FINAL DRAFT
CULTURAL LANDSCAPE REPORT/ ENVIRONMENTAL ASSESSMENT

Jewel Cave Historic Area

Jewel Cave National Monument



Cave Entrance, trail, and CCC Ranger's Cabin from across Hell's Canyon, 2003

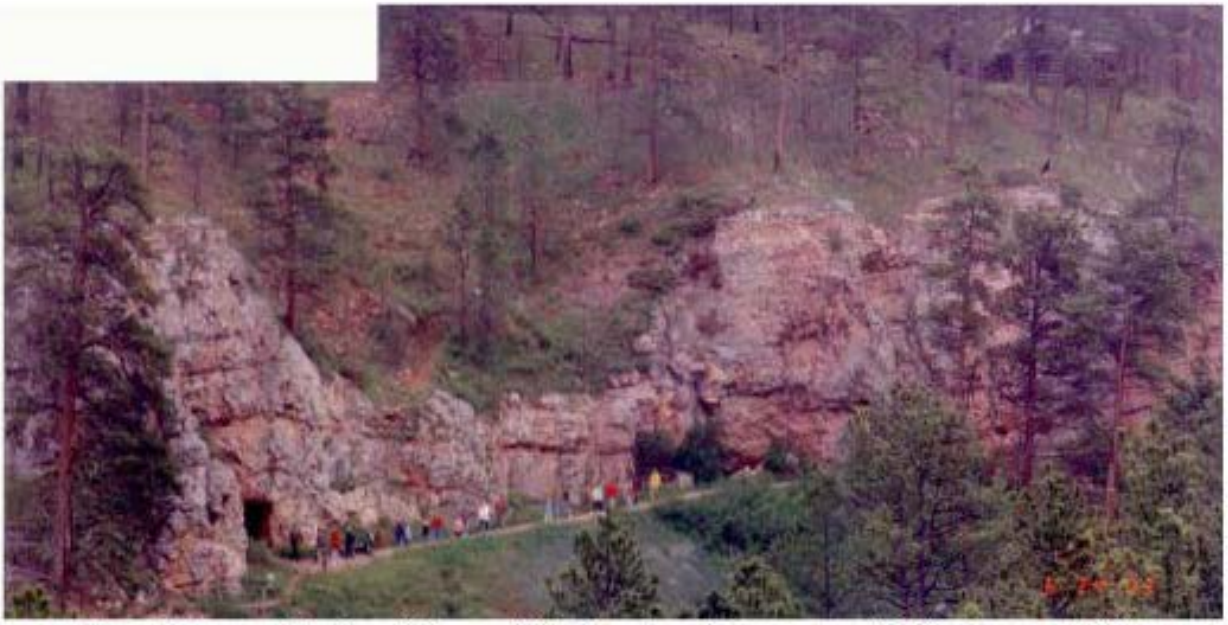
MARCH 2005

Prepared by:
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219½ North Main Street
Ann Arbor, Michigan
In association with WOOLPERT, LLP

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Chapter I:
Introduction (Purpose and Need)

CHAPTER I: INTRODUCTION (Purpose and Need)

Scope of the Report

The intent of this combined *Cultural Landscape Report* (CLR) and *Environmental Assessment* (EA) is to guide treatment and use of the above-ground resources associated with the historic area at Jewel Cave National Monument. A thorough investigation and evaluation of the historic landscape has been conducted using National Park Service (NPS) and National Register of Historic Places guidelines. The documentation of historic significance and evaluation of integrity of the cultural landscape serves as a framework upon which treatment recommendations are based. The report provides park managers with a comprehensive understanding of the physical evolution of the historic landscape, and guidance for management of the site. The *Cultural Landscape Report* portions of the document have been prepared by Quinn Evans|Architects (QEA), and the *Environmental Assessment* has been prepared by Woolpert, LLC, to fulfill a contract with the Midwest Regional Office of the National Park Service. NPS staff have contributed specific sections of the *Environmental Assessment*.

Report Methodology (Applicable Regulatory Requirements)

This CLR was prepared according to National Park Service standards outlined in: *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques,* and *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.* The CLR/EA was prepared in accordance with federal regulations (40 CFR 1500-1508) implementing the *National Environmental Policy Act of 1969* (NEPA), regulations of the *Council on*

Environmental Quality (40 CFR 1508.9), *NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-Making*, and the *National Historic Preservation Act of 1966* (as amended). Other applicable regulatory requirements include: *Federal Cave Resources Protection Act of 1988, National Park Service Organic Act, American Indian Religious Freedom Act, and the Archeological Resources Protection Act*.

A field inventory of existing conditions and landscape features, and interviews with existing Monument staff regarding management and maintenance issues at the historic site, was conducted by Quinn Evans|Architects (QEA) in June 2003. Historical research was conducted by QEA at the following locations: the park administrative files, the accession files, the park library, maintenance flat files located in the visitor center, and the park archives located at Mount Rushmore National Monument.

The *Environmental Assessment* (EA) analyzes the impacts on the human environment from three alternatives, including the no action alternative and two treatment alternatives. The *Environmental Assessment* portion of the project is being coordinated by Woolpert, LLP, a consulting firm that specializes in environmental planning. QEA and staff from Jewel Cave National Monument also prepared portions of the E*nvironmental Assessment*.

Although the federal government has standard guidelines for the preparation of *Cultural Landscape Reports* and *Environmental Assessments*, there are no guidelines for preparing a combined report. The National Park Service has recognized that combining the two can increase the value of the overall document by integrating the information generated through the CLR with the in-depth evaluation process inherent

to the *Environmental Assessment*. This improves and validates the recommended treatment while also combining the costs associated with preparation and printing.

This report has been organized in the following manner:

Part I: Site History, Existing Conditions, Analysis and Evaluation

- *Chapter I: Introduction (Purpose and Need)* – Documents the Purpose and Need for the proposed landscape treatment, scope of the report, location and description of the property, identifies project consultants, and describes the methodology used. Also, this chapter includes a description of topics that were considered and dismissed during the analysis and evaluation of potential impacts from the landscape treatment alternatives.

- *Chapter II: Site History* – Documents and analyzes historic information as it relates to the chronological development of the site. This section identifies the major periods of development and describes the evolution of the physical landscape.

- *Chapter III: Existing Conditions (Affected Environment)* – Describes and illustrates the existing conditions of the landscape features associated with the site. Additional topics that need to be addressed from a NEPA compliance standpoint are also described in this Chapter.

- *Chapter IV: Analysis of Cultural Landscape* – Identifies the extant features related to each of the property types associated with the National Register multiple property listing for Jewel Cave National Monument. Defines a proposed historic landscape district for Jewel Cave that supplements the multiple property listing. Evaluates the historical integrity of the character-defining features associated with the historic landscape district. Evaluates the landscape characteristics associated with the historic landscape including; natural systems and features, spatial organization, land use, circulation, topography, vegetation, views, buildings, structures, and small-scale elements.

Part II: Treatment

- *Chapter V: Management Philosophy and Management Issues –* Describes the four types of treatment for historic landscapes as outlined by *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* and *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques.* Rehabilitation is selected as the most appropriate approach for the Jewel Cave Historic District. Management issues to be addressed by the treatment recommendations are identified and described.

- *Chapter VI: Treatment Alternatives* – Three alternative landscape treatment plans are described at a schematic level of detail.

- *Chapter VII: Impacts from Treatment Alternatives (Environmental Consequences)* – The consequences of each treatment alternative are analyzed. The intensity, duration and timing of the impacts to each topic area is addressed as outlined in CEQ guidelines and as required in *NPS Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making*. The impacts to each topic area are summarized in an impact summary matrix. The results of the impact analysis form the basis for identification of the Environmentally Preferred Alternative. The rationale for identification of the Environmentally Preferred Alternative is presented. Necessary mitigation measures are described.

- *Chapter VIII: Recommended Treatment (Preferred Alternative) – The recommended treatment adheres to a management philosophy of rehabilitation, emphasizing restoration within the historic core. This chapter includes schematic designs for treatment of the historic area.*

- *Chapter IX: Costs and Implementation – This chapter includes Class "C" cost estimates for implementing the recommended treatment, and an implementation plan.*

- *Chapter X: Consultation and Coordination* – Describes the process of public scoping/involvement, tribal coordination, and coordination with local, state and federal agencies.

Purpose and Need

The purpose of this combined *Cultural Landscape Report* and *Environmental Assessment* (CLR/EA) is to guide treatment and use of the above-ground resources associated with the historic area at Jewel Cave National Monument (also referred to as "the Monument" and "Jewel Cave"). The historic area serves as an interpretive site for the Monument. Selected elements within the historic area are listed in the National Register of Historic Places, as part of a Multiple Property designation that was accepted in April 1995. The analysis and evaluation conducted as part of this CLR/EA indicates that a historic landscape district, within which the previously identified contributing historic resources are located, is eligible for listing in the National

Register as a district that contributes to the Multiple Property designation. A description of the proposed district and its boundaries along with the rationale for its eligibility, are provided in Chapter IV.

Since the initial development at the site in 1900, a series of incremental changes have affected the landscape. The most significant of these occurred during the period spanning from 1933 through 1939, when Federal Relief projects were implemented. During the 1940s, 1950s and 1960s, the historic area served as the only developed area within the park. Facilities for visitor services, maintenance, administration, and employee housing were all developed within the historic area boundaries. Since the new visitor center, maintenance facility, housing development and park administrative headquarters, were opened in the 1970s, most of the facilities associated with these uses have gradually been removed from the historic area. Some remnants of the 1940s through 1960s developments remain, and some additional elements have been introduced to the site. Also, the current and planned future use of the site will require that some changes be made.

The Monument staff is in need of a detailed plan identifying and recommending treatments for cultural landscape elements that are significant and contributing to the historic landscape, and elements that are non-contributing. The Monument also needs guidance on how to implement the future interpretation plan for the site, providing necessary visitor services while also minimizing impacts to the cultural landscape. Finally, the Monument needs guidance on how to best manage the significant cultural resources located within the historic area.

The specific purposes of the actions described in this CLR/EA include the following:

- Determine the most appropriate management philosophy and treatment approach for the historic area.
- Preserve the significant historic resources within the historic area.
- Remove non-contributing elements that impact the cultural or natural resources within the historic area.
- Expand visitor experience of the Monument by expanding exposure to and understanding of the historic area and the history of the development of the park.
- Provide necessary visitor services including restrooms, a picnic area, gathering/interpretive area, and a weather shelter.
- Provide design options that explore the implementation of a shuttle-only access system for the historic area, or a combined independent vehicle and shuttle access system.
- Provide employee parking.
- Provide a private outdoor break area for employees.
- Provide a storage facility for the cave-tour lanterns.

Park Purpose/Significance and Description of the Site

Jewel Cave National Monument (1,273.51 acres) was created on February 7, 1908, by a proclamation made by President Theodore Roosevelt (Presidential Proclamation 799, 35 Stat. 2180) under the authority of the Antiquities Act (34 Stat. 225, June 8, 1906). The purpose of the Monument is to preserve the Jewel Cave ecosystem, especially significant caverns and other geological features, for its scientific

interests and for public enjoyment. Additionally, the Monument is to preserve the cultural resources within its boundaries for public understanding and enjoyment.[1]

Jewel Cave is a pristine and relatively unchanged underground environment. It includes many rare speleothems, including helictites, scintillates (root-like features eroded in chert and coated and coated with tiny quartz crystals, and delicate hydromagnesite balloons. The cave is a complex three-dimensional maze beneath about three square miles of surface area, making it one of the premier caves of the world. It is the third-longest cave in the world, with more than 130.3 miles of passages discovered, and more being documented continually. Airflow studies indicate that approximately two-percent of the cave has been discovered.[2]

Historic resources associated with Jewel Cave National Monument are listed in the National Register of Historic Places under a multiple property nomination that was accepted by the Keeper of the National Register in 1995. Three associated property types were identified as contributing to the multiple property listing including resources associated with tourism and the early development of Jewel Cave, 1890-1944; resources associated with the development and administration of Jewel Cave National Monument, 1908-1944; and resources associated with NPS rustic architecture and Public Works Construction, 1933-1942. Resources previously identified as contributing to the National Register Multiple Property listing include the

[1] *Final General Management Plan and Environmental Impact Statement*, Jewel Cave National Monument, South Dakota, June 1994, 1.
[2] Ibid., 3-4; and personal communication, Mike Wiles, Cave Specialist, Jewel Cave National Park and Conn, H. W. 1966, *Barometric Wind in Wind and Jewel Caves, South Dakota*: National Speleological Society Bulletin, v.28, p.55-69. Based on a paper by Herb Conn and later personal communication between Mr. Conn and Mike Wiles, it has been shown that the cave exhibits a barometric wind that blows in or out in response to outside pressure changes. The volume of blowing air is proportional to both the pressure change and the total volume of the cave. By measuring the change in pressure and the corresponding airflow, it is possible to calculate an estimate of the total volume of the cave. The volume of the known cave is approximately 2.5 percent of the predicted total volume.

Ranger Cabin, the trail leading from the Ranger Cabin to the historic cave entrance, and the historic cave entrance. Additional contributing resources have been identified through research conducted for this CLR/EA. They are described in Chapter IV.

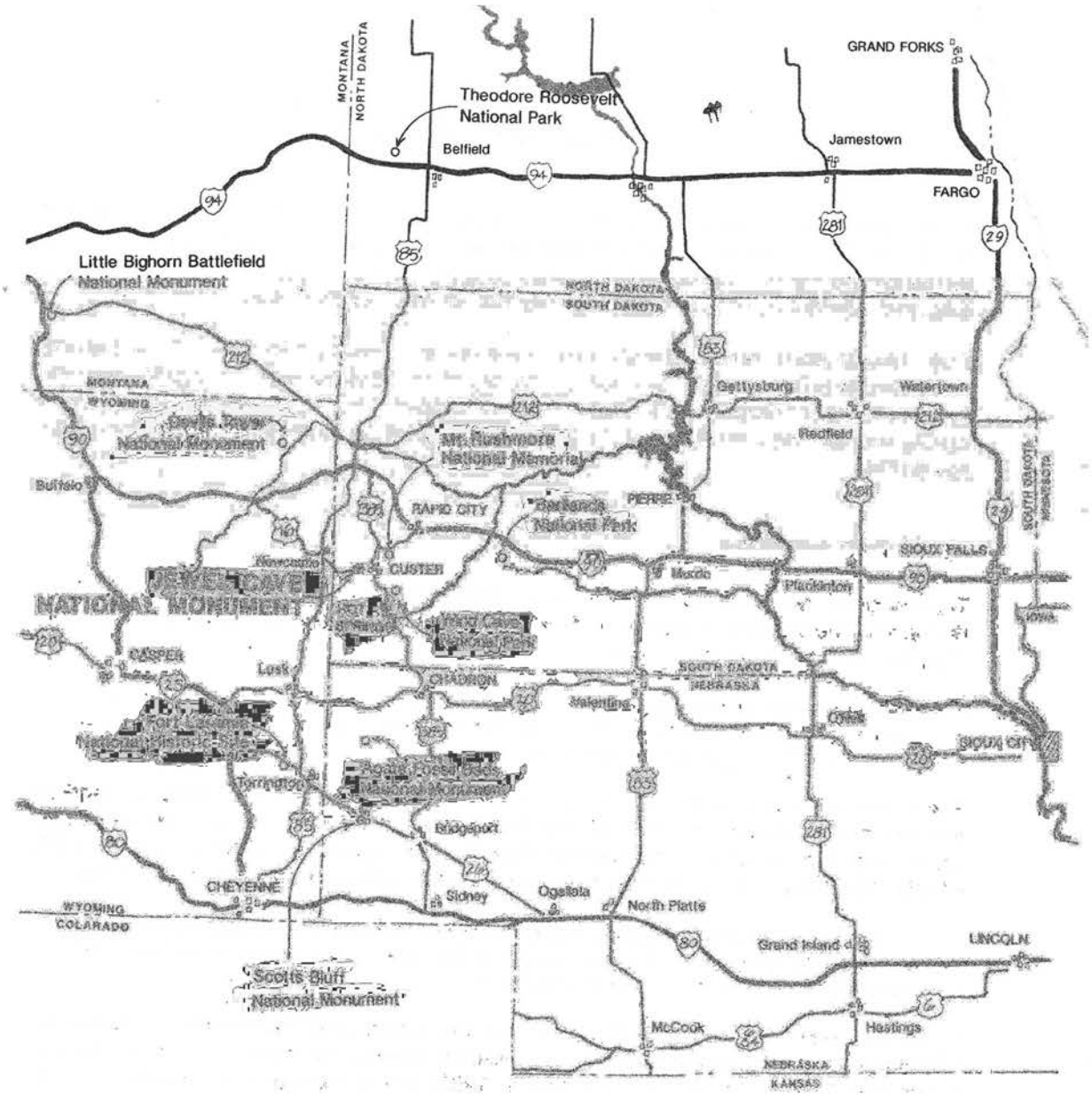


Figure 1.1: Regional Location (Source: *Jewel Cave National Monument General Management Plan and Environmental Impact Statement*, NPS drawing 146-20012-A-DSC-May 93)

Location

Jewel Cave National Monument is located in the southwest corner of South Dakota in Custer County and the Black Hills Region. The region includes a large amount of public land including the Black Hills National Forest (of which Buffalo Gap National Grassland is a portion), Pine Ridge Indian Reservation, Badlands National Park, Mount Rushmore National Memorial, Wind Cave National Park, and Devils Tower National Monument in Wyoming. In addition, the state of South Dakota administers the 73,000-acre Custer State Park. The scenic beauty of the area and extensive public lands provide wide ranging opportunities for outdoor recreation making the Black Hills a destination area for tourists.[3]

The Monument encompasses 1,273.51 acres and is surrounded by the Black Hills National Forest. The explored cave underlies the Monument surface area and extends into the adjacent Forest Service lands.[4] The historic area occupies approximately 10 acres in the northwest portion of the Monument.

[3] *Final General Management Plan and Environmental Impact Statement*, Jewel Cave National Monument, South Dakota, June 1994, 38.
[4] Ibid.

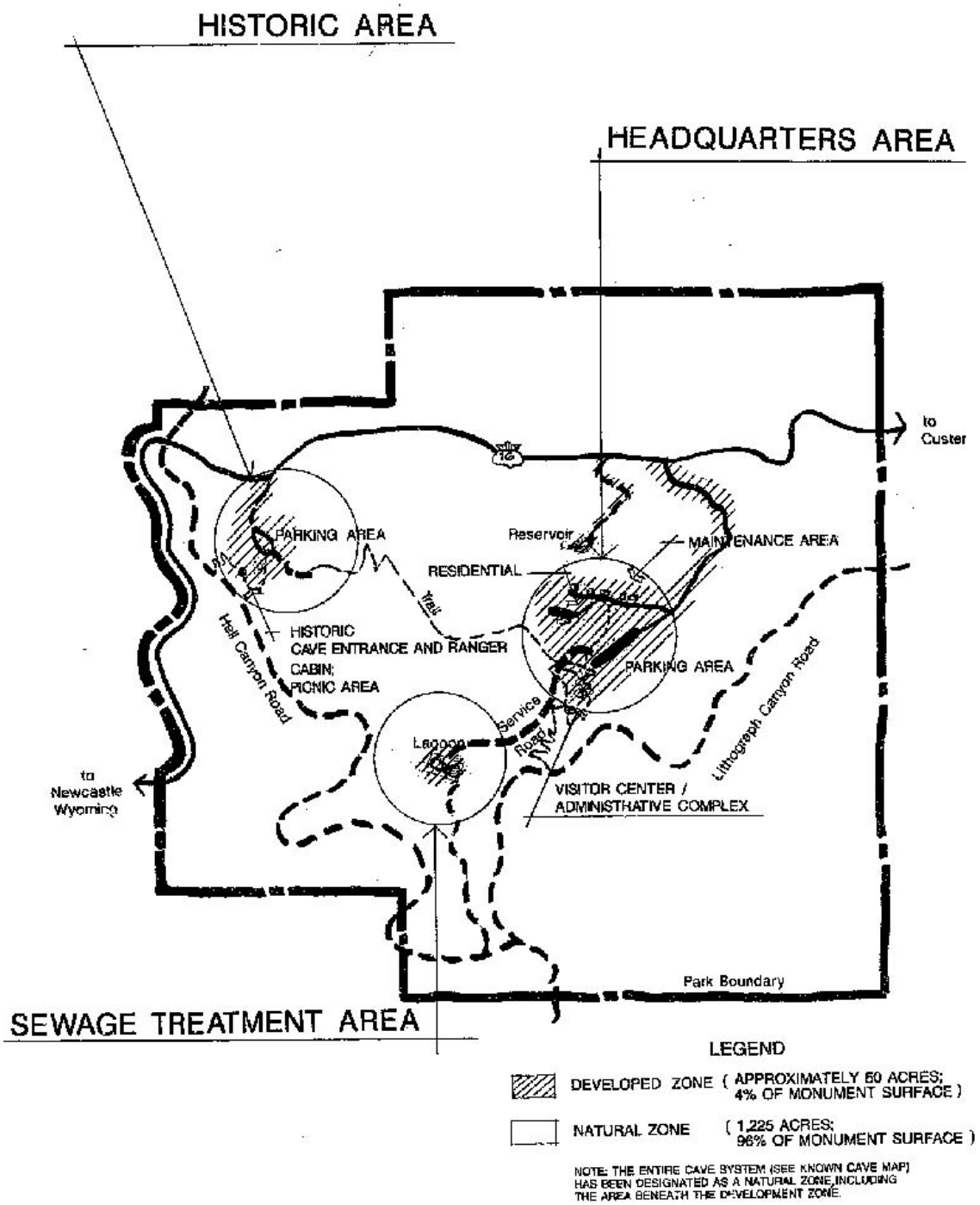


Figure 1.2: Current Park Boundary and Management Zones (Source: Jewel Cave GMP, NPS 000514.tif)

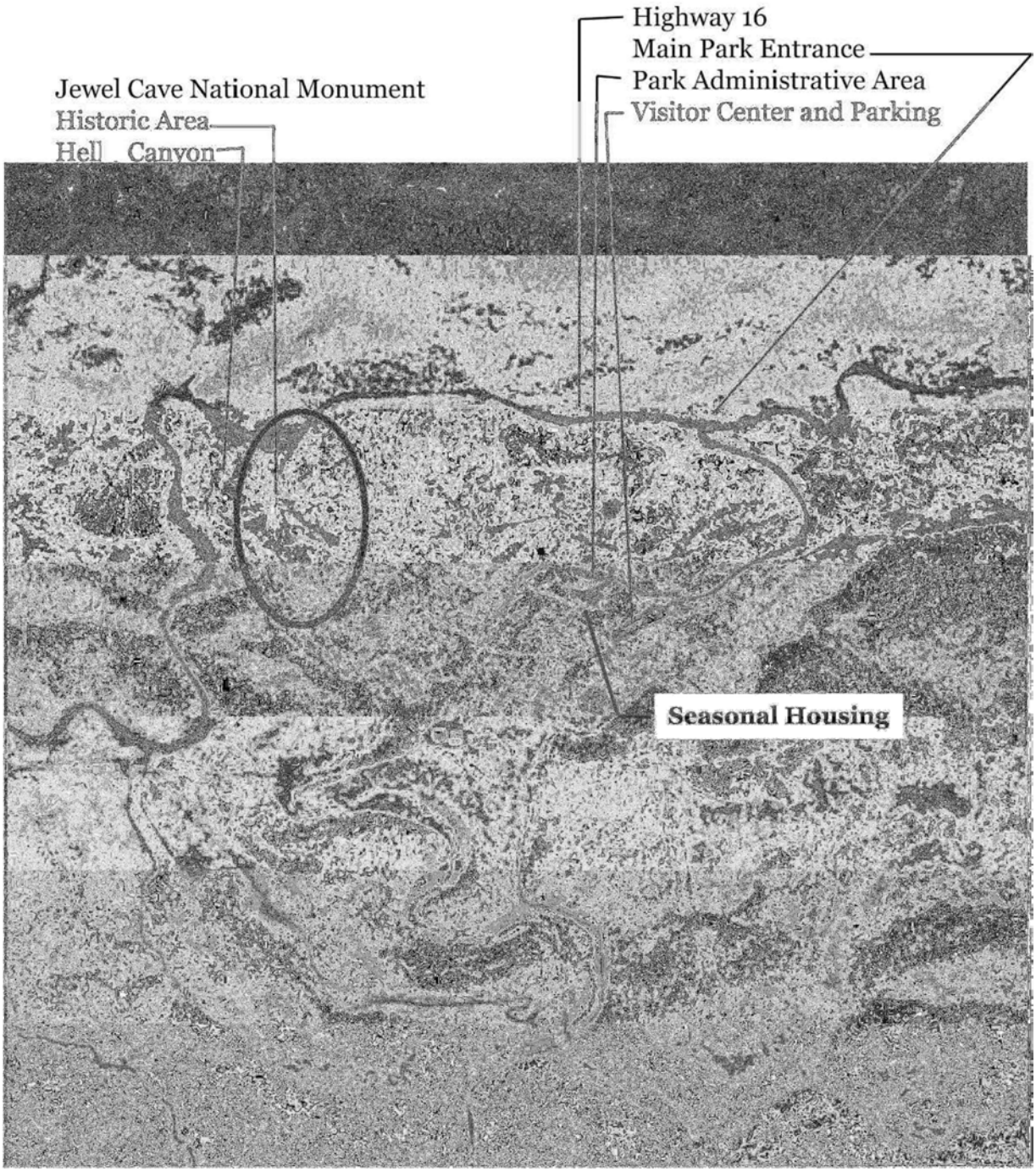


Figure 1.3: Aerial Photograph of Jewel Cave National Monument (Source: Jewel Cave National Monument, digital files)

Vehicular access is via U.S. 16. The Monument is 53 miles southwest of Rapid City, the largest city in the area (population of over 60,000 in 2000). The nearest city

is Custer, 15 miles east of Jewel Cave, with a population of 1,741. Newcastle, Wyoming, with a population of 3,649, is 24 miles west of Jewel Cave National Monument.

Relation to Other Planning Projects

A General Management Plan for the Monument was prepared in 1993. The plan directs that historic resources within the monument be evaluated according to the Secretary of the Interior's standards. The Historic Structures Report prepared for the Ranger Cabin in 1999 and the current CLR/EA are meant to fulfill that directive. Therefore, the CLR/EA is tiered from the GMP. The Historic Structures Report provides a basis for understanding the evolution of the Ranger Cabin and establishes a period of significance and management objectives for that structure. Other planning documents including the Resource Management Plan (1999), the Long Range Interpretive Plan (Draft November 2001, the final will be completed in 2004), the Fire Management Plan (Draft 2004), and the Cave and Karst Resource Management Plan (Draft to be completed in 2005), serve to inform the CLR/EA with background and management information. These documents, along with research conducted as part of this CLR/EA, guide the formation of the treatment alternatives and the analysis of their potential impacts.

In 1993 the United States Congress passed the Government Planning and Results Act (GPRA) to provide for the establishment of strategic planning and performance measurement in the Federal Government. To comply with the Act, the Monument has established a goal to restore approximately ½ acre in the former housing area. This includes removal of foreign materials (mainly gravel) in the previously developed area, grading to restore the former topography (this involves

removing materials from roads and housing sites and placing topsoil) and planting a native plant seed mix. The implementation of this project will depend on the recommendations of the CLR/EA. The recommended treatment plan provided herein supports the GPRA goal. The disturbance of the area occurred outside of the period of significance, and the remaining materials do not contribute to the integrity of the historic district. It is recommended that they be removed, and the topography and vegetation be returned as close as possible to their pre-disturbance conditions. More details about the recommended treatment are provided in Chapter VIII.

Issues and Concerns

The Jewel Cave Historic District contains the "original" or "historic" cave entrance that was discovered and enlarged around 1900. From 1933 until 1939 a number of federal relief projects were completed at the site, resulting in the development of an entrance road, log Ranger Cabin, pedestrian trail and stone stairs to the cave entrance, and other improvements. The character of the CCC-related developments established a rustic design quality that continues to exist today.

In 1972 when the "new" visitor center and administrative area of the park was opened, the historic area ceased to serve as the main visitor and operational center for the park. The former administrative, housing, and operations areas need to be regarded and revegetated. Revegetation is also necessary to repair damage to the historic area by the Jasper Fire of 2000.

The site is interpreted as a historic area whose relationship to the historic cave route is relayed by rangers during formal tours. Although visitors can access the site on their own during park operational hours, no passive interpretation is provided at the site. The current *Long Range Interpretive Plan* for the park recommends that the

historic area ultimately be accessed only by those visitors purchasing tickets for the historic cave tour. These visitors could be transported to the site in a shuttle. This could result in a reduction of visitor parking in the historic district and enhancement of the visitor experience.

The site includes a historic core consisting of extant resources with high integrity however visitor services need to be improved to enhance visitor experience in the historic district. The existing portable toilets should be removed and replaced with permanent toilet facilities. The potential for impact to cave resources needs to be a primary consideration in identifying the type of new facilities.

Visitors are sometimes confused about site orientation and pedestrian access throughout the historic district. Site orientation cues and on-site interpretive signage is minimal.

The State of South Dakota is in early deliberations regarding a potential realignment and/or widening of U.S. Highway 16. This highway is the access road to Jewel Cave National Monument and the historic district. Relocation and/or widening of U.S. Highway 16 could affect the entrance to the historic area and alter the amount of surface water runoff from the road.

Treatment for the Ranger Cabin (HS-1) has been previously addressed. A 1999 *Historic Structure Report* (HSR) prepared by Alan W. O'Bright addresses changes to the cabin over time, and provides alternative approaches to preserve the building. The 1999 report supplements a 1995 *Historic Structure Report* authored by Nancy MacMillian. Restoration to its circa 1940 appearance was selected as the most appropriate treatment for the building. In 2002 the Ranger Cabin was restored and repaired according to recommendations presented in O'Bright's HSR.

Additional information on landscape management issues are summarized in Chapter V: Management Philosophy and Management Issues.

Impact Topics Selected for Analysis

Cultural Resources

The environmental analysis process focuses on all cultural landscape elements and any proposed future landscape treatments. This includes not only the exterior conditions and finishes of the structures but also how they interact with the surrounding matrix of plant communities. Activities such as digging to install plant materials, regrading soil or other ground disturbing activities have the potential to disturb archaeological resources. Landscape characteristics addressed include natural systems and features, spatial organization, land use, circulation, topography, vegetation, and views.

Cave Resources

A subset of geology is the cave resource. Data supports that the cave is impacted by water entering the cave through fractures in the limestone from surface developments. Changes in water quality or water flow patterns and changes in humidity could affect geologic formations, microbiotic, and macrobiotic resources.

Surface Water Quality

Changes in the amount of cleared area, type of vegetative cover, or relocation of Highway 16 could change the absorptive capacity of the soil — and runoff/infiltration patterns, intensity, and duration -- which could impact water quality of springs in the vicinity of the historic area.

Wildlife and Threatened and Endangered Species

Cultural landscape treatments may affect wildlife in the historic area during the construction phase of the proposed landscape treatments. Noise from light construction equipment and potential disturbance from construction activities may affect wildlife movement. Landscape treatments would reintroduce native plant species that could benefit wildlife by providing increased shelter and food.

Visitor Experience

Visitors come to the Jewel Cave National Monument to experience the underground resources of one of the longest caves in the world. Visitors are also attracted to the historic area and participate in interpretive tours that enter through the historic cave entrance. Actions taken by the NPS at the historic area, including landscape treatments, could either contribute to or detract from the overall visitor experience.

In particular, the proposed shuttle access to the site would change visitors experience. If the shuttle is implemented it will provide a more controlled presentation of the history of the site as a whole to visitors. If vehicular access to the site is limited to the shuttle, only visitors who pay to take the historic cave tour will have the opportunity to visit the historic site. Also, visitors riding the shuttle to the historic site might not have an opportunity to explore the cultural landscape at their own pace, or linger to have a picnic. Since all visitors arriving by vehicle would be accompanied by NPS staff, this approach would reduce the potential impacts to the historic resources associated with visitor use or vandalism.

Socioeconomics

The use of a visitor shuttle from the Jewel Cave Visitor Center to the historic area may affect the local socioeconomic environment if a local vendor was given the opportunity to provide transportation services.

Solid Wastes

The two action alternatives would involve removal of asphalt from the road and parking area. Action alternatives would result in an increase in the waste stream to the regional landfill. The increase would only last as long as the duration of construction.

Utilities

Action alternatives taken at the Jewel Cave historic district would require improvements to the potable water supply to enhance visitor comfort.

Impact Topics Eliminated from Further Consideration

Floodplains and Wetlands

Floodplains and wetlands do not exist within the historic developed area at Jewel Cave National Monument. Natural Resource management treatment recommendations related to areas within the floodplain (Hell Canyon) would not require any changes to topography or the construction of new structures and would not impact the floodplain. Therefore, floodplains and wetlands were dismissed as impact topics.

Prime and Unique Farmland

There is no prime or unique farmland located on Jewel Cave National Monument. Therefore, prime and unique farmland was dismissed as an impact topic.

Regional Air Quality

Jewel Cave National Monument has been designated as a class II clean air area. The South Dakota Department of Air Quality recommended using Badlands National Park as the guide for air quality at Jewel Cave. A representative from the South Dakota Department of Air Quality stated that monitors at Badlands National Park show that air quality is typically well below National Ambient Air Quality Standards (NAAQS) (personal communication with Brad Schulz, 2004). In most instances the pollutant levels are approximately 50 percent below NAAQS. It is unlikely that any of the possible landscape treatments would generate any noticeable air emissions. Implementation of possible landscape treatments might result in emissions from light construction equipment. Equipment emissions would be limited to short periods of operation and only during construction activity. Therefore, regional air quality was dismissed as an impact topic.

Environmental Justice

Under a policy established by the Secretary of the Interior, to comply with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* departmental agencies should identify and evaluate, during the scoping and/or planning processes, any anticipated effects, direct or indirect, from the proposed project or action on minority and low-income populations and communities, including the equity of the distribution of the benefits and risks. Proposed treatment alternatives are not expected to cause any effects to minorities or low-income populations. Therefore environmental justice was dismissed as an impact topic.

Indian Trust Lands

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies by explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no American Indian trust resources at Jewel Cave National Monument. The Monument is not held in trust by the Secretary of the Interior for the benefit of American Indians. Therefore, American Indian trust resources was dismissed as an impact topic.

Ethnographic Resources

The nature of any of the possible cultural landscape treatments within the historic district is such that there would be no direct or indirect impact on tribal members or their lands. Additionally, there are no known Native American traditional cultural places or sacred sites associated with the historic area. Therefore, ethnographic resources was dismissed as an impact topic.

Museum Collections

Actions concerning the cultural landscape would have no impact on the curation of museum items associated with Jewel Cave National Monument. Therefore museum collections was dismissed as an impact topic.

Soundscape Management

In accordance with National Park Service *Management Policies* (2001) and Director's Order #47, *Sound Preservation and Noise Management*, an important part of the National Park Service mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and duration of human-caused sound considered acceptable vary among National Park Service units depending upon the level of surrounding development.

Currently, the major source of man-made noise in the historic area is from vehicles accelerating or decelerating on Highway 16, across Hell Canyon. Any construction equipment used in landscape work would result in human-caused sound; however, the noise impacts from construction operations would be for short periods of time and only last during construction. Following proposed construction activities the historic area would revert back to its existing soundscape; therefore soundscape management was dismissed as an impact topic.

Lightscape Management

In accordance with National Park Service *Management Policies* (2001), the National Park Service strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light. Any construction activities associated with landscape work would take place primarily during daylight hours and would not require any permanent lighting at the historic

area. The historic area would only be open to the public during daylight hours.

Therefore, lightscape management was dismissed as an impact topic.

Chapter II:
Site History

CHAPTER II: SITE HISTORY

This chapter presents a chronological history of the historic landscape at Jewel Cave National Monument, identifying each of the major periods of development and describing the evolution of the physical landscape. The discussion of each phase includes a narrative of the major events during the period.

Pre-Euro-American Settlement (Pre-1743)

The Black Hills served as a seasonal hunting area for Native Americans of the Middle Missouri River valley and the High and Northern plains cultures as early as 10,000 B.C. In addition to hunting, the abundant native stone was collected and manipulated for use as tools. Paleo-Indian camps have been documented at Hell Gap and Agate Basin that date between 10,000 and 5,000 B.C.

The McKean Complex people lived throughout the Plains during the Middle Archaic Period from 3,500 to 1,000 B.C. They hunted bison with projectile points and knives crafted from native stone. The Black Hills and Badlands continued to serve as seasonal hunting grounds during the Late Prehistoric Period (A.D. 200-1750) when ceramic production and the bow and arrow were introduced.

As Euro-American settlement pushed groups of indigenous people westward during the seventeenth and eighteenth century, the Kiowa, Crow, Ponca, Cheyenne, and Sioux continued to use the Black Hills seasonally. Since 1640, the Sioux Indians have been associated with the Black Hills through a series of treaties and the battle of

Little Big Horn. The Sioux believe that the landscape of the Black Hills is sacred, including the caves and hot springs.[1]

Early Exploration (1743 - 1860s)

Documentation of early European exploration in the Black Hills began in 1743 when a party led by Francois and Louis La Verendrye passed through the Black Hills. The French expedition moved throughout the region, seeking to explore and claim expansive western territories. When the Treaty of Paris was signed in 1763, Spain was temporarily given ownership to lands west of the Mississippi. France obtained title once again then transferred the land to the United States in 1803 as part of the Louisiana Purchase. The next year Lewis and Clark passed through the Black Hills, recording the area on their maps. Later explorers who skirted the northern portion of the Black Hills included the Astorian party in 1811 and the Hayden Expedition in 1854. When Hayden returned to gather physical and geological data on the Black Hills in 1857, he discovered and named Harney Peak.[2]

The Laramie Treaty of 1868 placed the Black Hills in the ownership of the Sioux, forbidding Euro-American use. However, the mineral resources of the region attracted attention and prospectors entered the area illegally. A United States military expedition discovered gold in the hills in 1874. The gold rush that immediately ensued resulted in mining claims, camps, placer mines, and crude roads that were established by prospectors on the Sioux land. The town of Custer was platted in 1875, making it

[1] Karsmizki, Kenneth W. *National Register of Historic Places Multiple Property Documentation Form for the Historic Resources at Jewel Cave National Monument*. United States Department of the Interior, National Park Service, 1993, 1-2.
[2] Ibid., 2.

the first town established in the Black Hills. It served as an important hub for early gold mining activities.[3]

By 1876 Custer City had a population of 11,000 and in 1877 the Sioux were forced to cede the Black Hills to the United States government. The discovery of rich lodes of gold in Deadwood Gulch in 1876 directed population and development activities to the Deadwood area.

Transportation routes in the region were developed to take advantage of the gold mining activities. During the 1870s and 1880s routes were established that connected the area with Cheyenne, Wyoming; Sydney, Nebraska; Yankton, Pierre and Chamberlain, South Dakota; and Bismarck and Dickinson, North Dakota. Rail service reached Pierre and Chamberlain in 1880.[4]

By 1886 the gold rush had faded. Ranching and farming were gaining prominence, and settlement was solidified by the arrival of the railroad in Rapid City from Chadron, Nebraska. Ranchers took advantage of the 1862 Homestead Act, the Timber Culture Act of 1873 and the Dessert Land Act of 1877, as well as available public domain grazing land to expand their holdings and sustain their livestock in the arid environment. Cattle and sheep were brought to the public domain land to graze throughout the 1870s and 1880s. The Jewel Cave vicinity remained largely unsettled, although maps from the late 19th century indicated ranches and homesteads of varying size and duration in the area.[5] The notes of a United States Deputy Surveyor who visited the area on 31 August 1896 indicate that the land was mountainous, with

[3] *Soil Survey of Custer and Pennington Counties*, Black Hills Parts, South Dakota, 3-4.
[4] Kenneth W. Karsmizki, 1993, 3. The Andreas Map (1884) reportedly shows a trail between Custer and Newcastle, Wyoming "Road to Jenny's Stockade" – its route lay just south of the present boundary of Jewel Cave National Monument. This would be the road that went down Lithograph Canyon.
[5] Ibid.

settlers located along the canyons. Although characterized by a scarcity of water, springs along the canyons allotted a limited supply. The description of the timber is impressive, being described as "...beautiful, an abundant growth of heavy pine timber ranging from 12" to 30" in diameter is to be found within the boundaries of this Township," and apparently the main reason for the recommendation that the Township should be subdivided.[6]

The Black Hills Forest Reserve and National Forest

The Forest Reserve Act of 1891 authorized Congress to withdraw timberlands from the public domain and to establish forest reserves by Presidential proclamation. The forest reserves were withheld from development but not actively managed by the government. Instead, they were simply treated as areas closed to use or extraction, and not made available to the public for any use. The earliest forest reserves were located in areas that were sparsely populated; their establishment went unchallenged.

On 2 February 1897 the Black Hills Forest Reserve was established by a proclamation by President Grover B. Cleveland, setting aside 960,680 acres of virgin timber lands in the Black Hills. The land was to be withheld from development and governed by the Department of the Interior, General Land Office.[7] The establishment of the Black Hills Forest Reserve in an area with a population dependent on the use of forest resources as a basis for the local economy resulted in controversy. Protests regarding the "disastrous effects" of the Reserve on the local economy led to an

[6] United States Deputy Surveyor, *Survey Notes*, Description of Boundaries of Township 4S, Range East of the Black Hills Meridian, 31 August 1896.
[7] Rom, Lance, Tim Church, and Michele Church, eds. *Black Hills Cultural Resources Overview, Volume 1, Synthetic Summary*. (Custer, South Dakota: USDA, Black Hills National Forest, 1996. Chapter 5, the Development of the Black Hills, includes a section on The Black Hills National Forest by Brad Noisat and Linea Sundstrom.

unsuccessful petition to President McKinley to abolish the Black Hills Reserve in March 1897. The controversy quickly led to the passage of the Pettigrew Amendment on 4 July 1897, which opened the forest reserves to development under the multiple-use concept. The Amendment provided that: "1) No new lands could be added to forest reserves except those needed to improve forests, to secure water flow, and to furnish continuous timber supply; 2) lands used primarily for mining and agriculture could not be added; 3) filing on forest reserve lands for mineral prospecting, mining, and related timber-cutting was permitted under the authority and administration of the Secretary of the Interior."[8] In effect, the Pettigrew Amendment ended the "protectionist" philosophy in Federal land management.

Timber consumption and mining were expanding in the Black Hills. Large companies required tremendous quantities of timber and were known to trespass on federal lands. The first large timber sale in a forest reserve, Case Number One, occurred in 1899. The transaction involved a 1,000 acre tract located in the Black Hills Forest Reserve. "This set a national precedence for sale of federal timber under conditions of regulated cutting …and marked the beginning of scientific forest management on federal lands in the U.S."[9] In 1905 the administration of all forest reserves was transferred to the Department of Agriculture, the Bureau of Forestry became the U.S. Forest Service, and the Black Hills Forest Reserve became the Black Hills National Forest. In 1910 President Taft created the Harney National Forest from lands in the Black Hills National Forest (Proc. 1124, 6 May 1910). The Harney National Forest consisted of the southern half of the lands formerly included in the

[8] Ibid., 5e-2.
[9] Ibid., 5e-9.

Black Hills National Forest and headquarters were established in Custer. The northern half of the forest, headquartered in Deadwood, retained the name Black Hills National Forest.[10]

The discovery of Wind Cave, and its promotion as a private tourist business beginning in the 1890s, set a precedent for the commercial and recreational development of natural resources in the region. By 1903, the need to protect the cave resources and provide access to the public was recognized. On 9 January 1903, 1,920 acres were removed from the Black Hills Forest Reserve to create Wind Cave National Park. Three years later the creation of Devils Tower National Monument on 24 September 1906 again required removal of land from the Forest Reserve. In February 1908, Jewel Cave National Monument was established and 1,273.51 acres were withdrawn form the Black Hills National Forest (as described above, this portion of the forest would be renamed the Harney National Forest two years later). The events leading up to the establishment of the Monument are described in the following narrative.

Discovery and Early Development of Jewel Cave (1900-1908)

The first known record of Jewel Cave was made by members of the Michaud family in 1900. Although there is some dispute regarding the actual date and participants in the discovery, a Placer and Water Rights Location Certificate (also referred to as "Location Certificate") filed at the office of the Register of Deeds of Custer County on 31 October 1900 indicates that the cave was discovered on 18

[10] Ibid., 5e-3.

September 1900.[11] The Location Certificate was filed by four men, Frank Michaud, Albert Michaud, Felix Michaud and Charles Bush. The mineral claim was necessary, since the site was situated on public domain land in the National Forest Reserve. The claim is also referred to as the Jewel Lode and the Jewel Tunnel Lode in some documents.

According to one account Frank and Albert Michaud made the discovery earlier that year, possibly in June. Reportedly, Charles Bush heard of the discovery on 8 July 1900 and quickly prepared to join the Michauds in the Black Hills.[12] All versions agree that the Michaud brothers were prospecting in Hell Canyon and inadvertently discovered the cave entrance:

> *They were letting themselves carefully down a chimney in the rocks and remarking the favorable character of the place for a cave, when one of them noticed a hole a couple of inches in diameter and called his brother's attention to it, saying: "There is the entrance to a cave." The brother began pulling away the earth with his hand when a strong current of air blew a cloud of dust in his face. They knew so strong a current could come only from an immense cavern, and that they had indeed discovered a cave of great extent.*[13]

After filing their claim, the group immediately set to work exploring the cave and building a road to provide an access route to the site for visitors. By 8 June the

[11] Office of the Register of Deeds, Custer County, South Dakota. *Placer and Water Rights Location Certificate*. 31 October 1900; Placer Record Book Y, 552. This document states that Jewel Cave was discovered on 18 September 1900 by Frank Michaud, Albert Michaud, Felix Michaud and Charles Bush.
[12] According to an interview he conducted with Marie Michaud Bogard, the youngest daughter of Francois Michaud (who was a brother of Felix Michaud and an uncle of Frank and Albert), a diary (Marie's?) told of a letter received on 8 July 1900 from Frank and Albert Michaud "telling in detail of a wonderful cave they had discovered in the Black Hills." "Marie remembered that Charles Bush (aka Charles Brusque) was there when the letter arrived and he was really excited and left for the Black Hills soon afterwards."
[13] Sanford, Rev. John I. *The Black Hills Souvenir: A Pictorial and Historic Description of the Black Hills*. Denver: The Williamson-Haffner Engraving Company, 1902, 218.

following spring, a road was complete.[14] The emphasis on providing access to the public at such an early date may be indicative of the desire to raise funds to support the development and exploration of the cave. In continuing efforts to encourage the public to visit the cave, a two-story log house (also referred to as a log hotel) was constructed to provide lodging for visitors. In 1902, the accommodations were described in Reverend John I. Sanford's *Black Hills Souvenir* as "…commodious… providing hospitable shelter for the visitor, who will ever cherish the memory of a visit to the romantic place." Sanford was obviously impressed with Jewel Cave. He suggested that the "great attraction," when fully developed, would "rival the great wonders of nature."[15] Another account agrees that by 1902, the "big log house was noble," a passable road had been constructed between the house and Lithograph Spring, and a "new entryway" to the cave had been excavated. The cave routes were explored and improved, and large timbers were installed and used as ladders.[16] The log house (hotel) was constructed of rough hewn logs on a stone foundation. Developments at the site also included a spring house, barn, road, and an enclosure adjacent to the cave entrance.[17] A conjectural period plan is illustrated in **Figure 2.1**. The two-story log hotel is illustrated in **Figures 2.2 and 2.3**.

[14] *The Custer Chronicle,* 8 June 1901, 1; and Michaud, Ira, *What I have Heard and Seen*, Michaud indicates that a road was built from Lithograph Spring, northwest to the junction between the location of the present main Monument access road and U.S. Highway 16, and then west, down the drainage to the hotel site.
[15] Rev. John I. Sanford, 1902, 218.
[16] Michaud, Ira. *Statement regarding the history of Jewel Cave.* Unpublished typed document located in the library at Jewel Cave National Monument. August 15, 1989. Ira Michaud was one of Frank Michaud's three sons. He spent his childhood exploring Jewel Cave with his father and brothers.
[17] Sheveland, Genna J. *A Level III (Intensive) Cultural Resource Survey of Jewel Cave National Monument*. Custer, South Dakota: United States Department of the Interior, National Park Service, 1998.

A unique approach to draw visitors was developed in 1902 when the Jewel Cave Dancing Club was organized. In the Fall of 1902 the club included 31 members, all of whom were men. The dances were held in the two story house (hotel) at Jewel Spring.[18]

Although the partners applied for a patent for their claim in 1902, they were never issued the title to the land.[19] A movement toward federal ownership of Jewel Cave began as early as the spring of 1903. In April of that year the United States government was reportedly considering making the cave a "national resort."[20]

By 1905 Charles Bush had moved to Orient, Iowa, and was no longer an active partner in the Jewel Cave project. The Michauds needed outside funding to buy out Bush's interest in the claim, and to support the cave development endeavor. Frank and Albert Michaud sold one-third of the Jewel Tunnel Claim to Bertha Cain, of St. Louis, Missouri, on 10 November 1905 for six hundred dollars.[21] On 27 November of the same year a Location Certificate Deed was filed by Frank Michaud, Albert Michaud, and Bertha Cain, describing the claim as relocated on 15 November 1905. The corrected description reflects the extended claim based on the cave explorations conducted. It is likely that this document was filed as a reaction to a claim filed by Henry Pilger on 2 October 1905. The document states:

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[18] 1902, Fall. Typed sheet listing 31 members of the Jewel Cave Dancing Club, organized 1902. A portion of the sheet indicates that dances were held in the two-story cabin at Jewel Spring. Eugene Akin, Horace Fowler, Vance Coe, and Albert Michaud are listed as officers of the club. It is believed that this two-story cabin is the same building as the two-story house/hotel referenced in other documents.
[19] Ira Michaud, 1989.
[20] *The Custer Chronicle, 4 April* 1903, 1. The article indicates that the United States was considering making the cave a "national resort." It advocates for the government to reimburse the owners if this happens, and lists Mr. Frank W. Michaud, Albert Michaud and Charles Bush as those whom presently claim the property.
[21] 1905, November 10: *Indenture*, Recorded by the Clerk of the Circuit Court of Custer County, South Dakota. Legal Records (note from sheet in file at Jewel Cave National Monument) .

> ...*150* feet running *Southerly* from said center of discovery shaft; said Lode within the lines of said Claim, in *no organized* Mining District, County of Custer, State of South Dakota. *Said Jewel Lode claim is located about 12 ½ miles from Custer and about 2 miles south of west from that town the south end of said claim being in Hells Canyon*.[22]

The next day an Indenture filed at the Custer County Circuit Court recorded the release of Charles Bush's rights to the Jewel Cave claim. Bush was paid three hundred dollars in exchange for his interest in the claim.[23]

In 1905, Frank Michaud and Mamie Reilly were married. By 1910 the family included three sons, Francis, Ira, and Joe. Two daughters, Mary and Marie, were eventually added to the family. The family home was located on Lightning Creek, six miles east of Jewel Cave. Throughout their childhoods, the children helped in the cave explorations and improvements. Ira Michaud relays tales of the materials used, and the practice structure their father constructed at the homestead. The practice structure was designed to help the children develop caving skills by practicing at home.[24]

The Michaud hotel site included several outbuildings and landscape features. In addition to the log house there was a "double-walled cache building" in the hillside, and other buildings. Also, in the front yard there was a vernacular rock sculpture that consisted of a "pyramid about seven feet high which contained many beautiful specimens very neatly arranged." The sculpture was named "Rocky," and included "so-called petrified moss from the warm waters of Fall River below Hot Springs," also there were "beautiful blue malachite from an old copper mine on lower French Creek,"

[22] 1905, November 27: *Location Certificate Deed* (Book 15 of Location Certificate Records, Page 114, in the office of the Register of Deeds of Custer County, South Dakota).
[23] 1905, November 28: *Mining Deed Record*. Indenture recorded by the Clerk of the Circuit Court of Custer County, South Dakota.

and "large pieces of quartz both in massive and crystal form." Also there were "pieces of petrified wood from the Badlands" and "large books of mica still imbedded in the pegmatite material." The pyramid was topped by the skeleton of the head and horns of a bighorn sheep. No photographs have been located of any of the structures at this site, with the exception of the log hotel.[25]

It appears that the expenses for developing the cave exceeded profits made from tourist visits. The Michaud brothers sold an additional one-sixth interest in the Jewel Lode Claim to Bertha Cain on 3 January 1906 for $300.[26] The Michauds continued to advertise the cave, indicating that a trail one and one-half miles long had been established through the cave by 1907. They offered tours for a nominal fee.[27]

As the Michauds continued to struggle to make ends meet, a movement to preserve the natural resources in and around Jewel Cave was set into motion. As early as 1905, area residents voiced concerns about the management of the cave.[28] The idea to have a federal game preserve established became popular. The Forest Service undertook a study to consider the idea, resulting in a report indicating that the "natural resources of the area were of significant economic value for ranching, homesteading, and timber harvesting, and that it would not be in the interest of the

[24] Ira Michaud, 1989.
[25] Ibid.
[26] 1906, January 3: *Indenture* recorded by the Clerk of the Circuit Court of Custer County, South Dakota. Indenture signed by Frank w. Michaud and Albert Michaud of Custer South Dakota, transferring 1/6th interest in the of the Jewel Lode Claim to Bertha Cain of St. Louis, Missouri, for $300. Legal Records (note from sheet in file at Jewel Cave National Monument)
[27] Kenneth W. Karsmizki, 1993, 4; and Ira Michaud, 1989. Karsmizki indicates that some specimens were removed from the cave and sold at Pilcher's drugstore. Michaud disputes this claim and indicates that some crystals were stolen from the cave.
[28] Kenneth W. Karsmizki, 1993, 5.

