Evaluation of Hanging Lake

Garfield County, Colorado

for its Merit in Meeting National Significance Criteria as a National Natural Landmark

in Representing

Lakes, Ponds and Wetlands

in the Southern Rocky Mountain Province

prepared by

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EXECUTIVE SUMMARY

Hanging Lake, in Garfield County, Colorado is recommended for designation as a National Natural Landmark in the Southern Rocky Mountain biophysiographic province. The primary features of the 72 acre site represent the Lakes geologic sub-theme, and the Lakes, Ponds and Wetlands ecological theme. Hanging Lake is a unique example within the province of a lake formed by travertine deposition, and supports one of the best examples of a hanging-garden plant community in the province. The surrounding canyon represents the secondary ecological natural feature of dry coniferous forest. The site is also one of the larger and least altered travertine systems in the province, where natural geologic and hydrologic processes continue to operate as they have done throughout the history of the lake.

INTRODUCTION

Source of Site Proposal

The Hanging Lake site was proposed by Marr et al. (1980) as part of a comprehensive survey of potential national natural landmarks in the Southern Rocky Mountain region.

Evaluator(s)

The evaluation presented here was conducted by the Colorado Natural Heritage Program (CNHP).

Scope of Evaluation

Materials researched for this evaluation include literature on the topics of natural lakes, calcareous lakes and ponds, geology and natural history of travertine and tufa deposits, and the history of the Glenwood Springs area. Additional information about the geology of the area was provided by retired geologist Robert Kirkham. The statewide database maintained by CNHP provided information on the biological components of the site, and a field visit was conducted by CNHP ecologist and zoologist on August 1, 2008 to verify the currency of this information. Information about the history of USFS involvement at the site and plans for future management was provided by Rich Doak, White River National Forest (WRNF).

PNNL SITE DESCRIPTION

Brief Overview

Hanging Lake is located in Garfield County, Colorado, along the Dead Horse Creek drainage some 1000 feet above the Colorado River flowing through Glenwood Canyon. The public trailhead is accessed from the Hanging Lake rest area exit on Interstate 70, about nine miles east of the town of Glenwood Springs. The lake itself, together with most of the surrounding area, is under federal ownership, administered by the Eagle Ranger District of the White River National Forest. The site is a well-known and popular hiking destination for both local residents and visitors.

Natural History Themes Represented

Primary natural features of the Hanging Lake site fall under the following themes and subthemes:

- Geological natural history themes, Group 1, landforms of the present:
  Theme: River Systems and Lakes
  Sub-theme: Lakes

- Ecological natural history themes, Group 4, aquatic ecosystems:
  Theme: Lakes, ponds and wetlands
  Sub-theme: Hanging gardens

Primary Natural Features

Hanging Lake is associated with a series of travertine (calcium carbonate) falls on Dead Horse Creek above the Colorado River in Glenwood Canyon. The lake is perched on a deposit of tufa (also called travertine) on the side of the valley. Above the lake, Spouting Rock spring discharges water from lower Paleozoic bedrock. Carbonate members of the strata are presumed to be the source of dissolved calcium and bicarbonate responsible for formation of the tufa supporting the lake. As water slows and spreads out into the lake, calcium carbonate precipitates along the bottom and edges as deposits of travertine, gradually adding to the rim and ledges below. Hanging Lake is an example of an active 'travertine-depositing system' (*sensu* Pentecost 2005), that has resulted in the formation of a beautiful natural lake and waterfalls (Figures 1 and 2).

The lake, creek, and associated falls support an aquatic dependent wetland ecosystem. Plant species linked to the calcareous geology and hydrology of the site form an unusual 'hanging-garden' community (Figure 3) that includes the Colorado endemic hanging garden sullivantia (*Sullivantia hapemanii* var. *pupusii*), ranked as globally imperiled (G3T3) by NatureServe (2008). The occurrence at the Hanging Lake site is ranked by the Colorado Natural Heritage Program as having excellent (A-ranked) viability, and is the largest population in the Southern Rocky Mountain Region (larger occurrences are more typical of the Colorado Plateau to the west). The species is common on deposits of calcium carbonate at the lake's edge and on the downstream slope, where it typically occurs with Barneby's columbine (*Aquilegia barnebyi*). Small wetlands adjacent to the lake, stream, and associated falls are dominated by Barneby's columbine, hanging garden sullivantia (on steep faces), red-osier dogwood (*Cornus sericia*), river birch (*Betula occidentalis*), beaked sedge (*Carex utriculata*), Rocky Mountain rush (*Juncus saximontanus*), bog orchid (*Limnorchis* sp.), brookgrass (*Catabrosa aquatica*), redtop (*Agrostis gigantea*), and American speedwell (*Veronica americana*). Hornwort (*Ceratophyllum demersum*) is the dominant aquatic species in these areas.
Finally, the site has been recorded as supporting a nesting colony of black swifts (*Cypseloides niger*), a species that nests near or behind waterfalls or in caves with running water. Such nesting habitats are uncommon on the landscape, and the Hanging Lake area falls represent an important resource for the species in the region (Knoor 1960)

