5.0 HUMAN USE OF THE PRESERVES

5.1 OVERVIEW

Human use of preserves refers to the various activities that humans undertake on a preserve that may have a negative impact on natural resources. These activities primarily include certain types of outdoor recreation described below (e.g., off road vehicles, encampments, shooting, trail use), but also agriculture, some types of reserve management activities (e.g., disking soils, creating fire breaks), and biological surveys, which can all lead to the unintentional spread of invasive plant species. Additionally, humans have intentionally released nonnative species on or adjacent to Conserved Lands (e.g., pigs) that have resulted in significant impacts to MSP species.

Participation in outdoor recreation and the rates of visitation to protected areas are increasing rapidly in the United States (Cordell 2008) and around the world (Balmford et al. 2009). While outdoor recreation is often thought to be compatible with species protection (Reed and Merenlender 2008), there is a growing awareness that even quiet, nonconsumptive recreational activities, such as hiking and wildlife viewing, can affect the distribution and abundance of certain species within protected areas (Reed et al. 2014). Recreation activity has been linked to declines in wildlife species occupancy, changes in spatial or temporal habitat use (George and Crooks 2006; Cardoni et al. 2008), increased physiological stress (Arlettaz et al. 2007), reduced reproductive success (Finney et al. 2005), and behavioral effects such as increased vigilance and flight (Taylor and Knight 2003). Thus, certain types of recreational activities may not be compatible with achieving species conservation goals in the preserves. A growing body of research demonstrates the negative impacts of outdoor recreation on plant and animal communities (Liddle 1997), with recreation the second-leading cause of endangerment to species on U.S. federal lands (Losos et al. 1995). California has the greatest number of listed species threatened by recreation (Czech et al. 2000).

While the impacts from human use in preserve systems can be alarming, outdoor recreation does have many health (Frumkin 2001) and economic benefits (Goodwin 1996). Due to this, it is important that land and wildlife managers find the balance between the benefits of outdoor recreation and its potentially negative effects on species and habitat (Reed et al. 2014). When considering the impacts from recreation, the most important factors are amount of use, type and behavior of

use, timing of use, resistance and resilience of the environment, and the spatial distribution of use (Cole 2004).

In San Diego, key objectives of the MSCP and MHCP preserves are to provide passive recreation and educational opportunities, while providing adequate protection for biological resources (The City of San Diego et al. 1998; AMEC Earth & Environmental, Inc. et al. 2003). The plans allow riding and hiking trails within appropriate portions of the preserves to provide passive recreational opportunities for the public. Other passive activities such as photography, bird watching, scientific research, and public education programs are also encouraged. However, excessive or uncontrolled access can result in habitat degradation through trampling and erosion (e.g., along trails) and the disruption of breeding and other critical wildlife functions at certain times of the year. Passive recreational activities (e.g., hiking, bird watching) are generally compatible with the plans' conservation goals. In general, passive activities pose a significant threat to biological resources when the level of recreational use becomes too intense or in areas of sensitive resources.

Therefore, enforcement programs are needed to ensure compliance with land use plans and restrictions to ensure that recreational uses are compatible with preserve goals. Preserve owners and managers should continue providing public education programs to explain open space conservation goals, the natural resources protected, and the regulations in the area (The City of San Diego et al. 1998).

5.1.1 Off-Road Vehicles

The large increase in use of off-road vehicles (ORVs) since the 1960s has generated concern over the negative environmental effects (Baldwin and Stoddard 1973; Brander 1974; Webb and Wilshire 1983, all cited in Boyle and Samson 1985). Recent studies in the Southwest have demonstrated severe effects of ORVs on wildlife of arid regions through direct mortality, harassment, noise, and habitat destruction (Webb and Wilshire 1983, cited in Boyle and Samson 1985). ORV use has been linked with population declines of the desert tortoise and Couch's spadefoot in California (Berry 1980; Bury 1980, both cited in Boyle and Samson 1985). Other studies have shown decreases in density and diversity of desert birds and mammals where use of ORV use was extensive (Busack and Bury 1974; Bury 1978; Luckenbach 1978). Additional adverse effects from ORVs include reductions in air quality due to automotive exhaust and creation of dust, soil erosion and sedimentation into local waters, petrochemical pollutants entering watersheds, transporting and dispersing

exotic weed seeds, and illegally dumping trash (Dillingham and Miner 2009). Disturbance from ORVs can also disrupt breeding activities.

Due to the numerous negative impacts from ORVs, they are banned from many preserves in the MSPA. In North County, the MHCP prohibits the use of ORVs. In the South County, ORV use is incompatible with preserves and linkages in the MSCP, except on designated roads and as provided for in the subarea plans.