Forest Service or the locals to set a large tract of land aside as a game preserve." Instead, the report suggested that the area had sufficient scientific interest to warrant consideration as a National Monument.[29]

Creation of Jewel Cave National Monument (1908-1928)

Congress passed the Antiquities Act in June 1906, providing for the creation of national Monuments by proclamation of the President of the United States. The Monuments were meant to differ from previous federal land reservations with their focus on areas of historical, prehistoric, or scientific importance. They were to be no larger than necessary to protect the specific cultural or scientific values of concern. Having no single administrative overseeing agency, the Monuments were placed under the administration of the departments of Interior, Agriculture, or War, depending on their location. The Antiquities Act gave very little direction regarding the day-to-day management of the Monuments other than indicating that taking antiquities from federal lands was illegal, and authorizing a permit system to allow excavation of antiquities from within the Monuments for professional research purposes. This focus on research at national Monuments differed from an emphasis on tourism and public use characteristic of national parks, and resulted in many Monuments remaining inaccessible for years. Eventually however, the policies of limited use and strict preservation of the Monuments gave way to extensive recreational tourism development when funding and staffing were favorable. [30]

In February, 1908, a proclamation made by President Theodore Roosevelt created Jewel Cave National Monument. It was the first cave to become a National

[29] Ibid.
[30] Sellars, Richard West. *Preserving Nature in the National Parks: A History*. New Haven: Yale University Press, 1997, 13-14.

Monument and contained 1,273.51 acres from the Black Hills National Forest. Jewel Cave became one of the twenty-eight national Monuments created in the first five years after the Antiquities Act was passed. **Figure 2.4** illustrates the original Monument boundary. The opening paragraph of Presidential Proclamation 799 (35 Stat. 2180) stated that:

> *Whereas, the natural formation, known as the Jewel Cave… is of scientific interest and it appears that the public would be promoted by preserving this formation as a National Monument, with as much land as may be necessary for the proper protection thereof…*[31]

The Monument was placed under the management of the Forest Service, and in keeping with the times, was essentially ignored by the federal government for the next twenty-five years. **Figures 2.5** and **2.6** illustrate the location of the Monument within the boundaries of Harney National Forest. The map shows the locations of seven ranches (including Cramer's, Gillette's, Babcock's, Y4, Ninemile, Twelvemile, and LAK ranches), the State Forest and Game Preserve, Jewel Cave National Monument, roads and railroads. The road between Jewel Cave and Custer uses a route that passes by the Monument on the south. Mud Springs Road leads from the main east-west road north to the Monument. Hell Canyon is also illustrated, at the eastern side of the Monument.

The Michaud family continued to explore the cave independently until 1927 when a local business group, made up of members from both Custer and Newcastle,

[31] Presidential Proclamation 799 (35 Stat. 2180); cited in Long Range Interpretation Plan, Jewel Cave National Monument, November 2001, 6.

took over running the site until 1933. Ira Michaud (the second son of Frank and Mamie Michaud) recounts a story of strained relations between the family and the local business group. He suggests that they were treated as outsiders, and indicates that the "Custer group" wanted to gain control of the cave from the Michauds. Rumors were apparently spread indicating that the Michauds were conducting operations that would ruin the cave. Michaud indicates that "any mining of calcite crystal was purely a no-no, as their sole purpose was to preserve and protect the natural state of the cave." He also states that a small amount of material was removed from the cave to be used for a religious shrine, the Grotto of the Redemption, in West Bend, Iowa. He accounts that a specimen was shipped in about 1915 and the removal was "strictly supervised by my father," and "collected from remote side passages."[32] The shrine is extant and open to the public. No documentation regarding other sales of cave materials has been located.

In 1910 Albert Michaud left South Dakota, relinquishing his claim to the Jewel Lode to his brother Frank Michaud. Albert Michaud traveled to British Columbia, Canada, where he settled and eventually became a citizen of that country.[33] On 25 August 1911 a retracement and resurvey of Township No.4 South, Range No.2 East of the Black Hills Meridian was prepared by Wilbur S. Wills, a United States Surveyor. The surveyor recorded the following account:

> *The surface of this township varies from rolling land, in small areas, to rough, mountainous land.*

[32] Ira Michaud, 1989; a "Time-line of important dates for Jewel Cave" indicates that in 1910 Calcite from the cave was sold to build part of the Grotto of the Redemption in West Bend, Iowa. Information on the Grotto's website, www.westbendgrotto.com, indicates that work on the site began in 1912.
[33] 1928 June 23: *Affidavit* filed by Mamie Michaud "upon him so leaving he executed deed to his interest in the above mentioned Jewel Lode Claim to Frank W. Michaud, now deceased, above mentioned, but the said deed was destroyed by accident without having been recorded."

> *The mountainous land is covered with a good growth of pine timber of considerable value for the purposes of adjacent settlers, although not of a quality to give it much value for commercial purposes.*
>
> *The township is traversed by a number of drains and gulches, or canyons, and some of them are of considerable width and depth. A few water holes are to be found in these drains but, as a whole, the township is very poorly watered; the water even where found usually being of a very poor quality.*
>
> *The soil on the rolling land is of fair quality while the greater portion of the township is covered with a stony soil of no value for agricultural purposes.*
>
> *Although there are several cabins in the township, the owners are unknown and have abandoned their holdings, as the township is of value only for grazing purposes.*
>
> *There are two natural curiosities in the township. Coe Cave, near the north boundary of section 3, is unexplored. Jewel Cave, in the northeast quarter of section 2, has been extensively developed and explored.*[34]

This surveyor's statement provides an interesting description of the area on one day in 1911, and provides hints regarding conditions and use in the time preceding his account. Longer-term observations of the area indicate variations in climate and conditions. Oral tradition relates a story of a perennial stream in Hell Canyon during the 1920s that flowed past the Jewel Cave entrance before disappearing into the limestone bedrock. In the 1980s, Hell Canyon had been dry for decades. In 1995, clear potable water began to flow through the Canyon a few months each spring. From ca. 1997 through ca. 1999, water flowed year round. Since then, water has flowed only during spring thaw and during flash floods subsequent to the Jasper Fire of 2000.[35]

[34] 1911, August 25: *Field Notes of the Retracement and Resurvey of the South Boundary, and Survey of the Subdivision Lines of Township No.4 South, of Range No. 2 East of the Black Hills Meridian in the State of South Dakota*, prepared by Wilbur S. Wills, U.S. Surveyor.
[35] *Personal communication*, Mike Wiles, Cave Specialist, Jewel Cave National Monument, 2004.

A 1916 map (**Figure 2.**7) of mineral claims within Harney National Forest was the first to indicate the locations of a road and three buildings associated with the Michaud development. In 1926 Frank W. Michaud died leaving as his heirs his widow, Mamie Michaud and his children, Francis, Ira, Joe, Mary, and Marie Michaud.[36]

By the time a photograph was taken of the cave entrance ca.1916, the new entrance had been enlarged to the size of a typical doorway (see **Figures 2.8** through **2.11**). The sides and top were supported with wood posts and a beam, and large stones were carefully situated to reinforce the doorway structure. A short trail extended to the south approximately thirty to forty feet from the opening. The trail is defined by horizontal logs along its western edge. The logs likely served as a safety warning for visitors, since the adjoining slope was extremely steep. A pile of stones on the slope appear to be a retaining wall constructed to support the path. Although they could simply be a pile of rocks removed from the cave, the uniform size of the stones, and their neat, linear pattern indicate an organized design. At the southern-most end of the path a set of wood steps lead up the steep rock outcrop. The trail just described appears to be the only one present at the time. **Figure 2.12** provides a conjectural period plan for 1908 through 1928 illustrating the elements documented to exist at the site.

Management by the Jewel Cave Corporation (1928 – 1933)

The spring of 1928 brought new management and developments to Jewel Cave. On 26 April 1928, thirty-eight members of the Custer Commercial Club attended a Lions Club meeting in Newcastle, Wyoming, to discuss opening Jewel Cave to the public. There was no member of the Michaud family enumerated in the list of meeting

[36] Mamie Michaud, 1928.

attendees. After discussing the appeal that the cave would have to potential visitors, and the minimal expenditures that would be necessary to open the cave to tourists, the groups agreed to work together to: secure a lease from the Forest Service; make improvements to the Hell Canyon road; construct a road to the cave entrance; and develop tourist routes through the cave. **Figure 2.13** shows roads in the area including a road in Lithograph Canyon that was met at Lithograph Spring by a road that extended to Jewel Cave. The current highway alignment is north of this road. Also, Mud Springs Road is shown running north/south through the Monument.

The Forest Service agreed to issue a free special use permit to the organizations for the cave, providing that the claim of the Michaud Brothers be addressed. The Jewel Cave Corporation was organized and individuals purchased stock for $25.00 per share. The money was collected for the purpose of installing ladders, settling the Michaud's claim, and providing a guide for the first season.[37]

In June, two months after the meeting in Newcastle, Mrs. Mamie Michaud (Frank Michaud's widow) filed an affidavit establishing herself as the sole owner of the Jewel Lode Claim.[38] Shortly after that, the Jewel Cave Corporation purchased the claim from Mrs. Michaud, and obtained a lease from the government for about one square mile of land.[39] By the end of June the committee appointed by the Commercial Club had already started work on the development of Jewel Cave and the improved

[37] 1929, November 18: Toll, Roger W. *Report to The Director*, National Park Service, on Jewel Cave National Monument.
[38] Mamie Michaud, 1928. Frank Michaud's widow Mamie Michaud establishes herself as the sole owner of the Jewel Lode Claim.
[39] *The Custer Chronicle,* September 20, 1928, 1*;* and Roger W. Toll, 1929. Toll indicates that the Michauds were paid $750 for their claim, $500 in 1928 and $250 in 1929.

highway would soon be open between Newcastle and Custer.[40] **Figure 2.14** illustrates the area indicating the location of Jewel Cave National Monument, the city of Custer, two schools, numerous roads, springs, and creeks, two mines, and nine ranches (including Smith's, Y4, Ninemile, Belmore's, McKinney, Forah's, Tibb's, Richarson, and Collin's ranch) situated between Custer and Jewel Cave.

By the middle of July, 1928, Jewel Cave was informally opened to the public. The road between Custer and Newcastle was complete, and improvements within the cave had reportedly created a "safe and comfortable" passageway for visitors to traverse, "without getting lower than stooping your head and shoulders, through about a mile of passages." "Strong" staircases had been constructed inside the cave where needed to provide easy passage, loose rock and dirt removed, and passages between rooms made larger, all to appeal to visitors. Trained guides were available between 10:00am and 2:00pm to lead tours at the cost of twenty-five cents per person. Potential visitors were encouraged to bring a picnic lunch, or to enjoy the free and "ideal camping grounds" that surrounded the cave.[41] The main focus was on physical improvements during 1928. Despite minimal advertisement, 834 people took the cave tour that year.[42]

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[40] *The Custer Chronicle,* June 28, 1928, 1. The article states that the committee appointed by the Commercial Club had already started work on the development to Jewel Cave. "Passageways are being cleared and some of the most beautiful sights are being disclosed," also, "Work will first be done on the west side of the cave entrance, and it will take only a short time to clear passageways on that side, after which the other branch will be opened. The latter route is probably the most beautiful of all the caves in any National Park. Milky River is one of the greatest curiosities and the wonderful stalactites and stalagmites, vari-colored, are most attractive. The highway being constructed both from Newcastle and from Custer will soon permit uninterrupted travel. A meeting with the Newcastle club which has joined with us in promoting the Cave, will be held soon." The writer of this article has mistaken the left branch for one running to the west, when it actually goes north. This is known as the "Dungeon Room" route. Also, it is unclear if the highway referred to was the historic route to the cave, or another route.
[41] *Jewel Cave Open to Visitors*. The News Letter, July 26, 1928, 1.
[42] *The Custer Chronicle,* September 20, 1928, 1.

According to one account, a one and one-half mile rough road from the Custer-Newcastle highway to the cave entrance was constructed. By October 1929, this road ended within about a hundred yards of the mouth of the cave, at a location approximately sixty feet *below* the entrance to the cave. This is the only reference to a road approaching from below the cave entrance. It is possible that the road utilized an alignment in the location of the current Hell Canyon Road that extended from the south toward the cave entrance. **Figure 2.15** is a conjectural plan for the period between 1928 through 1933.

In 1929, 2200 visitors paid fifty cents to take the cave tour. The fifty-cent fee covered improvements and running expenses. The entrance fee was allowed by the National Park Service, so long as the surplus was allotted to improvements.[43]

When Roger W. Toll, then Superintendent of Yellowstone National Park, visited Jewel Cave on 20 October 1929, Mr. Anton J. Snyder, Superintendent of Wind Cave National Park, accompanied him. After taking the cave tour Toll concluded that the cave was of "local and state-wide importance rather than of national interest." He indicated that while the cave had extensive beautiful formations, the crystals could "hardly hold the continued interest of visitors, to the same extent as 'drip formations," found in other caves.[44] Despite Toll's less than enthusiastic report, Jewel Cave was eventually transferred to the management of the National Park Service. On 10 June 1933, Executive Order 6166 transferred the administration of all previously designated

[43]Roger W. Toll, November 18, 1929. The cave entrance was reportedly at an elevation of 5,289 feet above sea level.
[44] Ibid.

national Monuments from the United States Forest Service to the National Park Service.[45]

NPS Planning and Design during the 1920s, the Rustic Design Style

By 1917, a "unique American style of landscape design based on indigenous plant materials and naturalistic principles of design" was emerging. This design ethic is commonly referred to as the rustic style and is applied to the treatment of landscapes, structures, and other design elements. Based on the mainstream principles and practices of the American landscape design profession, an emphasis was placed on "subordinating development to natural character and scenic values." Harmonization of constructed improvements with the natural setting and topography was stressed to preserve and enhance natural character using informal naturalistic design elements. The style's practitioners emphasized preservation of existing rock formations and vegetation, planting of native vegetation, creation of naturalistic rockwork, development of vistas and viewpoints, and construction of rustic shelters.[46]

In the Midwest, Wilhelm Miller, an advocate for the works of landscape architects O.C. Simonds and Jens Jensen, coined the term 'prairie style' to define a new approach to landscape design. Miller attributed the origins of this new design style to Simonds.

Miller credited Jens Jensen with the idea of using the prairie as the inspiration for the landscape design style. "Jensen, inspired by the natural beauty of the Midwest, incorporated fields of wildflowers and used natural and naturalistic features such as waterfalls, brooks, streams, and lakes in his work." Jensen was a conservationist who

[45] McClelland, Linda Flint. *Building the National Parks: Historic Landscape Design and Construction.* Baltimore: The Johns Hopkins University Press, 1998, 328.
[46] Ibid., 328 and 17-18.

worked to preserve areas of historic and scenic interest. He believed that providing urban park visitors with a "vivid out-of-doors experience" would foster in them an "appreciation of nature through assimilated versions of the wilderness." Jensen and other landscape architects working in the Prairie landscape style "shared the same appreciation and idealization of the midwestern landscape as the architects of the Prairie style of architecture, Frank Lloyd Wright, Walter Burley Griffin, Dwight H. Perkins, Marion Mahoney, and Robert Spencer." The shared ideals and close working relationships between architects and landscape architects led to a "unity of architecture and landscape" in the Prairie style.[47]

On the west coast, a California style of gardening was emerging that "used plants native to specific climatic zones within the state." The style was practiced on a residential scale and publicized by Eugene O. Murmann, whose designs also utilized the principles of the Arts and Crafts movement by using native materials and striving to create unity between structures and the natural setting.

Thomas Chalmers Vint became the chief landscape architect for the newly organized NPS Landscape Division in 1927 and at the same time "assumed official responsibility over the location, character, and quality of all park construction."[48] Vint embraced this role describing the work of his division:

> The work of the Landscape Division . . . is a different character than the general practice of the landscape profession. Although landscape work predominates in the work, it merges into the field of architecture. We have little use for landscape men whose experience is limited to the planting of shrubbery and allied to landscape work. There is little planting done within the National Parks and what is done is limited to the transplanting of native shrubs and trees, so the general commercial stock is not used. The

[47] Ibid., 61-66.
[48] Ibid., 197.

> work has to do with the preservation of the native landscape and involves the location and construction of communities, buildings, etc. within an existing landscape.[49]

Under the direction of Vint the NPS landscape program expanded into a process of park planning and development focused on rustic style principles emphasizing landscape preservation and harmonious design.[50] The rustic design style was embraced and developed by the National Park Service into a rustic park design style.

Support for the design ethic was widespread. In 1938 Arno B. Cammerer, Director of the National Park Service, emphasized the link between preservation of natural beauty and the development of facilities within National Parks.

> *In any area in which the preservation of the beauty of Nature is a primary purpose, every proposed modification of the natural landscape, whether it be by construction of a road or erection of a shelter, deserves to be most thoughtfully considered. A basic objective of those who are entrusted with development of such areas for the human uses for which they are established is, it seems to me, to hold these modifications to a minimum and so to design them that, besides being attractive to look upon, they appear to belong to and be a part of their settings.*[51]

The elements constructed as implementations of the rustic park design style established a durable "visual identity for national and state parks and reflected an

[49] Job Analysis, Assistant Landscape Architect, n.d., ca. June 1928, Record Group 79, National Archives, Washington, D.C. This quote was cited in McClelland, 1998, 199.
[50] Linda Flint McClelland, 1998, 196.
[51] Good, Albert H. 1999. *Park and Recreation Structures.* (New York: Princeton Architectural Press, a reprint of the 1938 edition published by the United States Department of the Interior, National Park Service), foreword to the original edition by Arno B. Cammerer, then director of the National Park Service, VII.

equally robust sense of purpose for the parks."[52] This style was advanced by the large-scale implementation of projects by the CCC during the 1930s.

CCC Design Approach During the 1930s

Projects funded by the PWA emphasized construction however, the work had a "strong relationship to the landscape design of the parks."[53] The projects were based on master plans that focused on the broader issues of site development and principles for landscape protection and harmonization of park development. Also, many individual functional structures, including comfort stations, privys, roads, and maintenance buildings, became important landscape features. Designs for the western division were produced by the Branch of Plans and Design, under the direction of Thomas Vint, in the San Francisco office. Designs and working drawings for western parks, including Jewel Cave, were prepared by the San Francisco office.

The National Park Service utilized PWA funds for a wide variety of construction projects including patrol cabins, fire lookouts, gates, steps, utility systems and visitor facilities. From 1933 to 1937 the Western Division received 185 PWA allotments. The emphasis for these projects was placed on "principles of landscape protection and harmonious design."[54]

[52] Ibid., foreword to the 1999 edition by Randall J. Biallas, Chief Historical Architect, National Park Service, i.
[53] Linda Flint McClelland, 1998, 330-333.
[54] Ibid.

National Park Service Management and Federal Relief Development Projects at Jewel Cave (1933-1939)

Jewel Cave began a new era in 1933. Its newly appointed administering agency, the National Park Service, took a different approach to managing lands than the Forest Service. Since its creation in 1916 the National Park Service had focused on its mission to "conserve the scenery and the natural and historic objects and the wild life therein and… provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."[55] The recreation and enjoyment of visitors was placed on an equal level with the conservation of resources.

Since its designation as a national Monument in 1908, Jewel Cave had received practically no federal funding or federally-directed management. In fact, the only Federal activity that involved the Monument during its first twenty-five years of existence was the granting of a request by the Jewel Cave Corporation for a lease to develop and promote the property. Two major events occurred in 1933 that brought an influx of governmental attention to the site. By shifting management from the Forest Service to the National Park Service, the wheels were set in motion for more emphasis to be placed on providing access and amenities for visitors to the Monument. Also, beginning in the spring of 1933, New Deal programs were authorized throughout the nation making possible the development and improvement of national parks at an unprecedented level.[56]

[55] Ibid., 1.
[56] Ibid., 327.

The effect at Jewel Cave was immediate. By July 1933, a federally funded project referred to as the "Custer-Wind Cave park approach roads," was underway. The project involved widening, re-grading, and surfacing Highway 16, providing a comfortable route to Jewel Cave from Custer and Newcastle.[57] Illustrations of Hell Canyon before and during the construction of Highway 16 are provided in **Figures 2.16** through **2.22**.

During the summer of 1934, Emergency Conservation Work (ECW) Company 2754, Camp NP-1 was established at Wind Cave National Park. During the next year crews from the Wind Cave camp undertook projects at Jewel Cave. The ECW was the predecessor of the Civilian Conservation Corps (CCC). The workers traveled back and forth between the two sites each day until a side camp was set up at Jewel Cave.[58]

On 20 May 1935 a "spur camp" or "side camp" from the Wind Cave ECW camp was established at Jewel Cave.[59] The side camp was located near the site of the current parking lot at the historic area (see **Figures 2.23 – 2.25**). A park road followed roughly the alignment of the existing road, with a loop at the southern end. A tent located to the south of the loop in the road served as housing for the park ranger. A pedestrian trail led from the ranger's tent to the loop road, then continued in a winding pattern toward the south west, then made a sharp curve near the site of the proposed Ranger Cabin, and continued northwest to the cave entrance. Another trail led from the cave entrance down to Hell Canyon, including stairs.

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[57] *The News Letter,* July 6, 1933, 1. "New Highway By Jewel Cave Will Be Opened For Travel By Middle of July: Work on Newcastle-Custer Road in South Dakota Progressing Rapidly in Forest Section." The road improvements were made through contracts with private highway contractors.
[58] Kenneth W. Karsmizki, 1993, 6. (Karsmizki indicates that the camp was established at WICA in July 1934).

The Michaud hotel and associated structures were demolished by the ECW in 1934. The buildings were reportedly burned and the remains removed from the area to an unspecified location.[60]

By June 1935 a 2-inch pipe line had been installed from the spring to a "reservoir site" with a branch line to the side camp.[61] **Figure 2.24** illustrates the locations of the CCC side camp, the ranger's tent, the proposed cabin site, and a drinking fountain near the "existing trail" leading to the cave entrance. Although the drinking fountain is referred to, its location is not indicated on the plan. It is possible that it was never installed. Work continued on the reservoir through January 1936 when the 3,000 gallon capacity reinforced concrete structure was completed and "back filling and landscaping were completed to make this reservoir almost invisible." Work began immediately on constructing a cesspool and sewer system that was completed in January.[62]

In 1935 the Jewel Cave ECW crew constructed a rustic log Ranger Cabin for use as an administrative office building. The cabin was placed on the National Register of Historic Places in April 1995. It has had several names, including Ranger Cabin, Old Administrative Office Building, Ranger Station, Building No.1, and Residence No.1.[63] In this report it is referred to as the Ranger Cabin. It initially provided office space and living quarters for a temporary ranger to be stationed at the park during the

[59] Evans-Hatch, Michael, unpublished notes, part of research for a Historic Resource Study for Jewel Cave National Monument, 2004, 1. Notes from 5 June 1935, "Report to the Director, National Park Service" from the Superintendent of Wind Cave National Park.
[60] Ira Michaud, 1989.
[61] Evans-Hatch, Michael, unpublished notes prepared for the National Park Service as part of a Historic Resource Study for Jewel Cave National Monument, 2004, 1.
[62] Ibid.
[63] O'Bright, Alan W. *Rugged Charm: Ranger Cabin (HS-1) Historic Structure Report, Jewel Cave National Monument*, 1999, 18.

summer months. Although the log structure was erected in 1935, the interior finishes were not completed until sometime in 1938. The log joint daubing and interior finishes were delayed until the logs had time to season. The cabin was probably occupied quickly after its completion, and it appears to have been operational as an administrative office during the summer season of 1938.[64] During the summer of 1936 the crew spent several days transplanting shrubs around the Ranger Cabin.[65] The 1999 *Historic Structure Report* for the cabin provides a complete history of changes made to the interior and exterior of the building.

The Ranger Cabin included a living room/office, kitchen, storage closet, bedroom, bathroom, public restrooms (with separate exterior entrances for men and women), and porch. The cabin was occupied as an office/residence from ca. 1938 through the late 1950s. Only minor changes were made to the structure until the 1980s when repairs included extensive interior alterations. The public restrooms are notable in that they appear to be the only permanent public sanitary facilities to have served the area since the cabin was constructed. No privies are indicated on any of the plans for the site.

In November 1935 a barracks and mess hall were moved from Wind Cave to the Jewel Cave side camp to be used by workers at the site. The barracks had toilet facilities, a wash room and showers by January of 1936.[66]

In addition to the water system and the Ranger Cabin, the CCC crew constructed an eight-hundred foot long trail that led from the entrance road to the Ranger Cabin and the cave entrance. One hundred yards of dirt and gravel fill were

[64] Ibid., 18-19.
[65] Evans-Hatch, Michael, unpublished notes, 2004, 2.
[66] Ibid., 1.

placed along the shoulder of the trail in January 1936. During the following summer an iron gate was installed at the cave entrance and the "old ramshackle buildings" at the cave entrance were removed.[67]

Construction drawings for "Jewel Cave National Monument, Proposed Foot Trail and Masonry Steps, Headquarters" were approved in November 1935 (see **Figure 2.28**). The plan indicates the location of an existing trail to the cave entrance, and the proposed trail, which roughly follows the route of the extant trail. The trail existing in 1935 approached the cave entrance more directly from the east, ending in a set of wood steps adjacent to the southeastern side of the cave entrance (see **Figure 2.29**). The trail also continued down toward the west. The plan also indicates that the ranger's tent was located in the general vicinity of the former campground, and the proposed location of the Ranger Cabin (administrative building) is shown. The building was constructed soon after this drawing was approved (see **Figures 2.31-2.34**).

In February 1936 a survey was made of the cave trails and notes of the survey were prepared by assistant engineer Wohlbrandt.[68] The crew surveyed the cave passageways and made preparations for "slight improvements" to the cave trails (see **Figure 2.26**).

During 1937 a gravel trail was constructed between the parking area, the Ranger Cabin, and the cave entrance.[69] In June 1938 the need for stairs to "overcome the change in elevation along the trail leading from the Custodian's Residence to the

[67] Ibid., 1-2.
[68] Ibid.
[69] Kenneth W. Karsmizki, 1993. Karsmizki cites NA, RG79, Monthly Narrative Report, S. Serrano, May 20 to June 20, 1937.

Cave entrance," was cited in a field trip report.[70] In July a monthly narrative report mentioned that fill used in the area near the cave entrance was obtained from the highway construction project, and that "top soil, duff, and planting material" were to be used to bring the "slope to a natural condition" (see **Figure 2.30**).[71]

This approach was in accordance with the NPS treatment of road banks and steep slopes. "Though many slopes quickly reverted to natural conditions, erosion on newly cut and shaped slopes was a constant concern. At the same time that Vint's staff was developing ways to blend road banks into the scenery by rounding and flattening the slopes, they became interested in the possibilities of speeding up and controlling the process of revegetation by planting or sodding the finished slopes. Practical concerns about erosion, maintenance, and visibility were coupled with an interest in returning the roadsides to a scenic and naturalistic appearance. Planting roadsides added to their beauty and created a pleasing sequence of effects, particularly where there were no distant views."[72]

A second construction drawing for "Stone Trail Steps" along the cave trail was prepared by C.D. Carter of the Region II Branch of Plans and Design and approved by the Regional Landscape Architect, Howard W. Baker, the Coordinating Superintendent, Harry J. Liek, and the Regional Director, in mid-September 1939.[73] This plan indicates that a set of wooden steps were present, and that the masonry steps approved in 1935 were never constructed. The 1939 drawing reveals some interesting details of the design of the steps (see **Figure 2.27**). Notes regarding the hand-placement of native sandstone rocks, and shaping of the stone steps to respond

[70] Ibid., Cites NA, RG79, Field Trip report June 4 to 23, 1938.
[71] Ibid., Cites NA RG79, Monthly Narrative Report, Lloyd Fletcher July 20 to August 20, 1938.
[72] Linda Flint McClelland, 1998, 207.

to the native rock walls, indicate the influence of a skilled designer who was sensitive to the aesthetic qualities of the indigenous materials, and the inherent beauty of the natural rock crevice. The design directed that a dead tree lying over the trail not be disturbed and existing trees become integral features along the trail's edge. On 30 September 1939, the Wind Cave CCC camp was disbanded.[74]

The First NPS Master Plan for Jewel Cave (1940 – 1956)

NPS Design Approach during the 1940s

The approach used for planning at Jewel Cave mirrored that of the NPS nation-wide, and presents an excellent example of the applications of changing NPS planning and design philosophies. As the value of recreation to American life and the relationship between conservation and recreation became solidified, public administrators, park designers, and landscape architects responded in their planning approach. As the number of parks increased, and their accessibility and visitor services improved, visitation in national parks grew tremendously in the late 1930s.[75] The federal stance on the relationship of conservation and recreation held that "conservation for recreation is conservation in its broadest aspects," since it was seen to preserve both the intrinsic values of areas of scenic, scientific, and historic importance, as well as providing for the "proper use of these values to meet human requirements."[76] Planning was viewed as "critical to successful park design, and natural areas required that design be subservient to the natural character of an area

[73] The park was in Region Two in 1939. It is now in the Midwest Region.
[74] *National Park Service News Release*, April 10, 1936.
[75] Linda Flint McClelland, 1998, 455.
[76] Ibid. McClelland cites Paul V. McNutt, "Conservation for Recreation: The Landscape Architect as Land Use Planner in Public Works," *Landscape Architecture* 30, no.4 (1940): 174.

and that the work of the landscape designer be simple, understated, and naturalistic."[77]

1942 Master Plan

The first Master Plan for Jewel Cave National Monument was prepared in 1942 (**Figures 2.37-2.39**). The plan directly reflected the then-current NPS philosophy of providing increased recreational facilities and development at the site. The master plan included a new campground for visitors, and increased facilities for employee housing, administration, and maintenance. A conjectural Historic Period Plan for 1940 through 1956 is illustrated in **Figure 2.41**.

A field survey conducted in October 1942 resulted in the production of a topographic map illustrating existing site conditions. It includes the sizes of trees in the area between the parking lot and the Ranger Cabin, as well as along the first portion of the trail to the cave entrance (see **Figure 2.36**). The plan indicates that a trail approached the Ranger Cabin from the parking lot, then continued to the southeast toward the cave entrance. At the Ranger Cabin (administration building) the trail included three side paths. One led to the front door, the second led to the door to the women's toilet room, and the third led to the men's toilet room. The drawing also indicates the location of the parking area, to the northeast of the cabin and trail.

A 1942 Headquarters Area Plan (**Figure 2.38**) indicates that a utility area including one permanent employee's residence, a storage building, a fire equipment building, and outdoor utility use area were planned for a site southeast of the Ranger

[77] Linda Flint McClelland, 1998, 455.

Cabin. The campground had seven spaces, and two outhouses. Day-visitor parking was provided in three locations along the main loop road. The typical campsite was envisioned in the NPS standard unit of the day (**Figure 2.38**).[78] An entrance sign was erected at Highway 16 by 1942 (**Figure 2.35**).

By the time a park brochure was published in 1945, Jewel Cave was open every day of the week during the entire months of May through September, and included a public campground with free wood and spring water. A fee of 50 cents was charged for cave tours, which began every hour from 8 a.m. to 4 p.m. The proximity of the park to other nearby national attractions, including Wind Cave National Park, Mount Rushmore National Memorial, Custer State Park, and Devils Tower National Monument were cited in the brochure as added incentives to visit the area. The brochure map indicated that the historic area included a loop parking area and a campground, as well as the Ranger Cabin (the log ranger station) and the trail to the cave entrance (see **Figure 2.40**).[79]

During the 1946-1947 fiscal year, the Monument hosted 10,211 visitors, 9,743 of whom made the cave trip. The previous year the park hosted only 1,748 visitors. By 1947 the park entrance road and parking area were paved in gravel and considered to be in good condition, although quite dusty during dry weather. The surface trails were in good condition (the surface treatment at the time is unknown), and the Ranger Cabin was in good shape structurally.[80]

[78] *Headquarters Area Plan*, Part of the Master Plan for Jewel Cave National Monument, From NPS Data as of January 1, 1942.
[79] United States Department of the Interior, National Park Service, 1945. *Jewel Cave National Monument, South Dakota*. Park Brochure including a map dated April 1945.
[80] *Coordinating Superintendent's Annual Report for Jewel Cave National Monument,* 1947.

A 1948 photograph indicates that the southeast side of the building (left side) was used for parking at least one vehicle, probably the Ranger's vehicle. The trail to the Ranger Cabin from the parking lot appears to be surfaced with compacted earth, and informally edged with medium sized rocks. The rocks define a secondary path parallel to the northeast (right) side of the building (see **Figure 2.44**). This path may have been a portion of the original path to the cave.[81]

1950s Master Plan

A 1951 plan of the Headquarters Area indicates a small square storage building was located to the southeast of the curve in the surface trail that led to the cave entrance. The map indicated that this item was to be obliterated.

A General Development Plan for Jewel Cave was prepared by H.P. Benson in January 1961. It was the first to give physical form to the idea of moving the park headquarters from the original location. The plan includes a new Monument boundary, shifted to include the cave area explored. Herb and Jan Conn began exploring the cave in 1959. Their efforts showed that much of the cave extended to the east of the original boundary. Their efforts led to a new park boundary, a new tour route, a new cave entrance, and a new Visitor Center at the Monument. The boundary revision was equivalent to an acre-for-acre land exchange. A new headquarters, housing, and maintenance area are indicated on the plan, located to the southeast of the historic headquarters (see **Figure 2.46)**. Although it would be over five years

[81] Bitz, Bruce. August 1988, Oral interview with Shirley Wolf. Ms. Wolf's husband, Elwood Wolf, was the first permanent ranger at Jewel Cave. The couple arrived at the park in August 1941 and lived in the log Ranger Cabin during the summer season until August 1943. They also lived in the cabin during the winter of 1942.

before the groundbreaking for the new visitor center, the plan laid out in 1961 corresponds closely with the later development in the new area.

In 1952 three seasonal rangers were employed by the park. The administration and responsibility of the Monument was placed under the Superintendent of the Black Hills Areas Office in Rapid City. Approximately 15,688 visitors came to the park and 4,481 made the cave trip.

During the year, four cattle-guards were built at the Monument boundaries on the Hell Canyon road and truck trail. These are horizontal grates in the road that cattle will not cross over. A radio and telephone system was installed for the Monument, including a power house building with portable light plant, radio poles and antenna. The system included four telephones with three in the cavern and one in the headquarters office. Communication by radio to Wind Cave and Rapid City were in operation at the end of the fiscal year. In 1952 the entrance road that led from the highway to the parking area was reconstructed and surfaced, including the parking area and a spur road to the proposed residence and utility area. An entrance control gate was installed, and campground signs were constructed and installed. The Superintendent reported that the water supply system was becoming unreliable. The need for a permanent residence for the area was urgent.[82]

In 1953 a small cabin building (building #24) was moved from Wind Cave National Park to Jewel Cave to provide seasonal ranger quarters.[83] During 1953, 16,458 visitors entered the campground and headquarters area and approximately

[82] Like, Harry J. *Coordinating Superintendent's Annual Report for Jewel Cave National Monument,* 1953. The cattle guards mentioned are believed to be the horizontal grates in the Hell Canyon Road. These would provide vehicular access while deterring cattle when combined with fences that enclosed the Monument.
[83] *Superintendent's Annual Report for Jewel Cave National Monument,* 1954.

5,000 took the cave tour. Three seasonal park rangers and naturalists conducted the trips and also provided Monument protection, interpretation, campground maintenance, refuse disposal, and minor maintenance jobs. No major construction projects were performed during the year. The Superintendent's annual report stressed that a permanent residence was urgently needed, and that considerable building maintenance, cave trail maintenance, and Monument sign construction were necessary to bring the Monument's facilities up to a high maintenance level.[84]

During the 1954 season the Monument was staffed by four seasonal employees. The need for a permanent ranger continued. During the off-season (24 September 1954 through 29 May 1955) monthly protection and inspection patrols were conducted by staff from Wind Cave National Park. Jewel Cave now had a Park Fire Chief headquartered at the park, a high pressure tanker, and a small fire tool cache. Cave entrance fees continued at fifty cents. The park maintained five buildings, one house trailer, and water, sewer and light systems. During the 1954-1955 travel year 6,718 visitors registered at the park. The public campground was heavily used and in a bad state of repair due to inadequate funding. Asphalt was applied to the foot trail from the parking area to the Ranger Cabin. A new public drinking fountain was installed (this replaced an older drinking fountain in the same location —its implementation date is not known). The water line to the campground was repaired and placed in operation for the first time since 1950. Dangerous trees and snags were removed from the Headquarters Area. Reservoir and spring area catch basin manhole covers were

[84] Like, Harry J., Earl Semingsen, and Richard T. Hart. Coordinating Superintendent's Annual Report for Jewel Cave National Monument, 1954.

replaced as recommended by the US Public Health Service to prevent water contamination to the system.[85]

A 1955 roads and trails plan for the park indicates a proposed utility area at the end of the road on the north side of the Ranger Cabin (see **Figure 2.42**). During 1955, 8,254 visitors took tours at the park. Heavy rains in August caused erosion problems in the campground and on the surface trail to the cave. A new entrance sign was installed and the area near the park entrance was cleared of rock and mowed. Use of the campground continued to increase. The superintendent expressed concern that visitors missed the entrance, even with the new entrance sign. The trail between the Ranger Cabin and the cave entrance was resurfaced. Nine steps were added to the outside trail and a rock retaining wall was built to stop "short-cutting" and to keep soil from washing onto the lower trail. The edges of the new trail were "feathered" with black dirt and this was seeded to grass.[86]

Mission 66 (1957 – 1972)

Mission 66 was a National Park Service-wide initiative to update facilities, visitor services, and maintenance within the parks. The program had a direct impact on Jewel Cave, ultimately resulting in the development of the existing visitor center, cave elevator, administrative headquarters, and housing area. A conjectural Historic Period Plan for 1957 through 1972 is illustrated in **Figure 2.52**.

During 1956 over 20,000 people visited Monument, and 8,649 took cave tours. Over 1,300 people camped at the park. A windstorm damaged over 600 trees in the

[85] Semingsen, Earl M. and Richard T. Hart, *Annual Report for Jewel Cave National Monument,* 1955. The Ranger Cabin was referred to as the "headquarters building."
[86] *Annual Report of Operation of Jewel Cave from Ranger Naturalist in Charge, Jewel Cave, to Superintendent, WICA, 1956.*

Monument in November. A new "pylon" cave entrance sign was installed at the park entrance road, and 26 directional and labeling signs were constructed to be installed at the park. Throughout the rest of the decade attendance to the park, and use of the campground grew. In 1959 rangers gave evening slide talks at the campground. In 1959 the water supply from the spring began to be inadequate to serve needs at the site.

A new era of cave exploration began at Jewel Cave in 1959 when Dwight Deal obtained a permit to explore and map the cave and to study its geology. He was joined by Herb and Jan Conn whose life work and passion became the exploration of Jewel Cave. The three worked together until 1961 mapping 5 miles of passageways. After that, Deal moved from the area and the Conns continued mapping and exploring Jewel Cave for another two decades, retiring in 1981 after discovering more than 65 miles of cave passages. Caving parties led by the husband-and-wife team made 708 trips into the cave and logged over 6,500 hours each exploring and mapping. Their discoveries led them to recommending that the National Park Service excavate a second entrance to the cave, so that the high vaulted ceilings and colorful crystal displays could be revealed to the public. The Conns helped to plan the new tour route and install the electric lights to accentuate the natural characteristics of the cave. Initially, a plan included creating a tunnel from Lithograph Canyon, however, NPS personnel determined that sufficient parking space for visitors could not be provided in the Canyon. A tunnel was completed in 1966. The elevator shaft was completed in

1967, and the elevator was installed in 1972. The new "Scenic Tour" opened to the public in 1972.[87]

During the 1960s while the Conns were exploring and mapping new areas in the cave, NPS personnel continued to lead visitors through the historic cave tour. As visitation increased, changes occurred to the landscape surrounding the Ranger Cabin and the historic cave entrance. In 1961 the water to the campground had to be turned off due to the dwindling supply. In 1962 a submersible pump was installed. In 1963 a septic tank and filter field were constructed to handle the sewage from the "temporary headquarters facilities."

In 1963 visitation at the Monument exceeded 45,000 people. During 1964 visitors had to be turned away because the cave tours were often filled to capacity. In 1964, the Monument received national publicity due to Herb and Jan Conn's discoveries of new portions of the cave. Visitation continued to grow. The Superintendent's Annual Report in 1964 stated that additional cave guide personnel and development for public use of the newly discovered cave passages were urgently needed to meet the public use demand.[88]

Based on discoveries made by the Conns, the NPS pursued a change in the Monument boundary to reflect the location of the cave passages that had been discovered. In 1964 a meeting of NPS and US Forest Service officials was held and an agreement at the local level regarding an adjustment to the Monument boundary was reached. Preparation of a new Master Plan for park development was underway.

[87] Palmer, Arthur N. *Jewel Cave: A Gift from the Past* (Black Hills Parks and Forests Association, Wind Cave National Park, Hot Springs, South Dakota), 1999, 6-8; and Herb and Jan Conn, *The Jewel Cave Adventure* (Revised printing, St. Louis, Missouri: Cave Books), 1991; and *Jewel Cave National Monument: Official Map and Guide* (U. S. Department of the Interior, National Park Service, no date).
[88] Lombard, Jess H. *Superintendent's Annual Report for Jewel Cave National Monument,* 1964.

Exploration of the cave was suspended due to the perceived potential danger involved in removal of an injured person from the back portions of the cave.[89] Cave tour visitors increased so much that it was not possible to provide conducted tours of the cave for all those who wished to take one. Additional temporary parking spaces for fifteen cars were constructed to help alleviate the overcrowded parking lot. The surface trail to the cave entrance was resurfaced with asphalt and handrails were installed. A ticket kiosk was brought to the site from Wind Cave and installed in front of the Ranger Cabin to alleviate crowding in the office.[90]

By the mid-1960s, it was apparent that most of the known cave was located beyond the Monument boundaries and inaccessible to most visitors through the existing historic entrance. In response to this problem, a land exchange bill—PL 89-250 (79 Stat. 971)—was enacted by Congress and signed by President Johnson on 9 October 1965. The Monument and the Black Hills National Forest exchanged an equal amount of acreage; the area added to the Monument was determined to correspond with the known cave. Only 11% of the original Monument was retained in the boundary adjustment.[91]

In 1965 work began on the new visitor center and administrative complex. Contracts were awarded for the construction projects and test borings were drilled to determine the location for the elevator shaft. Construction continued through 1972 when the new area was opened to the public.

In 1967 the natural rock cliffs around the historic cave entrance were altered. Experienced rock climbers removed portions of rock to reduce the danger of injuries

[89] Ibid.
[90] Ibid.

to visitors. The Monument ticket booth was expanded to provide better public contact opportunities. Topsoil and seed were applied to the area immediately surrounding the Ranger Cabin to restore vegetation in this trampled site.[92]

On-going Management of Jewel Cave by the National Park Service (1972 – 2004)

Once the new visitor center and administrative area was open in 1972, development pressure on the historic area began to subside. Use of the campground was discontinued before 1979 and the management of the property as a historic area was implemented. Eventually, sometime after 1982, the housing and administrative buildings were removed from the historic area, leaving only the pump building and the Ranger Cabin. The upper trail to the cave entrance and the stone steps along that trail were altered during this period. The asphalt trail was paved with concrete and changes were made to the stone steps.[93] The preparation of an updated General Management Plan in 1994 solidified the policy of treating the original cave headquarters area as a historic property.

A *Historic Structure Report* (HSR) was completed for the Ranger Cabin in November 1999. The report recommends that the Ranger Cabin interior and exterior be restored to its circa 1940 appearance and used for programmed interpretation of activities at the site during that period. Based on the recommendations made in the HSR, the Ranger Cabin exterior was restored and repaired to a circa 1940s appearance. Two of the interior rooms were restored to a circa 1940s appearance.

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[91] *Final General Management Plan and Environmental Impact Statement, Jewel Cave National Monument* (United States Department of the Interior, National Park Service) 1994, 1.
[92] *Superintendent's Annual Report for Jewel Cave National Monument,* 1967.
[93] Mike Wiles, Cave Specialist, Jewel Cave National Park, was present at the time the work occurred. He recalls that additional steps were added and that some of them were added in pairs -- previously they had been single steps only.

The two public restrooms were adapted to shelter fire suppression equipment and detection and electrical panels. The project was completed in 2001.[94]

The Jasper Fire

On 24 August 2000, a forest fire was reported north of Highway 16 about two and one-half miles west of Jewel Cave National Monument. The fire quickly spread into the park and beyond, overwhelming all containment efforts. Fire behavior included crowning, spotting and running in rough canyons.[95] By the end of the day on 28 August, over ninety percent of Jewel Cave National Monument had burned, and approximately fifty percent of the trees were lost, but all structures had been protected.[96] The historic Ranger Cabin was foamed on three occasions by fire crews as the fire burned all around it. Fire management efforts, including prescribed fires and thinning around the headquarters area buildings in 1996 and 1999, were credited with contributing greatly to the protection of those structures. During the time that the fire was burning in the area of the administrative offices, some valuable items were placed inside the cave, 270 feet below the surface, to protect them from the fire. The fire

[94] Alan W. O'Bright, 1999.
[95] *Fire and Aviation Management, Terms and Definitions* (U.S. Department of the Interior, National Park Service, digital version at: ata2.itc.nps.gov/fire/index.cfm). According to the terms and definitions, a fire crown, or crowning, is the "movement of fire through the crowns of trees or shrubs more or less independently of the surface fire." Spotting refers to "behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire." Running indicates a "rapidly spreading surface fire with a well-defined head.
[96] An archeological site, the timber-supported dugout located on the floor of Hell Canyon in the hillside, was damaged by the fire. Sheveland documented this feature along with archeological site 39CU1314, Hell Canyon Cabin. In 1998, there was a dugout in the hillside nearby that was supported by timber supports. During Williams' site visit in 2003, these timbers were no longer apparent. They were burned during the Jasper fire in 2000. It is possible that the duout structure was used to store dynamite for CCC construction projects. Sheveland, Genna J. *A Level III (Intensive) Cultural Resource Survey of Jewel Cave National Monument*. Custer, South Dakota: United States Department of the Interior, National Park Service, 1998.

continued to spread, devastating area forests, until it was contained on 8 September 2000. The fire burned 83,508 acres of the Black Hills National Forest.[97]

The impacts of the Jasper Fire were still clearly visible at Jewel Cave in 2003. The intense heat of the fire wiped out all vegetative material (including evergreen trees) in large areas. Seeds of pest species including prickly lettuce and Canada thistle were abundant in the ground layer of some of these areas in 2003. Restoration management of the damaged ponderosa pine ecosystem is a continuing issue for the park.

[97] *Jasper Fire Binder,* daily summary of the Jasper Fire found in the Jewel Cave National Monument library.

CHAPTER II: SITE HISTORY ILLUSTRATIONS

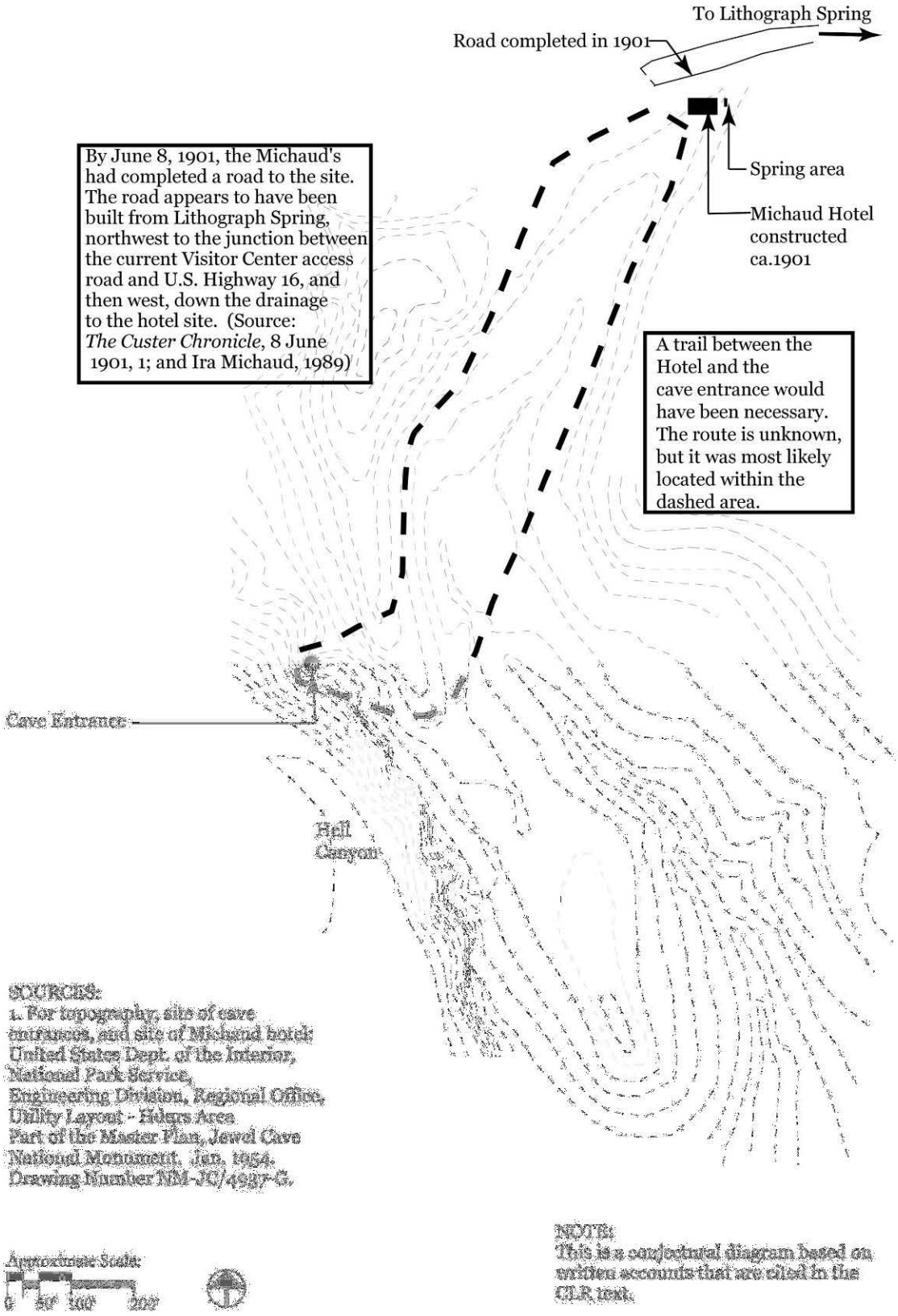


Figure 2.1: Historic Period Plan, 1900-1908



Figure 2.2: The Michaud Hotel, after 1905 (Source: JECA 1803)



Figure 2.3: Michaud Hotel 2, after 1905 (Source: JECA 1801)

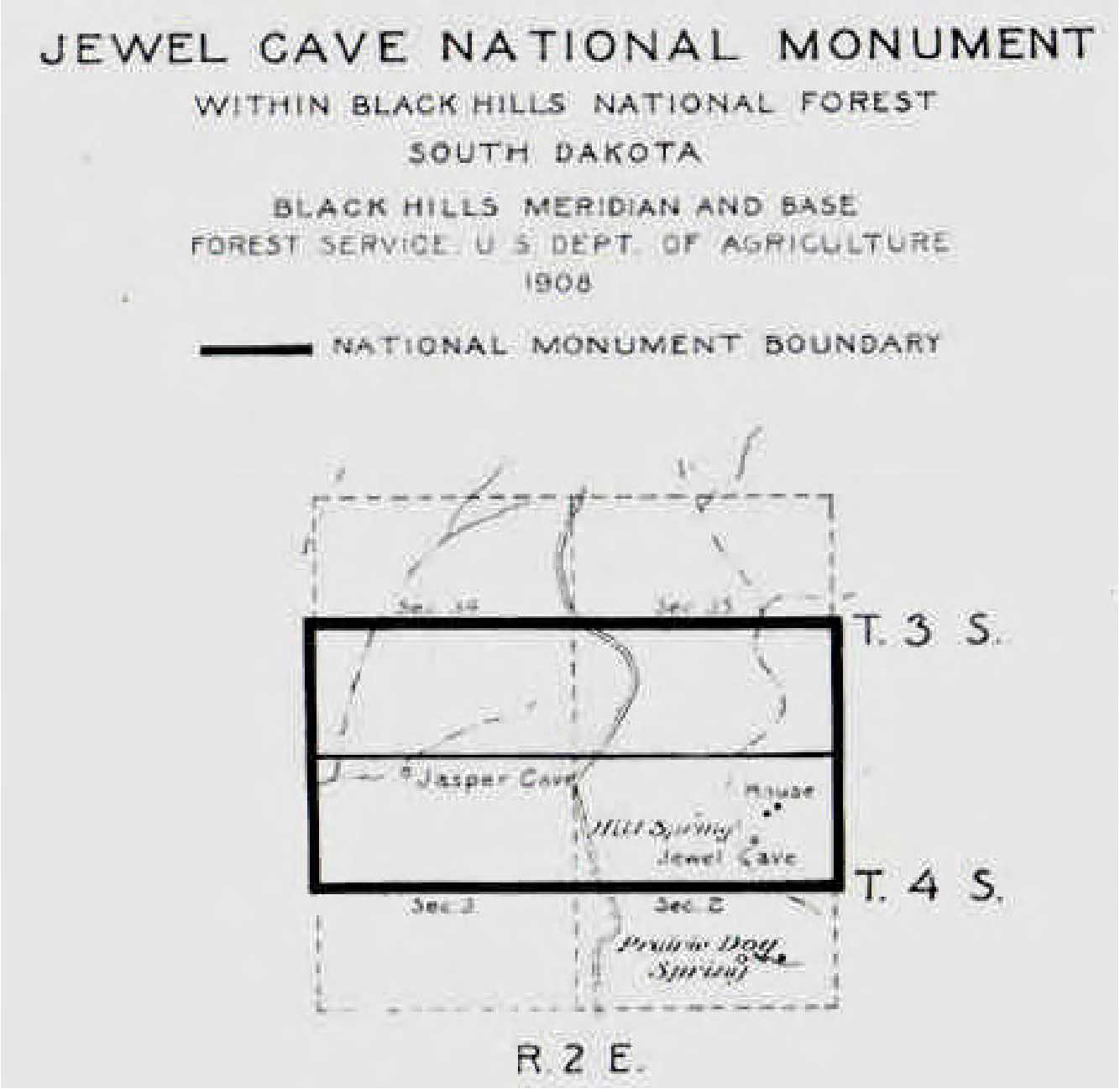


Figure 2.4: Jewel Cave National Monument Boundary, 1908 (Source: NPS, files at JECA). The house and another structure are indicated, as well as the entrances to Jewel Cave and Jasper Cave. The road in Hell Canyon is present, however, no road is indicated near the Michaud Hotel (labeled "house" on the plan).

