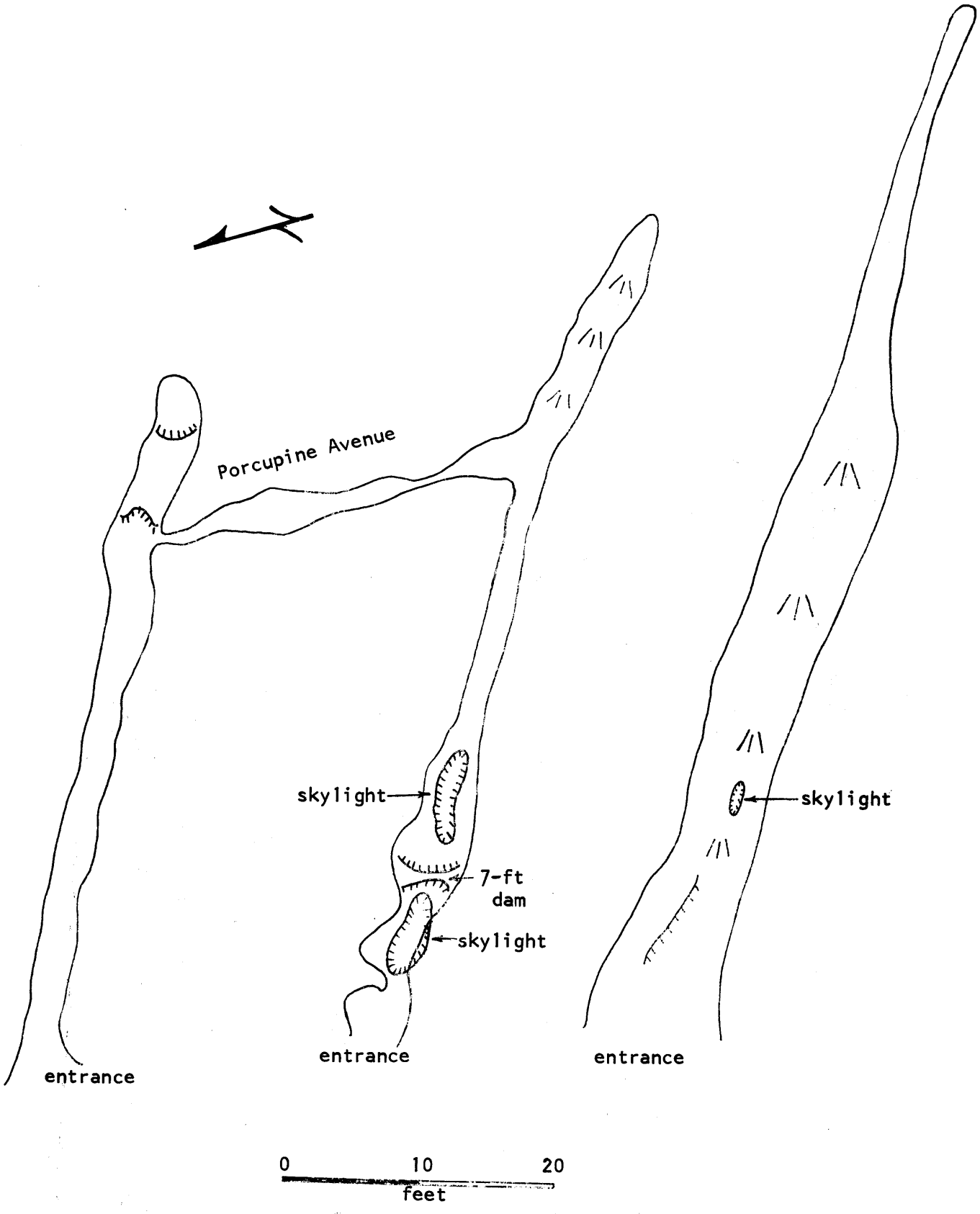

Figure 30. Plan view of the Sand Hills Caves, Owyhee County. Tape & compass survey by the Gem State Grotto, 1968.