Natural lakes in the Southern Rocky Mountain province are typically small, and found at higher elevations. For example, 89 % of Colorado's naturally occurring lakes are found at altitudes above 9,000 feet (Nelson 1970). Although a complete inventory for the province is not available, there are probably several thousand natural lakes scattered throughout the region. Nelson (1970) indicated 2,124 in Colorado above 9000 feet, including 275 in the Flattops north of Hanging Lake. Unlike Hanging Lake, the majority of these natural lakes are of glacial origin. Natural lakes not formed by glacial activity are relatively rare in the province, and most have been altered for water-storage purposes.

Figure 1. View of Hanging Lake from above. Photo by J.B. Bell.

Figure 2. Falls entering Hanging Lake. Photo by J.B. Bell.

Figure 3. Hanging-garden plant community at Hanging Lake. Photo by J.B. Bell.

Active travertine depositing systems resulting in falls, pools, and lakes are found in many regions of the world. Some spectacular examples include Croatia's Plitvice Lakes National Park, Huanglong, Jiuzhaigou Valley in China, and Mammoth Hot Springs at Yellowstone National Park, Wyoming (Pentecost 2005). Travertine systems in the Southern Rocky Mountain province are generally small and associated with extensive deposits of limestone. Feth and Barnes (1979) list some 35 sites (both active and inactive) that fall within the province, and a literature search revealed several additional sites, including Hanging Lake (Krikham et al. 1995) and Rifle Falls (Scott et al. 2001). Within the province, travertine depositing systems are distributed from Jackson County, Colorado in the north, to the Jemez valley in Sandoval County, New Mexico in the south. Most of the active travertine systems take the form of mounds deposited around natural springs. Hanging Lake is unique in the region as a lake formed by travertine deposition.

Hanging-garden communities are known from Colorado, Utah, and Arizona, where they are typically associated with canyon walls and cliff faces. These highly localized environments are found in canyonlands where perennial water sources provide a stable source of moisture within a surrounding arid environment, forming pocketed wetlands and allowing the draping of vegetation across wet cliff faces. The associated wetland species are typically herbaceous, and often include species endemic to the Colorado Plateau. Common species include northern maidenhair (*Adiantum pedatum*), common maidenhair (*Adiantum capillus-veneris*), Eastwood's monkeyflower (*Mimulus eastwoodiae*), seep monkeyflower (*Mimulus guttatus*), hanging garden sullivantia

(*Sullivantia hapemanii* var. *pupusii*), Rydberg's thistle (*Cirsium rydbergii*), and several species of columbine (*Aquilegia*).

NatureServe and the Colorado Natural Heritage Program recognize two distinct groups of hanging-garden communities, characterized by geology and species composition (CNHP 2005, NatureServe 2003). Those of the Utah High Plateau ecoregion (corresponding to the northern portion of the NNL Colorado Plateau biophysiographic province), are associated with calcareous formations, especially shales of the Green River Formation, while those of the Colorado Plateau ecoregion (the southern portion of the province) are associated with massive sandstone deposits such as the Navajo and Entrada. The classic alcove type of hanging garden in the canyonlands of southeastern Utah occurs in sandstone cliffs where water percolating through the stone reaches the surface along joints between impervious strata. In the northern portion of the Colorado Plateau, however, and in the Southern Rocky Mountians, hanging gardens are associated with springs, seeps, and waterfalls formed in calcareous shales. The vegetation grows in the cracks behind and beside the waterfall, where it often completely fills every available ledge. In the seeps adjacent to waterfalls and in the splash zones at the base of falls, the substrate is saturated during most of the growing season. Here the vegetation is continually wet, at least near the bases of the plants, and water can very commonly be seen dripping from leaves, exposed roots, and old stems. Although large occurrences of these hanging gardens are primarily associated with waterfalls, smaller occurrences can occur along cliff seeps above streams. The hanging-garden community at Hanging Lake belongs to the Utah High Plateau type, together with other occurrences at similar latitudes to the west.

