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Membership is open to all interested in Alaskan cave discovery, exploration, description, survey, mapping, photography, hydrology, morphology, biology, geology, history, speleogenesis and other spelean processes, conservation, management, adventures, and the fellowship of Alaskan cavers. Annual dues are $15 for individual or $20 for family membership. Add $8 to dues if overseas and airmail postage is preferred over surface. Institutional subscriptions are $20 per volume (6 issues).

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Cover: Ella Allred in Dimple Cave, 1990 (POWIE IV). Photo by Carlene Allred.

Table of Contents

President's Corner: Publicity and Caving 3
Slate Cave 5
Three POWIE Adventures, 1990 7
Old Things Found in Caves 7
Mmm Mmm Good, Captain Soup Cave 8
March Meeting in Ketchikan 9
Management of the Karst Areas Within the Ketchikan Area
Of the Tongass National Forest, Southeastern Alaska 10
Members in the News 21

President's Corner: Publicity and Caving

There is a well-justified difference of opinion among cavers about the amount of information the public should be provided about caves and caving. On one extreme are those who feel that all knowledge developed from the caving experience should be kept secret within the group, lest others find out about the cave(s) and (1) deprive the finders of the opportunity to enjoy the caves or (2) use the caves and either willfully or inadvertently destroy their aesthetic and scientific qualities. On the other extreme are those who would publish all information developed and describe the location of each cave and its contents in enticing detail. The optimum degree and nature of public education required depends on the circumstances of each cave and region involved. Exquisite show caves, where access is rigorously controlled by accompanying guides, can be well described and publicized without danger to the cave. For caves in sparsely inhabited areas the danger is greater, and special procedures need to be followed.

But life is not simplistic. For instance, in West Virginia, before caving became really popular, sinkholes were used as disposal areas for dead cows, garbage, old cars, and other noxious solid wastes. Many cave entrances were filled because they were considered hazardous and inconvenient. Then with the publication of Davies's book which described locations in detail, caving became popular among the local inhabitants and they put a stop to the destructive practices. Since then, increased traffic affected the hibernation of bats, increased wear and tear on caves, and resulted in some vandalism. Steps were taken to gate the caves and otherwise prevent entry. With fewer caves available to explore, the youth of the region found other pursuits, and now, according to Harvey Bowers, sinkholes are once again beginning to collect solid wastes in all their noxious variety.

It has not been the Glacier Grotto's policy to popularize caving, but the popular support the Forest Service is receiving regarding caves encourages them to take their cave management responsibilities seriously. Before our arrival on Prince of Wales Island, there was a tendency to dump logging trash and road fill into cave entrances and sinkholes. Some individuals may have been collecting speleothems. The Grotto is concerned about any threat to the caves and their contents, and also the dangers of exposing enthusiastic but uninformed and untrained would-be cavers to this vast collection of vertical shafts.

For the past several years we have been mapping extensive cave systems on Prince of Wales Island in Southeast Alaska. These caves were not known until 1987, when one was mapped. Five were mapped in 1988, twelve in 1989, and eighteen in 1990. The reason for this stepped-up effort was that it was found that some of the logging practices in the Tongass National Forest were destroying caves. The caves are located in limestone bedrock called karst. Karst is characterized by sinking streams, sinkholes, caves, springs, dry valleys, and similar features indicative of underground drainage developed through the solution of bedrock. It was reported that 60% of the karst features were cave-connected on unlogged karst, while only 10% to 20% of the karst features were cave-connected on otherwise comparable clearcut karst. From this, one could figure that clearcutting, as practiced, destroyed over half of the cave entrances. In the clearcutting method of logging, all trees are cut down; the loggers then haul out what trunks they want and leave the rest. Because these forests are so thick, it is difficult to walk through what is left because the "slash", as they call it, is about five or more feet thick. Cave entrances were covered because loggers would push this slash into the entrances or sinkholes, where it would rot. Builders of logging roads would fill in the cave entrances as they built the roads over

or close to them. Both the loggers and the road builders considered these pits to be hazardous nuisances. In addition, the vegetative matt on the steep sides of sinkholes would be destroyed by the dragging across of cut trees; the raw exposed earth would then erode into the caves. Also, increased erosion due to logging and road construction is causing gravel and other soils to wash in and fill cave passages, often with nonsoluble material. This filling process, in some cases, is continuing decades after the logging had taken place. We have already found new gravel bars in cave streams.

The Forest Service has recently realized that the caves should be saved. Steps are being taken to protect cave entrances by moving boundaries of units to be sold to logging companies, establishing buffer strips around cave entrances, and moving paths of new roads away from caves. Two members of our Grotto were hired by the Forest Service to search for caves in sections to be cut before logging takes place. Then, during one month this past summer, about a score of cavers (our Grotto members, ten at a time) surveyed over fifty of these newly-discovered caves--all in areas that were to be cut. Buffer strips are being recommended around all cave entrances. For caves over 1000 feet in length, larger buffer strips are being recommended, as well as buffer strips around drainages into karst features associated with them. The success of implementing these procedures, and the success of their effects, of course, remain to be seen.

Other than the filling in of cave entrances with slash and road fill and the filling of cave passages with gravel carried in by erosion, the collection of speleothems by individuals is also a problem. This is being discouraged by the National Cave Resources Protection Act of 1988, which came along at just the right time for us. Also, keeping cave locations secret until a management plan has been developed should help.

We have a major public education task to educate residents, tourists, and the many transient workers to respect the integrity of the caves. So far, we estimate less than 5% of all the caves on the island may have been mapped.

Because of the national and local publicity in the press and in local talks and other media events, support for the Forest Service activities in cave protection, and general awareness of it is on the rise. The Forest Service is planning to open a selected cave or two to the public in 1992 and more later as the development of cave management plans unfold. Their determination to do this has been largely the result of interest demonstrated on the part of the public. These plans, complete with interpretative signs and walks, are being designed for the general public. Hopefully, their implementation will strengthen resolve to protect caves and especially reduce destruction of the entrances caused by poor logging and road building practices. Without this effort the destruction of the caves would continue.

Thus, in the interest of cave conservation, neither extreme should be followed and a careful, more central, policy needs to be developed to assure that the resource is protected and, at the same time, used for the enjoyment and education of the public for the present and in the future. ¤

New Anchorage Area Meeting Schedule

Members residing in SouthCentral Alaska received a postcard survey along with their October issue of The Alaskan Caver. In the past weeks, about a dozen recipients responded to the survey, and those responses have now been evaluated. Checking both conflicts and preferences, the best weekdays were Wednesday and Thursday. The tally was close, but it turns out that the most preferred and least conflicting day of week of month was the fourth Wednesday, and so thus it shall be. Therefore, our next meeting will be on Wednesday, January 22.

Slate Cave

by Carlene Allred

Slate Cave was discovered in the spring of 1990, during the U.S. Forest Service biological cave survey. Jim Anderson and Kevin Allred were searching the south side of El Capitan Peak for surface specimens entering El Capitan Cave, when they happened upon a surface stream. It wandered across some slate bedrock until it hit the limestone. Upon contact, the stream immediately plunged down a twenty-foot-diameter shaft and disappeared. Kevin noted this especially-impressive cave lead, named it Slate Cave, and saved entry for POWIE IV (which would begin in a couple of months). Since the entrance is near a logging road and because I could go caving for no more than three hours at a time (since I was nursing our baby), it would be a perfect trip in which I could participate.