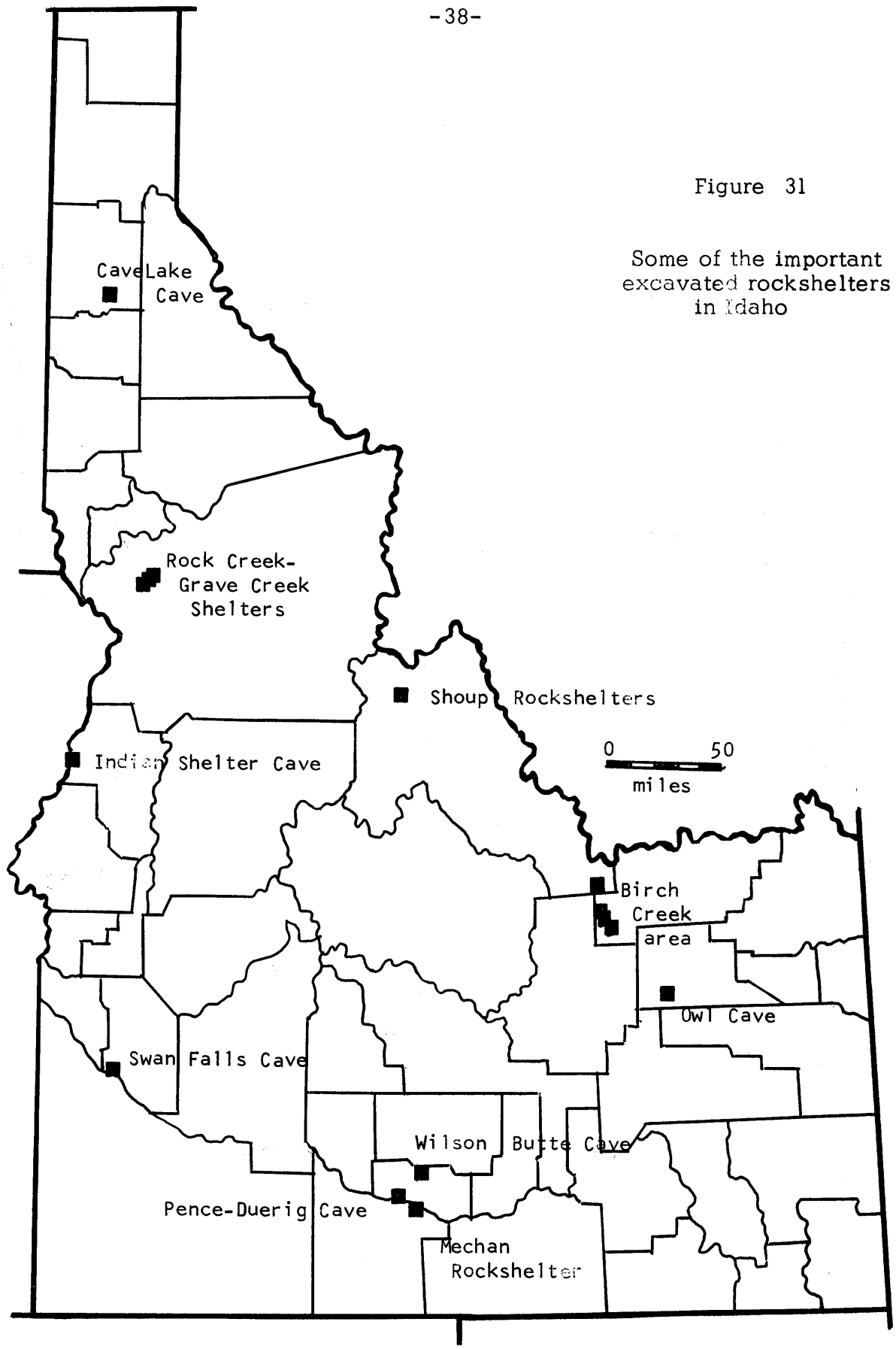

Figure 31

Some of the important excavated rockshelters in Idaho

Unfortunately, many potential archeological sites have been distroyed by souvenir hunters. In Idaho, two organizations, the Sociology-Anthropology Department of the University of Idaho at Moscow, and the Idaho State University Museum at Pocatello, are able to evaluate the archeological value of rockshelters. These organizations will be grateful for any information that is forwarded to them concerning potential sites.

The following sections briefly discuss various caves and rockshelters that have been excavated within the State.

Wilson Butte Cave

Wilson Butte Cave, a lava blister along a lava tube in northern Jerome County (fig. 31), is one of the best-studied caves in Idaho. The first room, about 65 feet in diamter, was the site of most of the archeological excavation. In addition to the main room, a 4 1/2-foot-high tube leads to another small room and from there to two other tubes.

Five strata were recognized as the cave was excavated (fig. 32). Stratum E, the oldest, shows some evidence of human occupation. Layer D, perhaps deposited in a pool of water, contains no cultural material. Horizon C, laid down in a cool, moist climate, contains bones of large mammals and some cultural materials such as finished artifacts, waste flakes, and charcoal. Strata B and A, indicating long, warm, dry periods, contain human cultural material and the bones of large and small animals, many of which were probably killed for food.

Radiocarbon dating of the material shows that the entire sequence represents a time span of approximately 12,000 years. The site yielded a great deal of significant information about early Indian culture in the Snake River Plain, even though the site had been disturbed prior to organized excavation.

Other shelters on the Snake River Plain

Less than half-a-dozen other shelters have been systematically excavated on the Snake Plain; most of these have been along the walls of the Snake River Canyon.

Two of the more productive caves are in Jerome County, north of the Snake River near Twin Falls (fig. 31). In addition, rock shelters near Swan Falls, southwest of Boise, have yielded artifacts and at least one burial. Unfortunately, some of these deposits were disturbed before they could be excavated properly.

Birch Creek area

An area that has been intensively studied is the Birch Creek valley and the bordering mountain ranges. This area gives a picture of the culture that was developed in the foothills at the same time that the Wilson Butte artifacts were deposited in caves on the Snake River Plain. Several types of sites, including numerous rockshelters were investigated to give a relatively complete picture of the area.

