13.0 URBAN DEVELOPMENT

13.1 OVERVIEW

Urban development can have a number of impacts on preserves in the MSPA, including artificial lighting, nitrogen deposition, and various forms of pollution. Human disturbances tend to occur closer to urban areas because of the ease of access and proximity to roads. The urban edge was calculated as any area within 250 meters of an urban land use. In the MSPA, Conserved Lands with a higher land area within the urban edge may be at a higher risk of impact from urban development.

13.1.1 Edge Effects

Urban environments produce a variety of threats to native species. Human disturbance on preserves is typically higher closer to urban areas due to the demand for recreational opportunities, ease of access, and proximity of roads to preserves. These all provide opportunities for authorized and unauthorized use of preserves. Humans can directly damage species through trampling/killing species or their habitat, intentional and unintentional introductions of exotic and invasive species, road kill, increased fire frequency, nonpoint source pollution, and disruption of nighttime movements due to urban and suburban light increasing the ambient light levels in preserves. The percent area of a Conserved Land complex within the urban edge (250 meters) was calculated for all Conserved Land complexes (Table V2B.13-1; Figure V2B.13-1). MUs with Conserved Lands with very high levels of urban-wild interface (> 40%) include MUs 1, 2, 6, and 7. The urban-wild interface area on Conserved Lands in MUs 3, 4, 5, and 8 is much lower, although potential future development in the eastern part of the MSPA would increase the threat/stress from urban sources. This potential increase in urban edge will be tempered by the larger patch sizes of lands conserved in the eastern MUs.

13.1.2 Artificial Lighting

Light from urban areas can disrupt nighttime activities of many animals (Perry and Fisher 2006). It can allow predators to more easily see prey, such as nocturnal reptile species and small mammals, causing significant declines in their populations. Nighttime light pollution is the strongest near urban areas, including roads. Near wetlands, artificial light can disrupt nocturnal activities, such as croaking by frogs and toads, which can interfere with reproduction (International Dark-Sky

Association 2016). Additionally, many insects are drawn to artificial light, which often has fatal consequences. A decline in insect populations can negatively impact all species that rely on insects for food or pollination.

The World Atlas of Artificial Sky Brightness estimates the artificial light intensity based on satellite images and models based on the earth's curvature, topography, and measured locations (Cinzano and Elvidge 2004; Cinzano et al. 2012). The model is based on the Bortle light scale, which ranges from 1 (no light pollution) to 9 (entire sky is greyish or brighter). San Diego County has high levels of light pollution along the coast and city centers with less pollution in the eastern portions and areas blocked by mountains (Figure V2B.13-2). Some species (e.g., amphibians, reptiles, and birds) that occur in high light areas are likely being adversely impacted by night lighting level, especially preserves in MUs 1, 2, 4, 6, and 7.

Table V2B.13-1. Percent of area of Conserved Lands with urban edge.

MU	Acres of Conserved Land in Urban Edge	Total Acres of Conserved Land	Percent of Conserved Land in Urban Edge
1	3,742.4	7,245.6	51.7
2	5,520.7	6,736.2	82.0
3	20,388.5	85,122.9	24.0
4	17,484.5	58,467.2	29.9
5	6,612.5	40,129.2	16.5
6	27,630.5	42,946.3	64.3
7	3,029.5	3,817.8	79.4
8	5,964.3	23,881.6	25.0
9	17,571.1	137,926.2	12.7
10	18,759.7	141,868.2	13.2
11	17,262.3	115,258.8	15.0

13.1.3 Nitrogen Deposition

Nitrogen deposition is defined as reactive nitrogen originating from air pollution caused by fossil fuel combustion and that moves from the atmosphere to the ground as nitrate and ammonium (Simkin et al. 2016). Increasing levels of soil