On July 17, Susan DeLisa and Steve Lewis (both from Fairbanks) and I headed for the entrance, while Kevin babysat at the car. The rope was rigged onto a huge tree and lowered down into the hole. Fortunately for us, the stream was nearly dry, so it was a pleasant drop. Steve went down first, then Susan, and I last. The first 38 feet was down the steep wall of the sink. The funnel led down into an impressive shaft about twenty feet in diameter and 67 feet deep. As a rappeller, one has to jump outward and away from the wall during descent to avoid becoming entangled in the branches of two old logs that have fallen in.

I landed on the cobble floor and unhooked myself from the rope. We were standing in a clean, somewhat horizontal passage about twelve feet wide and twelve feet high. To the north the tunnel sloped downwards; we headed down, surveying as we explored. After passing under a dome and across a path of boulders, we came to a change in direction. The passage turned to the east, and, narrowing into a canyon, plunged downward in several short drops. As we bridged downward, we passed above a side canyon entering on our right. The downward-trending canyon ended abruptly at the brink of a pit. The passage did continue beyond the pit horizontally, but our thoughts were only on descending deeper. To this day, that horizontal ongoing passage is still unentered. Tying an additional rope onto our entrance rope, we lowered the end down into the new pit. Steve and I shined our lights down together, but couldn't see the bottom. Susan and I elected Steve to go down first. He hesitantly rigged to the rope and dropped down into the hole. The rope ended, after eighty feet, in a large passage below, but unfortunately that was not the end of the drop. In the floor of the hall under the rope, the pit continued on downward into more blackness. It would have been risky for him to pendulum onto the slippery rubble pile to get off rope, only to lose the end, so Steve did a changeover and came right back up. This pit was later named Pendulum Pit.

By then, I figured the baby would be getting hungry (and feeding a 3-1/2-month-old baby is something that only his mother can do), so I suggested that we exit the cave. On our way out, we decided to map the south-trending passage below the entrance drop. This was a steep climb through a tight clog of vegetable debris, and it led into an adjoining sinkhole. The passage split and ascended upwards steeply before breaking out in the bottom of the steep-walled, collapsed doline. The floor was all unstable vegetable debris; I sketched it and discovered that, on the other side, an archway led into another adjoining sinkhole. I did not discover it at the time, but later Kevin entered this third sink and found, in its bottom, the vertical entrance to what we later named Cloister Cave. With difficulty, I found a way out of the middle sink and back to the car (where the baby was eagerly awaiting me). Now it was Kevin's turn to go caving.

Steve, Susan, and Kevin immediately went back down and rerigged the Pendulum

Pit with a longer rope. Steve dropped first, followed by the other two. Kevin sketched, Steve operated compass, and Susan took lead. They found themselves in a huge, echoing hall averaging maybe forty feet wide, with the ceiling thirty feet above them. This long room sloped about thirty degrees and the floor fill varied. In some places, it was clean, beautiful bedrock; in others, it was silty. Boulders were strewn about haphazardly. This 260-foot-long hall was later named the Troll's Bowling Alley. The upper end of the hall ended in a wall of cobbles and silt fill, and the lower end narrowed, then dropped down another pit. There were four pits total that began in various places along the floor of the Troll's Bowling Alley. One of the pits is unstable and therefore not enterable. The three called it a day and headed back to the surface. Between the two trips, we had surveyed a total of 812.1 feet.

While they were down below, I took our four children for a stroll along the logging road above. Shortly after we returned to the vehicle, our Forest Service liason reported a fresh kill--about half a fawn lying in the road where we had just taken our stroll. This had been carried there between the time of our return and Bruce's drive. And to think the three children had been darting about in the same spot only minutes before! It had been either a bear or a wolf.

On July 20, the third and last assault was made on Slate Cave. Steve, Susan, and Kevin headed down with more rope. One by one they dropped and surveyed three of the four pits in the floor of the Troll's Bowling Alley. They were all washed out clean and "sporting", and lead down into a clean, horizontal passage eighty feet below. Among their discoveries is an eccentric stalactite about a foot long with a helictite growing from its tip. A soda straw hangs from the helictite. In one area the lower-level passage forms a high fissure that was later named Black Rock Fissure because of the blackish covering all over the floor cobbles. At the top of the pit furthest from the entrance, called route III, there is a muddy passage that winds upward. As Kevin explored this, it became narrow and too small for him. Susan was able to fit through and she dug it out for Kevin so he could get through. It lead into a tiny room which Steve named "Susan's Slime Hole". The low-level passage has a cobble floor and two streams entering it. One tumbles down route I, which is the pit dropping down below Pendulum Pit. This is the same stream that enters the cave in the shaft we rappelled down. It sinks into the floor soon after reaching the bottom of route I. The other stream enters from the lower end of the Troll's Bowling Alley and pours down route III into the lower passage. It goes a short way and then tumbles further down into another pit. Susan, Steve, and Kevin rappelled about 25 feet down this lowest pit to a sublevel. This is a clean, scalloped, circular pressure tube about five feet in diameter. They followed it a short ways to a sump. After surveying this, they went back upwards and finished surveying connections in and out of pits. All was surveyed in the lower portions of the cave except for a high lead which has a waterfall coming out of it. This will require a lead climb of at least 5-8. The total feet surveyed was now 683.8, bringing the cave to a surveyed length of 1495.9 feet and a depth of 386.6 feet.

During the first half of August, there were several days of hard rain which caused streams to swell, and this included the one entering Slate Cave. At this time, a crew from KTOO (Juneau) stopped by our camp to film some caving action for a television program called "Rain Country". One of the scenes they got footage of was Kevin and I rappelling down into Slate Cave. We each had to do it several times, so it was the perfect "yo-yo" opportunity. We, each in turn, attached our racks onto the rope at the top, and then became movie stars, rappelling into the shaft and attempting to dodge the raging waterfall. In spite of my new red, waterproof coveralls (which happen to be "movie star red"), I still

got soaked. During Kevin's last time down, he went to the top of Pendulum Pit to derig it. The heavy current had damaged the rope pad and its teather.

Next year, we not only have more exploration in Slate, but also a newly-discovered shaft lead said to be even more impressive than Slate's entrance. ¤

Three POWIE Adventures, 1990

#1: El Capitan Cave
by Ella Allred, mid-August

I am 7 years old and I went to El Capitan Cave with Soren and my mom. Soren's 6 years old. Daddy took care of the baby and Flint. Flint's 4 years old. We pit on our lights and helmets. I have a headlight. Soren has a headlight just like mine. We started into the cave and saw broken stalactites. We saw popcorn formations. The only stalactites that weren't broken were little ones.

We didn't have to climb. We went all the way to a pool. We didn't see any bats. Then we started back out of the cave. We passed 2 pits but we didn't fall down any. We got out of the cave and started down the mountain. Then we got onto the road. We saw the baby and Daddy and Flint. We met them.

#2: El Capitan Cave
by Soren Allred

I went with Ella. I was at the pool. I saw formations. The formations were pretty. They're bacon. They look like a triangle. They're short and they're white. I saw a pit. It was black and really really really really deep down to a lake. It was straight down. It scared me.