Most of the rockshelters within the area are stream-cut overhangs, although a few are limestone solution caves that have been opened by rock falls or by stream

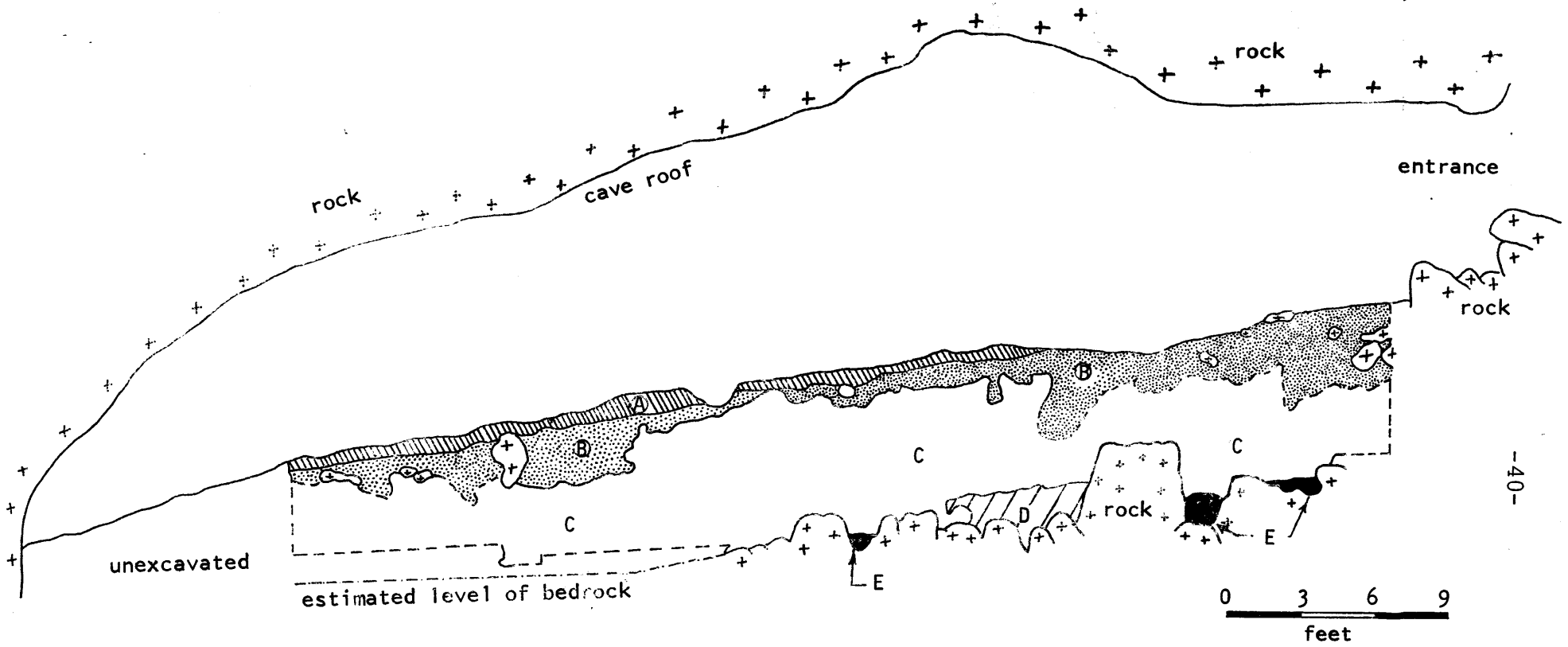

Figure 32. Cross-section of Wilson Butte Cave. Stratum A, dust and dry vegetal material; stratum B, eolian brown silt; stratum C, grey/brown sand; stratum D, yellow/brown sandy silt; stratum E, yellow/brown clay. See text for interpretation. (Simplified from Plate 8, ISU Museum Occasional Paper 6.)

erosion. Some of the larger or more important caves, such as Jaguar, Bison, and Veratic, have been named, but most of the shelters carry only a numbered designation.

Because many of the Birch Creek shelters are not true caverns, they were more sensitive to climatic changes than was Wilson Butte Cave. Thus, in the Birch Creek area, more can be deduced about the alternating wet and dry cycles of the last 10,000 to 12,000 years. In this area, human habitation depended to some extent on climatic variation: The desert zone was occupied only during the wetter cycles, while the middle and upper valley zones were occupied almost continously over the entire time of record.

Shoup Rockshelters

Two rockshelters along the Salmon River near Shoup were studied by Idaho State University archeologists to provide a link between the cultures of the Birch Creek area and those across the mountains in other parts of the Pacific Northwest. Both shelters are beneath overhangs in rocks along the river; both are filled with alluvium deposited by a higher river stage. The geologic and archeologic sequence, as shown by fill in the shelters, is approximately the same as those farther south in the Birch Creek area.

