Proposed Joshua Tree Expansion - Values and Resources Survey

Setting

This survey describes values and resources found in the Eagle Mountain area, adjacent to Joshua Tree National Park, which is a region proposed for protection under the Antiquities Act as a national monument managed by the National Park Service.

The proposal is based on a 2016 Environmental Assessment (EA)[1] conducted by the National Park Service to determine the feasibility of adding approximately 25,000 acres of federal, state, and private lands to Joshua Tree National Park. As delineated in the History section, below, all the land at issue was designated as part of Joshua Tree National Monument under the Antiquities Act in 1936, and then was removed from the Monument in 1950 by an act of Congress to facilitate iron mining for the defense industry. Mining in the area has now largely ceased aside from limited extraction of aggregate from tailings piles, as well as some small-scale pick and shovel placer gold mining by local enthusiasts. Joshua Tree National Monument was remade into a National Park by the passage of the California Desert Protection Act of 1994.

The 2016 Environmental Assessment identified a preferred alternative in which 17,670 acres are federally managed by the Bureau of Land Management were deemed appropriate for management transfer to the National Park Service and inclusion within the boundaries of Joshua Tree National Park. These acres do not include lands that were found to be appropriate for inclusion into the national park due to their resources and values, but not immediately possible due to non-federal ownership or existing withdrawal, such as lands previously withdrawn by the Federal Power Act for the proposed Eagle Mountain Pumped Storage facility. Land proposed for a transmission right-of-way for the pumped storage project is also omitted from the 17,670 acres cited above, as well as federal lands deemed only “potentially feasible” for addition to the National Park by NPS due to their proximity to infrastructure projects or inaccessibility from other parts of the National Park.

The proposed new National Monument comprises those 17,670 acres of feasible federal land identified in the 2016 EA, which occupy the area between the current Park boundary and the Metropolitan Water District’s Colorado River Aqueduct in the vicinity of the Eagle Mountain Townsite (Antiquities Act authority does not extend to expanding existing national parks, nor does it enable the administration to fold state or private lands into newly designated national monuments). Creating a National Monument managed by the National Park Service will serve to consolidate management of the area with that of Joshua Tree National Park, similar to how Castle Mountains National Monument is administratively managed by the Mojave National Preserve.

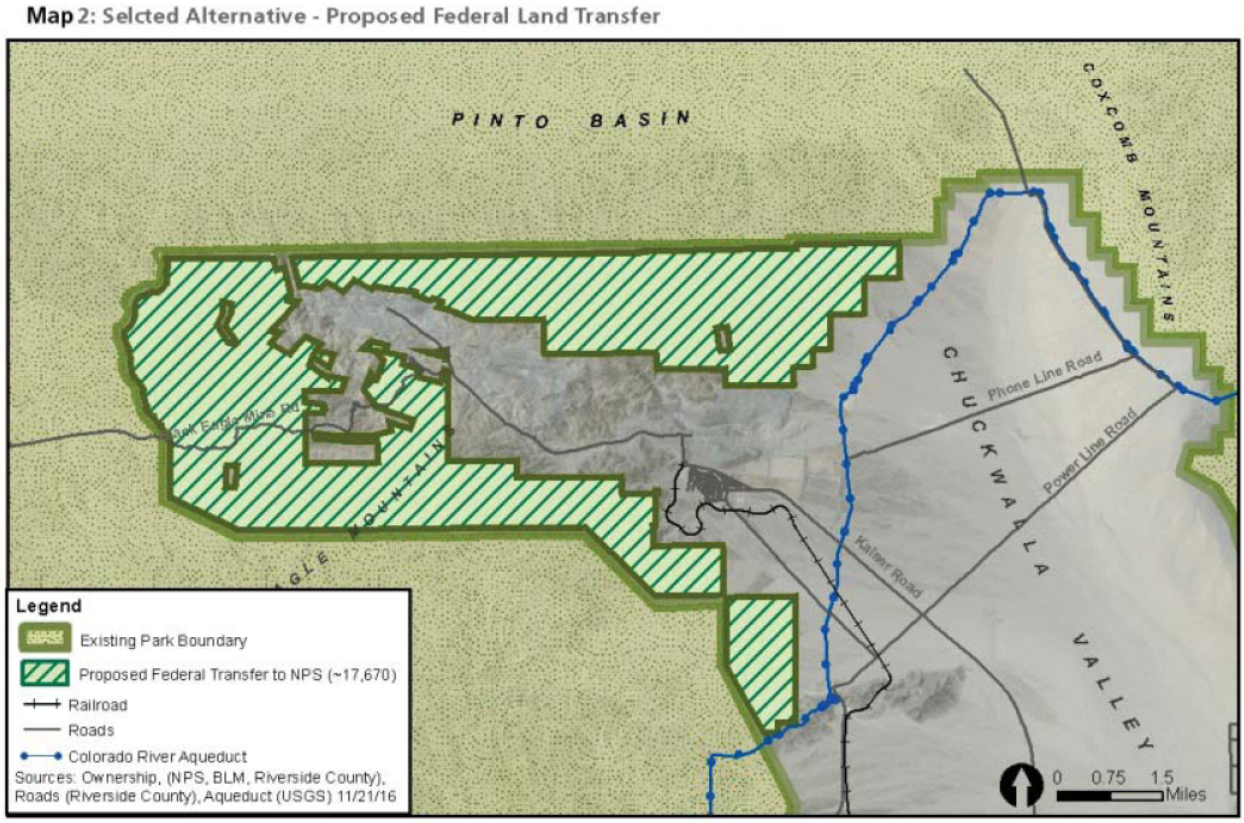
The proposed monument would adjoin the National Park boundary on the north, west, and south sides of the 1950 Eagle Mountain removal area. The westernmost portion of the new monument, which adjoins an extensive network of dry wash habitat leading into Joshua Tree National Park, was designated an approximately 6,000-acre California Desert National Conservation Land by the 2016 Desert Renewable Energy Conservation Plan (DRECP), while the DRECP-designated Chuckwalla ACEC occupies approximately 3,000 acres on the eastern edges of the proposed monument.

The landscape is remote and difficult to access without lifted off-road-capable trucks. Vehicle access to the monument at present is only possible from the west, using Black Eagle Mine Road to reach the monument from Pinto Basin in the National Park. The difficulty of access has helped preserve the wild character of the landscape.

The topography in the proposed monument is predominantly characterized by low, rounded hills rising from about 2,100 feet above mean sea level in the western, wash-dominated portion to 3,500 feet or so on the tallest peaks.