#3: When I Go in the Cave
by Flint Allred, July 28

El Capitan Pit (Dimple Cave). It almost fell down the cave (my light). Mommy, Daddy, I love you. I goed in with Daddy, you (Mom), Morgan, Ella and Soren. It was scary. I almost fell in a pit so I grabbed on a rope. When I almost fell in the pit I was not grabbing the rope. I almost slipped in the pit. I saw a big giant skeleton. A bear. I almost slipped in the water. You (Mom) pulled on my arm and got me out. I came out.

Old Things Found in Caves
by Jay Rockwell, Jr.

On the last night of POWIE V, Jim Baichtal and Steve Lewis went into the back part of El Capitan Cave, and Jim took samples of two logs in the Alaska Room. He reports that one near the sump was found to be 4120 years old and one near the hoodoos was found to be 6500 years old. He also reports that another log, from a raised littoral cave on Baker Island, was found to be 4200 years old. (See article on pages 10 through 21.)

Some animal bone samples were found to be between 9500 and 10,800 years BP; official report to follow.

Coming Attractions

Assuming most of the Glacier Grotto members renew their membership for 1992, and funds are available for the printing of more issues of the newsletter, there are lots of interesting reports waiting to be published. Plan on an issue about the Chitistones expeditions, an issue on the history of caving in Alaska (which goes back over a century!), an issue on the various 1991 expeditions throughout Alaska, and, of course, more issues on POWIE caves, including El Capitan Cave.

Mmm Mmm Good, Captain Soup Cave

by Kevin Allred

One of the most treasured cave memories that will linger in my thoughts many a year began the fine, hot day of July 19, 1990, after Bruce Campbell and I had checked a few of Stan McCoy's cave leads in an area due to be logged off soon. (Stan McCoy is a U.S. Forest Service timber layout person.) We had hopes of finding something significant, but there is always a lingering doubt, especially as one is slowly negotiating even relatively open old-growth karst forest. After locating the two cave entrances and quickly investigating the one not requiring rope, we began what I so fondly refer to as "wandering aimlessly through the forest" looking for cave entrances. But in only a short while our efforts were rewarded with a fine-looking pit about twenty feet across and thirty feet deep with what looked like going passage below!

On July 21, our whole family dropped Steve Lewis and Susan DeLisa off near a walk-in, unexplored resurgence cave (Blanket Cave) that they were anxious to explore and map. We then drove to the previously-mentioned cave area. For the rest of the day, it was just like the good old times, as we solo-surveyed two caves, rotating the tending of the kids. I entered Captain Soup Cave, named after Bruce Campbell's citizens band radio handle, and had no idea at the time as to just how appropriately the name fit the nature of the cave. After the first thirty-foot pitch, a sloping bedrock ramp led to another drop of 25 feet. From here, various leads took off with the obvious way being a large walking passage trending downwards.

The route led to a broad gallery containing a deer skeleton lying on a mud bank. I flagged it off to prevent future accidental disturbance. From the ceiling hung many soda straws up to ten inches long. I chose a downward canyon having black rimstone, flagged some of it off, and turned back in spacious passage with no end in sight. It was obvious that we had lots of cave to map and its muddy nature would produce a real challenge.

The next day, while Carlene drove Susan to her departure plane in Thorne Bay, Steve and I returned to Captain Soup determined to push a good amount of survey before Steve had to leave the island. After descending, one climbing lead went steeply up to overlook a high room connecting with the rest of the cave. This was very difficult to negotiate, requiring friction holds in the mud! I asked Steve to tie a rope onto the tape so I could get back down. In the next lead we surveyed, Steve suggested calling the various passages after different soups, and immediately named the one we had just entered "Alphabet Soup" and the steep climb "The Man Handler". Steve's experience in the research of Sitka blacktails enabled him to identify the deer skeleton as a three-year-old doe. No telling how long it has been there.

As the surveying continued, we discovered "Chicken Noodle", a beautiful stoopway containing abundant translucent soda straws and creamy milk-colored stalactites and stalagmites. In a chimney above, Steve located some tiny white clusters of the finest helictites I have yet seen in the state. A nearby soda straw was bicolored, being part white and part clear.

Later, down in the canyon, Steve, who was in the lead, started raving about some draperies (bacon) he found, and described one thusly: "This makes the Fan (in El Capitan Cave) look like junk". Of several bacons, one in particular was especially noteworthy, being translucent and about eight inches by eight inches and 1/8-inch thick.

After doing the canyon, which became pinched, one single lead remained from the bacon area. "Bean with Bacon" ran upwards through spar and formations, and then down a sloping tube having one wall covered with some translucent helictites and soda straws. The tube continued level with ten inches of airspace above

a foot of dark brown, sticky mud. I happened to be leading at the time, and announced the end of the survey, but Steve egged me on by continually asking "doesn't it keep going?" It was the most horrible sticky, mucky slime hole I could imagine in my worst nightmares, and Steve laughed heartily at my groanings and the associated sucking sound effects. After some 25 feet, it finally opened up into a tiny room. I told Steve to come ahead, as it went, although it didn't look like it did and I was too miserable to find out at the moment. I laughed gleefully at his exclamations: First, "Oh no! It's getting up my pant legs!"; then with a higher pitch, "Ohhoo, the compass is a big glob of mud!" I suggested, "Now you have to lick off the lens!", to which he replied, "If I licked it off, it would fill my stomach!".

Beyond the ultimate slime crawl was about eighty feet of passage, with one branch obviously continuing beyond a two-foot-long soda straw column with helictites coming from its side. We did not attempt to slide by it. On the way out, we mapped one final chimney, and finally rolled into camp for a total of a seventeen-hour trip and 1157.7 feet surveyed.

Our next challenge with Captain Soup was to photograph its beauty. On August 6, Bob Bastasz, David Klinger, and Carlene Allred entered some of the upper portions and photographed them. I had given them wrong directions to the tiny helictites, and the flashes finally quit from mud and lots of dripping due to the heavy rain outside. On August 11, I entered again and photographed the missed target areas. I discovered the translucent bacon to be photoluminescent in blue for about six seconds.

Although Captain Soup is very muddy, it is, in my opinion, the most beautiful cave in the state, and should be protected from possible logging and vandal impacts. ¤

March Meeting in Ketchikan

by Jay Rockwell, Jr.

In March, I was flown to a Forest Service Workshop in Ketchikan. I had a good slide show, seventy of the most appropriate from the files of the Allreds, Norm Thompson, and myself. Jim Baichtal had prepared a 5/8-inch-thick book, "Cave Resource Management--Ketchikan Area, Tongass National Forest", which defined terms, values, cave mineral and biological features, management objectives, inventory processes, cave studies, management practices, etc. Included are the Federal Cave Resources Protection Act, articles on cave management, Forest Service policies and practices with regard to caves, general descriptions of Ketchikan Area karst, a list of 57 caves known at that time (no locations given), descriptions of selected caves, an example of how the Forest Service worked to protect a significant cave (Captain Soup Cave), and applications to the Glacier Grotto and the NSS. That evening, they had arranged a public meeting for me to meet the Ketchikan cavers. I expected about 25 but 175 showed. We only had seats for 85 after pulling the benches in from the museum lobby. Some of those attending stayed for half an hour afterward, asking questions. Nine new members joined and two of these ordered complete sets of The Alaskan Caver. I was surprised and impressed by the number who had caved previously. The next day, Jim and I went to Thorne Bay and Craig where we gave the same talk again, and five new members joined. Altogether, we now have twenty to thirty members in the Ketchikan Area. Mark Keith, a professional diver in Ketchikan, videoed my talk and sent me a copy of it and a copy of the "Rain Country" tape which KTOO (PBS Juneau) made during POWIE IV. The tape of the talk came out well and the "Rain Country" video is highly recommended to all who are interested in Alaskan caving.

