

Cave Management and Restoration Efforts at Coronado National Memorial, Hereford, AZ

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Coronado National Memorial is one of the most southern National Park units in the United States and the largest of the 29 Memorials (Figure 1). The Memorial is located in the southern portion of the Huachuca Mountains in the Mexican Highland section of the Basin and Range Province. The Huachucas are one of 40 mountain ranges in the borderlands named “sky islands.” These mountain ranges received the name because they resemble islands that rise above the grassy sea. There are seven located caves within the Memorial and possibly three other unlocated caves. Only three are of sub-

stantial size, with Coronado Cave being the largest. The remaining four features are extremely small and likely have little or no interest for the general public. The Memorial is bounded by Montezuma Pass to the west, Bob Thompson Peak to the north, and a 3.3 mile-long southern boundary marking the US-Mexico international border. The geology of Coronado National Memorial, in southeastern Arizona, spans more than one billion years with a rich history including mountain building events, rifting, periods of shallow

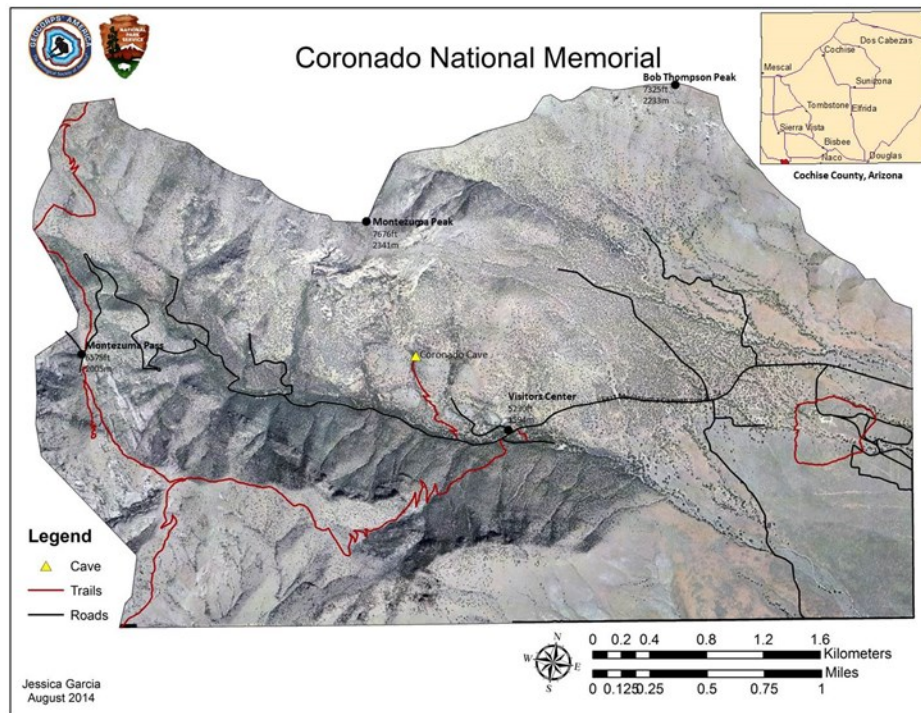


Figure 1. Coronado Park Boundary showing roads, trails, location of Coronado Cave and peak/feature elevations.

seas, and supervolcanoes. These events created a diverse geologic landscape composed of Permian limestone, Mesozoic and Tertiary volcanics, and Quaternary deposits. Karst features formed 15,000-10,000 years ago by phreatic conditions, leading to the dissolution of the limestone. Coronado Cave, formerly known unofficially as Montezuma's Cave, Montezuma's Treasure Vault, and Geronimo's Cave until the mid-1980s, not only attracts present day visitors but served as an attraction to miners during the 1800s. Its spectacular size and once pristine speleothems captivated its visitors. Unfortunately, most of these formations have been advertently or inadvertently destroyed. Due to concerns that other caves may be subject to similar types of vandalism and for visitor safety, Coronado Cave remains the only cave resource open to the public. Intact speleothems are rare. Speleothems found within the cave include: cave popcorn, drapery, chandelier, stalactites, stalagmites, moonmilk, flowstones, rimstone, columns, soda straws and

helictites. Other cave features include gypsum boxwork and scallops. Mathematical derivation calculated that water flowed at a rate of less than 24 feet per minute. Today the cave is mostly ephemeral; water is usually only observed during monsoon season. Coronado Cave consists of one large room that is 180 meters long by 6 meters high by 20 meters wide, with a narrower portion near the center of the cave's length, and three narrow crawlways which can be seen in the Coronado Cave map (Figure 2).