5.1.2 Encampments

Transients and migrant workers sometimes maintain shelters and living areas illegally within habitat areas (AMEC Earth & Environmental, Inc. et al. 2003). Such living areas have a detrimental effect on native vegetation and wildlife use, including an increase in refuse, poaching of wildlife, increased fires, and raw sewage disposal that can pollute water resources. The volume of refuse generated attracts black rats, which contribute to the decline of native rodent populations. Scattered living areas are difficult to control, but villages of transients are incompatible with the preserve areas and linkages and should be removed (AMEC Earth & Environmental, Inc. et al. 2003) in collaboration with local law enforcement and public welfare agencies.

5.1.3 Shooting

The noise of shooting is known to cause animals to flee from an area and change behavior (Anderson 1995). Birds in particular may break flight formation and become disorganized (Wiseley 1974; Anderson 1995). There are also instances where the sound from shooting has caused geese to fly up and hit transmission lines, buildings, or windows as they try to escape the noise (Anderson 1995). Shooting and other human-caused noise also can cause animals to avoid habitats.

Shooting in the South County has the potential to start fires. Other impacts from recreational target shooting can include destruction of native vegetation; disturbance to wildlife; visual disturbance from natural objects destroyed and landscapes scarred; and visual disturbance from the targets, shells, and ammunition left behind (Tuell 2016). When irresponsible shooters use electronics as targets, they can leave behind cadmium, arsenic, selenium, and mercury. These heavy metals persist in the soil and can contaminate surface or subsurface water.

While lead ammunition is severely restricted in California, a full ban on lead ammunition will not take place until July 1, 2019, as phase 3 of Assembly Bill 711

(CDFW 2016) wraps up. Numerous studies have documented the adverse effects of lead exposure to waterbirds and scavenger species, like eagles and hawks, as well as reptiles and small mammals near shooting ranges (Live Science Staff 2008). Lead poisoning causes behavioral, physiological, and biochemical effects, and often death. Spent ammunition can also slowly dissolve and enter the groundwater, negatively impacting plants, animals, and even people if it enters a water body or is taken up by plants used for consumption.

5.1.4 Trail Use

Trails in the MSPA are used for various types of nonconsumptive recreational activities, including walking, running, biking, wildlife viewing, and equestrian riding. While certain recreation activities are permissible on the preserves, they are not without impacts to native flora and fauna. Trail creation alters the microclimate of the ecosystem, which can lead to decreased nesting near trails; altered bird species composition near trails; and increased nest predation by cowbirds, skunks, raccoons, and foxes using the clearings as corridors (Jordan 2000).

Recreation activities have immediate and long-term impacts on wildlife, with exposure to recreational activities particularly high in urban systems (George and Crooks 2006). A George and Crooks (2006) study assessed activity for bobcat, coyote, mule deer, humans, and domestic dogs along paths in the Nature Reserve of Orange County. In this reserve, the probability of detecting deer during the day was lower with increasing levels of human recreation. Results also suggested that bobcats, and to a lesser degree coyotes, exhibited both spatial and temporal displacement in response to human recreation. Bobcats were detected less frequently and appeared to shift their activity patterns to become more nocturnal in areas with high human use.

Behavioral changes in animals in response to recreation may also include increased time spent vigilant and decreased time resting and foraging; as was the case for caribou in a Canadian ecotourism study (Duchesne et al. 2000). Besides changes in activity patterns, recreation can impact density and community composition of wildlife. In a Reed and Merenlender study (2008), they determined that the presence of dispersed, nonmotorized recreation led to a 5-fold decline in the density of native carnivores and a substantial shift in community composition from native to nonnative species. Results from a Boulder County study suggest that recreational trails may also affect habitat selection of some raptor species in grassland ecosystems (Fletcher Jr. et al. 1999).

High levels of human activity can also impact an animal's alert distance as a Cooper et al. study revealed. They determined that eastern grey squirrels in areas of low human activity had much shorter alert distances than those with high human use (Cooper et al. 2008). However, some animals may simply avoid the areas in and around the trail system due to human use of preserves. This appeared to be the case for pronghorn antelope in Antelope Island State Park, where antelope distanced themselves from the trails following the introduction of human recreation. Over a 3-year trail study, there appeared to be no habituation to recreational users (Fairbanks and Tullous 2002).

While hiking, walking, and jogging may be popular recreational activities in preserves, mountain biking and equestrian riding are additional uses allowed in certain preserves. Mountain biking can impact the habitat and wildlife in ways unlike hiking. Trampling is a major concern for mountain biking that may occur off-trail and when on developed trails, erosion is a major concern. Since mountain bikes travel more swiftly and silently then other forms of recreation, they can have a more pronounced impact on certain animals due to the 'sudden encounter' effect (Chernoff and Quinn 2010). Compared to hikers and runners, horses cause greater compaction of the soil and leaf litter (Dawson et al. 1974; Whittaker 1978). Horses were also found to destroy 8 times as much cover and created an order of magnitude more bare ground than hikers (Nagy and Scotter 1974, cited in Jordan 2000). Additionally, horse manure can be a dispersal mechanism for exotic species in nature preserves (Benninger 1989, cited in Jordan 2000).

