

Air Quality and Visibility

The Mojave Desert Air Quality Management District (MDAQMD) manages and enforces the Clean Air Act's air quality standards in the Mojave National Preserve. The district includes the desert portion of San Bernardino County.

Congress established the Prevention of Significant Deterioration program as part of the Clean Air Act. To facilitate the implementation of this program, an area classification scheme was established. This classification scheme has class I receiving the highest degree of protection with only small amounts of certain kinds of additional air pollution (sulfur dioxide and particulate matter) allowed. The other two areas are class II, which allows moderate increases in certain air pollutants; and class III, which allows a large amount of new air pollution (Congress has yet to designate any class III areas). There are no class I areas in the California Mojave Desert. Mojave National Preserve is a class II "floor" area, meaning that it may never be redesignated to class III.

Federal and State Nonattainment Areas

The Clean Air Act developed national ambient air quality standards for a finite number of pollutants called "criteria pollutants." The criteria pollutants are: sulfur dioxide, carbon monoxide, total suspended particulates, nitrogen oxides, lead, ozone, and particulate matter less than 10 microns in diameter (PM₁₀). State of California standards, which are stricter than federal standards, include additional standards for hydrogen sulfide and particulate sulfates.

The Environmental Protection Agency has classified the Mojave National Preserve as a nonattainment area for ozone and PM₁₀ standards. Nonattainment areas are areas that are not in compliance with the National Ambient Air Quality Standards, and therefore must reduce pollution to reach compliance. Nonattainment requirements include reasonable controls on existing stationary sources, most stringent controls on new sources, emission offsets, transportation control plans (including inspection and maintenance), and sanctions for failing to submit a plan.

Pollution Sources

Visibility is probably the most important air quality resource in the desert region, and it is the most easily affected by activities that generate dust (especially fine particulates) and sulfur dioxide. Visibility impacts occur from long-range transport of pollutants from as far away as the San Joaquin Valley and the Los Angeles basin (RESOLVE study 1988, cited in BLM 1995).

Nearby sources of emissions include the Army's National Training Center at Fort Irwin; Viceroy Mine near Searchlight, Nevada; the Mojave Generation Station near Laughlin, Nevada; Molycorp Mine and Stateline Power Generation Station near Primm (Stateline), Nevada; and vehicle traffic on Intestates 15 and 40.

Local pollution sources in the desert consist primarily of particulate matter from off-road vehicles, windblown soil, mining operations, livestock grazing, and agricultural activities. These sources have left certain areas denuded or sparsely vegetated, allowing wind erosion to occur and air quality to suffer and occasionally causing violations of particulate standards at many locations.

Night Sky

The night sky of Mojave National Preserve is dark and offers visitors the chance to enjoy stargazing

mostly untainted by artificial light reflection. However, the northern and southern boundaries are interstate highways. Traffic on these highways and the lights from Baker, Primm, and Laughlin are beginning to have a noticeable adverse effect on the night sky.

Noise

Vehicle noise can be heard in the planning area. For example, the Kelbaker, Kelso-Cima, Morning Star, Ivanpah Roads in the Mojave National Preserve are connectors with I-15 and I-40. About 8,000-11,000 vehicles use these north-south connector roads each month. It is believed that many people using these roads are California residents living south of the preserve (for example, Palm Springs and Twentynine Palms) who use the preserve roads as a short cut to Las Vegas and other areas outside California. The I-15 (north of the Yermo Inspection Station to the Stateline) average daily traffic is between 26,000 and 35,000 vehicles (CalTrans, 1996). Peak northbound traffic along this stretch occurs on holiday eves or Fridays; peak southbound traffic occurs on Sundays.

Vehicle noise is generally not an issue within the preserve in spite of the many and heavily used roads (I-15, I-40, and NPS major paved roads). Because of the preserve's vastness, most areas are well away from traffic and its noise.

Other areas where localized noise occurs are at the Razor Open Area, adjacent to the western boundary of the preserve, the Union Pacific and Santa Fe rail lines, and mining operations.

Overflights

The preserve is within 100 miles of five U.S. Department of Defense facilities having air operations: Fort Irwin Military Reservation, U.S. Naval Weapons Center, China Lake, Marine Corps Air-Ground Combat Center, and Air Force Bases at Edwards and Nellis. Military aircraft from these facilities occasionally use preserve airspace. Although aircraft noise does not appear to affect wildlife, visitors to the area often react adversely to jet noise and sonic booms. In addition, some booms have caused damage to natural and cultural resources (NPS 1988).