Management of the Karst Areas Within the Ketchikan Area Of the Tongass National Forest, Southeastern Alaska

by James F. Baichtal, Forest Geologist, Tongass National Forest

Abstract

The Ketchikan Area of the Tongass National Forest is located in the southern extreme of the panhandle of Alaska. Over 925 square miles of the Area are underlain by carbonate rocks, mainly Silurian, massive limestones and minor marble. Karst topography is known to have developed on approximately 700 square miles of the Area, the majority being on Prince of Wales and Dall Islands. Thirty square miles of alpine and subalpine karst is known to exist.

The Forest is in the beginning stages of understanding the significance of the resource, developing standards and guidelines for resource management, and understanding the scope of the inventorying process. The dense vegatation of the region makes exploring for caves both difficult and dangerous. Preliminary inventories suggest that hundreds of caves exist in the Area. The surveyed areas on north Prince of Wales Island have already yielded several record features. "El Cap Pit" is the deepest known natural pit in the United States, an initial drop of 589.3 feet; "Snowhole" ranks third in the U.S. at 448.8 feet. The seven deepest known caves in Alaska and the five longest have been recorded. Biological studies of the caves have begun. Large numbers of mammal bones are present in the caves. Salmon swim through some caves to spawn upstream; some may actually spawn in caves. Historically, timber harvest has been highest on these well-drained areas, where the nutrient-rich soil grows the largest timber. These areas still are targeted for timber removal. It is no small task to insure that surface management activities are designed to protect the cave resources. Only recently has protection of the cave resources on the Area been a concern. The challenge is to educate the land managers and public as to the significance of this unseen resource.

Introduction

The intent of this paper is twofold; to bring to light the tremendous extent of karst development in southern Southeastern Alaska, specifically on the Ketchikan Area of the Tongass National Forest, and to describe the Cave Resource Management Program which is being developed on the Area. The Tongass National Forest is the largest National Forest in the National Forest System, encompassing about seventeen million acres. Because of the immense size of the Tongass, the Forest has been divided into three administrative areas. The Ketchikan Area covers about 5.5 million acres, or the southern third of the Tongass National Forest. Throughout this paper, the Ketchikan Area will be referred to as "the Area". Timber harvest is now, and historically has been, highest on the lower elevation karst areas which yield the greatest timber volume per acre. In 1951, the Ketchikan Pulp Company (KPC) signed a long-term timber harvest contract with the U.S. Forest Service. The contract entitles the operator to harvest approximately 8.25 billion board feet of timber over the fifty-year life of the sale. Driven by the requirements of the Long-term Timber Sale Contract, the Area must prepare a certain volume of timber to be harvested.

Until recently only a few local residents have known about some of the caves and significant karst features. As a result of the passing of the Federal Cave Resources Protection Act (FCRPA) in 1988, the Ketchikan Area entered into a partnership with the Glacier Grotto, the local National Speleological Society (NSS) grotto, to help evaluate the cave resources. In 1990 the Area began a widespread inventory process to gain a better understanding of the extend and significance of the karst resources.

Emphasis was also placed on identifying cave resources within proposed timber sale units where surface management activities could result in damage of karst resources. When significant karst resources are discovered, mitigation to insure protection of the feature are applied. This mitigation is based on observations of the effect of timber harvest on karst features within old harvest units.

The Ketchikan Area is planning to step up its inventory process and strengthen the partnership with local and national caving organizations, research units, and universities. The Area is actively involved in education of its employees and the local communities on the values of the resource, caving safety, and caving ethics. Though the majority of the public and resource managers are excited about the karst resource, there are those who view the resource as "just another resource" which further limits the acreage available for harvest. Herein lies the management challenge--identifying karst features on the ground so that mitigation to protect the resource can be enacted, and education of land managers and the public as to the resource values of the karst systems.

Description of Area and Geologic Setting

Southeast Alaska consists of both a narrow strip of mainland coast averaging 25 miles wide from tidewater to the mountain crests which mark the U.S.-Canada boundary, and the hundreds of islands of the Alexander Archipelago. The topography is generally rugged with the lands rising quickly from the sea. The modern topography of the area reflects the region's glacial history. Several of the straits of the Alexander Archipelago are the result of glacial scouring of pre-existing fault zones. The rounded summits of the mountains of lower elevation are the result of Pleistocene glaciation. The area is heavily forested and is characterized as a temperate rain forest comprised primarily of hemlock and spruce interspersed with poorly-drained muskegs and forested muskegs.

A cool, moist, maritime climate characterizes Southeast Alaska. Average Fahrenheit temperatures range from the 40s to mid-60s in the summer and from the high teens and low 20s to the 30s and low 40s in the winter. Due to the moderating influence of the ocean, summer temperatures are cooler and winter temperatures are warmer along the outer coasts than farther inland. Precipitation is high, about 80 to 160 inches annually, though certain areas receive considerably more or less due to the interaction of weather circulation patterns and local topography (Arndt, et. al., 1987).

The geology of Southeast Alaska is very complex. The bedrock includes lithologies which range in age from Proterozoic(?)-Cambrian to Quaternary (Berg, 1988; Brew, 1984; Eberlein, 1983; Gehrels, 1991). Portions of five tectonostratigraphic terranes are found in the Area (Berg, et. al., 1988). Karst development is limited mainly to outcrops of uppermost Lower to Upper Silurian-aged Heceta Limestone and Middle to Upper Devonian Wadleigh Limestone. Locally, these have been metamorphosed to marble. Some 950 square miles of carbonate rocks underlie the Area. All but 25 square miles of carbonate are found on Prince of Wales Island and the surrounding islands. Two thin bands of Permian marble are exposed on Revillagigedo Island (Berg, et.al., 1987) (See figure 1). On Heceta Island, the Heceta Limestone has a maximum stratigraphic thickness of 9900 feet but the total thickness of the formation probably exceeds 12,000 feet. The limestones are massive or thick-bedded, fine-grained, locally fossiliferous, commonly fractured, and light- to medium-dark gray (Berg, 1988; Brew, 1984; Eberlein, 1983; Gehrels, 1991).

Structurally, the area is dominated by large, northwest-southeast-trending, high-angle faults. Many of these are deeply eroded and very visible from the air. These faults break the area into blocks of carbonate and noncarbonate bedrock.