Dogs are often brought on trails by humans either on-leash or off-leash. In a Boulder County open space study, in areas that allowed dogs, deer activity was decreased within 100 meters of trails, twice the distance of deer on trails with recreational activity without dogs (Lenth et al. 2006). In addition to mule deer, a Miller et al. study (2001) found sparrows (*Pooecetes gramineus*), western meadowlarks (*Sturnella neglecta*), and American robins (*Turdus migratorius*) all showed elevated sensitivity and flushing distances when dogs accompanied hikers, particularly when off-trail.

5.1.5 Biological Surveys

Human use in the preserves by organizations conducting species and vegetation monitoring and use of preserves by the public can contribute to invasive species spread. Seeds on clothing and shoes can be left in native habitat and aid invasive species in spreading to previously unoccupied areas. Additionally,

walking/biking/riding through areas with biologically active soils can disturb the soil crust and provide an invasion opportunity for invasive species from adjacent areas.

5.2 RESULTS OF HUMAN USE STUDIES IN THE MSPA

An increasing number of studies and projects address human use of the preserves in the MSPA. The results and progress of a few of these studies are summarized below, with full descriptions provided in Table V2B.5-1.

Beginning in 2010, the County of San Diego Sheriff's Department and CDFW wardens participated in an Open Space Enforcement Program, funded by SANDAG, to implement an aggressive multi-agency enforcement effort for conservation and management of open space. Goals of the project were to prevent and reduce habitat damage, prevent take of MHCP and MSCP "covered species," reduce preserve management and remediation costs, and support volunteer patrol activities on preserves. This pilot program was viewed as a success by land managers and SANDAG and was continued through 2015.

Several projects funded by TransNet Environmental Mitigation Program (EMP)7 grants resulted in the installation of a steel vehicle barrier in concrete footings with gates along Proctor Valley Road in Jamul. The goal was to prevent trespass by ORVs and prevent the further degradation of sensitive habitats on the property. This Proctor Valley parcel is owned and managed by the City of San Diego Public Utilities Department, and is part of the larger USFWS San Diego National Wildlife Refuge. The barrier was continued through an additional TransNet grant by CDFW and the California Wildlife Foundation. This vehicle barrier has allowed the native habitat to recover and a vernal pool restoration project is now underway.

The City of San Diego Department of Park and Open Space conducted an access study specifically aimed at documenting patterns and trends in use of both open and closed trails within the Del Mar Mesa Preserve. Information from the study directed management and enforcement activities by highlighting problematic areas and periods of highest use. Data showed that increased enforcement resulted in a change in use of closed trails before and after enforcement. Additionally, illegal mountain bikers were the highest user type pre-intervention, but they were no higher than other user groups post-intervention.

[7] Go to www.keepsandiegomoving.org for more information on the *TransNet* EMP.

Table V2B.5-1. Summary of relevant studies on Human Use of Preserves.

Topic/Species	Publication(s)	Summary
Open Space Enforcement Program	San Diego Sheriff's Department Off-Road Enforcement Team, CDFW	An Open Space Enforcement Program to coordinate and implement an aggressive multi-agency enforcement effort for conservation and management of open space in the region. Goals of the project were: (1) Prevent/reduce habitat damage, (2) Reduce/prevent take of MHCP and MSCP "covered species," (3) Reduce preserve management and remediation costs, and (4) Support volunteer patrol activities on preserves. The Off-Road Enforcement Team will provide increased technical and administrative law enforcement services, via overtime from County of San Diego Sheriff's Department and California Department of Fish and Wildlife Game Wardens, to reduce negative impacts on the environment.
Off-road Vehicle Barrier Project Proposal for Proctor Valley Road	CDFW, (City of San Diego Public Utilities Dapartment 2011)	Several TransNet EMP grant projects to prevent trespass by off-road vehicles and the further degradation of sensitive habitats managed by the California Department of Fish and Wildlife and San Diego Public Utilities Department within Proctor Valley. Grant funding led to the installation of steel vehicle barriers in concrete footings with gates along Proctor Valley Road in Jamul. The Chaparral Lands Conservancy also used TransNet grant funds to complete the fencing on private lands where there was a gap between public land parcels.
Access Study Plan for Del Mar Mesa Open Space	City of San Diego	An access study specifically aimed at documenting patterns and trends in use of both open and closed trails within the Del Mar Mesa Preserve. Information from this study directed management and enforcement activities by highlighting problematic areas and periods of highest use. The study also determined that increased enforcement resulted in a change in use of closed trails before and after enforcement. Trail use during and after enforcement was significantly different than the use pre-enforcement. Additionally, illegal mountain bikers were the highest user type pre-intervention, but they were no higher than other user groups post intervention.
Wildlife Response to Human Recreation on NCCP Reserves in San Diego County	Reed et al. 2014	An applied research project to complement existing species and habitat monitoring efforts in San Diego County. The study developed a program to assess the possible effects of human recreation on wildlife populations. Specific objectives were to: (1) Develop recommendations for research studying the effects of recreation on wildlife species; and (2) Test methods for monitoring recreation and complete a pilot field study. First, researchers implemented a systematic review of studies examining the impacts of recreation on wildlife, in