Parts of the preserve are within a joint service restricted airspace complex designated as a military operations area (R2508) that permits aircraft to fly at speeds exceeding 250 knots and at altitudes 200 feet above ground level or higher (DOD 1995). The military operations area is used on a daily basis by Navy and Air Force aircraft. Low-level overflights of various military aircraft are occasionally observed in the preserve.

Title VIII of the California Desert Protection Act, 1994, contains the following provision:

Nothing in this Act, the Wilderness Act, or other land management laws generally applicable to the new units of the National Park or Wilderness Preservation Systems (or any additions to existing units) designated by this Act, shall restrict or preclude low-level overflights of military aircraft over such units, including military overflights that can be seen or heard within such units.

Water Resources

Groundwater

Groundwater is found underneath most of the preserve and varies greatly in depth and quality. The Mojave River is the primary subsurface water source for the preserve (BLM 1996). The many groundwater basins in the preserve are recharged from surface and subsurface infiltration. Depletion of

groundwater basins and diminishing water quality are concerns that were expressed at public meetings. Groundwater is the preserve's principal source for desert springs, seeps, and a few ephemeral streams, and its only perennial spring, Piute Creek. The maintenance of groundwater quality and quantity is critical to the survival of desert surface waters and their associated plant and animal life.

There are two major areas of concern for Ivanpah Dry Lake. One is groundwater depletion, as the water is being used to maintain three golf courses and to supply Molycorp's mining operation at Mountain Pass. Water levels in the Ivanpah Dry Lake basin have declined an average of about 2 feet per year for the past 50 years (Molycorp 1996). This depletion did not include the golf courses that were completed in 1996. Molycorp is also proposing to enlarge its mining operations, including a substantial dewatering of new mine pits. This dewatering could cause the springs to go dry in the Clark Mountain segment of the preserve. The other concern is the contamination of Ivanpah Dry Lake's surface and groundwater from Molycorp's legal and illegal mine waste discharges.

Another site near the preserve where the rate of groundwater use appears to exceed normal groundwater recharge is the Castle Mountain Mining Project Viceroy Gold Mine, which is adjacent to the preserve's eastern boundary. At Castle Mountain the average groundwater withdrawal has been over 400-acre feet per year since 1996 (BLM 1997). This mining operation has proposed to continue mining for another 10 years past its present operation, until about 2010 (BLM 1997). Well data has shown a continued drop in water levels, indicating that the withdrawals exceed groundwater recharge.

Other Water Sources

The small springs and seeps in the preserve offer isolated and limited water for plants, wildlife, or domestic or commercial purposes. Some springs produce potable water, but overall water quality is poor because of high dissolved mineral concentrations (BLM 1996). Over 200 springs and seeps have been identified in the preserve (King and Casebier 1981). Many, if not most, have been altered by the installation of retention dams, pipelines, and troughs for livestock use. Most are also available for wildlife and burro use. In the eastern portion of the preserve is a 1-mile perennial stream called Piute Creek. Recorded spring outlet flows (measured monthly since June 1988) have ranged from 21 gallons per minute (gpm) in November 1991 to 58 gpm in December 1993. The average over this time was 42 gpm (Viceroy Gold, 1997). This stream, only perennial stream in the preserve, is an important wildlife water source as well as a popular recreation site.

Some people have said that historic and present mining and cattle ranching have resulted in less water for wildlife consumption being available now than was available about 220 years ago, when the first Europeans entered the Mojave Desert. The literature offers no evidence to support these claims; rather, it indicates that there may be more water now. Accounts from the late 18th and early 19th centuries by Garces and Jediah Smith and from surveys conducted by Thompson for the USGS in the early 20th century indicate that water holes were few and far between. The number of springs and seeps that are now known is far greater than the early inventories recorded by Thompson. With the addition of wells and guzzlers, it may seem that there is more water now than in the past.

Water wells have been drilled primarily for domestic use and livestock needs, but a number of wells have also been drilled for mining use. Viceroy Gold Mine has developed a well field that is adjacent to and within the preserve. This well field is within a 9-square mile area located northwest of the mining site. Viceroy is permitted to pump 725 acre-feet per year, but it has been averaging about 400 acre-feet (about 11 million gallons per month) since 1995 (BLM 1997).

Water wells have been drilled specifically for visitor and administration use at the Mid Hills campground and Hole-in-the-Wall campgrounds.

Water Rights

Initial research on outstanding water rights in the preserve at the State Water Resources Control Board in Sacramento revealed that there are approximately 110 appropriated water rights claims on 97 water sources (springs, seeps, streams, wells) in the preserve. Many of these were obtained by ranchers who lease grazing allotments. See attached Land Protection Plan in Appendix C for a complete list.

