REPORT OF THE VIRGINIA COMMISSION ON THE CONSERVATION OF CAVES TO THE GOVERNOR AND THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 5

COMMONWEALTH OF VIRGINIA
DIVISION OF PURCHASES AND SUPPLY
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Report of the Virginia Commission on

the Conservation of Caves

To

The Governor and the General Assembly of Virginia

Richmond, Virginia

December, 1978

To: Honorable John N. Dalton, Governor of Virginia

and

The General Assembly of Virginia

The Virginia Commission on the Conservation of Caves (hereinafter referred to as the Commission), consisting of eleven citizens of the Commonwealth and representing a wide variety of expertise relating to caves, was established by the 1978 session of the General Assembly pursuant to the provisions of House Joint Resolution No. 10.

HOUSE JOINT RESOLUTION NO. 10

Creating a Commission to study the use and conservation of caves.

WHEREAS, there exist in the Commonwealth a number of caves whose natural beauty constitutes a resource of considerable value to Virginia; and

WHEREAS, these caves have attracted and continue to attract many tourists to Virginia and thus generate considerable income both for the Commonwealth and for the operators and owners of the caves; and

WHEREAS, these caves additionally afford a locus for geological, paleontological, and other forms of scientific research; and

WHEREAS, many caves provide a habitat for rare and/or endangered species; and

WHEREAS, some caves have suffered from the depredations of vandals; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That there is hereby created the Commission on Conservation of Caves. The Commission shall be composed of eleven private citizens appointed by the Governor. The Commission shall elect a chairman from among its own membership; and, be it

RESOLVED FURTHER, That the Commission shall study all problems incidental to cave use, protection, and conservation in Virginia, including, but not limited to, the use of caves in education, the protection of caves as a natural resource, the protection of caves from vandalism and spoliation, the protection of rare and endangered species living in caves, and the enforcement problems appertaining to present cave protection laws; and, be it

RESOLVED FURTHER, That in its work, the Commission shall not concern itself with any matters concerning caves operated as commerical enterprises; and, be it

RESOLVED FURTHER, That the Commission shall make recommendations to assure the preservation of the property rights of cave owners, subject to such criteria as the Commission may recommend; and, be it

RESOLVED FURTHER, That the Commission shall not go on the real property of any person without the permission of the owner; and, be it

RESOLVED FURTHER, That the Commission shall not make any recommendations interfering with any real property owner's rights as owner of said real property and the cave located thereon; and, be it

RESOLVED FURTHER, That the Commission may make recommendations not only to the government and agencies of the Commonwealth, but also to local agencies and governments. All agencies of the Commonwealth may assist the Commission in its work; and, be it

RESOLVED FINALLY, That the Division of Legislative Services may assist the Commission in the preparation of the Commission's report.

The Commission shall complete its study and report its findings and recommendations to the Governor and General Assembly on or before October one, nineteen hundred seventy-eight.

ABSTRACT

The Commonwealth of Virginia, with over 2,500 caves, is one of only five states in the United States with over two thousand known caves. At least five hundred of these, nearly all located in the limestone valleys west of the Blue Ridge (See Figure 1), could be classified as of some significance. They include some of the historically best known caves in the United States and those operated commercially attract many tourists. About ninety per cent are in private hands, with the rest on federal, state, or local public property. In any comprehensive assessment, some of the smaller rock shelters should also be considered.

Virginia is also fortunate in having within its borders several hundred citizens with extensive knowledge of the many facets of speleology: cave exploration, protection, management and the scientific study of cave fauna, flora, hydrology, geology, and archeology. The combination of rich cave resources and knowledgeable citizens puts Virginia in a unique position in the field of cave protection. Since the passage of the Commonwealth's cave protection law (see Appendix I) which served as a model for other states during the late 1960's, several other states have passed more comprehensive laws [e.g., West Virginia, California, Arizona, Texas, and Georgia (1977), and Maryland (1978)]. A short summary of these laws is contained in Appendix IX. Virginia now has both a need and an opportunity to take further steps to protect its caves.

Vandalism, already experienced to an alarming degree, is more serious than most natural phenomena. Cave features and contents, once destroyed or removed, take milennia to reform. Historical material that has been tampered with can never be reconstructed.

The Commission recommends:

1. Rewriting or amending the existing Cave Protection Act to strengthen it with some provisions similar to those contained in more recent statutes enacted in other states, including Maryland and West Virginia.

2. Conducting a two-year archeologic survey of Virginia caves through the Virginia Research Center for Archeology. It is understood that matching federal funding may be available.

3. Establishing a permanent eleven member Virginia Cave Commission to provide consultative services to State agencies on cave-related matters. This proposed Commission will also study ways of improving the protection of Virginia's caves, including ways to acquaint the citizens of the Commonwealth with the value of this unique resource.

HISTORICALLY

Historically, people have utilized the caves of Virginia for at least 9,800 years. Indians from a variety of cultures selected caves for shelter, exploration, burial places, and a multitude of other purposes. Our more immediate ancestors found many uses for caves including exploration, temporary residence, saltpetre mining, churches, water supply, and commercial attractions. The accumulated residue of the millenia of human activities forms a unique and vital record of the lifeways of these people and the environment upon which they depended. Once disturbed or destroyed, the archeological record of past cultures cannot be recreated.

An unfortunate number of archeological resources in caves have already been disturbed. Of the 26 known Indian burial caves, none has escaped disturbance. A majority of the 55 known saltpetre caves have been vandalized. Portions of many of the 40 known prehistoric rock shelter sites have been pot-hunted. With increased interest in archeology and caving, vandalism will continue at an accelerated rate unless effective measures are implemented to monitor and protect these resources.

Professional archeologists have only begun to investigate the implications of materials discovered in Virginia's rock shelters and caves. (See Appendix V for complete assessment of the archeologic resources found in Virginia caves.) One of the deepest sites checked to date, Daughtery's Cave, has been placed on the National Register of Historic Places, but others undoubtedly qualify for such placement. Indian burial caves can yield important demographic information. Unfortunately much of this information has already been lost due to vandalism. Review of available literature reveals 40 rock shelters and caves with evidence of prehistoric habitation and 26 burial caves. There are undoubtedly more.

In more recent history, Virginia's caves were extensively mined for saltpetre (used in the manufacture of gunpowder) from the early colonial period to the close of the Civil War. Speleological historians have documented much of this but the materials left in the caves have for the most part disappeared into private collections, or worse, into the fires of uneducated cavers. Caves like Clark's Cave along the Cowpasture River, where evidence of the saltpetre operations is extensive and in a good state of preservation, would be eligible for nomination to the National Register of Historic Places and would make an excellent and unique history-oriented state park.

While saltpetre mining was the main activity in caves during the historic period, caves were also used for such diverse purposes as churches, stills, temporary residences for fugitives, overnight hunting or fishing camps, sources of water, garbage dumps, fallout shelters, and commercial display. Thomas Jefferson visited and described one of Virginia's caves. George Washington left his signature in the Madison Saltpetre Cave.

Protection of archeological resources on federally or State-owned property is provided through the federal and Virginia Antiquities Acts, which established permit systems to insure that investigations are conducted by qualified archaeologists. A series of environmental laws insure that archeological resources affected by federal projects are properly evaluated during the environmental review process. However, the current Virginia Cave Protection law does not cover archeological resources. The above-mentioned permit system can be extended to sites on private property or property owned by a city, county, town, or regional authority, given the express prior written consent of the owner involved. This is, however, a time-consuming process and often the owner is unwilling to give such consent. Therefore the Commission recommends extending protection to archeological deposits and materials in caves.

New federal laws (the National Historic Preservation Act, National Environmental Policy Act of 1969, Executive Order 11593, Department of Transportation Act, and the Archeological and Historic Preservation Act) provide for the inventorying of archeological and historical properties in the nation to determine which ones are eligible for placement on the National Register of Historic Places.

Any federally related land modification project normally requires an archeological survey to determine if significant sites will be affected. If so, then the project will either be modified to avoid the sites or the sites will be excavated. No legislation exists to protect archeological sites affected by private development.

A section in the proposed Cave Protection Act (see Appendix III) would provide archeologists

and speleologists with effective means to prosecute vandals who destroy, deface, or remove irreplaceable archeological resources form the caves of Virginia. A permit system would be established so that investigations in caves can be carried out only by individuals whose professional qualifications and purposes assure protection of these archeological resources.

These proposed changes in the law are essential if we are to curtail the vandalism which has already depleted many of the archeological resources in caves. Effective implementation of the law will require an awareness on the part of state officials as to which caves contain archeological sites. Also the nature and significance of those sites needs to be documented. To accomplish this evaluation, the Commission recommends that the Virginia Research Center for Archeology (VRCA) administer a two-year archeological survey. As the VRCA does not have sufficient staff or resurces to conduct the intensive effort required, it is recommended that the General Assembly add a special appropriation to the 1980-1982 budget of the VRCA. The survey would cost $41,000.00. (See Appendix IV for complete funding proposal.) This money would be eligible for survey and planning matching funds from the U.S. Department of the Interior.

The Commission recommends that the proposed Cave Protection Act which broadens the definition of "cave" to include rockshelters and extends legal protection to archeologic remains in caves, be adopted. Further, the Commission recommends that a special appropriation be granted to the Virginia Research Center for Archeology for the 1980-82 biennium for a two-year archeologic survey of Virginia caves. Lastly, it is suggested that a review procedure for federal projects affecting potentially archeologically significant caves be set up.

SCIENTIFICALLY

Limestone caves provide unique natural laboratories for the investigation of biological and geological processes and, thus, are of great interest scientifically. Research on the cave environment has increased dramatically in the last fifteen years. One of the most important uses of caves scientifically is their utilization as limited and simple laboratories in which one can study the principles governing evolution in more complex, stable environments on the surface.

A. Biologically

The discoveries of basic scientific principles and ideas have been based on observation and experimentation with the least complicated systems available for study. This rationale applies to the study of ecology. In the search for basic ecological principles, the environmental parameters of ecosystems such as the tropics are too many and too complex. Over the years, more ecological research has been focused on simple, well-defined systems such as islands and caves. The potential for understanding all of the biological interactions is much greater in a cave community than in a tropical rain forest. The knowledge gained from the study of caves can then be utilized in the construction of models that more clearly explain the interactions that are occurring in larger, more complex and economically important ecosystems.

Caves as natural laboratories are ideally suited for ecological studies (Appendix VII provides a bibliography of the major papers on Virginia cave biology). Their boundaries are concise and fairly small; the cave climate is relatively stable and predictable; and there are comparatively few species of living organisms that inhabit caves. Cave-adapted animals are easy to work with because they are blind and will still behave normally when observed with dim lights. One whole group of organisms, the green plants, is entirely absent from the cave biota. The available food is scarce, being limited to animals that either die or are preyed upon in the cave and organic nutrients that are washed in by flooding or streams. With so little food input, the total number of organisms living in a cave is low, making it possible to identify not just a few members of a population but frequently every single member of that population. Long-term studies in which the environment is experimentally manipulated are relatively uncomplicated in caves. Because of these advantages in ecological research, caves are important to the future understanding of the rules that govern community structure and function.

More than 200 species of animals, classified in 18 major taxonomic groups, have been collected and identified from Virginia caves (Appendix VI outlines the animals included in these taxonomic groups). Approximately 94 of these species are true cave-adapted organisms, known ecologically as obligatory cavernicoles or troglobites. Troglobites are typically eyeless, unpigmented organisms that

live exclusively in the subterranean environment. Many are rare local or regional endemics, and their ranges are often limited to a single cave or group of caves in a single karst (limestone-floored) valley. In addition to the troglobites, approximately 40 species are troglophiles, or organisms that spend all or a part of their life cycles in caves but which under certain conditions may be found in ecologically suitable surface habitats. Some of these species have degenerate eyes and are weakly pigmented but usually not to the same extent as troglobites.

At a conference on Endangered and Threatened Plants and Animals of Virginia, held in Blacksburg, Virginia, on 19-20 May, 1978, a great deal of emphasis was placed on the potentially threatened status of many of the state's caves and their associated animal life. The need for protection and preservation of cave ecosystems as a significant non-renewable resource was stressed. It is undoubtedly significant that more than 50 percent of the species listed as being "endangered," "threatened," or of "special concern" by the Conference Committee on Freshwater and Terrestrial Arthropods are cave forms. Moreover, both the Conference Committee on Mammals and the U.S. Fish and Wildlife Service have listed three species of cave-dwelling bats in Virginia as "endangered." These species are the Indiana bat, Myotis sodalis ; the gray bat, Myotis grisescens ; and the Virginia long-eared bat, Plecotus townsendii virginianus .

Some of the more important reasons for the concern for cave animals and their environment include:

1. Cave ecosystems are limited in size and sensitive to perturbation and are therefore highly vulnerable to groundwater pollution and disturbance by man in the form of heavy caver pressure.

2. Cave-adapted species (troglobites and many troglophiles) are frequently rare, unique, highly specialized forms with restricted ranges and low population numbers.