[1] National Park Service, Eagle Mountain Boundary Study Including Possible Land Withdrawal Environmental Assessment – Final December 2016

Map: Proposed Federal Transfer – NPS Boundary Expansion Study



Cultural Resources

The Joshua Tree National Park area includes a rich and diverse cultural history. Human occupation dates to at least the early Holocene period, with what is known as Pinto culture (7,000-10,000 years ago); human occupation continued throughout the Holocene into the historical era with tribes known today as Cahuilla, Chemehuevi, Mojave, and Serrano. The park preserves thousands of sites and materials associated with these four overlapping ethnographic native cultures.[2]

Projectile points found along an extinct water channel in the Pinto Basin represent the earliest known human occupation of this area. Dated from four to eight thousand years ago, this Pinto culture was first described by amateur archeologists William and Elizabeth Campbell in the 1930s. The Campbells believed that there had been a river flowing through Pinto Basin when the Pinto Culture people used the area; more recent research by geologists dispels that notion. The points collected by the Campbells are thick and triangular in shape, with notched shoulders and a broad stem. Pinto hunters attached the points to a wooden spear shaft and used a spear thrower, or atlatl, to propel the spear.

Based on the relatively large number of Pinto points—as well as cutting and scraping tools—compared with the few seed-processing implements found at these early sites, it is believed that Pinto Culture was a mobile population dependent upon large game hunting and seasonal plant gathering. The period of Pinto Culture occupation was an era of decreasing moisture, and by the end the environment was probably close to what we have today. As the Pleistocene water sources dried up, only desert adapted plants and animals survived. The

[2] NPS 2016

archeological evidence suggests that the human population gradually adapted as well, by hunting smaller game and processing small seeds.

Little evidence links the Pinto Culture with today's tribal groups. The Cahuilla, Chemehuevi, and Serrano who followed the Pinto period had a more diversified strategy of hunting and collecting food items that included distinct changes in stone tools and increasing numbers of hard-seed milling stones.

Prehistoric cultural resources are associated with human occupation prior to European 18th contact in the century. These resources may include sites, structures, rock art, trails, or other artifacts of Native American life. The first indigenous Americans arrived in California approximately 13,000-15,000 years ago (late Pleistocene era). Archaeological evidence in and around the region of Joshua Tree National Park confirms that people lived and hunted in a cooler and more moist grassland environment between 10,000 and 4,000 years ago.[3]

These descendants of Pleistocene and Archaic people, and those who followed after them (such as the Pinto Culture), learned to adapt and thrive in harsh environment by making careful use of local plants and living in oases and along water courses.[4] [5] [6] These people hunted both large and small game, gathered seasonal wild plants, and likely manipulated land to their benefit by practicing various forms of gardening. They also likely used fire to revitalize the land and prevent catastrophic fires.[7] They generally lived in small, mobile bands with a highly developed network of trails and connections with other groups. There was considerable cross-cultural connection despite occasional conflict. Segments of two east-west trails are still present in the vicinity of the proposed monument. The trails were major transportation corridors used for hunting, trading and ceremonial purposes. The routes are marked by votive stone piles (cairns) and ceramic scatters (pot drops).[8] [9] The trails could be eligible for the National Register of Historic Places (NRHP) and considered a Traditional Cultural Property (TCP). Prehistoric archeological resources reflect the lifestyle of mobile hunter-gatherers and include shell beads, remnants of stone tool making, hammers, mortars, pestles, millstones, handstones, scrapers, stone pendants, pots, seasonal camps, rock-shelters, milling sites, lithic and ceramic scatters, and rock art sites.[10] Surveys conducted for past projects in Eagle Mountain area documented over 130 small, isolated finds.[11] Resources include prehistoric lithics, milling stones, ceramics, pot drops, cairns, rock rings, cleared circles, bedrock milling and trash scatters. Some of these finds have the potential to be eligible for listing in the National Register of Historic Places.

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[3] Dilsaver, Lary M., 2015. Joshua Tree National Park: A History of Preserving the Desert. Administrative History. Prepared for the National Park Service. Joshua Tree National Park. Twentynine Palms, California.

[4] United States Department of the Interior, National Park Service 1995 Joshua Tree National Park General Management Plan, Development Concept Plans and Environmental Impact Statement. Denver, CO: National Park Service, Denver Service Center.

[5] ASM Affiliates 2011, Final Historic Properties Management Plan California Eagle Mountain Pumped Storage Project FERC Project Number 13123-002. Prepared for Eagle Crest Energy Company. Carlsbad, California

[6] BLM 2011, Desert Sunlight Solar Farm Project California Desert Conservation Area Plan Amendment and Final Environmental Impact Statement. South Coast Field Office, Palm Springs, California. CACA #48649.

[7] Desert Renewable Energy Conservation Plan Land Use Plan Amendment to the California Desert Conservation Area Plan, Bishop Resource Management Plan, and Bakersfield Resource Management Plan (DRECP). BLM/CA/PL-2016/03+1793+8321, September 2016.

[8] Johnson, Francis, J. and Patricia H. Johnson 1957: "An Indian Trail Complex of the Central Colorado Desert: A Preliminary Survey." University of California Archaeological Survey Reports 37:22-34.

[9] ASM Affiliates 2011: Final Historic Properties Management Plan California Eagle Mountain Pumped Storage Project FERC Project Number 13123-002. Prepared for Eagle Crest Energy Company. Carlsbad, California.

[10] ASM Affiliates 2009: A Class I cultural resources investigation for the proposed Eagle Mountain Pumped Storage Project, Riverside County, California. Prepared for Eagle Crest Energy Company, Palm Desert, CA. Prepared by ASM Affiliates, Inc., Carlsbad, CA.

[11] Federal Energy Regulatory Commission 2012: Final Environmental Impact Statement for Hydropower License Eagle Montain Pumped Storage Electrical Project—FERC Project No. 13123-002, California, FERC/FEIS-F-0238. Washington, D.C

History

In the late 19th century, European American surveyors, cattlemen, miners, and homesteaders began to arrive and, alongside native peoples, created a set of enduring social and cultural legacies for these lands. Historic sites preserve information on the history of the processing of gold ore, cattle ranching, rustling, World War II military training grounds, and homesteading of the southwestern deserts.[12]

In 1936, President Franklin D. Roosevelt established Joshua Tree National Monument as a unit of the national park system[13]. The national monument included 825,340 acres of land, some of which remained in private ownership, including patented mining claims in the Eagle Mountain area. Establishment of the monument withdrew the lands from future mineral entry, which meant that no new mining claims could be established. Mining advocates concerned with the closure of the monument to new claims requested legislation to allow mining within the monument in December 1936 causing the NPS to evaluate the 1936 monument boundaries.[14]

Mining is an integral part of the region's history, beginning over 130 years ago when prospectors roamed the west in search of gold, silver, and other valuable minerals. There are nearly 300 abandoned mines in Joshua Tree National Park and several mining districts in and adjacent to the park including the Twentynine Palms, Dale, Rattler, Monte Negras, Eagle Mountains, Cottonwood Spring, Piñon, and Gold Park districts.[15] (The Eagle Mountain Mining District covers much of the land proposed for protection as a monument.) In the late 1880s, gold and silver discoveries in the Chuckwalla Mountains caused the greatest gold rush in Riverside County.[16] Mines in the Eagle Mountains produced gold, lead, silver, tungsten, copper, and limestone. The mineral mined in the largest quantity was iron, with the richest deposit located in the northern Eagle Mountains at the Eagle Mountain Mine.