Vegetation and Wildlife

Exotic Species

Exotic species can include both plants and animals. They are generally defined as those species that occur in a given place as a result of direct or indirect, deliberate or accidental actions by humans. The exotic species introduced because of such human action would not have evolved with the species native to the place in question and therefore would not be a natural component of the ecological system characteristic of that place. Examples of exotic species in the preserve are wildlife such as burros and chukar and plants like tamarisk and Russian thistle.

Vegetation

Tamarisk, Russian thistle, and introduced annual grasses (from Europe and Asia) are some of the more pernicious exotics within the Mojave National Preserve. These species often out-compete native vegetation, subsequently eliminating or displacing natives and associated native animals. Annual plants such as introduced grasses and Russian thistle often cause an unnatural increase in the amount of dried material available as wildfire fuel.

The tamarisk (*Tamarix ramosissima*) or salt cedar, an introduced shrub or small tree 5 to 20 feet tall, is an opportunistic invader of moist areas. Both the Bureau of Land Management and the National Park Service have ongoing control programs that are attempting to manage this invasive plant. Continuing control is needed to prevent this weedy tree from outcompeting and eliminating native vegetation. A larger, less invasive relative, the athel (*T. Aphylla*), has been planted (typically as a windbreak or sand-break) in a number of locations in the preserve (e.g., near Kelso Depot).

Russian thistle (commonly called tumbleweed) is common in many disturbed areas in Mojave National Preserve, such as at old mining sites and along roadsides.

Introduced annual grasses such as *Bromus* and *Schismus* species are serious pests when mature (Hitchcock and Chase 1971). "The narrow, sharp-pointed minutely barbed florets (or fruits) with their long rough awns work into the eyes, nostrils, and mouths of stock, causing inflammation and offer serious injury" (Hitchcock and Chase 1971). The increase of these grasses throughout much of the arid west is believed to be an important contributing factor in the increase in desert wildfires, which were uncommon at one time.

Animals

Chukar. The Chukar (*Alectoris graeca*), an upland game bird popular among hunters, was first introduced into California (from India) in 1932 (Mallette c.1970). Between 1932 and 1955, more than 52,000 birds were released by the California Department of Fish and Game (Mallette c.1970). The birds prefer rocky open hills and flats. Sightings have been reported from below sea level to above 12,000 feet in the White Mountains and Sierra Nevada. The animal is abundant in parts of the preserve.

Rocky Mountain Mule Deer. The California Department of Fish and Game introduced the Rocky

Mountain mule deer (*Odocoileus hemionus hemionus*) into the New York and Providence Mountains of the preserve in February and March of 1948 from Arizona (Dasmann 1968 and Burke 1997). Nine bucks and 31 does were released. The first authorized hunt of this population was in 1955. The department estimates that about 25 deer are taken per year (Burke 1997). The population has remained relatively stable since the first introduction. Tag returns for buck kills in Northeastern San Bernardino County were 18 animals (see table 8).

Burros. Burros were used little on the Southwest between 1530s, when the Spanish explorers first brought them to North America, until the 1850s, when the discovery of gold in California led to the burro becoming the prospector's principal means of transportation (Douglas and Leslie 1996). When mines played out or when motorized vehicles became the more practical mode of transport, the miners' burros were released into the wild (NPS, 1979).

From about 1920 to the 1960s, burro populations were kept at low levels by government agencies like the National Park Service and by the public by organized and random shooting of the burros. These efforts to reduce or eliminate feral burros from national park lands were park managers' response to the burros damaging park resources and changing the ecological composition at the expense of the park's native biotic communities.

Ecological niches to which Pleistocene equids related do not exist today, and no other animals in the contemporary North American fauna would have the same niche relationships as the modern-day equids, with or without the latter's presence (NRC 1982).

In the 1950s the states of Arizona and California passed burro protection laws that limited the killing of these animals by private citizens. In the late 1960s, Grand Canyon National Park was prevented by public outcry from continuing the 40-year custom of shooting burros (NPS, 1979). In 1971 the Federal Wild Free-Roaming Horse and Burro Act was passed. This act limited the killing of horses and burros on public lands administered by the Bureau of Land Management and the U.S. Forest Service. This law does not apply to NPS lands.

Before the passage of the California Desert Protection Act, the Bureau of Land Management managed 13 herd management areas (HMAs) in the California Desert District. Now the agency manages nine herd management areas, with the four former herd management areas found within, and now managed by NPS units. Of the Bureau of Land Management's nine HMAs, four are outside the NEMO planning area and the other five HMAs about the expanded National Park Service lands. Death Valley National Park and Mojave National Preserve manage burros on lands recently acquired from the Bureau of Land Management at the same population numbers as established by the Bureau of Land Management before the California Desert Protection Act was passed. These management numbers are 297 burros and 9 wild horses for Death Valley and 130 burros for Mojave National Preserve.