Rocky Canyon-Grave Creek Shelters

Basalt shelters along Rocky Canyon and Grave Creek, tributaries of the Salmon River near Cottonwood in Idaho County, have been excavated in a study of the prehistory of the Nez Perce Indians and the territory that they controlled in historic times. Rockshelters, some rather large and impressive, occur in the upper part of Rocky Canyon. In contrast, the lower part of the canyon contains several open-ground archeological sites, but few, if any, rockshelters. Grave Creek Canyon contains only one shelter, the Weis rockshelter (fig. 33), of any significance. Most of the information about the entire region is based on work in the Weis rockshelter, as many of the Rocky Creek shelters had been disturbed before excavation.

Four phases of culture, each characterized by a particular set or combination of artifact traits, were uncovered. The oldest of these phases began about 5500 BC, and the youngest phase ended about AD 1400. Thus, there is a break in the record between the last occupation and historical times when the Nez Perce occupied the area.

Cave Lake Cave

The small, gas-pocket cave in basalt along the shore of Cave Lake in Kootenai County is unimportant, both as a true cave or archeologically, but it is mentioned here because it is the only known Idaho cave north of the Clearwater River. Only a few tools, bone fragments, and charcoal were found in test pits dug into the floor of the cave.

Summary

Although most rockshelters are not of interest to the spelunker, many shelters are important as archeological research sites. In the search for larger caves,

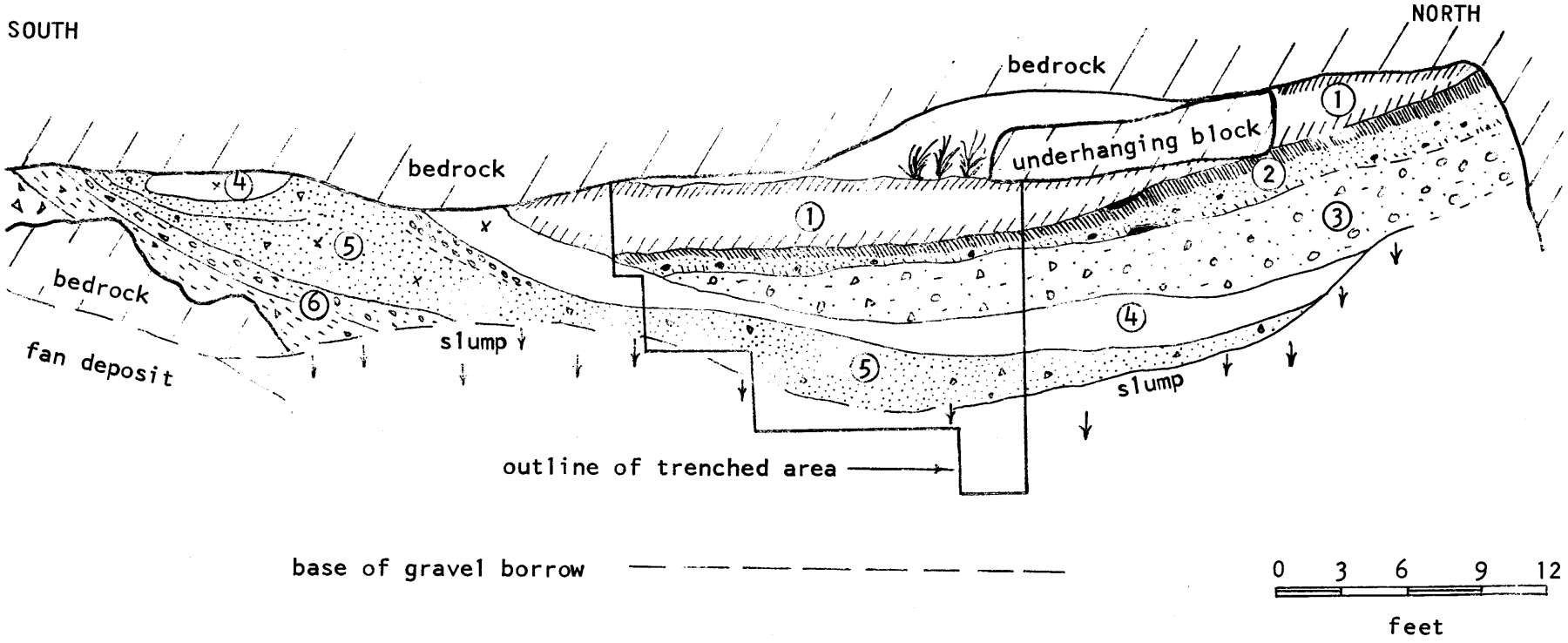

Figure 33. Longitudinal section of the Weis Rockshelter exposed by the gravel borrow operation in the early 1940's as it appeared in 1961-1962, with the 1961-62 trench cuts outlined on the face of the deposits. Strata 1, 2, and 3 comprise a continual accumulation of alluvial sediments from the fan at the northern end of the site. Stratum 4 is a culturally sterile, wind-deposited layer of volcanic ash. Stratum 5 is a complex sequence of eolian and alluvial sediments, and stratum 6 is alluvial fill from a southern fan deposit. (Simplified from figure 6, ISU Museum Occasional Paper 9.)

spelunkers often look at shelters in the hope that they will lead to "bigger and better" caverns. Thus, cavers are in an excellent position to watch for potential sites and to report them to archeologists who can decide if they are value.