In 1942, General George Patton established the World War II Desert Training Center to train troops in combat under harsh conditions to prepare for combat the Germans in the deserts of North Africa. Known as the Desert Training Center, California-Arizona Maneuver Area (DTC CAMA), it was the largest military training area in the world, covering 18,000 square miles of desert lands in California and Arizona. One million troops trained there until the camp closed in 1944. The headquarters of the training center, Camp Young, was located west of the proposed monument in Chiriaco Summit.[17] [18] [19] The divisional camp closest to the proposed monument was Camp Desert Center. Camp Desert Center encompassed 34,000 acres and was located north of Interstate 10, between Desert Center and Chiriaco Summit. Components of the camp included an evacuation hospital, maneuvers area, several campsites, and temporary housing. However not much is known about the camp's history. Camp remains, including rock lined roads and walkways, tent areas, and trash have been identified just outside of the proposed monument east of Eagle Mountain Road. Although specific sites and visible remains have not been identified

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[12] NPS boundary study, 2016

[13] Proclamation No. 2193, 50 Stat. 1760, August 10, 1936

[14] Dilsaver, 2015

[15] Trent, D. D. 1998: "Mines in Joshua Tree National Monument, San Bernardino and Riverside Counties." California Geology: September/October 1998, p. 17.

[16] BLM and [DOE] U.S. Department of Energy, 2012: Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States

[17] Bureau of Land Management, 2015 World War II Desert Training Center, California-Arizona Maneuver Area. Available at web.archive.org/web/20151116070815/http://www.blm.gov/ca/st/en/fo/needles/patton.html. Accessed September 24, 2023

[18] BLM 1985 Desert Training Center: California-Arizona Maneuver Area: Interpretive Plan. California Desert District, Riverside, California

[19] Bischoff, M. 2009; The Desert Training Center/California-Arizona Maneuver Area, 1942-1944, Volume 1: Historical and Archaeological Contexts for the California Desert, Technical Series 75. Prepared under contract with the U.S. Army Corps of Engineers. Los Angeles District. Los Angeles, California.

within the proposed monument to this date, there is the potential to uncover visible remains of training in the area, such as tank tracks, exploded ordinance, target ranges, and ammunition cans.

Meanwhile, shortly after the monument was established, United States involvement in World War II created new demand for steel. In 1942, Kaiser Steel Corporation (Kaiser) opened the west coast's first financially successful, large- scale, fully-integrated steel mill in Fontana, California. Industrialist Henry J. Kaiser, whose industries developed several ship building yards to supply the war effort, had submitted previous proposals to open a west coast steel mill prior United States involvement in World War II. But it was the bombing of Pearl Harbor in December 1941 and subsequent U.S. involvement that ultimately led to federal approval and financing for construction of the steel mill in 1942. The Fontana steel mill was initially supplied with iron ore from the Vulcan Mine near Kelso in the Mojave Desert.[20] In 1943, the U.S. Bureau of Mines estimated that vast resources, possibly more than 3,000,000 tons of iron ore, existed at the Iron Chief Mine in the Eagle Mountains. Kaiser purchased the patented lands associated with the Iron Chief Mine in 1944. Iron ore reserves at the Vulcan Mine declined in the late 1940s while production of iron ore on the patented lands at Eagle Mountain commenced in 1948 under a conditional use permit with the National Park Service.[21]

In response to pressure from the mining community to open park lands to new claims, the demand for mineral resources that grew during World War II, and with an eye to a potential new war with Korea, Congress removed substantial portions of the national monument in 1950, including the Eagle Mountain area.[22] The 1950 legislation[23] reduced the size of the monument to 557,934 acres, excluding mineral rich areas in the north and southeast. Federal lands removed from the monument were transferred to the Bureau of Land Management (BLM) for administration. To further support the Kaiser Steel Corporation's (Kaiser) mining activities, Congress enacted a law in 1952[24] transferring 460 acres of federal land in the Eagle Mountain area to Kaiser for purposes of establishing a mining camp or Townsite to house its employees and for other related needs. The same Act also granted a 200-foot wide right-of- way to Kaiser across BLM-managed federal land for a railroad to haul iron ore from the mine the mill in Fontana, California. Private Law 790 included a reversionary clause which provided that in the event the Townsite or railroad were not used for mill site or other incidental purposes related to mining for a continuous period of seven years, the properties would revert in fee to the United States. As a result of economic factors and international competition, Kaiser ceased active operation of the Eagle Mountain Mine by 1983.

The Eagle Mountain Mine was the largest mining operation west of the Mississippi River and mined 100 million tons of iron ore during its operation from 1948 to 1983.[25] Metal production from the Eagle Mountain mining district also included 7,257 oz. of gold, 14,768 oz. of silver, 1.48 million pounds of lead, and 114,424 pounds of copper.[26] In 1984, a Mineral Resource Potential Report of the Eagle Mountains Wilderness Proposed monument was completed by Powell *et al* for land in the western proposed monument.[27] This report states that gold, silver,

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[20] Dias, Ric Anthony 1995 Together we build: the rise and fall of the Kaiser Steel Corporation in the New Deal West. Ph. D. Dissertation. University of California, Riverside.

[21] Dilsaver, 2015

[22] Dilsaver, 2015

[23] Act of Sept. 25, 1950, Pub.L. 81-837, 64 Stat. 1033

[24] Act of July 8, 1952 (Priv. L. No. 790, 66 Stat. A130)

[25] BLM, 1993: Mineral Report, Amendment to Mineral Potential Report, P.K. Morton for the Exchange of Public and Private lands, Eagle Mountain Landfill Project.

[26] Powell, R. E., Whittington, C. L., Grauch, V. J. S., and McColly, R. A. 1984: Mineral Resource Potential of the Eagle Mountains Wilderness Proposed monument (CDCA-334), Riverside County, California. Open File Report: 84-631. Riverside County, California.