The existing population levels for Mojave National Preserve and Death Valley greatly exceed the BLM's management levels. The estimated population is about 1,200 animals in Mojave National Preserve, and at least 400 burros in Death Valley. The current estimate is based on a September 1996 survey (Haley, 1996) that counted approximately 1,400 burros, adjusted to include a typical 15 percent annual population growth and the removal of 600 burros in 1997. Only one part of the preserve is adjacent to a BLM Herd Management Area, the Clark Mountain Herd Management Area. There are no wild horses in Mojave National Preserve. A total of 600 burros were captured and placed for adoption in September 1997. Alternatives for future management strategies are presented in this document.

Clark Mountain is the only HMA adjacent to the preserve. Approximately 45% of this HMA is now within the preserve boundary. The herd management level is 44 burros. The Bureau of Land

Management's October 1996 population estimate is 202 burros.

Table 6: Wild Horse and Burro Population Data for the Planning Area

	Horses	Burros
BLM's Pre-CDPA Management Levels	267	843
Post-CDPA Management Levels (Does not include burros and horses on NPS Land)	247	307
Estimated Population in entire California Desert District (BLM 1996 Population Estimates)	411	2,343
Estimated Death Valley National Park Populations (BLM herd management level)	12 (9)	350-550 (297)
Estimated Mojave National Preserve Populations (BLM herd management level)	0 (0)	1,300 (130)

On February 28, 1995, the superintendents of Death Valley National Park and Mojave National Preserve agreed to an interim management policy for burros on lands formerly managed by the Bureau of Land Management. The policy is to maintain the BLM-approved management levels until a final decision is derived through the formal planning process, which includes the preparation and public review of this document. That level is 130 burros for Mojave National Preserve and 297 burros and 9 wild horses for Death Valley National Park.

The National Park Service estimates that at least 110 burros from Death Valley National Park and 1,100 burros in Mojave National Preserve need to be removed to reach the BLM-approved management levels. Under this interim policy all wild horses and burros removed would be captured and made available for adoption to the public.

Since many of the herd management areas are adjacent to NPS lands, this plan, the Death Valley Draft Environmental Impact Statement / General Management Plan, and the Bureau of Land Management's amendment to the California Desert Conservation Area plan will consider options that are developed with BLM and NPS interagency cooperation for wild horse and burro management in units of the national park system and on lands managed by the Bureau of Land Management.

Species and Habitats of Special Consideration

Within the Mojave National Preserve are confirmed populations or potentially viable habitat for 3 federally endangered, 1 federally threatened, 6 state (California) endangered and 1 state threatened plants and animals. The tables in appendix D reflect the overlap of protective designations for these and a number of endemic species. The tables note additional plants ranked as CNPS 1B and several endemic plant and animal species not formally recognized by agencies as listed or rare.

Listed Species in Mojave National Preserve

Federally listed species known to inhabit the Mojave National Preserve are the desert tortoise (*Gopherus agassizii*) and the Mohave tui chub (*Gila bicolor mohavensis*). Final recovery plans exist for

both of these species. The southwestern willow flycatcher (*Empidonax trailli extimus*) and least Bells vireo (*Vireo bellii pusillus*) are listed birds that could periodically inhabit riparian areas such as Piute Spring but have not been verified to occur in the preserve.

California listed species known to occur in the preserve are the desert tortoise, the Mohave tui chub, and the willow flycatcher (*Empidonax trailli*). The California (or western) yellow-billed cuckoo (*Coccyzus americanus occidentalis*), normally in need of broad riparian cover, may have some, but limited potential to appear in the preserve.

There are no known federally listed or proposed plant species in the preserve. California rare plant species that occur are July gold (*Dedekera eurekensis*) and rock lady (*Maurandya petrophila*).

The species detailed in the text below are designated as federally endangered (FE), federally threatened (FT), federally proposed threatened (FPT), California endangered (CAE), California threatened (CAT), California rare (CA Rare), Nevada critically endangered (NVCE) or Nevada threatened (NVT). Where indicated by a heading of more than one species, discussion is intended to reflect common or closely related habitat needs. Additional information about these and other species of special consideration not discussed below but known or likely to occur within NEMO can be found in appendix D.

Desert Tortoise (*Gopherus agassizii*)-FT, CAT

The range of the desert tortoise includes the Mojave and Sonoran deserts in southern California, Arizona, southern Nevada, the southwestern tip of Utah, and Sonora and northern Sinaloa, Mexico. The Mojave population of the desert tortoise (an administrative designation for animals living north and west of the Colorado River) is listed as a threatened species by the federal government and the State of California. Critical habitat for this species was designated in 1994 (FWS 1994).