Secondary Natural Features

- Ecological natural history themes, Group 3, land ecosystems:
  Theme: Dry coniferous forest
- Ecological natural history themes, Group 4, aquatic ecosystems:
  Theme: Lakes, ponds and wetlands
  Sub-theme: Montane riparian forest

The canyon vegetation surrounding the Hanging Lake site provides examples of dry coniferous forest dominated by Douglas-fir (*Pseudotsuga menziesii*), and montane riparian deciduous forest characterized by box elder (*Acer negundo*), red-osier dogwood (*Cornus sericea*), Colorado blue spruce (*Picea pungens*), and mock-orange (*Philadelphus microphyllus*). The box elder / red-osier dogwood riparian community is rare throughout its range, and is documented from only a handful of sites in the Southern Rocky Mountain province (CNHP 2008).

Physical Setting

Hanging lake is located in west central Colorado, near the southern margin of the White River Plateau in the upper Colorado River basin. The White River Plateau lies at the western edge of the Southern Rocky Mountains biophysiographic province as delineated

in the Potential NNL guidelines (NPS 2007), near the junction of that province with the Colorado Plateau and Wyoming Basins provinces.

The White River Plateau preserves a sequence of Paleozoic marine sedimentary rocks some 8,000 feet thick (Hopkins and Hopkins 2000). The uplift of the area during the Laramide-age orogeny of 20 mya means that these strata are now high above the floor of Glenwood Canyon where the Colorado River erodes through the southern edge of the White River Plateau. The canyon of Dead Horse Creek above the Colorado River is narrow and steep, with high walls formed in horizontally stratified sandstones of Sawatch Quartzite. Hanging Lake is perched at the base of the massive deposit of marine sediments, whose calcareous composition has facilitated the formation of the lake and associated travertine falls.

Average annual precipitation for the period of record at Shoshone (elevation 5,930 ft.), in the canyon below Hanging Lake, is 19.47 inches (WRCC 2008). Precipitation amounts are expected to be greater (30 in. or more) with increasing elevation on the White River Plateau (PRISM Group 2008) which reaches an elevation of 10,700 ft above the headwaters of Dead Horse Creek. Hanging Lake, at an elevation of about 7,200 feet, may receive slightly more precipitation than Shoshone. In addition, the lake receives run-off from the upstream catchment area of the east fork of Dead Horse Creek, providing a perennial flow to the site. Precipitation is distributed fairly evenly throughout the year. Temperatures in the area follow a similar elevational pattern, with generally cooler temperatures with increasing elevation. Summer temperatures at the Shoshone station typically range from lows in the 40's to highs in the 70's and 80's, with an extreme high of 108°F recorded in July of 1939. Winters bring highs in the upper 30's and lows generally in the teens, with a record low of -25°F recorded in 1913 (WRCC 2008). The moderate to cool temperatures and perennial streamflow of the area enable the persistence of the characteristic streamside vegetation, as well as the continued existence of Hanging Lake.

Land Use and Condition

Prior to arrival of the prospecting expedition led by Captain Richard Sopris in 1860, the area was occupied by Ute bands who used the Glenwood Springs valley and hot springs as a summer encampment (Urquhart 1970, Nelson 1998). As mineral prospecting intensified during the 1880's, the Utes were removed to reservation lands further west, and the city of Glenwood Springs was established. Until the completion of the Denver and Rio Grand Western railroad in 1887, access to Hanging Lake via Glenwood Canyon would have been difficult; the canyon between the confluence of the Eagle River to the east and the Roaring Fork to the west was virtually impassible due to its steep walls and numerous rapids (Nelson 1998). In 1890, a rough and narrow wagon road that connected crude trails between drainages on the north side of the river was constructed, and by the early 1900's, the Taylor State Road through the canyon was passable by automobiles. In the canyon just below Dead Horse Creek, the Shoshone Hydroelectric Complex was completed in 1910; the area was home to a construction camp of some 1,000 workers for several years. In 1924 a parcel encompassing the trail and lake were acquired from the US Forest Service by the city of Glenwood Springs (Frontier Historical Society 2008).