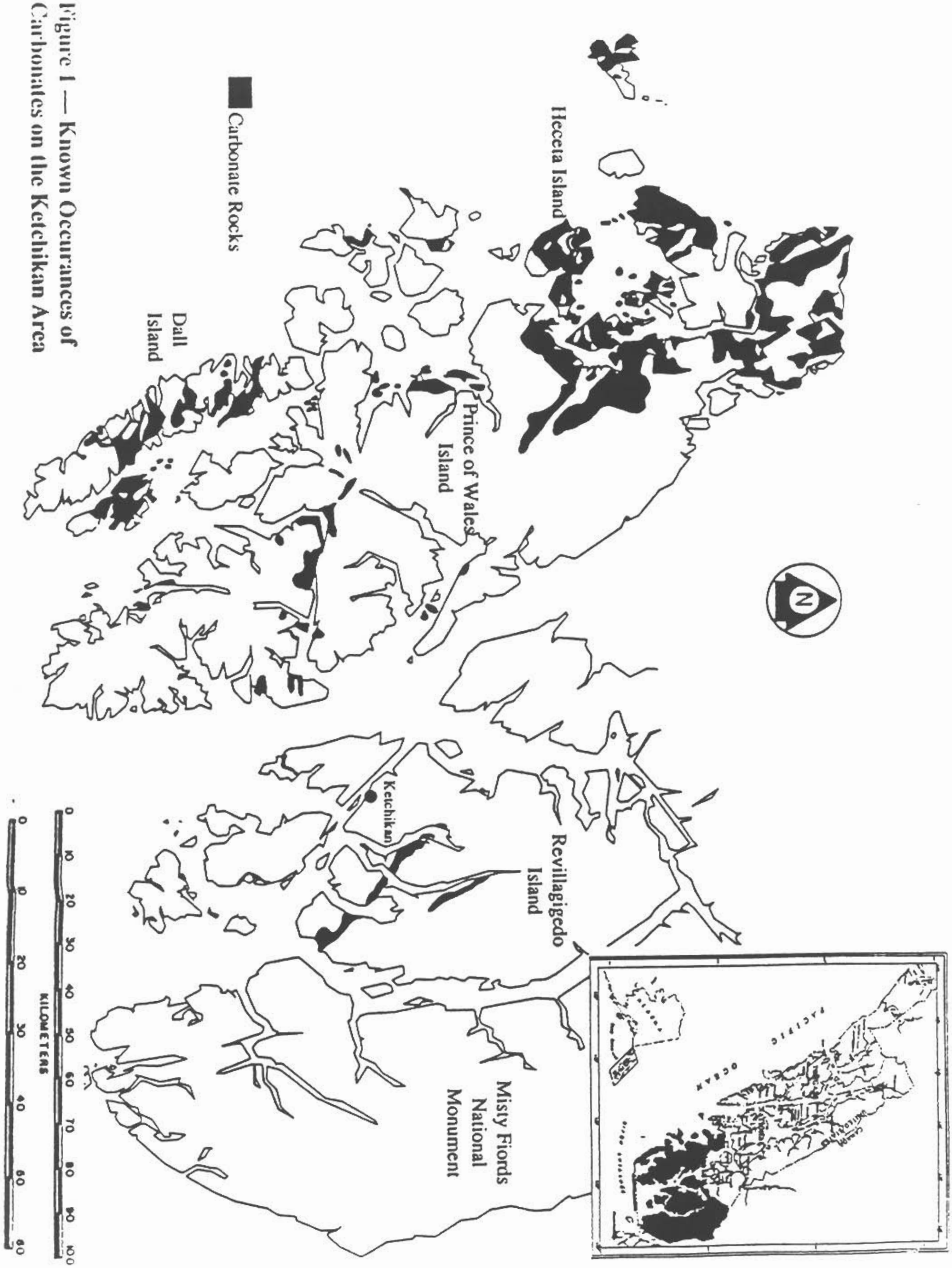

Figure 1 — Known Occurances of Carbonates on the Ketchikan Area

Factors Influencing Karst Formation

As mentioned above, it is estimated that 950 square miles of carbonate rocks occur within the boundaries of the Ketchikan Area of the Tongass National Forest. Karst topography has developed on approximately 700 square miles of the carbonates. There are some thirty square miles of alpine and subalpine karst found on the Area. Significant karst is found from sea level to the top of the highest limestone peaks, 3400 feet in elevation. The characteristics of the karst basically divide it into somewhat distinct types: low-level karst which generally occurs below 1100 feet elevation, and the subalpine and alpine karsts which are found above 1800 feet. The following generalizations can be made about the physical nature of the karst:

1. Development of the low-level karsts is a function of both geologic structure and the presence of muskegs. The majority of solution features occur along faults, joints, dikes and sills, and changes in lithology which are generally fault bounded. Muskegs form atop poorly-drained noncarbonate rocks and glacial hardpans which overlie carbonates. Surface waters which originate from these poorly-drained areas seldom flow more than a few yards onto carbonate substrate before diving subsurface down vertical shafts or into cave entrances. The highly acidic waters from the muskegs seem to accelerate cave development.

2. The cave passages which occur within the low-level karsts are characterized by one or more phreatic tubes atop a vadose canyon. The canyons generally widen towards the floor of the cave. Commonly, the caves have a vertical entrance down a shaft greater than thirty feet deep. Evidence suggests that the caves predate the last glacial period. The caves are emerging from the glacial sediments that filled much of the systems.

3. The carbonate bedrock beneath the forest floor has been sculpted by the high rainfall and the organic acids of the forest floor. Roots following soil-filled fractures and structural features have guided surface waters downward. This karst surface is characterized by highly dissected, smoothed bedrock with many small pits, arches, and passages. Grikes are common in these areas.

4. Annual rainfall exceeds 180 inches per year in some of the areas where karst has developed. Evidence of the force of the tremendous volume of groundwater responsible for formation of the passages is everywhere in the cave passages. Scalloped walls, spiraling passages, ceiling pendants, deep plunge pools, frequent and dramatic water level fluctuations, flooded passages, and sumps are common. Such pressure tubes or conduits play an important role in cave formation. With large seasonal stoms and frequent rain-on-snow events, large volumes of water are forced through these passages. Boulders in excess of two feet in diameter seasonally batter the walls of some passages. Walls, ceilings, and clasts on the floor bear collision marks from battering during high flow periods. The rapid water level fluctuations in these caves is one of the most dangerous aspects of caving in this region.

5. Ground water temperatures range from 36 to 40 degrees F in most caves. Air temperature fluctuates around 40 degrees F. With few exceptions, caves in the Area are wet. Hypothermia is a constant threat when exploring these caves.

6. Above 1800 feet elevation, subalpine and alpine karst is well developed. There are areas where thousands of solution features per square mile are present. These features form generally along structural weaknesses, sills, and dikes in the bedrock. Collapse and solution dolines are common where low gradient slopes are found at the higher elevations. Where massive carbonates are exposed, lines of pits and vertical shafts, and deep grikes form along structural features. Between 1800 and 2400 feet elevation the slopes support stunted alpine vegetation. Above 2400 feet little or no vegetation is found. Karst

formation is driven by the high amounts of precipitation which fall on these areas. The most recent glaciation has modified existing karst features, leaving a thin mantle of glacial deposits in solution dolines, choking some features with glacial sediments. Frost wedging within some of the shafts and pits have choked the features with recent rockfall.

Surface Features and Cave Systems

Hundreds, if not thousands, of yet unexplored caves exist within the boundaries of the Ketchikan Area of the Tongass National Forest. In the previous four years of cave inventory and exploration (1987-1990) some 57 caves had been inventoried (Metzler and Allred, 1990). During the 1991 field season the inventory process was greatly accelerated with the increased emphasis on timber harvest for the KPC Long-term Sale Contract. In a six month period some 96 new caves were discovered. Many of these were located within, or adjacent to, proposed timber harvest units.