The Mojave population of the desert tortoise primarily occupies valleys and bajadas characterized by scattered shrubs. The soils range from sand to sandy-gravel, though caliche soils, desert pavement, and rocky, boulder terrain are occasionally used (FWS 1994). Desert tortoises spend a large portion of the year underground to avoid extreme temperatures and, for younger tortoises, to avoid a variety of predators, such as coyotes, foxes, raptors, and ravens (BLM 1996). Tortoises generally are active during spring, early summer, and autumn when annual plants are most common and daily temperatures are tolerable. Additional activity occasionally occurs during warm weather in winter months and after summer rainstorms (BLM 1996).

As early as the 1970s biologists began to recognize that desert tortoise numbers were declining sharply in many areas. In 1984, the U.S. Fish and Wildlife Service listed the desert tortoise on the Beaver Dam Slope in Utah as a threatened species. The entire Mojave population was listed as a threatened species in 1990 (FWS 1994).

These declines are mainly attributed to direct and indirect human-caused mortality coupled with the inadequacy of existing regulatory mechanisms to protect desert tortoises and their habitat. (FWS, 1994)

Desert tortoise habitat has been destroyed, degraded, and fragmented as a result of urbanization, agricultural development, livestock grazing, mining and roads. The removal of tortoises by humans for pets or for use as food or folk medicine is also a major factor in the decline of the desert tortoise population (FWS 1994). A respiratory disease is an additional cause of desert tortoise mortality and population decline, particularly in the western Mojave desert (FWS 1994).

In June 1994, the U.S. Fish and Wildlife Service released the *Desert Tortoise (Mojave Population) Recovery Plan*, which presented recommended prescriptions for population recovery. Also included in this document are maps of the tortoise's critical habitat and of areas where recovery actions are recommended. These areas are called Desert Wildlife Management Areas (DWMAs). Within the NEMO planning area are the Fenner, Ivanpah, and Piute-Eldorado California Desert Wildlife Management Areas.

The range of the desert tortoise in the NEMO planning area extends from the southern boundary of the preserve north to the southern boundary of Death Valley National Park. About 52% of the preserve is designated as critical habitat for this species. Critical habitat extends north of the preserve into BLM lands in the Shadow Valley north to the southern slope of the Kingston Range. Critical habitat is also found in BLM lands north of Nipton Road up to Ivanpah Dry Lake (FWS 1994).

In April 1994 the U.S. Fish and Wildlife Service issued a "Biological Opinion" for the Bureau of Land Management's interim livestock grazing program in Mojave desert tortoise critical habitat. The FWS opinion concluded that for more than 2½ years the Bureau of Land Management could continue grazing operations under the management prescriptions that were in effect before the *Desert Tortoise Recovery Plan* was published. At the end of the 2½ years the Bureau of Land Management would fully implement the recommendations of the *Recovery Plan*. These operations were not considered likely to result in the destruction or adverse modification of designated critical habitat if the Bureau of Land Management managed grazing according to the FWS prescribed conditions. A portion of the grazing operations covered by the opinion became the responsibility of the National Park Service with the passage of the California Desert Protection Act.

In October 1996, the Bureau of Land Management and the National Park Service requested an extension of the 1994 "Biological Opinion" while this planning process is underway. On March 25, 1997, the U.S. Fish and Wildlife Service released a "Biological Opinion" for the Interim Livestock Grazing Program Proposed by the Bureau of Land Management and National Park Service in Mojave desert tortoise critical habitat (1-5-96-F-296R). This opinion allows time to complete and implement the recommendations made in this report, as well as recommendations arising from the Northern and Eastern Mojave Planning Effort. Within the Eastern Mojave Recovery Unit, the Bureau of Land Management and the National Park Service will continue to operate their grazing programs under terms and conditions described in previously prepared biological opinions (see page 7 of 3/25/97 "Biological Opinion"), and prohibit all off-highway vehicle activity, all clearing of land for agricultural uses, vegetation harvest, and landfill development within the Mojave National Preserve.

Mohave tui chub (*Gila bicolor mohavensis*)-FE, CAE

The Mohave tui chub (*Gila bicolor mohavensis*) is in the minnow family and can reach over 10 inches in length. The Mohave tui chub was listed as an endangered species in 1970 by the U.S. Fish and Wildlife Service. The Mohave tui chub is the only fish native to the Mojave River basin in California. The arroyo chub (*Gila orcutti*) was introduced into the Mojave River system in the 1930s. This exotic chub successfully hybridized with the Mohave tui chub, and by 1970 the latter fish species was believed to have been eliminated by this process of introgression. A small population of (believed) genetically pure Mohave tui chub was found at a small pond (6 feet deep and 9 feet in diameter) at Soda Springs on the western bank of the dry Soda Lake (FWS 1984). Since its rediscovery, populations have been successfully introduced to constructed ponds at Soda Lake, Camp Cady, China Lake Naval Weapons Center, and the Bureau of Land Management's California Desert Information Center in Barstow, California. The total estimated population at these four areas is between 10,000 and 20,000 fish (Mohave tui chub recovery team meeting, November 1996).