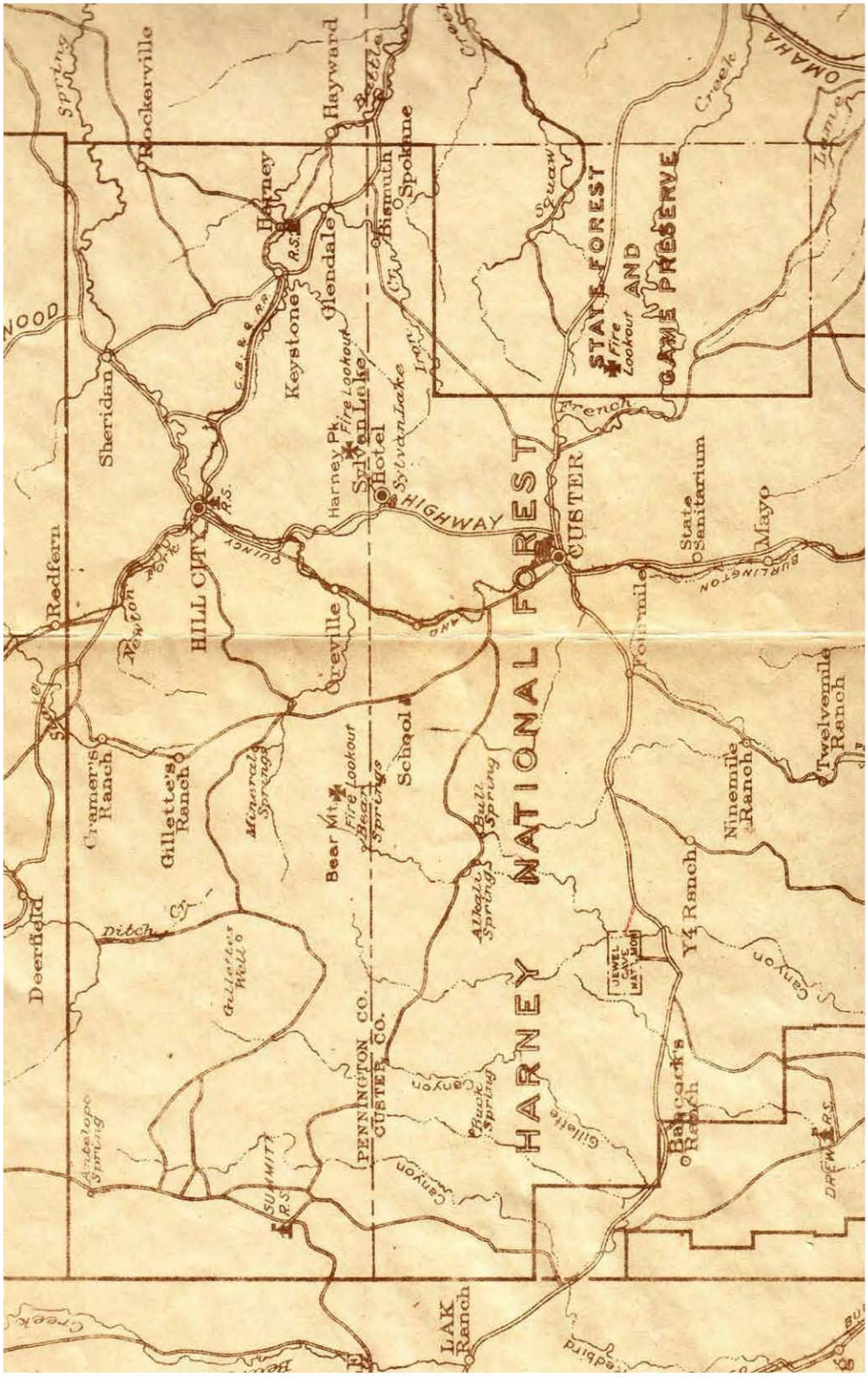


Figure 2.5: Forest Service Map, Date unknown, after 1910 (Source: JECA 1655)



Figure 2.6: Forest Service Map Detail, Date unknown, after 1910 (Source: JECA 1655). The map identifies only one road, on the west side of Hell Canyon, providing access to the Monument.

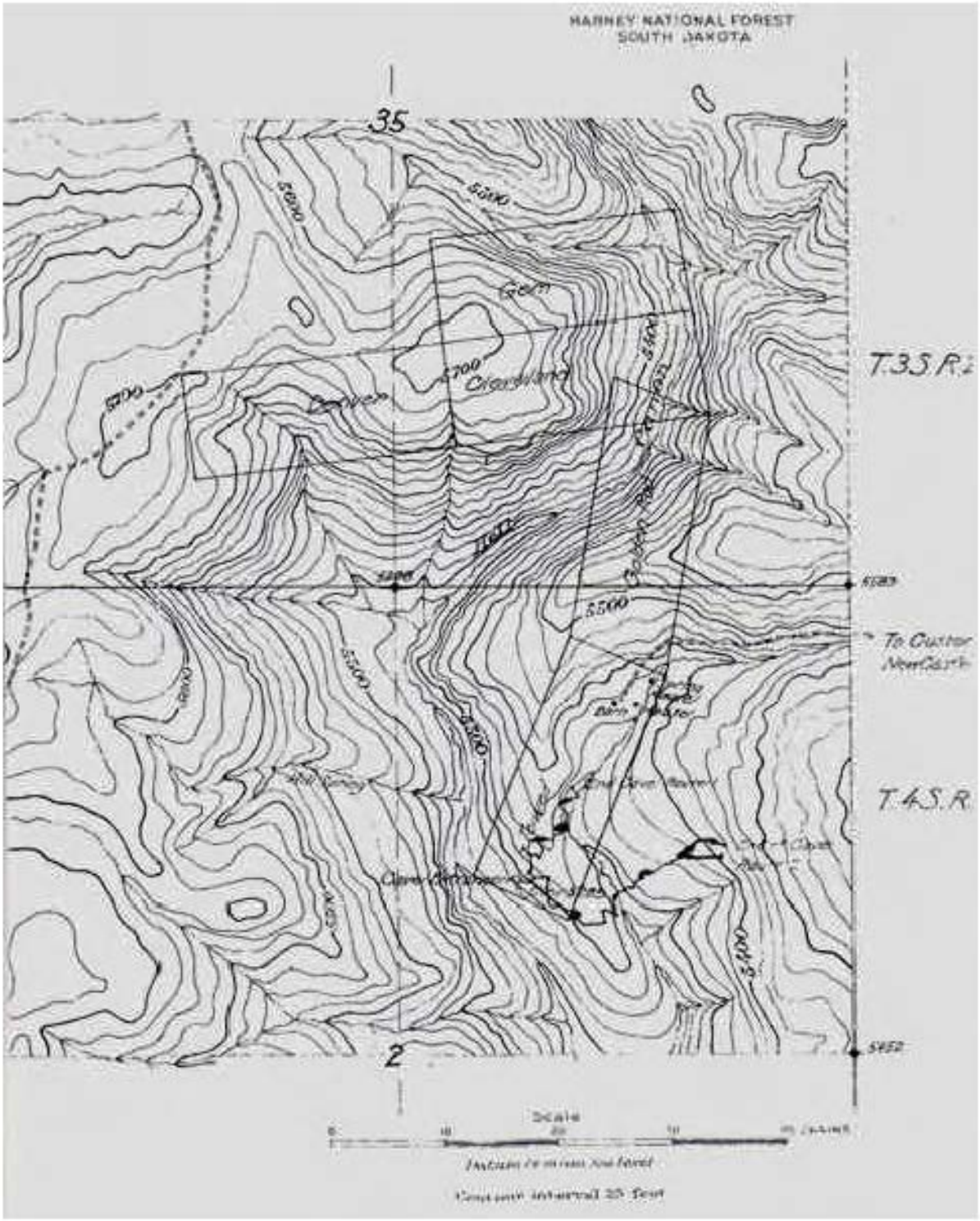


Figure 2.7: Harney National Forest Mineral Claims, 1916 (Source: files at JECA) This map indicates that the Spring house, Hotel, and Barn were present in 1916, as well as the road to Custer, via Lithograph Canyon. It appears that the road terminated at the barn. Two underground cave routes are also illustrated, and the cave entrance, however, no surface route between the hotel and the cave entrance is indicated.



Figure 2.8: 1916 Historic Cave Entrance Overview (Source: JECA 2645)



Figure 2.9: 1916 Cave Entrance Area Overview (Source: JECA 2643)



Figure 2.10: 1916 Historic Cave Entrance Close-Up (Source: JECA 2645)



Figure 2.11: 1916 Cave Entrance Area Close-Up (Source: JECA 2643)

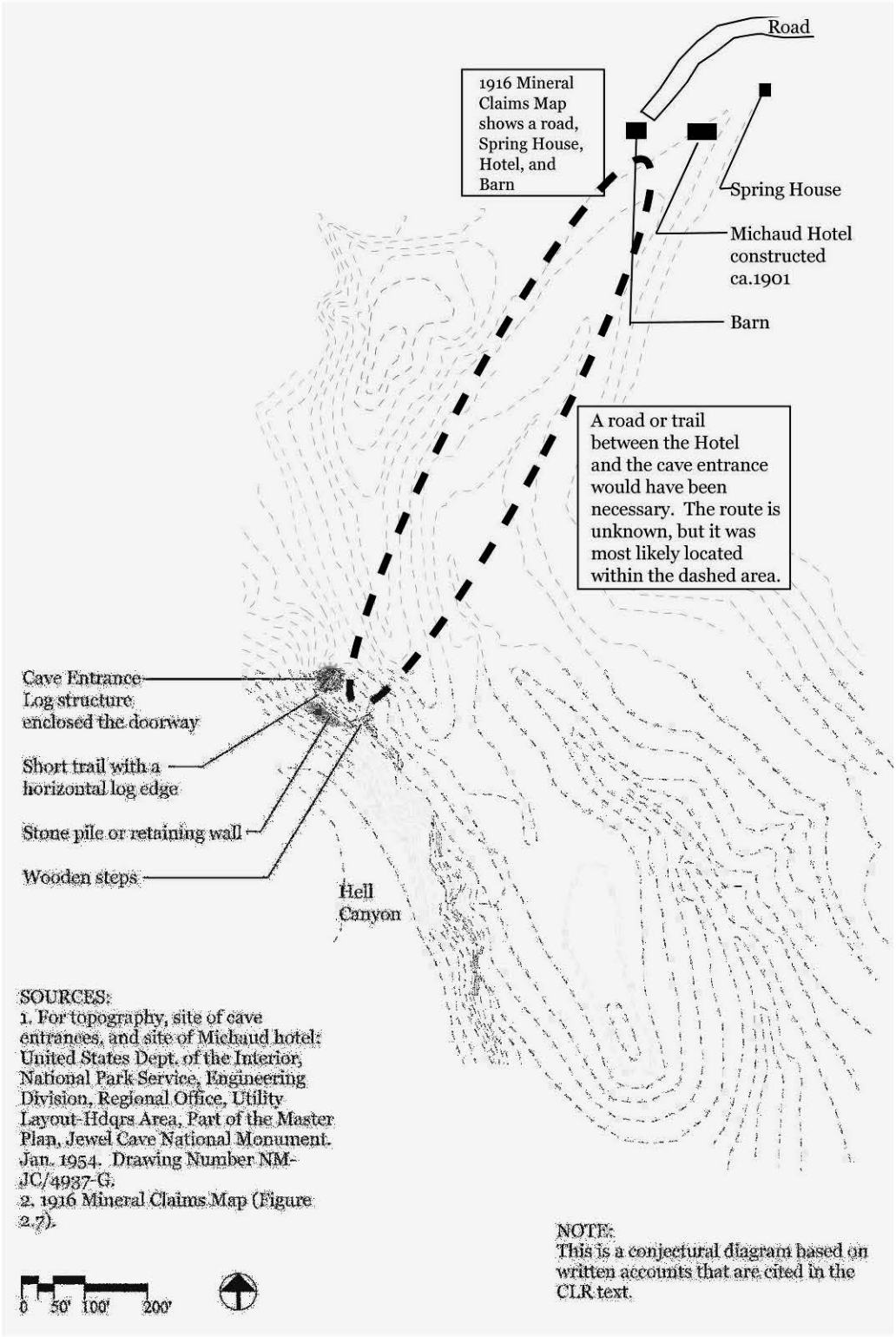


Figure 2.12: Historic Period Plan, 1908-1928

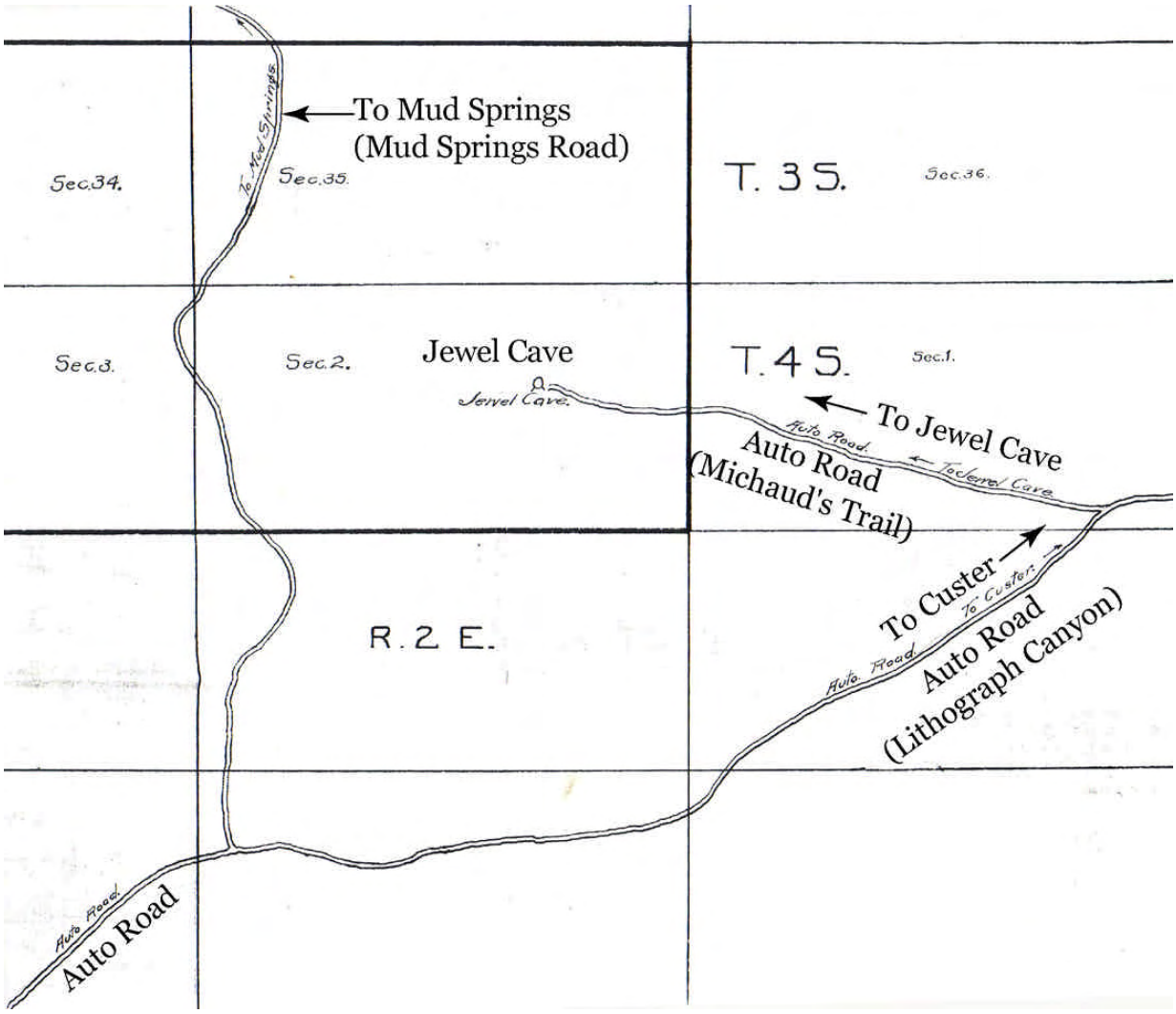


Figure 2.13: Modified from: Historic Road to Jewel Cave, no date, before 1933 (Source: NPS, Jewel Cave Accession Room)

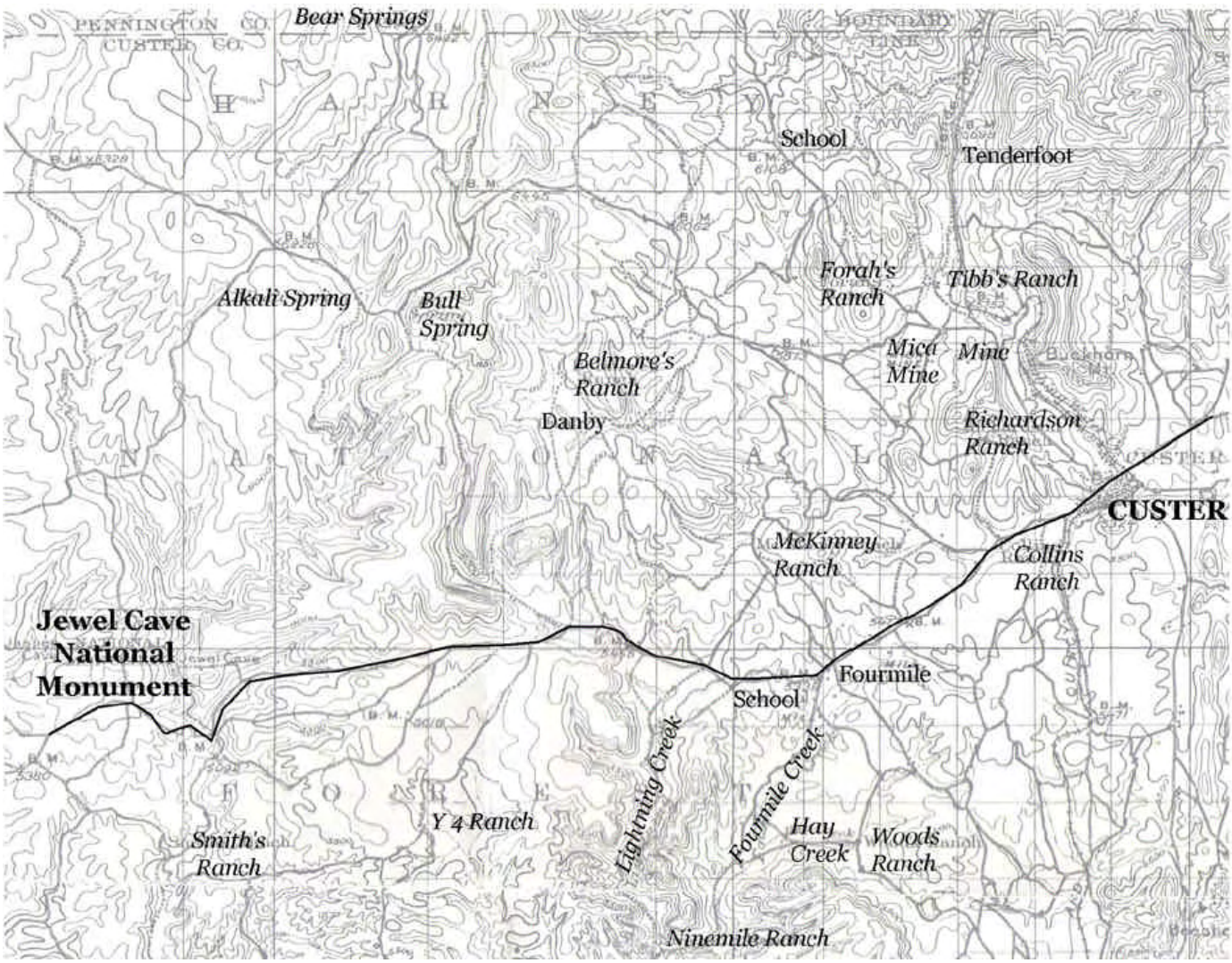


Figure 2.14: Modified from: USGS 1932, ranches and homesteads in the area (Source: USGS South Dakota, Harney Peak Quadrangle, Edition of June 1901, reprinted 1932.)

Note a faint line along what could be the Michaud trail. Also there is a "V" in the road where it crosses Hell Canyon; this indicates that that the original road emerged from Lithograph Canyon and went down Hell Canyon several hundred yards before climbing back up the other side. A later alignment has it emerging from Hell Canyon and immediately crossing it and climbing up a ridge. Part of the reason for this being later, is because it required more cut and fill -- a more difficult engineering feat. The fill, a possible rock wall, is still there.

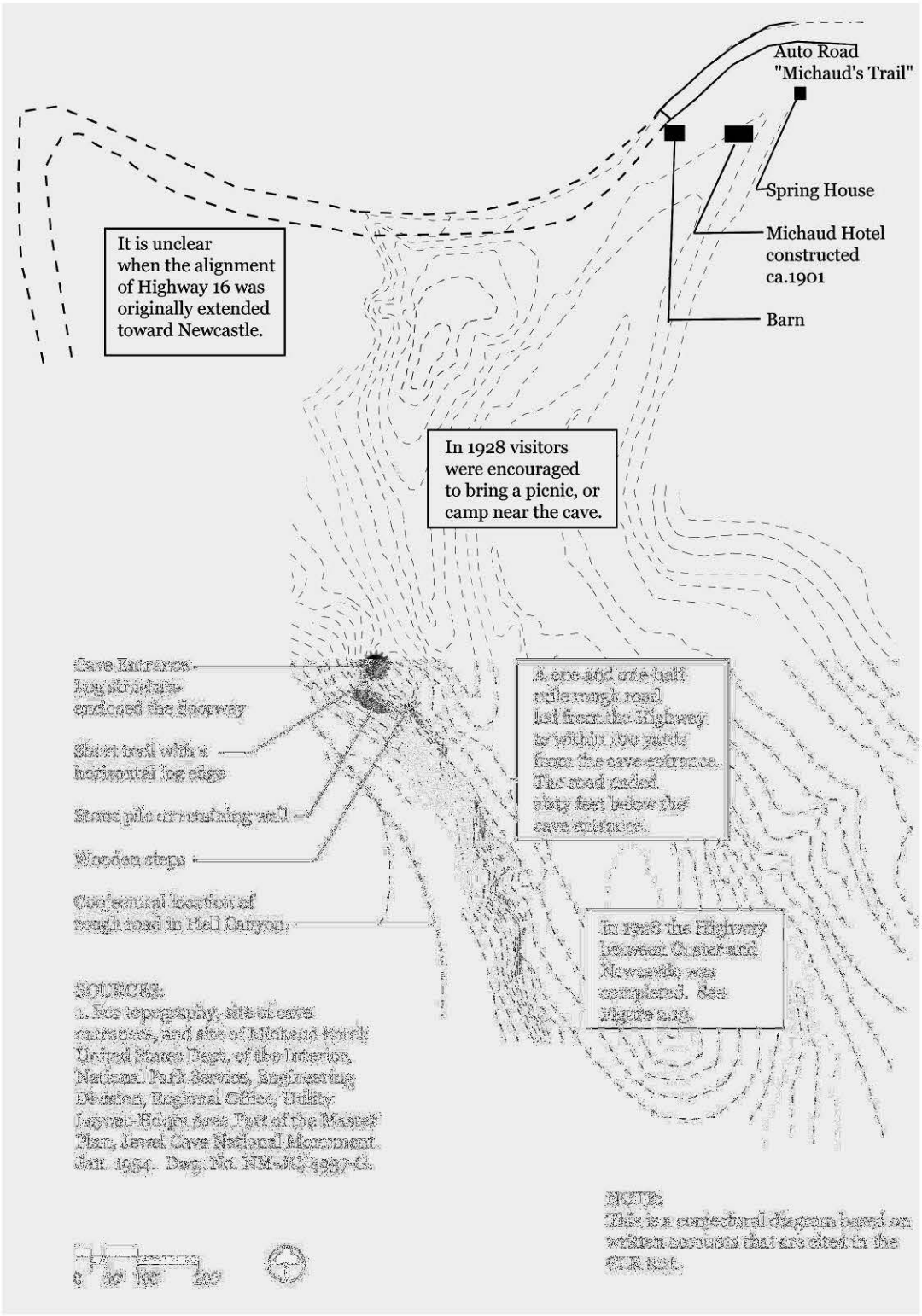


Figure 2.15: Historic Period Plan, 1928-1933



Figure 2.16: Hell Canyon, before Highway construction (JECA 2622)



Figure 2.17: 1933 "landslide across from entrance road" (JECA 2801)



Figure 2.18: Slope graded for new road, 1933 (JECA 2803)



Figure 2.19: Highway 16 Construction, 1937 (Source: JECA 2898)



Figure 2.20: Highway 16 facing east from Hells Canyon, 1937 (Source: JECA 2888)



Figure 2.21: Hell Canyon Road, 1933 (Source, JECA 2896)



Figure 2.22: Completed Highway, 1933 (Source: JECA 2900)



Figure 2.23: CCC Crew Member on Rock before Steps at Hell Canyon, ca. 1935 (Source: accession files at JECA)

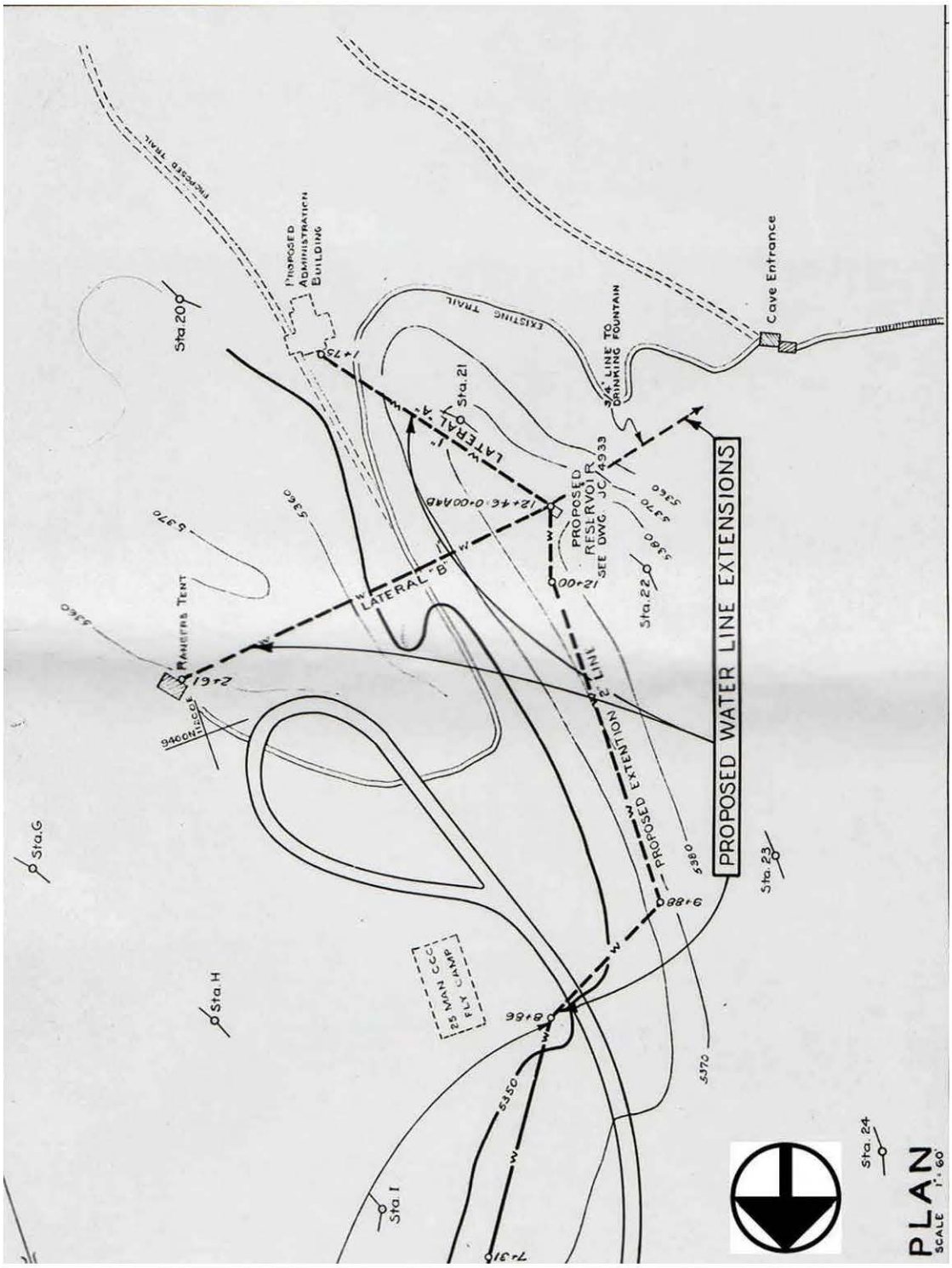


Figure 2.24: Portion of "Jewel Cave National Monument, Proposed Water System, Headquarters Area, August 1935" (approved Sept.1935) (Source: map files at JECA). The two structures shown at the cave entrance are the wooden stairway and the wooden entrance structure.

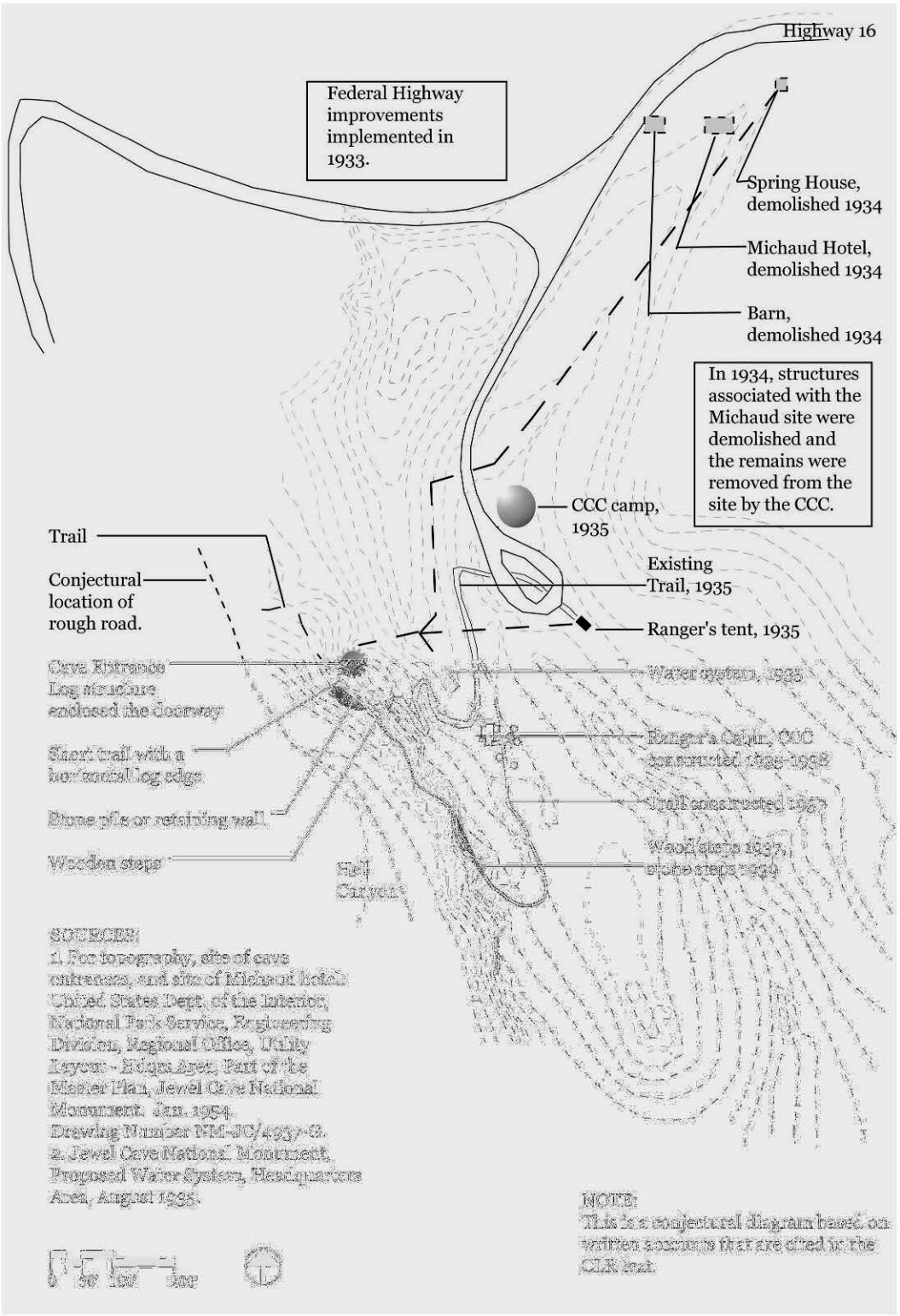


Figure 2.25: Historic Period Plan, 1933-1939

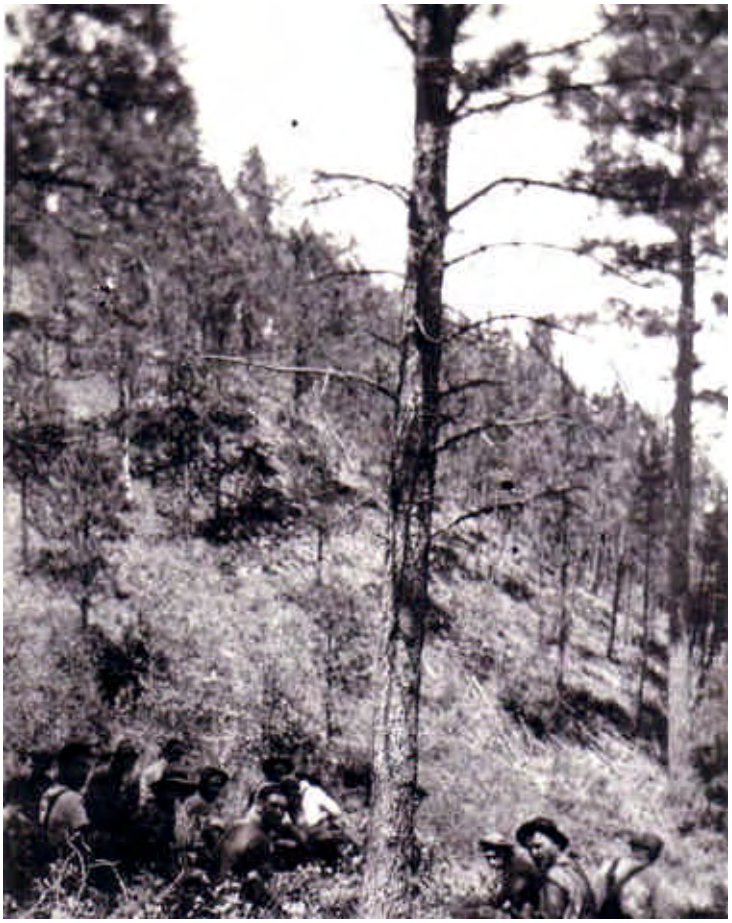


Figure 2.26: CCC Crew, Hell Canyon, ca. 1935 (Source: files at JECA)

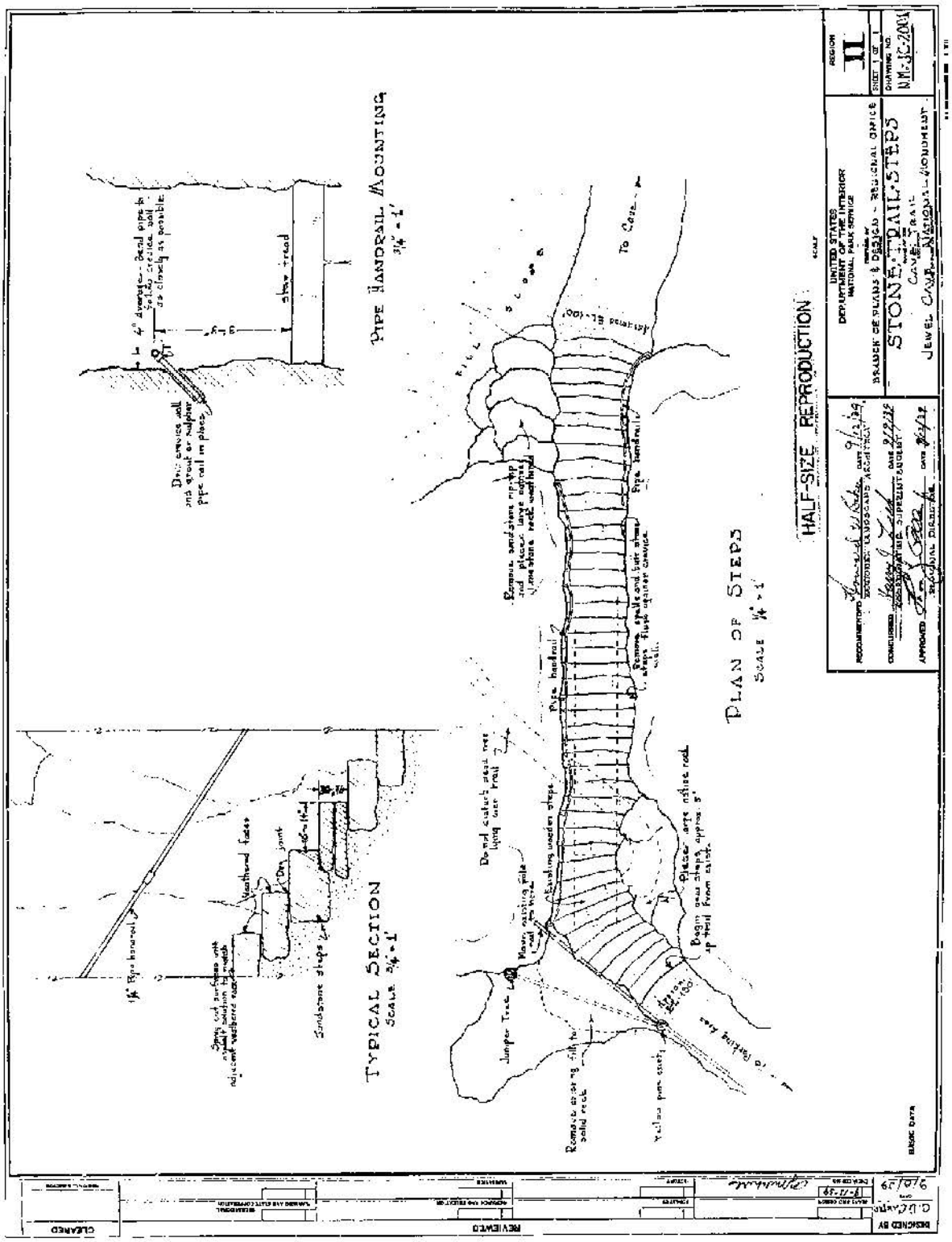


Figure 2.27: Steps Construction Drawing, 1939 (Source: NPS 000479) Note that in 1939 there were wooden steps in place before the stone steps were constructed.

Figure 2.28: Steps Construction Drawing, 1935 (Source: NPS 000506)



Figure 2.29: Path to Cave Entrance under Construction, ca.1935 (Source: JECA 2794)



Figure 2.30: Path to Cave Entrance, 1938 (Source: JECA 1878)



Figure 2.31: Construction Materials near Cabin, ca.1935 (Source: JECA 2631)



Figure 2.32: Ranger Cabin, 9 August 1938 (Source: JECA 2612 and *Rugged Charm: Ranger Cabin Historic Structure Report, 1999, Figure 8, JECA 2620).*



Figure 2.33: Ranger Cabin, north and east sides, ca. 1935 (Source: JECA 2618)



Figure 2.34: Ranger Cabin, north and west sides, 1935 (Source: JECA 2628 and *Rugged Charm: Ranger Cabin Historic Structure Report*, 1999, Figure 6)



Figure 2.35: 1942 Historic Entrance Sign (Source: files at JECA)

Figure 2.36: Existing Topography 1942 (Source: NPS 000510.TIF)

Figure 2.37: 1942 Master Plan Cover (Source: NPS 000489)

Figure 2.38: Headquarters Area Plan, part of the Master Plan, 1942 (Source: NPS).

Figure 2.39: Excerpt from 1942 Master Plan, Vegetative Type Map (Source: NPS 000480)

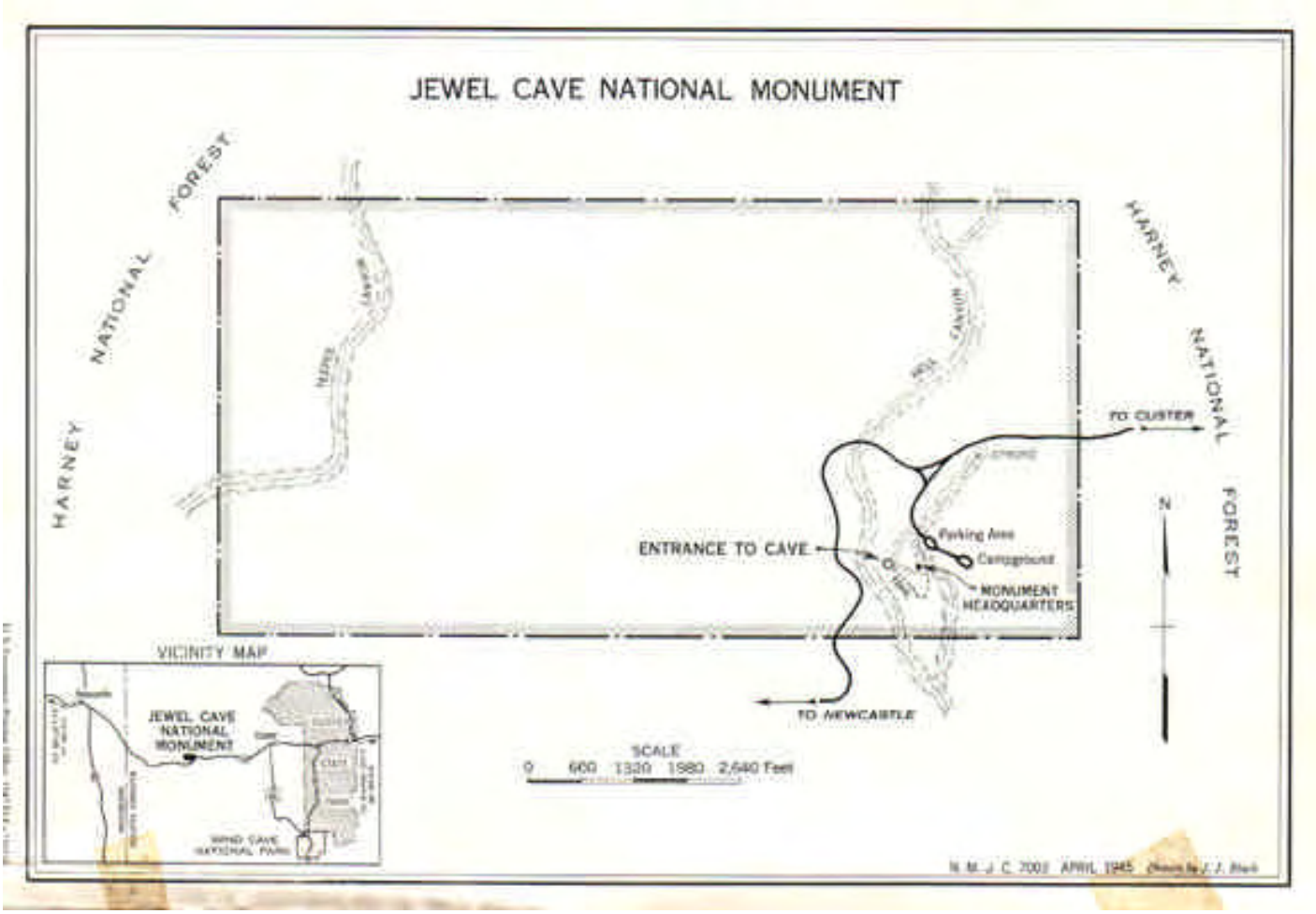


Figure 2.40: Brochure Map 1945 (Source: files at JECA)

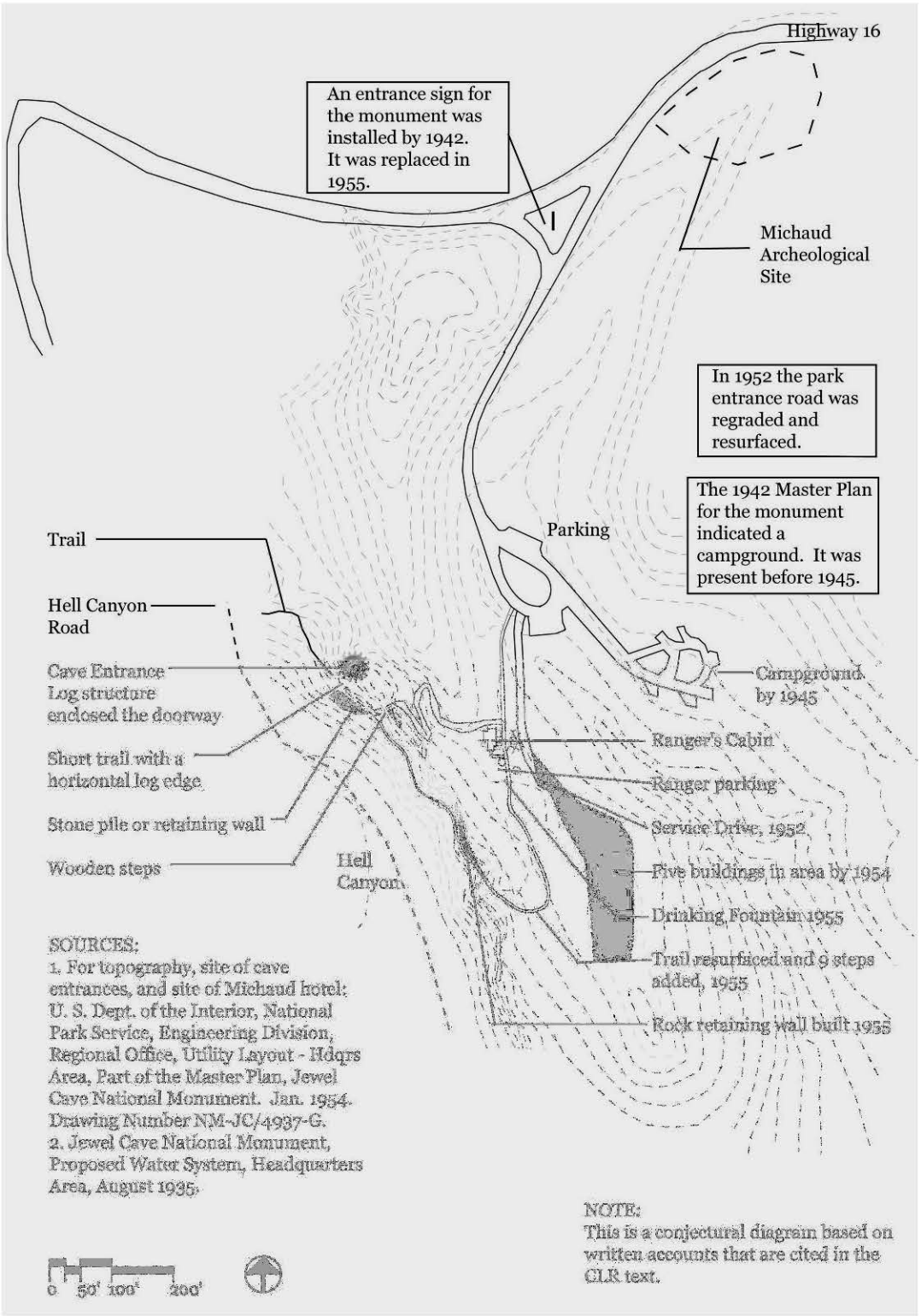


Figure 2.41: Historic Period Plan, 1940-1956

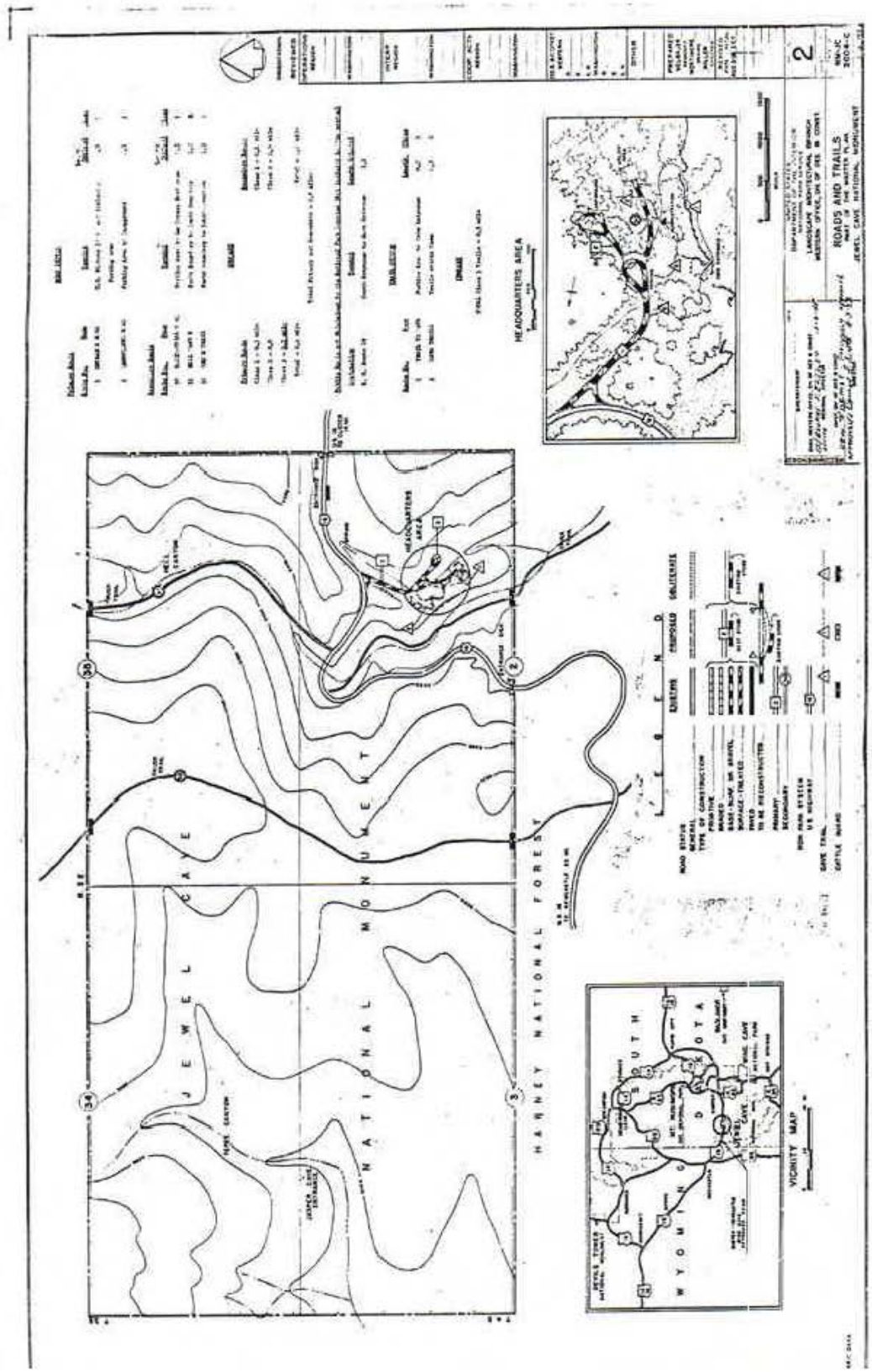


Figure 2.42: Roads and Trails, 1955 (Source: files at JECA)

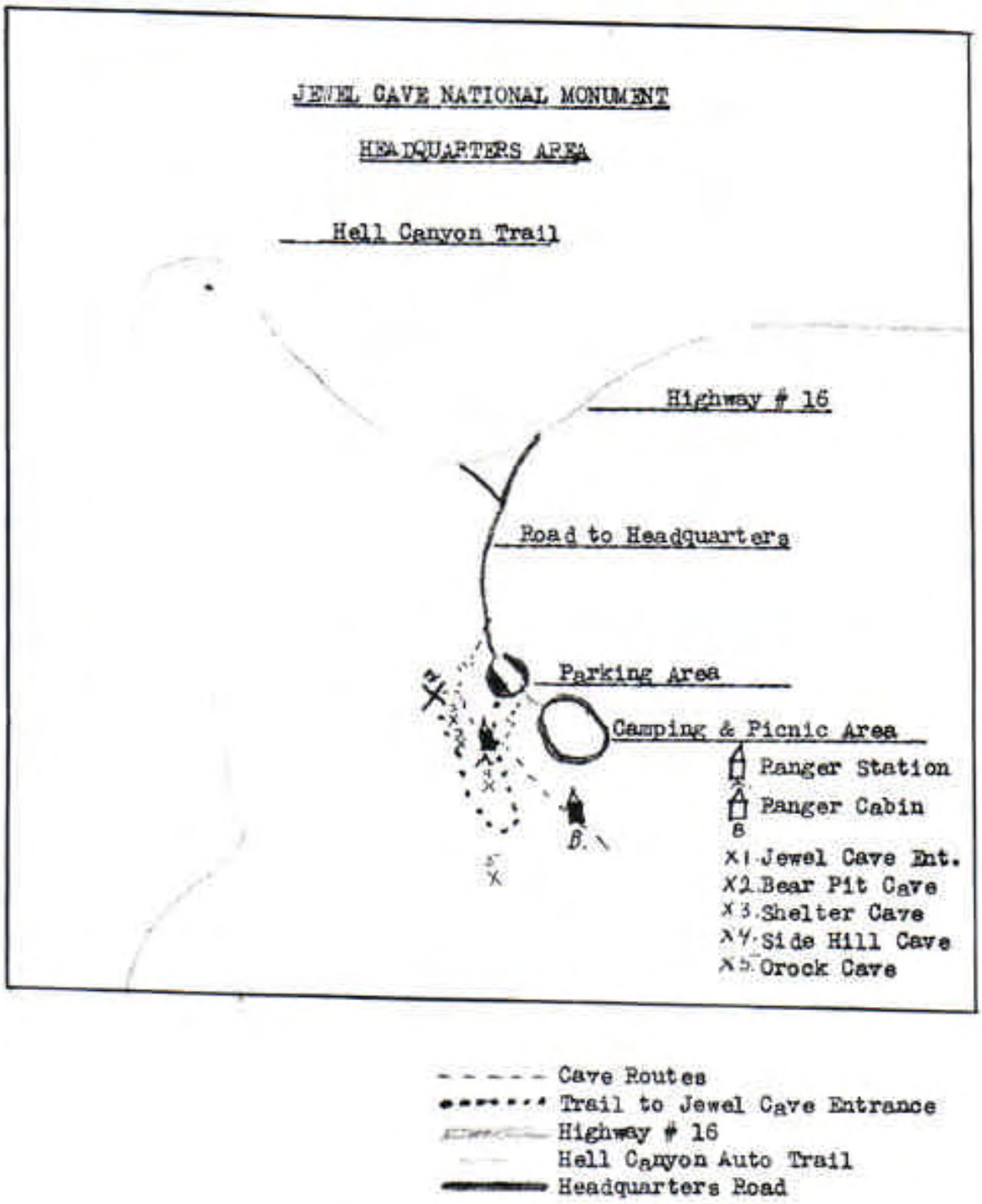


Figure 2.43: Hell Canyon Trail Map, ca.1946 (Source: files at JECA). The "Ranger Station" shown is the CCC-Ranger Cabin. The building indicated to be the Ranger Cabin is a housing unit located along Service Drive "A." It appears that at the time the drawing was created the CCC-Ranger Cabin was being used for administrative purposes, while the other building served as a residence.