The site was maintained as a city park until 1972, when it was returned to the White River National Forest. The trail system was enhanced by the CCC in the 1930's, and a privately operated resort at the trailhead was present from 1945 until the construction of Interstate 70 in 1968 ended its stay (Gardner 2006). In the early 1990's Glenwood canyon became the last 4-lane stretch of I-70 to be completed. Out of concern for the Hanging Lake drainage, highway lanes were bored through tunnels on the south side of the river, allowing the construction of a rest area at the trailhead (Nelson 1998). Under the current highway configuration, the Hanging Lake rest area is accessible only from the eastbound lanes; west bound users must double back from the Grizzly Creek exit. Over the past few decades, easier access to the trailhead has led to increased visitation.

The area surrounding Hanging Lake is primarily federal land under the management of the White River National Forest. A 40 acre parcel under private ownership sits about half a mile upstream on the West Fork of Dead Horse Creek. A 75 acre parcel spanning I-70 at the Hanging Lake Rest Area and encompassing the lower end of the Hanging Lake trail is state land under the management of the Colorado Department of Transportation. Hanging Lake itself, and all land within the proposed NNL boundary, are part of the proposed Recreation River area on US Forest Service land, and are managed for recreational use. The White River National Forest is currently working on a plan to renovate the trail and boardwalk, and to stabilize the landslide debris on the east side of the lake (Doak personal communication 2009).

Threats

The primary known threat to the site is impact from heavy recreational use; there are perhaps 80,000 visitors to the lake over the course of a year (Doak personal communication 2009). Off-trail hiking and contamination of the lake by litter or visitor incursions into the water are ongoing threats that the US Forest Service works to mitigate through trail signage, interpretive displays, and other management efforts. A secondary known threat to the site is the natural geologic process of mass wasting; debris from a small landslide reached the lake several years ago. The potential for additional impacts from this threat are unknown, but a large slide could dramatically alter or even eliminate the lake. Changes to the hydrologic regime of the watershed, whether anthropogenic or due to natural causes, would also threaten the natural features of the site, but such changes are not currently anticipated. Mineral prospecting has occurred in the area in the past, but is not anticipated to pose a threat in the future, due to the scarcity of locatable minerals in the surrounding geologic formations (Doak personal communication 2009).

Sensitive or Hazardous Resources

Potentially hazardous conditions at the site are primarily a factor of the steep and often rocky trail that must be traversed in order to access the lake. Handrails have been installed along some of the more arduous stretches of the trail, but access requires no special equipment beyond a little strenuous hiking. As part of a travertine depositing system, the lake is sensitive to anthropogenic changes to its chemistry, structure, or water supply. The hanging garden communities associated with the travertine deposits are also susceptible to damage by trampling or changes in water supply. Visitors to the site are

prohibited from swimming, wading, or fishing in the lake, and are directed to stay on the trail and boardwalk. Pets are prohibited as well.

COMPARATIVE ASSESSMENT

Regional Site Inventory

There are no known sites within the Southern Rocky Mountain biophysiographic province that share all the features of Hanging Lake, i.e., a natural lake or pond associated with active travertine deposition. Although there are perhaps 15 documented active travertine systems in the province (Feth and Barnes 1979, Scott et al. 2001, Table 1), none of these sites have the combination of natural lake, falls, and hanging garden plant communities found at Hanging Lake. Many travertine deposits are associated with hot or warm springs, and these have been highly altered for human use, essentially eliminating them as comparative sites in this assessment. Sites with significant features that remain in largely unaltered condition are Soda Dam and Rifle Falls/East Rifle Creek.

Table 1. Active travertine sites in the Southern Rocky Mountain biophysiographic province, from Feth and Barnes (1979).