THIS PAGE INTENTIONALLY LEFT BLANK

SO YOU WANT TO GO CAVE EXPLORING

Throughout this discussion of Idaho caves, no exact locations have been given. This omission is for two reasons:

1. It is inadvisable for inexperienced persons to explore most caves without experienced members in the group. Although infrequent, accidents during cave exploration are not unknown, especially in groups consisting entirely of novices.

2. Inexperienced cavers can accidentally destroy cave formations or other features that are important to the natural beauty of the cave or to future scientific study.

Where to find other cave explorers

Most cave explorers are members of the National Speleological Society, which has its headquarters at 231 North Kenmore Street, Arlington, Virginia, 22201. Most cavers in Idaho are members of the Gem State Grotto, a chapter of the National Society. The Gem State Grotto welcomes prospective cavers and will be glad to answer any inquires. The address is P. O. Box 595, Mountain Home, Idaho 83647. Would-be cavers can also write the Idaho Bureau of Mines and Geology at Moscow for more information and names of local cave explorers.

Dr. William R. Halliday, a member of the National Speleological Society and head of the Western Speleological Survey is also a source of information about Idaho caves. His present address is 1117 36th Avenue E., Seattle, Washington 98102.

These organizations and individuals keep files of all known caves in the State and will be glad to supply information on them to serious cavers. Conversely, they are interested in adding information to their files, and welcome any additional notes on Idaho caves.

Cave exploration safety

One highly important matter needs consideration before you go underground: the matter of safety. These following statements are caving's cardinal safety rules. They should be read, memorized, and followed.

1. Never cave alone. Three or four persons is perhaps the ideal number, although two is permissible. Depending on the cave, many more are acceptable.

2. Tell someone where you are going and what time you expect to return. That way, if trouble does occur, an organized effort to find and rescue you can be attempted.

3. Never cave beyond your ability or equipment. If you are not qualified to explore a vertical cave, do not attempt it, except under the guidance of a qualified instructor. Clothesline is not an adequate rope, even for a "quick check" of a pit.

4. If you become separated from the main group and end up lost, or if all three sources of light fail — stop. Find a comfortable place to sit and take it easy. The rest of the group or a back-up party (if you told someone where you were going) will soon be there.

5. Old mine shafts and tunnels, which are common in many parts of Idaho, are vastly different from caves. The walls and ceilings of caves are stable because they are natural features that have evolved over a period of time. Mines, on the other hand, often contain zones of weakness which are subject to collapse unexpectedly; in addition, timbers used to shore up weak zones rot out with age. Caves almost never contain poisonous gases or "bad air"; such a hazard if often present in unused mines. Thus, although the dangers inherent in cave exploring are very real but miminal, the dangers of exploring abandoned mines are many times greater.

6. One final rule: Take nothing but pictures — leave nothing but footprints. Safety and conservation are first and foremost among the aims of the Gem State Grotto and the National Speleological Society and should be the aims of all cave explorers.

For each and every caver then, preparedness is the thing that makes cave exploring fun, satisfying, and rewarding — instead of frustrating, tiring, and dangerous. If there is a chance of going underground in the near future, are you prepared?

The first item for a potential caver to consider is his own physical condition. Caves differ in physical requirements, but a cave explorer should be in reasonably good physical condition before entering any cave. He should be aware of his physical limitations and should never attempt any effort that he cannot complete safely. Caving can be strenuous exercise, and a weak, tired cave explorer is a hazard not only to himseft, but to his entire party. If in doubt, save that extra effort for another day or another trip.

Equipment

In addition to proper safety habits, adequate equipment is necessary for safe and enjoyable cave exploring.

Clothing

Clothing is generally of the caver's choice and ranges from a skin-diver's suit to a heavy parka, depending on the cave. In general, clothes should be tough, warm, and light weight. Coveralls are a favorite depending on temperature and water conditions. If much water is to be encountered, a minimum of clothing while underground, with a dry outfit at the entrance will be an advantage. Too much clothing just adds weight when wet.

Shoes should give plenty of ankle support. The advantages and disadvantages of boots versus tennis shoes will be argued as long as there are caves to explore. Often the characteristics of a particular cave will determine the best footgear.

Hard hats

The first item in the small amount of basic equipment that is needed for a first expedition is a hard hat, which will serve three main functions: first and foremost, it is a protection from bumps. Second, it is a place to mount a light; and third, it is a protection from occasional falling debris.

Two basic types of hard hats are available: the cap and the full-brim hat. The cap-type is far more advantageous in tight spaces; however, it does not provide a great deal of protection to the back of the neck. A motorcycle crash helmet or a football helmet may serve even better. In any cave, however, some sort of helmet is necessary. A chin-strap is also helpful.

Lights

The only other item that is really necessary is light. Three independent sources are an absolute must. The first light source should be one that has a long life and can be mounted on the helmet, thus leaving the hands free. Both carbide and electric headlamps are suitable, although both have drawbacks.