Topic/Species	Publication(s)	Summary
		order to assess what has been studied and where knowledge gaps remained, which species are particularly vulnerable, and what types of effects are the most prevalent. Second, they acquired and augmented a GIS database to facilitate field site selection and spatial analysis. They worked with SDMMP staff members to select 51 reserves for the expert opinion survey and 18 reserves for the pilot field study. Third, they conducted an expert opinion survey to assess relative levels of visitation to a subset of NCCP reserves. Fourth, they implemented a pilot field study to test methods for monitoring recreation visitation and provide a more precise quantitative estimate of actual visitation rates at 18 NCCP reserves. They found that remotely-triggered cameras were the most efficient and cost-effective technique for counting visitors to reserves. They provided recommendations for a research design to study potential impacts of recreation on wildlife species in NCCP reserves and next steps for communicating the results of the project to scientists, land and wildlife managers, and the public.

A Reed et al. (2014) study developed a program to assess the possible effects of human recreation on wildlife populations. Researchers implemented a systematic review of studies examining the impacts of recreation on wildlife. They acquired and augmented a GIS database to facilitate field site selection and spatial analysis. Researchers worked with SDMMP staff members to select 51 reserves for the expert opinion survey and 18 reserves for the pilot field study. Lastly, they implemented a pilot field study to test methods for monitoring recreation visitation and provide a more precise estimate of visitation rates at 18 NCCP reserves. They found that remotely triggered cameras were the most efficient and cost-effective technique for counting visitors. From their assessment, they provided recommendations for a research design to study potential impacts of recreation on wildlife species in NCCP reserves, as well as recommendations for communicating the results of the project to scientists, land and wildlife managers, and the public.

5.3 MANAGEMENT AND MONITORING APPROACH

The goal for managing human use of preserves is to understand and reduce the impacts of human uses on Conserved Lands where human use is reducing the population levels and/or viability of MSP species populations. The approach for managing human use of the preserves is divided into 2 parts: general and species-specific. General objectives focus on supporting research and enforcement programs across the MSPA. Species-specific objectives have been developed for those MSP species identified as at highest risk from loss due to human use in the preserves, and for which specialized objectives are required to ensure their persistence in the MSPA.

In addition to the MSP Roadmap general and species-specific objectives, the MHCP has preserve management recommendations for various recreation types. The MHCP prohibits recreational activities that require the construction of new facilities or roads. When new trail construction is required, design standards should address the avoidance of sensitive species, unique habitats, wildlife corridors, erosion control, and access to major features. Preserve managers should also construct trails to any prominent features or viewpoints that are likely to attract hikers, thereby preventing extensive trampling and compaction.

5.3.1 General Approach Objectives

The general approach for managing the human use in the preserves is to continue supporting recreation research and jurisdictions that are developing enforcement programs, as described below. For the most up-to-date goals, objectives, and

actions, go to the MSP Portal Human Use summary page: http://portal.sdmmp.com/view_threat.php?threatid=TID_20160304_1452.

5.4 CONTINUE SUPPORTING ONGOING RECREATION RESEARCH

As the Reed et al. (2014) study highlighted, there are still knowledge gaps surrounding the topic of human use and wildlife. The second phase of the recreation and wildlife study led by researchers at Colorado State University and the Wildlife Conservation Society began in 2016. To ensure that the conservation community makes sound decisions involving human use of the preserves, it is important to support the continuing research on recreation and its impacts on wildlife.

5.5 SUPPORT JURISDICTIONS TO DEVELOP AND IMPLEMENT ENFORCEMENT PROGRAMS

As more humans use the preserves, both legally and illegally, it is important to have more enforcement programs in place to protect the preserves. Jurisdictions should be supported as they develop and implement enforcement programs.

5.6 IMPLEMENT BIOSECURITY MEASURES

Biosecurity measures to prevent the spread of invasive species will be developed as part of the invasive plant and invasive animal strategies. These measures should be included in biological surveys and management actions where appropriate.

Restrict Recreation Uses

Depending on the preserve, passive recreation can be a popular use of the preserve, bringing in hundreds of visitors a day during peak days. To limit the impacts of the passive recreation, preserve managers should limit or restrict passive uses within IMAs and/or significant occurrences of MSP species during the breeding season for animals and peak growing season for plants. They should also work to minimize adverse effects of passive recreation, such as trampling vegetation and erosion. Litter control measures, such as closed garbage cans and recycling bins, should be provided at preserve access points.