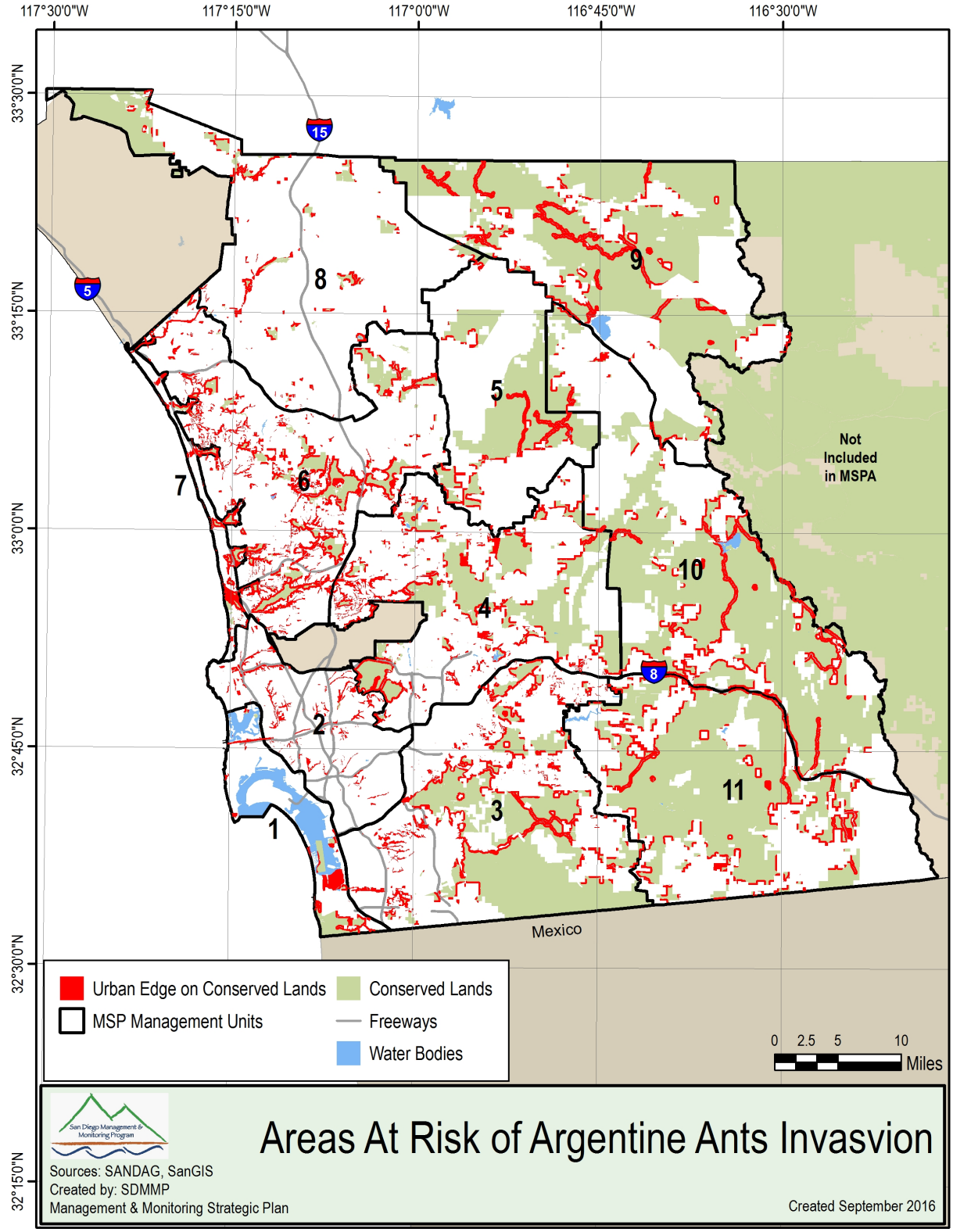

Figure V2B.13-1. Conserved Lands within 250 meters of an urban edge that are at risk of invasion by Argentine ants.