Figure 2.44: Ranger Cabin Office, summer 1948 (Source: files at JECA)

Figure 2.45: Cave Trails, 1950 (Source: NPS 000488)

Figure 2.46: General Development, 1961 (Source: NPS 000490)

Figure 2.47: Headquarters Area Plan, 1951 (Source: NPS 000492.tif)



Figure 2.48: Aerial View of Historic Area, ca. 1980s (Source: JECA 3009)



Figure 2.49: Aerial View of Historic Area, ca. 1980s (JECA 3008)

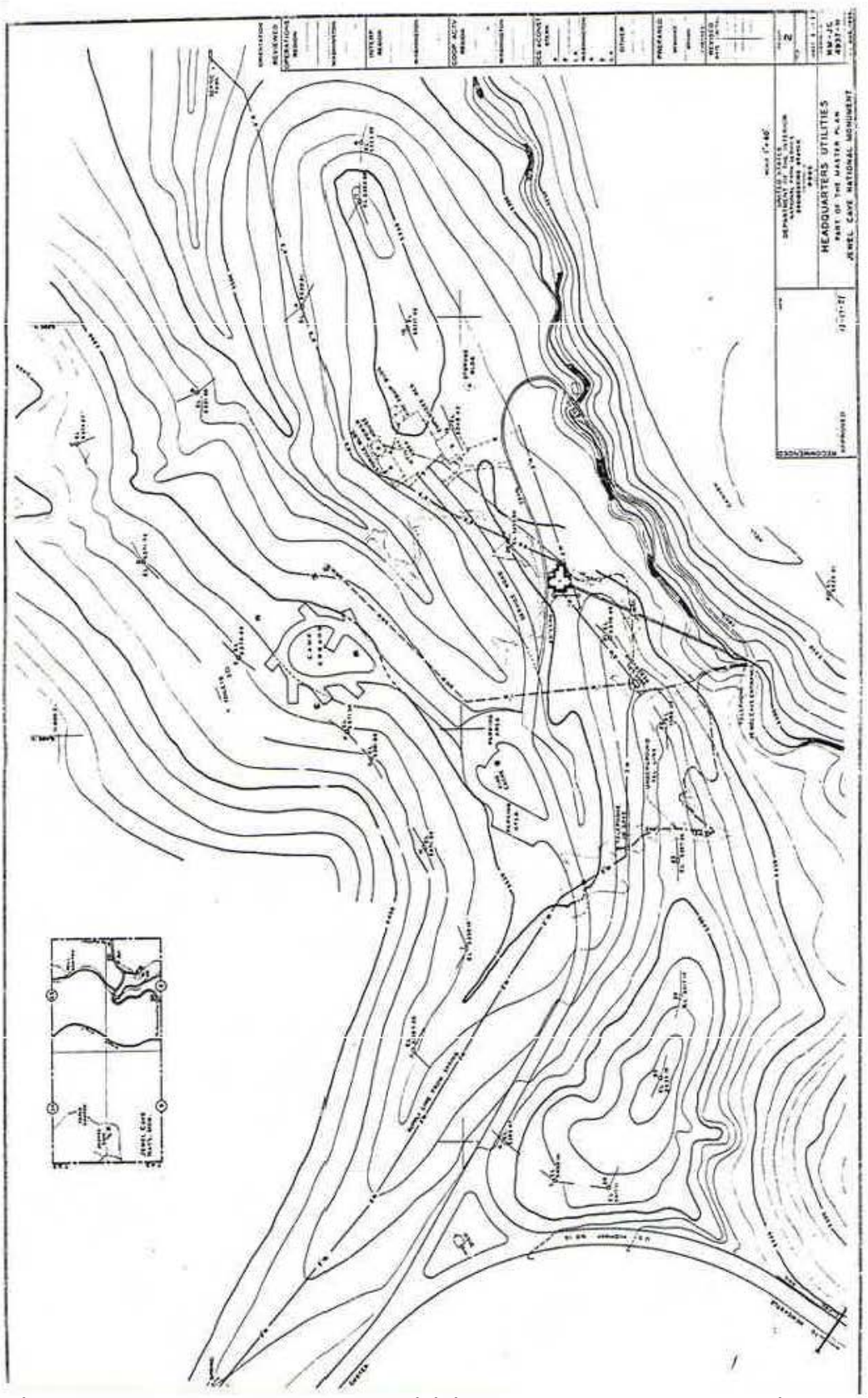


Figure 2.50: Headquarters Utilities Plan, 1961 (Source: files at JECA)

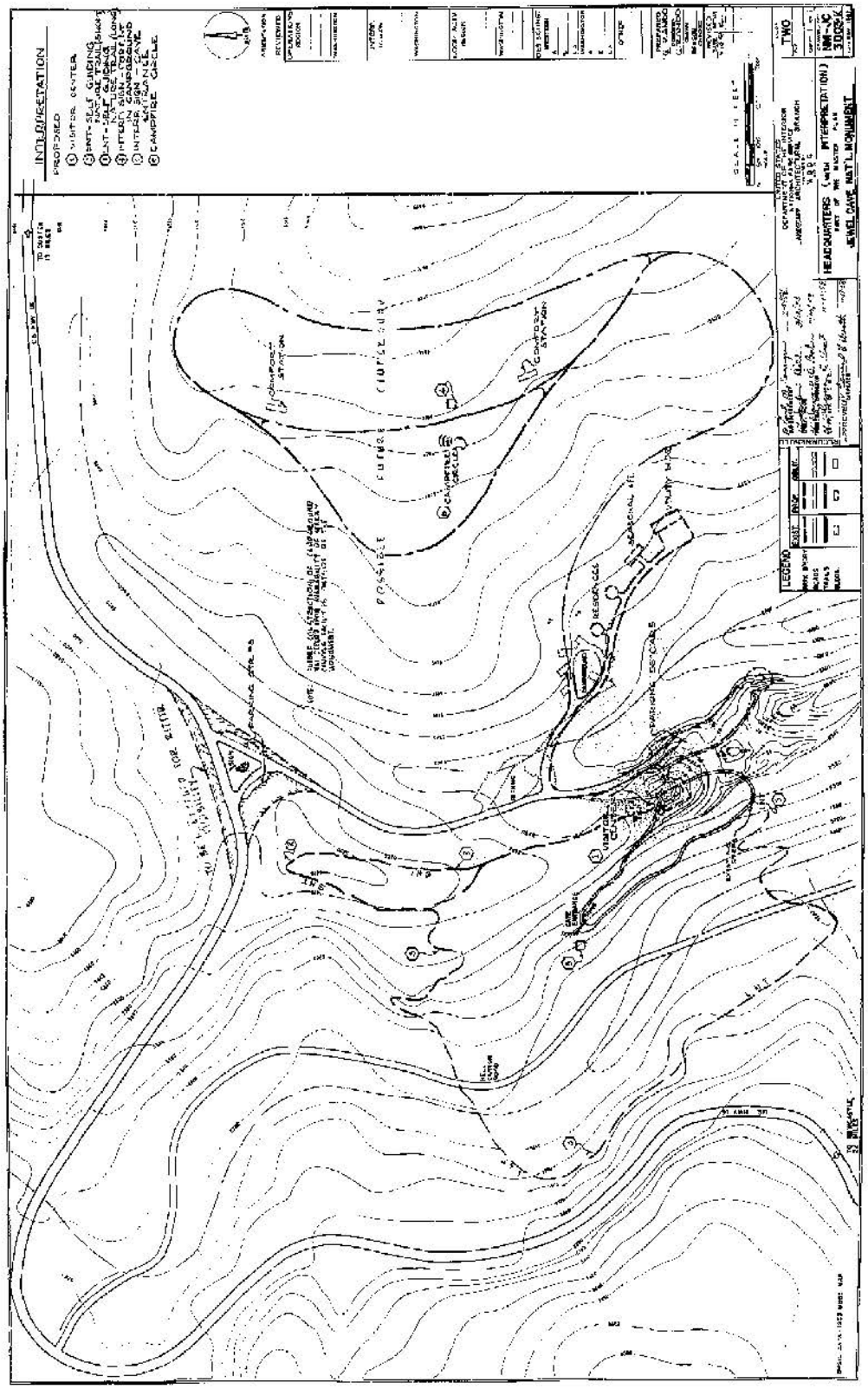


Figure 2.51: Proposed Site Interpretive Plan, 1957 (Source: NPS 000493)

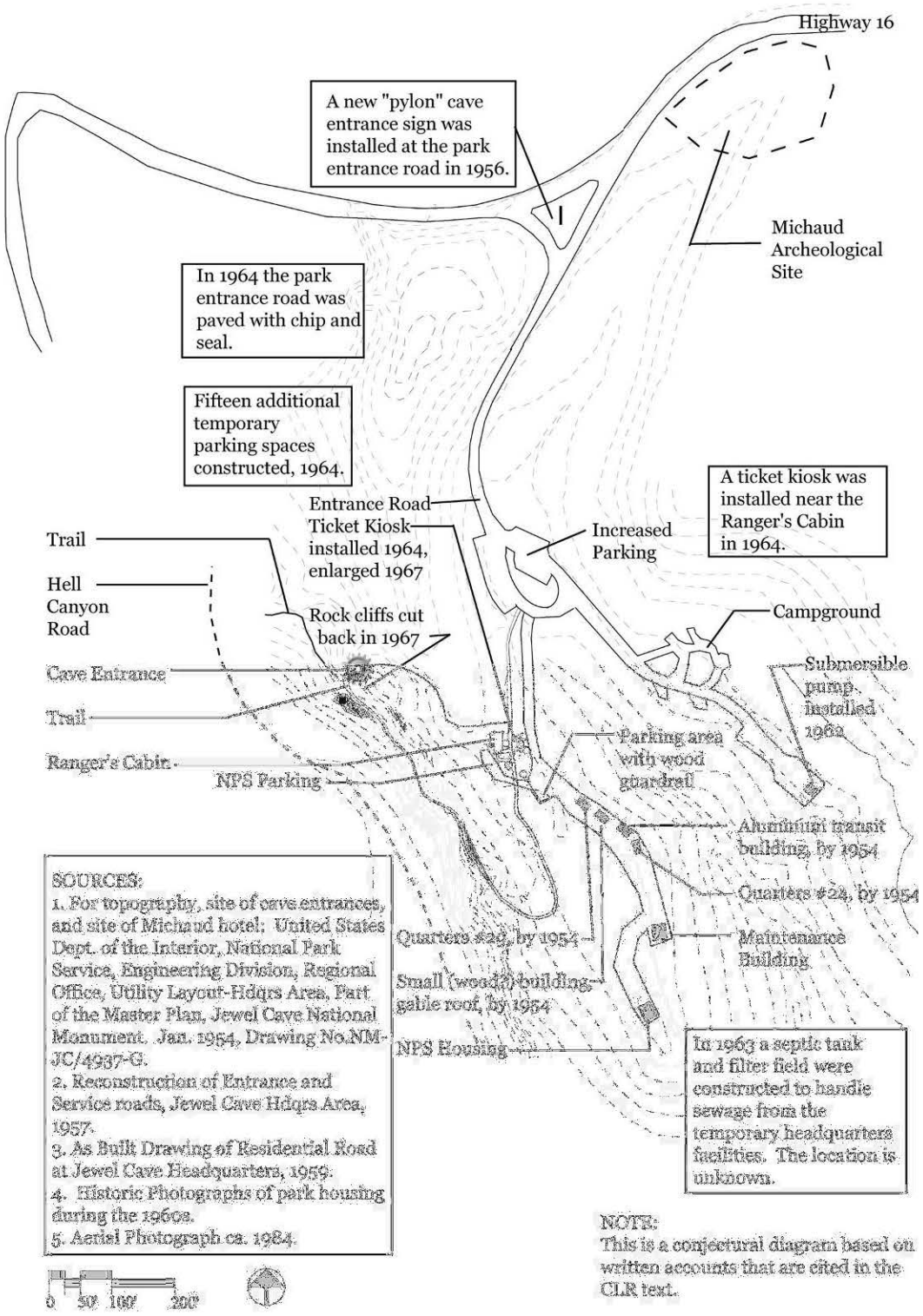


Figure 2.52: Historic Period Plan, 1957-1972



Figure 2.53: Cave Entrance, 1958 (Source: JECA 2633)

Figure 2.54: Headquarters Area As Built, 1959 (Source: NPS 000496.tif)

Figure 2.55: Proposed Site Plan, 1959 (Source: NPS 000495.tif)

Figure 2.56: Preliminary Water System, 1962 (Source: NPS 000497.tif)



Figure 57: Signs to Privies at Historic Area, date unknown (Source: JECA 1994) Note: it is believed that these were near the campground and present beginning in the late 1950s.



Figure 58: Upper Trail to Cave entrance with steps and housing in background, 1961 (Source: JECA 2072)



Figure 59: Ranger Cabin, drinking fountain, sign, and bench, 1961 (Source: JECA 2082)



Figure 60: Trails, benches, parking and housing viewed from roof of Ranger Cabin, 1967. (Source: JECA 1906)



Figure 61: Campground at Jewel Cave, 1961 (Source: JECA 2100)



Figure 62: Ticket Booth, drinking fountain, bench and soda machine at Ranger Cabin, 1967 (Source: JECA 1908)

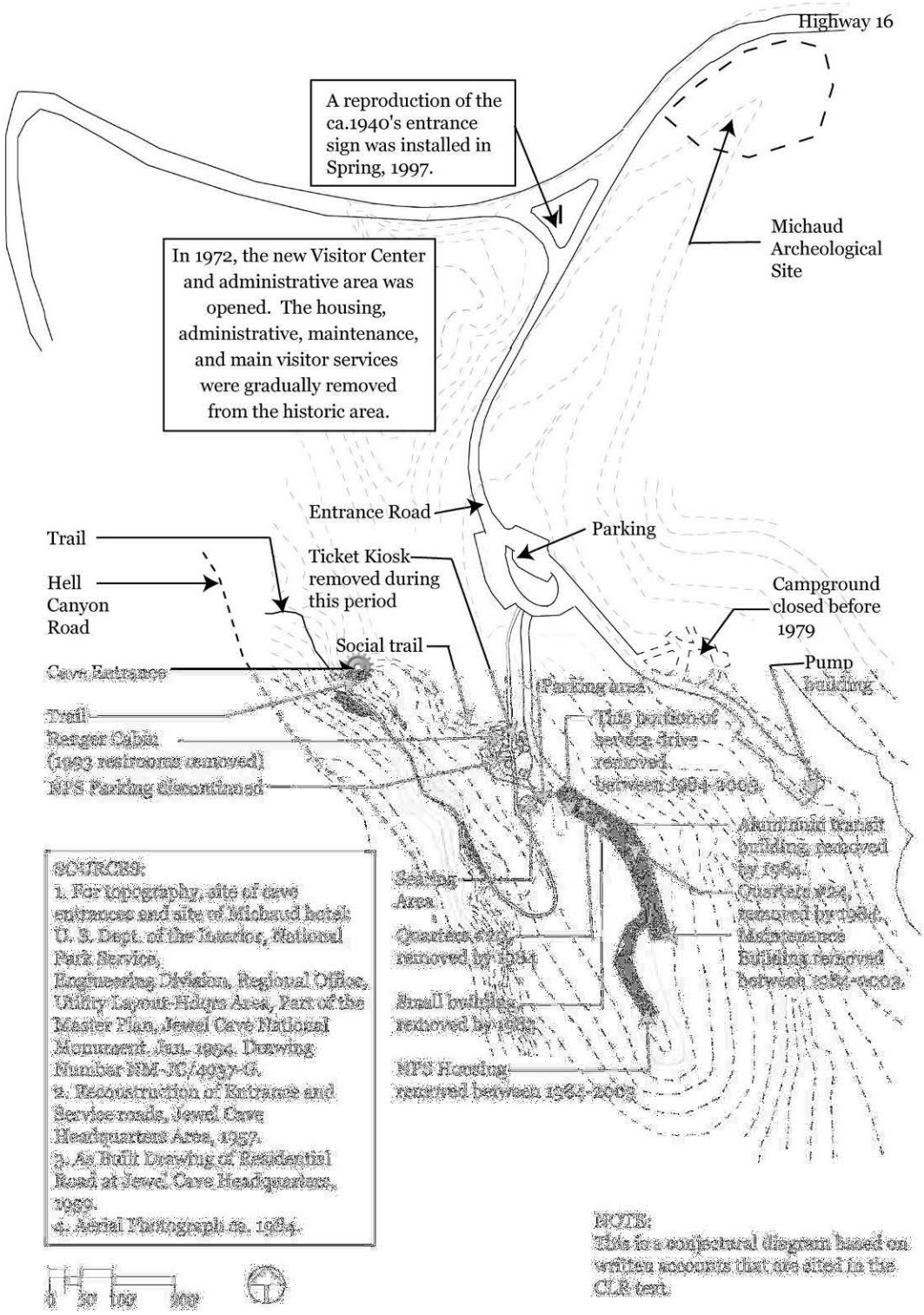


Figure 2.63: Historic Period Plan, 1972-2000

Figure 2.64: Constraint Map, 1981 (Source: NPS 000516.tif)

Figure 2.65: Management Zoning, 1993 (Source: NPS 000514.tif)



Figure 2.66: Aerial of Historic Area, 1984 (Source: JECA 2648C) Note there is still a house located at the end of the driveway that branches from Service Drive "B," and a maintenance building at the end of Service Drive "B."

Chapter III:
Existing Conditions (Affected Environment)

CHAPTER III: EXISTING CONDITIONS (Affected Environment)

This chapter describes existing conditions and the impact topics that could be affected by the treatment alternatives. This chapter provides the foundation for the analysis of potential impacts, which is presented in Chapter VII.

Cultural Landscape Methodology

A site survey was conducted in June 2003 to record the existing conditions of the structures, vegetation, and cultural landscape features at the historic area. Existing Conditions Plans are illustrated in Figures 3.1 and 3.2. An assessment of cultural landscape characteristics relevant to the historic area is provided including land use, spatial organization, topography, vegetation, circulation, structures, small-scale features, and archeological sites.

Descriptions of existing features of the cultural landscape and their conditions are provided in Table 1. Conditions evaluations are made based on the following criteria:[1]

- **GOOD -** The features of the landscape need no intervention; only minor or routine maintenance is needed.
- **FAIR -** Some deterioration, decline, or damage is noticeable; the feature may require immediate intervention; if intervention is deferred, the feature will require extensive attention in 3-5 years.
- **POOR -** Deterioration, decline, or damage is serious; the feature is seriously deteriorated or damaged, or presents a hazardous condition; due to the level of deterioration, damage, or danger the feature requires extensive and immediate attention.

[1] Page, Robert R. *Cultural Landscapes Inventory Professional Procedures Guide*. U. S. Department of the Interior, National Park Service, Cultural Resources, Park Historic Structures and Cultural Landscapes Program, Washington, DC, 1998, 62.

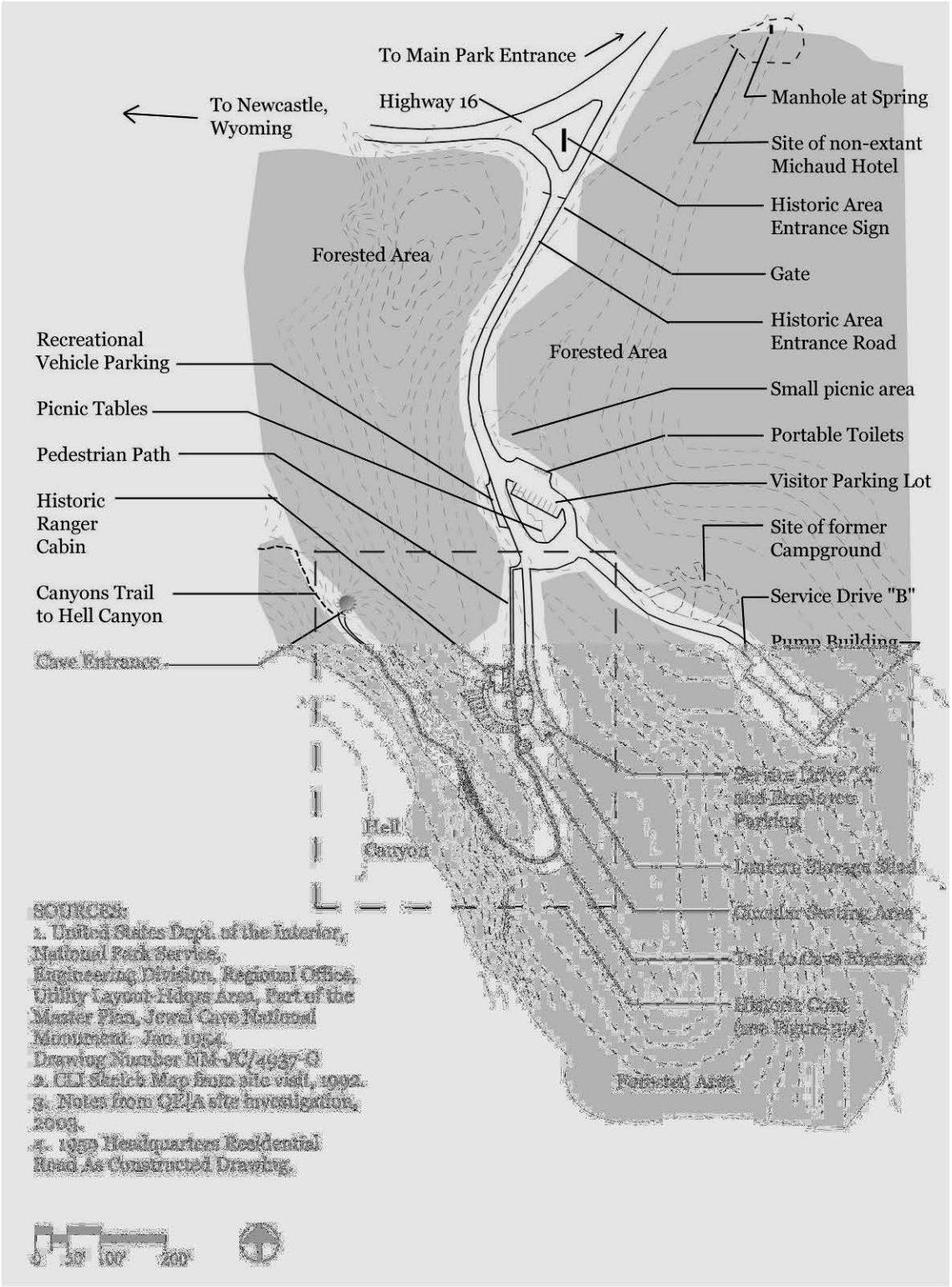


Figure 3.1: Historic Area Existing Conditions, 2003 (Prepared by QE|A)

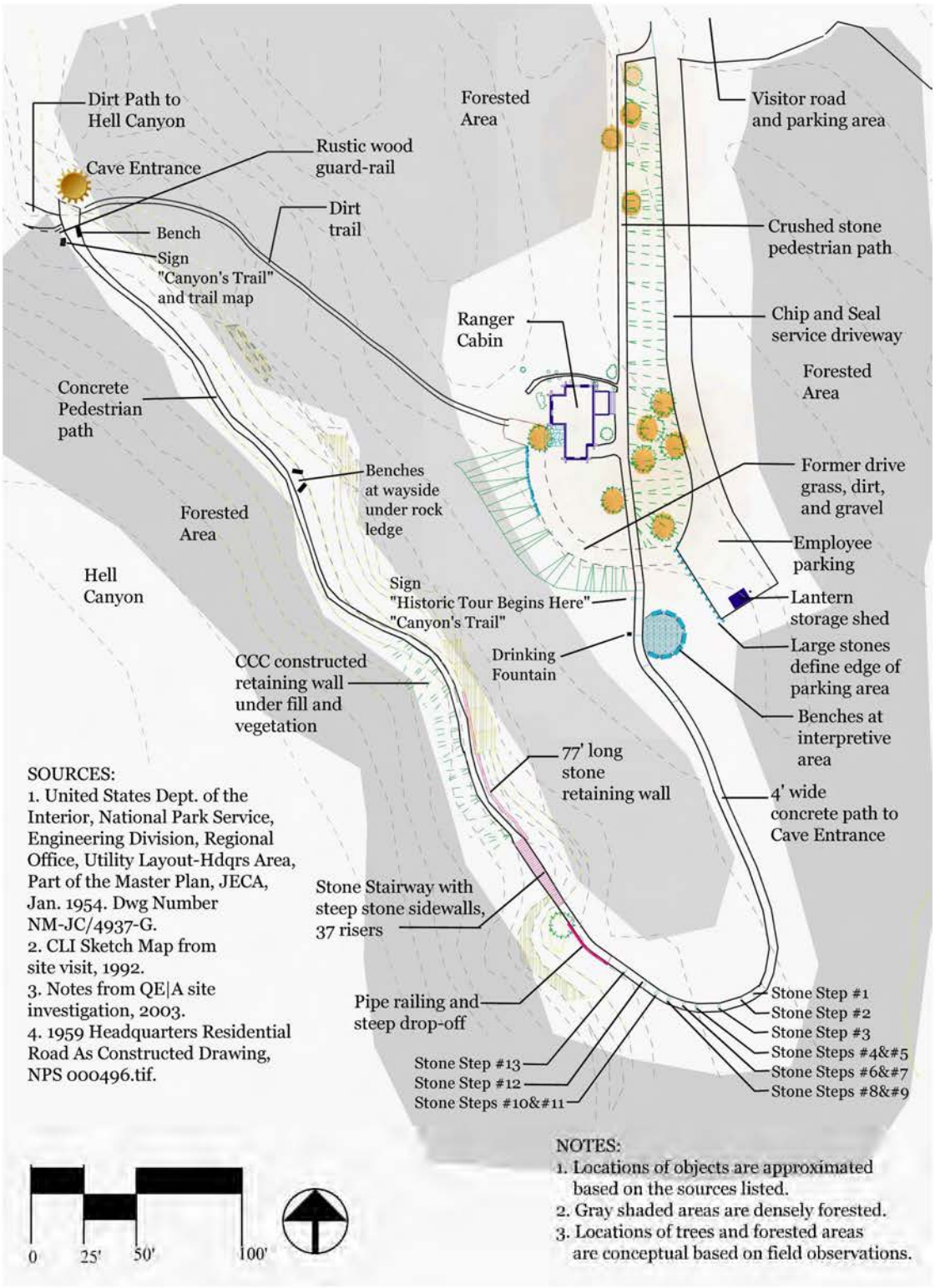


Figure 3.2: Historic Core Existing Conditions, 2003 (Prepared by QE|A)

Environmental Setting

Jewel Cave is located on the southwestern edge of the Limestone Plateau area of the Black Hills physiographic region. The area is characterized by steep topography and deep canyons underlain by resistant Pahasapa limestone (Mississippian). Elevations throughout the Monument range from 5,100 feet above sea level at the southern part of Hell Canyon to 5,860 feet above sea level at the far northeastern corner of the Monument. Ponderosa pine forest dominates the landscape. The historic area is the only portion of the Monument that has not been logged.[2]

Seasonal temperatures vary greatly, with an average winter temperature of 23 degrees Fahrenheit and summer average temperature of 62 degrees Fahrenheit. The average daily minimum temperature in Custer is 9 degrees in winter and average daily maximum in summer of 80 degrees. The area is dry with an average annual precipitation of 18 inches, the majority of which typically falls between April and September. The area is prone to thunderstorms and hail. Average seasonal snowfall is 45 inches.[3]

Cultural Resources (All elements of the cultural landscape)

Land Use

The historic area lies completely within the boundaries of Jewel Cave National Monument, and is managed as an interpreted historic site. Adjacent properties are managed as natural resource preservation areas as units of Jewel Cave National Monument and the Black Hills National Forest. The historic area serves as a visitor contact site. Ranger-led interpretive tours originate at a circular seating area located

[2] Marriott, Hollis and Ronald L. Hartment. *A Survey of the Vegetation of Jewel Cave National Monument*. Unpublished Report. University of Wyoming Department of Botany, 1986.

near the historic Ranger Cabin. The seating area also serves as a waiting area for visitors with tour tickets. The tours utilize the historic trail and stone steps to approach the historic entrance to the cave.

The historic area includes visitor parking for approximately ten vehicles and a rustic picnic area. There are portable toilets and a drinking fountain. Although the gate at Highway 16 is locked at the end of each day, the area remains accessible to hikers via the Canyons Trail. Two service roads provide vehicular access and parking for NPS staff and maintenance vehicles.

Geology, Soils, Topography and Spatial Organization

The historic area is located entirely on the cave-bearing Pahasapa limestone, and the lowest two subunits (sandstone and limestone) of the Minnelusa Formation. All three units are very permeable, providing a mechanism for surface disturbances to impact cave resources via infiltrating water.

The topography ranges from moderate to steep slopes. The rock units dip gently to the south and are incised by nearby Hell Canyon – about 100 feet deep with vertical cliffs up to 30 feet high. The entrance to the cave is located at the base of a cliff on the east wall of the canyon, about 70 feet above the canyon floor. Soils are generally thin, especially on south-facing limestone surfaces. All soils are well-drained.

The overall spatial organization of the historic area responds to the steep indigenous topography. The roads and trails stretch along the contours to achieve gradual changes in elevation in an area made up of steep slopes surrounding relatively

[3] Soil Survey of Custer and Pennington Counties, Black Hills Parts, South Dakota.

flat ridges and valleys. The result is a system of linear corridors and nodes that respond directly to the native terrain and the utilitarian needs of the site visitors. Figure 3.3 illustrates the system of corridors and nodes, as they relate to the steep slopes indigenous to the site.

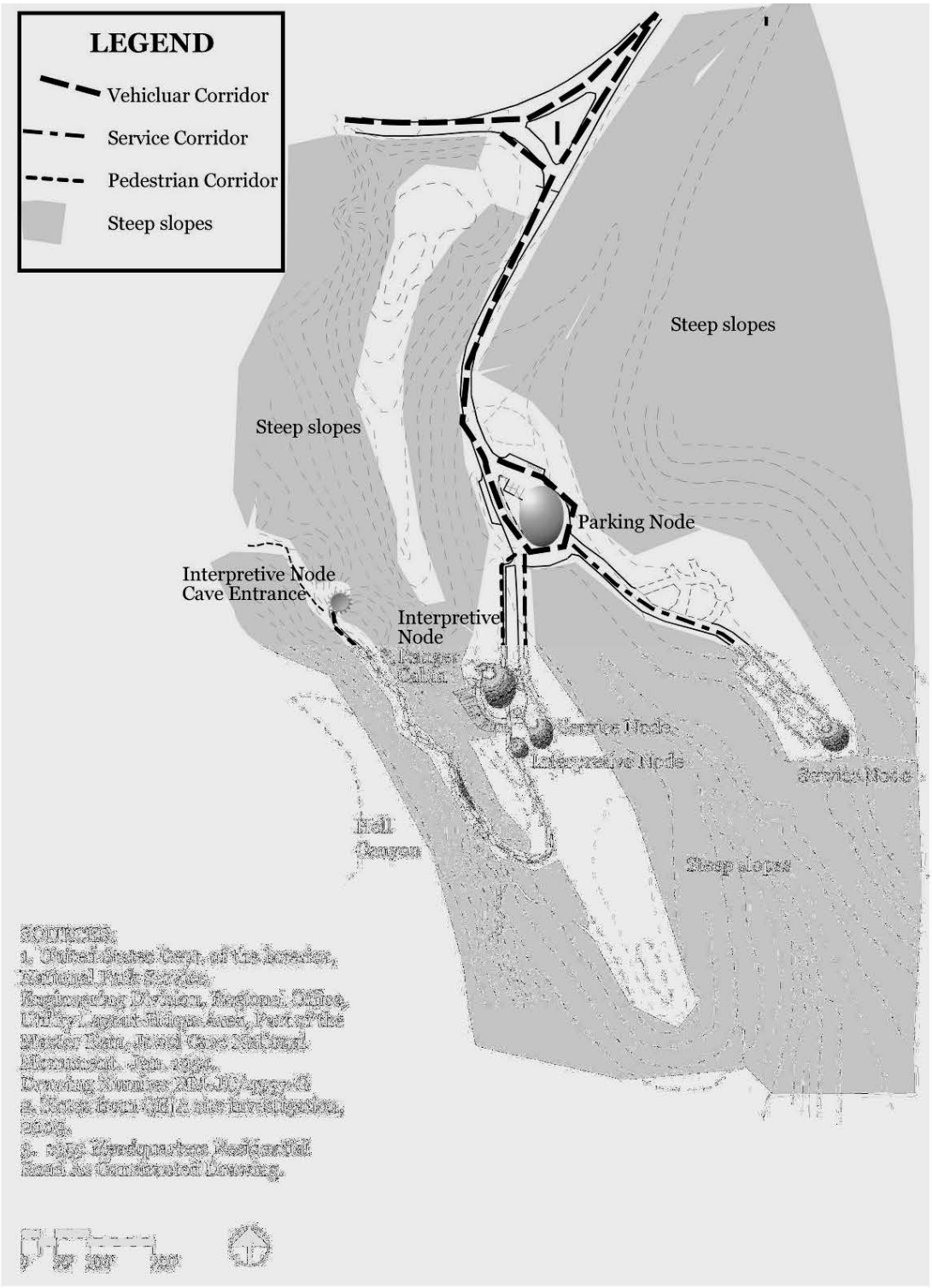


Figure 3.3: Spatial Organization and Topography (Prepared by QE|A)

Vegetation

According to a 1986 vegetation survey at the park, the historic area lies within a large ponderosa pine-snowberry association and Hell Canyon is composed of the ponderosa pine-gooseberry association. Generally, ponderosa pine trees in the southern Black Hills tend to be small in diameter for their age. This is because of the semi-arid environment, with an average of only 17 inches of rain each year. While the ponderosa pine-snowberry association makes up a large portion of the Monument, the historic area stand differs from corresponding stands in other areas within the park. The average tree size in the historic area is larger than those in adjoining areas, sapling density is higher, and this is the only forest stand in the park that does not include cut stumps. Many of the trees in the historic area are older than those in nearby stands and it is likely that the historic area was not logged. It is believed that there are trees within the historic area that are at least 260 years old, and possibly trees that are closer to 600 years old.[4]

The ponderosa pine-snowberry association occurs on west-and east-facing slopes and gentle south-facing slopes. It also occurs on or near level upland topography such as ridgetops and benches, and integrates with the ponderosa pine-little bluestem association. The individual trees are large and stands range from closed to somewhat open. Stands of dog-haired pine are common and Snowberry

[4] Mike Wiles, Jewel Cave National Monument Cave Specialist, stated in an email dated 22 July 2004 that in 1992 Marsha Davis determined the ages of trees growing in the dry stream channel in Hell Canyon. On average these are younger than those outside the stream channel. The oldest tree was 261 years, with a diameter of 28.7 inches. Trees only 8 inches diameter were often at least 100 years old. In reference to land north of US Highway 16 near the Monument, Amanda McAdams of The Nature Conservancy stated in a 2 June 1997 memo to the park that "much of this old-growth stand consists of areas which have never been logged." Although the source of her statement is unknown, the historic area has definitely not been logged since 1908 when the Monument was established. No evidence has been found to indicate the area was logged before 1908.

(*Symphoricarpos sp.*) is the dominant understory species. In 1986, the density of herbaceous groundcover varied from 0% to 100% from site to site, and grassy openings were common.[5] Forty-eight exotic species were known to exist at JEWEL CAVE, three of which were considered noxious weeds in Custer County (*Euphorbia esula, Cirsium arvense,* and *Convolvulus arvensis*).[6] Since the survey was conducted in 1986, vegetative communities have been altered by a devastating forest fire.

In the year 2000 the Jasper Fire burned through the entire Monument. Despite the fast progression of the wildfire, the intense heat inflicted damage to the native forest vegetation. As of June 2003, the encroachment of noxious weeds in the ground layer was extensive. Areas that previously included little or no invasive species are now dominated at the ground layer by Prickly lettuce and Canada thistle. Although the fire did not eliminate the native seed bank, it is possible that the weed seed coexisted with the native seed, survived the fire, and then out-competed the native plants during growth subsequent to the fire. The intensive heat and crowning of the fire also wreaked havoc on the ponderosa pines. The park displays extensive areas of dead ponderosa pine, and three years after the fire there is little or no evidence of pine seedlings in some areas. The vegetation at the historic area was affected by the fire and numerous maturing ponderosa pines were lost.

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[5] Bock, Jane H. and Carl E. Bock. *Effect of Fires on Woody Vegetation in the Pine-grassland Ecotone of the Southern Black Hills*. The American Midland Naturalist, 112(1), 1983, 35. When wildfires are absent in ponderosa pine forests that naturally burn every 10-25 years, dense stands of dog-haired pines result. Dog-haired pines are dense spindly pine stands in the forest understory.
[6] Hollis Marriott and Ronald L. Hartment, 1986.

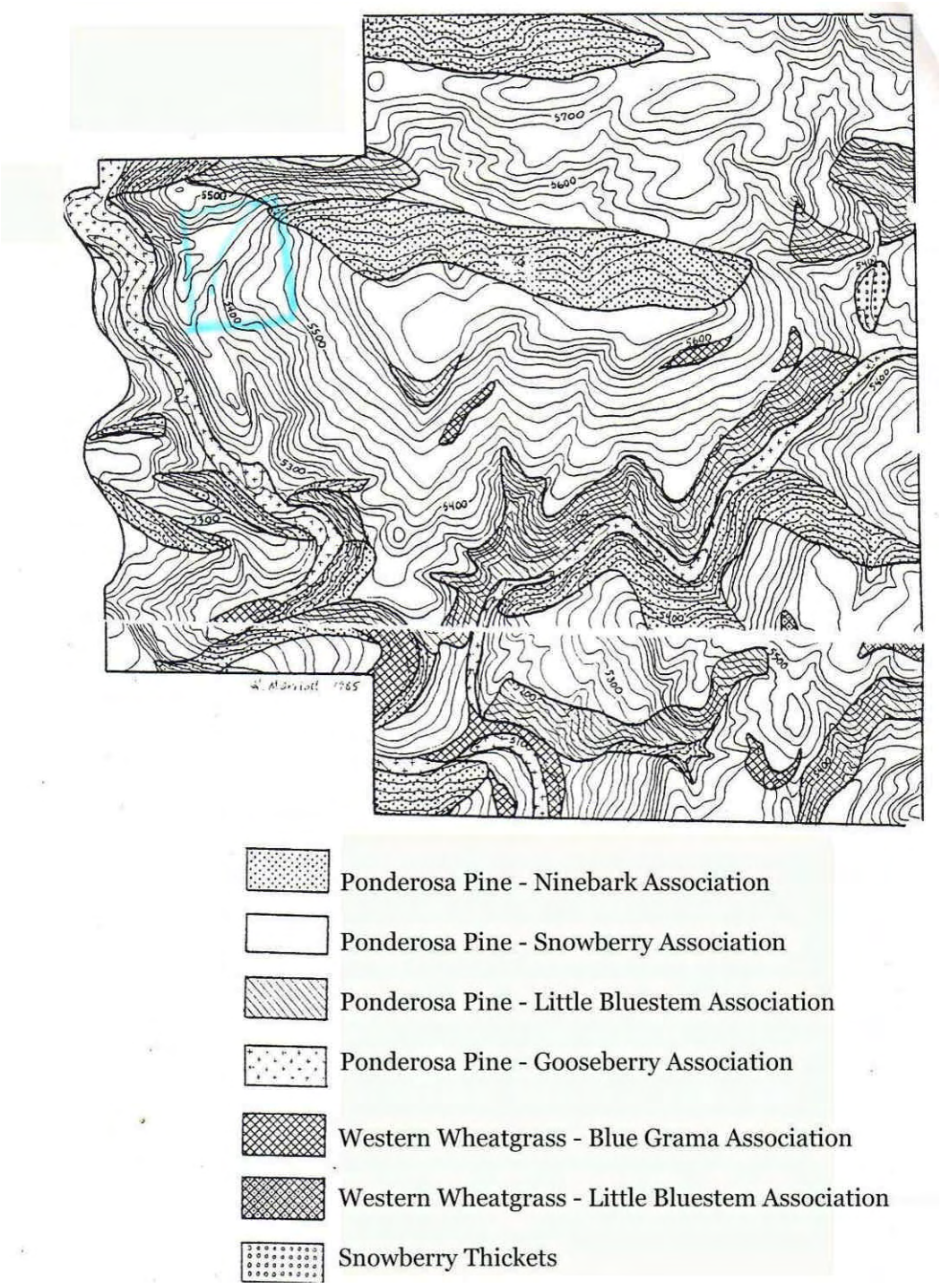


Figure 3.4: Vegetation Associations of Jewel Cave National Monument
(Source: Marriott and Hartment, 1986, "A Survey of the Vegetation of Jewel Cave)

Domestic vegetation at the historic site is minimal, consisting of a few Juniperus sp. near the Ranger Cabin.

Circulation

There are currently two means of access to the historic area. One can use a private vehicle or walk into the site. Park managers are considering adding a shuttle from the visitor center to reduce the impacts of overcrowding in the small historic area parking lot.

Vehicular Circulation

The historic site can be accessed by automobile via U.S. Highway 16. A reconstruction of the historic ca. 1940's entrance sign demarcates the entrance road to the historic area. The site entrance road follows its historic alignment that gently curves and slopes displaying the ponderosa pine forest surrounding the site. The road ends for visitors at a loop and small parking area, a short distance from the historic Ranger Cabin. Visitors can park and walk up the trail to the Ranger Cabin and wait at the seating area for their tour to begin.

Two service roads extend from the end of the loop road, providing access for NPS vehicles. The eastern-most road, Service Drive "B", extends from the visitor parking area to the southeast and dead ends at a small paved area and the pumphouse. Service Drive "A" is roughly parallel to Service Drive "B." It is located between the path that leads to the Ranger Cabin and Service Drive "B." It provides access to a small parking area for NPS employees, near the circular tour waiting area. A small structure for storing lanterns for the cave tour was constructed at the end of this road in 2003.

Pedestrian Circulation

Pedestrian access to the historic site is provided via the Canyons Trail that begins at the main Monument visitor center and passes through the historic area and Hell Canyon.

Pedestrian circulation within the site is simple and straightforward. A short trail surfaced with fine crushed stone provides access from the parking lot to the historic Ranger Cabin. The trail was previously paved with asphalt, but the pavement was removed in 2003 to fix a leaking water line that runs beneath the trail. The trail then continues past the front of the cabin to the south. The trail is paved in concrete from the circular seating area to the cave entrance. A series of stone steps are located along the upper portion of the trail, leading to a narrow stairway in a stone crevice. At the stone crevice a CCC-constructed stone stairway traverses the terrain to the lower trail. The lower trail is concrete with a short, NPS-constructed stone retaining wall on the up-slope side in one area. A larger CCC-constructed retaining wall on the downslope side of the trail is mostly disguised by vegetation planted for that purpose. The trail is fairly level, and wraps around the edge of the canyon wall toward the cave entrance. The Canyons Trail continues past the cave entrance into Hell Canyon.



Figure 3.5: Cabin, service road, and path 2003 (source: QE|A 2003 Roll 7 14)



Figure 3.6: Service road and path from parking (source: QE|A 2003 Roll 7 22)

Structures and Small-Scale Features

The Jewel Cave Historic Area includes historic and non-historic structures and small scale elements. A description of the individual structures and other features present at the site and their current condition is included in Table 1. The historic Ranger Cabin is an important extant feature that establishes the character of the area as a historic site. The oversized log construction techniques utilized by the CCC give the building a sturdy and rugged appearance associated with the historic period (1930's). The reconstructed entrance sign, and the trail and stone steps that lead to the historic cave entrance, reinforce the historic character of the area, exhibiting use of natural materials and attention to design details reminiscent of the 1930's CCC construction techniques. It was installed in the 1990s, and its design is closely based on the original, which is located in the Monument's museum collection.

A stone retaining wall located on the east side of the path and railings along the paths have been added as necessary to control erosion or provide assistance to visitors.

Site furniture includes picnic tables, half-log benches, trash receptacles, and directional signs. These elements are consistent with those used throughout the park. Modern site elements that do not contribute to historic character include the pump building, portable toilets, drinking fountain, and a lantern shed.

The Michaud archeological site includes some remnants of stone foundation walls and a later concrete manhole-type structure at the spring.



Figure 3.7: Manhole Structure at Seep/Spring near former Michaud Hotel Site (source: QE|A 2003, Roll1 AA007A)



Figure 3.8: HWY 16 and Remnants of Stone retaining wall at site of the former Michaud Hotel (source: QE|A 2003, Roll 8 5.2A and 4.1A, merged)



Figure 3.9: Site of Non-Extant Michaud Hotel (source: QE|A 2003, Roll1 AA013A)



Figure 3.10: Historic Area Entrance Sign 2003 (source: QE|A 2003 Roll8 9.4A)

Views

Important views within the historic district include those to and from the cave entrance, and views in the area around the Ranger Cabin and along the trail to the cave entrance.

Cave Entrance Views

Views to and from the cave entrance are dominated by the steep topography and rock outcrops surrounding Hell Canyon and the Ponderosa pine forest that blankets the hills. The only cultural elements viewed within this predominantly natural scene are those associated with the CCC developments within the historic area, the road cut for Highway 16, and occasionally a vehicle traveling along the road.

From Highway 16, one can identify the large rock outcrop that surrounds the cave entrance and stands out against the vegetation-covered landscape that surrounds it. The Ranger Cabin and lower trail to the cave entrance are also visible to the discerning eye.



Figure 3.11: Cave Entrance from across Hell Canyon (source: QE|A 2003, Roll 8, 31.15A)



Figure 3.12: Cave Entrance 2003 (source: QE|A 2003 Roll 8 30.14A)



Figure 3.13: View from Cave Entrance (source: QE|A 2003, Roll 6, AA000A)

Ranger Cabin Views

Existing views from the Ranger Cabin in all directions are filled with ponderosa pine trees, steep topography, and rock outcrops. Views from the front porch to the east include Service Road "A," the lantern storage building, and any cars parked in the small lot. The circular seating area with log benches is also dominant in the view. Service Road "B," across the draw, is visible to the attentive viewer. To the north, the visitor's parking lot, cars, and bright green portable toilets are visible through the ponderosa pines. During the 1970s there were electrical lines and a pole-mounted light fixture in the area, but their locations are not documented.

Stone Stairway

A dramatic view is provided of Hell Canyon and the lower path to the cave entrance from the stone stairway as one descends from the upper path.

Archeology

An archeological survey of the National Monument was completed in 1998. The report indicates that one prehistoric site and three historic sites have been documented within the historic district. Of these, one is potentially eligible for the National Register. The historic site of the Michaud Hotel (39CU844) contains two potentially contributing above-ground resources; portions of a stone building foundation and the cement manhole at the spring. The building foundation is a remnant of the Michaud hotel. The manhole was constructed by a CCC crew. Archeological fieldwork has been completed by Bruce Jones of the Midwest Archeological Center and a final report is being prepared. Archeological resources located in Hell Canyon include the Hell Canyon Road, a concrete foundation, and remnants of a masonry fireplace.

Table 1: Existing Structures and Features

Historic Structure/ Feature	*Figure Number*	*Description*	*Condition*
Ranger Cabin	3.23	CCC-constructed log cabin, built 1935	Good
Upper Trail to cave	3.24-3.35	4' concrete path was altered in 1960's, and again ca.1980s, some structural problems exist.	Fair
Stone Stairway	3.14, 3.36	CCC-constructed 1939, some minor alterations	Fair
Metal railing at top of stairway	3.33-3.37	Simple pipe rail at edge of path	Good to Fair
Lower trial to cave	3.14 3.37-3.44	This historic route was established by the CCC. The current 4'-wide concrete pavement was installed recently.	Fair
CCC-retaining wall	3.14, 3.37, 3.39	Stone wall was constructed and covered with earth and vegetation by CCC. Some erosion is exposing the stones.	Fair
Cave entrance area	3.11-3.13, 3.44	Pavement widens and terminates at iron gate to cave entrance. Interpretive site includes a bench and sign overlooking Hell Canyon.	Good
Historic Area Entrance Road	3.45-3.46	CCC-constructed road alignment into site.	Good
Michaud Archeological Site	3.8-3.9	Archeological site # 39CU844, with remnants of stone foundation.	Fair
Manhole at the Seep/Spring	3.7	CCC-constructed, repaired by NPS	Good
Remnant of trail west of Ranger Cabin	3.15	Informal trail indicates portion of earlier route to the cave entrance.	Fair
Ponderosa pines in historic area	3.15-3.25 3.37, 3.45	Many of these trees have been present for over 300 years. Most were scorched by the Jasper fire in 2000.	Fair
Highway 16	3.8-3.9 3.13	The historic alignment from Custer to the Jewel Cave historic area was established by 1901 (good condition). Highway 16 between Custer and Newcastle was completed in 1928 and went down Lithograph Canyon (poor condition).	Good/Poor
Building fdtn. remnants in Hell Canyon	3.47	Portions of concrete foundation.	Fair
Fireplace remnants in Hell Canyon	3.48	Fireplace remnants impacted by weather, vegetation, and structural deterioration.[7]	Poor
Hell Canyon Road	3.49	Route is maintained for fire vehicle access. Cattle guard installed by CCC remains. The route is washed out in two places.	Fair to Poor
CCC-const. cistern	3.50-3.51	Concrete cistern constructed by CCC crews. Located on a rise near the Ranger Cabin.	Fair
Former Campground Site	3.17	Site of non-extant NPS campground. Large rocks exclude vehicular access.	Good

[7] Sheveland, Genna J. *A Level III (Intensive) Cultural Resource Survey of Jewel Cave National Monument*. Custer, South Dakota: United States Department of the Interior, National Park Service, 1998. Sheveland documents this as archeological site 39CU1314, Hell Canyon Cabin. In 1998, there was a dugout in the hillside nearby that was supported by timber supports. During Williams' site visit in 2003, these timbers were no longer apparent. They were burned during the Jasper fire in 2000. It is possible that the duout structure was used to store dynamite for CCC construction projects. Sheveland indicates that the cabin site probably represents a late 1800 or early 1900 homesteader's cabin. It is probably not related to the Michauds, as it was located outside of their claims.