Many, perhaps most, cave exploers prefer carbide. Carbide lamps and carbide are relatively inexpensive, and the lamp provides a well-rounded light, ideal for walking. On the negative side, carbide lights may not always work properly, especially when a draft of air is blowing or the caver must travel through large amounts of cascading water. Spent carbide, which gives off a slight odor (and often excessive heat), should be removed from the cave. Finally, almost every cave explorer can testify to occasionally burnt hair and skin.

Electric lights, in comparison with carbide, are expensive. Two types of electric lamps are in use: The first, and most common, type has a relatively inexpensive initial cost, but because it uses D-cell batteries as a power source it is expensive to use. (Eight hours of light from carbide cost about 8 cents; batteries for the same period generally cost more than a dollar.)

The second type of electric light, the rechargeable miners' lamp, has a high initial cost for lamp, wet-cell battery, and charger, but it is relatively inexpensive to use. One problem is that of recharging the lamp in the field. For each eight hours of continuous use the lamp must sit overnight in order to be fully recharged.

An excellent second source of light is a two-cell flashlight. It gives a good concentrated beam for looking at specific objects and it easily can be tucked in with the third source of light in a pocket or pack. As a third source of light (to be used in emergency only), a candle and package of waterproofed matches or a cigarette lighter is sufficient.

Additional equipment

Other (optional) equipment might include a camera and flash and candy bars or other food. Sardines or especially prepared mixtures of concentrated or dehydrated foods are popular with some cavers. A canteen is useful in many caves.

On large, organized trips other equipment is often required. Some or all of it may be owned by the organization sponsoring the trip instead of individual members. Such things as ropes, ladders, equipment for ascending ropes, bolts, pitons, and the like may be needed in a difficult cave.

On specific types of expeditions, special equipment may be taken underground: Cameras and related gear for photography; Compasses and tapes or surveying; and special collecting equipment for a study of cave ecology are just some examples.

Conclusions

The preceeding sections have discussed some of the better-known caves of Idaho and their general locations. In this last section the emphasis has been on where to find other persons who are interested in caves and cave exploration, and what is needed to begin the hobby of spelunking.

Because caving can be somewhat hazardous, special emphasis on this last chapter has been on safety. A related matter is cave courtesy. Perhaps it is self-evident that one should always ask permission to cross over private land or to enter a cave on private land. Other forms of courtesy and thoughtfullness, although not as obvious, can help prevent accidents, eleminate many problems, and just plain reduce "bad feelings" between cave explorers and others.

The "golden age" of caving in Idaho is just beginning. Many caves are still not listed in any cave file, and most of the known caves have not been mapped or studied in any great detail. New caverns and pits are being explored every year, yet there are ample numbers of interesting, but relatively easy-to-explore caves for the inexperienced beginner. In short, there is something for everyone in Idaho.

Good caving.

ADDITIONAL READING

Compiled by George N. Huppert

The following list of references is not nearly complete, but should serve as a guide to books about caves and cave exploring.

Idaho Caves

Belknap, 1960, Man on the moon in Idaho: National Geographic, v. 118, p. 504-525.

Butler, B. R., 1962, Contributions to the prehistory of the Columbia Plateau, a report on excavations in the Palouse and Craig Mountain sections: Occasional Papers of the Idaho State College Museum, no. 9, 86 p., 21 fig.

_____, 1968, An introduction to archeological investigation in the Pioneer Basin locality of eastern Idaho: TEBIWA, v. 11, no. 1, p. 1-30.

Dort, Wakefield, 1965, Paleotemperatures and chronology at archeological cave site revealed by thermoluminescence, Jaguar Cave, Idaho: Science, v. 150, p. 480-481.

Gruhn, Ruth, 1961, The archeology of Wilson Butte Cave, south-central Idaho: Occasional Papers of the Idaho State College Museum, no. 6, 198 p., 39 plates.

Groefsema, Olive, 1949, Elmore County: Its historical gleanings: The Caxton Printers, Caldwell, Idaho.

Halliday, W. R., 1959, Adventure is Underground: Harper and Brothers, New York.

Papadakis, J. L., 1967, Crystal Ice Caves: Pamphlet published for Crystal Ice Caves, American Falls, Idaho.

_____, 1967, Crystal Ice Caves, Idaho: NSS News, v. 25, p. 154-160.

Rhodenbaugh, E. F., 1953, Sketches of Idaho Geology: The Caxton Printers, Caldwell, Idaho, 267 p.

Robinson, Russell, (no date), The story of Shoshone Indian Ice Caves: Pamphlet published for Shoshone Indian Ice Caves, Shoshone, Idaho.

Stearns, H. T., 1938, A guide to the Craters of the Moon National Monument: The Caxton Printers, Caldwell, Idaho.

Thornton, Jerry, 1967, Cleft Caves of Idaho: NSS News, v. 25, p. 220-221.

Westcott, R. L., 1968, A new subfamily of blind bettle from Idaho Ice Caves: Contributions in science, no. 141, Los Angeles County Museum of Natural History.

Books of General Interest

Bogli and Rranke, 1966, Luminous Darkness: Rand McNalley, New York, N. Y.

