"Have Cave, WIll Travel" - A Portable Cave Exhibit for Environmental Education

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Abstract

A traveling cave exhibit can be used very effectively to help get across the messages of cave resource conservation and ethics. The Bureau of Land Management designed and constructed such a cave for use as an environmental education exhibit. It was constructed of 1" pvc pipe, covered with chicken wire, burlap, and sprayed with industrial grade polyurethane foam. The exhibit has been used several times across the United States and has held up quite well. It contains bilingual interactive interpretive signs, running stream and plunge pool, bat roosts, interpretive video, an interactive cave restoration station, and is wired for sound, lights, and climate control.

The Challenge: As part of the 1997 Boy Scouts of America (BSA) National Jamboree the Bureau of Land Management requested a cave as one of their exhibits on the "BSA Adventure Trail". The Carlsbad Field Office was contacted to design and produce the exhibit. The objective was to produce an exhibit that would convey the sights, sounds, and feel of being in a real cave and combine that with the elements of cave resource education, conservation, and safety.

The Design: The most efficient design was an S shaped structure with two common interior walls (see Figure 1). The entrance is at one end of the S and the exit at the other. This design creates three parallel passages, each with a different theme. Both ends have crawl way and wheelchair-accessible entry and exit. The wheelchair access is through a light-tight removable door. The entrance passage contains a running stream and plunge pool and the interpretive signs tell about cave and karst geology. The middle passage has speleothems and a bat roost. The interpretive signs discuss bat myths and bat truths. The exit passage has a restoration section and interpretive signs that convey messages on cave conservation and safety.

The Construction: After several unsuccessful initial construction concepts it was decided to construct it out of one inch PVC pipe as a frame, covered with one inch chicken wire, then covered with burlap. The entire structure was then sprayed with structural polyurethane foam. The speleothems were constructed in the same manner. First the outline of the exhibit was drawn out on the floor of the BLM warehouse. It measured 20X28 feet and averaged a six and one half foot ceiling height. The PVC pipe was laid out, fitted together with couplers, and glued. Where the pipe was arched to make the roof, a hot air gun was used to relieve the stress on the PVC.

The structure was wired to incorporate electrical outlets for lighting sconces, sound, and video capability. The wiring was installed in electrical pvc conduit with all outlets a minimum of eighteen inches above ground height and ground fault boxes to meet electrical codes. The lighting is indirect and uses 4 watt night lights.

Once the frame and wiring were complete, 1x12 pine boards were mounted in the areas where the interpretive signs were to be installed. This gives the signs something to be screwed into and hold them securely. The frame was then covered with one-inch chicken wire, and burlap was applied to the chicken wire using hog rings. The next operation was to contract the spraying of the polyurethane foam. Two *55* gallon drums of urethane and catalyst were used to cover the structure. The foam was sprayed on hot, using a direct displacement pump. The inside was sprayed first. By the time the outside was ready to be sprayed the structure was sturdy enough lo walk on. After the outside was sprayed the structure was coated with a heavy weather resistant latex paint. The inside was painted with a light grey base coat then highlighted with spray paint in just the right cave colors.

The structure was then cut into eight pieces so it could be loaded into a truck and transported. Removable polyurethane speleothems were then added.

Bells & Whistles: To add realism to the exhibit, enhance its interpretive value, and increase its fun-factor several special effects were added.

Interpretive Signs: Twelve interactive interpretive signs are used in the exhibit. All the signs are in English and Spanish. One part of the message is on the front of the sign; then the sign can be opened up for the rest of the message inside. Interpretive signs cover cave geology, karst hydrology, cave biology, cave climatology, bat myths and truths, cave conservation and safety.