Compatible Feature		***Description***	***Condition***
NPS retaining wall	3.38-3.39	Stone retaining wall on the upslope side of the lower trail between the stone stairway and the seating area. Height varies from 2' to 3'-6". A 15' long portion of the wall is deteriorating.	Fair to Poor
Benches	3.40	Half-log benches echo the material and character of the historic Ranger Cabin. Installed before 1980.	Good
Directional Signs	3.13, 3.45 3.53	Small, simple signs indicating the locations of the Canyons Trail.	Good
Historic Area Entrance Sign	3.10	Reconstructed ca. 1940's entrance sign	Good
Stone steps on upper trail	3.26-3.32	Added or altered in 1960's. Added and altered again in the early 1990s.	Fair
Visitor Parking lot	3.45-3.46	Small gravel lot for about 10 cars.	Fair
Seating area on lower trail (Wayside #1)	3.40	Two benches at widened area in trail, under a rock ledge at a secondary cave opening. Site is interpreted.	Good
Service Drive "B"	3.53	Chip and seal pavement, turf is breaking through in some areas.	Fair
Stainless steel Gate at cave entrance	3.52	This gate is modeled after the original iron gate that is in the park's museum collection. The gate controls visitor access to the cave and includes horizontal openings to facilitate bat flight in and out of the cave.	Good
Non-Contributing Feature		***Description***	***Condition***
Portable toilets	3.46	Bright colored fiberglass 4'x4' portable building.	Good
Lantern storage shed	3.20, 3.22, 3.54	Approximately 4' x 6' x 5' tall log shed with shake-shingle shed roof. Eye wash station is adjacent.	Good
Service Drive "A"	3.5-3.6, 3.20-3.22	Chip and seal pavement.	Good
Pump Building	3.18	Concrete block shed painted brown, shed roof.	Good
Well cap	3.18	3' tall gable roof structure painted brown. The foundation of the structure appears to be settling and may need to be stabilized.	Fair
Drinking fountain	3.54	Concrete drinking fountain.	Good
Circular seating area near cabin	3.21-3.22 3.24, 3.54	Gravel area with log benches.	Fair
Rocks at edge of employee parking area	3.22, 3.54	Large rocks along the edge of Service Drive "A" and near the circular seating area.	n/a
Shrubs around the Ranger Cabin		Juniperus sp. at front and north side of the Ranger Cabin.	Fair
Utility poles, lines, boxes		Overhead utility lines and poles.	Good

Cave Resources

Because of the lack of natural regenerative processes, Jewel Cave is a non-renewable resource; all impacts are cumulative and essentially permanent. The cave system is entirely beneath the surface. Activities on the surface will affect the cave environment only if they cause changes impacting the exchange of matter and energy between the surface and the cave. Such exchange results from the movement of air, water, people, and animals. Air, people, and animals can only enter and leave the cave via the entrance. Water can enter the cave by gravity via fractures in the limestone, but is limited by impermeable geologic layers.

1. Water Resources

   There are several wet cave areas beneath the visitor parking area, and the cabin parking area. Some of these contain actively forming speleothems.

2. Geologic Resources

   Impacts consist of trail degradation, offtrail disturbances (tracking), inadvertent damage to speleothems, and deliberate damage to or defacement of speleothems or other cave features.

   The presence of manganese makes the matter of tracking one of the foremost management concerns. There are deposits of manganese minerals throughout most of the cave. These deposits are fine-grained and dark in color. They stain clothing and cave surfaces. Traveling through the cave can result in tracking these dark deposits onto adjacent limestone and calcite, leaving footprints, handprints, and smudges wherever people come into contact with cave surfaces. This is known as “manganese tracking.”

Finally, some speleothems, such as hydromagnesite balloons, gypsum beards, and calcite rafts are extremely fragile and can be easily damaged by human activity. There are not any of these formations in the cave passages beneath the Historic surface area.

3. Macrobiotic Resources

All small caves in the area are home to various common vertebrates and invertebrates. The caves are essential shelters for these surface dwelling animals. Various bat species are known to frequent the small caves in limited numbers. The passages of Jewel Cave within about 1000 feet of the entrance serve as summer roost and winter hibernaculum for at least six species, including five Myotis species and a large population of Corynorhinus townsendii (Townsend's Big-eared bat). The former occur in numbers of 250-500, and the latter ranges from 600 to 1,100 individuals. Jewel Cave is presently one of the world's largest known hibernacula for the Corynorhinus townsendii (Townsend's Big-eared bat). There are no known vertebrates or invertebrates that are cave adapted.

4. Microbiotic Resources

Along the Historic tour route, Moore (1996) found heterotrophic bacteria and fungi in densities approaching those found in soils collected outside the entrances. These high densities closely paralleled lint deposition from visitors traveling in those areas. Common protozoa were found throughout the cave. Nematode and arthropod populations were largely restricted to the entrances,

tour route, and well-traveled corridors. The ecosystem is largely detritus-based, probably as a result of human activity.

Recent discoveries in other National Park Service caves have shown that microbiologic communities can exist in the low-energy environment present deep within the larger cave systems. These microbes are cave adapted and often differ uniquely from their surface counterparts. A single in situ sampling effort in 2001 has confirmed the presence of microbes at the farthest known reaches of Jewel Cave, but researchers did not attempt to culture, classify, or identify them (Northup 2002).

Water Quality

Except for three springs (actually large seeps), there are no perennial surface water resources within the monument. Hell Canyon and Lithograph Canyon are subject to occasional flash flooding, particularly during the spring rains and snowmelt. Jewel Cave Spring was developed in the 1930s and does not presently have surface flow; it is not certain that it ever did.

The three springs were extensively monitored for water quality for three years in the early 1990s. The resulting date has been compiled into the national STORET database. Ongoing efforts monitor lead, nitrates, and chlorides at these three springs on a monthly basis. Two springs (Jewel Cave Spring and Prairie Dog Spring) adjacent to U.S. Highway 16 are subject to high chloride concentrations, presumably from highway runoff bringing in salts from winter de-icers.

Wildlife

A fairly complete list of vertebrate fauna has been compiled at Jewel Cave National Monument. The list includes 88 species of birds, 29 species of mammal (including 11 species of bats), 2 species of reptiles, and 4 species of amphibians. There are no species of fish present within the Monument. A list of common vertebrates can be found in Appendix A.

Large mammals include white-tail and mule deer, elk, bighorn sheep, and mountain lions. Because Jewel Cave consists of two square miles of park land surrounded by Forest Service land, these animals frequently pass through the Monument without necessarily making it their home.

Over 300 species of invertebrates have been documented, and list of common invertebrates can be found in Appendix A.

Threatened and Endangered Species

The only federal- or state-listed species occasionally present in the Monument is the bald eagle (*haliaeetus leucocephalus*). It is federally listed as threatened and also listed by the state of South Dakota as threatened. No nest sites are known within the Monument, particularly near the historic area.

Visitor Use and Experience

Overall visitation at Jewel Cave National Monument since 1996 has experienced a steady, slight decline, with the exception of 2002. The total visitation for 2003 was 122,369. An estimated 24 percent of total Jewel Cave National Monument visitors (number taken from traffic counters in visitor center area and at Historic Area entrance road) visit the Historic Area.

	Total Park Visitation	Historic Area		
		Lantern Tour	Non-tour ranger contacts	Traffic Counter
1996	144,983	7,993	N/A	N/A
1997	133,393	7,718	N/A	N/A
1998	131,313	8,689	N/A	N/A
1999	131,253	9,469	N/A	N/A
2000 [A]	129,445	6,017	1,920	14,246
2001 [B]	125,678	5,417	1,936	12,583
2002	131,599	7,655	1,795	12,509 [C]
2003	122,369	7,417	226 [D]	16,002 [D]

[A] The Jasper Fire resulted in the closure of the monument between Aug. 25 - Sept. 2, 2000. The Historic Area is traditionally open through Labor Day.
[B] Statistics for the Historic Area for Labor Day, 2001 are missing.
[C] Traffic counter for Historic Area stats available only through Aug. 20, 2002; traffic counter cable sliced during chip/seal project.
[D] Traffic counter not installed until 6/11; personnel scheduling changes meant that the area was unstaffed while rangers were giving tours.

The majority of U.S. visitors to Jewel Cave National Monument tend to be from outside of the state, with most from Minnesota, followed by California.[8] Visitation in the Historic Area is comparable to overall monument visitor makeup, with the majority being families, followed by groups of friends or combinations of friends and family. Occasionally, organized groups such as scouts or church groups participate in ranger-guided historic tours. A number of visitors to the Historic Area are those approaching from the west who enter the area without the understanding that the main visitor facilities are actually one mile further east.

Jewel Cave's Historic Area is located one mile west of the primary park entrance, just off of South Dakota Highway 16. This area is open on a seasonal basis (approximately Memorial Day through Labor Day). Participating in the historic tour

is the primary visitor activity in the Historic Area. Candle lanterns were replaced with oil lanterns in 2003 (primarily in response to mold growth problems on dripped candle wax in the cave). Historic tours are limited to 20 persons, with a minimum age of 6 years for safety reasons. Tickets for these tours are sold at the monument's visitor center.

Historic Area visitor facilities currently include the historic Ranger Cabin, CCC-era foot trail between the historic cave entrance and the cabin, two parking areas (employee, near cabin, and visitor, below cabin), four to eight picnic tables (this varies from season to season), three to six portable toilets (also varies seasonally), and trailheads. Access to the area is currently via personal vehicle by way of Highway 16 and the Historic Area entrance road, or by foot trail. The Canyons Trail is a 3.5 mile loop between the Historic Area and Visitor Center area, with area trailheads at the Visitor Center and just east of the Historic Area parking lot.

The Historic Area offers visitors an opportunity to experience the early history of the monument by visiting the Ranger Cabin and the historic entrance to the cave, as well by participating in the Lantern cave tour. Restoration of the Ranger Cabin has enhanced visitor understanding and appreciation of the structure. Hikers on the Canyons Trail use the Historic Area as a rest stop along the trail. The small picnic area appeals to those who wish more shade and quiet than what is available in the vicinity of the visitor center.

[8]Skalitsky, T. 2003. Satisfaction and Visitor Knowledge at Jewel Cave National Monument, South Dakota. *Master's Thesis, Dept. of Forestry, Southern Illinois University Carbondale.*

Socioeconomics

Jewel Cave National Monument is located 13 miles west of Custer, South Dakota (pop. 1800), and 24 miles east of Newcastle, Wyoming (pop. 3000). Newcastle has been growing slowly in recent years, and Custer has been growing much more rapidly. Rural development has been on the rise on either side of the Monument, but particularly to the east, in the Pass Creek area. Custer, South Dakota, the nearest city to Jewel Cave, has a population of 1,860 individuals, while Custer County has 7, 370 individuals. Racially, the county is primarily white (94%), with American Indian ethnic groups making up the next highest category with 3.1%. While the median income of Custer City is slightly below the state average ($31, 739 for Custer City compared to $35, 282 for South Dakota), the county median income is slightly higher than the state average ($36, 303 for Custer County). Custer County has a tourist-based economy centered upon outdoor pursuits and industry. The Agriculture, Forestry, and Mining Trades and the Arts, Entertainment, and Recreation Fields both employ 12-percent of the population, or 24% total. The only higher employment sector is the education and social services, making up 20% of the employment base in the county.

Solid Wastes

Solid waste from Jewel Cave National Monument is taken to the Rapid City Landfill, located roughly one hour north of Custer, SD. This 450-acre landfill has been open since 1960 and accepts an average of 300-350 tons of non-hazardous solid waste per day. The landfill attempts to recycle as many materials as possible, including large scale recycling of yard waste and asphalt. About 2 tons of asphalt and 15, 000 tons of

yard waste are received by the landfill each year. The asphalt is ground-up and used either on site or sold back to the public. Any yard waste is composted and sold to the public as an organic soil amendment. Other materials accepted by the Rapid City Landfill include cardboard, mixed recyclables (glass, aluminum, plastic), and scrap metals.

Utilities

The area includes two wells and one pump house, buried water lines a sewer line and septic system, aerial and buried power lines, and buried phone lines.

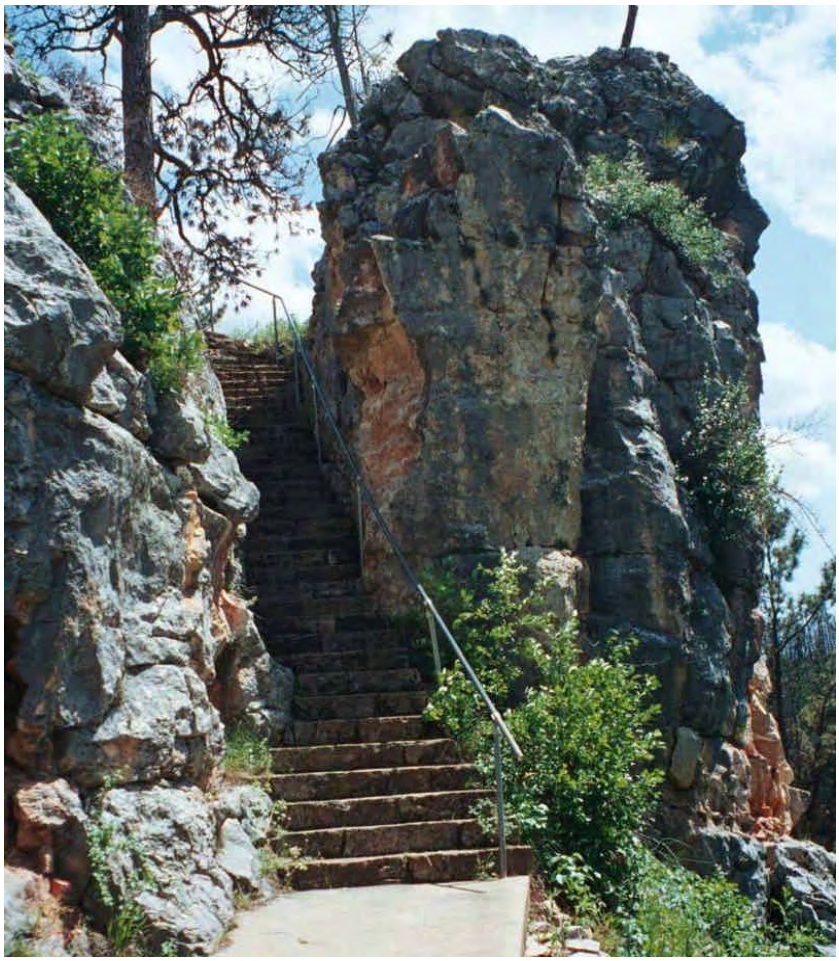


Figure 3.14: Stone CCC Stairway viewed from lower trail (Source: QE|A 2003, Roll5-2)



Figure 3.1: Former parking area on southwest side of Ranger Cabin. (Source: QE|A 2003, Roll3-16)



Figure 3.2: Former NPS campground site is barely discernible in 2003. (Source: QE|A 2003, Roll7-17)



Figure 3.3: Pump building and cap. (Source: QE|A 2003, Roll7-16)



Figure 3.4: Landscape along the Canyons Trail between the historic area and the Monument visitor Center, east of the historic area. Damage from the Jasper Fire of 2000 is still very much apparent in 2003. (Source: QE|A 2003, Roll7-23)



Figure 3.5: Southern end of Service Drive "A," note former developed area in the distance, gravel stockpile, eyewash station, and lantern storage shed. (Source: QE|A 2003, Roll2-20)



Figure 3.6: View to southeast from Ranger Cabin. Note former driveway, parking area, former developed area in background, and circular seating area. (Source: QE|A 2003, Roll2-5)



Figure 3.7: Lantern Storage and Eyewash Station (source: QE|A 2003, Roll2, AA007A)



Figure 3.23: Ranger Cabin, South side (Source: QE|A 2003, Roll3, AA000A.jpg)



Figure 3.84: Upper trail to Cave entrance, from Ranger Cabin facing south (Source: QE|A 2003, Roll4-1)



Figure 3.25: Upper trail to Cave entrance, from south of seating area facing south (Source: QE|A 2003, Roll 4-4)



Figure 3.26:Upper trail stone steps 1, 2, and 3 (Source: QE|A 2003, Roll4-8)



Figure 3.27: Upper trail stone steps 3, 4, and 5. The double-step configuration shown is a recent (ca. 1980s-1990s) modification and is awkard to negotiate. (Source: QE|A 2003, Roll4-9)



Figure 3.28: Upper trail stone steps 6, 7, 8, and 9 (Source: QE|A 2003, Roll4-10)



Figure 3.29: Upper trail stone step 10, deteriorating concrete (Source: QE|A 2003, Roll4-12)



Figure 3.30: Upper trail stone steps 10 and 11 (Source: QE|A 2003, Roll4-13)



Figure 3.31: Upper trail stone step 12, cracking edge (Source: QE|A 2003, Roll4-14)



Figure 3.32: Upper trail stone step 13, pulling away from concrete (Source: QE|A 2003, Roll4-16)



Figure 3.33: Upper trail curve near stairway, failing concrete (Source: QE|A 2003, Roll4-18)



Figure 3.34: Detail of structural failure at curve in upper trail (Source: QE|A, Roll4-20)



Figure 3.35: Pine at curve in upper trail (Source: QE|A, Roll4-24)



Figure 3.36: View down the CCC stone stairway (Source: QE|A, Roll4-26)



Figure 3.37: View of Lower trail and area of CCC retaining wall from stone stairway (Source: QE|A 2003, Roll5-1)



Figure 3.38: Lower trail facing north, NPS constructed stone retaining wall on right. Note impacts from vegetation and erosion. (Source: QE|A 2003, Roll5-3)



Figure 3.39: Lower trail facing north, area of CCC retaining wall to left. Cover over stones is thin in places, exposing the wall materials. (Source: QE|A 2003, Roll5-4)



Figure 3.40: Wayside #1 with benches along lower trail at opening in rock. This is presently called "Bush's Cave." The diagram illustrated in Figure 2.43 indicates that it was referred to as "Shelter Cave" in 1946. (Source: QE|A 2003, Roll5-10)



Figure 3.41: Tree at lower trail's edge about 60' north of wayside #1. Concrete is in poor condition in several areas along the lower trail. (Source: QE|A 2003, Roll5-13)



Figure 3.49: Lower trail concrete in poor condition near small cave opening located to the south of the historic cave entrance. (Source: QE|A 2003, Roll5-16)



Figure 3.43: Small cave opening located to the south of the historic cave entrance. The Monument staff do not use a name for this opening currently, however, according to Figure 2.43 it was called "Bear Pit Cave" in 1946. (Source: QE|A 2003, Roll5-17)



Figure 3.44: Historic Cave Entrance. (Source: QE|A 2003, Roll5-22)



Figure 3.45: Entrance road and parking, facing north (Source: QE|A 2003, Roll7-1)



Figure 3.46: Parking area, picnic area, and portable toilets. (Source: QE|A 2003, Roll7-13)



Figure 3.47: Concrete foundation, remnant of former structure in Hell Canyon. (Source: QE|A 2003, Roll 1-23)



Figure 3.48: Remnants of fireplace in Hell Canyon. (Source: QE|A 2003, Roll 1-22)



Figure 3.49: Hell Canyon Road. (Source: QE|A 2003, Roll 1-24)



Figure 3.50: CCC-Constructed Cistern. (Source: QE|A 2003, Roll 1-17)

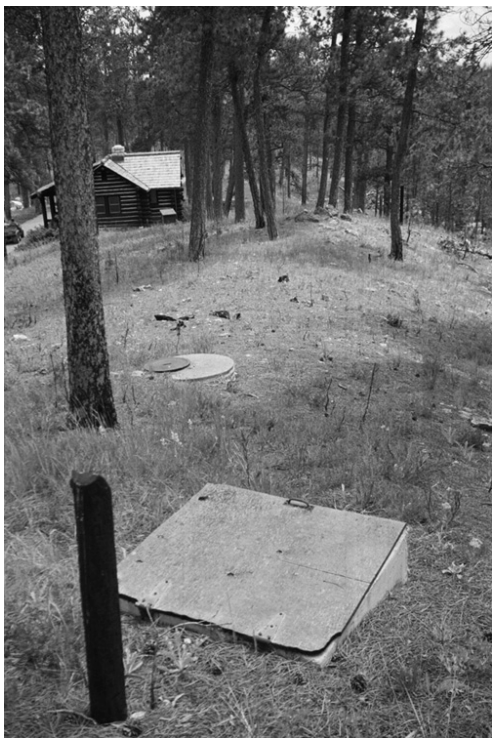


Figure 3.51: CCC-Constructed Well Cap and Cistern in relation to the Ranger Cabin. (Source QE|A 2003, Roll 1-16)

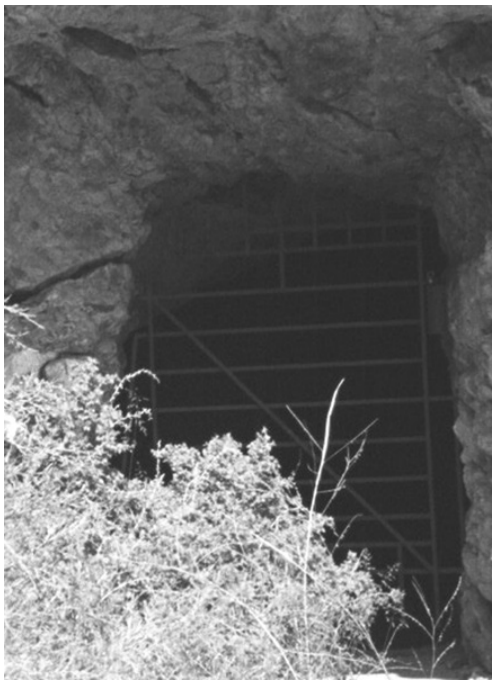


Figure 3.52: Gate at cave entrance. (Source: QE|A 2003, Roll5-22)



Figure 3.53: Service Drive "B" and directional sign. (Source: QE|A 2003, Roll7-15)



Figure 3.54: Lantern storage shed, eyewash station, circular seating area, and drinking fountain. (Source: QE|A 2003, Roll 2-7)

Chapter IV:
Cultural Landscape Analysis

CHAPTER IV: CULTURAL LANDSCAPE ANALYSIS

National Register Status

Historic features associated with Jewel Cave National Monument are listed in the National Register of Historic Places under a Multiple Property designation that was accepted in April 1995. The "Jewel Cave National Monument Multiple Property Submission" includes three associated property types: 1) Resources associated with tourism and the early development of Jewel Cave, 1890-1944; 2) Resources associated with the development and administration of Jewel Cave National Monument, 1908-1944; and 3) Resources associated with NPS rustic architecture and Public Works Construction, 1933-1942. The CCC Ranger Cabin, the cave entrance and the trail leading from the Ranger Cabin to the historic cave entrance are listed in the National Register as contributing resources associated with the Jewel Cave Multiple Property listing.

Jewel Cave Historic Landscape District Boundary

The analysis and evaluation conducted as a part of this CLR indicates that the proposed historic district is eligible for listing in the National Register. The historic district boundary is defined as the area where the original National Monument boundary overlaps the current National Monument boundary. The boundaries and proposed district are illustrated in **Figure 4.1**.

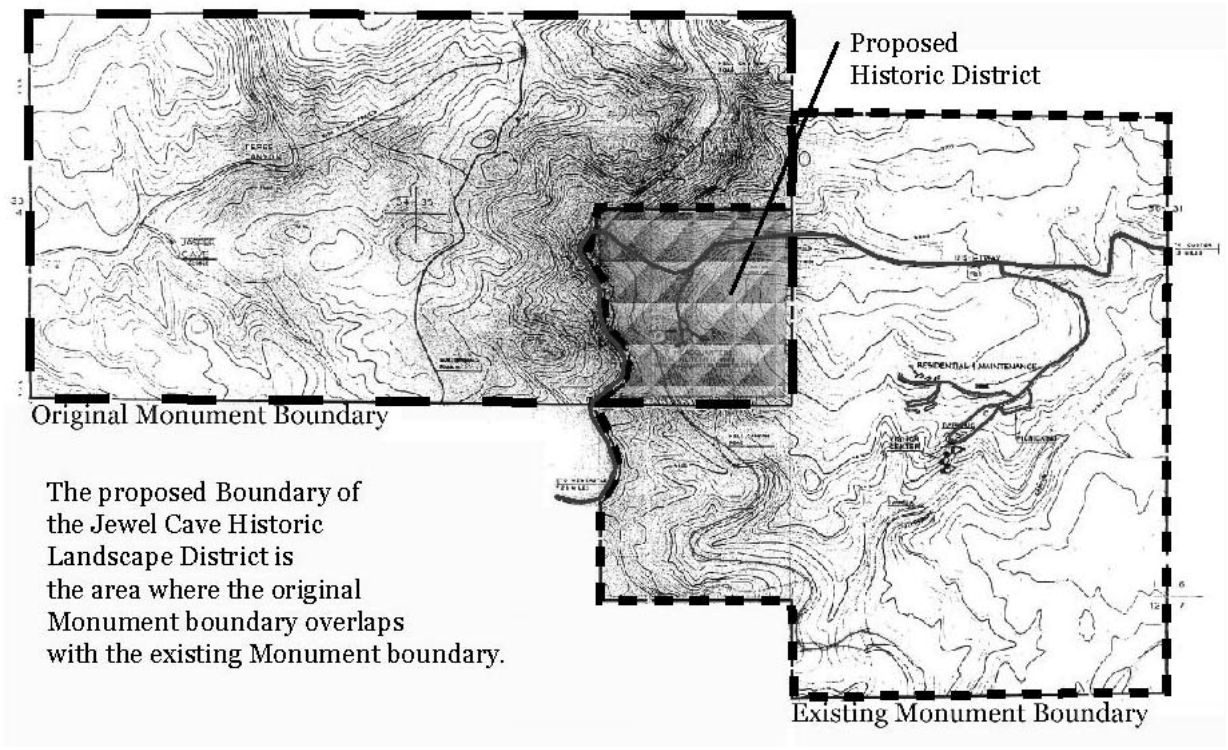


Figure 4.1: Original Monument Boundary overlapped with the Existing Monument Boundary. (Source: revised by QE|A from NPS 000490.tif, General Development of JEWEL CAVE, 1951)

Figure 4.2 provides a more detailed diagram of the proposed district which includes four component landscapes including:

1) the Historic Developed Area, Ranger Cabin, upper trail to cave, stone steps on trail, stone stairway, metal railing at top of stairway, lower trail to cave, CCC retaining wall, cave entrance area, historic area entrance road;

2) the Michaud archeological site, includes the site of the non-extant Michaud Hotel and the remnants of the stone foundation, and the manhole at the spring;

3) US Highway 16 includes the highway; and

4) Hell Canyon Road area includes the road alignment, the remnants of a brick fireplace, and remnants of a foundation of a building. Research conducted as a part of

the CLR indicates that each of the component landscapes contribute to the existing National Register multiple property designation.

Although the majority of the contributing cultural resources are located within the Historic Developed Area indicated in **Figure 4.2**, the larger district boundary is justified due to its representation of the long-term jurisdictional boundary associated with the National Monument. Within the district boundary, the harvesting of timber has not been allowed since the original creation of the National Monument in 1908, and it is unique in possessing a remnant of an old growth pine forest. The district also contains all of the historic resources associated with the property. Finally, the boundary is definable based on historic documentation and legal descriptions.

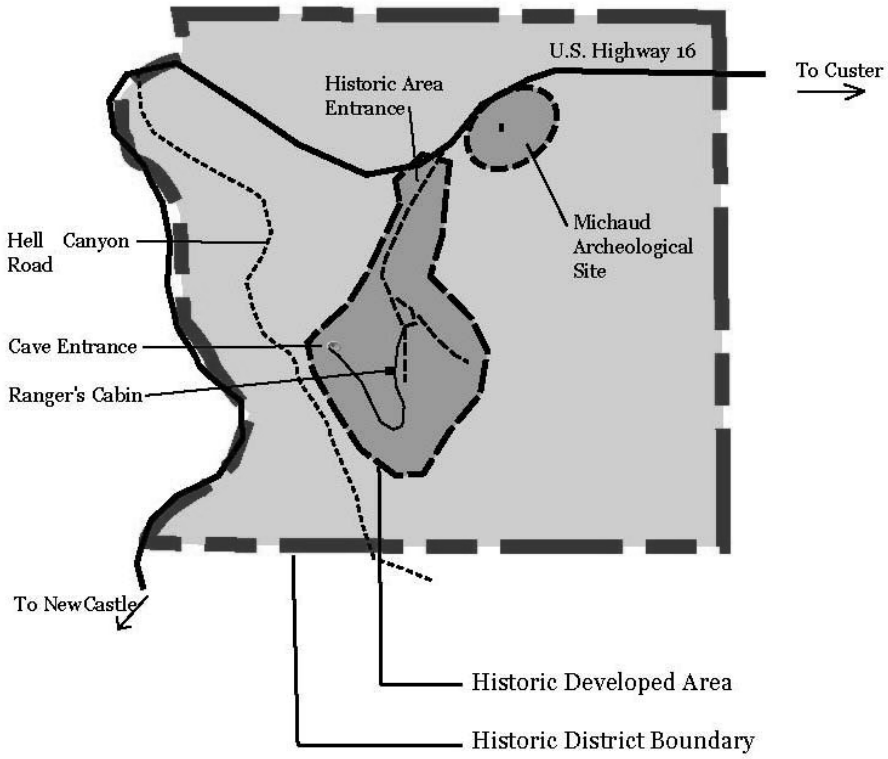


Figure 4.2: Detail of proposed historic district boundary. (Source: QE|A 2003, adapted from U.S. Department of the Interior, National Park Service, Branch of Engineering, "Topographic Map, Part of the Master Plan for Jewel Cave National Monument," January 1, 1942. Drawing number NM-JC, 5300A.)

Jewel Cave Historic Landscape District Significance

The proposed Jewel Cave Historic Landscape District is significant according to National Register Criteria A and C. According to the multiple property nomination, the property consists of three associated property types including: those associated with tourism and the early development of Jewel Cave from 1890 through 1944; resources associated with the development and administration of Jewel Cave National Monument from 1908 through 1944; and resources associated with NPS rustic architecture. **Table 1** provides descriptions of each of the contributing elements and their associated property type. **Table 2** describes elements that are non-historic, but are compatible with the historic integrity of the district. **Table 3** enumerates non-contributing elements.

Associated Property Type One Description

Property type one includes resources associated with tourism and the early development of Jewel Cave from 1890 through 1944. Resources within this category were "conceived and developed as tools for encouraging recreation and tourism in the Black Hills, especially in the Jewel Cave vicinity." Properties designed and developed by the National Park Service are excluded from this category. [1]

Property Type One, Registration requirements

- Must be within current boundaries of Jewel Cave National Monument
- Criterion A: must be directly associated with tourism or recreation and demonstrate clear and positive patterns of usage related to this topic.
- Criterion C: must embody the distinctive characteristic, types, and methods of construction of the period, especially as they relate to tourism and recreation.

[1] Karsmizki, National Register Nomination, p. 5

Property Type One, Eligible Resources

The Michaud archeological site, Highway 16, and the Hell Canyon road, fit within this category.

- Michaud archeological site: The site represents the earliest development for accommodating visitors to the cave. The hotel was built to provide a location for cave visitors to sleep and eat, thereby enabling their cave visit in the earliest years when the site was most difficult to access.
- Highway 16: Recognizing the importance of good access, local citizens and organizations advocated for public funds to be allocated for the development of transportation facilities in the Black Hills. The combined efforts of private owners, booster organizations, and concerned citizens, and responses made by governmental organizations including state highway planners and state and federal elected officials, played a major role in developing Highway 16 as an accessible route to Jewel Cave.
- Hell Canyon Road: The naturally accessible route through the bottom of Hell Canyon from the southern Lithograph Canyon route provided an early trail.
- Archeological site in Hell Canyon: remnants of masonry fireplace.
- Archeological site in Hell Canyon: concrete building foundation.

Associated Property Type Two, Description

Associated property type two includes resources associated with the development and administration of Jewel Cave National Monument from 1908 through 1944. These are resources directly associated with NPS development and administration of natural resources within the present boundaries of Jewel Cave National Monument. Elements originating from NPS design principles and products of the Civilian Conservation Corps projects are eligible.

Associated Property Type Two, Registration Requirements

- Must be within current boundaries of Jewel Cave National Monument
- Criterion A: eligible if they "were intended to enhance public viewing and appreciation of the national monument and its natural resources or to provide for the administration and operation of the facility."
- Resources must have been developed by the NPS or the CCC.
- Public recreational resources are eligible under Criterion C if they were designed according to the NPS design principles of appropriate park design and "embody the distinctive characteristics of types and methods of construction of the period." For Jewel Cave National Monument, eligible resources must display such character-defining qualities as log construction, use of local rock, and a scale and appearance in harmony with the surroundings. Examples should be evaluated for how they convey to the visitor that Jewel Cave National Monument is a National Park Service facility.
- Date between 1908 and 1944
- Alterations must continue the application of NPS design principles. Alterations more than 50 years old may be part of the historic fabric.
- Resources related to government efforts at conserving natural resources form a part of this property type. These resources should contribute to an overall recognition that one is indeed at an NPS site.
- Utility buildings not associated with an important theme related to park development are less likely to rank highly.
- Publicly oriented roads and trails are likely to rate highly due to visibility.

Associated Property Type Two, Eligible Resources

Properties that fall within this category include:

- Above-ground Resources within the Historic Developed Area (Ranger Cabin, upper and lower trails to the cave and the associated stone steps and stairway, metal railing at the top of the stairway, CCC retaining wall, cave

entrance area, historic area entrance road, remnant of trail west of the Ranger Cabin, ponderosa pines, site of former NPS campground).

- Resources outside the Historic Developed Area (ponderosa pines, manhole at the spring near the Michaud Hotel site)

Significance: "Federal activities regarding the conservation of natural resources represent a fundamental shift in American responses to the environment. The development of national monuments such as Jewel Cave illustrates National Park Service policies and principles which balance responsibility for preserving natural resources with public participation and appreciation of them. Important examples illustrate a key NPS design principle, that of establishing harmony between the built and natural environments."

Associated Property Type Three, Description

Property type three includes resources associated with NPS Rustic Architecture. These resources are significant under Criterion A for their "association with the public works relief agencies of the Great Depression," and under Criterion C for their relationship to the distinctive characteristics that have made park Rustic Architecture such an important facet of early park development.

Property Type Three, Registration requirements

- Must be historically associated with the context NPS Rustic Architecture and Public Works Construction and have construction dates within the 1933-1944 period of significance.
- Must retain high degree of integrity of design, materials, workmanship, and historic feeling.

- Design and construction methods of the Landscape Engineering Division and the Branch of Landscape and Design of the NPS, as well as the CCC and LEMs, must be apparent.
- Must possess a sufficient amount of historic fabric and workmanship to reflect their historic significance and rustic methodology of materials and construction. Additions or modifications must not impair the quality of historic integrity. Interiors must exhibit a rustic feeling not compromised by alterations.
- Each resource must retain its essential features that convey its historic function or character during the period of significance.
- Within a historic district, the majority of the resources must be contributing, with the historic elements that compose the district intact and apparent.

Property Type Three, Eligible Resources

Properties that fall within this category include:

- Ranger Cabin (CCC cabin)
- Upper trail to cave entrance
- Lower trail to cave entrance
- Cave entrance area
- Views to and from the cave entrance
- CCC-constructed retaining wall
- Stone stairway
- CCC-constructed cistern
- Remnant of trail west of Ranger Cabin
- Remnant old growth ponderosa pines in the historic area

The proposed district is significant for its representation of the original Monument boundary, as established by President Roosevelt in 1908. Because the

Monument boundary was revised in 1965, and only the area within the proposed historic district boundary reflects on-going management as a National Monument since 1908, the entire proposed district is significant. The vegetation within the proposed district is unique, because it has been protected from logging since 1908 and contains ponderosa pines that range from 100 to 300 years old.

Analysis of Integrity

The analysis and evaluation of landscape integrity provided herein follows guidelines provided by the National Park Service and National Register standards. In particular, two documents have been used, A Guide to Cultural Landscape Reports: Contents, Process, and Techniques, and National Register Bulletin 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes.[2] The Jewel Cave historic area cultural landscape analysis focuses on nine landscape characteristics including natural systems and features, spatial organization, land use, circulation, topography, vegetation, views, buildings and structures, and small-scale features. These landscape characteristics are the tangible and intangible aspects that collectively make up the historic character of the property. The analysis of these characteristics provides a summary of qualities and features that should be understood to protect or enhance the historic landscape through a historic landscape treatment plan.

[2] Page, Robert R., Cathy A. Gilbert, and Susan A. Dolan. 1998. A Guide to Cultural Landscape Reports: Contents, Process, and Techniques (Washington, D.C.: U.S. Department of the Interior, National Park Service, Cultural Resource Stewardship and Partnerships, Park Historic Structures and Cultural Landscapes Program); and McClelland, Linda Flint, J. Timothy Keller, Genevieve P. Keller, and Robert Z. Melnick. National Register Bulletin 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes (U.S. Department of the Interior, National Park Service, Interagency Resources Division).

The seven aspects of historic integrity are location, design, setting, materials, workmanship, feeling, and association. **Table 4** includes a summary of integrity for each of the component landscapes and landscape features within the historic area.

Natural Systems and Features

The Cave

The most significant natural system associated with the Jewel Cave Historic District is the cave itself. The Black Hills region was formed 60 to 70 million years ago when the North American Continent buckled and formed a domed uplift and the dramatic geological formations that are associated with the Black Hills. Jewel Cave is the third longest cave in the nation (exploration continues, and it is expected that it will soon be identified as the second longest cave in the nation) and includes notable formations of calcite crystals, flowstone, cave pearls, cave popcorn, dripstone, frostwork, and rare hydromagnesite balloons. Jewel Cave is a breathing cave, characterized by the movement of air through portals as exterior air pressure changes. The existence of Jewel Cave is the reason the Monument was established and the associated above-ground historic resources were developed. The focus of this *Cultural Landscape Report* is on the above-ground features, therefore the historic significance and integrity of the cave is not the focus of the current evaluation.

The Spring

Historically, the spring served an important role in providing potable drinking water for workers and visitors to the cave. The spring is believed to be an alluvial spring that was manipulated to collect water, acting like a cistern when the concrete manhole was installed by the CCC. It was utilized by the Michauds initially, and later

the CCC constructed a pipe system to provide water from the spring to the Ranger Cabin, Rangers Tent, and a drinking fountain. A line to the campground was added in the 1950s. The system supplied water for the needs at the historic area until 1961 when the natural water supply became inadequate. A pump installed in 1962 (at the end of Service Drive B) continues to provide water for the historic area today.

Spatial Organization

The overall spatial organization of the Historic Developed Area retains a high level of integrity. Alterations, mainly consisting of the addition of non-contributing elements, have been made to accommodate changing needs. Although a number of non-contributing elements have been removed from the Historic Developed Area, a few remain that are potentially confusing and distracting for visitors.

The addition of Service Road "A" in the early 1950s brought a more intense level of development and use to the historic core. From ca. 1950 until ca. 1970, the area contained several park housing units, utilities and storage buildings, and the administrative headquarters for the Monument. During that period, the view from the Ranger Cabin to the southeast included a road, a number of mobile homes and trailers, and vehicles. After the new headquarters, visitor center, and housing area were developed, the trailers were removed. A portion of Service Road "A" and a small employee parking area remain and can be plainly viewed from the Ranger Cabin and the historic trail to the cave entrance.

The addition of Service Road "B", or at least a portion of it, occurred during the later portion of the period of significance when the campground was developed in the early 1940s. Although the campground has been disbanded, the service road remains.

The road continues to serve a maintenance-related purpose, and does not distract from the character of the historic core.

Land Use

Since the Michauds discovered the natural cave opening in 1900, the area around it has been consistently used to provide access to the cave, with developments being aimed at encouraging visitation by the general public. Beginning in the 1930s with the CCC activities at the site, the historic area served as a visitor contact station and orientation site, as well as staff office space and housing. From the 1950s until the 1970s the site provided campsites for visitors, housing for NPS staff, and the administrative and maintenance needs of the Monument.

The park administration, housing, and visitor facilities structures were removed from the site in the 1980s. These functions are now located within the main park developed area. The historic site serves as an interpretive area – a place where the history of the surface activities related to the cave can be explained to visitors and continues to provide a historic arrival experience to portions of the cave.

Circulation

The site's simple circulation patterns have remained intact throughout its development. The vehicular entrance road present during the CCC period (and perhaps earlier) continues to serve as the main access to the site connecting the historic core area with Highway 16. Although ongoing maintenance may have resulted in minor alterations to the road, no major changes to this route have been documented. The original loop has been adjusted and now provides recreational

vehicle parking spaces, car parking spaces, a small picnic area, and a space for portable toilets.

The addition of Service Roads "A" and "B" represent the largest changes to circulation at the site. The addition of at least a portion of Service Drive "B" occurred during the period of significance, and is not considered intrusive to the historic character of the historic core. Service Road "A" is very close to the heart of the historic core, and is confusing for visitors to the site.

Pedestrian circulation at the site retains a high level of integrity. The path between the parking lot and the Ranger Cabin has been adjusted with new grading, surfacing, and layout since the period of significance. However, it continues to serve essentially the same purpose and location as the original path. The historic path between the Ranger Cabin and the cave entrance that required steps adjacent to the cave entrance exists only as a remnant not connected to the lower cave trail. The trail developed by the CCC between the Ranger Cabin and the cave entrance, retains a high level of integrity. The upper portion of the trail was altered, the materials and steps were changed (ca. 1980s). The stone stairway through the rock crevice retains a high level of integrity, as does the lower trail.

Park managers are currently considering altering circulation to and from the historic site by initiating a shuttle system that would provide access from the visitor center. This system would help to alleviate parking pressure at the historic area, and could increase interpretive opportunities regarding the historic site.

Topography

The topographic character of the historic area has remained intact throughout the history of the site. The dramatic cliff in which the natural cave entrance was discovered was modified slightly to enlarge the opening and to provide pedestrian access in the 1920s and 1930s. The most significant change to the topography of the historic area was implemented by the CCC in 1938 during the construction of the lower surface trail to the cave entrance. The trail closely hugs the rock outcrops along the edge of Hell Canyon. In order to provide a wide and mostly level trail, the CCC constructed a substantial stone retaining wall along the downhill side of the path. The retaining structure was built into the side of the hill and then covered by earth and vegetation to disguise its manipulated appearance.

The construction of roads, parking lots, and pedestrian trails has reflected the indigenous topography throughout the history of development at the site. Minor changes addressing erosion and slope stabilization have occurred since the CCC constructed the stone steps in 1939. Short stone retaining walls were constructed on the up-slope portion of the lower surface trail to the cave opening by the National Park Service during the 1950s.

Vegetation

Overall District

The Ponderosa Pine forest has remained the dominant vegetative community within the proposed historic district throughout the recorded history of the site. The community has been managed with a primary approach of hands-off treatment since the establishment of the Monument in 1908. It is believed that the area has never

been logged, and known that it has definitely not been logged since the Monument was established in 1908. There are trees within the historic area that are at least 260 years old.[3]

An impact to vegetation at the site occurred in 2000 when the Jasper fire damaged native plants and appears to have encouraged the spread of invasive plants. Despite the fire, the vegetation in the area maintains a moderate to high level of integrity. Potential impacts include invasive exotic plants, and potentially damaging insects or diseases, also potential future forest fires pose a threat. Careful monitoring by the Forest Service on adjacent land and by the National Park Service within the Monument boundaries assists in lowering the potential impacts.

Historic Core

Within the historic core, alterations to vegetation have occurred to accommodate development and to address perceived aesthetic issues. The most intrusive of these changes was the removal of vegetation for the development of Service Road "A," and the housing and other former buildings that were associated with this road. The area where a portion of the road has been removed contains herbaceous understory species, as well as road remnants including gravel.

The area immediately surrounding the Ranger Cabin includes some introduced plants—mainly Juniperus sp., planted around the front of the cabin. Historic photographs do not reveal evidence of this treatment during the historic period.

An area along the upper trail to the cave that contains very few pines is vegetated with herbaceous species including native grasses, sedges, and forbs. The

[3] Chapter III provides information regarding the age of the trees in the historic area.

variety of species in this area hints that some species may have been planted to "beautify" the area. The plants appear to be native, indigenous plants that are neither intrusive nor invasive.

Views

Views to and from the cave entrance across Hell Canyon have changed very little since the period of significance. Although these views encompass a large land area, modern intrusions have not been introduced to distract from the historic view. There are no buildings, utility lines, billboards, signs, or graded areas that announce the current date. From the cave entrance the road cut for Highway 16 is apparent across Hell Canyon. Because the road was developed during the period of significance the road cut would have been a part of the view during that time.

Cultural Landscape Features

For the purpose of this analysis, buildings, structures, and small-scale elements within the Jewel Cave Historic Developed Area are referred to as *cultural landscape features*, or simply *features*. These have been grouped into three categories based on their relationship to the historic integrity of the district.

- Contributing Features are extant buildings, structures, or small-scale elements that were present and directly related to the historic character of the property during the period of significance; and continue to contribute to the overall integrity of the present-day historic landscape. Requirements for contributing elements are outlined within the discussion of associated property types in this chapter. These elements are eligible for listing in the National Register.

- Compatible Features are existing buildings, structures, or small-scale elements that were not present during the period of significance, but are compatible with the historic character of the property. These features do not detract from the integrity of the historic landscape. These elements are not eligible for listing in the National Register.
- Non-Contributing Features are existing buildings, structures, or small-scale elements that do not relate to the historic significance of the property and may impact the integrity of the historic landscape.

Tables 1, 2, and 3 provide lists of all of the contributing, compatible, and non-contributing features within the Jewel Cave Historic district, and a brief description of each. A summary of the integrity of contributing features is provided in Table 4.

TABLE 1: CONTRIBUTING FEATURES

Contributing Feature	*Description*	*Associated Property Type*
Ranger Cabin	CCC-constructed log cabin, built 1935	2 and 3
Upper Trail to cave entrance	4' concrete path was altered in 1960s, again in 1980s, some structural problems exist	2 and 3
Stone stairway	CCC-constructed 1939, some minor alterations	2 and 3
Metal railing at top of stairway	Simple pipe rail at edge of path	2
Lower trial to cave	Route established by CCC. The current 4'-wide concrete pavement was installed recently.	2 and 3
CCC-constructed retaining wall	Stone wall was constructed and covered with earth and vegetation by CCC. Some erosion is exposing the stones.	2 and 3
Cave entrance area	Pavement widens and terminates at iron gate to cave entrance. Interpretive site includes a bench and sign overlooking Hell Canyon.	2 and 3
Views to and from the cave entrance	Views are uninterrupted by modern intrusions and display the canyon, native rock outcrops, and Ponderosa pine trees.	3
Historic area entrance road	CCC-constructed road alignment into site.	2
Michaud archeological site	Archeological site with remnants of stone foundation.	1
Manhole at the seep/spring	CCC-constructed manhole has been repaired by the NPS.	2
Remnant of trail west of Ranger Cabin	Informal trail indicates portion of earlier route to the cave entrance.	2 and 3
Ponderosa pines in historic area	Many of these trees have been present for over 300 years. Most were scorched by the Jasper fire in 2000.	2 and 3
Highway 16	Portion near historic area entrance was established by 1901.	1
Building foundation remnants in Hell Canyon	Archeological site, concrete foundation.	1
Fireplace remnants in Hell Canyon	Archeological site, portions of masonry fireplace.	1
Hell Canyon Road	Historic route through the canyon. Cattle guard installed by CCC remains.	1
CCC-constructed cistern	Concrete cistern located on a rise near the Ranger Cabin.	3
Site of former NPS Campground	Area near Service Drive B that served as a NPS campground.	2

TABLE 2: NON-CONTRIBUTING, COMPATIBLE FEATURES

Compatible Feature	*Description*	*Associated Property Type*
NPS retaining wall	Stone retaining wall on the upslope side of the lower trail between the stone stairway and the seating area. Height varies from 2' to 3'-6". A 15' long portion of the wall is deteriorating.	2
Benches	Half-log benches echo the material and character of the historic Ranger Cabin.	2
Directional Signs	Small, simple signs indicating the locations of the Canyon's trail.	2
Historic Area Entrance Sign	Reconstructed ca. 1940s entrance sign	2 and 3
Trail to cabin	Gravel trial with wood curb-edge on the east side provides pedestrian route from parking area to the Ranger Cabin. The trail was damaged and repaired in 2003.	2
Visitor parking lot	Gravel lot for about 10 cars.	2
Stone steps on upper trail	Stone steps along the concrete trail are positioned in groups of one, two, and three.	2
Service Drive "B"	Associated with ca.1940's NPS development of area, and consistent with low-impact design philosophy.	2
Seating area on lower trail (Wayside #1)	Two benches at widened area in trail, under a rock ledge at a secondary cave opening. Site is interpreted.	2
Stainless steel gate at cave entrance	Gate modeled after original iron gate that is in the Monument's museum collection. The gate controls visitor access to the cave and includes horizontal openings to facilitate bat flight in and out of the cave.	2

TABLE 3: NON-CONTRIBUTING FEATURES

Non-Contributing Feature	*Description*	*Impacting District Integrity?*
Portable toilets	Bright colored fiberglass buildings.	Yes
Lantern storage shed	Log shed with shed roof and eye wash station.	Yes
Service Drive "A" And employee parking	Within historic core, added after 1950. Close to Ranger Cabin and upper trail to cave entrance. Impacts views in this area.	Yes
Pump Building	Concrete block shed building painted dark brown. Not visible from historic core.	No
Well cap	3' high structure with gable roof. Painted brown. The foundation appears to be settling.	No
Drinking fountain	Located along upper trail to cave near the circular seating area. Compatible use with type 2, but materials and style are not consistent with historic character.	Yes
Circular seating area near cabin	Gravel area with log benches. Possibly compatible with type 2.	Yes
Rocks at edge of employee parking area	Large rocks along edge of Service Drive "A."	Yes
Shrubs around the Ranger Cabin	Juniperus sp. at front and north side of Ranger Cabin.	No
Utility poles, lines, boxes	Overhead utility lines and poles. Possibly compatible with type 2.	No

TABLE 4: Analysis of Integrity of Contributing Landscape Features

Landscape Area/ Feature	*Level of Integrity*	*Location*	*Design*	*Setting*	*Materials*	*Work-manship*	*Feeling*	*Association*
Ranger's Cabin	*M/H*	*H*	*M/H*	*H*	*H*	*M/H*	*H*	*H*
Upper trail to cave	*M*	*M*	*M*	*H*	*L*	*M/L*	*M*	*H*
Stone steps on trail	*M*	*M*	*M/L*	*H*	*M*	*M*	*M*	*H*
Stone stairway	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
Metal railing	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
Lower trail to cave	*H/M*	*H*	*H*	*H*	*M*	*M/L*	*M*	*H*
CCC retaining wall	*M*	*H*	*H/M*	*H*	*M*	*M*	*M*	*H*
Cave entrance area	*H/M*	*H*	*H/M*	*H*	*H/M*	*M*	*H*	*H*
Entrance Road	*M/H*	*M/H*	*M/H*	*H*	*M*	*M*	*H*	*H*
Michaud archy. site	*L*	*H*	*L*	*L*	*L*	*L*	*L*	*H*
Manhole at Spring	*M/L*	*H*	*H*	*L*	*M*	*M*	*L*	*H*
Pedestrian trail west of cabin	*L*	*M*	*L*	*L*	*L*	*L*	*L*	*M*
Ponderosa pines	*H*	*H*	*H*	*H*	*H*	*N/A*	*H*	*H*

Chapter V:
Management Philosophy and Management Issues

CHAPTER V: LANDSCAPE MANAGEMENT PHILOSOPHY AND MANAGEMENT ISSUES

Management Philosophy

The publication *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* provides professional standards and guidance for treatments to cultural landscapes listed in or eligible for the National Register of Historic Places. The document defines four types of treatment for historic landscapes including preservation, restoration, reconstruction, and rehabilitation.[1]

The Jewel Cave Historic Developed Area retains a high level of integrity (see Figure 4.2). The site as it currently exists possesses elements from several historical periods. Throughout each of the periods, the site was managed by the National Park Service to provide visitor access and interpretation of the natural cave resource. While this use is projected to continue into the foreseeable future, some former uses have been discontinued. The site retains remnants that hint of previous uses that included a public campground, park housing site, and the administrative and utilities operations for the park. Removal of these facilities from the historic area has resulted in the reduction of development impacts and a high level of integrity. The area retains its essential historic use—that of serving as the primary above-ground contact and interpretation site for the historic portion of the cave. This continued use, and the

[1] Birnbaum, Charles A. and Christine Capella Peters, 1996. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.* Washington DC: Department of the Interior, National Park Service, 3-5.

projected needs for visitor services while protecting historic and natural resources, indicate a need for flexibility in future management treatments.

Preservation

Preservation involves applying measures to sustain the *existing* form, integrity, and materials of a historic property. This approach focuses upon stabilizing and protecting extant historic resources, rather than replacing missing elements. It is appropriate when a historic property is essentially intact and does not require extensive repair or replacement; depiction at one particular period of time is not appropriate; and when continuing or new use does not require additions or alterations.[2]

Although a preservation management approach could be effectively applied to the Jewel Cave Historic Area, the limitations imposed would preclude the introduction of new elements that could reduce potential impacts on cultural and natural resources. For instance, alterations to the Ranger Cabin were necessary to protect the building from structural fire. The alterations included removing the public restrooms that were a part of the building since its construction in 1935. The restrooms were not universally accessible, and could not be made accessible without greatly altering historic integrity and appearance of the building and surrounding landscape. The restroom space was adapted to provide room for a tanked fire suppression system. The site currently does not include permanent public restrooms, and portable toilets are situated in the parking lot. The physical character of the portable restrooms is

[2] Ibid., 17-18.

incongruent with the historic character of the site, however they do provide a service that is necessary and has been associated with the site since the CCC period. Providing permanent restroom facilities will require the addition of a new structure within the historic district.