[27] Powell et. al. 1984

tungsten, molybdenum, manganese, zinc, copper, lead minerals, scheelite, galena, pyrite, fluorite, hematite, limonite, copper carbonate minerals and dendritic manganese oxide are likely to occur in the Eagle and Chuckwalla Mountains.[28] The report also states that the rare earth minerals of thorium, lanthanum, and yttrium were detected in mineral samples and are likely to occur in some of the more common minerals identified in heavy mineral fractions from the Eagle Mountains, such as apatite, fluorite, sphene, and zircon.[29] The Powell report stated gold, silver and tungsten are common in the Transverse Ranges and Mojave Desert provinces of southern California, but that the deposits are generally small in volume and of low to medium grade, although some high grade pockets have been found. It also noted that the occurrence of larger subsurface gold and silver deposits are possible because the geologic setting of the area is similar to other large gold producing regions in the Rand, Cargo Muchacho, and Chocolate Mountains.[30]

In 1989, Kaiser issued a 100-year lease to Mine Reclamation Corporation to develop a landfill at the mine site. At full operation, the landfill would have received approximately 20,000 tons of garbage per day from the Los Angeles area via the Eagle Mountain Mine railroad line. More acreage was needed for the project, and Kaiser proposed a land exchange to BLM so they could acquire additional land needed for the landfill. BLM agreed and issued patents to Kaiser for 3,481 acres of federal land surrounding the mine pits. BLM received 10 separate parcels totaling 2,846 acres. In 2013, after years of controversy and litigation, the landfill project was terminated. In 2014, the issue was settled in the form of a Stipulated Judgment which voided the patents issued to Kaiser for the 3,481 acres of exchange lands around the mining pits and restored those lands to public land status. Kaiser also agreed to donate to the United States the lands it had previously conveyed as part of the voided land exchange (1,083 acres). In return, the Stipulated Judgment restored Kaiser's mining and mill site claims to over approximately 2,400 acres of the former exchange lands around the mine pits. In 2015, Kaiser Steel sold all of its private land and its interests in unpatented mining claims in the Eagle Mountain area to Eagle Crest Energy Company. (Eagle Crest holds title to this land under the corporate name Kaiser Eagle Mountain.) Eagle Crest Energy Company has a FERC license allowing it to construct the Eagle Mountain Pumped Storage Hydroelectric Project, though lack of interest in Eagle Crest among buyers in the energy marketplace have delayed construction for more than a decade.

In the western section of the proposed monument, six unpatented mining claims are held by private individuals or mining clubs. These claims are mined casually and do not involve the use of earth-moving equipment or explosives.[31]

Geology

The proposed monument lies at the east end of California's Transverse Ranges province, straddling the transition between the Mojave Desert to the north and west, and the Colorado Desert subsection of the Sonoran Desert to the southeast. The Mojave Desert is bounded on the west by the Sierra Nevada, Tehachapi, San Bernardino, and San Gabriel mountain ranges. The Colorado Desert is bounded on the west by the Peninsular Ranges and on the east by the Colorado River. The Eagle Mountains make up the majority of the proposed monument. The Coxcomb Mountains are to the northeast, the Pinto Basin is north; to the south are the Orocopia, Chuckwalla, Cottonwood, and Chocolate Mountains ranges.

The land in and around Joshua Tree National Park was created at least 1.7 billion years ago when a mix of igneous and metamorphic rocks, including Pinto Gneiss, developed deep under a massive mountain system. During the Mesozoic era from 250 to 75 million years ago there was active subduction of the Pacific Plate under the North American Plate leading to more upwelling of intrusive volcanic material that formed several types of granite that

[28] Powell et. al. 1984
[29] Powell et. al. 1984
[30] Powell et. al. 1984
[31] NPS, 2016

are found in the Eagle Mountains and other nearby mountain ranges.[32] The picturesque monzogranite features found throughout the park are not in the proposed monument; instead, there are gentle slopes and undulating rocky slopes, outcrops and valleys.

The topography of the proposed monument is typical of western deserts: bare mountain ranges are separated by flat connecting deserts. The mountains rise abruptly out of the desert to an elevation of approximately 3,000 feet. The mountains are dissected by sharp gullies with high, barren, rock walls and canyons. Alluvial fans spill from the gullies of the mountains and connect toward the center of the desert basin (or playa). On gradual mountain slopes, soils are deep, sandy, loamy, and covered with vegetation; on steeper slopes, bedrock outcrops are more gravelly with less vegetation. Many of the flat areas have a thin white crust of alkali or salt. Soil conditions consist of desert pavement, erosive (e.g., carbonate, high-silt) soils, corrosive saline soils saline, and expansive (high-clay) soils[33]. Gneissic basement rocks are overlain by two sedimentary units, separated by unconformities. The lower unit contains carbonate rocks and quartzite. The upper unit contains thick conglomerates. This layered sequence of rocks is deformed into a west-plunging anticline. Intrusion by Jurassic quartz monzonite apparently followed this deformation. Quartz monzonite forms a branching network of sills, some of which dilate the contact between the upper and lower sedimentary sequences. Intrusion resulted in extensive, mostly anhydrous skarns, but stratabound iron ore is just as closely related to some other features: 1) regional alteration of quartz monzonite, with iron ore adjacent to little-altered rocks along the boundary between sodic and potassic domains, 2) the two unconformities, which apparently formed stratigraphic traps for precipitation of iron ores, 3) a north-facing monoclinal plane between folds, which was preferentially replaced. Iron ore replaces a variety of host rocks along the two unconformities, forming massive to globular bodies, and its mineralogy correlates with deuteric alteration features, not anhydrous skarn. Its pyrite contains as much as 3% cobalt. Iron was only one of five elements that showed mobility in this region on a scale that suggests basic crustal processes. The others in probable order of flux magnitude are silica, magnesium, sodium, and potassium, to form regionally distributed “vitreous quartzite,” dolomite, and secondary feldspars, respectively.

Water

The Colorado River is the major watercourse in the southwest, spans six states, forms a boundary between California and Arizona, and extends into Mexico. The proposed monument is within the Chuckwalla watershed, which extends over portions of Riverside and Imperial counties and drains to the Colorado River. The central portions of the watershed include the Palen and Chuckwalla Valleys. The Colorado River Aqueduct begins near Parker Dam on the Colorado River and eventually emerges and begins flowing through 60 miles of siphons and open canals on the southern Mojave Desert and Eagle Mountains. The aqueduct forms the eastern border of the proposed monument. Located in an arid desert region of eastern Riverside County, the proposed monument has an average annual precipitation of approximately four inches per year. Perennial streams are relatively non-existent due to low precipitation, high evaporation, and permeable soils, but some ephemeral streams do exist. In rare large rainfall events, substantial runoff occurs in dry washes or these ephemeral streams. Eagle Creek and Bald Eagle Creek flow into the Lower Reservoir in the Eagle Mountain Mine.[34] Flood waters usually evaporate rather quickly due to the arid climate.

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[32] Harder, Cecil 1912 Iron-Ore Deposits of The Eagle Mountains, California. Bulletin 503. Department of the Interior United States Geological Survey. Government Printing Office, Washington, DC; Force, Eric R. 2001 Eagle Mountain mine—Geology of the former Kaiser Steel operation in Riverside County, California. U.S. Geological Survey Open-File Report 01-237, Tucson, AZ.; Dilsaver 2015

[33] Desert Renewable Energy Conservation Plan Land Use Plan Amendment to the California Desert Conservation Area Plan, Bishop Resource Management Plan, and Bakersfield Resource Management Plan. BLM/CA/PL-2016/03+1793+8321, September 2016.