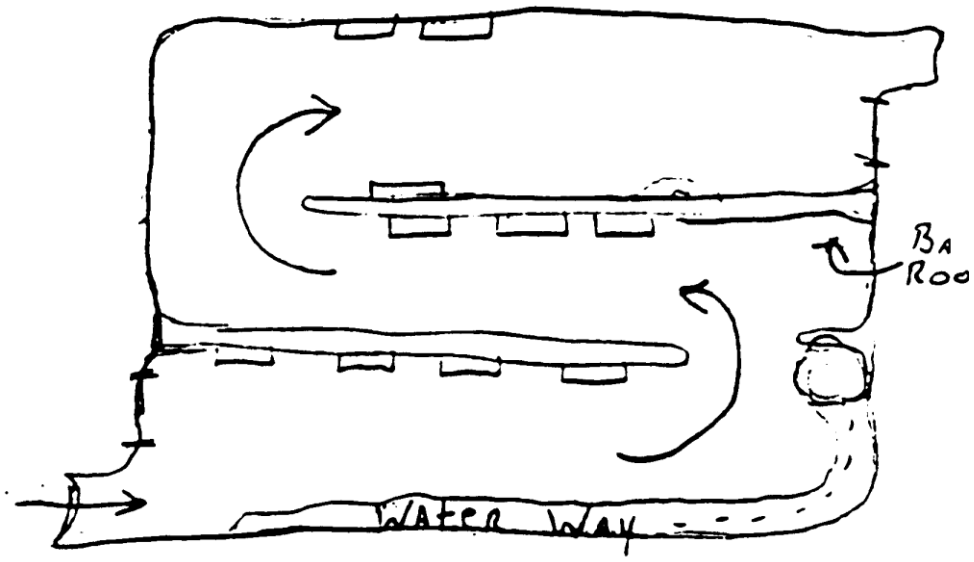

Figure 1

Stream and Plunge Pool: The right side of the entrance passage has a live stream which comes out of the wall and flows down a trough to the end of the passage, turns the corner and disappears into a plunge pool. The plunge pool is about 18 inches deep with a submersible water pump in the bottom. A hidden 3/8-inch tube returns the water to the spring source.

Bat Roost: Around the corner you enter the bat roost area. The bats are made of cast resin and are actual size and anatomically correct. There are clusters of Mexican freetails, and individual Big Brown Bats and Myotis Velifer. Under the bats are guano piles. Bat squeak and flutter sounds are heard from a specially produced compact disc. The CD player is hidden under a rock ledge that is accessible from the outside. The bat sounds play on a repeating track. A 13 inch TV-VCR plays a three minute continual loop video about bats and bat conservation. Four interpretive signs cover bat myths and truths.

Speleothems: The middle passage also contains a number of speleothems which can be removed when the exhibit is transported. Stalactites, stalagmites, sodastraws, and columns grace the hall way. They are affixed using velcro and made fast with spray polyurethane foam.

Climate Control: the cave is given a further touch of realism by the addition of refrigerated air. An air-conditioner is placed outside the exhibit and refrigerated air is fed into the cave through an air duct. This reduces the noise level of the air-conditioner and fans. The refrigerated air gives the entire cave cool realism and also adds positive air pressure inside the cave which creates a cool breeze blowing out the entrance and exit crawl ways.

Restoration Station: Around the next corner you face a wall of graffiti. On the floor is a limestone block which also has spray paint on it and several nylon bristle scrub -brushes. This is the visitors´ opportunity to get first hand experience on how difficult it is to remove spray paint from cave walls. The interpretive signs give a “Leave No Trace” message and points on cave conservation and safety.

The exit passage is filled with the echoing sounds of dripping water. The specially produced sound track comes in from a CD player hidden behind a false rock.

Transportation and Assembly: The pieces of the structure can be craftily loaded into a 24-foot moving truck, with only one piece left over. the last piece can be transported on a 16 fool flat bed trailer. Once on location the pieces can be placed together and drawn tight using binding cinches. The joints are then filled with spray foam and allowed to dry over night. The foam can then be spray painted to match the interior of the cave; the speleothems are then added. When the cinch straps are removed the structure is sturdy enough to walk on. There are electrical outlets on the outside of the exhibit that can be plugged in and

provide current to the entire display. It is easiest to assemble the exhibit with five or six people but it has been done with two. Complete assembly takes from six to eight hours. Disassembly is best done with a keyhole saw to cut the foam joints apart. A reciprocal saw may also be used but there is a greater possibility of cutting into the structure of the exhibit.

Availability: The exhibit has been on display at Fort AP Hill, Virginia for the two week BSA National Jamboree. Nearly forty-thousand scouts visited the exhibit during that time. It has also been on display in Phoenix; AZ; Bishop, CA; and Tucson, AZ; Santa Fe, NM; Roswell, NM, and Carlsbad, NM. For further information contact Jim Goodbar at the BLM Carlsbad Field Office, 620 E. Greene SI. Carlsbad, New Mexico 88220. (505) 234-5929, james_goodbar@blm.gov.