Establish Recreational Area Patrols

It is important that visitors to the preserves stay on designated trails and out of sensitive habitat. To ensure this, when possible, managers should establish a recreational area patrol to regulate use of the preserve. Patrol groups could also take note of any unauthorized uses in the preserve, including homeless camps, ORV use, trash dumping, illegal trails, and vandalism. Unauthorized use has been documented to cause habitat and species impacts and is more often documented as occurring close to urban areas. Enforcement actions focused at reducing unauthorized use of preserves have been implemented on some preserves and additional monitoring (camera traps, citizen patrols, etc.) would help focus enforcement and education efforts to reduce impacts.

5.6.1 Species-Specific Approach Objectives

The impacts of human use in the preserves on rare and endemic species can vary widely. Some native species may not be impacted at all by human use, while other rare and endemic species are disproportionately affected. Species for which human use goals and objectives have been identified as part of their management and monitoring approach are identified in Table V2B.5-2. Use the MSP Portal for the most updated list of species with Human Use of Preserves objectives.

Table V2B.5-2. MSP plant and animal species with specific human use management and monitoring objectives.

	Scientific Name	Common Name	Management Category	Summary Page Link
Plants				
	Acanthomintha ilicifolia	San Diego thorn-mint	SO	https://portal.sdmmp.com/view_species.php?taxaid=32426
	Acmispon prostratus	Nuttall's acmispon	SO	https://portal.sdmmp.com/view_species.php?taxaid=820047
	Agave shawii var shawii	Shaw's agave	SL	https://portal.sdmmp.com/view_species.php?taxaid=810342
	Ambrosia pumila	San Diego ambrosia	SO	https://portal.sdmmp.com/view_species.php?taxaid=36517
	Aphanisma blitoides	Aphanisma	SL	https://portal.sdmmp.com/view_species.php?taxaid=20679
	Atriplex coulteri	Coulter's saltbush	VF	https://portal.sdmmp.com/view_species.php?taxaid=20523
	Atriplex parishii	Parish brittlescale	VF	https://portal.sdmmp.com/view_species.php?taxaid=20554
	Baccharis vanessae	Encinitas baccharis	SO	https://portal.sdmmp.com/view_species.php?taxaid=183764
	Bloomeria clevelandii	San Diego goldenstar	SS	https://portal.sdmmp.com/view_species.php?taxaid=509575
	Brodiaea filifolia	Thread-leaved brodiaea	SS	https://portal.sdmmp.com/view_species.php?taxaid=42806
	Brodiaea orcuttii	Orcutt's brodiaea	SO	https://portal.sdmmp.com/view_species.php?taxaid=42815
	Brodiaea santarosae	Santa Rosa brodiaea	SS	https://portal.sdmmp.com/view_species.php?taxaid=810190
	Centromadia parryi ssp. australis	Southern tarplant	VF	https://portal.sdmmp.com/view_species.php?taxaid=780715
	Chloropyron maritimum ssp. maritimum	Salt marsh bird's-beak	SL	https://portal.sdmmp.com/view_species.php?taxaid=834234

Scientific Name	Common Name	Management Category	Summary Page Link
Chorizanthe orcuttiana	Orcutt's spineflower	SL	https://portal.sdmmp.com/view_species.php?taxaid=21019
Clinopodium chandleri	San Miguel savory	SL	https://portal.sdmmp.com/view_species.php?taxaid=565077
Cylindropuntia californica var. californica	Snake cholla	VF	https://portal.sdmmp.com/view_species.php?taxaid=913470
Deinandra conjugens	Otay tarplant	SS	https://portal.sdmmp.com/view_species.php?taxaid=780273
Dicranostegia orcuttiana	Orcutt's bird's-beak	SL	https://portal.sdmmp.com/view_species.php?taxaid=834156
Dudleya blochmaniae	Blochman's dudleya	SL	https://portal.sdmmp.com/view_species.php?taxaid=502165
Dudleya brevifolia	Short-leaved dudleya	SL	https://portal.sdmmp.com/view_species.php?taxaid=502166
Dudleya variegata	Variegated dudleya	SS	https://portal.sdmmp.com/view_species.php?taxaid=502182
Dudleya viscida	Sticky dudleya	SS	https://portal.sdmmp.com/view_species.php?taxaid=502185
Ericameria palmeri ssp. palmeri	Palmer's goldenbush	VF	https://portal.sdmmp.com/view_species.php?taxaid=527914
Eryngium aristulatum var. parishii	San Diego button-celery	VF	https://portal.sdmmp.com/view_species.php?taxaid=528066
Erysimum ammophilum	Coast wallflower	SL	https://portal.sdmmp.com/view_species.php?taxaid=22928
Euphorbia misera	Cliff spurge	VF	https://portal.sdmmp.com/view_species.php?taxaid=28104
Ferocactus viridescens	San Diego barrel cactus	VF	https://portal.sdmmp.com/view_species.php?taxaid=19801
Hazardia orcuttii	Orcutt's hazardia	SL	https://portal.sdmmp.com/view_species.php?taxaid=502882
Lepechinia cardiophylla	Heart-leaved pitcher sage	SL	https://portal.sdmmp.com/view_species.php?taxaid=32553
Monardella viminea	Willowy monardella	SL	https://portal.sdmmp.com/view_species.php?taxaid=833060