[34] Federal Energy Regulatory Commission, 2012; Final Environmental Impact Statement for Hydropower License Eagle Mountain Pumped Storage Electrical Project—FERC Project No. 13123-002, California, FERC/FEIS-F-0238. Washington, D.C

Groundwater

With little surface water, water in the desert is primarily obtained from underground aquifers. Water found in aquifers was trapped with sediments when they were deposited on the valley floor millions of years ago. This ancient water moves through fractures and joints in the bedrock and flows into springs, seeps, and wells. Water in the area is approximately 160 feet underground. Groundwater basins are hydrogeologic units that contain one or more connected or interrelated aquifers. The proposed monument is within the Pinto Valley Groundwater Basin and the Chuckwalla Valley Groundwater Basin and near the Palen Valley, Orocopia Valley, and Hayfield Basins. The Pinto Valley groundwater aquifer is hydraulically connected to the Chuckwalla groundwater aquifer and the Pinto Valley basin is upgradient from the Chuckwalla basin.[35]

Surface expressions of groundwater are few in the proposed monument, and land management agency maps of springs and seeps are inconsistent. Aside from a rumored handful of minor and perhaps ephemeral springs in the western portion of the proposed monument, two significant water sources are known: Eagle Tank Spring at the head of Placer Canyon in the northwestern section of the proposed monument,[36] and the nearby Eagle Tank, which is not a groundwater expression but rather a tinaja or catchment area that holds recently fallen rainwater.

Scientific study opportunities

The Presidential Proclamation that established the park in 1936 recognized objects of scientific interest. The Park's Foundation Document further articulates that, "Joshua Tree National Park offers unparalleled opportunities for research of arid land ecosystems and processes, adaptations of and to desert life, sustainability, and indications of climate change. The proximity of the park to urban regions of Southern California and Nevada enhances its value for scientific research and education." The Eagle Mountain area, once conveyed to National Park Service management, could provide new opportunities to conduct research on the restoration of ecological communities, wildlife habitat values, and cultural resources. Some vegetative recovery and re-establishment of plants such as *Phacelia crenulata*[37] and *Hyptis emoryi*[38] is occurring on large piles of waste rock that have not been disturbed for decades. There is potential interest in researching this successional process in desert ecosystems.

Wilderness Characteristics and Recreation

Outside of the disturbed mine areas, the proposed monument contains pristine and untrammeled lands that abut Joshua Tree National Park wilderness areas. The congressionally designated Joshua Tree Wilderness comprises approximately seventy-five percent of Joshua Tree National Park. Between the original wilderness designation in 1976, the lands added through the California Desert Protection Act of 1994, and through the passage of public law P.L. 111-11 in 2009 Joshua Tree Wilderness currently totals 595,364 acres, with 70,557 acres of potential wilderness and 402 acres of proposed wilderness.

Collectively, 84 percent of the park is designated, proposed or potential wilderness. The park's wilderness provides opportunities for primitive recreation and solitude in wild settings. Wilderness access is limited to hikers, since no motorized equipment is permitted and thus vehicles and bicycles are not allowed. The wilderness areas adjacent to the proposed monument are some of the most pristine in the park. Values include dark night skies, excellent air quality, and natural quiet, all of which could be affected by proposed future uses of the area. Bringing the proposed monument under NPS management would ensure a greater degree of protection of the park's wilderness values. Areas adjacent to existing park wilderness contain roadless areas with wilderness values.

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[35] Woodward, Clyde, 1998: "Phase I Technical Feasibility Report for Offstream Storage on the Colorado River Aqueduct." prepared for Metropolitan Water District of Southern California.
[36] Latitude: 33° 53' 27" N Longitude: 115° 35' 22" W
[37] https://www.cch2.org/portal/collections/individual/index.php?occid=4037639
[38] https://www.cch2.org/portal/collections/individual/index.php?occid=4037626

In 1979 as part of the California Desert Conservation Area Plan development, BLM conducted a comprehensive wilderness inventory of the desert region, including two separate areas in the Eagle Mountains. The California Statewide Wilderness Study Report published in 1990 proposed final recommendations and a Record of Decision for the study was published in 1991. Portions of the 61,000-acre Eagle Mountains Wilderness Proposed monument (51,434 acres) were ultimately recommended as wilderness while another 7,028 acres of this area were not recommended for wilderness.[39] [40] The recommended wilderness area included some lands along the southwestern boundary of the proposed monument.

The primary reasons that BLM recommended the area as suitable for wilderness was because the area: 1) possessed outstanding wilderness values; 2) was adjacent to existing wilderness in Joshua Tree National Monument; and 3) possessed numerous special features that would benefit from wilderness designation. Wilderness values ascribed to the area included opportunities for solitude, primitive and unconfined recreation and the area's diversity of landforms. The study also identified the Eagle Mountains as a natural extension of the outstanding diversity of desert landscapes protected on surrounding national park lands. Special features noted included: habitat for desert tortoise; potential occurrence of rare plant species; and the existence of cultural values.[41]

Vegetative communities

There are two major natural vegetation types in the proposed monument: Lower bajada and fan Mojavean–Sonoran Desert scrub and Sonoran–Coloradan semi-desert wash woodland/scrub. There are also bedrock cliff and outcrops and disturbed areas which are characterized by little or no vegetation, and a small amount of mid-elevation mixed desert scrub along the northern boundary.

Desert scrub occurs on lower canyon slopes, bajadas, sandy flats, and access roads. The dominant species include creosote (*Larrea tridentata*), burro bush (*Ambrosia dumosa*), and brittlebush (*Encelia farinosa*). Other species include cheesebush (*Ambrosia salsola*), white rhatany (*Krameria grayi*) and a variety of cacti such as silver cholla (*Cylindropuntia echino*carpa), pencil cholla (*Cylindropuntia ramosissima*), beavertail cactus (*Opuntia basilaris*), and hedgehog cactus (*Echinocereus engelmannii*). Desert dry wash woodlands/scrub occur in well defined washes primarily consisting of desert ironwood (*Olneya tesota*), smoke tree (*Dalea spinos*a), palo verde (*Parkinsonia aculeata*), mesquite (*Prosopis pubescens*), desert willow (*Chilopsis linearis*), and/or cat's claw (*Senegalia greggii*). Other species that are commonly found along wash corridors in the proposed monument include desert brickellbush (*Brickellia arguta*), desert lavender (*Hyptis emoryi*), cheesebush, chuparosa (*Justicia californica*), Anderson wolfberry (*Lycium andersonii*), desert almond (*Prunus fasciculata*) and white-stemmed milkweed (*Asclepias albicans*).