Rank	Name	County, State	Comments
Undeveloped			
1	Hanging Lake	Garfield, CO	Federal USFS Lake formed by travertine dam.
2	Rifle Falls/East Rifle Creek	Garfield, CO	State of Colorado / Private ownership Travertine falls. Natural flow of falls altered by old hydro plant.
3	Soda Dam	Sandoval, NM	Federal USFS Large travertine deposit partly dams Jemez River. System altered by highway construction.
4	Guffey - Yellow Soda Spring	Park, CO	Private ownership Travertine mound is 20-30 m wide, 3-5 m high, lacks significant water flow.
5	Cement Creek Spring	Gunnison, CO	Private ownership Spring has formed mound of travertine. Ranch buildings constructed on top of deposit. Natural hydrology altered.
6	Brands Ranch springs	Jackson, CO	Private ownership Reported as mineralized uraniferous peat, current status unknown
Developed, highly altered, private ownership			
---	Hot Sulphur Springs	Grand, CO	Travertine mound, unknown size
---	Idaho Springs	Clear Creek, CO	Many extinct deposits of travertine occur, fewer are active
---	Manitou Springs	El Paso, CO	Travertine mounds are near 3 of 6 springs. Largest extends downslope to bank of stream
---	Poncha Hot Springs	Chaffee, CO	Travertine mounds of considerable size are at various of the 40 springs
---	Cebolla Hot Springs	Gunnison, CO	Travertine mounds surround many of the 20 springs
---	Mineral (Chamberlain) Hot springs	Saguache, CO	Thirty springs are associated with large deposits of laminated travertine 6-11 m high. Deposit is being mined.
---	Ouray	Ouray, CO	In Ouray and vicinity, various springs have deposited large masses of travertine
---	Wagon Wheel Gap Springs	Mineral, CO	Travertine apron is at one of three springs
---	Ojo Caliente	Rio Arriba, NM	Hill is covered by travertine a few feet thick that covers 0.2 ha

Site Descriptions

Rifle Falls / East Rifle Creek

Located in central Garfield County, Colorado, about 27 miles west of Hanging Lake, Rifle Falls is also situated along the margin of the White River Plateau. Several tufa or travertine deposits are found along East Rifle Creek at and above Rifle Falls (Scott et al. 2001). At Rifle Falls, the creek flows over a travertine dam, forming a scenic falls which is the center attraction of Rifle Falls State Park. Many small caves are present in the travertine deposits. The falls themselves are not entirely natural; one of the streams issues from a pipe that is the legacy of a hydroelectric plant that once occupied the site. Black swift have been reported nesting behind the falls, and hanging garden sullivantia has been documented from calcareous substrates several miles upstream on Rifle Mountain Park (CNHP 2008), and could be present at the falls in small amounts.

Soda Dam

More than a dozen seeps and springs discharge from the Jemez Fault zone at the Soda Dam site in Sandoval County, New Mexico, a few miles north of the town of Jemez Springs. Here thermal waters have deposited a massive formation of travertine 325 ft. long and 65 ft. wide across the canyon of the Jemez River (Goff and Shevenell 1987). The river passes through a tunnel in the dam. Springs in the vicinity are still actively depositing travertine, but the pattern of deposition has been altered. A notch blasted in the end of the dam to accommodate the passage of State Highway 4 prevents the deposition of additional travertine on the dam itself, which is now slowly eroding away (Goff and Shevenell 1987). The site is managed by the US Forest Service.

Comparative Analysis & Discussion

The three sites described above provide illustrative, easily viewed examples of travertine deposition. At Hanging Lake a travertine dam has formed a spectacular lake on top of the deposits, while at nearby Rifle Falls comparable geologic substrates and processes have instead produced scenic waterfalls and caves in the tufa. Soda Dam is a massive example of travertine deposition, but has not formed a natural lake. Instead, the river has eroded a passage under the dam, providing an excellent example of the simultaneous operation of natural processes of deposition and erosion in the past. Because each site presents a different result of travertine deposition, there is little to distinguish one as being more illustrative than the others.

The essential difference between the three sites with regard to primary significance criteria is in their present condition. Although all three sites receive heavy visitor use, Hanging Lake is the only site with unaltered hydrologic processes. Rifle Falls and East Rifle Creek are scenic and largely in natural condition, but the altered hydrology of the site detracts somewhat from the illustrative character of the falls. At Soda Dam, highway construction has altered the hydrology of the site, threatening the future integrity of the dam. The high level of visitation at all three sites has resulted in some impacts to the native vegetation. Vegetation in some areas at Hanging Lake has been trampled by recreational users, and this may have facilitated the spread of non-native species which

are present in low amounts. Of the three sites, however, it is the only one lacking vehicle access in the immediate drainage, which mitigates against the degradation of the surrounding native vegetation. At Rifle Falls/East Rifle Creek, the presence of a road in the drainage, as well as historic and ongoing construction of structures such as the old hydroelectric plant, fish hatchery and state park facilities has contributed to the increase of non-native understory species, especially in the lower sections. The riparian and surrounding vegetation at Soda Dam is the least well preserved of the three sites, due to the immediate proximity of the highway, and consequent heavy use of the streamside by visitors.