	Scientific Name	Common Name	Management Category	Summary Page Link
	Navarretia fossalis	Spreading navarretia	VF	https://portal.sdmmp.com/view_species.php?taxaid=31328
	Nolina cismontana	Chaparral nolina	SL	https://portal.sdmmp.com/view_species.php?taxaid=507567
	Orcuttia californica	California orcutt grass	SL	https://portal.sdmmp.com/view_species.php?taxaid=41970
	Packera ganderi	Gander's ragwort	SO	https://portal.sdmmp.com/view_species.php?taxaid=565357
	Pogogyne abramsii	San Diego mesa mint	VF	https://portal.sdmmp.com/view_species.php?taxaid=32639
	Pogogyne nudiuscula	Otay mesa mint	SL	https://portal.sdmmp.com/view_species.php?taxaid=32643
	Rosa minutifolia	Small-leaved rose	SS	https://portal.sdmmp.com/view_species.php?taxaid=504824
	Tetracoccus dioicus	Parry's tetracoccus	SS	https://portal.sdmmp.com/view_species.php?taxaid=28420
Invertebrates				
	Branchinecta sandiegonensis	San Diego fairy shrimp	SL	https://portal.sdmmp.com/view_species.php?taxaid=624043
	Euphydryas editha quino	Quino checkerspot butterfly	SL	https://portal.sdmmp.com/view_species.php?taxaid=779299
	Lycaena hermes	Hermes copper	SL	https://portal.sdmmp.com/view_species.php?taxaid=777791
	Panoquina errans	Wandering skipper	VF	https://portal.sdmmp.com/view_species.php?taxaid=706557
	Streptocephalus wootoni	Riverside fairy shrimp	SL	https://portal.sdmmp.com/view_species.php?taxaid=624020
Amphibians				
	Anaxyrus californicus	Arroyo toad	SO	https://portal.sdmmp.com/view_species.php?taxaid=773514
	Spea hammondii	Western spadefoot toad	VF	https://portal.sdmmp.com/view_species.php?taxaid=206990

	Scientific Name	Common Name	Management Category	Summary Page Link
Reptiles				
	Emys pallida	Southwestern pond turtle	SL	https://portal.sdmmp.com/view_species.php?taxaid=668677
	Phrynosoma blainvillii	Blainville's horned lizard (Coast horned lizard, San Diego horned lizard)	VF	https://portal.sdmmp.com/view_species.php?taxaid=208819
Birds				
	Agelaius tricolor	Tricolored blackbird	SL	https://portal.sdmmp.com/view_species.php?taxaid=179060
	Aquila chrysaetos canadensis	Golden eagle	SO	https://portal.sdmmp.com/view_species.php?taxaid=175408
	Athene cunicularia hypugaea	Western burrowing owl	SL	https://portal.sdmmp.com/view_species.php?taxaid=687093
	Charadrius nivosus nivosus	Western snowy plover	SL	https://portal.sdmmp.com/view_species.php?taxaid=824565
	Circus cyaneus	Northern harrier	SO	https://portal.sdmmp.com/view_species.php?taxaid=175430
	Empidonax traillii extimus	Southwestern willow flycatcher	SL	https://portal.sdmmp.com/view_species.php?taxaid=712529
	Passerculus sandwichensis beldingi	Belding's savannah sparrow	VF	https://portal.sdmmp.com/view_species.php?taxaid=179325
	Polioptila californica californica	Coastal California gnatcatcher	VF	https://portal.sdmmp.com/view_species.php?taxaid=925072
	Rallus obsoletus levipes	Light-footed Ridgway's rail	SO	https://portal.sdmmp.com/view_species.php?taxaid=176211

	Scientific Name	Common Name	Management Category	Summary Page Link
	Sternula antillarum browni	California least tern	SO	https://portal.sdmmp.com/view_species.php?taxaid=825084
	Vireo bellii pusillus	Least Bell's vireo	SO	https://portal.sdmmp.com/view_species.php?taxaid=179007
Mammals				
	Antrozous pallidus	Pallid bat	SL	https://portal.sdmmp.com/view_species.php?taxaid=180006
	Lepus californicus bennettii	San Diego black-tailed jackrabbit	VF	https://portal.sdmmp.com/view_species.php?taxaid=900973
	Plecotus townsendii pallescens	Townsend's big-eared bat	SO	https://portal.sdmmp.com/view_species.php?taxaid=203457
	Puma concolor	Mountain lion	SL	https://portal.sdmmp.com/view_species.php?taxaid=552479
Vegetation Communities				
	Salt Marsh			https://portal.sdmmp.com/view_species.php?taxaid=SDMMP_vegcom_6
	Torrey Pine Forest			https://portal.sdmmp.com/view_species.php?taxaid=SDMMP_vegcom_8
	Vernal Pool/Alkali Playa			https://portal.sdmmp.com/view_species.php?taxaid=SDMMP_vegcom_4

5.7 HUMAN USE OF PRESERVES REFERENCES

AMEC Earth & Environmental Inc, Conservation Biology Institute, Onaka Planning & Economics, and The Rick Alexander Company. 2003. Final MHCP Plan.