3. Cave habitats are being destroyed or severely altered by the quarrying away of whole caves, filling in and covering over of sinkholes and cave entrances, pollution of subterranean waters, and siltation of underground passages by heavy runoff caused by over-development of the surface in karst areas.

4. The tendency for the three endangered species of cave-dwelling bats to concentrate both hibernating and maternity populations in only a few caves makes the entire species particularly susceptible to local catastrophies such as flooding. Moreover, these bats are readily disturbed by human activity, and this factor alone is believed to be partially responsible for the documented decline in population sizes of all three species in recent years.

At least 22 caves in Virginia with significantly diverse troglobitic faunas and/or rare, locally endemic species that are in need of immediate protection include: Madison Saltpetre in Augusta County; Starr Chapel and Witheros in Bath County; Ogdens in Frederick County; Cope, Gallohan No. 1 and 2, Litton No. 1, McClures, Molly Wagle, Sweet Potato, Thompson Cedar , and Unthanks in Lee County; Showalters in Rockbridge County; Grigsby , McDavids and Speers Ferry in Scott County; Buchanan Saltpetre in Smyth County; Cassell Farm No. 2, Fallen Rock and Hugh Young in Tazewell County; and Rocky Hollow in Wise County. Other such caves exist and can be identified with further study.

One prime example of a Virginia cave with a significant fauna that was recently destroyed by a rock quarrying operation is Erharts Cave in Montgomery County. This cave was the habitat for three rare troglobitic species: an isopod, a beetle and a milliped. The cave could have been saved had it been identified and protected early enough. Two other caves, with interesting populations of troglobitic crustaceans, one in Rockbridge County and one in Alleghany County, were destroyed by road construction in the early 1960's.

Caves of ecological importance might be acquired and protected through purchase, lease, or scenic easement. Three agencies, two State and one private, that are apparently in a position to assist with the task of cave protection through some form of acquisition are the Virginia Commision of Outdoor Recreation, Virginia Division of Parks, and the Nature Conservancy. A State-operated "natural areas" or "nature preserve" system, modeled after those in some of the other states, would clearly be useful in initiating the protection of ecologically significant caves in the Commonwealth. Caves facing immediate threats, such as destruction or alteration, heavy visitation, or pollution, should be given first priority in a program of acquisition. The protection of cave biotas would be

further ensured with the incorporation of the collecting permit system in the proposed Virginia Cave Protection Act (See Appendix III).

B. Geologically

A large number of caves in Virginia are of scientific value to the geologist. Several hundred caves in the Commonwealth contain mineral growths or sedimentary deposits which are likely to yield important new information on the geologic and climatic history of Virginia over the last 100,000 years. The cave environment has also proven nearly ideal for the preservation of fossil bone deposits and ancient seeds and pollen. The hundred odd Virginia caves thought to contain fossil biological deposits of this type will, when properly excavated, undoubtedly provide important new documentation on both the migrations and extinctions of animals and plants in the state's prehistoric past. Additional data on Virginia's recent geologic and climatic history can also be gleaned from these ancient biological remains.

An estimated 200 Virginia caves contain rare or unique mineral deposits of scientific value. These caves provide an outstanding natural laboratory in which geologists can study the processes of low temperature mineral formation. It should also be noted that many of these same mineral deposits are formations (speleothems) of great beauty and hence are important for their aesthetic value as well.

Many of Virginia's caves are valuable to the geologist because they permit observation of geologic structures below the earth's surface. Whereas soil and vegetation often cover the bedrock on the surface, the rock is usually completely exposed in a cave. Additionally, the solutional development in a cave often highlights structural features which would probably go unnoticed on the surface.

Because most caves are formed by the solutional action of groundwater and represent major components of the underground drainage network in the areas where they occur, caves provide a unique natural laboratory for groundwater studies. Some caves contain streams which represent the entire drainage for large limestone or karst areas. Many springs in Virginia, including some of the largest ones, emanate from cave systems. The general purity of these springs is well known and their enormous economic value cannot be underestimated. Caves are therefore likely to play a growing role in groundwater studies which seek to find better ways to protect and utilize Virginia's groundwater resources as increasing demands are placed on these resources.

At the present time, vandalism of mineral formations and fossil bone deposits in caves threatens to erase an important record of Virginia's geologic and climatic past before it can be interpreted and reconstructed. The Commission recommends that these natural materials be given additional protecton under the law as outlined in the proposed Virginia Cave Protection Act (see Appendix III).

The pollution of groundater as a result of the dumping of garbage, dead farm animals, and toxic chemicals in sinkholes and cave entrances in the limestone areas of Virginia is a growing problem that potentially threatens the sources of many domestic water supplies. Although pollution of this nature is illegal under present laws, enforcement is difficult because it is nearly always impossible to prove the source of the pollution. Adoption of the proposed Virginia Cave Protection Act would further protect the Commonwealth's groundwater resources by outlawing all waste disposal in sinkholes and cave entrances. This action would eliminate the difficulty in proving that a given sinkhole or cave entrance utilized for waste disposal was a pollution source, since all such dumping would be illega under the new act.

In view of the number of caves which are discovered, altered, or destroyed by limestone quarrying operations, it is recommended that an informational pamphlet be written describing the value of caves and the potential hazards of quarrying in cavernous limestone. This proposed pamphlet should include directions on how a quarry operator can obtain the services of a trained speleologist who could evaluate the scientific value of and the potential hazards posed by any caves affecting the quarry operation. Often a trained speleologist can develop acceptable alternatives which will prevent the destruction of significant caves as well as helping the quarry operator avoid such costly and dangerous problems as collapse or quarry flooding. This publication could be prepared by the proposed Cave Commission for publication by an appropriate State agency and distribution to applicants for limestone quarrying permits and other similar applications for land use in karst areas.

C. Promotion of Cave Research

The Commonwealth of Virginia has figured prominently in speleological research. Some of the first cave research in the United States was carried out in Virginia. But aside from publication of Descriptions of Virginia Caves (Holsinger, 1975) by the Division of Mineral Resources and indirect support of the cave sciences through research programs at some of her universities, the Commonwealth has not actively supported or promoted speleological research. Considering the State's significant cave resources and the increasing regional and national interest in speleological research, it seems appropriate that the Commonwealth become more active in the promotion and support of cave science. This might be done through such State agencies as the Science Museum, the Commission of Outdoor Recreation, the Division of Mineral Resources, and the Division of Parks.

ECONOMICALLY

Economically, the Commission recommends exploring a way to provide a central data base of information on caves and rock shelters. No such data base is available to State agencies at this time. The data is being collected by the Virginia Speleological Survey, an organization of the National Speleological Society, but is not in readily accessible form. If a data processing system could be set up to provide for storage and retrieval of all pertinent data on Virginia caves and rock shelters, this would facilitate rapid distribution of information on caves and karst when needed by State agencies or for environmental impact statements.

In this connection, both DYNAPLAN (a State information system being developed at the School of Forestry and Wildlife by Dr. Robert H. Giles, Jr., of the School of Forestry and Wildlife Resources at Virginia Polytechnic Institute and State University) and the Tennessee Valley Authority Regional Heritage Program are already in the process of developing systems for computerizing data on Virginia caves in certain areas with the idea of ultimately utilizing this information in assessing natural diversity and environmental planning.

Possible economic benefits from having ready access to information about caves would be the avoidance of unstable areas in limestone country for highway or other construction, the location of dams away from porous limestone with attendant exhorbitant costs to prevent leaking, and the prevention of problems of pollution of groundwater by sewage or other pollutants.

Some economic value accrues to Virginia simply from the existence of so many caves in the Commonwealth. The economic impact of the several commercial cave complexes within this State exceeds $12 million annually. Many tourists, attracted to Virginia by the national reputation of these caves, remain in the Commonwealth to enjoy her other attractions. Noncommercial caves also have significant value as recreational resources. Approximately 10,000 trips are made by residents of Virginia to noncommercial caves and 30,000 out-of-state visitors are attracted to noncommercial Virginia caves each year.

In addition, a number of cave explorers and speleologists are attracted to Virginia by the undeveloped caves. For instance, four national conventions of the National Speleologial Society have been held in Virginia since 1950; the most recent in Blacksburg in 1971 attracted hundreds of people. More recently, in September 1978, the International Symposium on Groundwater Biology was co-sponsored by Old Dominion University and Virginia Polytechnic Institute and State University at Blacksburg. One of the principal reasons for holding this scientific meeting in Virginia was the interest in karst groundwater ecosystems of the State. Virginia's significant undeveloped caves will undoubtedly also attract a number of foreign speleological visitors in 1981, when the International Congress of Speleology will be meeting in Kentucky.

A study of the caving population also reveals that a substantial number of serious speleologists have become residents of Virginia, attracted by the combination of cave resources and employment opportunities using their talents.

EDUCATIONALLY

Elsewhere in this report the irreplaceable value of caves for the study of history, archeology, hydrology, biology, and geology has been noted and desbribed. It is significant that these are

educational values of importance to scholars and students at all levels of the academic community. Experts and professionals in these fields find in caves subjects of study that contribute much to the advancement of their fields, both in terms of the total accumulation of knowledge and, in some cases, the accumulation of data required for practical projects and technological advances. Graduate students in the same academic disciplines can focus the attention of their researches on these important aspects of the underground world. Every year in universities around the country, as well as in our own State, such studies are completed and their results made available to historians, archeologists, and scientists. On the college and high school level, caves can be natural classrooms and laboratories for introducing young people to these fields, and inspiring their interest in further study.

For examples: An ongoing program directed by a member of this Commission has enabled high school students from seventeen school districts and five private schools, as well as students in several colleges and graduate programs, to carry on scientific studies in the caves of Virginia. The Mathematics and Science Center, an educational facility of the Richmond area school districts, has made cave study a major annual project of its program. In the Department of Biological Sciences at Old Dominion University, several graduate students are doing thesis projects in Virginia caves, and, in addition, a course in Cave Biology is offered on alternate years.

A chief purpose of any program to perserve and protect the caves of Virginia is necessarily to conserve one of the most valuable and irreplaceable educational resources in the State.

SALE OF SPELEOTHEMS

A major recommendation of the Commission is that Virginia join West Virginia and Maryland in banning the sale of speleothems or their export from the Commonwealth for sale elsewhere (see proposed Virginia Cave Protection Act, Appendix III). By eliminating this incentive for removing these mineral formations from caves, much vandalism should be stopped. Information on the provisions of the State cave protection law should be widely disseminated, perhaps by signs posted in cave entrances, to warn vandals that their activities are unlawful.

Generally speaking, there are two markets for speleothems - souvenir hunters and serious collectors of mineral specimens. A ban on speleothem sales will primarily affect the souvenir hunter who buys a small speleothem for a dollar or two from a wayside rock shop or souvenir stand. These souvenir speleothems are usually not particularly attractive once removed from their natural surroundings and have little lasting value. Souvenir hunters will probably never notice their disapperance if the sale of speleothems is prohibited. The potential economic loss to owners of rock shops and souvenir stands will be negligible as speleothem sales usually account for only a minute percentage of their business. Further, most of the souvenir hunters who would buy a speleothem if they were offered for sale probably will end up buying some other trinket if speleothem sales are banned.

For the serious collector of mineral specimens, a ban on the sale of speleothems will not prevent the legitimate collection of speleothems from caves simply by obtaining the prior written permission of the cave owner. With the profit motive for collecting removed, collecting of speleothems is expected to become limited, selective, and professional in the way it is done. Indiscriminate collection by profiteers operating without the cave owners permission hopefully will be eliminated.

LIMITATION OF CAVE OWNER LIABILITY

As recreational caving has become increasingly popular over the last decade, there has been a corresponding rise in the number caving accidents. Undoubtedly this trend will continue as the sport of caving grows and increasing numbers of inexperienced and ill-equipped individuals enter caves.

For the cave ower, cave accidents represent a source of potential liability with which it is difficult for him to deal. Few cave owners can objectively evaluate the caving abilities of persons wishing to enter their cave. Further, few cave owners have ever been in their cave, and thus cannot evaluate the difficulty of their cave or the risks involved. Many cave owners are absentee land owners and, therefore, have little effective control over access to their cave. Thus, unless a cave

owner closes his cave to all persons by gating it or posting it, he has little chance of limiting his potential liability.

The Commission, therefore, recommends that cave owners be absolved from liability in the event of an accident in their cave. Persons entering a cave would then have to do so at their own risk except at commercial caves where an admission fee is paid. These provisions of the proposed Cave Protection Act (See Appendix III) will permit the use of caves for recreational and scientific purposes without imposing unwarranted liabilities upon the cave owner.

PROPOSED PERMANENT CAVE COMMISSION

The Commission recommends establishing a permanent Virginia Cave Commission composed of eleven members, serving three-year staggered terms (See proposed legislation creating Commission, Appendix II). Most of the members should be persons active and knowledgeable in the management, exploration, study, and conservation of caves. Expertise in the fields of cave biology, geology, archeology, palentology, history, and recreation may be represented.