Restoration

Restoration is the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period in time. This includes reconstruction of missing features from the restoration period, and removal of features from all other periods. The approach can be considered only when the property's significance during a particular period of time outweighs the loss of extant elements from other historical periods; and when there is substantial physical and documentary evidence for the work; and when contemporary alterations and additions are not planned.[3] Restoration is not an appropriate approach for the proposed Jewel Cave Historic District because significant extant features relate to more than one historic period, adequate documentary evidence does not exist to restore the property to one period, and contemporary needs require some alterations.

Reconstruction

Reconstruction is the act or process of using new construction to depict a non-surviving site, landscape, building, structure, or object as it appeared at a specific period of time in its historic location. The approach is appropriate only when the

[3] Ibid., 89-90.

property's significance during a particular period of time outweighs the potential loss of extant features that characterize other historical periods. In addition, there must be substantial physical and documentary evidence for the work, and the work must be clearly identified as a contemporary re-creation.[4] The Jewel Cave Historic Area site is not eligible for reconstruction because significant extant features relate to more than one historic period, adequate documentary evidence does not exist to reconstruct the property to one period, and contemporary needs require some alterations.

Rehabilitation

The act or process of Rehabilitation allows repairs, alterations, and additions necessary to enable a compatible use for a property as long as the portions or features which convey the historical, cultural, or architectural values are preserved. This approach is appropriate when depiction at one particular period of time is not appropriate; repair or replacement of deteriorated features is necessary; and alterations or additions are needed for a new use.[5]

Rehabilitation has been chosen as the most appropriate management philosophy for the proposed Jewel Cave Historic District. This philosophy has been chosen because of the existence of features related to more than one type and period of significance, and the need for minor alterations to accommodate visitor services and protection of the historic resources. Three alternative rehabilitation treatment approaches have been developed and evaluated for the proposed Jewel Cave Historic district. The alternatives are described in Chapter Six.

[4] Ibid., 127-129.
[5] Ibid., 47-48.

Management Issues

Management issues for the proposed historic district are summarized below:

- Management of the site needs to be closely coordinated with plans for interpretation.
- Parking at Service Drive "A" is impacting the historic character of the area near the Ranger Cabin.
- The lantern storage shed is necessary for storing paraffin and oil lanterns that are used for the historic cave tour. Safety guidelines regulate the storage of these materials.
- Bruce Jones is preparing an archeological report for the site of the Michaud hotel.
- The park would like to have guidance regarding the eligibility of US Highway 16 near Hell Canyon. The state of South Dakota is currently considering realigning / widening this portion of the road.
- Any septic system at the historic site needs to utilize a self-contained system (vault, composting, etc…). Septic systems are not a good option in the park, due to their potential impacts to the cave.
- An existing concrete septic system exists at the historic site that may have been constructed during the CCC era. A drain field was installed in the mid- to late-1970s.
- A *Historic Structure Report* for the Ranger Cabin was completed in 1999. The report provides alternative approaches for treatment of the building, and an evaluation of each. The report recommends Restoration to the cabin's circa

1940 exterior appearance and provides detailed guidance for treatment. In 2002 the Ranger Cabin was repaired according to the HSR recommendations.

- A fire suppression system was installed in the Ranger Cabin (HS-1), to help protect the building from interior fires. The system is located in the former public restroom area. The regional historical architect indicates that it would be far easier and less expensive to clean up water damage than to restore a building reduced to charcoal.
- National Monument managers are considering removing the interior fire suppression system from the Ranger Cabin.
- The Ranger Cabin's recently installed internal fire suppression system would not protect the building from a forest fire. An attempt to provide external fire suppression would be cost prohibitive and damaging to the landscape. Continued controlled burns and trimming dead overhanging branches surrounding the cabin would be the only recourse in passive fire protection. The park should have a formal fire protection plan for the Ranger Cabin, prescribing a process for protecting the building in the event of a forest fire. The resources necessary for implementing the plan should be readily available.
- The permanent restroom facilities need to be replaced at the site. Currently this need is served with portable toilet structures.
- The park is interested in regrading and revegetating the site beyond Service Drive "A" that was used for housing and maintenance structures during the 1950s through the 1970s.

- Need to provide visitor access to the Ranger Cabin (not necessarily universally accessible).
- Need vehicular access for maintenance vehicles to the Ranger Cabin.
- Need a place for visitors to wait for tours to begin.
- Need parking or alternative transportation option for visitors.
- A *Long Range Interpretive Plan* is being prepared for the park.
- A shuttle transportation system from the main visitor center to the historic area may be established in the future. It is possible that an interpreter would drive the shuttle to provide a "package deal." Implementation of the system is tentatively predicted for FY 2006 or 2007. The CLR should address this possibility.
- The management team has not yet decided if the historic area would still include vehicular access for visitors for picnicking and self-guided surface exploration. They would like guidance from the CLR regarding this. Given the proposed shuttle system, the parking needs at the site will either remain the same as they currently are, or possibly be reduced.
- Often visitors arrive in large recreational vehicles that take up a large portion of the parking lot.
- Currently all of the signs at the main visitor center are being replaced with new signs that meet the new NPS messaging standards. Messaging standards have the potential to conflict with historic character. The signs at the historic area should not be changed to match the new signs at the visitor center.

- The existing signs along the Canyons Trail do not follow messaging standards. They are consistent throughout the trail to provide a unified look for hikers that does not conflict with the character of the historic area. These signs should not be changed to match the new signs at the visitor center.
- The Canyons Trail should continue to provide a pedestrian route to the historic site. Often people using this trail become confused and disoriented. Suggestions regarding signs or other orientation for visitors are welcome.
- The entrance sign at the historic area is confusing to some people—especially those approaching the site from the west. They mistake this for the main entrance of the park. The highway sign, its content, and location have been considered extensively regarding this issue. The construction of a new highway bridge along HW 16 would help to alleviate this problem.
- There is a vehicular gate at the entrance to the historic area that is kept closed when there is no staff at the site. However, when the staff members are in the cave, they are not accessible to incidental visitors. .
- Tours of the historic area are conducted from Memorial Day through Labor Day. During this time the bats are not hibernating, and the tours do not disturb them. The historic tours allow a maximum of 20 participants. The treatment plan should address the potential need for a weather shelter at the site. Currently, visitors and staff wait in cars or on the front porch of the cabin if the weather is bad. The treatment alternatives should also address possibilities for staff needs at the site.

- It would be helpful to have an orientation kiosk at the site. It should fit into the historic theme of the area using materials and design that relate well to the period of interpretation.
- Consideration of the possibilities for interpretation of the historic hotel site and spring should be included in the CLR. The potential impacts of these alternatives should be evaluated. The proximity of the site to the highway presents safety issues. The realignment of the highway, if the new bridge is built, would help to alleviate the safety issue. The potential for vandalism by bottle collectors could be greater if this site were more widely known.
- Circulation within the historic developed area. Universal accessibility to Jewel Cave is provided at the main visitor center. The topography within the historic developed area, and the historic resources themselves, inhibit users with mobility impairments from traversing the area. Modification of the upper and lower trail, the CCC-constructed stone stairway, the Ranger Cabin, and the historic cave tour, to provide universal accessibility for visitors would negatively impact the integrity of these historic resources and the natural resources to which they respond directly. Therefore, it is not a goal to provide universal access to the Ranger Cabin, trail to the cave entrance, or the cave. Any new facilities developed should be designed to accommodate universal accessibility standards, as long as this consideration does not result in negative impacts to the significant cultural and natural resources at the site.

Chapter VI:
Treatment Alternatives

CHAPTER VI: TREATMENT ALTERNATIVES

Overview

A general management philosophy of rehabilitation has been selected for the proposed Jewel Cave Historic District landscape. The act or process of rehabilitation allows repairs, alterations, and additions necessary to enable compatible use of a property as long as the portions or features which convey the historical, cultural, or architectural values are preserved. This philosophy has been chosen to allow the preservation and interpretation of extant historic features associated with the three associated property types defined by the National Register multiple property listing, and to allow alterations within the district that are deemed necessary to accommodate current and future preservation and interpretation of the historic resources.

Three alternative treatments have been developed for the Jewel Cave historic district. The treatment alternative descriptions include the no action alternative and two action alternatives. The no action alternative is required by NEPA and provides a baseline for evaluation of potential impacts from each treatment alternative and eventual comparison of all treatment alternatives. The evaluation of potential impacts is presented in Chapter VII: *Impacts of Treatment Alternatives*. Chapter VII concludes with a comparison of impacts, discussion of mitigation measures and identification of the Environmentally Preferred Alternative.

Treatment Alternative #1: Current Treatment (No Action)

The historic area would continue to be managed as it is currently and no new policies would be implemented. The proposed Jewel Cave historic district is managed as an interpretive area. Visitors to the park may purchase tickets to take a historic cave tour that begins near the Ranger Cabin. Minimal facilities are provided for visitors including a small parking area, trails, portable toilets, picnic tables, and a drinking fountain. The historic area can be reached by visitors via private automobile during the park's operational hours. The historic area can also be reached by pedestrians via the Canyons Trail. Service drive "A" provides access for NPS staff and maintenance vehicles, a small parking area, and a site for the lantern storage shed. A visitor seating area is adjacent to the service driveway. Service driveway "B" provides access for NPS maintenance vehicles to approach the pump building. The site of the former campground is adjacent to this driveway, and is demarcated with large stones. Selected historic resources within the area are interpreted and maintained in good to fair condition.

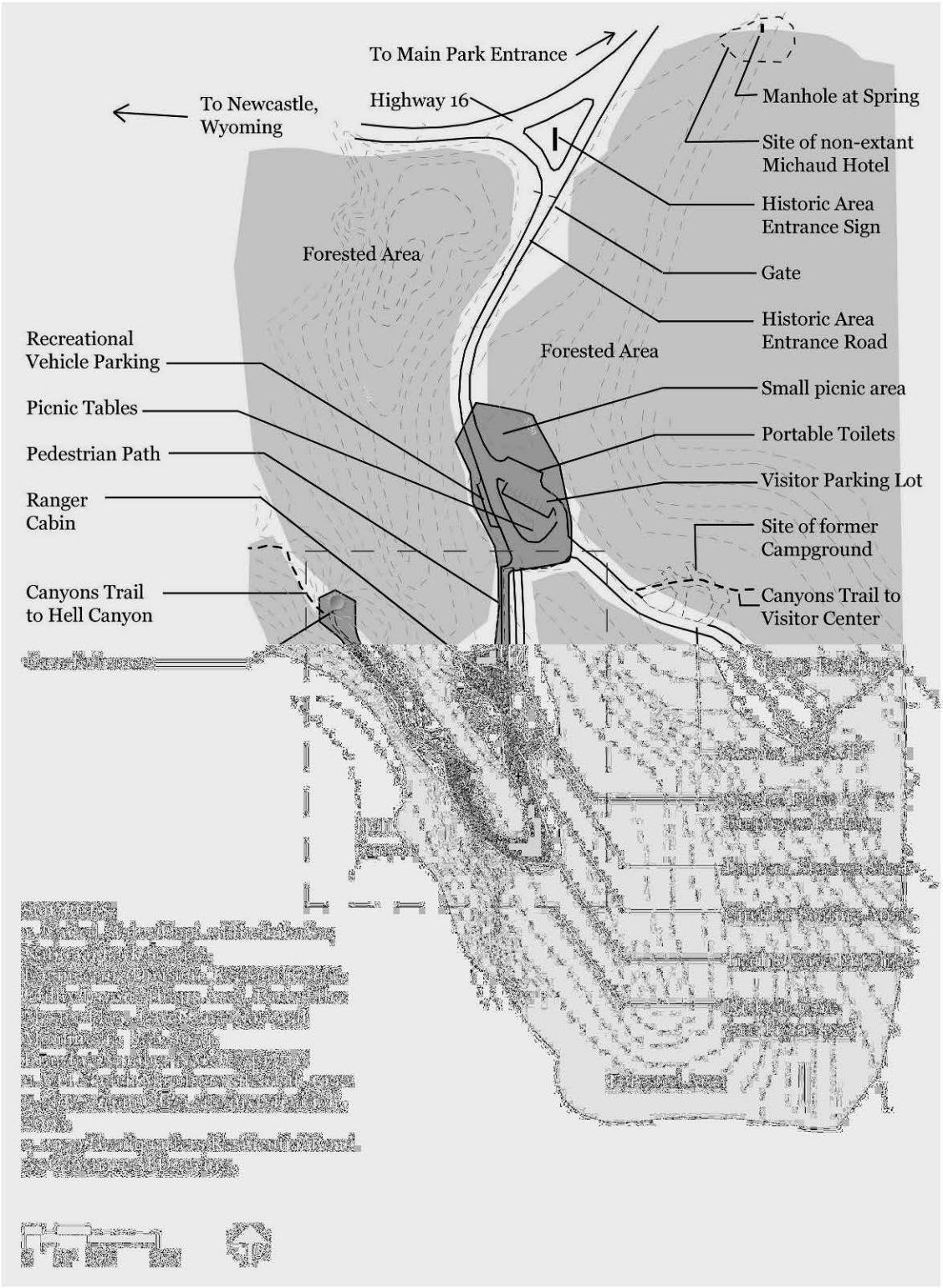


Figure 6.1: Historic Developed Area Treatment Alternative #1, No Action

Treatment Alternative #2: Ca. 1940 Representation with Shuttle Transportation

This alternative strives to present the historic developed area as it existed in ca.1940. This date represents the completion of the CCC-developments at the site, and the establishment of on-site management and interpretation by the National Park Service. The Historic Period Plan for 1933 through 1939 (see Figure 2.25 in Chapter 2) was developed based on construction documents, historic photographs, and other documentation from the CCC-development period, and provides the best understanding of the site conditions at the beginning of 1940. An overall management philosophy of rehabilitation would be applied, with restoration, rehabilitation, and preservation treatments used to address specific sites or elements.

This alternative includes four proposed management zones including; 1) Historic Resource Management and Interpretation Zone, 2) Natural Resource Management Zone, 3) Archeological Resource Management Zone, and 4) Park Operations Zone.

The majority of the historic area would be in the *Historic Resource Management and Interpretation Zone*. The historic area would be restored to represent its CCC-era condition as much as possible, based on available documentation. In addition to CCC-era elements, additional features would be developed to meet minimal operational needs. Visitor access to the site would be limited to visitors taking the historic cave tour. Those visitors would be transported to the site from the main visitor center in a park shuttle vehicle. The gate at the entrance to the historic area would be closed to other visitor traffic.

The Ranger Cabin has been restored to its ca. 1940 physical condition. The historic function of the building would also be restored in this alternative. It would serve as an office for the historic area ranger. Public restrooms would be re-established in the Ranger Cabin, and the historic fire protection system—providing mobile protection with pumper trucks, would be reinstated. The entrance/loop road would be restored to its 1939 configuration and the former ranger's tent site would be indicated with an interpretive sign. A small structure would be constructed in the former location of the ranger's tent. The structure would be used for providing shelter for visitors waiting for the shuttle. Another structure would be constructed nearby for storing the cave-tour lanterns. The general area of the former CCC camp would be indicated with an interpretive sign.

The pedestrian trail between the non-extant ranger's tent and the Ranger Cabin would be reconstructed. The pedestrian trail between the Ranger Cabin and the cave entrance would be restored to its 1939 condition when sufficient documentation exists to achieve this goal. The earlier pedestrian trail between the Ranger Cabin and the cave entrance would be interpreted as a historic circulation route.

The Canyons Trail would continue to provide a pedestrian route between the historic area and the park's Visitor Center and Administrative area. However, the Canyons Trail approach to the historic area from the east would be altered, so that it enters the area near the site of the non-extant Ranger's tent.

Two areas on site would be managed according to the *Natural Resource Management Zone*. Service drive "A" and the associated parking lot would be removed, and the landscape restored to its pre-development slope and vegetation.

The former housing area would also be restored to its pre-development slope and vegetation. The lantern storage shed would be relocated to the *Historic Resource Management and Interpretation Zone*. The circular interpretation/waiting area would be removed and replaced with a waiting area at the new shelter. The existing drinking fountain would be removed and a new fountain installed at the new shelter. The former NPS campground site would also be restored to its pre-development condition.

The *Archeological Resources Management Zone* encompasses the area near Highway 16 where the non-extant Michaud hotel and associated resources were located. The site currently includes the stone foundation of the hotel building and the CCC-constructed manhole at the spring. An Archeological Overview is currently being prepared for the area by Bruce Jones of the Midwest Archeological Center. Recommendations in this CLR/EA will defer to recommendations in that report when it is completed. The site would be stabilized, monitored for impacts by vandals or natural forces, and interpreted as a representative of the early developments at the historic area by the Michaud group. No visitor access to the site is recommended.

The *Park Operations Zone* would provide an area for service vehicles and employee parking. Service drive "B" would be maintained as a route for service vehicles and to provide access to the pump building.

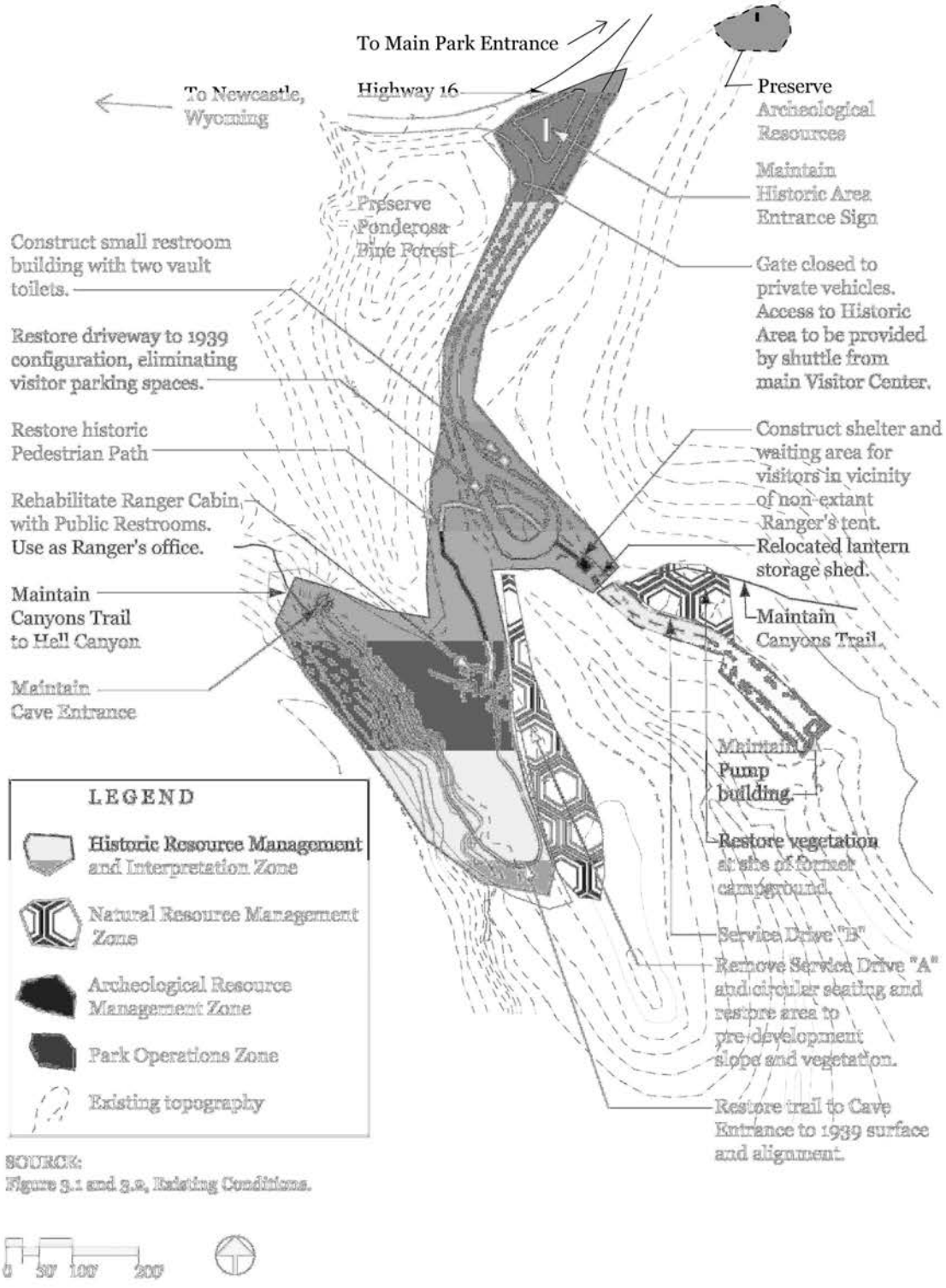


Figure 6.2: Historic Developed Area Treatment Alternative #2:
Ca. 1940 Representation with Shuttle Transportation

Treatment Alternative #3: Rehabilitation with improved Visitor Services

The purpose of this alternative is to protect and interpret extant historic resources, while improving visitor services. The overall management philosophy would be rehabilitation, with restoration, preservation, and rehabilitation applied to selected elements. Visitor services would be improved by adding an interpretive shuttle tour from the main visitor center to the historic site, adding a shelter/storage building, developing a vault toilet building, and providing a small picnic area. Visitor comfort while at the site would improve, as would transportation alternatives for accessing the site. The road and parking lot would remain open to visitors during Monument operational hours, to allow visitors to visit and explore the site at their leisure.

This alternative treatment plan consists of five management zones including; 1) Historic Core, Historic Resource Management and Interpretation Zone, 2) Historic Resource Management and Visitor Services Zone, 3) Archeological Resource Management Zone, 4) Park Operations Management Zone, 5) Ponderosa Pine Forest Preservation Zone.

The *Historic Core, Historic Resource Management and Interpretation Zone,* includes the Ranger Cabin, upper and lower trails to the cave entrance, the stone steps, retaining wall, cave entrance, and area within the outline created by these resources. All of these historic resources retain a high level of integrity. The cultural resources within this zone would be preserved or repaired as necessary to maintain them in good condition. The Ranger Cabin has been restored to its ca.1940 physical condition with the addition of a fire-suppression system, and the removal of the public

restrooms. The building would be maintained as restored and future management would adhere to recommendations made in the Historic Structure Report. The upper and lower trails to the cave entrance would be repaired by replacing the entirety of the pavement with new material and regrading where necessary. Erosion problems would be corrected by grading and implementing erosion control methods.

The ponderosa pine forest that constitutes the main vegetative resource within the zone would be preserved. Non-contributing elements within the historic core would be removed or relocated to a site outside of the historic core. These include the circular seating area and the drinking fountain. The Historic Core would be used for a guided tour that serves as the first portion of the historic cave tour. It would also continue to be open for use by visitors for informal explorations of the cultural landscape; however, the Ranger Cabin and historic cave entrance would only be unlocked during the staff-guided tours.

The *Historic Resource Management and Visitor Services Zone* includes historic resources associated with more than one period of significance. Integrity within this zone ranges from high to moderately-low. The zone includes the park entrance road and parking areas, reconstructed historic area entrance sign, the northern-most portion of Service Drive "B," and the site of the former NPS campground. Within this zone, the sites of non-extant historic elements would be interpreted (including the ranger's tent site, the CCC camp site, NPS housing and administrative area, and the NPS campground site). Interpretation should be consistent with the Monument's Interpretive Prospectus, and could include Ranger-led discussions as part of the historic cave tour. Additionally, a brochure about the

history of the site could be made available to visitors. It is recommended that signs or other elements not be added to the site to provide this information.

Selected visitor services would be provided including parking, restrooms, a weather shelter/waiting area for interpretive programs, a lantern storage facility, limited interpretive signs, a picnic area, and hiking trails. The existing loop road and parking area would be maintained and altered slightly to allow for a shuttle drop-off site near the proposed visitor services building. A path between the visitor services building and the trail to the Ranger Cabin would be installed along the outside edge of the loop road.

A small visitor-services building including an exterior shelter and lantern storage facility, would be developed at the site where the portable toilets are now located. Service drive "B" would remain, and employee parking would be provided near the pump building. The visitor parking lot would remain, and a shuttle drop-off area would be designated near the visitor services building.

A vault toilet building and small picnic area for visitors would be provided near the site of the former NPS campground. The vault toilet building would provide two stalls. The site of the non-extant CCC camp could be interpreted by Rangers as part of the overview of the historic area. The interpretation would be consistent with the park Interpretive Prospectus.

The entrance road would be open to visitors during the park's operational hours. A sign would be posted in the parking area restroom/kiosk/shelter explaining a brief history of the site, and explaining that tickets for the historic cave tour must be purchased at the main visitor center.

The *Archeological Resources Management Zone* encompasses the area near Highway 16 where the non-extant Michaud hotel and associated resources were located. The site currently includes the stone foundation of the hotel building and the CCC-constructed manhole at the spring. An Archeological Overview is currently being prepared for the area by Bruce Jones of the Midwest Archeological Center and the production of the final report is in progress. Recommendations in this CLR/EA will defer to recommendations in that report when it is completed. In the meantime, the site would be stabilized, monitored for impacts by vandals or natural forces, and interpreted as a representative of the early developments at the historic area by the Michaud group. No visitor access to the site is recommended. The archeological resources located in Hell Canyon are outside of the Historic Area Treatment Zones. The three sites include the Hell Canyon Road, a concrete building foundation, and remnants of a masonry fireplace. These resources would be managed according to recommendations made by the Midwest Archeological Center.

The *Park Operations Zone* includes the southeastern portion of Service drive "B," the pump building, and Service Drive "A." At Service Drive "B," the driveway and building would be maintained for use by NPS staff. The driveway would serve as employee parking and maintenance access. The portion of the drive that extends past the former campground site would not be open to visitors.

Service drive "A" and the employee parking area would be removed. All of the pavement along Service drive "A" would be removed and native vegetation would be restored in the areas of pavement removal. A two-track drivable surface would be maintained from the loop road to the cabin for use by emergency vehicles. If, in the

future, it is determined that this access for emergency vehicles is not required, consideration would be given to restoration of the road grade to its original topography, and also restoration of the native vegetation in the area.

The existing lantern storage shed would be removed. The new visitor services building would include a space for lantern storage that meets safety requirements. The circular visitor waiting/seating area (currently located near the lantern storage shed and Service drive "A") would be removed and this function would be provided at the new visitor services building. A picnic table for employees would be located within the former housing area, in a site that is screened from visitor's view.

The *Ponderosa Pine Forest Preservation Zone* includes the remaining land within the proposed historic district boundary. Cultural resources within this zone include the Hell Canyon Road, and two archeological sites in Hell Canyon. The Hell Canyon Road would be maintained as a fire access road. Its alignment should be maintained with mowing and repairs when necessary. The use of the road for early access to the area could be interpreted as part of the Canyons Trail by including information about it in a trail brochure. The archeological resources in this zone would be managed according to the recommendations of the Archeological Report that is currently being prepared by Bruce Jones of the Midwest Archeological Center. Again, if the report indicates this would be appropriate, these resources could be interpreted as part of a Canyons Trail brochure. Natural resources within the zone include Ponderosa Pine forest. The forest would be managed according to natural resource management goals for the overall Monument. The Fire Management Plan for

the Monument provides guidelines regarding treatment for the forest that should be adhered to for management of this zone.

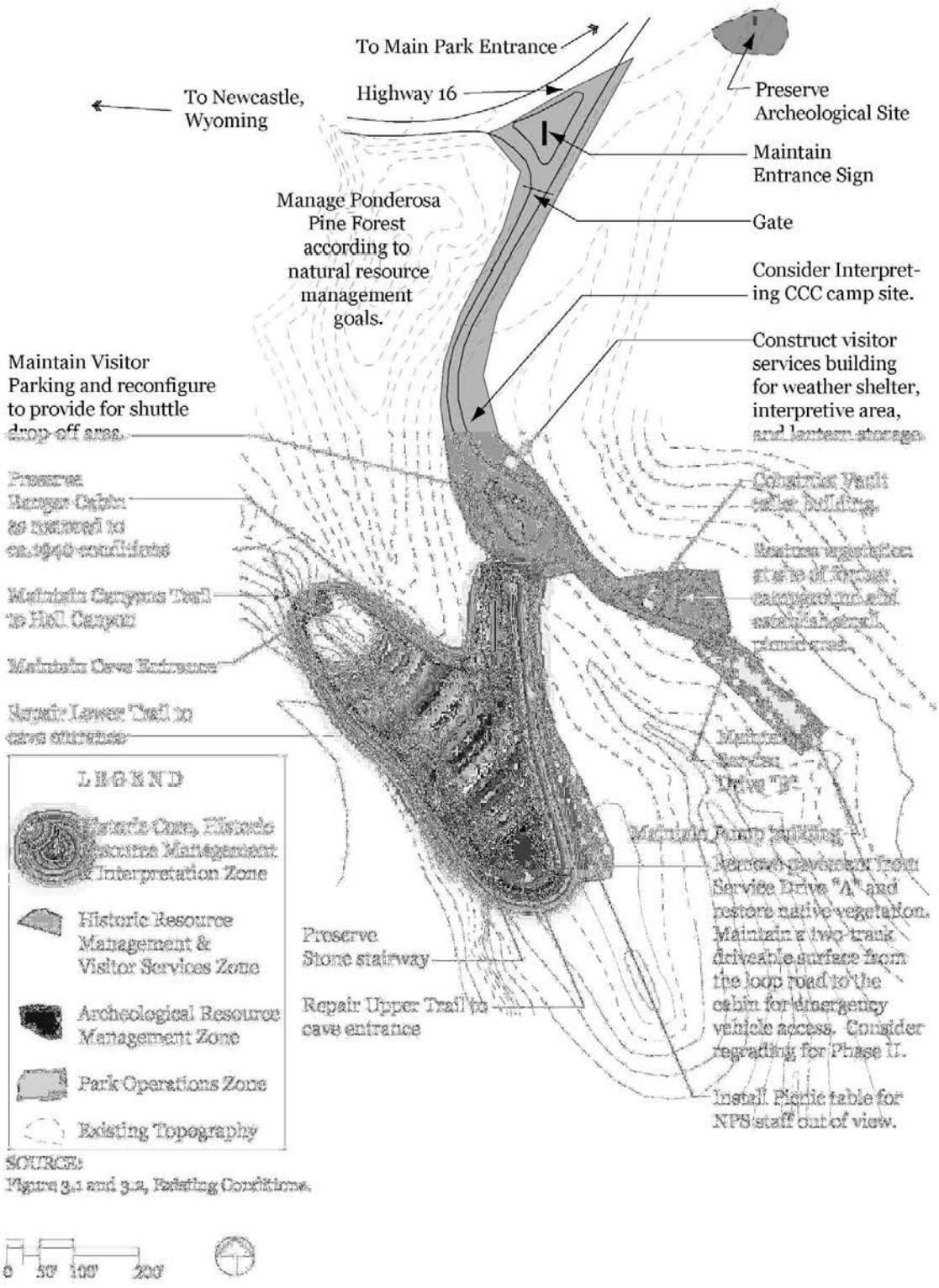


Figure 6.3: Treatment Alternative #3: Rehabilitation with Improved Visitor Services

Chapter VII:
Impacts from Treatment Alternatives (Environmental Consequences)

CHAPTER VII: IMPACTS FROM TREATMENT ALTERNATIVES (ENVIRONMENTAL CONSEQUENCES)

Environmental Consequences

This section of the *Environmental Assessment* forms the scientific and analytic basis for the comparisons of treatment alternatives as required by 40 CFR 1502.14. This discussion of impacts (effects) is organized in parallel with Chapter 3: Existing Conditions (Affected Environment) and is organized by impact topic areas. The no action alternative and each treatment alternative are discussed within each impact topic area. To the extent possible, short-term, long-term, beneficial, and adverse impacts of each alternative are described for each resource area. The comparison of impacts is summarized in Table 5. The impact analysis presented in this chapter results in a determination of an Environmentally Preferred Alternative. The Environmentally Preferred Alternative is described at the end of this chapter.

Intensity, Duration, and Type of Impact

Evaluation of alternatives takes into account whether the impacts would be:

- Negligible — the effect is localized and not detectable or the effect is at the lowest levels of detection.
- Minor — the effect is localized and barely detectable, but would not affect overall structure of any natural community or is confined to a small area of a cultural resource.
- Moderate — the effect is clearly detectable and could have an appreciable effect on individual species, communities, and/or natural

processes, or is sufficient enough to cause a change in the character-defining of a cultural resource.

- Major — the effect is highly noticeable, and would have a substantial influence on natural resources, including effects on individuals or groups of species, communities, and/or natural processes; or results in a substantial and highly noticeable change in character-defining features of a cultural resource.

Duration of impacts is evaluated based on the short-term or long-term nature of alternative-associated changes on existing conditions. Type of impact refers to the beneficial or adverse consequences of implementing a given alternative. More exact interpretations of intensity, duration, and type of impact are given for each resource area examined. Professional judgment is used to reach reasonable conclusions as to the intensity and duration of potential impacts.

Cumulative Impacts

The CEQ regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and proposed action alternatives.

Cumulative impacts were determined by combining the impacts of the proposed alternative with potential other past, present, and reasonably foreseeable

future actions. Therefore, it was necessary to identify other ongoing or foreseeable future projects within the surrounding area.

- Past cumulative actions:
    - Relocation of main monument visitor center, park housing, maintenance facilities and administrative headquarters from the historic area to the new site in 1972.
    - Jasper Fire 2000
    - Restoration of the Ranger Cabin (HS-1) 2002
- Reasonably foreseeable cumulative actions include:
    - Construction of restroom facility. This would be a two-unit vault system installed in a small structure. The building would have exterior details that compliment the materials and workmanship of the Ranger Cabin (HS-1).
    - The South Dakota Department of Transportation desires to widen and straighten U.S. Highway 16 through the Monument, which forms the northern and western boundary of the proposed formal designation of the Historic area.

Impairment Analysis

The *National Park Service Management Policies* (NPS, 2001a) requires analysis of potential effects to determine whether or not actions would impair park resources or values.

The fundamental purpose of the NPS, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to

conserve park resources and values; and the park's enabling legislation, as amended, further mandates resource protection. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable, actions that would adversely affect park resources and values that are related to the legislative establishment of the park, National Historic Landmarks, or other nationally significant resource. Jewel Cave National Monument was established to preserve the Jewel Cave ecosystem, especially significant caverns and other geological features.

These laws give NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. Impairment may result from NPS activities in managing the park, from visitor activities, or from activities undertaken by concessionaires, contractors, and others operating in the park. Impairment of park resources can also occur from activities occurring outside park boundaries. An impact would be more likely to

constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park.
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park.
- Identified as a goal in the park's GMP or other relevant NPS planning documents.

An impairment determination is included in the environmental consequences analysis section for all impact topics relating to park resources and values.

Impacts to Cultural Resources

Basis of Analysis:

- **Preservation of the Archeological/Historic Cultural Resource –** Impacts are examined from the perspective of *The Secretary of Interior's Standards for the Treatment of Historic Properties*.
- **Preservation of Cultural Landscape Elements –** Impacts are examined from the perspective of *Guidelines for the Treatment of Cultural Landscapes*.

Intensity levels:

- **Negligible** — Impact(s) would be at the lowest level of detection, or barely perceptible and not measurable. For the purposes of Section 106, the determination of effect would be — **no effect**.

- **Minor — Adverse impact** - impacts would not affect the overall cultural landscape, or the significant landscape characteristics. For purposes of Section 106, the determination would be — **no adverse effect**.

  Beneficial impact - preservation of the overall cultural landscape and significant landscape characteristics in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of*

Cultural Landscapes. For purposes of Section 106, the determination of effect would be — **no adverse effect**.

- **Moderate — Adverse impact** - impacts would alter the cultural landscape or one or more of the significant landscape characteristics, but would not diminish the integrity of the landscape to the extent that its NRHP status or eligibility is jeopardized. For purposes of Section 106, the determination would be — **no adverse effect**.

  Beneficial impact - rehabilitation of the cultural landscape or one or more of the significant landscape characteristics in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*. For purposes of Section 106, the determination of effect would be — **no adverse effect**.

- **Major — Adverse impact** - impacts would alter the overall cultural landscape or one or more of the significant landscape characteristics, diminishing the integrity of the landscape to the extent that its NRHP status or eligibility is jeopardized. For purposes of Section 106, the determination would be — **adverse effect**.

  Beneficial impact - restoration of the cultural landscape or one or more of the landscape characteristics in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. For purposes of Section 106, the determination of effect would be — **no adverse effect**.

  Duration:

  - **Short-Term** – The impact lasts less than three months.
  - **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1 No-Action Alternative

Analysis: Under the No Action Alternative, National Monument staff would continue to interpret the Ranger Cabin. The impacts on this historic structure from continued use would be both beneficial and adverse. The use of the cabin would help to educate visitors regarding the significance of the structure, and enable NPS staff to continuously enter the building and check its condition, resulting in a long term minor beneficial impact. Wear and tear from continued use would result in a long term

minor adverse impact to the structure. In this Alternative, the current fire protection sprinkler system would remain. The overall impact of this system is a long term moderate beneficial one. The system protects the building from interior fires, however, it could damage the structure unnecessarily if set off when not needed.

Portable toilets, parking, a drinking fountain, small seating area, and picnic area, would continue to serve as the main visitor facilities at the site. The historic site would be open to visitors to explore on their own, or to join an organized tour of the site and historic cave route. The incremental additions of the service driveways, employee parking, lantern shed, seating area, and drinking fountain would remain and continue to present a long term moderate adverse impact to the views and historic setting in the area immediately adjacent to the Ranger Cabin. The portable toilets would continue to have a long term moderate adverse impact on the character of the parking area—an important part of the arrival sequence to the historic site. Finally, this alternative would result in a moderate adverse impact to the upper and lower cave entrance trail and the CCC-constructed retaining wall, due to continued erosion problems. These include damage to the retaining wall and trails caused by storm water runoff during periods of intense rain. The water undermines the trails and strips the earth and vegetative cover from the CCC-constructed retaining wall.

Cumulative Impacts: The overall historic site would continue to present a somewhat confusing conglomeration of historic and non-historic structures and elements in the area. The presence of non-contributing elements that detract from the historic character of the site would continue to impact historic integrity and result in a cumulative long-term, minor, adverse impact.

Conclusion: The No-Action alternative would have an overall long-term moderate adverse impact on the historic landscape.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: This treatment approach limits visitor access to the historic district, minimizing visitor use impacts to cultural resources. The two structures required to meet visitor and operational needs would be small and designed to complement the historic character of the Ranger Cabin. This new construction would have a long term minor adverse impact on views in the area of the Ranger Cabin and visitor parking lot. The addition of the structures paired with the removal of a number of non-contributing elements would have a long term moderate beneficial impact on the historic landscape. The alternative provides the opportunity of ensuring that all visitors to the historic site receive consistent information provided as part of a Ranger-led interpretive tour. This would have a long term minor beneficial impact on cultural resources.

However, many visitors to the Monument might never get to the historic site, and could miss the opportunity to experience the rustic character of the area that calls to mind the early development of the Monument and the Black Hills region. Visitors to the site would also be more constrained by limited opportunities to explore the site at their leisure. This could result in a long term moderate beneficial impact to the historic resources due to a lower quantity of use.

The treatment maximizes the site's ability to represent the CCC-period, while eliminating its ability to represent changes made over time by the NPS. Through removal of non-contributing elements (service drive A, enlarged parking, and others), representation of selected non-extant features with on-site designating elements (the ranger's tent and the CCC camp site), and reconstruction of selected non-extant

features (historic pedestrian trails), and restoration of others (the Ranger Cabin and access road), the site would be most representative of its ca. 1935-1942 conditions.

Cumulative Effects: The loss of historic fabric related to the NPS development of the site would reduce its ability to represent significant periods in its development. The addition of new structures would result in a long-term, minor adverse impact to overall cumulative impacts to cultural resources. There would be a long-term moderate beneficial impact on the historic resources because impacts from visitor use could be carefully monitored and controlled.

Conclusion: Treatment Alternative 2 would have a long-term, minor beneficial impact to cultural resources following the removal of the non-contributing elements, and resulting from limited visitor access. A short-term, negligible adverse impact would occur only during the construction of new facilities and the removal of non-contributing elements.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: This treatment alternative provides a high level of integrity (based on the ca. 1940 period) of historic resources within the historic core area, while also allowing for flexible visitor access and adequate facilities to serve visitors and maintenance needs at the site. Although the construction of a new building at the site would involve moderate impacts to views from the Ranger Cabin, its location within the rehabilitation zone, and careful design to compliment the style of the Ranger Cabin, would prevent it from directly impacting the character of the historic core. The site chosen for this building is outside of the main view from the Ranger Cabin and the historic trail to the cave entrance. The use of vault toilets would eliminate potential impacts to the cave system however, they require frequent maintenance to control odor. The building would need to be designed to minimize the potential impacts of the odor.

Replacement of Service drive "A" with naturalistic vegetation would increase the quality of the historic setting in the area close to the Ranger Cabin. Use of the former campground site for visitor picnicking would create opportunities for interpreting the former NPS use of this site, and provide a high-quality picnic area.

Cumulative Impacts: Improvement of the condition of several historic landscape elements combined with the removal of non-contributing elements would increase the overall level of integrity of the historic landscape. Increasing the level of interpretation focusing on the historic landscape would heighten visitor's awareness of

this important cultural resource. This alternative would be long-term, minor, beneficial addition to the other cumulative actions.

Conclusion: Treatment Alternative 3 would provide a long-term, moderate beneficial impact to cultural resources. A short-term, negligible adverse impact would occur only during the construction of new facilities and the removal of non-contributing elements. There would be a long term beneficial impact to the historic site following the removal of the non-contributing elements.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Cave Resources

Basis for analysis: Impact analysis focused on the amount of disturbance to subsurface water quality, macrobiotic, and microbiotic resources in Jewel Cave beneath the historic district.

Intensity levels:

- **Negligible**—Impacts to park geologic features are not detectable based on standard scientific methodologies.
- **Minor**—Low probability of impact because either the activity would occur in an area or geologic layer not known to contain geologic features and the volume of disturbance would be negligible, or the activity would occur in an area or geologic layer containing geologic features but the volume of disturbance would be nearly indiscernible.

- **Moderate**— Moderate probability of impact because either the activity would occur in an area or geologic layer not known to contain geologic features and the volume of disturbance would be moderate, or the activity would occur in an area or geologic layer containing geologic features but the volume of disturbance would be small or moderate. Monitoring would identify most affected geologic features, but some features and/or associated contextual information would be lost.

- **Major**— High probability of impact because either the activity would occur in an area or geologic layer containing geologic features and the volume of disturbance would be large. Even with monitoring, many features and/or associated contextual information would likely be lost.

Duration:

- **Short-Term** – The impact lasts less than three months.

- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1: No Action Alternative

Analysis: The only cave resources that could be impacted are water resources. The volume, distribution, and quality of water entering would remain the same. Monitoring of drip sites within the cave has shown no significant impact, except for high chloride concentrations (believed to be caused by the salting of nearby Highway 16 in the winter). Changes in volume of water entering the cave, and changes in distribution of water entering the cave – that may be caused by the present level of development – are unknown.

Cumulative Impact: Past relocation of the visitor center, park housing and supporting facilities, tended to reduce the potential for impact on water infiltrating from the surface to the cave. The direct result of this action was to reduce the amount of water running through buried water lines, the amount of sewage running through the buried septic system, and the amount of runoff from the roofs of buildings.

Normally-functioning water and septic systems pose no threat to known cave resources. Effluent from the drain field could affect underlying resources, however none are known in that area. Reducing the use of these utilities has resulted in a long-term minor beneficial impact by reducing the likelihood of leaking, and reducing the amount that would eventually leak. Removing man-made structures has had a long-term negligible beneficial impact to cave resources, because it did not result in detectable changes in water quality or distribution within the cave.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. Though no in-cave drip sites were sampled for contamination, it is the professional judgment of the cave resource staff that this resulted in a short-term negligible adverse impact to cave resources.

Past restoration of the cabin had resulted in the use of port-a-potties rather than the established sewer system. The only use of water at the cabin is occasional minor use of a kitchen sink. Normally-functioning water and septic systems pose no threat to cave resources, but their active use creates a potential for problems, because they eventually deteriorate and leak. Reducing the use of these utilities has resulted in a long term minor beneficial impact by reducing the likelihood of leaking, and reducing the amount that would eventually leak. The continued use of port-a-potties in the parking area would cause long-term negligible beneficial impact on cave resources.

Runoff from the highway carries winter road salt into the groundwater and has been detected inside the cave in the form of chloride concentrations that exceed drinking water standards. Future realignment of nearby US Highway 16 would move the highway away from the known cave and would result in a long-term moderate beneficial impact by allowing water entering the cave to return to natural chloride levels. The impacts of alternative 1 would be long term negligible and beneficial in comparison to this overall moderate beneficial cumulative impact.

Conclusion: Alternative 1, factoring in the impacts from cumulative actions would result in future long-term moderate beneficial impacts to cave resources.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: The only cave resources that could be impacted are water resources. Changes in volume of water entering the cave, and changes in distribution of water entering the cave, would tend toward restoration of natural volumes and distributions.

Cumulative Impact: Past relocation of the visitor center, park housing and supporting facilities, tended to reduce the potential for impact on water infiltrating from the surface to the cave. The direct result of this action was to reduce the amount

of water running through buried water lines, the amount of sewage running through the buried septic system, and the amount of runoff from the roofs of buildings. Normally-functioning water and septic systems pose no threat to cave resources, but their active use creates a potential for problems, because they eventually deteriorate and leak. Reducing the use of these utilities has resulted in a long-term minor beneficial impact by reducing the likelihood of leaking, and reducing the amount that would eventually leak. Removing man-made structures has had a long-term negligible beneficial impact to cave resources, because it did not result in detectable changes in water quality or distribution within the cave.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. Though no in-cave drip sites were sampled for contamination, it is the professional judgment of the cave resource staff that this resulted in a short-term negligible adverse impact to cave resources.

Reestablishing restrooms at the cabin would result in treated effluent entering groundwater from the septic system, and would increase the likelihood of sewage entering the groundwater via leaks in the system. Normally-functioning water and septic systems pose no threat to cave resources, but their active use creates a potential for problems, because they eventually deteriorate and leak. This would result in a long-term minor adverse impact.

Runoff from the highway carries winter road salt into the groundwater; chloride concentrations exceeding drinking water standards are assumed to be from runoff

from Highway 16. Future realignment of US Highway 16 would move the highway away from the known cave and would result in a long-term moderate beneficial impact by allowing water entering the cave to return to natural chloride levels. The impacts of Alternative 2 would be long term minor and beneficial in comparison to this overall moderate cumulative impact.

Conclusion: Alternative 2, factoring in the impacts from cumulative actions would result in future long-term moderate beneficial impacts to cave resources.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: The only cave resources that could be impacted are water resources. Changes in volume of water entering the cave, and changes in distribution of water entering the cave, would tend toward restoration of natural volumes and distributions.

Cumulative Impact: Past relocation of the visitor center, park housing and supporting facilities, tended to reduce the potential for impact on water infiltrating from the surface to the cave. The direct result of this action was to reduce the amount of water running through buried water lines, the amount of sewage running through

the buried septic system, and the amount of runoff from the roofs of buildings. Normally-functioning water and septic systems pose no threat to cave resources, but their active use creates a potential for problems, because they eventually deteriorate and leak. Reducing the use of these utilities has resulted in a long-term minor beneficial impact by reducing the likelihood of leaking, and reducing the amount that would eventually leak. Removing man-made structures has had a long-term negligible beneficial impact to cave resources, because it did not result in detectable changes in water quality or distribution within the cave.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. Though no in-cave drip sites were sampled for contamination, it is the professional judgment of the cave resource staff that this resulted in a short-term negligible adverse impact to cave resources.

Past restoration of the cabin had resulted in the use of port-a-potties rather than the established sewer system. This removed the possibility of sewage entering the cave through eventual leaks in the system, and significantly removed the amount of treated effluent leaving the septic tank. Future installation of vault toilets would continue to preclude the possibility of sewage entering the cave. This installation would require a small one-time permanent ground disturbance that would result in a short-term negligible adverse impact to cave resources if properly located away from surface drainages and in-cave drips sites. A small amount of runoff from the building area would result in long-term negligible adverse impact cave resources.

Runoff from Highway 16 carries winter road salt into the groundwater and has been detected inside the cave in the form of chloride concentrations that exceed drinking water standards. Future realignment of nearby US Highway 16 would move the highway away from the known cave and would result in a long-term moderate beneficial impact by allowing water entering the cave to return to natural chloride levels. The impacts of Alternative 3 would be long term, negligible and beneficial in comparison to this overall moderate cumulative impact.

Conclusion: Alternative 3, factoring in the impacts from cumulative actions would result in long-term moderate beneficial impacts to cave resources.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Surface Water Quality

Basis for Analysis: Impacts of the alternatives on surface water runoff related to pervious surfaces.

Intensity:

- **Negligible**—Impacts would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

- **Minor**— Impacts would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

- **Moderate**— Impacts would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

- **Major**— Impacts would be detectable and would be frequently altered from the historical baseline or desired water quality conditions. Impacts would exceed water quality standards.

Duration:

- **Short-Term** – The impact lasts less than three months.

- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative 1: No Action Alternative

Analysis: Except for occasional flash floods in Hell Canyon, no surface water is present in the immediate vicinity of the proposed action.

Cumulative Impact: Past relocation of park facilities, tended to reduce the potential for runoff and contamination of surface waters. This has resulted in long-term negligible beneficial impacts.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. This resulted in short-term negligible adverse impacts.

Continued use of port-a-potties in the developed parking lot area would result in no ground disturbance, no increase in runoff, and no potential to adversely impact the quality of surface water. This would result in short-term negligible adverse impacts.

Realignment of the highway would retain normal impacts (runoff and contamination), but move the points of discharge away from the historic area. This would result in long-term negligible beneficial impacts.

The impacts of alternative 1 would be negligible in comparison to the overall long-term negligible beneficial impact to surface water resources.

Conclusion: Alternative 1 would result in a long-term negligible beneficial impact on water quality, quantity and distribution.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: No surface water is present in the immediate vicinity of the proposed action. Alternative 2 would reduce the effect of parking lot runoff infiltrating into the cave, but would increase the introduction of septic effluent into the ground water, via the extant septic system.

Cumulative Impact: Past relocation of park facilities, tended to reduce the potential for runoff and contamination of surface waters. This has resulted in long-term negligible beneficial impacts.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. This has resulted in short-term negligible adverse impacts.

Reestablishing restrooms at the cabin would result in no ground disturbance, no increase in runoff, and no potential to adversely impact the quality of surface water. This would result in short-term negligible adverse impacts.

Realignment of the highway would retain normal impacts (runoff and contamination), but move the points of discharge away from the historic area. This would result in long-term negligible beneficial impacts.

The impacts of alternative 2 would be negligible in comparison to the overall long-term negligible beneficial impact to surface water resources.

Conclusion: Alternative 2 would result in a long-term, negligible, beneficial impact on water quality, quantity and distribution. There could be negligible, adverse impacts to water quality, however these impacts would be short-term and only during the period of construction.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: No surface water is present in the immediate vicinity of the proposed action. Alternative 3 would reduce the effect of parking lot runoff infiltrating into the cave, but would increase the introduction of septic effluent into the ground water, via the extant septic system.

Cumulative Impact: Past relocation of park facilities, tended to reduce the potential for runoff and contamination of surface waters. This has resulted in long-term negligible beneficial impacts.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection; the chemicals constituting the foam are biodegradable, non-toxic, and were used in relatively low concentrations. This has resulted in short-term negligible adverse impacts.

Constructing vault toilets would result in ground disturbance, no increase in runoff, and no potential to adversely impact the quality of surface water. This would result in short-term negligible adverse impacts.

Realignment of the highway would retain normal impacts (runoff and contamination), but move the points of discharge away from the historic area. This would result in long-term negligible beneficial impacts.

The impacts of alternative 3 would be negligible in comparison to the overall long-term negligible beneficial impact to surface water resources.

Conclusion: Alternative 3 would result in a long-term, negligible, beneficial impact on water quality, quantity and distribution. There could be negligible, adverse

impacts to water quality, however these impacts would be short-term and only during the period of construction.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Wildlife and Threatened and Endangered Species

Basis for Analysis: Impact analysis focused on the potential for terrestrial disturbance and visitor use patterns.

Intensity:

- **Negligible**—The effect is localized and not detectable or at the lowest levels of detection.
- **Minor**—The effect is localized and slightly detectable but would not affect overall structure of any natural community.
- **Moderate**—The effect is clearly detectable and could have an appreciable effect on individual species, communities, and/or natural processes.
- **Major**—The effect is highly noticeable, and would have a substantial influence on natural resources, including effects on individuals or groups of species, communities, and/or natural processes.

Duration:

- **Short-Term** – The impact lasts less than three months.
- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1: No Action Alternative

Analysis: The present condition and use of the Historic area has no known impacts on any wildlife.

Cumulative Impact: Past relocation of park facilities, tended to reduce the number of visitors and vehicular use in the area, slightly improving wildlife habitat. This has resulted in long-term negligible beneficial impacts to wildlife.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection. This has resulted in short-term negligible beneficial impacts to wildlife.

Continued use of port-a-potties at the developed parking lot area would result in long-term negligible beneficial impacts to wildlife.

Realignment of the highway would move it farther away from the historic area and would have no impact on wildlife. This would result in long-term negligible beneficial impacts to wildlife.

The impacts of alternative 1 would be negligible in comparison to the overall long-term negligible beneficial impact on wildlife.

Conclusion: Alternative 1 would result in a long-term, negligible, beneficial impact on wildlife in the Historic area. There would be no effect to rare, threatened or endangered species and their habitats from this alternative.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3)

identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: The present condition and use of the Historic area has no known impacts on any wildlife. However, any improvement of natural conditions (removing paved surfaces and restoring topography and vegetation) would improve natural habitat.