Anderson, S. 1995. Recreational Disturbance and Wildlife Populations. In *Wildlife and Recreationists: Coexistence Through Management and Research*, 157–68. Island Press.

Arlettaz, R., P. Patthey, M. Baltic, T. Leu, M. Schaub, R. Palme, and S. Jenni-Eiermann. 2007. Spreading Free-Riding Snow Sports Represent a Novel Serious Threat for Wildlife. *Proceedings of the The Royal Society B: Biological Sciences* 74:1219–24. DOI:10.1098/rspb.2006.0434.

Baldwin, M. F., and D. H. Stoddard. 1973. *The Off-Road Vehicle and Environmental Quality*. Second. Washington D.C.: The Conservation Fund.

Balmford, A., J. Beresford, J. Green, R. Naidoo, M. Walpole, and A. Manica. 2009. A Global Perspective on Trends in Nature-Based Tourism. *PLoS Biology* 7(6):1–6. DOI:10.1371/journal.pbio.1000144.

Benninger, M. C. 1989. Trails as Conduits of Movement for Plant Species in Coniferous Forests of Rocky Mountain National Park, Colorado. Miami University, Ohio.

Berry, K. H. 1980. *The Effects of Four-Wheel Vehicles on Biological Resources*. Edited by R.N.L. Andrews and P. Nowak.

Boyle, S. A., and F. B. Samson. 1985. Effects of Nonconsumptive Recreation on Wildlife : A Review. *Wildlife Society Bulletin* 13(2):110–16.

Brander, R. B. 1974. Ecological Impacts of Off Road Recreation Vehicles. *Outdoor Recreation Research: Applying the Results* pp. 29–35.

Bury, R. B. 1980. What We Know and Do Not Know About Off-Road Vehicle Impacts on Wildlife. In *Off-Road Vehicle Use: A Management Challenge.* Washington D.C.: US Department of Agriculture, Office of the Environment.

Bury, R. L. 1978. Impacts of Snowmobiles on Wildlife. In Transactions of the Forty-Third North American Wildlife and Natural Resources Conference, March 18–22, pp. 149–56.

Busack, S. D., and R. B. Bury. 1974. Some Effects of off-Road Vehicles and Sheep Grazing on Lizard Populations in the Mojave Desert. *Biological Conservation* 6(3):179–83. DOI:10.1016/0006-3207(74)90064-0.

Cardoni, D. A., M. Favero, and J. P. Isacch. 2008. Recreational Activities Affecting the Habitat Use by Birds in Pampa's Wetlands, Argentina: Implication for Waterbird Conservation. *Biological Invasions* 141:797–806.

CDFW (California Department of Fish and Wildlife). 2016. Nonlead Ammunition in California. Accessed December 19. https://www.wildlife.ca.gov/hunting/nonlead-ammunition .

Chernoff, G., and M. Quinn. 2010. Mountain Biking : A Review of the Ecological Effects. Calgary.

City of San Diego Public Utilities Dapartment. 2011. Proctor Valley Off Road Vehicle Barrier Transnet Grant Final Report.

Cole, D. N. 2004. Environmental Impacts of Outdoor Recreation in Wildlands, pp. 1–16.

Cooper, C. A., A. J. Neff, D. P. Poon, and G. R. Smith. 2008. Behavioral Responses of Eastern Gray Squirrels in Suburban Habitats Differing in Human Activity Levels. *Northeastern Naturalist* 15(4):619–25. DOI:10.1656/1092-6194-15.4.619.

Cordell, H. K. 2008. The Latest on Trends in Nature-Based Outdoor Recreation. *Forest History Today* Spring:4–10. http://www.foresthistory.org/publications/FHT/FHTSpring2008/Cordell.pdf.

Czech, B., P. R. Krausman, and P. K. Devers. 2000. Economic Associations among Causes of Species Endangerment in the United States. *BioScience* 50(7):593–601. DOI:10.1641/0006-3568(2000)050[0593:EAACOS]2.0.CO;2.

Dawson, J. O., P. N. Hinz, and J. C. Gordon. 1974. Hiking Trail Impact on Iowa Stream Valley Forest Preserves. *Iowa State Journal of Restoration* 48:329–37.

Dillingham, T., and K. Miner. 2009. Off-Road Vehicle Barrier Project Proposal for Proctor Valley Road.

Duchesne, M., S. D. Côté, and C. Barrette. 2000. Responses of Woodland Caribou to Winter Ecotourism in the Charlevoix Biosphere Reserve, Canada. *Biological Conservation* 96(3):311–17. DOI:10.1016/S0006-3207(00)00082-3.