It became clear during the Commission's work that there is a role in the Commonwealth for a permanent Virginia Cave Commission to provide consultative services to state agencies on problems related to the use, management, protection, and scientific interpretation of caves and karst landforms. (See Appendix VIII for documentation on past interaction between speleologists and State agencies.) This proposed permanent Cave Commission could also provide considerable assistance to state agencies by coordinating programs or activities that involve caves and karst with federal agencies, regional parks, local governments, and private citizens.

Caves on Private Property

The proposed permanent Cave Commission can play an important role in assisting private land owners in conserving and managing caves on their property. The legislation creating the proposed Cave Commission will specifically charge that body with studying ways the proposed Cave Protection Act can be more effectively enforced. Further, the proposed Cave Commission will be charged with studying the rights of the property owner under Virginia law in order to clarify who owns a cave when the surface rights and the mineral rights are separately owned. Lastly, the proposed Cave Commission will seek to identify significant privately owned caves in danger of being destroyed and will recommend steps which can be taken to protect these caves. Emphasis will be placed on ways the Commonwealth can encourage private individuals and groups to save these threatened caves. Purchase of significant caves by government agencies in order to protect them should be considered a measure of last resort.

Caves on Public Property

The number of Virginia caves on public property is presently unknown. Several cities and counties as well as two regional parks own caves. There are ten caves in the Jefferson National Forest and twenty caves in the Cumberland Gap National Historic Park. Caves are also known to exist in the George Washington National Forest and on State land owned by the Department of Highways, Division of Parks, and Commission of Game and Inland Fisheries. Only a handful of these caves are managed so as to protect the cave from vandalism and visitors from injury.

The proposed Cave Commission could be instrumental in assisting public agencies which own caves in Virginia in formulating and implementing management plans for their caves. An inventory of publicly owned caves in Virginia would be the logical first step in this endeavor. Further, the proposed Cave Commissin would be able to put public agencies in touch with trained speleologists when cave related problems arise.

Civil Defense

In the past a number of Virginia caves have been designated as civil defense shelters. In many cases the caves selected were not suitable for this use (see Appendix X for fuller discussion of civil defense and caves). Typically caves are cold and damp, usually are remote from urban population centers, and occasionally are subject to flooding. Many have vertical pits or small, tight passages. The proposed Cave commisison could prepare a list for use by State and federal civil defense

agencies of Virginia caves suitable for use as civil defense shelters. This would prevent possible disasters arising as a result of the designation of inappropriate caves as shelters. It is recommended that signs now identifying inappropriate caves as civil defense shelters be removed.

Advising and Assisting Public Agencies

A major function of the proposed Cave Commission will be to advise and assist public agencies. There presently exists, due to the efforts of the Virginia Speleological Survey of the National Speleological Society, a wealth of data about Virginia caves, but this information is not generally accessible. The proposed Cave Commission will study ways and means of making these data more readily available to State agencies for their use in construction siting, land use planning, and environmental impact statement review. As previously mentioned, an electronic data storage and retrieval system maintained by an appropriate State agency seems to be the most logical way of providing ready access to these data.

The proposed Cave Commission will be able to act as a liason between caving organizations, cave scientists, public agencies, and the general public. For example, the proposed Cave Commission may be able to help local rescue squads obtain the assistance of experienced cavers to help them cope with the unique problems posed by cave rescue situations. Similarly, the proposed Cave Commission could assist in gathering input from interested parties if a State cave recreation plan is ever developed. (The need for and desirability of a cave recreation plan will be studied by the proposed Cave Commission.)

Lastly, the proposed Cave Commission will be able to play an important informational role by providing State agencies with general information about caves and by assisting these agencies in providing information about caves to the public. The scientific, recreational, and aesthetic value of Virginia's caves is not widely recognized. The proposed Cave Commission would attempt to generate an increased awareness of the value of Virginia's caves and the legal protection these caves are given under Virginia law. In this connection, the proposed Cave Commission could prepare or assist other State agencies in preparing publications on caves or cave related problems.

CONCLUSION

Virginia's caves represent a unique, limited, and non-renewable natural resource of great scientific, historic, educational, economic, and recreational value. Vandalism and pollution are rapidly destroying this resource. In order to prevent Virginia's spelean wilderness from being destroyed within our lifetime, immediate steps need to be taken to protect Virginia's significant caves. The Commission recommends that a permanent Cave Commission be created to assist State agencies dealing with cave-related problems, that a new, more comprehensive Cave Protection Act be enacted, and that the Virginia Research Center for Archeology be granted a special appropriation for the 1980-82 biennium to conduct a two-year archeologic survey of Virginia caves.

Respectfully submitted,

John M. Wilson, Chairman

John R. Holsinger, Vice Chairman

Evelyn W. Bradshaw, Secretary-Treasurer

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Robert W. Custard

Henry T. N. Graves

John M. Kettlewell

Philip C. Lucas

Virginia M. Tipton

APPENDIX I

§ 18.2-142. Damaging caves or caverns.—(a) It shall be unlawful for any person, without the prior permission of the owner, to wilfully and knowingly break, break off, crack, carve upon, write or otherwise mark upon, or in any manner destroy, mutilate, injure, deface, mar or harm any natural material found within any cave or cavern, such as stalactites, stalagmites, helictites, anthodites, gypsum flowers or needles, flowstone, draperies, columns, or other similar crystalline mineral formations or otherwise; to kill, harm or disturb plant or animal life found therein; to discard litter or refuse therein, or otherwise disturb or alter the natural condition of such cave or cavern; or break, force, tamper with, remove, or otherwise disturb a lock, gate, door or other structure or obstruction designed to prevent entrance to a cave or cavern, without the permission of the owner thereof, whether or not entrance is gained.

(b) Any violation of this section shall be punished as a Class 3 misdemeanor.

APPENDIX II

A BILL to amend the Code of Virginia by adding in Title 9 a chapter numbered 24.1, consisting of sections numbered 9-152.1 through 9-152.5, creating the Cave Commission; its powers; duties; and the conduct of a cave study; appropriation and expenditure of funds.

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding in Title 9 a chapter numbered 24.1, consisting of sections numbered 9-152.1 through 9-152.5, as follows:

CHAPTER 24.1.

CAVE COMMISSION.

§ 9-152.1. Cave Commission established; compensation.—A. There is hereby established in the office of the Secretary of Commerce and Resources the Cave Commission whose purpose shall be to implement the policy set forth in this article and to make recommendations to the Secretary and interested State agencies concerning any proposed rule, regulation or administrative policy which would directly affect or bear upon the use and conservation of caves in this Commonwealth. Members of the Cave Commission shall meet at least three times a year and serve without compensation but shall be reimbursed for their reasonable and necessary expenses incurred in the performance of their duties as Commission members.

B. The Cave Commission shall consist of eleven members who shall be appointed by the Governor on the basis of merit and shall be active and knowledgeable in the conservation, exploration and management of caves.

C. Each member must be a citizen of Virginia. The members of the Commission shall serve for a term of three years, provided that beginning with the first appointments four members shall serve for terms of one year, four members shall serve for terms of two years, and three members shall serve for terms of three years. The first terms hereunder shall commence July one, nineteen hundred seventy-nine.

D. The Commission shall annually elect a Chairman and such other officers as are deemed necessary from the Commission membership.

§ 9-152.2. Meetings.—The Cave Commission established pursuant to 9-152.1 shall keep a complete and accurate record of all Commission meetings, such record to be available for inspection by the public in the office of the Secretary of Commerce and Resources during normal work hours. Six members shall constitute a quorum for the transaction of business.

§ 9-152.3. Functions of Cave Commission.—The Cave Commission shall perform the following functions:

A. Serve as an advisory board to any requesting State agency on matters relating to caves and karst.

B. Conduct an inventory of publicly owned caves in Virginia.

C. Provide cave management expertise and service to requesting State agencies including the preparation of management plans for non-commercial caves on publicly owned property.

D. Identify all significant caves in Virginia and report any real and present danger to such caves.

E. Provide cave data for use by State and other governmental agencies which prepare or review environmental impact statements and land use plans.

F. Publish or assist in publishing articles, pamphlets, brochures or books on caves and cave-related concerns.

G. Facilitate data gathering and research efforts on caves and perform such other functions as may be deemed necessary in keeping with the general purposes of this article.

§ 9-152.4. Cave Commission to study and report on cave matters of special concern.—In addition to all other duties of the Cave Commission, it shall be the responsibility of the Commission to study the following areas of general and special concerns and prepare a report to the Governor and General Assembly not later than January one, nineteen hundred eighty-one:

A. Ways in which State agencies can assist local authorities in obtaining the assistance of experienced cavers to help them in cave rescue situations.

B. Ways in which the State can encourage private individuals and conservation groups interested in cave conservation to purchase and protect significant caves in danger of being destroyed.

C. Virginia laws relating to cave ownership in order to clarify ownership rights and determine potential liabilities.

D. Ways and means of making cave data available through an electronic data storage and retrieval system in order to assist public agencies in making decisions directly or indirectly affecting caves.

E. The need for and desirability of a State cave recreation plan.

F. Ways in which the Virginia Cave Protection Act can more effectively be enforced.

G. The use, present and future, of Virginia caves as civil defense shelters.

H. Ways in which the State can advise the public about the legal protection given to caves under the law and the penalties for violations of those laws.

I. Ways in which the state can encourage private individuals and conservation groups interested in cave conservation to purchase and protect significant caves in danger of being destroyed.

§ 9-152.5. Expenditures.—The Commission is authorized to expend such funds as are necessary in order to effectuate the purposes of this chapter.

2. There is hereby appropriated from the general fund of the State Treasury the sum of eight thousand dollars in order to implement the provisions of this act.

APPENDIX III

A BILL to amend the Code of Virginia by adding in Title 10 a chapter numbered 12.2, consisting of sections numbered 10-150.11 through 10-150.18, and to repeal § 18.2-142 of the Code of Virginia, the added and repealed sections relating to the conservation and protection of caves; penalty.

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding in Title 10 a chapter numbered 12.2, consisting of sections numbered 10-150.11 through 10-150.18, as follows:

CHAPTER 12.2.

VIRGINIA CAVE PROTECTION ACT.

§ 10-150.11. Findings and policy.—The General Assembly hereby finds that caves are uncommon geologic phenomena, and that the minerals deposited therein may be rare and occur in unique forms of great beauty which are irreplaceable if destroyed. Also irreplaceable are the archeological resources in caves which are of great scientific and historic value. It is further found that the organisms which have evolved to live in caves are unusual and of limited numbers; that many are rare and endangered species; and that caves are a natural conduit for groundwater flow and are highly subject to water pollution, thus having far-reaching effects transcending man's property boundaries. It is therefore declared to be the policy of the General Assembly and the intent of this chapter to protect these unique natural and cultural resources.

§ 10-150.12. Definitions.—As used in this chapter, the following words shall have the meanings stated unless the context requires otherwise:

A. "Cave" means any naturally occurring void, cavity, recess, or system of interconnecting passages beneath the surface of the earth or within a cliff or ledge including natural subsurface water and drainage systems, but not including any mine, tunnel, aqueduct, or other man-made excavation, which is large enough to permit a person to enter. The word "cave" includes or is synonymous with cavern, sinkhole, natural pit, grotto, and rock shelter.

B. "Commercial cave" means any cave utilized by the owner for the purposes of exhibition to the general public as a profit or nonprofit enterprise, wherein a fee is collected for entry.

C. "Gate" means any structure or device located to limit or prohibit access or entry to any cave.

D. "Sinkhole" means a closed topographic depression or basin, generally draining underground, including, but not restricted to, a doline, uvala, blind valley, or sink.

E. "Person" or "persons" means any individual, partnership, firm, association, trust, or corporation or other legal entity.

F. "Owner" means a person who owns title to land where a cave is located, including a person who owns title to a leasehold estate in such land, and specifically including the Commonwealth and any of its agencies, departments, boards, bureaus, commissions, or authorities, as well as counties, municipalities, and other political subdivisions of the Commonwealth.

G. "Speleothem" means a natural mineral formation or deposit occurring in a cave. This includes or is synonymous with stalagmite, stalactite, helectite, shield, anthodite, gypsum flower and needle, angel's hair, soda straw, drapery, bacon, cave pearl, popcorn (coral), rimstone dam, column, palette, flowstone, et cetera. Speleothems are commonly composed of calcite, epsomite, gypsum, aragonite, celestite, and other similar minerals.

H. "Speleogen" means an erosional feature of the cave boundary and includes or is synonymous with anastomoses, scallops, rills, flutes, spongework, and pendants.

I. "Material" means all or any part of any archeological, paleontological, biological, or historical item including, but not limited to, any petroglyph, pictograph, basketry, human remains, tool, beads, pottery, projectile point, remains of historical mining activity or any other occupation, found in any cave.

J. "Cave life" means any life form which normally occurs in, uses, visits, or inhabits any cave or subterranean water system, excepting those animals and species covered by any of the game laws of the Commonwealth.