Cadoux, J., 1957, One thousand meters down: A. S. Barnes and Company, New York, N. Y.

Casteret, N., 1938, Ten years under the earth: The Greystone Press, New York, N. Y. (Paperback, 1963, J. M. Dent & Sons, Ltd., London).

_____, 1947, My Caves: J. M. Dent & Sons, Ltd., London.

_____, 1955, The darkness under the earth, Henry Holt & Co., New York, N. Y.

_____, 1962, More years under the earth: Neville Spearman, London.

Colette, R., 1966, Climbing blind: Dutton, New York, N. Y.

Coon, C. S., 1957, The seven caves: Alfred A. Knopf, New York, N. Y.

Cullingford, C. H. D., 1962, British caving: Routledge and Kegan Paul, Ltd., London.

Folson, F., 1956, Exploring American caves: Crown Publishers, Inc., New York, N. Y. (Paperback, Collier Press).

Halliday, W. R.,1959, Adventure is underground: Harper & Brothers, New York, N. Y.

_____, 1966, Depths of the earth: Harper & Row, New York, N. Y.

Hovey, H. C., 1882, Celebrated American caverns: Robert Clarke & Co., Cincinnati, Ohio.

Lawrence and Brucker, 1955, The caves beyond: Funk & Wagnalls Co., New York, N. Y.

Lubke, A., 1958, The world of caves: Coward-McCann, Inc., New York, N. Y.

Mohr and Poulson, 1966, The life of the cave: McGraw-Hill, New York, N. Y.

Mohr and Sloane, 1955, Celebrated American caves: Rutgers University Press, New Brunswick, N. J.

Moore and Nicholas, 1964, Speleology, the study of caves: D. C. Heath and Co., Boston, Mass.

Perry, C., 1946, New England's buried treasure: Stephen Doyle Press, New York, N. Y.

_____, 1948, Underground empire: Friedman, Prot Washington, N. Y.

Siffre, M., 1964, Beyond time: McGraw-Hill, New York, N. Y.

Sloane and Gurnee, 1966, Visiting American caves: Crown Publishers, Inc., New York, N. Y.

Stenuit and Jansinski, 1966, Caves and the marvelous world beneath us: A. S. Barnes & Co., Inc., Cranbury, N. J.

Tazieff, H., 1953, Caves of adventure: Harper & Brothers, New York, N. Y.

Caves Surveys of Other States

Barr, T., 1961, Caves of Tennessee: Dept. of Convervation and Comm. Bull. 64.

Bretz, J., 1956, Caves of Missouri: Div. of Geol. Surv. & Water Resources, v. 29, 2nd Ser.

Bretz and Harris, 1961, Caves of Illinois: Illinois State Geology Survey Report of Investigation 215.

Davies, W., 1950, The caves of Maryland: Dept. of Geol., Mines, and Water Resources Bull. 7.

_____, 1949 (revised 1958, 1965), Caverns of West Virginia: West Virginia Geol. Survey, Vol. 19.

Halliday, W. R., 1963, Caves of Washington: Division of Mines and Geol, Information Circular 40.

Hogberg and Bayer, 1967, Guide to the caves of Minnesota: Minnesota Geol. Survey, Educational Series 4.

McGill, W., 1933, Caverns of Virginia: Virginia Geol. Survey Bull. 35.

Powell, R., 1961, Caves of Indiana: Indiana Geol. Survey Circular 8.

Stone, R. 1930 (reprinted 1932), Pennsylvania Caves: Penn. Topo. & Geol. Survey Bull G3.

Cave Geology

Bretz, J. H., 1942, Vadose and phreatic features of limestone caverns: Jour. of Geol., v. 50, p 675-811

Curl, R. L., 1966, Caves as a measure of karst: Jour. of Geol., v. 74, p. 798-830.

Davis, W. M., 1930, Origin of caves: Geol. Soc. Amer. Bull., v. 41, p. 375-628.

Gardner, J. H., 1934, Origin and development of limestone caverns: Geol. Soc. Bull., v. 46, p. 1255-1274.

Malde and Schick, 1964, Thorne cave, northeastern Utah, Geology: American Antiquity, v. 30, p. 50-59.

McGregor, D. R., 1963, Solution caves in gypsum, North Central Texas: Jour. of Geol., v. 71, p. 108-115.

Parker, G., 1964, Officers Cave, a pseudokarst features in altered tuff and volcanic ash of the John Formation in Eastern Oregon: Geol. Soc. Amer. Bull., v. 75, p. 393-401.

Swinnerton, A. C., 1932, Origin of limestone caverns: Geol. Soc. Amer. Bull. v. 43, p. 663-694.

Cave Ecology

Allen, G. M., 1939, Bats: Harvard University Press, Cambridge, Mass.

Barr, T. C., 1964, Cave ecology, a symposium: Science, v. 144, p. 321-322.

Vanel, A., 1965, Biospeleology: Pergamon Press, New York, N. Y.

Westcott, R. L., 1968, A new subfamily of blind bettle from Idaho Ice Caves: Contributions in science no. 141, Los Angeles County Museum of Natural History.