Cumulative Impact: Past relocation of park facilities, tended to reduce the number of visitors and vehicular use in the area, slightly improving wildlife habitat. This has resulted in long-term negligible beneficial impacts to wildlife.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection. This has resulted in short-term negligible beneficial impacts to wildlife.

Reestablishing restroom facilities at the cabin would result in long-term negligible beneficial impacts to wildlife.

Realignment of the highway would move it farther away from the historic area and would have no impact on wildlife. This would result in long-term negligible beneficial impacts to wildlife.

Conclusion: Alternative 2 would result in a long-term, negligible, beneficial impact on wildlife in the Historic area. There could be negligible, adverse impacts to wildlife common to the area, however these impacts would be short-term and only

during the period of construction. There would be no effect to rare, threatened or endangered species and their habitats from this alternative.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: Improvement of natural conditions (removing paved surfaces and restoring topography and vegetation) will provide an improvement of natural habitat for wildlife.

Cumulative Impact: Past relocation of park facilities, tended to reduce the number of visitors and vehicular use in the area, slightly improving wildlife habitat. This has resulted in long-term negligible beneficial impacts to wildlife.

Historic area fire-fighting efforts related to the Jasper Fire of 2000 were limited to a one-time event of foaming the cabin for its protection. This has resulted in short-term negligible beneficial impacts to wildlife.

Future installation of vault toilets would result in a one-time negligible adverse impact on wildlife, because of construction activities.

Realignment of the highway would move it farther away from the historic area and would have no impact on wildlife. This would result in long-term negligible beneficial impacts to wildlife.

The impacts of alternative 3 would be negligible in comparison to the overall long-term negligible beneficial impact on wildlife.

Conclusion: Alternative 3 would result in a long-term, negligible, beneficial impact on wildlife in the Historic area. There could be negligible, adverse impacts to wildlife common to the area, however these impacts would be short-term and only during the period of construction. There would be no effect to rare, threatened or endangered species and their habitats from this alternative.

Impairment: Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Jewel Cave National Monument; (2) key to the natural or cultural integrity of the Monument; or (3) identified as a goal in the Monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the Monument's resources or values.

Impacts to Visitor Experience

Basis of Analysis: The analysis focuses on the effects of development proposals at the historic area. The driveway, parking lot, Ranger Cabin, and upper and lower trails to the cave entrance are all accessible to visitors. Impact analysis evaluated the ability of NPS staff to adequately provide information to visitors regarding the resources at Jewel Cave, and to interpret cultural and natural resources at the historic area.

Intensity levels:

- **Negligible –** a negligible effect would be a change that would not be perceptible or would be barely perceptible by most visitors.

- **Minor –** a slight change in a few visitor's experiences, which would be noticeable but which would result in little detraction or improvement in the quality of the experience.

- **Moderate –** a moderate effect would be a change in a large number of visitor's experiences that would result in a noticeable decrease or improvement in the quality of the experience. This would be indicated by a change in frustration level or inconvenience for a period of time.

- **Major –** a substantial improvement in many visitor's experience or a severe decrease in the quality of many visitor's experiences.

Duration of Impact:

- **Short-term –** Lasting only one visitor season.

- **Long-term –** Lasting multiple visitor seasons or essentially permanent changes in the landscape.

Treatment Alternative #1: No-Action Alternative

Analysis: Visitor use of the historic area at Jewel Cave National Monument would be expected to continue at current levels with the No-Action Alternative. The NPS staff would continue to provide interpreted tours for a fee, and the area would remain open to visitors for exploration during park operational hours. No improvements would be made to the cultural landscape and the historic area would continue to provide a confusing mix of historic resources related to several different periods of significance. The site would not provide adequate visitor services. The portable restrooms in the parking lot are unsightly and emit an unpleasant odor. The picnic areas are close to the cars and portable toilets, and there is no weather shelter.

Cumulative Impacts: The No-Action Alternative would cumulatively result in long-term, minor, adverse effects to visitor use and experience. For visitors who do

not take the historic cave tour, frustration from a lack of understanding of the site and its relationship to the overall Monument would continue. Also, visitor frustration due to the character and smell of the restroom facilities, and the close proximity of the portable toilets and parking to the picnic areas could limit the use of the site by visitors.

Conclusion: This alternative would result in a long-term, minor, adverse impact on visitor experiences at the site.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: This treatment approach provides organized and limited visitor access by opening the site only to visitors who choose to pay to take the historic cave tour, or who hike in using the Canyons Trail. For visitors who choose to take the historic cave tour, this alternative would moderately increase the quality of their experience. By beginning the tour and interpretation at the visitor center, and transporting visitors to the historic site in a shuttle, the visitors would be provided with more information regarding the early development of the historic landscape. Also, the addition of two new visitor services structures at the historic site would add to visitor's satisfaction and comfort while at the site.

The removal of non-contributing elements would simplify the historic landscape, making it easier to understand and appreciate the CCC period, however, the removal of elements that relate to other periods of time would eliminate the landscape's ability to represent changes made over time by the NPS.

Although this alternative would provide a moderate improvement to the experience of visitors who take the historic cave tour, it would limit the opportunity for

visitors to enjoy the site at their own pace, or to picnic in the area, unless they hike in on the Canyons Trail. Visitors would no longer be able to drive to the site in their own vehicles, thus there would be a minor adverse effect to visitors.

Cumulative Impacts: Treatment Alternative 2 would cumulatively result in a minor beneficial impact to visitor use and experience. Visitor's understanding of the above-ground resources would be improved by increased access to interpreters while outside the cave, and by the simplification of the landscape. Also, the addition of new visitor facilities including vault restrooms and a weather shelter would help to keep visitors comfortable while at the site.

Conclusion: This alternative would result in a long-term, minor, beneficial impact on visitor experiences at the site. During a short period in which the shuttle system would be established, the alternative could have a moderate adverse impact on visitor experiences due to the potential for confusion for return visitors. There would be short-term, negligible, adverse impacts to visitor experience during the period of construction and removal of non-contributing elements.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: Treatment alternative 3 provides the most visitor experience opportunities of any of the three alternatives. By establishing a shuttle system to augment the historic cave tour, this alternative would moderately increase the quality of visitor experience. The tour would begin at the visitor center, and visitors would be provided with more information regarding the early development of the historic

landscape. Also, the addition of a new visitor services structure at the historic site would add to visitor's satisfaction and comfort while at the site.

The entrance road and parking area for visitors would be open during park hours providing all Monument visitors with the opportunity to visit the historic area at their own pace, and to spend time enjoying the beautiful surroundings. The removal of selected non-contributing elements would also increase visitor satisfaction, by providing improved views and historic character within the historic core.

Cumulative Effects: Treatment Alternative 3 would cumulatively result in a moderate beneficial effect to visitor use and experience. Expanded visitor facilities at the site, an improved picnic area, and a more historically representative landscape would combine with the shuttle to the historic cave tour to provide multiple ways for visitors to enjoy the site.

Conclusion: Treatment alternative 3 would result in long-term, moderate improvements to visitor experiences. Short-term moderate, adverse impacts would occur during implementation of the shuttle system and minor adverse impacts during construction of the new building. However these potential impacts would only occur during the period of construction.

Socioeconomics

Basis of Analysis: Impact analysis focused on potential impacts to the local and regional economy from changes to visitor patterns, and additional contractor services.
Impact levels:

- **Negligible**— The effects would to the local or regional economy would at the lowest levels of detection or not measurable.

- **Minor**—The effects to socioeconomic conditions are localized and slightly detectable.
- **Moderate**—The effects to the socioeconomic conditions would be readily apparent. Any effects would result in changes to socioeconomic conditions at the local level.
- **Major**—The effects to the socioeconomic conditions would be highly noticeable, long-term, and would have a substantial impact to the regional community.

Duration:

- **Short-Term** – The impact lasts less than three months.
- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1: No-Action Alternative

Analysis: Visitation is limited by the carrying capacity of the cave and staffing levels. Changes to the treatment of the historic area would have no direct effect on the local communities' overall population, income and employment base.

Cumulative Impact: Past relocation of park facilities resulted in a long term improvement in the Monument's ability to meet visitation demands. This resulted in a long-term minor beneficial impact on the socioeconomics of the area.

Firefighting resulted in short-term negligible beneficial impact.

Restoration of the cabin has enhanced the lantern tour, which may result in some minor increase in the number of visitors to the Monument and the region; however it would have a long-term negligible beneficial impact on socioeconomics.

Continued use of port-a-potties is a less desirable way to provide the needed services and would not result in new construction that could benefit local suppliers or contractors. This would result in a long-term negligible adverse impact on socioeconomics.

The realignment of the highway would result in no significant change to the Monument's activities, and would have a long-term negligible beneficial impact.

The impacts of alternative 1 would be negligible in comparison to this overall long-term minor beneficial impact.

Conclusion: Alternative 1 would result in long-term negligible beneficial impacts to the socioeconomics of the area.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: Visitation is limited by the carrying capacity of the cave and staffing levels. Changes to the treatment of the historic area would have no direct effect on the local communities' overall population, income and employment base.

Cumulative Impact: Past relocation of park facilities resulted in a long term improvement in the Monument's ability to meet visitation demands. This resulted in a long-term minor beneficial impact on the socioeconomics of the area.

Firefighting resulted in short-term negligible beneficial impact.

Restoration of the cabin has enhanced the lantern tour, which may result in some minor increase in the number of visitors to the Monument and the region; however it would have a long-term negligible beneficial impact on socioeconomics.

Reestablishing restrooms at the cabin would result in new construction that could provide a short term negligible benefit to local suppliers or contractors only during the length of construction.

The realignment of the highway would result in no significant change to the Monument's activities, and would have a long-term negligible beneficial impact.

The impacts of alternative 2 would be negligible in comparison to this overall long-term minor beneficial impact.

Conclusion: Alternative 2 would result in long-term negligible, beneficial impacts to the socioeconomics of the area. The period of construction may result in a short-term negligible, beneficial impact to the local economy.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: Visitation is limited by the carrying capacity of the cave and staffing levels. Alternative 3 could ultimately lead to the use of shuttle transportation, which could result in contracting the program to a local service provider.

Cumulative Impact: Past relocation of park facilities resulted in a long term improvement in the Monument's ability to meet visitation demands. This resulted in a long-term minor beneficial impact on the socioeconomics of the area.

Firefighting resulted in short-term negligible beneficial impact.

Restoration of the cabin has enhanced the lantern tour, which may result in some minor increase in the number of visitors to Jewel Cave and the region; however it would have a long-term negligible beneficial impact on socioeconomics.

Constructing vault toilets at the parking lot would result in new construction that could benefit local suppliers or contractors and provide a short term negligible benefit to the local economy only during the length of construction.

The realignment of the highway would result in no significant change to the Monument's activities, and would have a long-term negligible beneficial impact.

Conclusion: Alternative 3 would result in negligible long-term negligible beneficial impacts to the socioeconomics of the area. The period of construction may result in a short-term negligible, beneficial impact to the local economy.

Solid Waste

Basis of Analysis: Impact analysis focused on the amount of solid waste and the ability to recycle or reduce solid waste outputs.

Intensity levels:

- **Negligible –** Impacts would be at or below the level of detection. No long-term increases or decreases of the solid waste stream would be detected.
- **Minor –** Increases or decreases to the solid waste stream would be slight and likely short-term. Any impacts would be small and the initiatives applied or mitigation measures used would be inexpensive and/or simple to implement.
- **Moderate –** Increases or decreases to the solid waste stream would be apparent and could be either short or long-term. Impacts would result in changes to the solid waste stream on a local scale. Any initiatives applied or mitigation measures used could require some funding, but would be relatively simple to implement.
- **Major –** Increases or decreases to the solid waste stream would be readily apparent and long-term. Major impacts would have the potential to affect the regional solid waste stream. Any initiatives applied or mitigation measures used would be expensive and complex.

Duration:

- **Short-Term** – The impact lasts less than three months.
- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1: No Action Alternative

Analysis: The No Action Alternative would maintain the existing status quo at Jewel Cave. No changes in the solid waste stream are anticipated. This alternative would not require any large scale removal of construction debris from removing

Service drive "A" or realignment of the hiking trail. Service drive "A" would continue to provide access for NPS staff and maintenance vehicles. Access to the small parking area for NPS employees only and the small structure used for storing lanterns would remain in this alternative. The No Action Alternative would have a long-term, negligible, beneficial impact on the solid waste system at the Monument.

Cumulative Impacts: Cumulative impacts resulting from the improvements to Highway 16 or the construction of a new restroom facility at Jewel Cave may have short-term, minor, adverse impacts, but long-term, negligible beneficial impacts on the solid waste stream in and around the park during construction.

Conclusion: The No Action Alternative would have long-term, negligible, beneficial impacts.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: Alternative 2 calls for service drive "A" and its associated parking lot to be removed; resulting in the removal of about 4, 000 square feet (SF) of asphalt and gravel. Any bulk waste would be taken to the Rapid City Landfill site. Alternative 2 also calls for the realignment and resurfacing of the pedestrian trail. This action would involve the removal of roughly 1,600 SF of a combination of gravel and concrete. This would have a short-term, moderate, adverse, impact on the park's waste stream. The landfill would be able to recycle the majority of the material from service drive "A" and the trail, thus minimizing the impacts of its removal.

Cumulative Impacts: Cumulative impacts resulting from the improvements to Highway 16 or the construction of a new restroom facility at the Monument may

have short-term, minor, adverse impacts, but long-term, negligible adverse impacts on the solid waste stream in and around the park during construction.

Conclusion: Alternative 2 would have a short-term, minor, adverse impact; however, any long-term adverse impacts would be negligible.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: Alternative 3 calls for service drive "A" and its associated parking lot to be removed; resulting in the removal of about 4, 000 square feet (SF) of asphalt and gravel. Any bulk solid waste would be taken to the Rapid City Landfill site. Alternative 3 also calls for the realignment and resurfacing of the pedestrian trail. This action would involve the removal of roughly 1,600 SF of a combination of gravel and concrete. This would have a short-term, moderate, adverse, impact on the park's waste stream. The landfill would be able to recycle the majority of the material from service drive "A", thus minimizing the impacts of its removal.

Cumulative Impacts: Cumulative impacts resulting from the improvements to Highway 16 or the construction of a new restroom facility at the Monument may have short-term, minor, adverse impacts, but long-term, negligible adverse impacts on the solid waste stream in and around the park during construction.

Conclusion: Alternative 3 would have a short-term, minor, adverse impact; however the long-term adverse impacts would be negligible.

Utilities

Basis for Analysis: Impact analysis focused on impacts to on-site utilities.

Intensity levels:

- **Negligible**—The effect is at the lowest levels of detection or not measurable.
- **Minor**—The effect is localized and slightly detectable.
- **Moderate**—The effect is clearly detectable and appreciable.
- **Major**—The effect is highly noticeable, and would have a substantial impact to the utility system.

Duration:

- **Short-Term** – The impact lasts less than three months.
- **Long-Term** – The impact lasts three months or longer.

Treatment Alternative #1: No Action Alternative

Analysis: Alternative 1 would have a negligible effect on the utilities.

Cumulative Impact: Past relocation of park facilities resulted in removal of some overhead power and phone lines and buried phone, and of some buried water and sewer lines. Because there is no current need for any of the removed utilities, this is a long-term negligible beneficial impact.

Firefighting efforts in 2000 resulted in short-term negligible beneficial impact.

Restoration of the cabin resulted in long-term negligible beneficial impact.

The continued use of port-a-potties in the parking area would result in no change to the current utilities, resulting in long-term negligible beneficial impact.

Realignment of the highway would result in long-term negligible beneficial impact.

The impacts of alternative 1 would be negligible in comparison to this overall long-term negligible beneficial impact.

Conclusion: Alternative 1 would result in long-term negligible, beneficial impacts to the park utilities.

Treatment Alternative #2: Rehabilitation with Shuttle Transportation

Analysis: Alternative 2 would have no effect on the utilities.

Cumulative Impact: Past relocation of park facilities resulted in removal of some overhead power and phone lines and buried phone, and of some buried water and sewer lines. Because there is no current need for any of the removed utilities, this is a long-term negligible beneficial impact.

Firefighting efforts in 2000 resulted in short-term negligible beneficial impact.

Restoration of the cabin resulted in long-term negligible beneficial impact.

Reestablishing restrooms at the cabin would result in more use of existing water and sewer lines, with a long-term negligible adverse impact from heavier use.

Realignment of the highway could result in a long-term negligible adverse impact.

The impacts of alternative 2 would be negligible in comparison to this cumulative long-term, negligible, beneficial impact.

Conclusion: Alternative 2 would result in long-term, negligible, beneficial impact to the park utilities.

Treatment Alternative #3: Rehabilitation emphasizing Restoration within the Historic Core

Analysis: Retaining the drinking fountain would result in no impact. The existing fire suppression system would remain, affording significant protection from a structural fire. Vault toilets would be a significant improvement over the port-a-potties presently used.

Cumulative Impact: Past relocation of park facilities resulted in removal of some overhead power and phone lines and buried phone, and of some buried water and sewer lines. Because there is no current need for any of the removed utilities, this is a long-term negligible beneficial impact.

Firefighting efforts in 2000 resulted in short-term negligible beneficial impact.

Restoration of the cabin resulted in long-term negligible beneficial impact.

A vault toilet in the parking lot area would be a permanent replacement for the temporary port-a-potties currently in use, and would result in a long-term negligible adverse impact on utilities.

Realignment of the highway would result in long-term negligible beneficial impact.

The impacts of alternative 3 would be negligible in comparison to this overall long-term, negligible, beneficial impact.

Conclusion: Alternative 3 would result in long-term, negligible, beneficial impacts to the park utilities.

Summary of Environmental Consequences

The analysis of each alternative is summarized in Table 5.

Table 5
Impact Comparison Matrix

Resource Area	Treatment Alternative I No Action Alternative	Treatment Alternative II	Treatment Alternative III
Cultural Resources	• Long-term minor, adverse cumulative impacts. • Long-term moderate, adverse impacts. • No impairment to Monument resources.	• Long-term minor, adverse cumulative impacts. • Short-term negligible, adverse impact. • Long-term minor, beneficial impacts. • No impairment to Monument resources.	• Long-term minor, beneficial cumulative impacts. • Short-term negligible, adverse impact. • Long-term moderate, beneficial impacts. • No impairment to Monument resources.
Cave Resources	• Long-term moderate, beneficial cumulative impact. • Long-term moderate, beneficial impact. • No impairment to Monument resources.	• Long-term moderate, beneficial cumulative impact. • Long-term moderate, beneficial impact. • No impairment to Monument resources.	• Long-term moderate, beneficial cumulative impact. • Long-term moderate, beneficial impact. • No impairment to Monument resources.
Surface Water Quality	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact. • No impairment to Monument resources.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, adverse impact. • Long-term negligible, beneficial impact. • No impairment to Monument resources.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, adverse impact. • Long-term negligible, beneficial impact. • No impairment to Monument resources.

Table 5 (cont.) Impact Comparison Matrix			
Resource Area	**Treatment Alternative I No Action Alternative**	**Treatment Alternative II**	**Treatment Alternative III**
Wildlife	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact. • No effect to listed species. • No impairment to Monument resources.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, adverse impact. • Long-term negligible, beneficial impact. • No effect to listed species. • No impairment to Monument resources.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, adverse impact. • Long-term negligible, beneficial impact. • No effect to listed species. • No impairment to Monument resources.
Visitor Use and Experience	• Long-term minor, adverse cumulative impact. • Long-term minor, adverse impact.	• Long-term minor, beneficial cumulative impact. • Short-term negligible and moderate, adverse impacts. • Long-term minor, beneficial impact.	• Long-term moderate, beneficial cumulative impact. • Short-term minor and moderate, adverse impacts. • Long-term moderate, beneficial impact.
Socioeconomics	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, beneficial impact. • Long-term negligible, beneficial impact.	• Long-term negligible, beneficial cumulative impact. • Short-term negligible, beneficial impact. • Long-term negligible, beneficial impact.

Table 5 (cont.) Impact Comparison Matrix			
Resource Area	**Treatment Alternative I No Action Alternative**	**Treatment Alternative II**	**Treatment Alternative III**
Solid Wastes	• Short-term minor, adverse cumulative impacts. • Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact.	• Short-term minor, adverse cumulative impacts. • Long-term negligible, adverse, cumulative impacts. • Short-term, minor adverse impact. • Long-term negligible, adverse impact.	• Short-term minor, adverse cumulative impacts. • Long-term negligible, adverse, cumulative impacts. • Short-term minor, adverse impact. • Long-term negligible, adverse impact.
Utilities	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact.	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact.	• Long-term negligible, beneficial cumulative impact. • Long-term negligible, beneficial impact.

Mitigating Measures

If previously unknown and significant archeological resources are unearthed during construction, work would be stopped in the area of discovery and the NPS would consult with the South Dakota State Historic Preservation Office (SHPO) and as appropriate, the Advisory Council on Historic Preservation. If impacts to significant resources could not be avoided by redesign, mitigating measures would be developed in consultation with the SHPO to help ensure that the informational significance of the sites would be preserved. If appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990 would be implemented.

The use of NPS Best Management Practices (BMPs) would minimize short-term and long-term adverse impacts to water quality.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in NEPA, which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that "…the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101." Using the six criteria from Section 101 detailed below.

- ***Criterion 1***—*Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.*
- ***Criterion 2***—*Assure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings.*
- ***Criterion 3***—*Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.*
- ***Criterion 4***—*Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.*
- ***Criterion 5***—*Achieve a balance between population and resource use that will permit high standards of living and wide sharing of life's amenities.*

- ***Criterion 6***—*Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.*

After analysis of potential impacts for each Treatment Alternative it was determined that Treatment Alternative #3— Rehabilitation emphasizing Restoration within the Historic Core provides the greatest level of protection of resources of the Treatment Alternatives evaluated in this CLR/EA. Treatment Alternative #3 is the environmentally preferred alternative because implementation of this alternative would further protect all elements of the cultural landscape for future generations; improve visitor's experience and understanding of the cultural landscape and promotes a "…safe, healthful, productive, and aesthetically and culturally pleasing surroundings. This alternative also integrates resource protection opportunities, which "preserves important, historic, cultural and natural aspects of our natural heritage".

Chapter VIII:
Recommended Treatment (Preferred Alternative)

Recommended Treatment (Alternative #3): Rehabilitation emphasizing Restoration within the Historic Core

The purpose of this recommended treatment is to preserve and interpret extant historic resources, while improving visitor services. The overall management philosophy would be rehabilitation, with restoration, preservation, and rehabilitation applied to selected elements. A vault toilet building and a shelter/lantern storage building would be constructed to improve visitor comfort and remove impacts from the historic core. A shuttle system would be developed to augment visitor experiences and access to the site. The site would remain open to visitors to access and explore during the Monument's operational hours.

This alternative treatment plan consists of five management zones including; 1) Historic Core, Historic Resource Management and Interpretation Zone, 2) Historic Resource Management and Visitor Services Zone, 3) Archeological Resource Management Zone, 4) Park Operations Management Zone, 5) Ponderosa Pine Forest Preservation Zone. The general treatment approach associated with each of these zones is summarized in Chapter VI, Treatment Alternatives. This chapter includes more specific treatment recommendations for resources.

Historic Core, Recommended Treatment

The *Historic Core, Historic Resource Management and Interpretation Zone,* includes the Ranger Cabin, the landscape associated with the Ranger Cabin, upper and lower trails to the cave entrance, the stone stairway, retaining walls, and cave entrance, as illustrated in Figures 8.1 and 8.2. All of these historic resources retain a high level of integrity.

- Preserved or rehabilitate cultural resources as necessary to maintain them in good condition and ensure visitor safety.
- Manage the ponderosa pine forest that constitutes the main vegetative resource within the zone according to natural resource goals for the overall Monument.
- Remove or relocate non-contributing elements within the core to a site outside of the historic core. These include the lantern storage shed, Service Drive 'A' and employee parking area, rocks at the edge of the parking area, drinking fountain, and circular seating area near the cabin.
- Continue to conduct guided tours within the Historic Core as the first portion of the historic cave tour.
- Keep the area open for use by visitors for informal explorations of the cultural landscape; however, continue to keep the Ranger Cabin and historic cave entrance accessible only in the presence of NPS staff.

Development of designs and implementation of design treatments at this site reflect the spirit of the rustic park style embraced by the National Park Service and the Civilian Conservation Corps in the 1920s and 1930s, and strive to achieve maximum landscape protection and harmonious design. While proposed elements do not strive to look like the historic resources, they are designed in a manner that achieves unity of historic and new structures as well as natural and human-built features. Use of native materials and proportions, emphasis on views, and the application of textures and workmanship that correspond to the surrounding forest and geology are emphasized with all the design solutions recommended for the historic district.

Ranger Cabin:

- Maintain in its recently restored ca. 1940s condition.
- Retain the fire protection system and follow recommendations presented in the HSR.

Landscape directly associated with the Ranger Cabin:

- Maintain the area around the building as a low maintenance, unadorned landscape.
- Maintain the existing Junipers at the front and north side of the cabin. When these plants are no longer healthy or thriving, replace them with Juniperus horizontalis plants to create an even massing.
- Recondition the soil in the area in front of the building, and plant three more Juniperus horizontalis to create a massed planting. To recondition the soil, send soil samples to the nearest Agricultural Extension lababratory to determine the existing condition of the soil and to obtain instructions for enhancing the soil for evergreen shrubs. Carefully dig up the soil in the area (avoiding the roots of the existing shrubs). Using a hand shovel, mix in any organic matter or other additives suggested by the soil laboratory. Replace the soil ensuring that the surface will drain away from the building and the plants. The plants require a very well drained environment. Install the new plants being careful not to damage the plants and removing all packaging (container or burlap). The Juniperus horizontalis prefer a moderately acid to circumneutral soil, but will tolerate alkaline conditions with pH between 5.0-8.5.

- Discourage use of the social trail on the northern side of the building.
- Disguise the trail head with brush, and discourage NPS staff from using the trail.
- Continue to maintain one picnic table on the western side of the building.
- Remove the driveway and establish native ground cover consisting of grasses and forbs.

Upper Trail to Cave Entrance:

- Repave the trail using tinted concrete with a rough broom finish. The tint should be a light tan or gray that corresponds with the color of the natural rock outcrops.
- Conduct a detailed survey of existing conditions and grades at the site, and prepare construction documents. Construction documents are necessary to ensure that the trail and steps are built according to the intended design. The topography and drainage, as well as the design of the steps, are of particular concern, requiring a site survey and detailed grading and layout plan.
- Layout the trail route based on the historic alignment as closely as possible while relating the alignment to the natural topography by using gentle curves, and avoiding unnatural bends.
- To minimize grading along the route meet the existing land as quickly and naturally as possible.

- Reinforce any disturbed land with a temporary erosion control mesh and plant native ground cover species along the edges of the trail.
- Carefully address any potential erosion problems near the trail by ensuring that the trail surface drains adequately and does not create an obstruction to water flow.
- Grade the trail to ensure a safe approach to the historic stone stairway. Avoid grades greater than eight percent.
- If it is necessary to use steps along the trail, reuse the stone from the existing steps along the upper trail. Carefully position the stones to create a uniform rise-run ratio for all of the steps. Utilize a ratio that includes a minimum tread of twelve inches, and a minimum riser of seven inches. Install steps in groups of two or three whenever possible. Do not install a single step in any location, as this creates a tripping hazard.
- Use a tinted concrete with a rough broom texture finish for the surface to repave the trail. The concrete tint should be a light tan or gray in a hue that is similar to the native stone at the site.
- In the area just above the CCC-constructed stone stairway, the sidewalk is being undercut by erosion (see Figure 8.8). Construct a retaining wall to support the path. Use native stone in a naturalistic pattern as indicated in Figures 8.6 and 8.7. Consider extending the retaining wall thirty inches above the concrete sidewalk to create a guardrail as illustrated in Figure 8.6. Alternately, construct the retaining wall only

below the sidewalk and reuse the existing metal railing with the new pavement (see Figure 8.7).

- Remove non-contributing elements along the trail including the drinking fountain and the circular seating area. Once these elements have been removed, spread local topsoil and reestablish native vegetation in these areas.

Lower Trail to Cave Entrance:

- Repave the trail using tinted concrete with a rough broom finish. The tint should be a light tan or gray that corresponds with the color of the natural rock outcrops.
- Conduct a detailed survey of existing conditions and grades at the site, and prepare construction documents to ensure proper erosion control. Construction documents are necessary to ensure that the trail and steps are built according to the intended design. The topography and drainage, as well as the design of the steps, are of particular concern, requiring a site survey and detailed grading and layout plan.
- Remove the existing pavement. Relate the trail alignment to the existing topography, and avoid unnatural bends using gentle curves that respond to the adjacent rock outcrop.
- Use of grading along the route should focus on meeting existing grades, and achieving a sufficient cross slope for the pavement (between one and two percent) to allow for positive drainage away from the rock outcrop. Reinforce any disturbed land with a temporary erosion control mesh and

plant native ground cover species along the edges of the trail. Carefully address any potential erosion problems near the trail by ensuring that the trail surface drains adequately and does not create an obstruction to water flow.

- Use a tinted concrete and rough broom finish (matching that used for the upper trail) to repave the trail.

CCC-Constructed Stone Stairway

- Preserve the stone stairway and monitor its condition (Figure 8.10).
- Retain the existing handrail.
- Consider constructing a short stone structure at the base of the stairway to create a safer transition from the stairs to the lower trail (see Figure 8.11). This area currently has a steep drop-off that could be dangerous for visitors (see Figure 8.10) .
    - Regrade the area near the steps to create a stable shelf.
    - Place large stones that match the rock outcrop along the edge of the steps in a naturalistic arrangement.
    - Plant native shrubs at the edge of the rocks to increase soil stability and to help blend the new rocks with the existing rock outcrop.

NPS-Constructed Retaining Wall along high side of the Lower Trail

- This stone retaining wall is being impacted by erosion and structural failure in sections. Consider conducting a structural evaluation of the retaining wall and preparing a comprehensive erosion control plan for the slopes above this wall. If the plan indicates that the wall should be

removed and replaced with another structure, use construction materials and details that are consistent with the CCC-designed resources at the site.

- If a structural evaluation and comprehensive erosion control plan cannot be conducted, apply the following measures.
- Create an erosion-resistant surface on the slope above the retaining wall.
- Grade areas where erosion occurs to create a more smooth area for storm water run-off by eliminating any channels or ditches that have developed. Install erosion control mats and re-establish vegetation.
- Monitor the condition of the slope and promptly repair areas that display erosion problems. In particular, monitor areas where the slope exceeds thirty percent. If possible, regrade these areas to achieve a slope of less than thirty percent.
- In addition, repair sections of the stone retaining wall that have been damaged. Remove the sections of the wall that are failing and reconstruct using sound engineering principles.
- Finally, consider installing a perforated drain pipe along the back side of the wall to eliminate the accumulation of water. Slope the pipe to achieve positive drainage, and install it under the new sidewalk. Daylight the drain below the sidewalk base using an erosion-resistant outlet. Ensure that the outlet is not visible to people on the path or in Hell Canyon.

CCC-Constructed Retaining Wall below the Lower Trail

- There are areas where the stone wall has become exposed (the entire wall was originally covered by earth fill and vegetation) due to damage from surface drainage. Consider conducting a structural evaluation of the CCC-constructed retaining wall and preparing a comprehensive erosion control plan for the slopes above and below the lower trail to the cave entrance.
- If a structural evaluation and comprehensive erosion control plan cannot be conducted, the following measures should be applied.
- In areas where the CCC-constructed stone retaining wall has become exposed, restore the finished grade using fill dirt and install erosion control mats to re-establish vegetation.
- Monitor the condition of the slope and promptly repair areas that display erosion problems. In particular, monitor areas where the slope exceeds thirty percent. If possible, regrade these areas to achieve a slope of less than thirty percent.

Cave Entrance

- Maintain the cave entrance including the opening and the gate.
- Retain the log bench near the entrance.

Rock Outcrop adjacent to the Cave Entrance

- Monitor the rock outcrop for safety hazards. If dangerous conditions develop, resolve them on a case by case basis.

- For instance, if portions of rocks become loose and potentially hazardous, remove them. Avoid creating opportunities for more dangerous situations to develop. If removal of rocks is necessary carefully consider the appearance of the natural rock formation and avoid creating an unnatural appearance. For instance, use natural break lines rather than sheer cuts to remove dangerous portions of rock.
- Whenever possible, use hand tools to remove stone to limit visible traces of manipulation. Observe the natural pattern and character of the stone and ensure that the outcrop maintains this character when the work is complete. Avoid imitating the pattern of the CCC-developed and NPS-developed retaining walls at the site. Although the CCC-developed walls provide a useful template for repairs or additional retaining wall construction, they are not appropriate in addressing the rock outcrop that has retained its naturalistic appearance. Consider consulting a mason with experience working on similar projects, and/or reference guides including *Lightly on the Land*.[1]

Visitor Services Area, Recommended Treatment

The *Historic Resource Rehabilitation Zone* includes the park entrance road and parking areas, reconstructed historic area entrance sign, the northern-most portion of Service Drive "B," and the site of the former NPS campground.

[1] Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance Manual* (Seattle, Washington: The Mountaineers). Chapter Twelve, *Building With Rock*, provides practical and detailed guidance for hand rock manipulation methods.

- Within this zone, interpret the sites of non-extant historic elements (including the ranger's tent site, the CCC camp site, NPS housing and administrative area, and the NPS campground site). Interpretation should be consistent with the Monument's Interpretive Prospectus.
- Provide selected visitor services including parking, restrooms, drinking fountain, a weather shelter/waiting area for interpretive programs, a lantern storage facility, limited interpretive signs, a picnic area, and hiking trails.

EXISITNG ELEMENTS:

Historic area entrance road/Entrance sign/Gate

- Provide seasonal maintenance for the road and associated drainage structures.
- Maintain the gate and reconstructed entrance sign at the entrance to the historic area.
- Continue to keep the historic area entrance road open to visitors during the park's operational hours.

Visitor parking area

- Maintain the existing parking lot and add a shuttle drop-off area as indicated in Figures 8.1 and 8.4.

The northern-most portion of Service Drive "B"

- Maintain service drive "B" for access to employee parking and the pump building.

Site of the former NPS campground/Proposed Picnic Area

- Utilize this area for a visitor picnic area.
- Install picnic tables and trash receptacles.

Site of the non-extant CCC-Camp:

- Include information about the site in the ranger's introduction to the historic area.

PROPOSED ELEMENTS:

Shelter / Storage Building

- Develop a small visitor-services building including an exterior shelter and lantern storage facility near the parking lot and the site where the portable toilets are now located.
- Remove the existing lantern storage shed.
- Transfer lantern storage to the new visitor services building storage area.
- Remove the circular visitor waiting/seating area (currently located near the lantern storage shed and Service drive "A") and transfer this function to the shelter at the new visitor services building.

Drinking Fountain

- Remove the drinking fountain from its current location and provide a new drinking fountain near the new visitor services shelter.

Vault Toilet Building

- Construct a small building for two vault toilets. See Figure 8.6 for building design. Consider providing a wood screen fence at the front of the building.

Interpretive/Information Sign

- Consider installing a sign near the shelter explaining a brief history of the site, and explaining that tickets for the historic cave tour must be purchased at the main visitor center.

Former Employee Housing Area

- Remove remaining gravel and other building-related materials.
- Restore topography to natural contours.
- Recondition the soil and restore native vegetation. To recondition the soil, dig and rake surface to remove non-natural materials such as gravel and building materials. Replace cleaned soil and compact. Install erosion control fabric if necessary to stabilize portions of the soil until vegetation becomes established. Consider seeding with native plant seeds and/or planting Pondarosa pine seedlings.
- Install a picnic table for employees within the former housing area, in a site that is screened from visitor's view.

Archeological Resources Zone, Recommended Treatment

The *Archeological Resources Management Zone* encompasses the area near Highway 16 where the non-extant Michaud hotel and associated resources were located. The site currently includes the stone foundation of the hotel building and the CCC-constructed manhole at the spring. An Archeological Overview is currently being prepared for the area by Bruce Jones of the Midwest Archeological Center and the

production of the final report is in progress. Recommendations in this CLR/EA will defer to recommendations in that report when it is completed. In the meantime,

- monitor the site for impacts by vandals or natural forces, and interpret it as a representative of the early developments at the historic area by the Michaud group.
- Provide interpretation through staff presentations as part of the historic cave route tour.
- No visitor access to the site is recommended.

Park Operations Zone, Recommended Treatment

The *Park Operations Zone* includes the southeastern portion of Service drive "B," the pump building, and Service drive "A."

Southeastern Portion of Service Drive "B"

- Maintain the driveway and building for use by NPS staff.
- Utilize the driveway for employee parking and maintenance access to the building.
- Maintain the pump building.

Service Drive "A"

- Remove service drive "A" and the employee parking area.
- Remove the pavement along Service drive "A" and establish native vegetation in the areas of pavement removal.
- Maintain a two-track drivable surface from the loop road to the cabin for use by emergency vehicles.

- If, in the future, it is determined that this access for emergency vehicles is not required, consider restoring the road grade to its original topography, and also restoring of the native vegetation in the area.

Natural Resources Management Zone, Recommended Treatment

The *Natural Resource Management Zone* includes the remaining land within the proposed historic district boundary. Cultural resources within this zone include the Hell Canyon Road, and two archeological sites in Hell Canyon.

- Maintain the Hell Canyon Road as a fire access road. Maintain the road by mowing and repairs when necessary.
- Consider interpreting the use of the road for early access to the area (staff presentations or a trail brochure could be used).
- Manage the archeological resources in this zone according to the recommendations of the Archeological Report that is currently being prepared by Bruce Jones of the Midwest Archeological Center.
- Natural resources within the zone include Ponderosa Pine forest. Manage the forest according to natural resource management goals for the overall Monument.
- Adhere to recommendations in the Fire Management Plan for the Monument which provides guidelines regarding treatment for the forest.

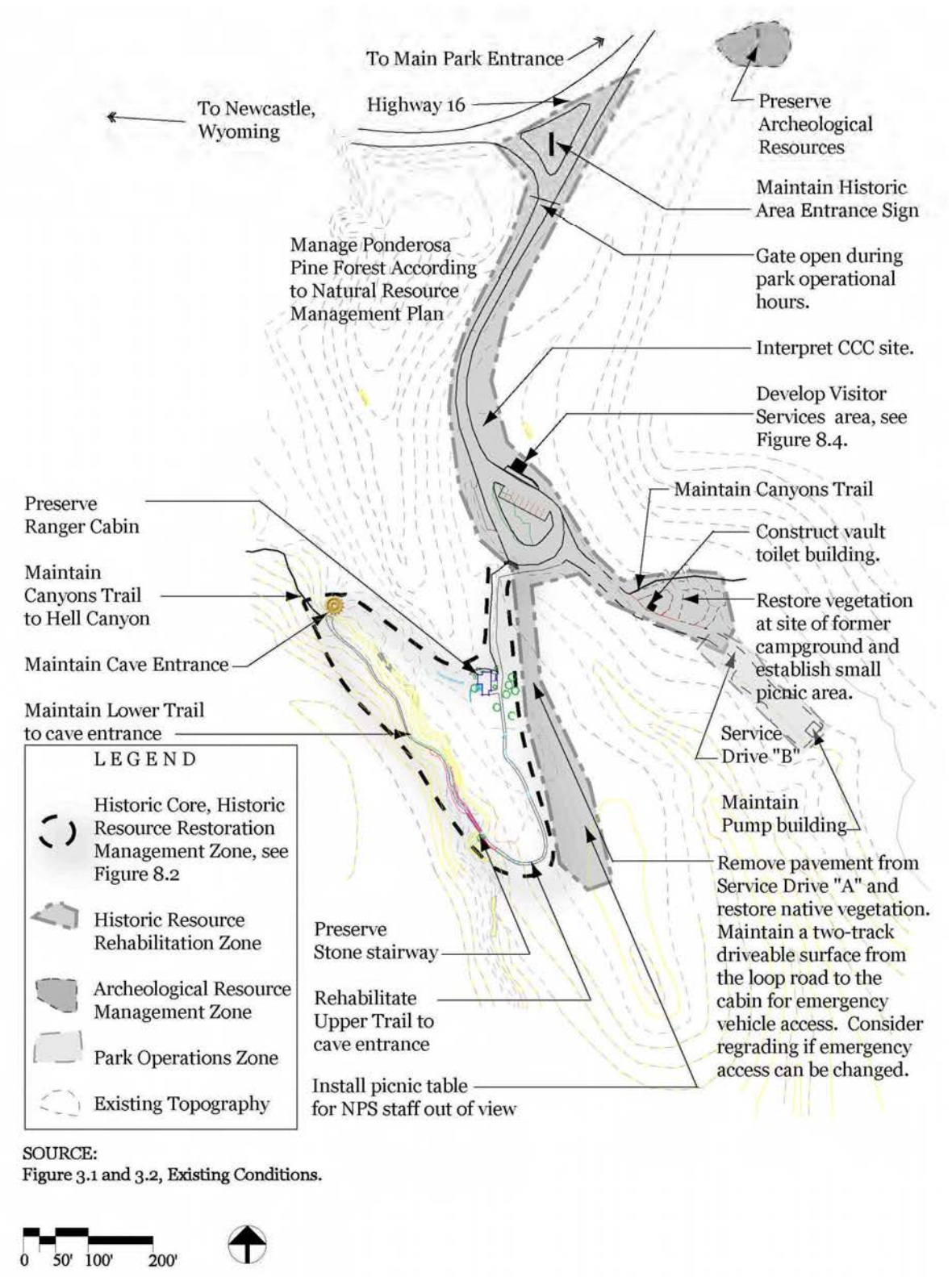
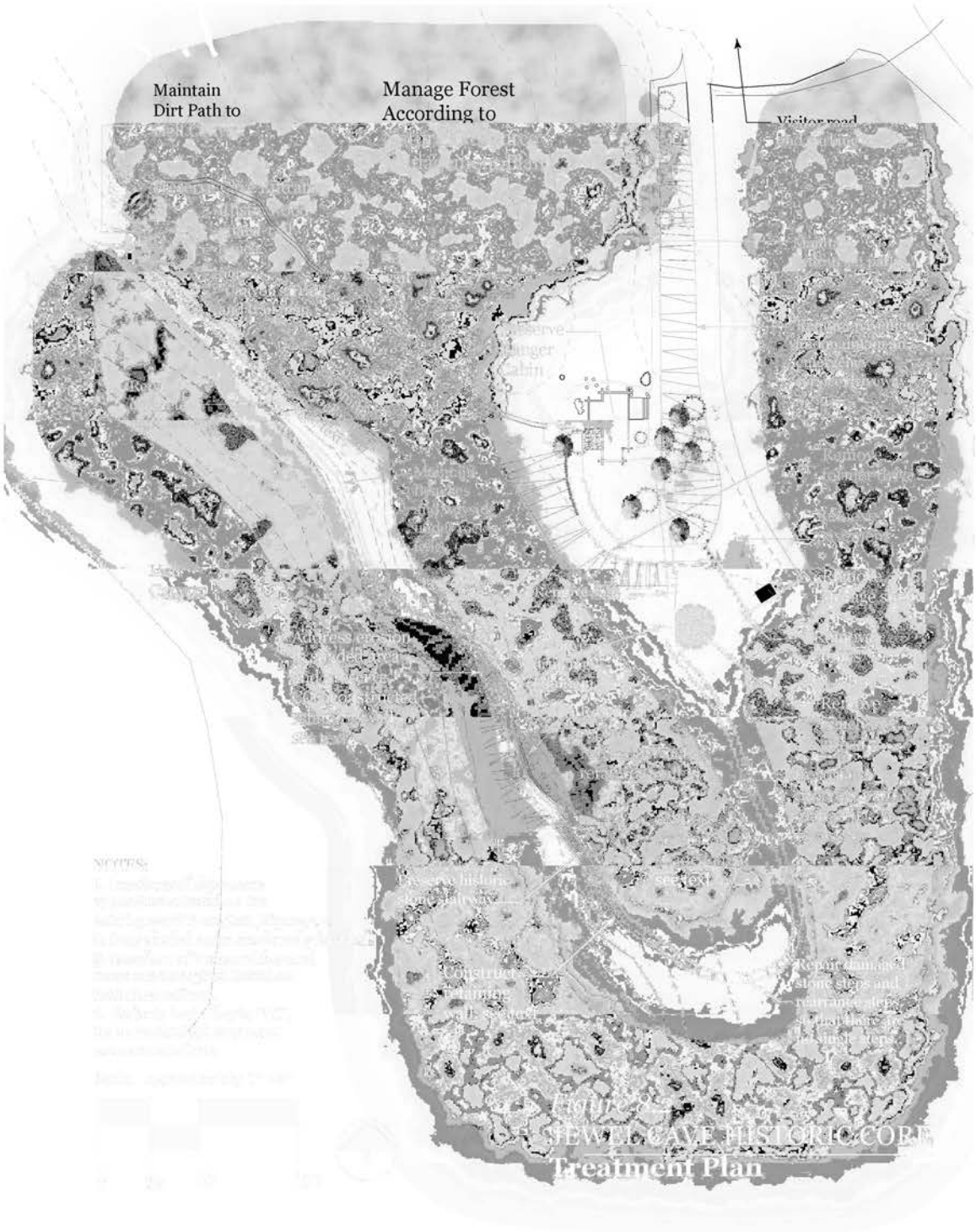