§ 10-150.13. Vandalism; penalties.—A. It shall be unlawful for any person, without express, prior, written permission of the owner, to wilfully and knowingly:

1. Break, break off, crack, carve upon, write, burn, or otherwise mark upon, remove, or in any manner destroy, disturb, deface, mar, or harm the surfaces of any cave or any natural material which may be found therein, whether attached or broken, including speleothems, speleogens, and sedimentary deposits. The provisions of this section shall not prohibit minimal disturbance for scientific exploration.

2. Break, force, tamper with, or otherwise disturb a lock, gate, door, or other obstruction designed to control or prevent access to any cave, even though entrance thereto may not be gained.

3. Remove, deface, or tamper with a sign stating that a cave is posted or citing provisions of this chapter.

B. The entering or remaining in a cave which has not been posted by the owner shall not by itself constitute a violation of this section.

C. Any violation of this section shall be punished as a Class 3 misdemeanor.

§ 10-150.14. Pollution unlawful; penalties.—A. It shall be unlawful to store, dump, litter, dispose of or otherwise place any refuse, garbage, dead animals, sewage, toxic substances harmful to cave life or humans, or to store other such similar waste materials in any quantity in any cave or sinkhole. It shall also be unlawful to burn within a cave or sinkhole any material which produces any smoke or gas which is harmful to any naturally occurring organism in any cave.

B. Any violation of this section shall be punished as a Class 3 misdemeanor.

§ 10-150.15. Biological policy; penalties for violation.—A. It shall be unlawful to remove, kill, harm, or otherwise disturb any naturally occurring organisms found within any cave, except for safety reasons; provided, however, scientific collecting permits may be obtained from any cave commission established for such purpose or from the appropriate State agency.

B. Any violation of this section shall be punished as a Class 3 misdemeanor.

§ 10-150.16. Archeology; permits for excavation; how obtained; penalties for violation.—A. In order to protect the archeological resources not covered by the Virginia Antiquities Act (§ 10-150.1 et seq.), it shall be unlawful to excavate, remove, destroy, injure, deface, or in any manner disturb any burial grounds, historic or prehistoric resources, archeological or paleontological site or any part thereof, including relics, inscriptions, saltpetre workings, fossils, bones, remains of historical human activity, or any other such features which may be found in any cave, except those caves owned by the Commonwealth or designated as Commonwealth archeological sites or zones, and which are subject to the provisions of the Virginia Antiquities Act. Any violation of this subsection shall be punished as a Class 3 misdemeanor.

B. Notwithstanding the provisions of subsection A. hereof, a permit to excavate or remove archeological, paleontological, prehistoric, and historic features may be obtained from the Virginia Historic Landmarks Commission. The Commission may issue a permit to conduct field investigations if the Commission finds that it is in the best interest of the Commonwealth, and the applicant is an historic, scientific, or educational institution, professional archeologist or amateur, who is qualified and recognized in the areas of field investigations or archeology. Such permit shall be issued for a period of two years and may be renewed upon expiration. Such permit shall not be

transferrable; provided, however, the provisions of this section shall not preclude any person from working under the direct supervision of the permittee.

C. All field investigations, explorations, or recovery operations undertaken under this section shall be carried out under the general supervision of the Commissioner of Archeology of the Virginia Research Center for Archeology and the Virginia Historic Landmarks Commission and in a manner to insure that the maximum amount of historic, scientific, archeologic, and educational information may be recovered and preserved in addition to the physical recovery of objects.

D. A person applying for a permit pursuant to this section shall:

1. Have knowledge of archeology or history as qualified in subsection B. hereof.

2. Provide a detailed statement to the Commission giving the reasons and objectives for excavation or removal and the benefits expected to be obtained from the contemplated work.

3. Provide data and results of any completed excavation, study, or collection at the first of each calendar year.

4. Obtain the prior written permission of the owner if the site of the proposed excavation is on privately owned land.

5. Carry the permit while exercising the privileges granted.

E. Any violation of subsection D. hereof shall be punished as a Class 3 misdemeanor. Any violation of subsection D. hereof shall be punished as a Class 4 misdemeanor, and the permit shall be revoked.

§ 10-150.17. Sale of speleothems unlawful; penalties.—It shall be unlawful for any person to sell or offer for sale any speleothems in this Commonwealth, or to export them for sale outside the Commonwealth. Any violation of this section shall be punished as a Class 3 misdemeanor.

§ 10-150.18. Liability of owners and agents limited.—A. Neither the owner of a cave nor his authorized agents acting within the scope of their authority are liable for injuries sustained by any person using the cave for recreational or scientific purposes if no charge has been made for the use of the cave, notwithstanding that an inquiry as to the experience or expertise of the individual seeking consent may have been made.

B. Neither the owner of a commercial cave nor his authorized agents, officers, employees, or designated representatives acting within the scope of their authority shall be liable for any injury sustained by a spectator who has paid to view the cave unless the injury is sustained as a result of the owner's negligence in connection with the providing and maintaining of trails, stairs, electrical wires, or other modification, and the negligence is the proximate cause of the injury.

Nothing in this section shall be construed to constitute a waiver of the sovereign immunity of the Commonwealth or any of its boards, departments, bureaus, or agencies.

2. That § 18.2-142 of the Code of Virginia is repealed.

APPENDIX IV

FUNDING A TWO YEAR ARCHEOLOGICAL SURVEY OF CAVES

Effective administration, monitoring, and conservation of the archeological resources in caves requires data on the location, composition, and significance of these resources. Our knowledge of the archeology of known cave sites is insufficient. Caves with excellent archeological potential have never been surveyed by archeologists. An archeolgical survey of known cave sites and caves with a high archeological potential is needed.

The survey would determine the current state of preservation of archeological resources, test sites for in situ materials, map saltpetre features, locate and test new sites, and determine which sites should be nominated for placement on the National Register of Historic Places. The survey would provide essential data for developing a comprehensive management plan for conserving the archeological heritage in the caves of Virginia. The data would be of immense scientific value.

We recommend that this survey be administered by the Virginia Research Center for Archaeology (VRCA). As the VRCA does not have sufficient staff or resources to conduct the intensive effort required, we recommend that the General Assembly add a special appropriation to the 1980-1981 budget of the VRCA. The survey would cost $21,000.00 the first year and $20,000.00 the second year. As outlined below, this appropriation would fund an archeologist position and include travel and equipment expenses. The appropriation of $41,000.00 would be eligible for survey and planning federal match money from the U.S. Department of the Interior. A match should be obtained to fund an assistant archeologist position.

The proposed budget is as follows:

1980	
Archeologist	$13,500.00
Mileage	1,500.00
Meals & lodging	4,500.00
Equipment (cameras, lights, rope rig, cave equipment, film)	1,500.00
Sub-total	$21,000.00

1981	
Archeologist	$14,500.00
Mileage	1,000.00
Meals & lodging	3,000.00
Equipment	500.00
Report preparation & publication cost	1,000.00
Sub-total	$20,000.00
Total project cost	$41,000.00

No new state agency will be created by this appropriation. The job classification of the principal investigator has already been defined by the state personnel office as Archeologist A, prehistoric. If federal matching funds are obtained, the assistant would be classified as an archeologist A. The archeologist should report directly to the Commissioner of Archaeology and should cooperate closely with the Assistant Commissioners of prehistoric and historic archeology at the VRCA. The archeologist should be concerned solely with matters relating to archeological resources in caves.

The field expenses are based on a projected 150 field days in 1980 and 100 field days in 1981. The second half of 1981 should be devoted to compilation of the data and writing of a comprehensive report. The artifacts, documents, photographs, and equipment acquired during this project should be retained by the VRCA.

The survey should accomplish the following objectives:

(1) Review the existing literature to determine the nature and location of archeological sites in caves of Virginia.

(2) Evaluate the literature on caves to determine which caves have a high potential of containing archeological resources.

(3) Plot the location of known cave sites and potential sites on the VRCA topographic map file. Fill out site survey forms on previously unrecorded historic and prehistoric sites.

(4) Develop a survey strategy for visiting, evaluating, and testing the known and potential sites. The survey strategy should include contacting local speleological and archeological chapters and knowledgeable individuals who may know the location of cave sites.

(5) Conduct a survey of the known and potential sites. Sufficient information should be acquired to determine the depth of deposits, the state of preservation, and the significance of the remains. Maps should be made of significant caves showing the position of historic or prehistoric deposits in the caves.

(6) Process and analyze the artifacts acquired during the survey.

(7) Write a coherent, comprehensive report which describes the sites surveyed, correlates the available information into a realistic perspective, determines the significance of the sites, and makes recommendaions for the conservation or further evaluation of the resources.

The past record of vandalism of the archeological resources of the caves in Virginia need not be the model for the future. Favorable action by the members of the General Assembly and the Governor on the recommendations of this report will provide a new model which other states will emulate. Virginia will again become a leader in cave conservation measures. The initial appropriation will provide the stimulus and means to carry cave research well into the next decade. Enforcement of the laws pertaining to protection of archeological sites will become more effective. Significant sites which cannot be monitored can be gated by using grants-in-aid funds provided by the Department of the Interior. Implementation of these recommendations will shine new light on the presently dark but inviting world of the past, buried in the caves of Virginia.

APPENDIX V

AN ASSESSMENT OF THE ARCHEOLOGICAL RESOURCES IN THE CAVES OF VIRGINIA

Wayne E. Clark

This analysis was based upon research from literature concerning the caves and archeology in Virginia. Every cave description provided by Douglas (1964), Holsinger (1975), and Hauer (1971) was reviewed for information on archeological sites. The archeological literature was consulted for references to archeological sites in caves (Holland 1960, 1970; Evans 1955; etc.). Archeological site survey forms of the Virginia Research Center for Archeology for the counties west of the Coastal Plain province were also reviewed for cave sites. As much of the pre-historic site data is unpublished, information regarding these sites is tabulated in figures 1-3. The 121 rockshelters, burial caves, and saltpetre archeological sites located during this study represent a sample of the sites which remain to be documented by future field work and research.

Prehistoric Rockshelter Sites

Rockshelters and caves have always fulfilled one of man's basic needs–shelter. The evidence of man's activities in caves is preserved through his archeological record. These remains have enabled archeologists to develop regional chronologies (Benthall 1975), interpret changes in environment (Guilday 1967), and determine means by which the Indians adapted to the changing environment (Adovasio et. al. 1975). Only a few of the rockshelter sites in Virginia have been excavated by professional archeologists. Many have been disturbed to varying degrees by looters who were concerned solely with collecting artifacts. The few professional excavations which have been conducted reveal complex stratigraphies as well as shallow deposits (Benthall 1975; MacCord 1972). One of the deepest sites tested to date, Daugherty's Cave (44 Ru 14), has been placed on the National Register of Historic Places. This is the only Virginia cave on the National Register although numerous others qualify for nomination.

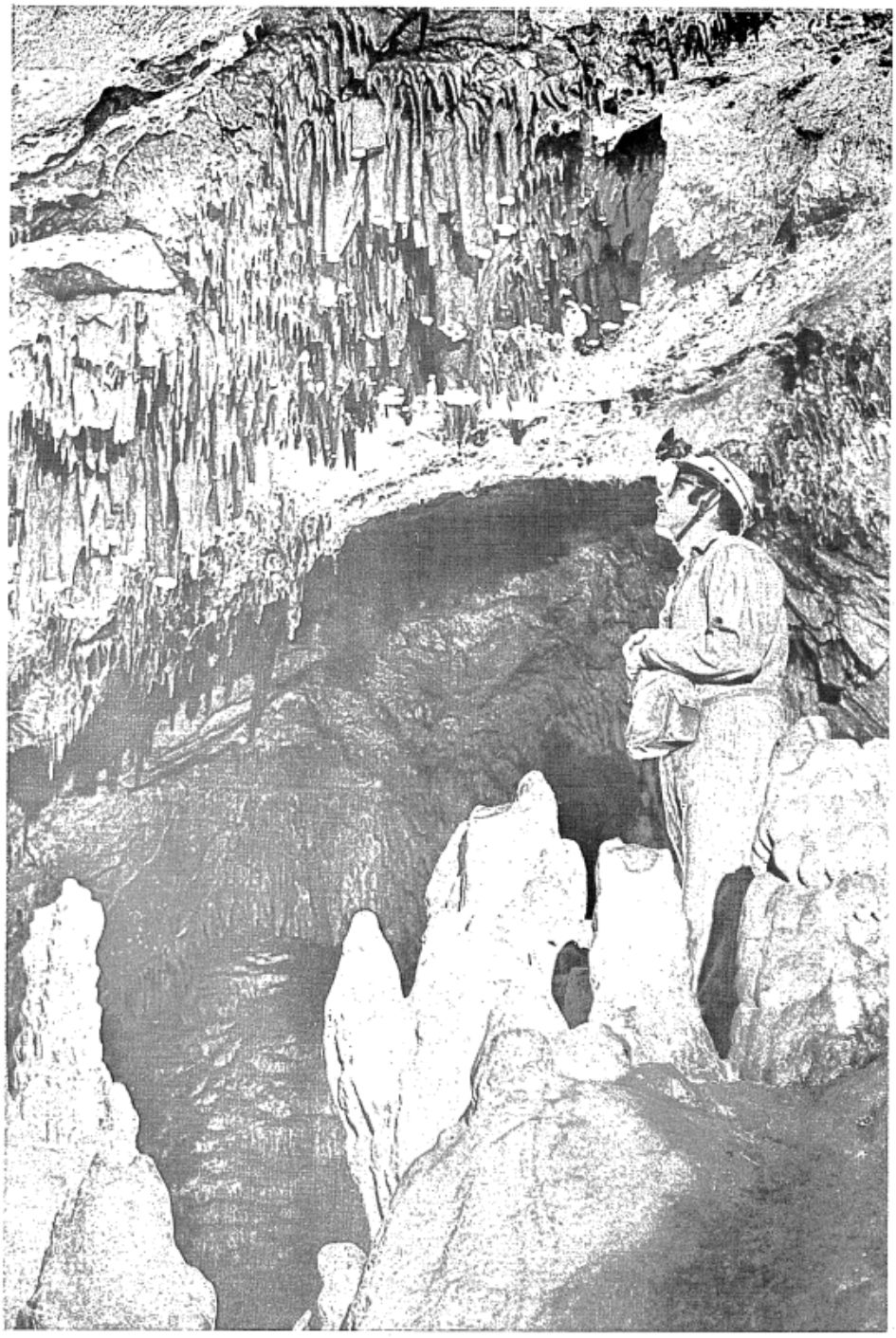
An evaluation of the literature revealed 40 rockshelters and caves which contain evidence of prehistoric habitations (Figure 1). The distribution of these sites by physiographic provinces follows:

Coastal Plain	0		
Piedmont	5		
Blue Ridge	9		
Ridge and Valley	21		
Appalachian Plateau	5	Total	40

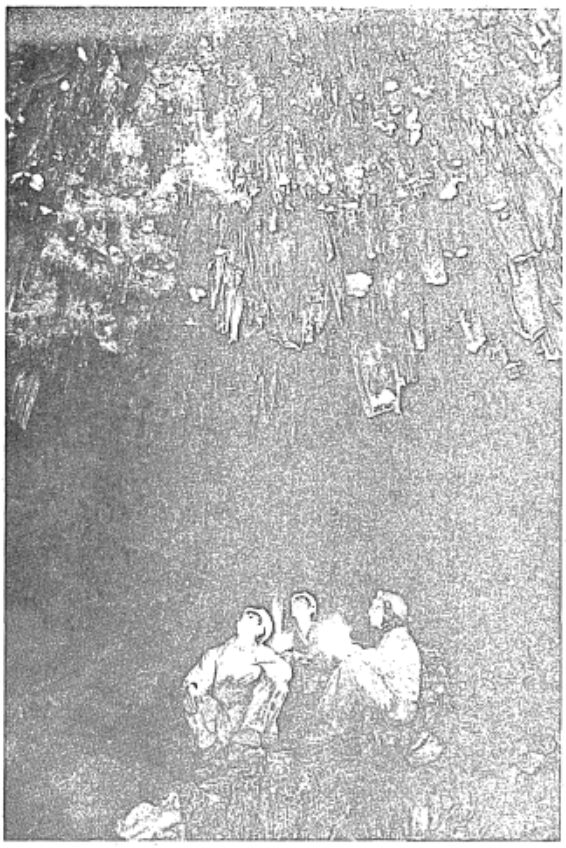
As expected, the limestone areas where most of Virginia's caves are located also have the largest percentage of archeological sites within caves. Some rockshelter sites, however, occur in rock types other than limestone (Figure 1). Most of the rockshelter sites are overhangs or solution cavities with sufficient size for human habitation. They range in size from 6 by 8 feet to 75 by 95 feet. The heights vary from 3 feet to 25 feet. Artifacts are deposited from three inches to seven feet below the present surface. Many of the sites have not been tested for depth.

References to specific pottery and projectile point types enabled placement of 20 shelters to specific time periods. Determination of the periods of occupation of twelve sites was restricted due to insufficient data. Only nine shelters could be placed within a general time period. Very little is known concerning the archeological resources of most known sites. The number of sites containing artifacts from each time period follow:

Paleo-Indian	13,000-8,000 BC	0
Early Archaic	8,000-6,000 BC	3
Middle Archaic	6,000-4,000 BC	3
Late Archaic	4,000-1,000 BC	9
Early Woodland	1,000- 500 BC	10
Middle Woodland	500 BC- 900 AD	10
Late Woodland	900 AD-1,600 AD	16

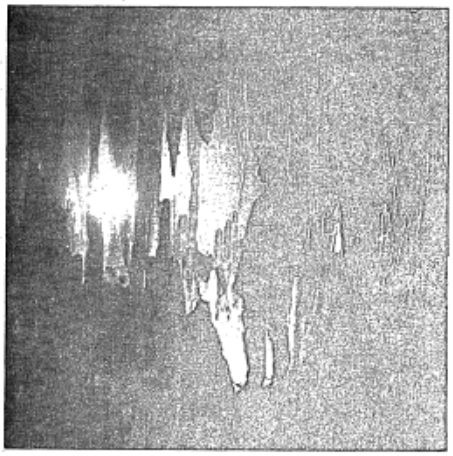


Estensive Vandalization: New River Cave
The most accessable areas show the effects of years of heavy visitor traffic: Virtually every formation within reach has been broken.

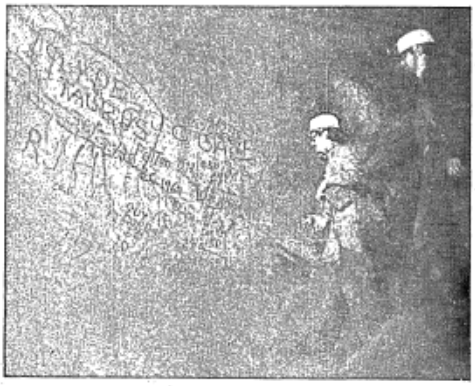


Stalactite Stumps: New River Cave
Rows of broken stumps over the ceiling along the main passage into the cave.

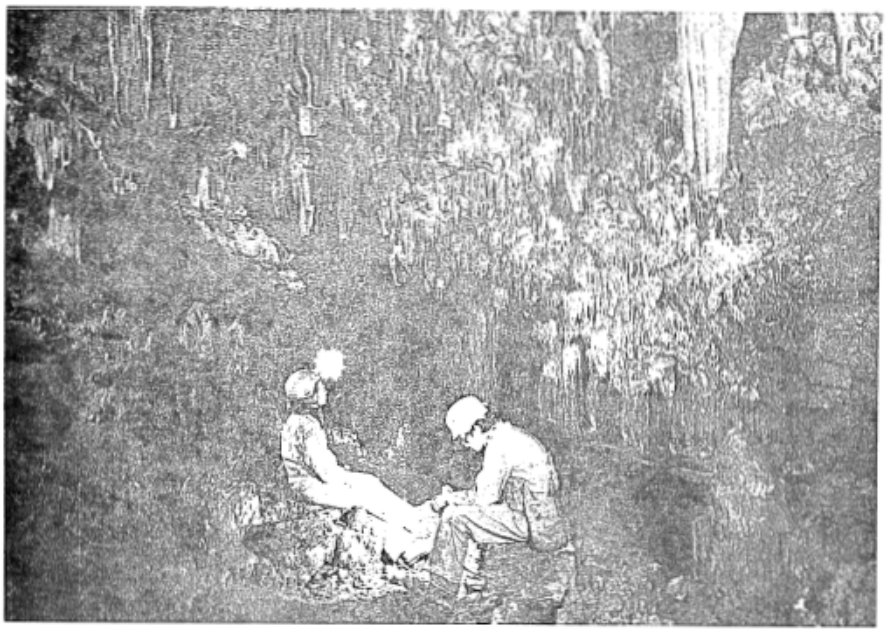
Translucent Crystal: Paytons' Cave
In a secluded crevice, crystalline calcite glows under backlight.



Silhouette: New River Cave
Only one, virtually inaccessable room remains undamaged.

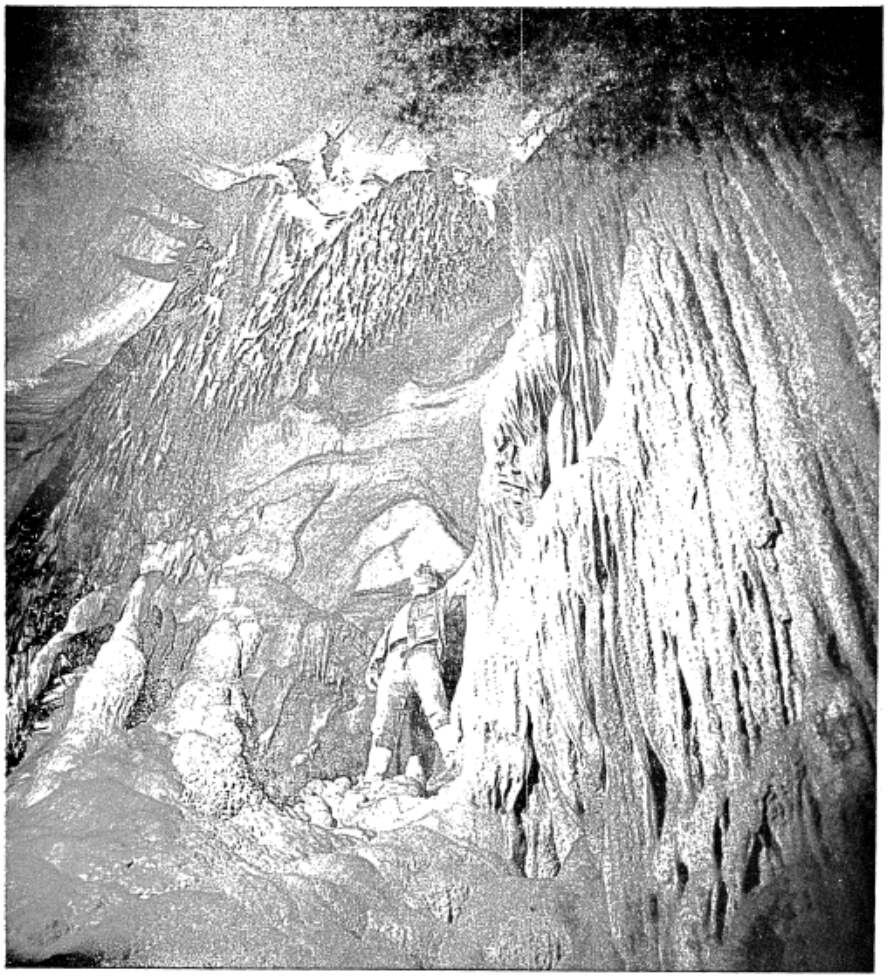


Graffitte: Smoke Hole Cave
Passages are often marred with soot and spray paint.



Devestated Room: New River Cave
Once a virtual forest of stalactites, vandals have stripped this room of formations: Even fragments from the floor were taken. Compare with loner photograph.

Forest Room: New River Cave
Protected by its' inaccessability this section of cave retains the beauty once found throughout the entire cave: Compare with main passage above.



Cathedral: Links' Cave
Caves represent a unique geological and biological environment.

Sleeping Bat: Hamilton's Cave
Bats are the most ubiquitous cave creature: These flying mammals eat enormous qantities of insects each season.