Cave Art

Brown, G. B., 1935, The art of the cave dweller: R. V. Colman, New York, N. Y.

Campell, G., 1965, Rock painting of the Chumash: Univ. of Calif. Press, Berkeley, Calif.

Cuvoy, R., Cave painting: Crown Publishers, Inc., New York, N. Y.

Gay, C. T. E. 1967, Oldest cave painings of the New World: Natural History, v. 76, April, p. 28-35.

Gay and Griffin, 1967, Oldest paintings in the Americas: Life, v. 62, May 12, p. 107-108.

Masters, J., 1960, Mysteries of the cave painters: Saturday Evening Post, v. 232, Jan 2, p. 30-31.

Schisgall, O., 1961, World's earliest paintings: Readers Digest, v. 78, Jan., p. 222-226.

Skira and Bataille, 1955, Lascaux, or the birth of art: Skira, Lausanne, Switzerland.

Ucko and Rosenfeld, 1967, Palaeolithic cave art: McGraw, New York, N. Y.

Archeology

Butler, B. R., 1962, Contributions to the prehistory of the Columbia Plateau, a report on excavations in the Palouse and Craig Mountain sections: Occasional Papers of the Idaho State College Museum, no. 9, 86 p., 21 fig.

_____, 1968, An introduction to archeological investigation in the Pioneer Basin locality of eastern Idaho: TEBIWA, The Journal of the Idaho State University Museum, v. 11, no. 1, p. 1-30.

Day, K. E., 1964, Thorn Cave, Northwestern Utah, Archeology: American Antiquity, v. 30, p. 50-59.

Dort, Wakefield, 1965, Paleotemperatures and chronology at archeological cave site revelaed by thermoluminescence, Jaguar Cave, Idaho: Science, v. 150, p. 480-481.

Ellis and Hammack, 1968, Inner sanctum of Feather Cave, A Mogollon sun and earth shrine linking Mexico and the southwest: American Antiquity, v. 33, p. 100-105.

Fowke, G., 1922, Archeological investigations: Bureau of American Ethnology Bull. 76, Smithsonian Institute.

Gruhn, Ruth, 1961, The archeology of Wilson Butte Cave, south-central Idaho: Occasional Papers of the Idaho State College Museum, no. 6, 189 p., 39 plates.

Jennings, J., 1957, Danger Cave: Memoir of the Society for American Archeology, no. 14, Univ. of Utah Press, Salt Lake City, Utah.

Martin, P., 1954, Caves of the Reserve Area: Anthropology, v. 42.

Schwartz, D. W., 1960, Prehistoric man in Mammoth Cave: Scientific American, v. 203, p. 130-136.

Wedel, W. R., 1968, Mummy Cave, prehistoric record from the Rocky Mountains of Wyoming: Science, v. 160, p. 184-186.

National Geographic and Canadian Geographical Journal

Belknap, 1960, Man on the moon in Idaho: National Geographic, v. 118, p. 504-525.

Mohr, C., 1964, Exploring American underground: National Geographic, v. 125, p. 803-837.

Rieder and Grove, 1964, Some Ontario Caves: Canadian Geographical Journal, v. 68, p. 164-167.

Sutherland and Helm, 1953, Carlsbad Caverns in color: National Geographic, v. 104, no. 4, p. 433-568.

Weber, J. N., 1960, Ontario underground: Canadian Geographic Journal, v. 61, p. 42-51.

National Parks Magazine

(Anon.), 1968, Mammoth master plan: National Parks Magazine, v. 42, July, p. 20.

Halliday, W. R., 1963, Features and significance of the Mt. St. Helens cave area: National Parks Magazine, v. 37, Dec., p. 11-14.

_____, 1965, Cave of the crystal balls: National Parks Magazine, v. 39, Jan., p. 13.

_____, 1965, Conservation and America's caves, Wyandotte Cave: National Parks Magazine, v. 39, Dec, p. 17-19.

Spliser, J., 1966, Unseen world of Kentucky's Mammoth Cave: National Parks Magazine, v. 40, Feb., p. 4-9.

Stouffer, C. W., 1967, Pictograph cave in Kings Canyon National Park: National Parks Magazine, v. 41, May, p. 16-17.

IBM&G EES 2
FIGURE 25

PAPOOSE CREEK
Main entrance
Entrance pits
15-ft drop
110
60-ft pit
40-ft waterfall
240
Dirt fill
Chimney 50-ft high
12-ft drop
8-ft drop
Dry passage
395
Valhalla
Sand Room
436
Safari Passage
Tread Softly Passage
12-ft pit
20-ft pit
(UNMAPPED)
576
65-ft waterfall
Miclaire Room
700
(UNMAPPED)
est. 1000 ft
50-ft pit
Siphon
745 est.

PLAN

Main entrance
100
110
100
150
200
200
240
250
300
300
350
400
395
400
436
450
500
500
500
550
576
600
600
640
650

DEPTH BELOW MAIN ENTRANCE, IN FEET

PROFILE

0 100 200
feet

Figure 25
map of PAPOOSE CAVE
Idaho County, Idaho

ey-69