The Mohave tui chub is morphologically similar to the Owens tui chub (*G. b. Snyderi*) and the Lahontan tui chub (*G. b. obesa*) (FWS 1984). A genetic study, completed in September 1997, found that the Mohave tui chub is a distinct subspecies (May et al. 1997).

Riparian Dependent Bird Species within NEMO

southwestern willow flycatcher (*Empidonax trailli extimus*)-FE, sp. level CAE

least Bells vireo (*Vireo bellii pusillus*)-FE

California/western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)-CAE

Mesic habitats in the planning area are not noted for high numbers of the riparian obligates listed above (relative to their known ranges), but such habitats do provide a degree of essential foraging and nesting habitat. To date, other than along the Colorado River, the study of the vireo and flycatcher in the desert have been concentrated along the Mojave River. Small numbers of all three species have been confirmed along the Amargosa River and in Death Valley.

In May 1986, *Vireo bellii pusillus* was federally listed. Its critical habitat was designated in February 1994. Endangered status took effect for *Empidonax trailli extimus* in March 1995, and a final determination of critical habitat was made in July 1997. Listing of the willow flycatcher by the state of California is at the species level. Federal recovery planning is underway for both the vireo and flycatcher. There is no critical habitat for either species in Mojave National Preserve.

The western yellow-billed cuckoo, listed by the state of California as endangered since 1988, generally requires a broader stand of riparian growth than the vireo or flycatcher. The loss of riparian habitat is the major common factor influencing the decline of all three species. The cuckoo does not appear to be affected by brood parasitism by the brown-headed cowbird (*Molothrus ater*), which is a severe problem for the vireo and flycatcher. In this behavior, cowbirds introduce their offspring to the nest and care of a host bird species, competing directly with the success of the host's young and sometimes eating or ejecting the host's eggs (Thelander 1994).

Other Rare Plants Within NEMO

Thorne's buckwheat (*Eriogonum ericifolium* var. *thornei*)-CAE

Tecopa bird's beak (*Cordylanthus tecopensis*)-NVT

forked buckwheat (*Eriogonum bifurcatum*)-NVT

Kingston Mountain bedstraw (*Galium hilendiae* ssp. *kingstonense*)-NVT

curved-pod milk-vetch (*Astragalus mohavensis* var. *hemigyris*)-NVCE#

July gold (*Dedeckera eurekaensis*)-CA Rare

rock lady (*Maurandya petrophila*)-CA Rare

A varied complex of habitats in the planning area support the life requirements of several listed and rare plant species. Among those specifically listed above, curved-pod milk-vetch (*Astragalus mohavensis* var. *hemigyris*), July gold (*Dedeckera eurekaensis*) and rock lady (*Maurandya petrophila*) are associated with carbonate soils at least part of the time. Thorne's buckwheat (*Eriogonum ericifolium* var. *thornei*) and Kingston Mountain bedstraw (*Galium hilendiae* ssp. *kingstonense*) thrive

at elevations upward of 4,000 feet in pinyon and juniper woodland. Tecopa bird's beak (*Cordylanthus tecopensis*) and forked buckwheat (*Eriogonum bifurcatum*) are lower elevation species dependent on moist alkaline soils and saline flats and rolling hills, respectively.

Realized or potential threats to these northern and eastern desert plants range from livestock grazing, trampling, mining, vehicle-use, and collection activities, as well as habitat alteration.

Game Animals

Hunting and Trapping

Hunting and trapping (under California Department of Fish and Game regulations) is allowed in the preserve. Hunted game species include mourning doves, quail, chukar, rabbits, bighorn sheep, and mule deer. These game species are not uniformly distributed in the Mojave National Preserve. The bighorn sheep prefer steep, mountainous, open terrain; the Rocky Mountain mule deer's preference is high-elevation Great Basin habitats; and the game birds' habitat of choice is the open desert areas near springs or guzzlers.

Mojave National Preserve is also one of the few places in California where bighorn sheep hunting is allowed. Limited hunting of bighorns began in 1987 (BLM 1988). A limited number of permits to hunt bighorn sheep are issued each year through a lottery system. One other permit in addition to the permits issued by the lottery system is awarded each year to the highest bidder, allowing him/her to hunt one animal.