County	Site number	Province*	River drainage	Geologic formation	Type** of cave	Time*** period	Dates	References
Albermarle	44 Ab 11	P	James	Lynchburg	S	LA - LW	3000 BC-1600 AD	McCary 1951
Albermarle	44 Ab 16	BR	James	Blue Ridge	S	LA - LW	3000 BC-1600 AD	Holland 1950
Augusta	44 Au 12	RV	Shenandoah	Ordovician	S	EW - LW	1000 BC-1600 AD	Holland 1960: 15-16
Augusta	44 Au 6	RV	Shenandoah	Beekmantown	S	W	-	Holland 1960: 17
Augusta	44 Au 27	RV	Shenandoah	Pocono	S	LW	900 - 1600 AD	Holland 1960: 24
Augusta	44 Au 28	RV	Shenandoah	Pocono	S	W	-	Holland 1960: 24
Bath	44 Ba 1	RV	Cowpasture	Devonian	S	LW	900 - 1600 AD	Holland 1960: 31-32
Bath	44 Ba 31	RV	Jackson	Devonian	S	EA - LW	8000 BC-1600 AD	MacCord 1973: 198-228
Bath	44 Ba 350	RV	Cowpasture	Brallier	S	-	-	Douglas 1964: 158
Bland	44 Bd 3	RV	New	Brallier	S	LW	900 - 1600 AD	VRCA files
Buckingham	44 Bk 5	P	James	Evington	S	W	-	VRCA files
Carroll	44 Ca 2	BR	New	Lynchburg	S	-	-	Holland 1970: 7
Carroll	44 Ca 11	BR	New	Lynchburg	S	-	-	VRCA files
Carroll	44 Ca 13	BR	New	Lynchburg	S	A?	-	VRCA files
Carroll	44 Ca 30	BR	New	Lynchburg	S	-	-	VRCA files
Carroll	44 Ca 31	BR	New	Lynchburg	S	-	-	VRCA files
Dickenson	44 Dk 3	AP	Russell	Wise	S	A - LW	? - 1600 AD	VRCA files
Fairfax	44 Fx 30	P	Potomac	Granitic Gneiss	S	A	-	VRCA files
Giles	44 Gs 3	RV	New	Ordovician	S&C	EA - LW	8000 BC-1600 AD	Holland 1970: 10 MacCord 1972: 36-58
Giles	44 Gs 21	RV	New	Ordovician	S	W	-	VRCA files
Grayson	44 Gy 3	BR	New	Granite Gneiss	S	MW	500 BC-800 AD	Holland 1970: 12

FIGURE 1

County	Site number	Province*	River drainage	Geologic formation	Type** of cave	Time*** period	Dates	References
Halifax	44 Ha 18	P	Roanoke	Shelton Granite	S&C	W	-	VRCA files
Highland	44 Hd 1	RV	**Potomac**	Devonian	S	-	-	Holland 1960: 31-32
Lee	44 Le 27	RV	Powell	Greenbrier	S&C	-	-	Holsinger 1975: 162
Loudoun	44 Ld 17	P	Potomac	Unicoi	S	A - LW	? - 1600 AD	VRCA files
Madison	44 Ma 1	BR	Rappahannock	Covington	S	LA - LW	3500 BC-1600 AD	Holland and Graves 1951
Nelson	44 Ne 7	BR	James	Pedlar	S	W	-	VRCA files
Patrick	44 Pk 11	P	South Mayo	Leatherwood Granite	S	MW - LW	500 BC-1600 AD	VRCA files
Rockingham	44 Rm 3	RV	Shenandoah	Elbrook	S	A - W	-	Holland 1960: 37
Rockingham	44 Rm 97	RV	**Shenandoah**	New Market	C	-	-	Holland and Harrington 1953 Douglas 1964: 408 Holsinger 1975: 221
Russell	44 Ru 14	RV	Clinch	Ordovician	S&C	EA - LW	7800 BC-1600 AD	Benthall 1975
Shenandoah	44 Sh 5	RV	Shenandoah	Chepoltepec	C	LW	900 - 1600 AD	VRCA files
Tazewell	44 Tz 3	RV	Clinch	Ordovician	S	LW	1200 - 1600 AD	Holland 1970: 40
Tazewell	44 Tz 17	RV	Clinch	Ordovician	S	W	-	VRCA files
Tazewell	44 Tz 18	RV	Clinch	Ordovician	S	-	-	VRCA files
Tazewell	44 Tz 29	RV	Clinch	Ordovicain	S	-	-	VRCA files
Washington	44 Wg 138	RV	North Fork Holston	Mississippian	S&C	-	-	Holsinger 1975: 390
Wise	44 Ws 1	AP	Russell	Norton	S	A - W	-	Holland 1970: 44
Wise	44 Ws 2	AP	Clinch	Lee	S	LW	900 - 1600 AD	Holland 1970: 44
Wise	44 Ws 6	AP	Clinch	Lee	S	A?	-	VRCA files
Wise	44 Ws 11	AP	Clinch	Lee	S	MW - LW	500 BC -1600 AD	VRCA files

The relatively higher percentage of Woodland period sites may reflect collector bias resulting from failure to test for buried deposits. For example, testing of Daugherty's Cave in Russell County (Figure 2: 44 Ru 14) revealed over seven feet of cultural material spanning the entire Archaic and Woodland periods. Charcoal from the lowest occupation level yielded a radio-carbon date of 7,840 B.C. (Benthall 1975). Similar deeply stratified deposits were discovered during deep testing of 44 Ba 31 and 44 Gs 3 (Figure 1). Deep testing of the known rockshelter sites and of potential sites is expected to reveal additional caves having deep depositional sequences. These caves are of national importance while caves with shallower deposits are of national, state, or local importance, depending upon the nature of the remains. Sites which have been extensively disturbed by vandalism or erosion are of lesser archeological value.

This summary reveals that a majority of the known rockshelter sites have been inadequately examined by archeologists. Only a few have been tested by professional archeologists. The known caves represent a small per centage of the caves which probably contain archeological sites. Most of the caves listed in Figure 1 are not even noted by Holsinger (1975) or Douglas (1964). Holsinger and Douglas discuss at least forty caves which have high archeological potential although material has not been reported from these caves. Many more cave habitation sites surely exist.

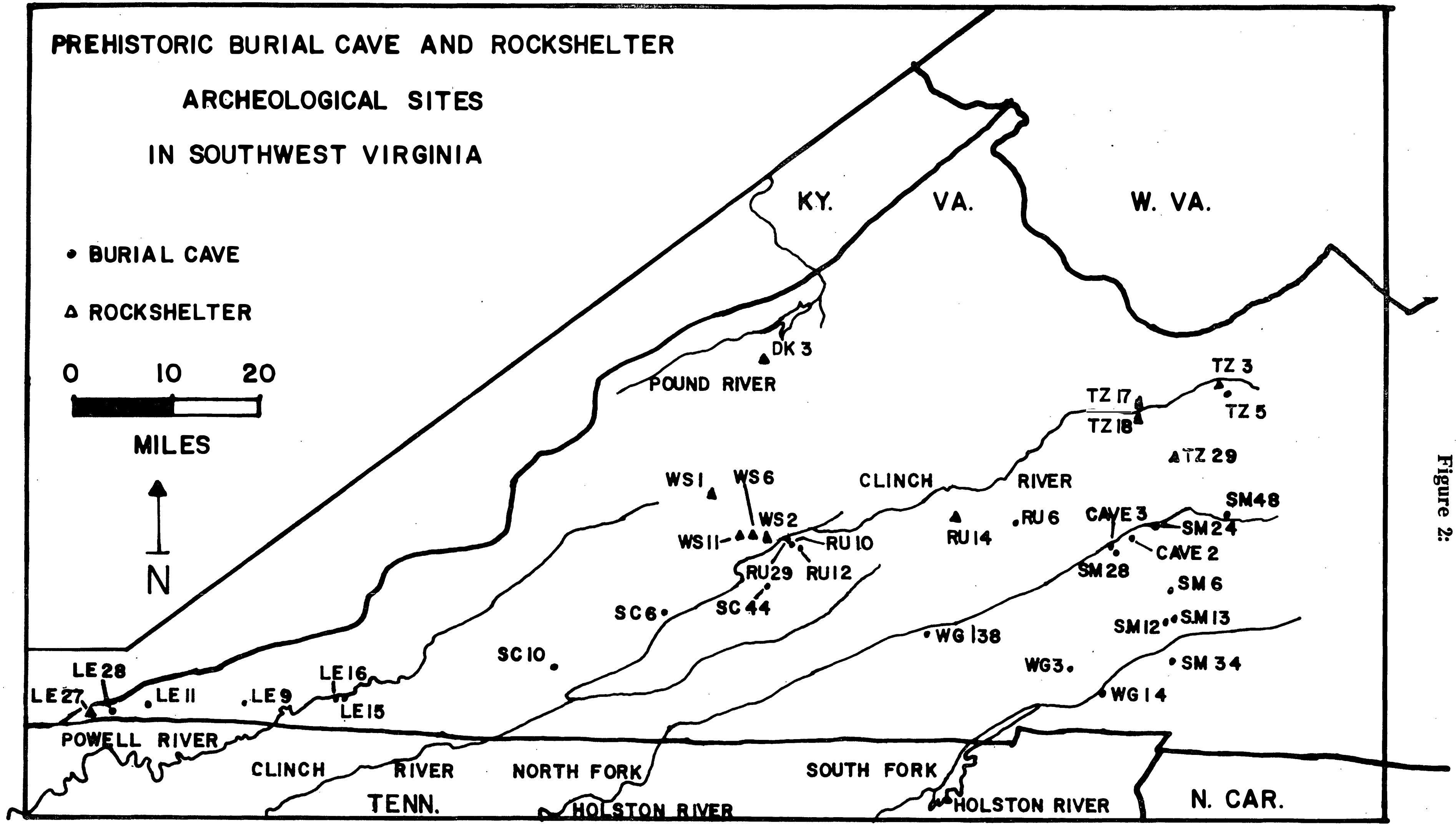

PREHISTORIC BURIAL CAVE AND ROCKSHELTER
ARCHEOLOGICAL SITES
IN SOUTHWEST VIRGINIA
• BURIAL CAVE
▲ ROCKSHELTER
0 10 20
MILES
N
KY.
VA.
W. VA.
DK 3
POUND RIVER
TZ 3
TZ 17
TZ 5
TZ 18
TZ 29
WS 1
WS 6
CLINCH
RIVER
WS 2
WS 11
RU 10
RU 14
RU 6
CAVE 3
SM 48
SM 24
CAVE 2
SM 28
RU 29
RU 12
SM 6
SC 6
SC 44
SM 12
SM 13
WG 138
SC 10
WG 3
SM 34
LE 28
LE 16
LE 27
LE 11
LE 9
LE 15
WG 14
POWELL RIVER
CLINCH
RIVER
NORTH FORK
SOUTH FORK
TENN.
HOLSTON RIVER
HOLSTON RIVER
N. CAR.

Figure 2:

Prehistoric Burial Caves

Certain Virginia caves were used by the Indians for disposal of their dead. A review of the literature revealed 26 recorded burial caves in the Commonwealth. Except for two caves reported from the Shenandoah River drainage in Page County, all of the burial caves are located in the Tennessee River drainage in southwest Virginia (Figures 2-3). Burial caves are reported from the Tennessee River drainage in Tennessee and Kentucky and extend as far south as northern Alabama and Georgia (Webb 1938). There are no known burial caves in Maryland, West Virginia, or North Carolina (Bastian, Fowler, and Coe 1978: personal communication).

The following number of burial caves are found along the various tributaries of the Tennessee River in southwest Virginia: Powell (5), Clinch (8), and Holston (11). All the caves are developed in limestone formations.

County	Site Number	Geologic Formation	River Drainage	Depth of Deposits*	Number of Burials	Time Period	Diagnostic Artifacts	References
Lee	44 Le 9	Chepultepec	Powell	-	100	Late Woodland	rattlesnake design shell gorget	Holland 1970: 18.
Lee	44 Le 11	Ordovician	Powell	15	+	Late Woodland	shell beads	Holland 1970: 18
Lee	44 Le 15	Ordovician	Powell	-	+	Late Woodland	shell beads	Holland 1970: 19
Lee	44 Le 16	Ordovician	Powell	-	+	-	-	Holland 1970: 19
Lee	44 Le 28	Ordovician	Powell	-	+	-	-	Douglas 1964: 301
Scott	44 Sc 6	Rome	Clinch	-	+	Late Woodland	triangle point, dove effigy pipe	Holland 1970: 32
Scott	44 Sc 10	Middle Cambian group	Clinch	25-30	+	Late Woodland	humen hair, pipes, shell beads, wood	Holland 1970: 35 Addington 1932
Scott	44 Sc 44	Conasauga	Clinch	-	+	-	white sand on floor	VRCA file
Russell	44 Ru 6	Ordovician	Clinch	55	69-113	Late Woodland	shell beads	Holland 1970: 31 Caldwell 1951 Robertson 1951
Russell	44 Ru 10	Conasauga	Clinch	-	+	-	-	Holland 1970: 31
Russell	44 Ru 12	Maryville	Clinch	20	+	Late Woodland	-	Holland 1970: 31
Russell	44 Ru 29	Maryville	Clinch	20	+	-	-	Holsinger 1975: 246
Tazewell	44 Tz 5	Ordovician	Clinch	32	102	Late Woodland	platform pipes, shell beads, bone beads, triangular points, Radford pottery, awls	Holland 1970: 40 Caldwell 1951
Washington	44 Wg 3	Beckmantown	Middle Fork Holston	200	+	Late Woodland	platform pipe, shell gorget	Holland 1970: 42
Washington	44 Wg 14	Beckmantown	South Fork Holston	-	+	-	artifacts	Holland 1970: 44
Smyth	44 Sm 6	Honaker dolomite	Middle Fork Holston	20	1	-	bone beads, pottery	Holland 1970: 34
Smyth	44 Sm 12	Conococheague	Middle Fork Holston	-	+	-	-	Holland 1970: 36

Figure 3:

County	Site Number	Geologic Formation	River Drainage	Depth of Deposits*	Number of Burials	Time Period	Diagnostic Artifacts	References
Smyth	44 Sm 13	Honaker dolomite	North Fork Holston	10	+	Late Woodland?	pottery?	Holland 1970: 38
Smyth	44 Sm 24	Nonaker dolomite	North Fork Holston	10	+	Late Woodland	plateform pipe, gorgets, celts	Holland 1970: 38
Smyth	44 Sm 28	Greenbrair	North Fork Holston	8	many	Late Woodland	platform pipe,celts, rattlesnake design gorget	Holland 1970: 39
Smyth	44 Sm 34	Cove Creek	South Fork Holston	-	+	Late Woodland	shell beads	Holland 1970: 40
Smyth	44 Sm 48	Honaker dolomite	North Fork Holston	90	+	Late Woodland	shell beads	Douglas 1964: 487
Smyth	Cave 2	Honaker dolomite	North Fork Holston	15	+	Late Woodland	platform pipes,celts bone awl, points	Brisco nd: 25
Smyth	Cave 3	Honaker dolomite	North Fork Holston	-	6	Late Woodland	platform pipe, shell beads	Brisco nd: 20
Page	44 Pg 4	Elbrook	South Fork Shenandoah	9	5+	Late Woodland	jasper knife, awl, bone pendant, ashes	Manson and Mac-Cord 1952

Most of these caves are entered through either vertical or angled passages. These entrances drop vertical distances of between 8 and 200 feet. The obscurity of entranceways and the difficulty of access has impeded the discovery of many of the burial caves.