Karsted surfaces found within the Ketchikan Area display many kinds of features. The features found on the low-level karst differ from those developed on the higher elevations and are best discussed separately.

The low-level karsts, those that are forming below 1100 feet elevation, are characterized by large closed depressions, uvala, solution channels, collapse and solution dolines, doline fields, vertical shafts, solution runnels, grikes, and caves. All these features are surrounded and/or covered by dense vegetation. Many features are at least partially covered by a vegetative mat which makes cave resource exploration dangerous in these areas. The karst features found in the lower karst zone show similar characteristics to those described from tropical regions. Closed depressions are common, many encompassing several square miles of terrain. There are vast areas where no surface drainage exists in this region where rainfall exceeds 180 inches per year. Cockpit/cone karst (Jennings, 1987) have been described from the northwestern corner of Prince of Wales Island (Allred, C., 1989). Understanding the complex geology of the area is the key to location of the significant karst features. Timber type, vegetation patterns, slope, and proximity to muskeg soils all play a role in cave location. Though some caves and significant karst features are found far from lithologic boundaries and the fringes of muskegs, the majority are discovered proximal to these boundaries. The dispersion of significant karst features is controlled by the drainage patterns developed off the muskegs and noncarbonate lithologies and structural weaknesses in the limestone and marble. Many caves sump or choke within the first 100 feet. Vertical shafts, 30 to 80 feet deep, are commonly found adjacent to muskegs or lithologic boundaries. The majority of these are choked with glacial sediments and forest debris. Two large vertical shafts have been located this year: Bear's Plunge at 142 feet deep and over 30 feet in diameter, and Yukon's Pit at 150 feet deep and greater than 65 feet in diameter. "El Capitan Cave" is the longest cave discovered so far with 10,190 feet of surveyed passages and a total depth of 256.3 feet (Allred, 1991). Eight caves have been mapped beyond 1000 feet in length with three of those nearing 3000 feet. Because of the large number of "virgin" caves and the need to identify the resources within the timber sale units, little or no digging to extend the length of these caves has occurred. Dolines are the most common karst feature encountered. Solution, collapse, and alluvial streamsink dolines have been found. The dolines often occur in large numbers close together forming doline fields. Dolines over 200 feet in diameter and 100 feet in depth have been found. A typical cave within the low-level karsts has an entrance at the base of a 30- to 80-foot-deep vertical shaft or collapse doline. These caves are characterized by a vadose canyon which meanders along structural weaknesses in

the limestone or marble.

The subalpine and alpine karst, which are found above 1800 feet elevation, are characterized by a wide variety of solution features. Besides countless dolines, rillenkarren, wallkarren, rundkarren, solution ripples, grikes, and pinnacle karst are found (Jennings, 1987). Joints and fractures have deeply eroded to form steep-sided narrow canyons a few feet wide and often tens of feet deep. It has been estimated that on three selected subalpine and alpine areas of northern Prince of Wales Island the doline density per square mile averages 3200 (approx. 2000/sq.km.) (Allred, K., 1989). Deep vertical pits are aligned along structural weaknesses in the bedrock. Many of these pits are choked with glacial debris and material from frost wedging. Others access yet unexplored cave systems. Many of the solution features are controlled by the numerous dikes and sills which crisscross these alpine regions. The intrusions act either as impervious barriers to groundwater or as conduits which rapidly carry groundwaters subsurface within open joints. On the north end of Prince of Wales Island, the high-elevation karst occurs atop some 3400 feet of limestone and marble. "El Capitan Pit", the deepest known natural pit in the United States, with an initial drop of 598.3 feet, in located here (Rockwell, 1989). The alpine karst areas on Dall Island have formed on some 700 feet of limestone thrust atop granodiorite. Mid-winter reconnaissance flights over these areas have revealed hundreds of melted openings where air exchange in the caves is adequate to keep the entrance free of the deep winter snows. Caves in these areas are characterized by steep, near vertical passages. Resurgences for these systems are generally found between the 800- and 1100-foot elevations. Exploration of these areas is hampered by their remoteness. These areas are best accessed by helicopter. Weather systems coming off the Gulf of Alaska shroud these areas in fog and clouds most of the year. During the short field season there are only a few days when the weather allows people and supplies to be flown into these areas.

Karst Management

The Forest Service is in the beginning stages of identifying the significance of the karst resources on the Area. With the help of the local NSS Grotto, the inventory process has begun. The focus of the inventory process has been on the north end of Prince of Wales Island where timber harvest threatens the karst resources. Next year the Area plans to expand its inventory process to other karst areas. Programs have been developed to educcate resource and land managers of the importance and significance of the karst resources on the Area. Several lectures on the karst resources have been offered to the public through the local museum and schools. Public response to these lectures has been overwhelming. The Area has entered into a cost-share agreement with the National Speleological Society/Glacier Grotto to help the Forest Service inventory and evaluate the resources. Last year the Area dedicated over $40,000 to house, feed, and transport cavers who participated in the Prince of Wales Island Expedition V (POWIE V). Eight to twelve individuals worked with the Forest Service for one month during the summer mapping and exploring the caves. Last year during POWIE V, over 50 caves were mapped and more than 18,000 feet of underground survey completed. The Area is also looking to enter into partnerships with universities and colleges to promote research on the karst resource.

The area has proposed that some 14,000 acres of alpine and subalpine karst be set aside for its geologic significance. These Karst Special Areas consist of twelve areas ranging in size from 350 to 4300 acres. These Special Areas have been proposed in the latest revision of the Tongass Land Management Plan. The Plan contains direction and standards and guidelines for management of the cave resources on the Tongass National Forest. These guidelines out-

line how the Forest will manage the cave resources for the future. The Area has proposed an Amendment to the Long-term Timber Sale Contract which would place in effect these proposed standard and guidelines for karst management.

Past surface management activities have greatly impacted the cave resources. Prior to 1988, and the passing of the FCRPA, no measures were taken to preserve and protect the karst resources. Surface management activities have in-filled many features with sediment and debris. It is estimated that over 50% of the significant karst features found on unharvested land have atmospheric and hydrologic connection to the surface. Most of these features can by physically entered. In existing harvest units, less than 5% of the significant karst features still have atmospheric connection. Logging slash and debris have accumulated within dolines because of past logging practices. The slopes of the dolines are naturally oversteepened and unstable. When logs are yarded through and across these features a furrow is plowed into these unstable slopes. In some old harvest units approaching 20 years in age, these furrows have not revegetated. For years sediments have bled down these slopes and into karst systems. Many of the caves begin as narrow canyons. In some instances, woody debris from logging have bridged these openings and captured sediment. When this has occurred, cave entrances and lower portions of the dolines have quickly filled with sediment and debris. Many dolines have been in-filled for forest road construction. The dolines are historically a convenient place to focus excess surface waters off roadways. Oversized materials and overburden from road and quarry development have been wasted in large dolines. Dolines adjacent to landings are used not only for slash disposal, but for garbage disposal as well. The lands in Southeastern Alaska regenerate and heal quickly, but the karst resources have been forever altered. The Standards and Guidelines for Cave Resource Management proposed in the Tongass Land Management Plan Revision have been formulated from these field observations (See figure 2). Though the Federal Cave Resources Protection Act only charges the Forest Service with protection of significant caves, the Tongass National Forest is working to protect all significant karst resources. Until resource values are determined, the Area is considering all caves significant.