Torres, et al. in their 1994 paper estimated that the number of bighorn sheep in or near the preserve at between 680 and 1,075 animals or more (Torres, S. G. et al. 1994).

Chukar have been introduced throughout most of the NEMO area. Rocky Mountain mule deer were introduced in the New York Mountains of the preserve in the late 1940s (see "Exotic Species" section).

Table 7: Northeastern San Bernardino County Buck Kill Data

Year	Number of Tags Returned	Year	Number of Tags Returned
1988	29	1992	38
1989	29	1993	43
1990	26	1994	36
1991	28	1995	33
		1996	18

Table 8: Hunting Statistics for San Bernardino County

ANIMAL	1992	1993	1994	1995
Chukar	37,873	15,001	5,007	5,063
Gambel's Quail	25,187	26,314	5,984	15,813
Dove	77,799	45,459	49,461	50,463

Jackrabbit	31,455	48,070	28,089	14,103
Cottontail	25,410	27,889	14,044	7,627
Coyote	3,769	4,144	2,280	1,841
Bobcat	?	?	81	99

From State of California memorandum, May 23, 1996

Table 9: Bighorn Sheep Harvest

Year	Old Dad Unit	Clark Mountain Unit
1987	5	Not Open
1988	5	Not Open
1989	6	Not Open
1990	4	Not Open
1991	5	Not Open
1992	5	2
1993	4	2
1994	4	0
1995	3	0

From personal communication with Vern Bleich, Eastern Units Supervisor, CDFG

Table 10: Bighorn Sheep Populations In or Near Mojave National Preserve

METAPOPULATION*	POPULATION	POPULATION STATUS**	POPULATION SIZE CLASS
Central Mojave	Old Dad/Kelso/Marl	N	201-300
	Granite	N	<25
	Providence	N	25-50
	Wood/Hackberry	N	51-100
	New York	N	<25
	Castle/Hart/Piute	N	<25
	Dead	N	25-50

Central North Mojave	Clark	N	101-150
	Kingston Mesquite	N	101-150
	Nopah	N	51-100
	Soda	E	0
	Avawatz	N	25-50
	Cady ⁺⁺		25-50

Population Range **680-1,075**

From, Torres et al. 1994, "Status of Bighorn Sheep in California, 1993, 1994 Desert Bighorn Council Transactions, pp. 17-28

* Metapopulation = Population management areas

**N = Native R = Reintroduced E = Extirpated

⁺⁺ From T. Egan, pers. comm., 1997

Species Restoration

The National Park Service's policy is to strive to restore native species to parks. See "Alternatives" section for details about restoration policies and programs. Such programs will be carried out in cooperation with other affected agencies, organizations, and individuals.

Any necessary confinement of animals in small fenced areas during restoration efforts will continue only until the animals have become thoroughly accustomed to the new area or they have become sufficiently established to minimize threats from predators, poaching, disease, or other factors (NPS 1988, 4:10 and 11).

The preserve was a former part of the range of at least one extirpated species, the pronghorn antelope (see references below). Subspecies of animal are still extant, but its pre-Columbian distributions have been drastically reduced by the direct result of human action. If at some time in the future a reintroduction of this species was planned, the above criteria would have to be met, along with public involvement and the preparation of a management plan and the necessary environmental compliance documents.

Pronghorn Antelope

The pronghorn antelope's pre-Columbian range included California's Mojave Desert (Sampson and Jaspersin 1963). In June 1862 John Brown reported his hunting of antelope in the vicinity of Marl Spring, which is within the present Mojave National Preserve (King and Casebier 1981). Uncontrolled market hunting (a commercial enterprise that hunted and sold game animals for human consumption) and conflicts with agriculture are thought to have been the major factors in the species' extirpation in many parts of their former range. Farmers and sheep growers are said to have killed large numbers of antelope to conserve their crops and sheep forage. As early as 1854 the antelope hunting season was closed, but market hunters continued their depredations despite the law. Extensive agricultural development replaced much of the antelope's natural habitat. The antelope began to use cultivated

crops as a replacement for their native forage.

Guzzlers (Water Catchments)

A guzzler is a permanent self-filling water catchment. Most are similar to a cistern and are simple, low-maintenance devices that are essentially tanks filled by rain-collecting aprons (Giles 1971). Guzzlers are installed and used to provide water for hunted species in arid areas. Nongame species such as reptiles, songbirds, and insects also use these manufactured devices. Birds enter the covered tank through an opening and walk down a ramp to the water. For bighorn sheep, piping extends from the storage tank to a drinking trough, which has a float valve to regulate the flow.