In a comparison of secondary criteria, Hanging Lake and Rifle Falls/East Rifle Creek have similar diversity. At both sites, travertine deposition processes have created calcareous substrates that provide habitat for hanging-garden wetlands, as well as waterfalls that provide nesting sites for black swifts, and both support examples of montane riparian forests. Although the habitats are similar between the two sites, Hanging Lake supports a more well-developed example of the hanging-garden community. Rifle Falls/East Rifle Creek includes additional geologic features such as caves in the travertine, but its hanging gardens are not as high quality as those at Hanging Lake, and its associated riparian and upland plant communities show more evidence of disturbance. The Soda Dam site lacks significant secondary plant community features, but is an example of the thermal waters sub-theme of the aquatic ecosystems group.

Both Hanging Lake and Rifle Falls/East Rifle Creek provide habitat for the rare hanging-garden sullivantia, as well as nesting sites for black swifts, a poorly documented species dependent on a rare habitat type. Habitat at Hanging Lake is of generally higher quality. It is not known if the Soda Dam site provides habitat for rare species, but its proximity to the highway indicates any such habitat would be threatened by a variety of anthropogenic activities.

The travertine forming Soda Dam represents the most recent deposits of a persistent hot spring system that was formerly much larger. Analysis of these travertine deposits has contributed to documenting the age and the evolution of the Valles Caldera hydrothermal system (Goff and Shevenell 1987). In comparison, the Hanging Lake and Rifle Falls/East Rifle Creek sites are relatively unstudied. Both sites may have potential value for documenting the origin and extent of karst features associated with the White River Plateau. All three sites are suitable for education through the use of interpretive signs or field trips. Signage at Soda Dam is minimal, consisting of a few sentences on the official scenic marker. The boardwalk at Hanging Lake, and the Coyote Trail at Rifle Falls State Park both have interpretive signs discussing the formation of the travertine features, as well as other natural features of the area. The US Forest Service has recently obtained funding for rebuilding the Hanging Lake boardwalk which will include maintaining the interpretive signs at the lake and generally enhancing visitor access to the site. Soda Dam and Hanging Lake have no charge for visitor access, while Rifle Falls requires payment of the State Park entrance fee. Of the three sites, Hanging Lake is not ADA accessible at any point near the travertine.

Hanging Lake appears to be unique in the Southern Rocky Mountain biophysiographic province as a natural lake formed by travertine deposition which also supports rare species and plant communities, and where natural geologic and hydrologic processes are unaltered.

EVALUATION RECOMMENDATIONS

The Hanging Lake site qualifies for designation as a National Natural Landmark.

Summary Significance Statement

Hanging Lake is a unique example within the Southern Rocky Mountain biophysiographic province of a lake formed by travertine deposition, and supports one of the best examples of a hanging garden plant community in the province. The site is also one of the larger and least altered travertine systems in the province, where natural geologic and hydrologic processes continue to operate as they have done throughout the history of the lake.

Proposed Landmark Boundary and Ownership Maps

The proposed landmark boundary is drawn primarily from the portion of the Dead Horse Creek drainage that is under WRNF management designation 4.4 – Recreation Rivers, Designated and Eligible (Figure 4). The boundary, which encompasses 72 acres, includes Hanging Lake, Spouting Rock, Bridal Veil Falls, and a surrounding portion of the canyon lying upstream from the CDOT parcel.