Figure 8.1: Recommended Treatment Management Zones


Maintain
Dirt Path to
Manage Forest
According to
Visitor road
Treatment Plan

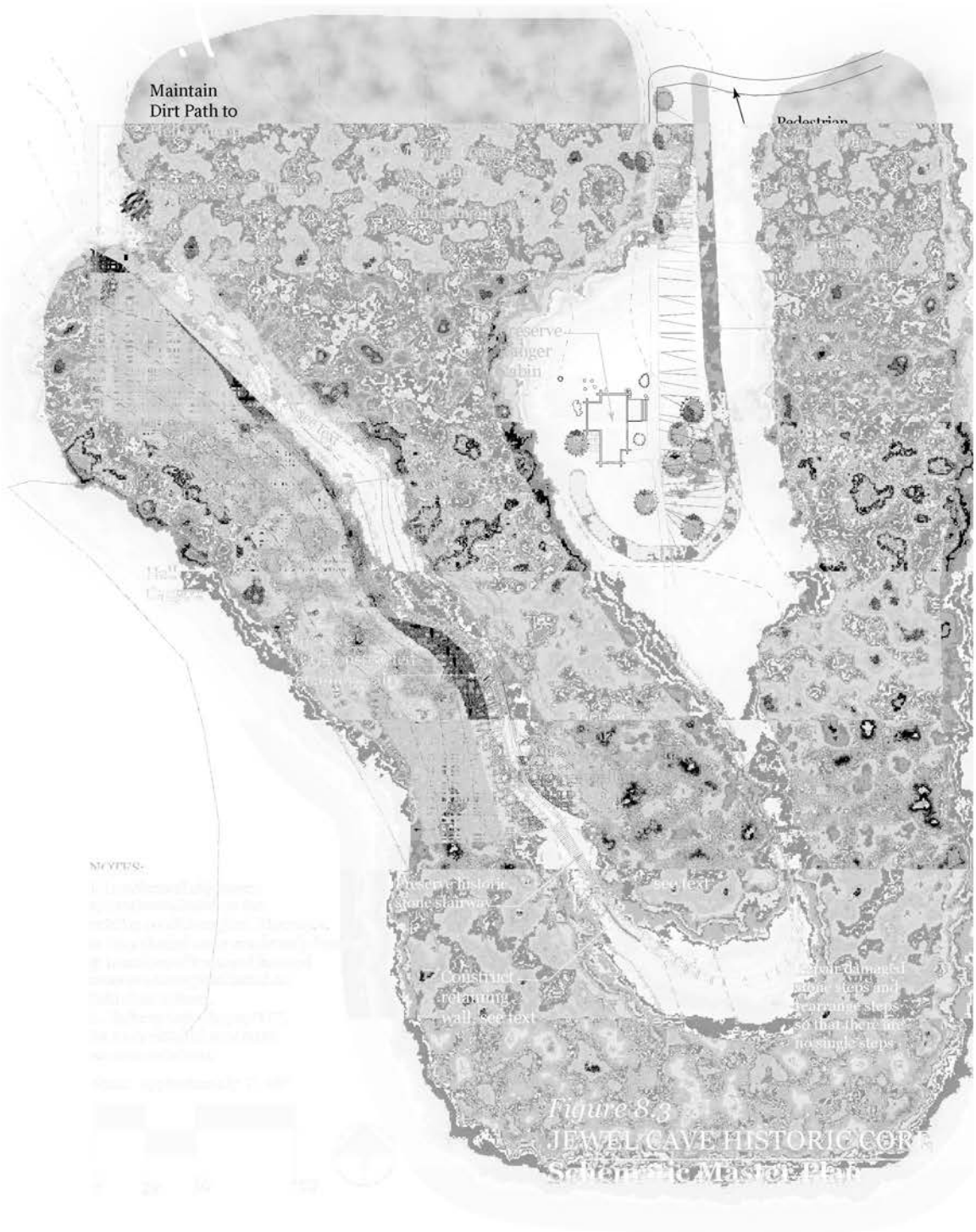


Figure 8.3
JEWEL CAVE HISTORIC CORE
Schematic Master Plan

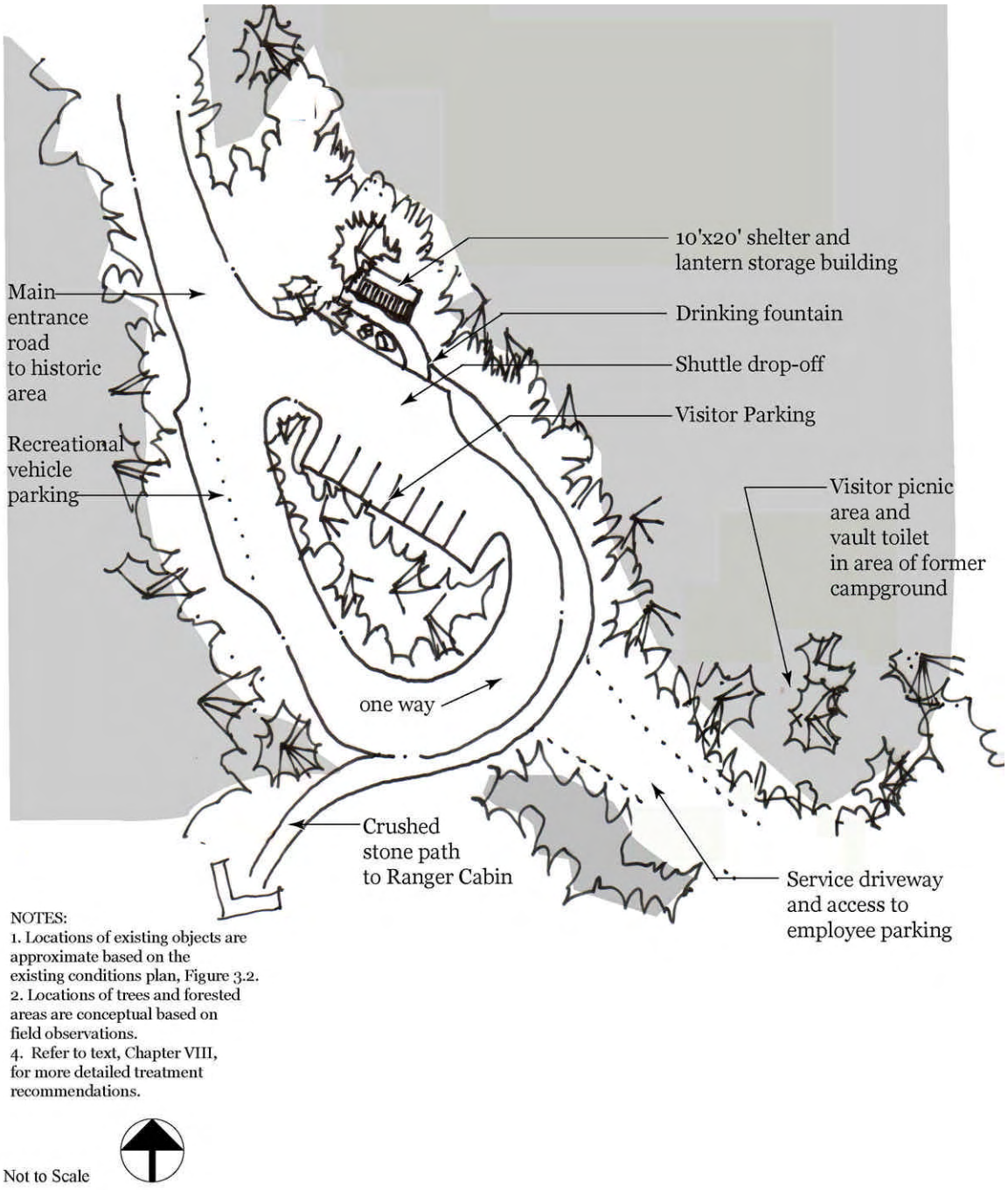


Figure 8.4: Recommended Treatment, Visitor Services Area

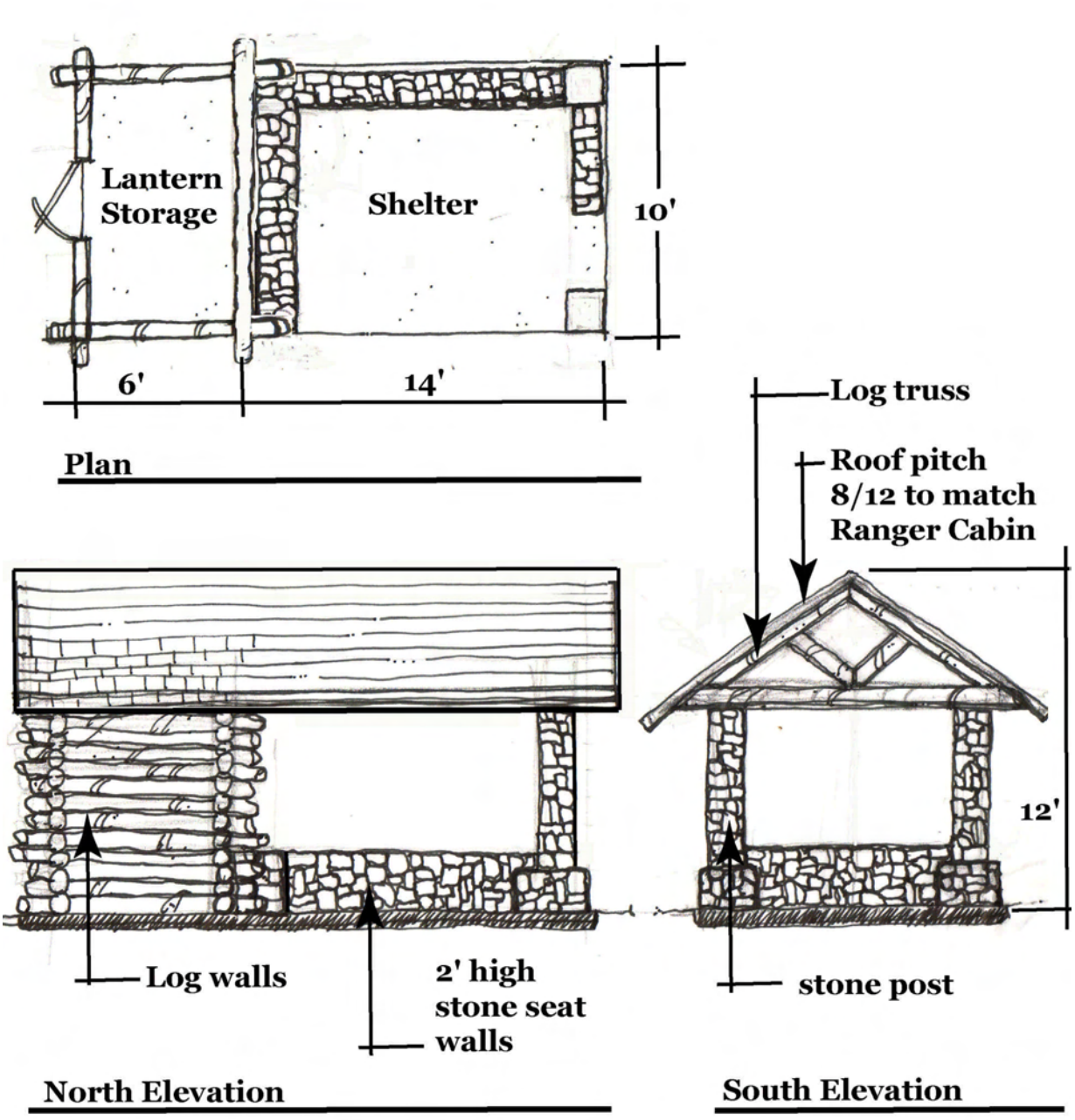


Figure 8.5: Proposed Shelter/Storage Building

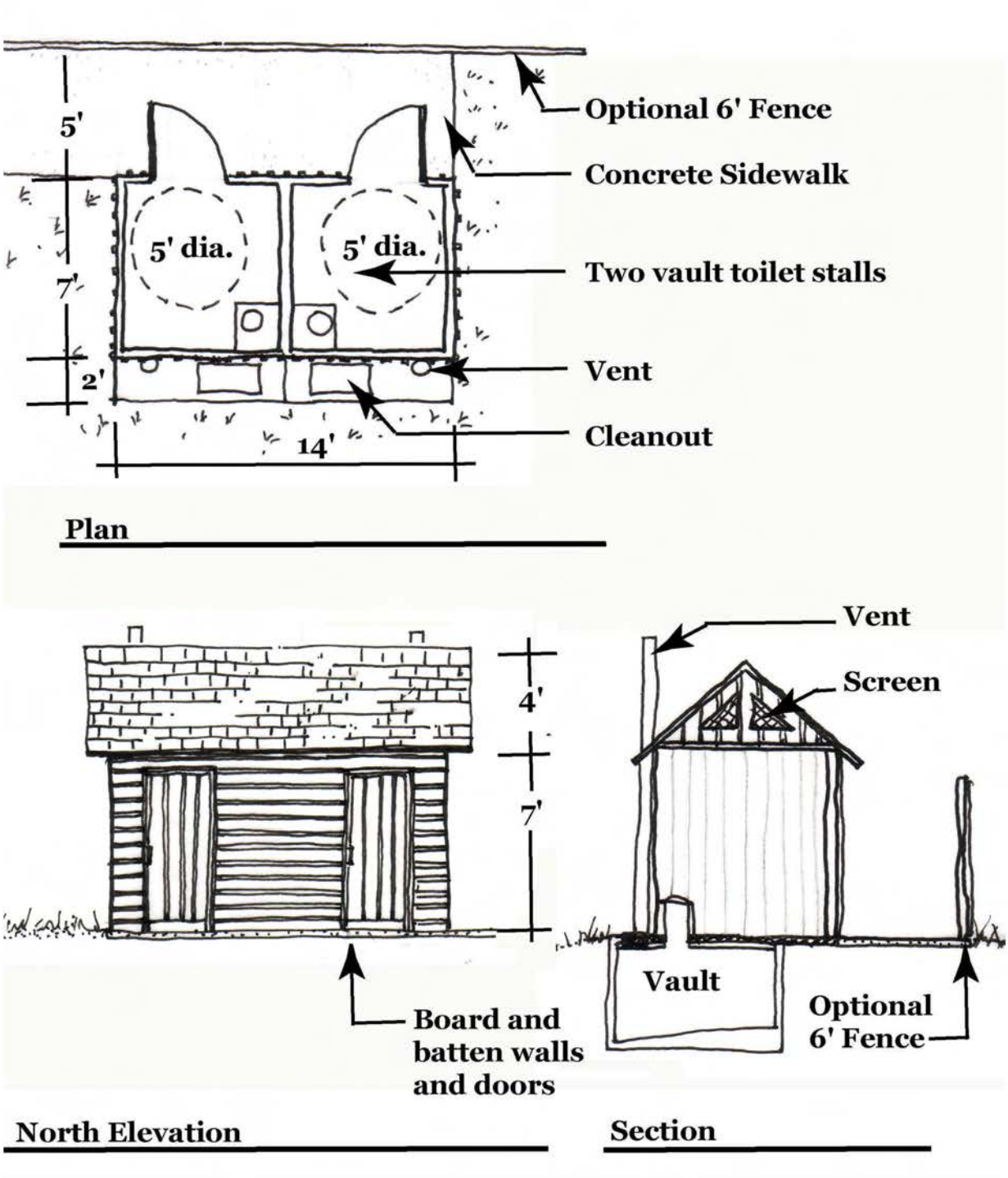


Figure 8.6: Proposed Vault Toilet Building

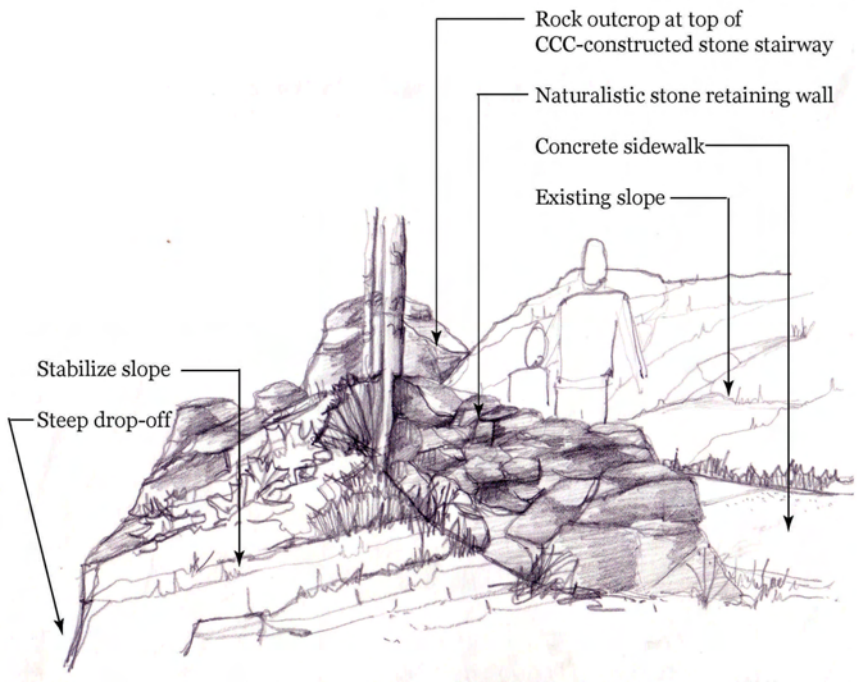


Figure 8.7: Stone Retaining Wall

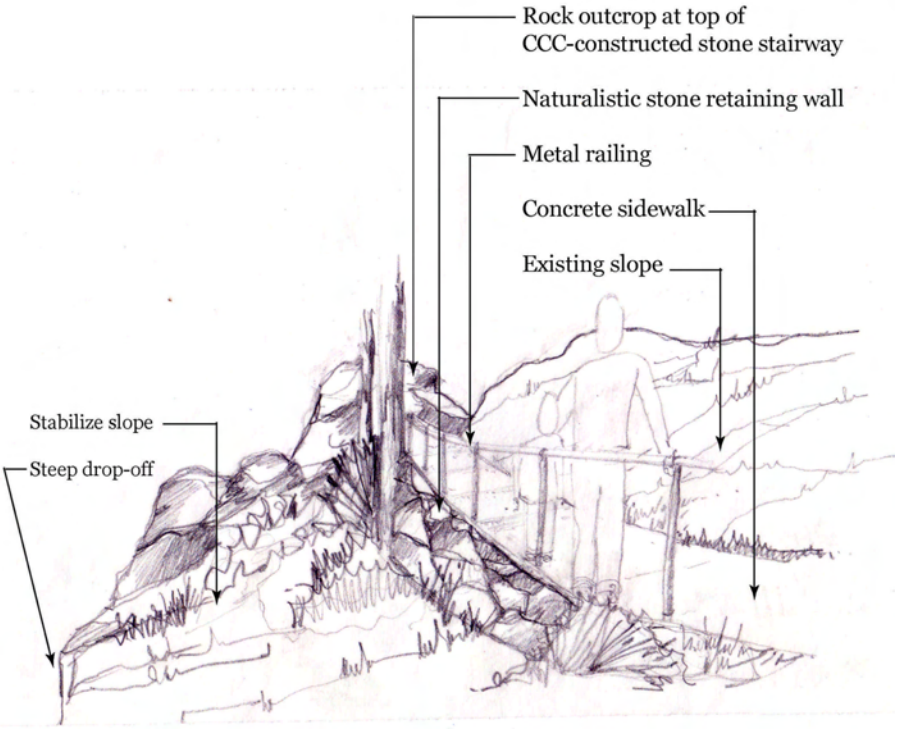


Figure 8.8: Stone Retaining Wall and Metal Railing



Figure 8.9: Existing conditions, Sidewalk and Railing above CCC-Constructed stone stairway *(Source: QEA, June 2003)*

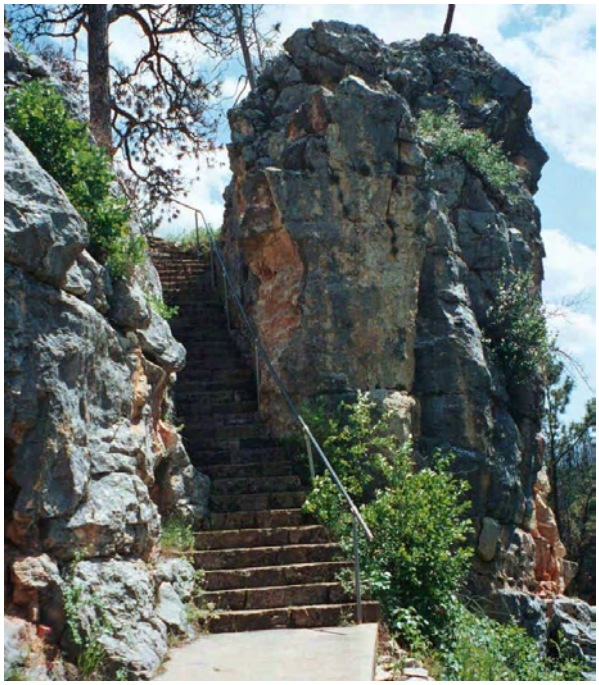


Figure 8.10: Existing Stone CCC-constructed stairway viewed from lower trail (Source: QE|A 2003, Roll 5-2)

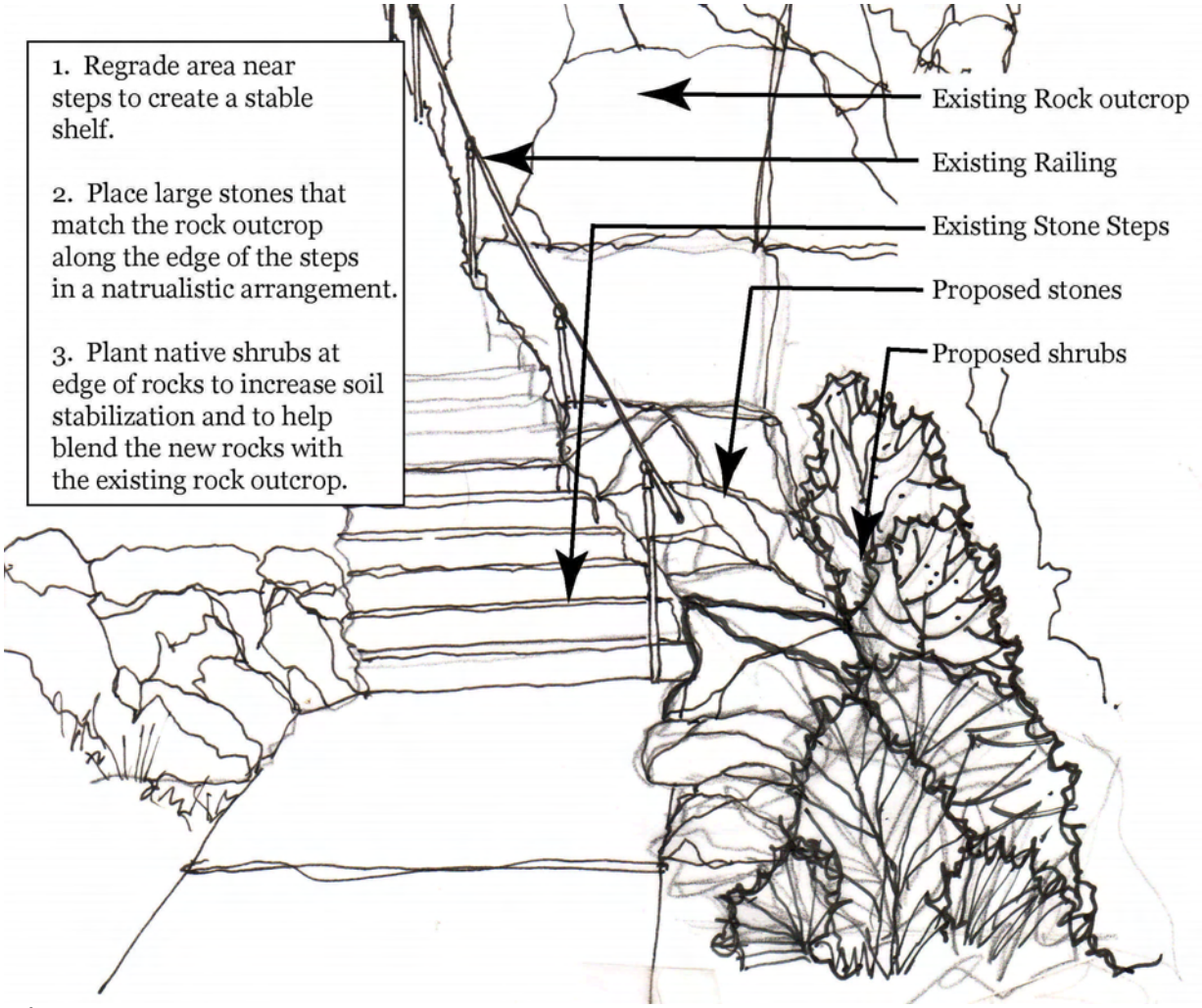


Figure 8.11: Recommended treatment at bottom of CCC-Constructed Steps

Chapter IX:
Costs and Implementation

Implementation Guidelines

This chapter provides guidelines for implementing the Recommended Treatment Approach for the Jewel Cave Historic Area. The implementation has been broken down into three phases. These phases do not imply importance or suggest a sequence for implementation.

Phase I includes projects that can be implemented individually as interim improvements. These projects do not rely on the implementation of other projects to be completed. Included are: *1) Improve the landscape associated with the Ranger Cabin; 2) Repair NPS-Constructed Retaining Wall; 3) Remove Service Drive "A" and associated elements, restore vegetation; and 4) Restore native vegetation in the former housing area south of Service Drive "A."*

Phase II includes projects that relate to the improvement of visitor services at the site. In order to maintain a basic level of visitor comfort and fulfill visitor needs, the projects in this phase should be implemented together. For instance, construct the shelter /storage building and remove the lantern storage shed and visitor seating area at the same time. Projects include: *1) Construct shelter/storage building; 2) construct vault toilet building; 3) remove existing lantern shed; 4) remove visitor seating area and drinking fountain; 5) establish visitor picnic area; 6) construct shuttle drop-off area.*

Phase III projects relate to the restoration of the historic core. These projects may be implemented individually. However, construction related to these projects will impact visitor access to the historic cave entrance. Implementing these projects individually may result in limited access for a number of seasons. Therefore, it is

recommended that the Phase III projects be implemented together. Projects include:

1) restore upper trail to cave entrance; 2) restore lower trail to cave entrance; 3) repair CCC-constructed retaining wall.

Phase I Implementation: Interim Improvements

Project: Improve landscape associated with Ranger Cabin

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Recondition soil at building	*23*	*SY*	*$ 2.00*	*$ 46.00*	
Install junipers	*3*	*EA*	*$75.00*	*$225.00*	
Remove driveway surface (gravel)	*90*	*SY*	*$ 3.00*	*$270.00*	
Disposal	*90*	*SY*	*$ 3.00*	*$270.00*	
Recondition soil at former driveway	*90*	*SY*	*$ 2.00*	*$180.00*	
Seed at former driveway & other	*100*	*SY*	*$ 1.20*	*$120.00*	
Project Cost:					*$ 1,111.00*

Project: Repair NPS-Constructed Retaining Wall

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Structural Evaluation			*$3,000*		
Comprehensive Erosion Control Plan			*$3,000*		
Implement Plan (cost unknown)					
Project Cost:					*unable to estimate*
Or					
Grade area above wall	*200*	*CY*	*$ 80.00*	*$16,000.00*	
Install erosion control mat	*200*	*SY*	*$ 20.00*	*$ 4,000.00*	
Re-establish vegetation	*200*	*SY*	*$ 4.00*	*$ 800.00*	
Repair stone wall	*96*	*CF*	*$100.00*	*$ 9,600.00*	
Install drain behind wall	*70*	*LF*	*$ 15.00*	*$ 1,050.00*	
Pipe to outlet	*15*	*LF*	*$ 15.00*	*$ 225.00*	
Erosion resistant outlet	*1*	*EA*	*$300.00*	*$ 300.00*	
Project Cost:					*$31,975.00*

Project: Remove Service Drive "A" and associated elements, restore vegetation

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Remove Pavement and gravel	*240*	*SY*	*$ 14.00*	*$ 3,360.00*	
Compact soil	*240*	*SY*	*$ 1.00*	*$ 240.00*	
Condition Soil/Topsoil	*120*	*CY*	*$ 10.00*	*$ 1,200.00*	
Erosion control material	*1*	*Allow*	*$ 500.00*	*$ 500.00*	
Seed	*120*	*SY*	*$ 1.20*	*$ 144.00*	
Project Cost:					*$ 5,444.00*

Project: Restore Native Vegetation in former Housing Area South of Service Drive "A"

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Remove gravel	*240*	*SY*	*$ 14.00*	*$ 3,360.00*	
Condition Soil/Topsoil	*120*	*CY*	*$ 10.00*	*$ 1,200.00*	
Erosion control	*1*	*Allow*	*$ 500.00*	*$ 500.00*	
Seed	*120*	*SY*	*$ 5.00*	*$ 600.00*	
Project Cost:					*$ 5,660.00*

SUBTOTAL PHASE I IMPLEMENTATION: $44,190.00

Phase II Implementation: Improve Visitor Services

Project: Construct Shelter / Storage Building

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Construct Building	*1*	*Allow*	*$ 30,000.00*	*$ 30,000.00*	
Concrete Sidewalk 4"	*20*	*SY*	*$ 56.00*	*$ 1,120.00*	
Eyewash station	*1*	*EA*	*$ 200.00*	*$ 200.00*	
Drinking fountain	*1*	*EA*	*$ 800.00*	*$ 800.00*	
Grading	*10*	*CY*	*$ 80.00*	*$ 800.00*	
Seed	*30*	*SY*	*$ 1.20*	*$ 36.00*	
Project Cost:					*$ 32,956.00*

Project: Construct Vault Toilet Building

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Construct Building	*1*	*Allow*	*$ 4,000.00*	*$ 4,000.00*	
Concrete Sidewalk 4"	*10*	*SY*	*$ 56.00*	*$ 560.00*	
Grading	*10*	*CY*	*$ 80.00*	*$ 800.00*	
Seed	*30*	*SY*	*$ 1.20*	*$ 36.00*	
Project Cost:					*$ 5,396.00*

Project: Remove existing Lantern Shed

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Remove Building	*385*	*CF*	*$ .60*	*$ 231.00*	
Remove Eyewash station	*1*	*EA*	*$ 100.00*	*$ 100.00*	
Project Cost:					*$ 331.00*

Remove visitor seating area and drinking fountain

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Remove Gravel	*50*	*SY*	*$ 5.00*	*$ 250.00*	
Remove Benches	*1*	*Allow*	*$ 100.00*	*$ 100.00*	
Remove Drinking Fountain	*1*	*Allow*	*$ 150.00*	*$ 150.00*	
Condition Soil/Topsoil	*25*	*CY*	*$ 10.00*	*$ 250.00*	
Seed	*50*	*SY*	*$ 1.20*	*$ 60.00*	
Project Cost:					*$ 810.00*

Establish Visitor Picnic Area

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Picnic Area Sign	*1*	*Allow*	*$ 200.00*	*$ 200.00*	
Picnic Tables	*4*	*EA*	*$ 600.00*	*$2,400.00*	
Trash Receptacles	*2*	*EA*	*$ 600.00*	*$1,200.00*	
Project Cost:					*$3,800.00*

Construct Shuttle Drop-off Area

Prepare site	*24*	*SY*	*$ 5.00*	*$ 120.00*	
Concrete Pavement 6"	*24*	*SY*	*$ 14.00*	*$ 336.00*	
Project Cost:					*$ 456.00*

SUBTOTAL PHASE II IMPLEMENTATION: $43,749.00

Phase III Implementation: Restore Historic Core

Project: Restore Upper Trail to Cave Entrance

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Survey	*1*	*Allow*	*$2,000.00*	*$ 2,000.00*	
Construction Documents	*1*	*Allow*	*$2,000.00*	*$ 2,000.00*	
Remove Pavement	*180*	*SY*	*$ 18.00*	*$ 3,240.00*	
Exposed Aggregate Concrete SW	*180*	*SY*	*$ 80.00*	*$14,400.00*	
Erosion control	*1*	*Allow*	*$ 500.00*	*$ 500.00*	
Topsoil	*30*	*CY*	*$ 10.00*	*$ 300.00*	
Seed	*90*	*SY*	*$ 1.20*	*$ 108.00*	
Project Cost (excluding new retaining wall):					*$ 22,548.00*
Stone retaining wall opt.1	*1*	*Allow*	*$10,000.00*	*$10,000.00*	
or					
Stone retaining wall opt.2	*1*	*Allow*	*$ 8,000.00*	*$ 8,000.00*	
Project Cost:	*(assuming option #1)*				*$10,000.00*

Project: Restore Lower Trail to Cave Entrance

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Survey	*1*	*Allow*	*$3,000.00*	*$ 2,000.00*	
Construction Documents	*1*	*Allow*	*$3,000.00*	*$ 3,000.00*	
Remove Pavement	*151*	*SY*	*$ 20.00*	*$ 3,020.00*	
Exposed Aggregate Concrete SW	*151*	*SY*	*$ 80.00*	*$12,080.00*	
Erosion control	*1*	*Allow*	*$ 1,000.00*	*$ 500.00*	
Project Cost:					*$20,600.00*

Project: Repair CCC-Constructed Retaining Wall

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Survey	*1*	*Allow*	*$ 5,000.00*	*$ 5,000.00*	
Construction Documents	*1*	*Allow*	*$ 5,000.00*	*$ 5,000.00*	
Erosion control	*1*	*Allow*	*$20,000.00*	*$20,000.00*	
Project Cost:					*$30,000.00*

Project: Construct Rock Barrier at Bottom of Stone Steps

ITEM	*QTY.*	*UNIT*	*UNIT COST*	*ITEM TOTAL*	*SUBTOTAL*
Rock Barrier at bottom of stone steps	*1*	*Allow*	*$15,000.00*	*$15,000.00*	
Project Cost:					*$15,000.00*

SUBTOTAL PHASE III IMPLEMENTATION: $98, 148.00

TOTAL IMPLEMENTATION ALL PHASES COMBINED: $186,087.00

Chapter X:
Consultation and Coordination

CHAPTER X: CONSULTATION AND COORDINATION

The National Park Service mailed a press release (presented on the following page) to the Custer Chronicle and Rapid City Journal on June 9, 2003 to announce the date for the two public scoping meetings. National Park Service representatives were present at the Custer Library at the designated time (June 17, 2003 at 1 pm and 6 pm) for the public meetings. However, the local newspapers did not publish the public scoping meeting notice resulting in no attendance at the designated meeting times. Subsequent to the intended meetings, the NPS mailed letters explaining the project and asking for public input. Letters were sent to 100 landowners in the Pass Creek area. Coordination/scoping letters were also sent to the following offices during the week of December 8, 2003:

- U.S. Forest Service
- Custer County Commissioners Office
- Custer Chamber of Commerce
- Mayor of Custer
- Office of Senator Tom Daschle
- Office of Senator Tim Johnston
- The Nature Conservancy

The NPS received two responses to the scoping letters. The responses are included at the end of this chapter.

FOR IMMEDIATE RELEASE *MIKE WILES*
(605) 673-2288

CULTURAL LANDSCAPE REPORT

PUBLIC SCOPING MEETINGS

Jewel Cave National Monument will be conducting research to complete a ***Cultural Landscape Report with Environmental Assessment (CLR)****. The National Park Service (NPS) uses these documents to guide the treatment and use of park historic landscapes. Jewel Cave's approximately 10 acre historic area contains a Civilian Conservation Corps (CCC) era ranger cabin and landscape development consisting of a ¼-mile long stone trail and stairway and cave entrance. The cabin is listed on the National Register of Historic Places (NRHP).*

The ***CLR*** *will include historic research and documentation of the historic area over time, a record of existing conditions, and an evaluation of landscape character and integrity. Schematic treatment recommendations will address how the park can adequately protect and manage historic landscape resources, resolve life safety concerns, rehabilitate or restore missing features, and meet uniform accessibility requirements from the cabin to the cave entrance. It will also include suggestions for phasing and cost estimates for implementation.*

The project may include developing ***HABS/HAER/HALS*** *documentation for the historic area. This documentation includes a description of existing conditions and construction changes made throughout the life of the property. It will establish an overview of the historic area according to its context, in relationship to federal works programs and the rustic architecture and landscape architecture design movement in the National Park Service system.*

Two public scoping meetings will be held in Custer on Tuesday, June 17, 2003. They will be held 1-3 p.m. and 6-8 p.m. in the Pine Room.

For more information, call 605-673-2288 x1221. The staff at Jewel Cave looks forward to visiting with you and receiving your input.

Steve Baldwin
25260 Ridge View Rd.
Custer, SD 57730

March 5, 2004

Todd Suess, Superintendent
Jewel Cave National Monument
Rt.1 Box 60AA
Custer, SD 57730

Dear Todd,

Thank you for sharing the various proposals for treatment of the historic area of the monument.

After reviewing the analysis and proposals, I have come to he conclusion that Treatment Alternative #3 would be the best course of action as long it doesn't entail a high dollar cost of implementation or future maintenance. In that case, I would recommend alternative #1 as the are is in pretty good condition and there aren't really any additional items needing protection or preservation beyond the cabin.

Sincerely,

Steve Baldwin

3-19-04

Todd Suess
Supt Jewel Cave
National Monument
RR 1-Box 60AA
Custer, S.D. 57730

Todd:

Thanks for explaining your project regarding the Historic Rangers Cabin at Jewel Cave.

I believe you have the names of some people that could help in providing information you are looking for.

There are two items that I feel should be addressed;

1. The provision for handicaped access to the area and maybe the cabin. If you are going to allow folks to enter the cabin, handicaped people should be included.
2. A storm or rain shelter should be part of the project plan. Rain storms

in these old Black Hills can come up fast and deliver a lot of rain and maybe hail in a short time. I would think a rain shelter would be part of the plan. I know in treatment Alternative 3. you also mention a weather shelter.

are there going to be items of historic value of the era you are working on in the cabin? My thoughts here are saws, cant-hooks, draw knives or other tools of the era or records of activities during this time period.

If I think of anything else I will give you a call.

Best Regards

Jack McBride

CUSTER SD
MAR 19 2004
3c USA
57730-9998
Jack McBride
R.R. 1 Box 60X
Custer, SD 57730
Mr. Todd Suess, Supt.
Jewel Cave National Monument
RR 1 - Box 60AA
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List of Preparers

List of Preparers

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Martha Alarie — Environmental Planner, Woolpert LLP

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Appendix A

Appendix A
Species Common to Jewel Cave National Monument

Amphibians
- Ambystoma tigrinum (tiger salamander)
- Bufo cognatus (Great Plains toad)
- Bufo woodhousii (Woodhouse's toad)
- Pseudacris triseriata (Striped chorus frog, western chorus frog)

Birds
- Accipiter cooperii (cooper's hawk)
- Accipiter gentiles (northern goshawk)
- Accipiter striatus (sharp-shinned hawk)
- Actitis macularia (spotted sandpiper)
- Aegolius acadicus (northern saw-whet owl)
- Aeronautes saxatalis (white-throated swift)
- Agelaius phoeniceus (red-winged blackbird)
- Anas discors (blue-winged teal)
- Anas platyrhynchos (mallard)
- Anas strepera (gadwall)
- Aquila chrysaetos (golden eagle)
- Ardea herodias (great blue heron)
- Bombycilla cedrorum (cedar waxwing)
- Bubo virginianus (great horned owl)
- Buteo jamaicensis (red-tailed hawk)
- Buteo lagopus (rough-legged hawk)
- Carduelis pinus (pine siskin)
- Carduelis tristis (american goldfinch)
- Carpodacus cassinii (cassin's finch)
- Cathartes aura (turkey vulture)
- Catharus minimus (gray-cheeked thrush)
- Catharus ustulatus (swainson's thrush)
- Catherpes mexicanus (canyon wren)
- Certhia Americana = Brown creeper (No common name)
- Charadrius semipalmatus (semipalmated plover)
- Charadrius vociferous (killdeer)
- Chondestes grammacus (lark sparrow)
- Chordeiles minor (common nighthawk)
- Colaptes auratus (northern flicker)
- Contopus sordidulus (western wood-pewee)
- Corvus brachyrhynchos (american crow)
- Cyanocitta cristata (blue jay)
- Dendroica coronata (yellow-rumped warbler)
- Dumetella (catbirds)
- Empidonax difficilis (western flycatcher)
- Empidonax oberholseri (dusky flycatcher)
- Empidonax occidentalis = Cordilleran flycatcher (No common name)
- Euphagus cyanocephalus (brewer's blackbird)
- Falco sparverius (american kestrel)
- Haliaeetus leucocephalus (bald eagle)
- Icterus galbula (northern oriole)
- Junco hyemalis (dark-eyed junco)
- Larus pipixcan (franklin's gull)

- Loxia curvirostra (red crossbill)
- Melanerpes erythrocephalus (red-headed woodpecker)
- Melanerpes lewis (lewis' woodpecker)
- Meleagris gallopavo (wild turkey)
- Melospiza lincolnii (lincoln's sparrow)
- Molothrus ater (brown-headed cowbird)
- Myadestes townsendii (townsend's solitaire)
- Nucifraga Columbiana (clark's nutcracker)
- Oporornis tolmiei (macgillivray's warbler)
- Parus atricapillus (black-capped chickadee)
- Passerina cyanea (indigo bunting)
- Pedioecetes phasianellus (sharp-tailed grouse)
- Perisoreus Canadensis (gray jay)
- Phalaenoptilus nuttallii (common poorwill)
- Phalaropus tricolor (wilson's phalarope)
- Pheucticus melanocephalus (black-headed grosbeak)
- Picoides arcticus (black-backed woodpecker)
- Picoides pubescens (downy woodpecker)
- Picoides villosus (hairy woodpecker)
- Pipilo maculates =Spotted towhee (No common name)
- Piranga ludoviciana (western tanager)
- Pooecetes gramineus (vesper sparrow)
- Regulus calendula (ruby-crowned kinglet)
- Salpinctes obsoletus (rock wren)
- Seiurus aurocapillus (ovenbird)
- Setophaga ruticilla (american redstart)
- Sialia currucoides (mountain bluebird)
- Sialia sialis (eastern bluebird)
- Sitta Canadensis (red-breasted nuthatch)
- Sitta carolinensis (white-breasted nuthatch)
- Spizella pallida (clay-colored sparrow)
- Spizella passerine (chipping sparrow)
- Spizella pusilla (field sparrow)
- Stelgidopteryx serripennis (northern rough-winged swallow)
- Tachycineta thalassina (violet-green swallow)
- Toxostoma rufum (brown thrasher)
- Tringa melanoleuca (greater yellowlegs)
- Tringa solitaria (solitary sandpiper)
- Troglodytes aedon (house wren)
- Turdus migratorius (american robin)
- Tyrannus verticalis (western kingbird)
- Vermivora peregrine (tennessee warbler)
- Vireo gilvus (warbling vireo)
- Vireo solitarius (solitary vireo)
- Zenaida macroura (mourning dove)

Fish
None

Mammals
- Canis latrans (coyote)
- Clethrionomys gapperi (southern red-backed vole)
- Corynorhinus townsendii (No common name)
- Eptesicus fuscus (big brown bat)
- Erethizon dorsatum (porcupine)

- Lasionycteris noctivagans (silver-haired bat)
- Lasiurus cinereus (hoary bat)
- Lynx rufus (bobcat)
- Microtus longicaudus (long-tailed vole)
- Microtus ochrogaster (prairie vole)
- Microtus pennsylvanicus (meadow vole)
- Myotis ciliolabrum (western small-footed bat)
- Myotis keenii (Keen's myotis)
- Myotis leibii (small-footed myotis)
- Myotis lucifugus (little brown bat)
- Myotis septentrionalis (northern long-eared bat)
- Myotis thysanodes (fringed myotis)
- Myotis volans (long-legged myotis)
- Neotoma cinerea (bushy-tailed woodrat)
- Odocoileus hemionus (mule deer)
- Peromyscus leucopus (white-footed mouse)
- Peromyscus maniculatus (deer mouse)
- Puma concolor (mountain lion)
- Sorex cinereus (masked shrew)
- Sylvilagus floridanus (eastern cottontail)
- Sylvilagus nuttallii (Nuttall's cottontail)
- Tamias minimus (least chipmunk)
- Tamiasciurus hudsonicus (red squirrel)
- Thomomys talpoides (northern pocket gopher)

Reptiles
- Liochlorophis vernalis (smooth green snake)
- Thamnophis elegans (western terrestrial garter snake)

Invertebrates
Documented in the Monument's museum collection

Common Name	Sci. Name
SPRINGTAIL	FOLSOMIA SP.
Ground beetle	Cyclotrachelus torvus torvus (LeConte)
Ground beetle	Harpalus pensylvanicus (DeGeer)
Ground beetle	Harpalus opacipennis (Haldeman)
Ground beetle	Agonum placidum (Say)
Ground beetle	Harpalus opacipennis (Haldeman)
Ground beetle	Harpalus desertus (LeConte)
Click beetle	Ctenicera destructor (Brown)
Ground beetle	Amara cupreolata (Putzeys)
Ground beetle	Cymindis planicollis (LeConte)
Ground beetle	Pasimachus sp.
Ground beetle	Lebia moesta (LeConte)
Ground beetle	Lebia vittata (Fabricius)
Scarab beetle	Phyllophaga sp.
Scarab beetle	Euphoria inda (Linnaeus)
Scarab beetle	Diplotaxis sp.
Scarab beetle	Euphoria india (Linnaeus)
Scarab beetle	Diplotaxis sp.
Scarab beetle	Trox sp.
Scarab beetle	Cyclocephala sp.
Scarab beetle	Canthon sp.

Leaf beetle	Haltica sp.
Leaf beetle	Heplorhychities aeneus (Boheman)
Leaf beetle	Heplorhychities aeneus (Boheman)
Leaf beetle	Haltica sp.
Leaf beetle	Trirhabda sp.
Leaf beetle	Chrysochus auratus (Fabricius)
Leaf beetle	Galuruca externa (Say)
Leaf beetle	Trirhabda bacharidis (Weber)
Leaf beetle	Trirhabda sp.
Leaf beetle	Cosinoptera vittigera
Leaf beetle	Crytocephalus sp.
Colorado Potato Beetle	Leptinotarsa decemlineata (Say)
Leaf beetle	Trirhabda bacharidis (Weber)
Leaf beetle	Acalymma vitatum (Fabricius)
Leaf beetle	Diabrotica undecimpunctata Mann.
Leaf beetle	Chelymorpha argus (Licht.)
Rove beetle	Creophillus maxillosus (Linnaeus)
Blister beetle - Black	Epicauta pennsylvanica (DeGeer)
Blister beetle - Spotted	Epicauta maculata (Say)
Blister beetle - Gray	Epicauta cinerea (Forst.)
Weevil Rose curculio	Merhyncites bicolor (Fabricius)
Weevil	Anthonomus sp.
Strawberry root weevil	Otiorhynchus ovatus (Linnaeus)
Longhorn beetle	Monochamus clamator (LeConte)
Longhorn beetle	Prionus sp.
Longhorn beetle	Tragosoma depsarium (LeConte)
Longhorn beetle	Batyle ignicollis (Say)
Longhorn beetle	Cortodera longicornis (Kirby)
Longhorn beetle	Anastrangalia sanguinea (LeConte)
Longhorn beetle	Comosalia chrysocoma (Kirby)
Longhorn beetle	Tetraopes tetraophthalmus (Foster)
Longhorn beetle	Strictoleptura canadensis (Olivier)
Longhorn beetle	Batyle suturalis pearsalli (Bland)
Longhorn beetle	Rhopalophora longipes (Say)
Longhorn beetle	Cymatodera boulieata (LeConte)
Longhorn beetle	Typocerus sinuatus (Nunn.)
Longhorn beetle	Cortodera longicornis (Kirby)
Carrion beetle	Silpha lapponica (Herbst)
Carrion beetle	Silpha noveboracensus (Forst.)
Carrion beetle	Nicrophorus sp.
Darkling beetle	Upis ceramboides (Linnaeus)
Darkling beetle	Eleodes tricostatus (Say)
Darkling beetle	Eleodes sp.
Checkered beetle	Trichodes sp.
Western pine borer	Chalcophora angulicollis (LeConte)
Click beetle	Melanotus sp.
Click beetle	Alaus oculatus (Linnaeus)
Tiger beetle	Cicindela punctatus
Tiger beetle	Cicindela nebraskana Cases
Sap beetle	Carpophilus sp.
Handsom fungus beetle	Aphorista vittata (Fabricius)
Hister beetle	Hister sp.
Red turpentine beetle	Dendroctonus valiens (LeConte)
Tumbling flower beetle	Mordellistena sp.
Soft-winged flower beetle	Collops sp.

Ladybird beetle	Anatis sp.
Ladybird beetle	Coccinella transversoguttata Fald.
Ladybird beetle	Hippodamia convergens Guerin-Meneville
Ladybird beetle	Coccinella transversoguttata Fald.
Ladybird beetle	Hippodamia convergens Guerin-Meneville
Baird's Swallowtail	Papilio bairdii (W.H. Edwards)
Oregon Swallowtail	Papilio oregonius (W.H. Edwards)
Orange Sulphur	Colias eurytheme Boisduval
Common Sulphur	Colias philodice Godart
Orange sulphur	Colias eurytheme Boisduval
Cabbage butterfly	Pieris rapae (Linnaeus)
Checkered White Butterfly	Pieris protodice (Boisduval & LeConte)
Pine White Butterfly	Neophasia menapia (C. & R. Felder)
Eastern tailed blue	Everes comyntas (Godart)
Melissa blue	Lycaeides melissa (W.H. Edwards)
Red Admiral	Vanessa atalanta (Linnaeus)
Ox-eyed Satyr	Cercyonis pegala (Fabricus)
Least Satyr	Cercyonis oetus (Boisduval)
Mead's Wood Nymph butterfly	Cercyonis meadii (W.H. Edwards)
Uhler's Artic butterfly	Oeneis uhleri (Reakirt)
Edward's Fritillary butterfly	Speyeria edwarsii (Reakirt)
Variegated Fritillary	Euptoieta claudia (Cramer)
Atlantis fritillary	Speyeria atlantis (W.H. Edwards)
Mourning cloak	Nymphalis antiopa (Linnaeus)
White Admiral butterfly	Basilarchia weidemeyerii (W.H. Edwards)
Painted lady butterfly	Vanessa cardui (Linneaus)
Monarch	Danaus plexippus (Linnaeus)
Tawny Crescent	Phycoides batesii (Reakirt)
Pearl Crescent	Phycoides tharos (Drury)
Zephur angle wing	Polygonia zephyrus (W.H. Edwards)
Aphrodite	Speyeria aphrodite (Fabricus)
Northern Pearl Crescent	Phycoides pascoensis (W.G. Wright)
Gorgone Checkerspot	Charidryas gorgone (Hubner)
Tiger Moth	Grammia sp.
Oithona Tiger Moth	Grammia oithona Strecker
Many-spotted Tiger Moth	Turuptiana permaculata Packard
Painted Lichen Moth	Hypoprepia fucosa Hubner
Lichen Moth	Hypoprepia sp.
Tiger Moth	Lycomorpha pholus (Drury)
Geometrid Moth	Hesperamia sulphuraria Packard
Geometrid Moth	Eriplatymetra coloradaria (Gand. R.)
Geometrid Moth	Itame occiduaria (Packard)
Geometrid Moth	Euchlaena sp.
Polyphemus Moth	Antheraea polyphemus (Cramer)
Army Cut-worm Moth	Euxoa auxiliaris (Grote)
Noctuid Moth	Euxoa mimallonis (Grote)
Unknown	Drasteria divergens (Behr)
Eastern Tent Caterpillar	Malacosoma americanum (Fabricius)
White-lined Sphinx Moth	Hyles lineata (Fabricius)
Snowberry Clearwing Moth	Hemaris diffinis (Boisduval)
Small-eyed Sphinx Moth	Paonias myops (J.E. Smith)
Variegated fritillary	Euptoieta claudia (Cramer)
Milbert's Tortiose shell	Aglais milberti (Godart)
Common Checkered Skipper	Pyrgus communis (Grote)
Dusky-wing Skipper	Erynnis sp.

Common Checkered Skipper	Pyrgus communis (Grote)
Silver-spotted Skipper	Epargyreus clarus (Cramer)
Dusky-wing Skipper	Erynnis sp.
Northern Pearl Crescent	Phycoides pascoensis (W.G. Wright)
Comma Skipper	Hesperia comma (Linneaus)
Bald Dusky Wing	Erynnis afranius (Lintner)
Comma Skipper	Hesperia comma (Linnaeus)
Robust Bot fly	Cuterabra beameri
Least Satyr	Cercyonis oetus (Boisduval)
Great Ash Sphinx Moth	Sphinx chersis (Hubner)
Comma or hop merchant	Polygonia comma (Harris)
Monarch	Danaus plexippus (Linnaeus)
Northern Pearl Crescent	Phycoides pascoensis (W.G. Wright)
Weidemeyer's Admiral	Basilarchia weidemeyerii (W.H. Edwards)
Variegated Fritillary	Euptoieta claudia (Cramer)
Green Lacewing	Chrysopa sp.
Brown Lacewing	Wesmaelius sp.
Ant Lion	Myrmelion immaculatus (DeGeer)
Ant Lion	Dendroleon obsoletus (Say)
Ant lion	Myrmelion immaculatus (DeGeer)
Darner Dragonfly	Aeschna palmata (Hagen)
Common Skimmer	Libellula forensis (Hagen)
Skimmer	Sympetrum fasciatum (Walker)
Skimmer	Sympetrum obtrusum (Hagen)
Stink Bug	Thyanta sp.
Stink Bug	Chlorochroa sp.
Stink Bug	Bahasa dimidiata (Say)
Stink Bug	Euschistus servus (Say)
Stink Bug	Chlorochroa sp.
Harlequin Bug	Murgantia histrionica (Hahn)
Shield-backed Bug	Homaemus sp.
Shield-backed Bug	Homaemus sp.
Plant hopper	Scolops sp.
Leaf Bug	Lygus sp.
Big-eyed Bug	Labops hesperius Uhler
Damsel Bug	Nabicula sp.
Damsel Bug	Nabis americoferus Carayon
Frog Hopper	Philaenarcys bilieata
Ambush Bug	Phymata sp.
Water Boatman	Corisella tarsalis (Fabricius)
Assassin Bug	Zelus tetracanthus (Stal)
Assassin Bug	Rhynocoris ventralis (Say)
Assassin Bug	Rhynocoris ventralis (Say)
Assassin Bug	Rhynocoris ventralis (Say)
Seed Bug	Neacoryphus bicrucis (Say)
Leaf-footed Bug	Merocaris typhaeus (Fabricius)
Leaf-footed Bug	Leptoglossus clypealis (Heidemann)
Broad-headed Bug	Alydus sp.
Scentless Plant Bug	Arhyssus sp.
Scentless Plant Bug	Stictopleurus sp.
Broad-headed Bug	Alydus sp.
Big-headed Bug	Megalotomus quinquespinosus (Say)
Broad-headed Bug	Alydus sp.
Leaf-footed Bug	Leptoglossus occidentalis (Haldemann)
Scentless Plant Bug	Harmostes sp.

Small Milkweed Bug	Lygaeus kalmii Stal
Cicada	Tibicen dealbatus (Davis)
Cicada	Okanagana rimosa (Davis)
Cicada	Tibicen dealbatus (Davis)
Box Elder Bug	Boisea trivittatus (Say)
Bumble bee	Bombus huntii Greene
Bumble bee	Bombus sp.
Digger bee	Melissodes sp.
Bumble bee	Peponepsis sp. (?)
Bumble bee	Anthophora sp.
Bumble bee	Megachile sp.
Bumble bee	Peponepsis sp (?)
Leaf-cutter bee	Megachile montivaga (s)
Leaf Cutter Bee	Coelioxys sp.
Sweat Bee	Dialictus sp.
Sweat Bee	Agapostemon sp.
Sweat Bee	Augochlorella striata Prov.
Cuckoo wasp	Chrysis sp.
Ant	Camponotus vicinus meyr
Ant	Camponotus vicinus
Velvet ant	Dasymutilla sp.
Ichneumons	Megarhyssa norton (cr.)
Ichneumons	Ichneumon sp.
Ichneumon	Xorides stigmapterus (Say)
Ichneumons	Thyreodon atricolor (oliv)
Ichneumons	Rhydenofaenus barnstone perplexus (Cr)
Ichneumon Wasp	Netelia sp.
Ichneumon Wasp	Netelia sp.
Ichneumons	Oxyrrhexis carbonator texana (ln)
Ichneumons	Pterocormus Sp.
Ichneumons	Anoplius (lophopompilus) atrox (Dahib)
Braconids	Iphiaulax Sp.
Braconids	Apanteles (S.L.) Sp.
Braconids	Ipobra Sp.
Braconids	Cremnops vulgaris (Cr.)
Braconids	Melanichneumon Sp.
Sawfly	Tenthredo Sp.
Yellowjacket	Vespula pensylvanica (S.S.)
Yellow jacket	Dolichorespula arenaria (F.)
Yellow jacket	Vespula vulgaris (L.)
Sand wasp	Bembix americana spinolae (Lep.)
Scoliid wasp	Scoliidae elis myzinum 5 - Cinctum
Spider wasp	Anoplius (lophopompilus) atrox (Dahib)
Wasp	Sphecodes sp.
Wasp	Podalonia mickeli (Miav)
Wasp	Podalonia velida (cr.)
Wasp	Euodynerus annulatus (Say)
Wasp	Sceliphoron caementarium (De.)
Wasp	Ammophila strenua (Cr.)
Wasp	Mischopyttarus flavitarsis (Ss.)
Eumenid Wasp	Mischocyttarus flavitarsis
Wasp	Prronyx atratus (Lep.)
Wasp	Podalonia luctuose (Sm.)
Wasp	Stizoides renicinctus (Say)
Wasp	Ammophila strenua (Cr.)

Wasp	Euodynerus annulatus (Say)
Wasp	Ancistrocerus antilope (Pz.)
Wasp	Protichneumon grandis (Br.)
Wasp	Sphecodes Sp.
Wasp	Euodynerus annulatus (Say)
Wasp	Stictiella emarginata (Cr.)
Wasp	Cryptus albitarsis (Cr.)
Wasp	Stictiella emarginata (Cr.)
Wasp	Anoplius (lophopompilus) atrox (Dahib)
Wasp	Sceliphron caementarium (De.)
Wasp	Prionyx canadensis (Rov.)
Wasp	Conocalama canadensis (Pr.)
Wasp	Sphex ichneumoneus (L.)
Wasp	Myzinum S-Cinctum
Wasp	Sphex ichneumoneus (L.)
Wasp	Philanthus bilunatus (Cr.)
Wasp	Lasius Spp.
Wasp	Eumenis crucifer hearcticus (Bel.)
Wasp	Sphecodes Sp.
Wasp	Ectemnius arcuatus (Say)
Wasp	Ancistrocerus catskill (Sr.)
Wasp	Eumenes Crucifer hearcticus (Bel.)
wasp	Leucospis affinis (Say)
Wasp	Philanthus bilunatus (Cr.)
Wasp	Euodynerus annulatus (Say)
Wasp	Cerupales maculate fraterna (Son)
Wasp	Photopsis Spp. Ectemnius Sp.
Two-striped Grasshopper	Melanoplus bivittatus (Say)
Two-striped Grasshopper	Melanoplus bivittatus (Say)
Carolina or Dust Grasshopper	Dissosteira carolina (Linnaeus)
Red Shank	Xanthippus corallipes (Haldeman)
Carolina or Dust Grasshopper	Dissosteira carolina (Linnaeus)
Carolina or Dust Grasshopper	Dissosteira carolina (Linnaeus)
Red Shank	Xanthippus corallipes (Haldeman)
N.western Red-winged Locust	Arphia pseudonietana (Thomas)
3-banded Range Grasshopper	Hadrotettix trifasciatus (Say)
Speckled Rangeland Grsshpper	Arphia conspersa (Scudder)
Wyoming Toothpick Grsshpper	Paropomala wyomingensis
Cricket	Gryllus sp.
German Cockroach	Blatella germanica (Linnaeus)
Tiger Moth	Eilema bicolor (Grote)
Geometrid Moth	Nacophora mexicanaria (Grote)
Pandora Moth	Coloradia pandora (Blake)
Predaceous Diving Beetle	Hydrophilus triangularis (Say)
Painted Lady Butterfly	Vanessa cardui (Linnaeus)
One-eyed Sphinx Moth	Smerinthus cerisyi (Kirby)
Small-eyed Sphinx Moth	Paonis myops (J.E. Smith)
Scarab Beetle	Diplotaxis sp.
Bark-gnawing Beetle	Temnochila sp.
Darkling Beetle	Eleodes hispilabnus (Say)
Scarab Beetle	Diplotaxis sp.
Scarab Beetle	Onthophagus hecate (Panzer)
Longhorn Beetle	Monochamus clamator (LeConte)
Longhorn Beetle	Tragosoma desparium (LeConte or Linnaeus?)
Eyed-click Beetle	Alaus oculatus (Linnaeus)

Carrion Beetle	Nicrophorus tomentosus (Weber)
Carrion Beetle	Nicrophorus sp.
Longhorn Beetle	Monochamus clamator (LeConte)
Longhorn Beetle	Strictoleptura canadensis (Olivier)
Longhorn Beetle	Arhopalus rusticus montanus (LeConte)
Longhorn Beetle	Monochamus clamator (LeConte)
Blister Beetle	Lytta nuttelli (Say)
Darner	Aeshna palmata (Hagen)
Skimmer	Libellula saturata (Uhler)
Ox-eyed Satyr	Cercyonis pegala (Fabricius)
Cicada	Tibicen dealbatus (Davis)
Cicada	Okanagana bella (Davis)
Alfalfa Butterfly	Colias eurytheme (Boisduval)
Snowberry Clearwing Moth	Hemaris diffinis (Boisduval)
Assassin Bug	Apiomerus crassipes (Fabricius)