Once discovered, burial remains are almost always extensively disturbed. Only three caves have been excavated by professional or qualified amateur archeologists (44 Pg 4, 44 Tz 5, 44 Ru 6). The remaining 23 caves were discovered by local people or pot-hunters and extensively disturbed prior to the arrival of qualified archeologists. Ten of these caves have not yet been entered by a professional archeologist. The caves visited by Holland (1960 and 1970) retained some evidence of human bone but had no in situ material. Except for the caves investigated by professional or amateur archeologists, the artifacts recovered from these caves have been dispersed to unknown resting places.

The artifacts reported to have been removed from burial caves in Virginia date to the Late Woodland period (900-1,600 AD). A sample of human bone from Higginbotham Cave (44 Tz 5) yielded a radio-carbon date of 1415 $\pm$ 65 A.D. (Figure 4). This cave contained at least 102 individual burials and is currently nominated to the National Register of Historic Places. Higginbotham Cave and a number of caves in southwest Virginia have yielded marine shell beads of a variety of types, platform pipes, and shell gorgets (some with a rattlesnake design). A lesser number of caves have yielded Radford type pottery, celts, bone awls and beads, stone knives and points, wood, and human hair (Figure 3). These artifacts date to the Late Woodland period and indicate influences from the southeast as well as trade to the east.

Of greater value are the human remains in burial caves. The skeletal remains are important for demographic studies of prehistoric populations. Since most of the burial caves were vandalized before the in situ deposits could be studied, very little is known of the burial practices which occurred there. Higginbotham Cave yielded evidence of one in-flesh cremation and two ossuaries consisiting of layers of human bone surrounded by dark soil organically enriched by decayed flesh. Site 44 Pg 4 contained one instance of an articulated burial (Manson and MacCord 1951). Most of the burial caves, however, contained only a jumbled pile of bones as a result of poor excavation techniques by previous investigators, post mortum movement of the deposits by water or slump, or initial deposition in that manner (Webb 1938; Caldwell 1951).

Many burial caves in southwest Virginia are found adjacent to or on a hillside overlooking a large Late Woodland period Indian village site. Burials in these caves have a high probability of representing those individuals who resided in the nearby village sites. Because the Indians buried their dead in the village as well as in caves, the desposits in caves are vital to understanding the nature of the Indian population of the village. For example, study of the mandibles from Higginbotham Cave revealed that the vast percentage of the excavated individuals were over 21 years of age. In contrast, a high percentage of infants and adolescents were exhumed from the associated Crab Orchard village site.

While burial caves contain important demographic information, much of this data has been lost to vandals. All known burial caves, as well as those reported by local informants, need to be visited and tested to determine what remains. As vandals continue to deplete the remaining deposits, a need arises to protect the known burial caves by either closing them or by removing the remains for study and storage (upon the owner's permission). Caves which still contain significant deposits and which can be protected from further vandalism should be nominated to the National Register of Historic Places. Determination of the current state of preservaton of these burial caves will require an archeological survey.

Saltpetre Mine Sites

From the early colonial period through the Revolutionary War and War of 1812, and throughout the Civil War, saltpetre from Virginia caves provided essential nitrates for the manufacture of gunpowder. During periods of peace, the mines produced saltpetre for gunpowder for local consumption. These unique historic sites are of archeological and potentially commercial value.

Due to the dedicated efforts of the late Peter Hauer, the late Burton Faust, and others, 48 of the known 55 saltpetre caves have been documented (Faust 1964; Douglas 1964; Hauer 1971; Holsinger 1975). Many of these caves and their historical features have been mapped and described.

An excellent summary of the history of saltpetre mining in Virginia is provided by Faust (1964).

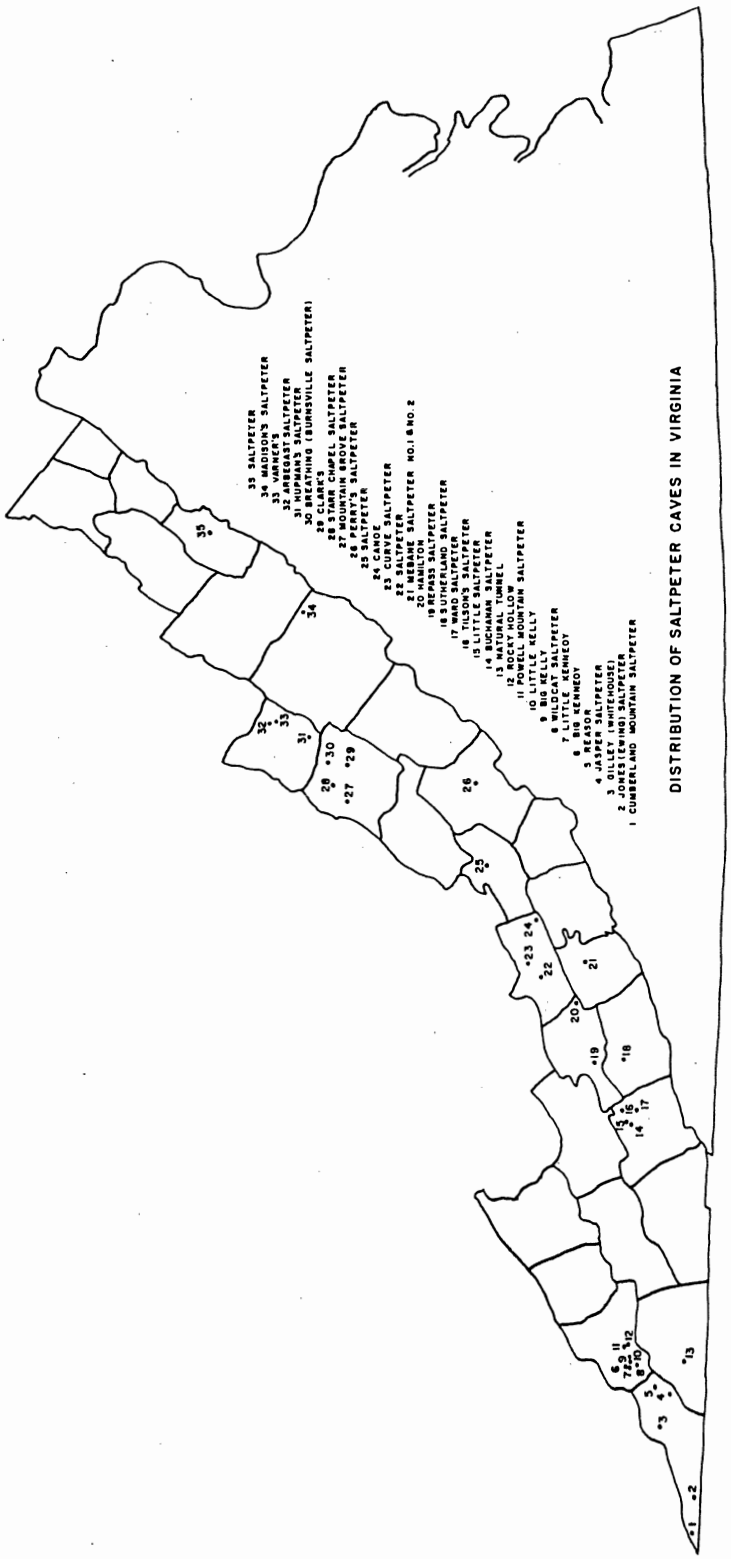
Saltpetre mines are confined to the limestone region of the Ridge and Valley province (Figure 4). Scott, Lee, and Wise Counties have the highest percentage of sites (23 mines). Numerous mines have been recorded since the publication of Faust's map in 1964 (Figure 4) and more are expected to become documented.

The saltpetre works in these caves have survived to varying degrees. Larger features such as petre dirt piles, leached and sifted dirt piles, quarry pits, pick marks, log and demountable ladders, talley marks, and trails still remain in many caves. Burned torches, wooden paddles and scrapers, wooden grapples, troughs, and other small artifacts are still present in the mines, but are rapidly disappearing into private collections or, worse yet, into the fires of uneducated cavers (Faust 1964).

While much material has been lost to vandalism and decay, many of the saltpetre mines still contain sufficient data to interpret the nature of the mining operations. An example is Clark's Saltpetre Cave along the Cowpasture River. This cave may have been worked for saltpetre as early as 1740 and was reportedly mined during the War of 1812 (Faust 1964). Evidence of salpetre operations is extensive and well preserved. A variety of artifacts have been documented along with numerous features such as quarry pits and bridges. Caves such as this one are eligible for nomination to the National Register of Historic Places and could be developed into excellent and unique history-oriented state parks.

The saltpetre caves of Virginia represent an important link to every major war fought within the boundaries of the United States. The preservational state of these unique sites ranges from poor to excellent. The current state of preservation of these caves needs to be assessed by field inspection, with the most significant caves being preserved for future study and display.

Figure 4: Distribution of saltpetre caves as of 1964 (from Faust 1964).



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APPENDIX VI

LIST OF VIRGINIA TROGLOBITES AND TROGLOPHILES

John R. Holsinger, Virginia M. Tipton

More than 200 species of animals have been identified from caves in Virginia. Of these, approximately 94 are true cave-adapted organisms, known ecologically as troglobites. The entire life cycles of troglobites are restricted to caves or similar subterranean habitats, and these species are generally eyeless and unpigmented. Many are rare local or regional endemics, and the ranges of some are limited to a single cave or a group of caves in a single karst (limestone-floored) valley. In addition to the troglobites, approximately 40 species are troglophiles, or organisms that spend all or a part of their life cycles in caves but which under certain conditions may be found in ecologically suitable surface habitats. Some of these species have degenerate eyes and are weakly pigmented but usuly not to the same extent a troglobites.

A brief survey of Virginia troglobites and troglophiles by taxonomic group follows:

1. FLATWORMS (Phylum Platyhelminthes, Class Turbellaria): 3 troglobites (2 in family Kenkiidae) and 2 troglophiles.

2. SNAILS (Phylum Mollusca, Class Gastropoda): 1 troglobite and 1 troglophile in the family Hydrobiidae.

3. OLIGOCHAETES (Phylum Annelida, Class Oligochaeta): 3 troglobites in the family Lumbriculidae.

4. ISOPODS (Phylum Arthropoda, Class Crustacea): 12 troglobites (1 in Cirolanida, 9 in Asellidae, 2 in Trichoniscidae) and 3 troglophiles.

5. AMPHIPODS (Phylum Arthropoda, Class Crustacea): 18 trogobites in family Crangonyctidae and 1 troglophile in Gammaridae.

6. CRAYFISH (Phylum Arthropoda, Class Crustacea): 1 or 2 troglophiles in the family Cambaridae.

7. MILLIPEDS (Phylum Arthropoda, Class Diplopoda): 6 troglobites (families Cleidogonidae and Trichopetalidae) and 4 troglophiles, although many more species in each category remain undescribed.

8. DIPLURANS or BRISTLETAILS (Phylum Arthropoda, Class Insecta): 4 troglobites in the family Campodeidae.

9. COLLEMBOLANS or SPRINGTAILS (Phylum Arthropoda Class Insecta): 4 troglobites in family Entomobryidae and 12 troglophiles.

10. BEETLES (Phylum Arthropoda, Class Insecta): 27 troglobites (most in family Carabidae) and 3 troglophiles.

11. DIPTERANS (Phylum Arthropoda, Class Insecta): 3 or 4 troglophiles in families Heleomyzidae, Phoridae and Sphaeroceridae.

12. CAVE CRICKETS (Phylum Arthropoda, Class Insecta): 1 troglophile in family Gryllacrididae.

13. MITES (Phylum Arthropoda, Class Arachnida): 1 troglobite in family Rhagidiidae, but several additional species remain to be described.