Great emphasis has been put on identifying significant karst features and caves within the proposed timber sale units. The Area is slowly getting ahead of the timber sale unit identification and offering process in identifying and inventorying significant features. The intent is to mitigate the effects of surface management activities on the karst and cave resources. New and creative methods of timber harvest are being proposed to protect these unseen features. The Area is using the mitigation applied to and surrounding the karst resources as an example for implementation of the Forest Service's New Perspectives Program.

If it is determined that a particular cave's resource values are such that management or protection is required, the cave will be placed in one of the following three classes:

1. Class 1: Sensitive Caves; these caves are considered unsuitable for exploration by the general public because of their pristine condition, unique resources, or extreme safety hazards.
2. Class 2: Undeveloped Caves; caves that are undeveloped or contain minimal developments, that are suited for persons who are properly prepared.
3. Class 3: Directed Access Caves; caves with direct public access and developed for public use and enjoyment.

In addition, each cave placed within one of the above classes will be given a rating from 1 to 5. A rating of "1" will mean that no caving experience is needed and access and exploration is not

A. Prior to determination of significance under the 1988 Cave Act, or Forest-wide comprehensive cave management analysis, the following direction is applicable:

1. During the cave inventory process, map the subsurface extent and position of the caves. Care shall be taken to note subsurface drainage pattens, resurgence areas, surface drainage, and drainage basin characteristics. This information is necessary to determine the cave's ecological relation to the surface.

2. Design of timber harvest, road construction, and other related management activities above or in the vicinity of a cave, or the course of such a cave, will be designed in a way to insure protection of the cave resources.

3. Require retention of vegetation in the vicinity of a cave or cave course to protect the cave's microenvironment. The extent and limits of no harvest buffer surrounding major karst features shall be determined on a case by case basis. Topographics breaks and vegetation patterns should be utilized during buffer design and layout. The intent of the buffer is to insure stability of the cave ecosystem, the integrity of the slopes surrounding the cave, and adequate sediment filtration between management activities and the cave resources. There will be no ground-disturbing activities on slopes steeper than thirty degrees adjacent to cave entrances. An example of this would be protection of a steep-sided, closed basin in which surface drainage flows into a cave system or on steep slopes immediately adjacent and uphill of a cave opening.

4. Similar buffers will be maintained around all direct drainages into caves. This includes sinkholes, cave collapse areas known to open into a cave's drainage system, and perennial, intermittent or ephemeral streams flowing into caves. The immediate area surrounding resurgence springs shall be protected to insure stability of the cave system's ecosystem. The intent of this direction is to insure that additional sediment is not introduced into the cave system, surface flows are not interrupted, and logging slash and debris are not transported into the cave system nor plug the cave entrance.

5. Avoid alteration of cave entrances, or their use as disposal sites for slash, spoils, or other refuse.

6. Avoid diversion of surface drainage into caves.

7. Design roads and related construction to avoid altering surface drainage into karst features or focusing sediment from road surface and/or drainage into karst features.

8. Design quarry and material sources to insure that location and excavation in no way threaten cave resources.

9. Where timber harvest is occurring in the vicinity of a cave, fall trees directionally away from the cave and its course. Yarding should in no way drag timber across and/or through cave openings. Full suspension yarding or other mitigation measures which will insure the stability of the karst slopes is required in these areas.

10. Limit public access if required to prevent damage to the cave resources or if there are safety hazards.

11. Information concerning the specific location of any significant cave may not be made available to the public unless disclosure of such information would further the purposes of the Act and would not create a risk of harm, theft, or destruction of the cave.

12. Scientific or educational use of caves will be authorized by the Forest Supervisor, where appropriate.

13. Communication and cooperation between the Forest Service, caving organizations, and recreationists will be fostered. Exchanged information will not be made public if it could lead to the degradation of sensitive caves.

14. Emphasize enforcement of laws protecting caves from relic collectors and vandalism.

Figure 2. Proposed Standards and Guidelines for Tongass Land Management Plan Revision for Cave Resources.

physically demanding. A rating of "5" will signify that only the most experienced and physically capable cavers should explore the cave. The Area is in the process of identifying several caves that can be opened to the public within the next two years. The Area is working closely with the Glacier Grotto to examine the resource values of various caves to select candidate caves appropriate for the general public to explore. Sadly, vandalism and speleothem collection by the general public is a real problem. Through public education programs, the Area hopes to stop the degradation of the resource. Regrettably, some gating of the most significant caves is needed to insure that their pristine nature is preserved.

The Area now hopes to put some emphasis on studying cave formation processes and cave ecosystems, and monitoring the effects of timber harvest on the karst resources. The following is a summary of some of the significant resource values that have been found within the inventoried karst features:

- The karst features give us a unique look into the subsurface geology of the region. Most of the caves have formed along faults and shear zones. Many caves are closely related to dikes and sills or along lithologic contacts. Silurian and Devonian marine invertebrate fossils can be seen in the walls of many passages.
- Strong evidence that the caves predate the last glacial period is found in nearly all caves. The recesses of most caves contain bedded glacial sediments, varved glacial clay, and layered organic debris and silts. It appears that the cave passages are emerging after being nearly choked with glacial deposits. During more recent years, more sediment has been added to the deposits in the caves. Two samples from logs which have been exposed within the floor of one cave have yielded carbon-14 dates of 6500 and 4120 +/- 60 years before present.
- The caves found within the low-level karst display a wide variety of speleothems. Stalactites, stalagmites, draperies, fans, flowstone sheets, helictites, popcorn, cave coral, etc. are found decorating the passages. Soda straws are common in the drier passages. Some soda straws approach three feet in length. Moonmilk covers many of the walls. Large columnar crystals of moonmilk reach a thickness greater than sixteen inches in some caves. One recently discovered pool is lined by botryoidal crystal forms resembling what is best described as underwater moonmilk. They depress to the touch and rebound quickly, resembling radiating crystals of cotton. Some passages are lined with calcite crystals five to eight inches in length. Caves found at higher elevations contain few speleothems.
- Anadromous fish species are known to spawn through some caves and may spawn within a few cave passages. Resident trout and anadromous fish fry seek shelter from bird predation in cave openings. Many insect forms use the photic zone of the caves to deposit their eggs. This also supplies fish with an abundant food source.
- Bats are known to inhabit many of the caves. Thousands of hours have been logged while exploring the caves during the summers and no bats have been seen, although their fecal deposits and remains have been found. It is possible that bats from the interior of Alaska migrate to these caves to winter (Cook and West, 1991). It is also possible that the Keen's bat, a sensitive species, may inhabit the caves. Working with the University of Alaska this winter, a bat trapping and tagging program is planned.
- Almost without exception, the caves and vertical shafts contain the remains of various mammals which have fallen in. The bones of black bear and Sitka blacktail deer are

common. The remains of birds, beaver, and other small furbearers have been reported. Some animals have survived the fall, to walk through the cave and find a place to lie where their articulated remains were found. Fish bones from the stomach content of some bears can be found. Most recently, the remains of what is thought to be a giant short-faced bear (Arctodus simus) have been discovered (Heaton and Grady, 1991). The remains of what is possibly a Pleistocene wolverine have also been located (Allred, 1991). Next year the Area is hoping to excavate the remains of the bear and other mammals to gain further understanding of the natural history of the area. If proposed grants are approved, the excavation will be under the direction of the Smithsonian, National Geographic, National Speleological Society, and the Forest Service.