Microphyll woodlands in the proposed monument are sparse to nonexistent. In the broad section of braided washes in the west end of the proposed monument, there are instead what could be called "microphyll shrublands," dominated by creosote and desert willow, with diverse subshrubs such as *Ambrosia* species, Physalis crassifolia, and cholla making up the understory.

Desert pavements are closely packed rock surface substrates created through wind and water erosion that generally have very low permeability and moisture available to plants.[42] While the Chuckwalla Valley to the east of

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[39] BLM 1990 California Statewide Wilderness Study Report: Part 4, Volume 6. Washington, D.C.
[40] BLM 1991 California Statewide Wilderness Study Report: Record of Decision. Washington, D.C.
[41] BLM 1991
[42] Miller, D.H., D.R. Bedford, D.L. Hughson, E.V. McDonald, S.E. Robinson, and K.M. Schmidt 2009
"Mapping Mojave Desert Ecosystem Properties with Surficial Geology." In The Mojave Desert, Ecosystem Processes and Sustainability, eds. Webb, R.H., L.F. Fenstermaker, J.S. Heaton, D.L. Hughson, E.V. McDonald, and D.H. Miller. 225-251. University of Nevada Press, Reno & Las Vegas, NV.

the proposed monument historically possessed extensive stands of desert pavement, that habitat is quickly being converted for renewable energy generation.[43] Significant relict stands of desert pavement occur in scattered flat areas between slopes in the hillier sections of the proposed monument, while approximately 300 acres of desert pavement separate braids of the large wash that covers the westernmost portion of the monument.

The Eagle Mountains are also host to a rare vegetation type, Hall's Tetracoccus (*Tetracoccus hallii*). These stands generally occur on colluvial slopes with *Yucca schidigera*, *Simmondsia chinensis*, *Nolina bigelovii*, and *Ephedra nevadensis*, and are likely to occur within the proposed monument.

The extent of spread of exotic invasive plants within the federal lands in the proposed monument is not currently known. However, given the remoteness of the area, such species are most likely located along the few road corridors that traverse the area. With annual rainfall in the area of 2"-4", the spread of exotic vegetation is often limited to drainages and other areas with higher-than-normal soil moisture content, such as the median along roadways. The environmental impact statement from the former landfill project notes that activities associated with mine operations, including the development of the Townsite, introduced exotic plant and animal species to the local ecosystem, and fragmented habitat through road construction and other development.[44]

The environmental impact statement for the pumped storage hydroelectric project documents known invasive species for the disturbed mine lands and Townsite areas outside the proposed monument. These species include red brome (*Bromus madritensis*), cheatgrass (*Bromus tectorum*), Mediterranean split grass (*Schismus* spp.), Sahara mustard (*Brassica tournefortii*) and red stem filaree (*Erodium cicutarium*). These species presence adjacent to the boundaries of the proposed monument suggest they may be present inside the monument as well.

Rare plants

There are three federally listed species that may exist in the proposed monument. One of them, the Coachella Valley milk-vetch (*Astragalus lentiginosus* var. *coachellae*) has a high likelihood of occurring in the proposed monument due to the presence of sand ramps at the base of the range and the proximity of known locations (less than six miles away in Chuckwalla Valley). Triple-ribbed milk-vetch (*Astragalus tricarinatus*) and Parish's daisy (*Erigeron parishii*) may also be present. There are over 20 rare and/or sensitive plants that are likely to occur within the proposed monument, with an additional species that could potentially occur if suitable habitat is present. Several rare taxa are known to occur within a few miles of proposed monument and therefore are likely to be present. They include California ditaxis (*Ditaxis serrata* var. *californica*), Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*), and Los Animas colubrine (*Colubrina californica*). Parish's club cholla (*Corynopuntia parishiorum*) and Alverson's foxtail cactus (*Coryphantha alvers*onii) are also present. In addition, there are isolated stands of Teddy-bear Cholla (*Cylindropuntia bigelovii*) found on the southern slopes of the Eagle Mountains very near the proposed monument. These stands are rare within the region.

Three plant species newly described to science are known to occur in the Eagle Mountains. They include *Eschscholzia papastillii*, *E. androuxii*, and *Cylindropuntia chuckwallensis*; the latter two are considered rare.[45] Verified entries in the California Natural Diversity Database (CNDDB) record observances of Alverson's foxtail, Harwood's milk-vetch, Wright's *Jaffueliobryum* moss, Los Animas colubrine, Parish's club-cholla, and Harwood's woolystar (*Eriastrum harwoodii*) within the proposed monument.[46]

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[43] Potter, C., 2016: Mapping Changes in Desert Pavement Surfaces of the Lower Colorado Desert of Southern California using Landsat Time Series Analysis NASA Ames Research Center, United States

[44] Riverside County and [BLM] Bureau of Land Management 1996 Draft Environmental Impact Statement/Environmental Impact Report for the Eagle Mountain Landfill and Recycling Project. Prepared by CH2MHILL. State Clearinghouse No. 95052023

[45] La Doux, T., C. Lea, E. Babich, 2013: A Summary of the Joshua Tree National Park Vegetation Mapping Project NPS Vegetation Inventory Program. Natural Resource Technical Report NPS/JOTR/NRTR—2013/723

[46] NPS 2016

Wildlife corridors

The proposed monument contains important habitat and functions as a significant migration corridor for wildlife in Joshua Tree National Park and other protected areas in the Mojave and Colorado deserts. These functions directly contribute to protection of biological diversity identified in the park purpose.

There has been a growing awareness of the need to protect broader landscapes to sustain wildlife and natural habitat, particularly in light of ecosystem stressors such as development, and warming temperatures and rainfall patterns associated with climate change. [47] [48] Development associated with renewable energy projects and urbanization can result in habitat fragmentation. Movement through contiguous habitat is essential to wildlife survival, whether it be the day-to-day movements of individuals seeking food, shelter, or mates, dispersal of offspring to find new homes, or seasonal migration to find favorable conditions. Movement is also essential for gene flow, for recolonizing unoccupied habitat after a local population goes extinct, and for species to shift their geographic range in response to global climate change.[49] Protection of habitat and migration corridors is an important adaptation strategy for mitigating the effects of climate change on biological resources.[50] Maintenance of biodiversity in the park depends on connectivity between habitats both within and outside park boundaries.[51] Developments along high-speed transport corridors to the northwest and southwest of the park pose barriers to species movements, inhibiting access to habitat outside of the park. Furthermore, since the 1970s, housing densities in these areas have increased from generally rural to exurban. Demographic projections forecast that by 2050 these areas will be heavily suburban. This land use intensification will precipitate habitat loss, fragmentation and loss of connectivity, increased colonization and spread of invasive species, and increased disturbance to ecosystems and species.[52]

Human activities originating outside park lands, including illegal roads and trails crossing park boundaries, as well as developments adjacent to the park, have impacts on resources within the park. Illegal roads, trails and associated driving activities damage and fragment habitat, disturb wildlife, introduce nonnative flora and fauna

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[47] DeFries, Ruth, et al. 2007 "Land use change around protected areas: management to balance human needs and ecological function." Ecological Applications, 17.4 (2007): 1031-1038.