14. PSEUDOSCORPIANS (Phylum Arthropoda, Class Arachnida): 10 troglobites (Most in family Chthoniidae) and 1 troglophile.

15. PHALANGIDS or HARVESTMEN (Phylum Arthropoda, Class Arachnida): 1 troglophile in family Erebomastridae.

16. SPIDERS (Phylum Arthropoda, Class Arachnida): 5 troglobites (Most in family Linyphiidae) and 3 troglophiles.

17. SALAMANDERS (Phylum Chordata, Class Amphibia): 1 or 2 troglophiles in the family Plethodontidae.

18. BATS (Phylum Chordata, Class Mammalia): 7 Troglophiles in the family Vespertilionidae.

APPENDIX VII

A SELECTED BIBLIOGRAPHY OF MAJOR PAPERS

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APPENDIX VIII

PAST INTERACTION OF SPELEOLOGISTS WITH AGENCIES OF THE COMMONWEALTH

John R. Holsinger

A need for speleological information by agencies of the Commonwealth as it relates to problems of use, ecology, conservation, protection, distribution, extent, and interpretation of the natural history of caves and karst areas in Virginia has arisen on a number of occasions during the last dozen or so years.

Some of the state agencies that have received this information include:

Department of Highways
Division of Parks
Commission of Outdoor Recreation
State Water Control Board
Division of Mineral Resources

Based on current trends, it is anticipated that there will be an increased need for this kind of information in the immediate future. The types of questions that arise are illustrated by examples from the correspondence received by the Virginia Speleological Survey in past years:

1. Correspondence with Mr. Douglas B. Fugate, former State highway Commissioner, on matters concerning the preservation of cave entrances long highway rights-of-way and ways to avoid destruction of major caves and karst features by highway construction.

2. Correspondence with Mr. Ben H. Bolen, Commissioner of State Parks, and Mr. G. S. Bledsoe, Superintendent of Natural Tunnel State Park, regarding the interpretation of the natural history phenomena of caves and karst landforms in Natural Tunnel State Park. Caves in this park have also been mapped and studied by members of the Virginia Speleological Survey.

3. Data on significant cave and karst areas were supplied to the Commission of Outdoor Recreation in January 1973 and were later utilized in the preparation of the "Virginia Outdoors Plans" of 1974 and 1979.

4. Pertinent information on caves and karst areas as they relate to water resource planning were transmitted to the Division of Water Resources (now a part of the State Water Control Board) for consideration in a comprehensive study of the Tennessee and Big Sandy River basins.

5. In the 1972 report of the Division of State Planning and Community Affairs, entitled 'Critical Environmental Areas,"statements identifying caves and karst features as natural areas worthy of future preservation were included.

In contacts with members of various State agencies, a member of the Commission encountered surprise on the part of such members that so much information was actually available on caves or, for that matter, that the Commonwealth had so many significant caves and karst features deserving of attention and protection. In all cases, staff personnel of the agencies expressed a sincere interest in protecting caves and karst features and indicated a willingness to cooperate in the solution of problems related to cave conservation.

Such attempts to supply information on caves to State agencies were largely sporadic and uncoordinated and were primarily through the efforts of a few individuals. Based on the anticipation of an increasing need for such information, and the fact that distribution of these data to State agencies can no longer be handled satisfactorily by one or two individuals, the Commission reached the conclusion that what is needed is a permanent Virginia Cave Commission. Its composition and possible functions are covered in this report.

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APPENDIX IX

SUMMARY OF CERTAIN PROVISIONS OF CAVE PROTECTION LAWS IN OTHER STATES

Evelyn Bradshaw

State	Year passed	Vandalism/theft prohibited	Cave terms defined?	Owner's liability covered	Sale of speleothems prohibited with no reference to owner's prerogative	Penalty (limits)
Wyoming	1909	(3)	--	--	--	Up to $100 and 60 days
Indiana (repealed 1977)	1947	(2)	--	--	--	$50-500; 10 days to 6 mos.
Kentucky (applies only to caves exhibited to the public)	1948	(2)	--	--	--	$5 to 100; 5 to 30 days
West Va.	1974	(1)	Yes	Yes	Yes	$150-500; 10 days to 6 mos.
Calif.	1977	(1)	Yes	Yes*	--	Up to $500 and 1 year
Arizona	1977	(1)	Yes	--	--	Class 2 misdemeanor
Texas	1977	(1)	Yes	--	Yes	Class B misdemeanor
Georgia	1977	(1)	Yes	Yes	Yes	(In Sec. 43-9916 of Code)
Maryland	1978	(1)	Yes	Yes	Yes	Up to $500; 10 days to 6 mos.
Tennessee	1967	(2)	--	--	--	$10-$10,000; up to 1 year

* Covered in separate legislation rather than in cave protection law.

(1) Yes except with consent of owner in writing.

(2) Yes except with consent of owner.

(3) Question of consent not covered.

Laws applying to cave protection have also been reported from Colorado (before 1883), South Dakota (1939), Oklahoma (1967), New York (1974), Alabama (1973), and Ohio. Recreational laws in Illinois have been made to apply to caves. A cave protection law was introduced in Missouri in 1978 but the legislative time ran out before final action; the chances of passage in the next session of the legislature are considered good.

Most cave protection laws are based on the property concept and it is the owner of the cave who can sue for violation of his or her property rights. The laws are acknowledged to have some deterrent value, but have seldom been invoked successfully except for violations in commercial caves. Enforcement is considered more likely if the public had a greater understanding of the value of caves as a resource and their need for protection.

APPENDIX X

THE ROLE OF CAVES IN CIVIL DEFENSE IN VIRGINIA

John M. Wilson

At the present time the Civil Defense Preparedness Agency, a branch of the Defense Department, spends approximately $91 million per year, mostly on natural disasters such as fires and floods. The remaining money is spent on maintaining a framework upon which a civil defense program could be built as a defense against war or nuclear attack. It appears that little if any money is presently being spent for hardened civil defense sites for protection of civilians in the event of a nuclear attack upon the United States.

There is, however, substantial evidence that the Soviet Union is expanding its civil defense prepardness and greatly outspending the United States in this area. The arms limitation agreements between the U.S. and the Soviet Union have and will probably limit weapons but not place any limitation upon civil defense. Thus it is possible that the Soviet Union could upset the balance of power by carrying out its extensive civil defense program.

In order to prevent Soviet nuclear superiority based on greater civil defense preparedness, the Defense Civil Preparedness Agency has proposed and President Carter has supported a plan calling for a new long-term commitment to upgrade the United States' civil defense capabilities. Present proposals call for the expenditure of up to $2 billion over a five year period beginning in 1980. The primary goals of the proposed plan are the upgrading of present civil defense facilities and the development of evacuation plans for urban areas.

Presently, a number of Virginia's caves are designated as civil defense shelters. More caves may be considered for possible use as hardened civil defense shelters for economic reasons. Most of the excavating and ceiling supports needed for a completely man-made structure would not be required for a shelter in a cave. However, not all of these costs could be eliminated since caves do not necessarily come equipped with pathways and rooms. Cave shelters need all of the other usual requirements that are needed in completely man-made shelters (lighting, heat, water, waste disposal, etc.) and in some cases, these items might be more expensive to install in caves. Where it is possible to use caves as civil defense shelters, the cost could be substantially less, and in ideal situations may be only 20% of the cost of a completely man-made equivalent site.

Caves, however, cannot become a major source of already dug hardened sites ready for remodeling into civil defense shelters for several reasons. Major metropolitan centers and caves are usually not located in the same place. Caves even when properly improved are not likely to be able to have functional capacities anywhere near that needed for protection of a significant percentage of the population of even of small cities. Most cave rooms and passages are of moderate size. Cave rooms that could accomodate 300 or more people with all of their equipment and supporting supplies are rare.

Previous attempts to stock Virginia caves with a few supplies and to designate them as civil defense shelters were probably useless. Most of the supplies were quickly pilfered. Improvements to the caves were not sufficient to make them habitable. Although signs designating these caves as civil defense shelters still remain in some cases, it is believed that there are at present no Virginia caves which are adequately enough improved or stocked for use as civil defense shelters.

Caves for the most part offer an inhospitable environment for people. They are cold (50 degrees to 54 degrees in Virginia), damp (many remaining at 100% humidity), have no natural light, no food and often no convenient safe water source. Considerable investment would be required to make caves useable as civil defense shelters. In addition to supplying food and water, cave shelters would, in most cases, need level floors constructed for living space, sanitation and waste disposal or storage systems, sleeping, eating and food preparation areas and supplies, some facility for heating parts of the shelter, and supplies of clothing and blankets. A central power and light system would be required as well as supplementary lights for each person in the shelters. Provision would also need to be made to insure that the shelter is protected from vandalism when not in use and that it is

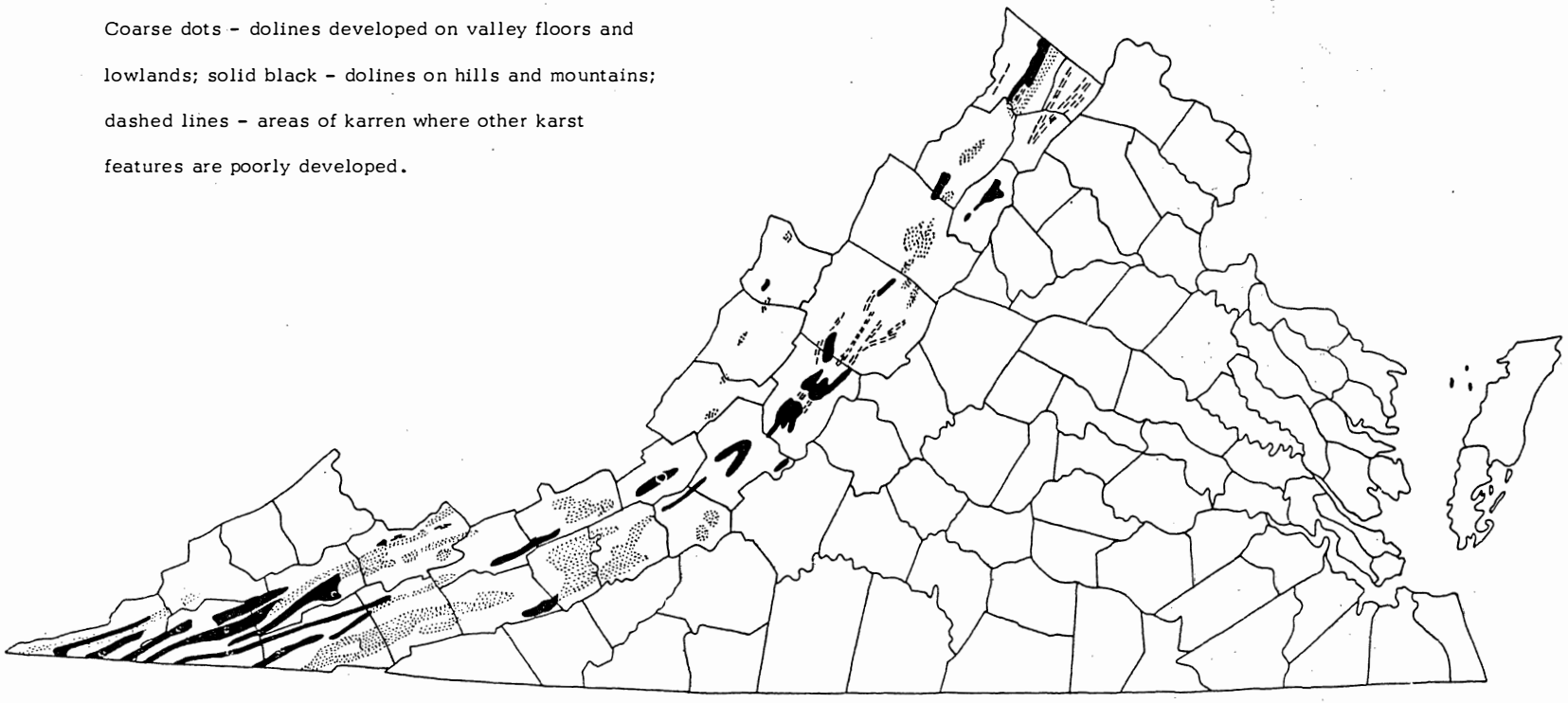
accessible to the proper number of people when needed. Inadequate preparation could lead to the same problem for people using the shelter that novice cave explorers have experienced when they were lost in a cave. These problems include hypothermia (loss of body heat), hunger, thirst, sickness, physical exhaustion, and disorientation. All of these conditions would make survival in a shelter more difficult.

SUMMARY

On balance the use of caves in civil defense should only be considered as a small supplementary part of any overall plan. Caves could provide some significant saving in construction cost, where readily adaptable caves are conveniently located to small cities and towns, over the cost of constructing hardened civil defense shelters from scratch. In the event that the construction of hardened civil defense shelters is not budgeted, then the mere stocking of supplies in caves and calling them shelters should not be considered. The cave environment in almost all caves is too hostile for people to survive even for a week or two unless adequate improvements are made. People should not be led to believe that such unimproved shelters will be adequate.

FIGURE 2. KARST AREAS IN VIRGINIA

Coarse dots - dolines developed on valley floors and lowlands; solid black - dolines on hills and mountains; dashed lines - areas of karren where other karst features are poorly developed.



Map from "Caves of Virginia", 1964, courtesy of William E. Davies and the Virginia Cave Survey.