There are many littoral caves along the western shorelines of the outer islands. Many of these caves are now well above mean high tide due to isostatic rebound of the earth's crust after glacial retreat and/or sea level fluctuations. These caves range in size from those only a few feet deep to those well over 300 feet in depth and over 150 feet in width. Beach logs, deposited in the caves centuries ago, lie stacked on the floors. One such log sampled has yielded a carbon-14 date of 4200 +/- 70 years before present. Scattered on the floors of these caves are mammal bones and bones of sea birds. Deer utilize several littoral caves for shelter and one cave is home to a pack of wolves. Some of the less accessible caves act as rookeries for a wide variety of sea birds. Early natives also sought shelter in these littoral caves (Autrey, 1991). The walls of one cave are decorated by magnificent paintings which incorporate the structural folding of the limestone and speleothems into the art. Another littoral cave shows possible human habitation dating back some 2250 years (Reger, et.al., 1986). Smaller solution features were utilized as burial sites along the shore (Autrye, 1991).

- o A wide variety of insects utilize the recesses of the caves. No detailed analysis of the species have been carried out, but collections have been made. Several insects, unfamiliar to the cavers working during the summers, have been collected (Allred, 1991). Collections have been forwarded to the Burke Museum of Natural History on the University of Washington campus for analysis, and a few species have been identified (Crawford, 1989).

Conclusions

The karst resources found within the Ketchikan Area of the Tongass National Forest are as unique as they are vast. Karst is well developed from sea level to alpine mountain tops. The karsted surfaces display many kinds of features. Caves are numerous, but often obscured by the dense vegetation and glacial deposits. The karst found within the Area may be one of the best examples of temperate rain forest karst in the world. Though past surface management activities have affected some karst systems, the Forest has the opportunity to learn from the negative effects of the past surface management practices. The Area is working hard to mitigate impacts of surface management activities on the karst resource. An accelerated inventory process will work to put the Area ahead of the timber sale unit design and offering process. This will allow more time to be devoted to understanding the karst systems and not solely to protection. The Area hopes to enter into partnerships with universities, colleges, state and private organizations, and caving organizations to begin research in the following areas:

- o Gain an understanding of the role

the organic acids from the soils and muskegs play in karst development.

- o Through dye tracing and close monitoring of atmospheric conditions and rainfall, gain a better understanding of the relation between the surface and subsurface hydrologic systems of selected karst areas.
- o Monitor the long-term effects of surface management activities on the cave systems.
- o Study the effects of water infiltration and saturation rates as the result of removal of the forest canopy over cave systems.
- o Study the importance of karst waters for anadromous fisheries.
- o Begin an intensive insect and small mammal inventory program. This would include determination of the relationship between bats and the cave systems.
- o Begin studies which would look into the passage formation rates, aging of speleothems, and long-term climatic studies utilizing oxygen isotope ratios and palynology.
- o Continue paleontological and cultural resource evaluation when discoveries are made.

The extensive karst resources of the Ketchikan Area are unique. They are truly "Tongass Treasures".

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Members in the News (Contributions invited)
by Jay Rockwell, Jr.

- o Kevin Allred's "Report on results of the 1988 Glacier Grotto Expedition to Prince of Wales Island, Alaska", from The Alaskan Caver 9(1):4-5 (Feb. 1989), and "Excerpts From the Glacier Grotto Prince of Wales Expedition", from The Alaskan Caver 9(2):7-9 (April 1989), were cited on page 32 of the 1990 Current Titles in Speleology, Number 22--The Literature of 1989.

- o Kevin and Carlene Allred are mentioned in Shelley Gill's article, "Prince of Wales Island", in The Anchorage Daily News--We Alaskans 11(45):15. The article, announcing the bottoming of El Capitan Pit, seemed to be based on a 1989 article in the Chilkat Valley News.

- o Kevin Allred, Miles Hecker, Harvey Bowers, and Bob Bastasz were mentioned in Jay Arnold's 1989 article, "New caving area yields deepest U.S. shaft", on page 17 of the Dec/Jan 1989/90 issue of Descent.

- o Kevin Allred and Mark Evans, among others, were mentioned in Rodney D. Horrocks' article, "Writing cave literature using the phenomological method", in the May 1989 Utah Caver 1(2):45-47, in which Rod recounts his feelings during some of his memorable caving experiences.

- o William R. Halliday is mentioned on pages 3, 4, 15, and 20 of the May 1990 issue UIS-Bulletin 1989 1/2(34) of Union Internationale de Speleologie, mainly in connection with the 6th International Symposium on Vulcanospeleology, which he chairs. It was held in Hilo, Hawaii, on August 5-11, 1991.

- o An excerpt from William R. Halliday's "Caves of California" (1962) was quoted in Roy Royce's article "The closure of Silver Shadow Cave" in the July 1990 issue of The Explorer, p. 106. It told of the discovery of a beautiful cave in a quarry and how, in the short space of five years, it was nearly completely stripped by mineral collectors and rendered "devoid of its former beauty". Also, in the same issue were discussions on graffiti removal techniques.

- o Bob Montgomery gave a slide show on "The 1989 NSS Field Trip to the Soviet Union", including a visit to Optimist Cave in the Ukraine, to the Southern California Grotto, according to the July 1990 issue of The Explorer, p. 100.

- o Julius Rockwell, Jr.'s report on the discovery of a record depth pit on Prince of Wales Island in the October 1989 issue of The Alaskan Caver was mentioned in "Ray's Review" of the February 1990 NSS News 48(2):47. Also mentioned were Kevin Allred, Jim Nicholls, and Miles Hecker.

- o Win Wright and others helped host part of the (Czechoslovakia/USA) 1989 Golden Horse Expedition, according to Tony Zelenka's and Milos Picek's article in the February 1990 NSS News 48(2):42.

Glacier Grotto
Area Meeting for
SouthCentral Alaska

!! note the new meeting schedule of
the **fourth** Wednesday each month !!

Meeting of the Glacier Grotto
for the SouthCentral Alaska Area
at 7:30pm on Wednesday, January 22

in the offices of Stewart Title
Suite 110 of the Calais I Bldg
3201 "C" Street (32nd and "C")

business meeting; trip planning;
reports from previous expeditions
including information from POWIE V

everyone welcome--member or not;
program will be an NSS slide show;
future expeditions will be discussed

Schedule of Events

22 January -- Area Meeting (SouthCentral)
?? Jan/Feb -- Byron Valley Glacier Caves
?? Jan/Feb -- Kings River X-C Ski Trip

Dues are Now D u e !

This may be your last issue of The Alaskan Caver!! If your mailing address label contains a 91, circled in red ink, and an envelope is enclosed (addressed to the Treasurer), your membership has just expired. In order to receive more exciting issues of The Alaskan Caver, you must mail your 1992 dues immediately! (See rates on page 2 under "Dues".) Do not delay! Do not miss a single issue! (If your address or phone number, home or work, has changed recently, please help us keep our members list current.)

Glacier Grotto
2944 Emory Street
Anchorage, Alaska 99508-4466

Address Correction Requested

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