[48] Hansen, Andrew J., Nathan B. Piekielek, Cory Davis, Jessica R. Haas, David M. Theobald, John E. Gross, William B. Monahan, Tom Olliff, and Steven W. Running, 2014 “Exposure of US National Parks to Land Use and Climate Change.” 1900-2100. Ecological Applications 2014 24:3, 484-502.

[49] Hansen, Andrew J., and Ruth DeFries, 2007 "Ecological mechanisms linking protected areas to surrounding lands." Ecological Applications 17.4 (2007): 974-988.

[50] Overpeck, J., G. Garfin, A. Jardine, D. E. Busch, D. Cayan, M. Dettinger, E. Fleish-man, A. Gershunov, G. MacDonald, K. T. Redmond, W. R. Travis, and B. Udall, 2013: “Summary for Decision Makers.” In Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment, edited by G. Garfin, A. Jardine, R. Merideth, M. Black, and S. LeRoy, 1–20. A report by the Southwest Climate Alliance. Washington, DC: Island Press.

[51] Hansen, A. J., Davis, C., Piekielek, N. B., Gross, J. E., Theobald, D. M., Goetz, S. J and Ruth DeFries, 2011 “Delineating the ecosystems containing protected areas for monitoring and management.” Bioscience, 61, 263-273.

[52] Monahan, W. B., Gross, J. E., Svancara, L. K., & Philippi, T., 2012: A guide to interpreting NPScape data and analyses (Natural Resource Technical Report NPS/NRSS/NRTR—2012/578). Fort Collins, CO: National Park Service.

and alter connectivity.[53] In addition, developments near park boundaries can disturb biota within the park, alter or block key migration corridors, and cause habitat destruction/fragmentation on lands adjacent to the park.[54] [55] [56]

Desert tortoise

The proposed monument is of great interest in the regional conservation of the federally listed Threatened desert tortoise as it is the main link between highly protected habitats in Joshua Tree National Park and habitats south of I-10. This area was described in detail by the biological opinion written by the U.S. Fish and Wildlife Service for the Desert Sunlight Solar Farm.[57]

The westernmost extension of the proposed monument consists of approximately 1,400 acres of washes and adjoining low hills, which are directly connected to existing tortoise habitat in the Big Wash and Pinto Basin sections of Joshua Tree National Park. The eastern boundary of the monument near Chuckwalla Valley also holds good habitat for desert tortoises, much of which enjoys some protection having been designated by the BLM as the Chuckwalla Desert Wildlife Management Area. However, increased human activity and habitat conversion in that area makes the viability of that desert tortoise population open to question.

Desert tortoises spend most of their lives in burrows, rock shelters, and pallets to regulate body temperature and reduce water loss. (Burrows are tunnels dug into soil by desert tortoises or other animals, rock shelters are spaces protected by rocks and/or boulders, and pallets are depressions in the soil.) The use of the various shelter types is related to their availability and climate. Males tend to occupy deeper burrows than females. Seasonal trends in burrow use are influenced by desert tortoise sex and regional variation. Desert tortoise shelter sites are often associated with plant or rock cover. Desert tortoises often lay their eggs in nests dug in sufficiently deep soil at the entrance of burrows or under shrubs. Nests are typically 3 to 10 inches deep.

Shelters are important for controlling body temperature and water regulation, as they allow desert tortoises to slow their rate of heating in summer and provide protection from cold during the winter. The humidity within burrows prevents dehydration. Burrows also provide protection from predators. The availability of adequate burrow sites influences desert tortoise densities.

Desert tortoises can use between 5 and 25 burrows per year. Some burrows are used repeatedly, sometimes for several consecutive years. Desert tortoises share burrows with various mammals, reptiles, birds, and invertebrates, such as white-tailed antelope squirrels (*Ammospermophilus leucurus*), woodrats (*Neotoma*), burrowing owls (*Athene cunicularia*), Gambel's quail (*Callipepla gambelii*), rattlesnakes (*Crotalus* spp.), beetles, spiders, and scorpions.

Ravens, kit foxes, badgers, roadrunners, coyotes, and fire ants are all natural predators of the desert tortoise. They prey on eggs, juveniles, which are 2–3 in long with a thin, delicate shell, or, in some cases, adults. Ravens have been determined to be responsible for significant levels of juvenile tortoise predation in some areas of the Mojave

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[53] Ouren, D. S., Hass, C., Melcher, C. P., Stewart, S. C., Ponds, P. D., Sexton, N. R and Zachary H. Bowen, 2007: Environmental effects of off-highway vehicles on Bureau of Land Management Lands. Fort Collins, CO: U.S. Geological Survey, Fort Collins Science Center.

[54] Ennon, J. R., Lovich, J. E., Meyer, K., Bjurlin, C., & Arundel, T. R. 2012: "Nesting ecology of a population of Gopherus agassizii at a utility-scale wind energy facility in Southern California." Copeia, 2, 222-228.

[55] Lovich, J. E., & Ennon, J. R, 2011: "Wildlife Conservation and Solar Energy Development in the Desert Southwest, United States." BioScience, 61(12), 982-992.

[56] Rudnick, D. A., Ryan, S. J., Beier, P., Cushman, S. A., Dieffenbach, F., Epps, C…Trombulak, S.C., 2012: "The role of landscape connectivity in planning and implementing conservation and restoration priorities." Issues in Ecology, Report Number 16. Retrieved from http://www.esa.org/science_resources/issues/FileEnglish/issuesinecology16.pdf

[57] U S Fish and Wildlife Service, 2011: "Biological Opinion on the Desert Sunlight Solar Project, Riverside County, California." Carlsbad Fish and Wildlife Office. Carlsbad, California.

Desert – frequently near urbanized areas. The most significant threats to tortoises include urbanization, disease, habitat destruction and fragmentation, illegal collection and vandalism by humans, and habitat conversion from invasive plant species (*Brassica tournefortii*, *Bromus rubens* and *Erodium* spp.) Desert tortoise populations in some areas have declined by as much as 90% since the 1980s.

The proposed monument offers remote, undisturbed wash and bajada habitat for tortoises, as well as a connectivity link between Joshua Tree National Park, the Chuckwalla Valley, and Mojave Trails National Monument to the north. This habitat corridor is one of the last remaining in the area and is vital to the population's genetic diversity as well as to the ability of desert tortoises to move between large blocks of suitable habitat.