Fairbanks, W. S., and R. Tullous. 2002. Distribution of Pronghorn (Antilocapra Americana Ord) on Antelope Island State Park, Utah, USA, Before and After Establishment of Recreational Trails. *Natural Areas Journal* 22(4):277–82.

Finney, S. K., J. W. Pearce-Higgins, and D. W. Yalden. 2005. The Effect of Recreational Disturbance on an Upland Breeding Bird, the Golden Plover Pluvialis Apricaria. *Biological Conservation* 121:53–63. DOI:10.1016/j.biocon. 2004.04.009.

Fletcher Jr., R. J., S. T. McKinney, and C. E. Bock. 1999. Effects of Recreational Trails on Wintering Diurnal Raptors along Riparian Corridors in a Colorado Grassland. *Journal of Raptor Research* 33(3):233–39.

Frumkin, H. 2001. Beyond Toxicity: Human Health and the Natural Environment. *American Journal of Preventive Medicine* 20(3):234–40. DOI: http://dx.doi.org/10.1016/S0749-3797(00)00317-2.

George, Shalene L., and Kevin R. Crooks. 2006. Recreation and Large Mammal Activity in an Urban Nature Reserve. *Biological Conservation* 133:107–17. DOI:10.1016/j.biocon.2006.05.024.

Goodwin, H. 1996. In Pursuit of Ecotourism. *Biodiversity and Conservation* 5:277–91. DOI:10.1007/BF00051774.

Jordan, M. 2000. Ecological Impacts of Recreational Use of Trails: A Literature Review. *The Nature Conservancy*. New York. http://www.parks.ca.gov/pages/795/files/ecologicalimpactsrecreationalusers.pdf .

Lenth, B. E., R. L. Knight, and M. E. Brennan. 2006. The Effects of Dogs on Wildlife Communities. DOI:10.3375/0885-8608(2008)28[218:TEODOW]2.0.CO;2.

Liddle, M. 1997. Recreation Ecology: The Ecological Impact of Outdoor Recreation. Chapman & Hall.

Live Science Staff. 2008. Lead Shot from Hunting and Fishing Kills Wildlife. *Live Science*, July 12. http://www.livescience.com/2690-lead-shot-hunting-fishing-kills-wildlife.html.

Losos, E. C., J. Hayes, A. Phillips, D. Wilcove, and C. Alkire. 1995. Taxpayer-Subsidized Resource Extraction Harm Species —Double Jeopardy. *American Institute of Biological Science* 45(7):446–55.

Luckenbach, R. A. 1978. An Analysis of Off-Road Vehicle Use on Desert Avifaunas. In *Transactions of the North American Wildlife and Natural Resources Conference 43*, pp. 157–62.

Miller, S. G., R. L. Knight, and C K. Miller. 2001. Wildlife Responses to Pedestrians and Dogs. *Wildlife Society Bulletin* 29(1):124–32. DOI:10.2307/3783988.

Nagy, J.A.S., and G. A. Scotter. 1974. Quantitative Assessment of the Effects of Human and Horse Tramplling on Natural Areas, Waterton Lakes National Park. Unpublished. Edmonton.

Reed, S. E., C. L. Larson, K. R. Crooks, and A. M. Merenlender. 2014. Wildlife Response to Human Recreation on NCCP Reserves in San Diego County. *Wildlife Conservation Society*.

Reed, S. E., and A. M. Merenlender. 2008. Quiet, Nonconsumptive Recreation Reduces Protected Area Effectiveness. *Conservation Letters*, 1–9. DOI:10.1111/j.1755-263X.2008.00019.x.

Taylor, A. R., and R. L. Knight. 2003. Wildlife Responses to Recreation and Associated Visitor Perceptions. *Ecological Applications* 13 (4): 951–63. DOI:10.1890/1051-0761(2003)13[951:WRTRAA]2.0.CO;2.

The City of San Diego, U.S. Department of the Interior, and California Resources Agency. 1998. Final Multiple Species Conservation Program Plan. San Diego, California.

Tuell, C. 2016. Public Lands Under the Gun: Recreational Target Shooting Puts Federal Public Lands in the Crosshairs. *The Arizona Journal of Environmental*

Law and Policy. Accessed December 19. http://www.ajelp.com/synthesis/public-lands-under-the-gun-recreational-target-shooting-puts-federal-public-lands-in-the-crosshairs/.

Webb, R. H., and H. G. Wilshire. 1983. Envronmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions. New York: Springer-Verlag.

Whittaker, P. L. 1978. Comparison of Surface Impact by Hiking and Horseback Riding in the Great Smoky Mountains National Park. Gatlinburg.

Wiseley, A.N. 1974. Disturbance of Snow Geese and Other Large Waterfowl Species by Gas Compressor Sound Simulation. In *Studies on Snow Geese and Waterfowl in the Northwest Territories, Yukon Territory, and Alaska*, 1973. Yellowknife, Canada.