Geologic resources have primarily been passively managed since the Memorial's inception, with the most well-known feature, Coronado Cave, operated as a "wild" cave without permits. Due to the detrimental effects of vandalism to Coronado Cave and a need for more scientific information about other geologic features in the Memorial, an overhaul of the cave management program was initiated in 2014 and

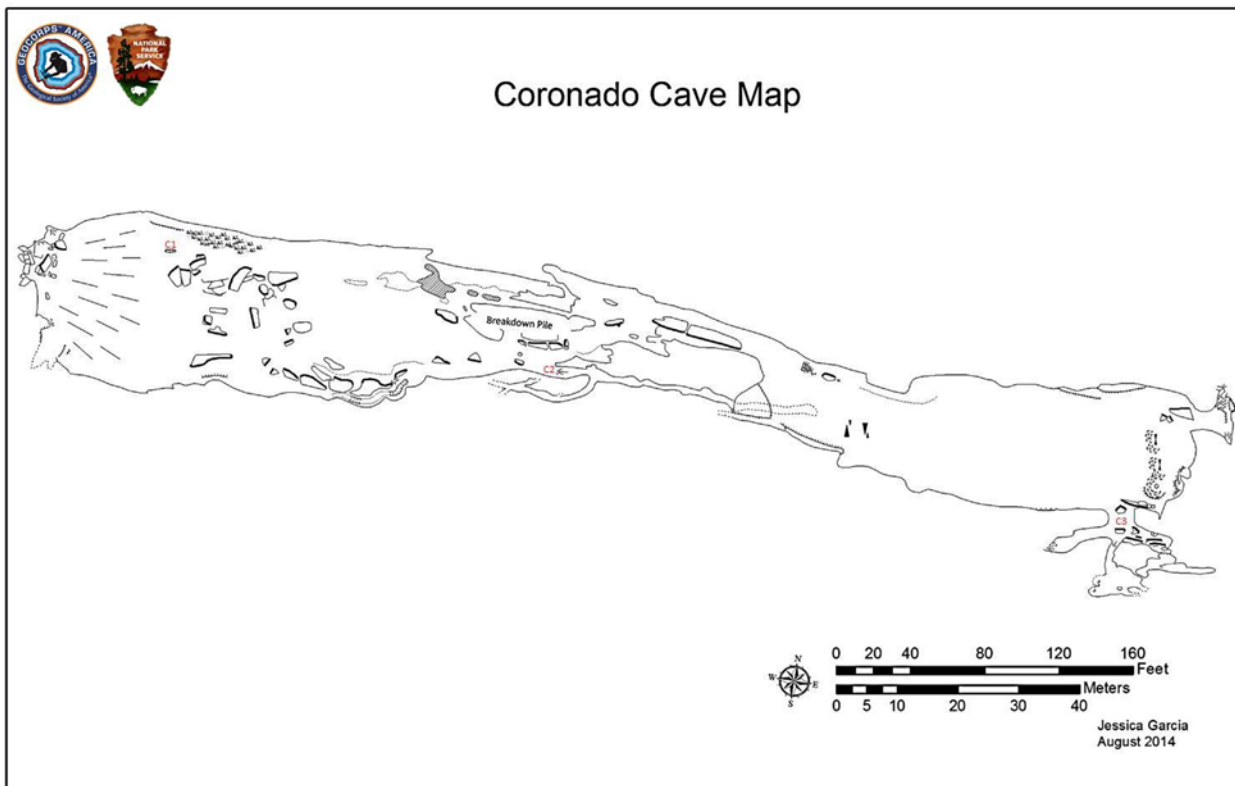


Figure 2: Coronado Cave map with crawlways located in red.



Figure 3: Graffiti and post-remediation efforts

has been developed and implemented over the last year. The two most prevalent destructive activities by visitors to Coronado Cave are littering and graffiti vandalism (Figure 3). Remediation efforts began in July 2014 with systematic removal and documentation of trash and graffiti. By April 2015, park staff, SCA interns, GeoCorps America interns and Boy Scout volunteers had meticulously scoured the cave and removed 45.53 lbs of trash in a total of 91.5 work and volunteer hours. Successful graffiti remediation by park staff occurred throughout the year using nondestructive techniques and materials.

Graffiti remediation and trash removal will continue into the foreseeable future. Over time, trends in littering and graffiti prevalence can

assist with further cave management actions. The cave management plan has also been updated to enhance monitoring activities and meet current management objectives. This effort has resulted in a more robust management program, which now includes updated management objectives; protocols for monitoring and remediation; a cave safety protocol; updated cave maps; collection of anthropological and meteorological data; information about possible unknown caves through reconnaissance efforts; and the creation of education and outreach materials for training park staff and improving public interpretive programs. This endeavor has served the mission of the National Park Service by enhancing the preservation of park caverns for the enjoyment of future generations.