Bighorn sheep

The proposed monument also serves as an important genetic and demographic corridor for desert bighorn sheep (*Ovis canadensis nelsoni*), which is a BLM California Sensitive Species, a State Fully Protected Species, and a State Game Species.[58] One of the most genetically diverse bighorn populations resides in the Eagle Mountains. Research and genetic testing have identified the corridor from the Eagle Mountains across proposed monument lands to the Coxcomb Mountains to be critically important for maintaining connectivity among desert bighorn sheep herds.[59] [60]

Within Joshua Tree National Park, the bighorn sheep population in the Coxcomb Mountains is considered most important to maintaining meta-population connectivity, while those in the Eagle Mountains are second most important. Among all existing bighorn herds in the greater Mojave Desert, both of these populations rank in the top third in terms of importance to bighorn meta-population connectivity.[61] [62] Herds of bighorn sheep currently travel through lands disturbed by the Eagle Mountain Mine, outside the boundaries of the proposed monument. However, the current mining of aggregate near the proposed monument is small in scale with relatively little disturbance to bighorn. A 2010 survey of wildlife in and around the proposed monument conducted to inform the planning for the proposed Eagle Mountain Pumped Storage Hydroelectric Project identified 51 desert bighorn sheep in six different locations.[63]

As with the desert tortoise, one of the most significant threats to desert bighorn sheep is the loss and fragmentation of habitat.[64] Habitat fragmentation has resulted in loss of genetic diversity[65] as well as reductions in fitness and vigor making bighorn sheep more vulnerable to stressors such as disease, drought, and predation. The introduction and spread of pneumonia in bighorn populations to the north of Joshua Tree National Park, with the potential for spread to the park's populations, has added concerns and the need for protecting the viability and

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[58] BLM and [CDFG] California Department of Fish and Game 2002: Northern and Eastern Colorado Desert Coordinated Management Plan and Final Environmental Impact Statement. Available at: http://www.blm.gov/ca/st/en/fo/cdd/neco.html. U.S. Bureau of Land Management, California Desert District, and California Department of Fish and Game, Inland, Desert and Eastern Sierra Region. July 2002.

[59] Creech, T.G., C.W. Epps, R. Monello, and J.D. Wehausen 2014, "Using Network Theory to Prioritize Management in a Desert Bighorn Sheep Metapopulation" Landscape Ecology: 29:605-619.

[60] Epps, Clinton W., John D. Wehausen, Per J. Palsbøll, and Dale R. McCullough, 2010 "Using Genetic Tools to Track Desert Bighorn Sheep Colonizations." Journal of Wildlife Management. 74 (3), 522-531.

[61] Creech *et al*, 2014

[62] Epps, Clinton W., John D. Wehausen, Vernon C. Bleich, Steven G. Torres, and Justin S. Brashares 2007 "Optimizing dispersal and corridor models using landscape genetics." Journal of Applied Ecology. 44.4 (2007): 714-724.

[63] Wildlife Research Institute, Inc. 2011 "Golden Eagle Survey Report for the Joshua Tree National Park in Riverside County, California." Report submitted to park.

[64] Wehausen, J.D. 2006: "Nelson Bighorn Sheep." West Mojave Plan Species Accounts. U.S. Department of the Interior, Bureau of Land Management. January 2006.

[65] Epps, Clinton W., J. Palsbøll, John D. Wehausen, George K. Roderick, Rob R. Ramey II, and Dale R. McCullough 2005 "Highways block gene flow and cause a rapid decline in genetic diversity of desert bighorn sheep." Ecology Letters, (2005) 8: 1029–1038

genetic links between remaining populations so that loss of an individual population to pneumonia does not mean the permanent extirpation of bighorn sheep from that home range. The proposed monument would protect a critical set of those genetic links by protecting migration corridors from further fragmentation.

Research provides evidence of desert bighorn sheep movement within the proposed monument. There are two distinct herds that live in and move through the area: the Eagle Mountain herd and the Coxcomb Mountain herd. Genetic testing has identified the corridor from the Eagle Mountains across the proposed monument to the Coxcomb Mountains to be extremely important for maintaining connectivity among desert bighorn herds within Joshua Tree National Park, the bighorn population in the Coxcomb Mountains is considered most important to maintaining population connectivity, while those in the Eagle Mountains are considered second most important. Among 37 existing bighorn herds in the greater Mojave Desert, both of these populations rank in the top third in terms of importance to bighorn meta-population connectivity.[66] Desert bighorn sheep have been known to use both undisturbed land as well as areas of previous human activity associated with the mining operations. The corridor from the Eagle Mountains to the Coxcomb Mountains, through the proposed monument, is extremely important for maintaining connectivity among desert bighorn herds and maintaining genetic diversity of the population.[67]

Bats

The Lower Colorado River corridor has the highest biological diversity of bat species in the western United States and numerous sensitive bat species are known to occur in the proposed monument. These species all prefer roosting areas associated with caves, cliffs, or rocky outcrop habitat. Foraging habitat for these species exists in desert scrub and desert riparian areas. Bats were found to roost in adits at the Eagle Mountain Mine and were observed near the mill site at the mine. Joshua Tree National Park has a history of installing bat-friendly gates that provide habitat to bats while preventing human access. The bat species potentially present in the proposed monument include: Yuma myotis (*Myotis yumanensis*), California myotis (*Myotis californicus*), long legged myotis (*Myotis volans*), western pipistrelle (*Pipistrellus hesperus*), spotted bat (*Euderma maculatum*), pocketed free-tailed bat (*Nyctinomops femorosaccus*), fringed myotis (*Myotis thysanodes*), western small-footed myotis (*Myotis ciliolabrum*), pallid bat (*Antrozous pallidus*), and California leaf-nosed bat (*Macrotus californicus*).[68] [69]

Eagles and other raptors

Golden eagles are known to nest in the Eagle Mountains, both within the proposed monument and surrounding mountain systems.[70] The BLM has identified three nesting sites on BLM lands within the proposed monument. As part of its FERC filing in 2010, Eagle Crest Energy Company provided results from golden eagle surveys that took place in March and April 2010. The surveys covered mountainous areas within 10 miles of the proposed project. The surveyors located a total of 34 golden eagle nest sites distributed among nine active and five inactive eagle territories in and near the proposed monument. Five golden eagles were seen; other species observed included: common ravens, great horned owls, a long-eared owl, an osprey, prairie falcons, red tailed hawks, Swainson's hawks, and turkey vultures.[71]

Night Sky

The Eagle Mountain area contains resources and values fundamental to the established purpose of Joshua Tree National Park, including dark night skies, and "the lack of artificial light provides an inspiring view of starry

[66] Epps et. al. 2005
[67] Epps et. al. 2005
[68] BLM 2016
[69] FERC 2012
[70] Wildlife Research Institute 2011
[71] Wildlife Research Institute, 2010

nights."[72] Night sky viewing, along with other recreational opportunities such as backcountry hiking and informal camping opportunities could be afforded without requiring extensive infrastructure improvements.[73]

[72] NPS 2016
[73] NPS 2016