Game numbers have been increased greatly in parts of the arid West by the use of guzzlers (developed by Ben Glading, California Department of Fish and Game) (Dasmann 1964). Professor Dasmann warned that while the guzzler is functioning, animal numbers should be limited to the area's carrying capacity as "excess numbers of game can easily damage food and cover in areas near water, and in arid lands this damage is long lasting" (Dasmann 1964). This type of damage has been observed in the Mojave Desert near big game guzzlers but not in guzzlers designed for game bird use (McGill, personal communication).

A disadvantage of guzzlers is that dead tortoises are sometimes found in them and the believed cause of death is drowning (Frank Hoover, pers. comm., 1995). In an examination of guzzlers on BLM lands, one in four were found to contain large dead mammals, and one in five were found to contain dead tortoises (McGill, in preparation). McGill further observed that all guzzlers with dead animals in them were constructed of fiberglass. McGill has not observed any animal carcasses in concrete guzzlers. The U.S. Fish and Wildlife Service recommends that "If guzzlers are constructed, they should include fencing or other means to exclude tortoises" and that existing guzzlers should be retrofitted with exclusion devices (FWS 1996). McGill recommends that fiberglass guzzlers be fitted with escape ramps, as he has observed no mortality in these types of guzzlers.

There are more than 100 artificial water impoundments in the preserve including livestock tanks and troughs, six big game and 133 game bird (gallinaceous) guzzlers. The guzzlers were developed by the California Department of Fish and Game, the Bureau of Land Management, and volunteers before the area was designated a national preserve in 1994.

Fire Management

Research began in fiscal year 1998 (FY98) to examine the history of fire and its effects on the natural environment. Results from this research and other information will be used in the developing a fire management plan. Preparation of the plan is scheduled to begin in FY99.

Paleontological Resources

The national preserve area contains a rich and diverse, but fragile and irreplaceable paleontological record. The fossil record in the national preserve is nearly as extensive and complicated as the geological record. Much of the area's geology is exceptionally well exposed. Soil development has been greatly retarded throughout much of the area, and the outstanding exposures of geological features support an equally notable exposure of fossil remains. These organisms have value as (1) stratigraphic indicators for correlation of deposits containing them and for determination of relative geologic age, (2) records of past life forms showing the course of evolutionary trends of plants and animals, and (3) evidence of changing paleoenvironments.

A literature and records search was completed for the national preserve area by Robert E. Reynolds, Curator, Earth Sciences, San Bernardino County Museum, Redlands, California. The records and literature search identified a number of potentially sensitive fossiliferous areas in the planning area. Significant paleontological resources and records relating to paleobiostratigraphic events that occur within or near the national preserve are as follows:

The world's oldest mitosing cells, 990 million years old, are preserved in silica in the Beck Spring Formation.

Significant Cambrian trilobite and invertebrate fossil localities mark the boundary of the Paleozoic Era, 550 million years of age.

The only dinosaur tracks in California and the only record of Jurassic dinosaurs in California are in the Mescal Range north of the Mojave National Preserve.

Early records of crustal extension and breakup that occurred 24 million years ago to form basins in the Mojave Desert are found in or near the national preserve. Significant occurrences of fossils, including rhinoceros, camel, canid, felid, bird track, and plant, are located in the Ship Mountains, Little Piute Mountains, Hackberry Mountains, Castle Mountains, Lanfair Valley, and Wild Horse Mesa in or near Mojave National Preserve.

There are significant Plio-Pleistocene fossil localities, which are being damaged by erosion and amateur collecting, at Valley Wells and Kingston Wash.

Cave deposits in the Mescal Range have produced significant vertebrate fossils.

Cave Resources

There are significant limestone caverns in the preserve that are found within the Providence Mountains State Recreation Area, which is operated by the California Department of Parks and Recreation. The Mitchell Caverns Natural Preserve was established in 1954 to protect and interpret two caves connected by a man made tunnel. The 97 acre-Mitchell Caverns Natural Preserve is within the larger 5,890-acre Providence Mountains State Recreation Area. The developed cave area consists of two small, but well decorated caves. A tunnel connected the two caves, known as El Pavika and Tecopa, in 1968. The caves contain areas of interesting speleothems, provide roost area for at least two species of bats (one of which is *Plecotis townsendii*), and may hold archeological material in the entrance areas.

Cave of the Winding Stair is a small but deep cave in the recreation area, open by permit to experienced vertical cavers. Several other small and unsurveyed caves exist with the local area. Very little is known about these caves and a comprehensive inventory is needed.

The Lava Beds area of Mojave is also known to contain at least one lava tube. This cave has a constructed ladder at the entrance. Other tubes may occur, but a comprehensive inventory has not been completed.