Natural Landmark Brief

Name: Hanging Lake

Location: Garfield County, Colorado

Description:
Hanging Lake, located in Garfield County, Colorado, along the Dead Horse Creek drainage about nine miles east of the town of Glenwood Springs (Figure 5), is an example of an active travertine-depositing system that has resulted in the formation of a beautiful natural lake and waterfalls. The lake is perched on a deposit of tufa (also called travertine) on the side of the valley. Above the lake, Spouting Rock spring discharges water from lower Paleozoic bedrock. Carbonate members of the strata are presumed to be the source of dissolved calcium and bicarbonate responsible for formation of the tufa supporting the lake. As water slows and spreads out into the lake, calcium carbonate precipitates along the bottom and edges as deposits of travertine, gradually adding to the rim and ledges below. The lake, creek, and associated falls support an aquatic dependent wetland ecosystem linked to the calcareous geology and hydrology of the site, including an unusual ‘hanging-garden’ community that includes the Colorado endemic, and globally imperiled hanging garden sullivantia (*Sullivantia hapemanii* var. *pupusii*).

The site also supports a nesting colony of black swifts (*Cypseloides niger*) and surrounding canyons supporting box elder (*Acer negundo*)/red-osier dogwood (*Cornus sericea*) riparian vegetation, a rare community that is only documented from a handful of sites in the Southern Rocky Mountain biophysiographic province.

Significance:
Hanging Lake is a unique example within the Southern Rocky Mountain biophysiographic province of a lake formed by travertine deposition. It is one of the larger and least altered travertine systems in the province, where natural geologic and hydrologic processes continue to operate as they have done throughout the history of the lake. The site also supports one of the best and largest examples of a hanging garden plant community in the province.

Ownership: Federal

Designation:

Evaluation: Karin Decker, Colorado Natural Heritage Program

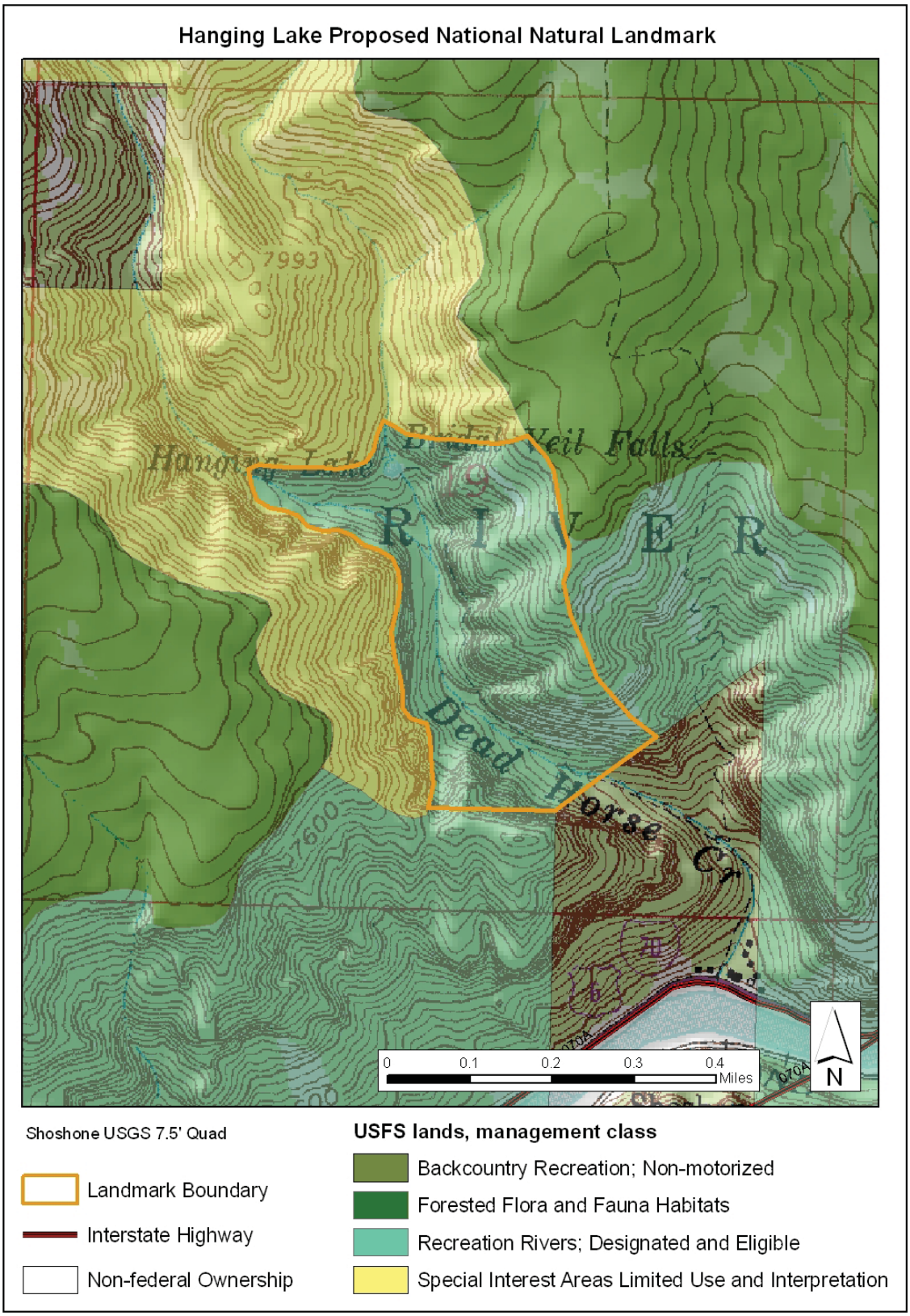

Figure 4. Proposed boundary and land ownership at Hanging Lake.

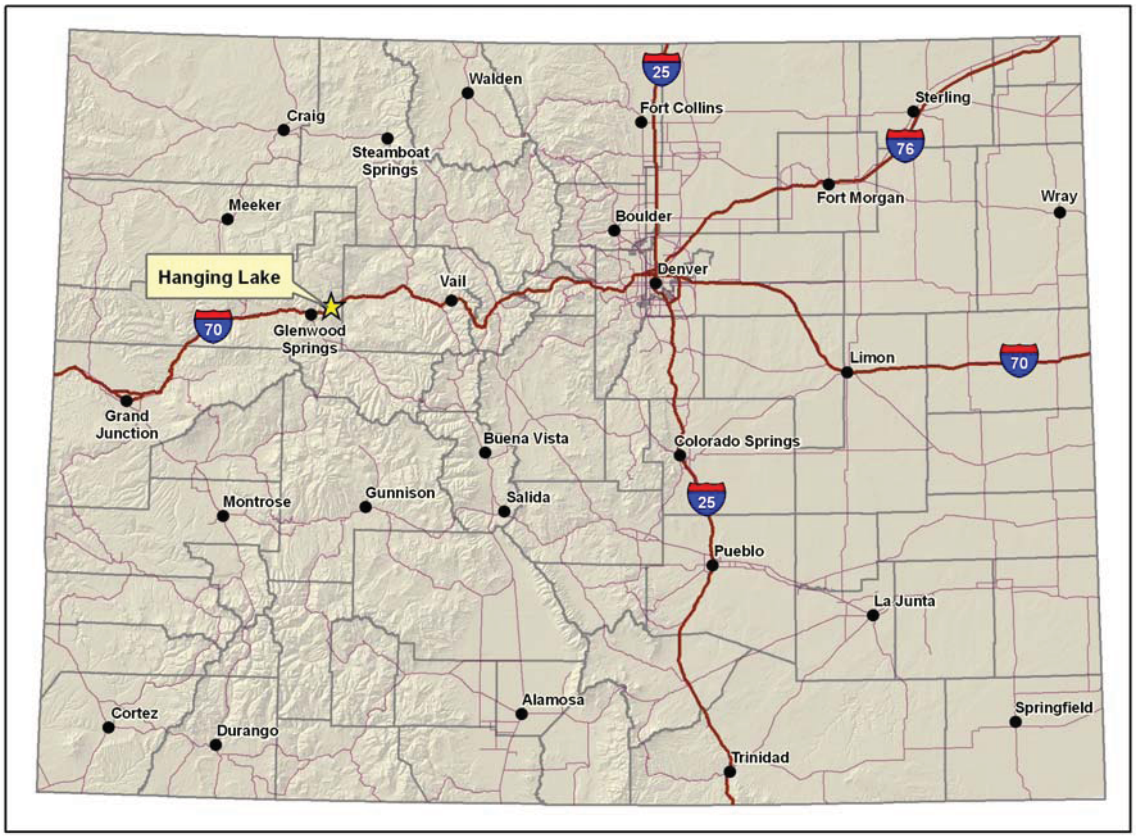

Figure 5. Location of Hanging Lake in Colorado.

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