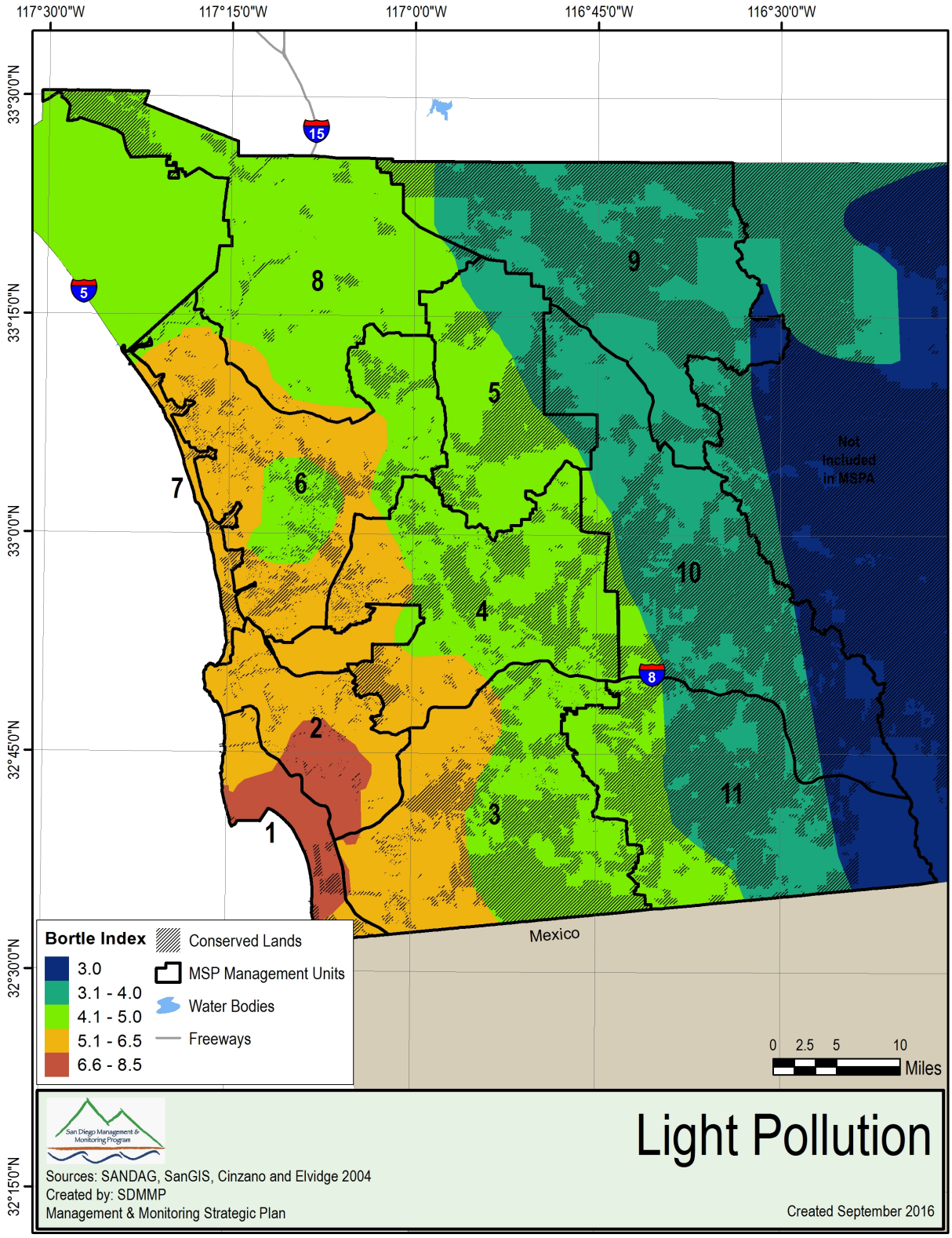

Figure V2B.13-2. Light pollution based on satellite images, topography, and earth curvature (Cinzano and Elvidge 2004).

nitrogen also arise from agricultural runoff (Perry et al. 2010). Global rates of nitrogen deposition have tripled in the last century (Simkin et al. 2016). This nutrient enrichment of the environment has led to worldwide declines in local plant species diversity, particularly the loss of rare plant species (Suding et al. 2005). Fifty percent of global biodiversity hot spots are subjected to nitrogen deposition levels of 15-20 kg N ha/yr, which threatens areas of high plant diversity and endemism (Phoenix et al. 2006). Increased soil nitrogen increases the invasion of nonnative plants into native plant communities (Perry et al. 2010). In the western United States, atmospheric nitrogen deposition is altering plant and microbial communities by changing species composition, and is associated with increased fire frequencies and sensitive species habitat degradation (Fenn et al. 2003).

In southern California, atmospheric nitrogen deposition is leading to the invasion of nonnative grasses into native grasslands, forblands, coastal sage scrub, and chaparral and facilitating vegetation type conversion to nonnative grassland (Weiss 1999; Fenn et al. 2003; Tallluto and Suding 2007; Cox et al. 2014; Kimball et al. 2014). Critical loads of nitrogen are those levels that facilitate invasion of nonnative grasses, with higher levels leading to type conversion to nonnative grassland (Fenn et al. 2010). These critical loads are: 7.8 to 10 kg N ha/yr in coastal sage scrub; 10-14 kg N ha/yr in chaparral; and 6-7.5 kg N ha/yr in grasslands. In California, 54% of coastal sage scrub, 53% of chaparral, and 44% of grassland vegetation communities exceed these critical loads of nitrogen (Fenn et al. 2010). Nitrogen deposition can act in concert with altered fire regimes and drought to accelerate the invasion process (Talluto and Suding 2007; Kimball et al. 2014). The process of coastal sage scrub type conversion is often facilitated by frequent fires, although critical loads of 11 kg N ha/yr or more are associated with landscape-scale type conversion over time in the absence of fire (Cox et al. 2014). Extreme drought may also slow natural succession and increase potential for type conversion of coastal sage scrub to nonnative grassland in nitrogen rich systems (Kimball et al. 2014). Elevated nitrogen deposition levels are impacting sensitive plant and animal species through degradation and type conversion of their habitats to nonnative grasslands (Weiss 1999; Fenn et al. 2003).

Estimates of nitrogen deposition were created by the University of California, Riverside based on remote sensing images and 13 atmospheric sensors in the San Bernardino Mountains (Bytnerowicz et al. 2015). Figure V2B.13-3 illustrates the modeled annual deposition of nitrogen in the MSPA (Tonneson et al. 2007). With the exception of small areas of the coast, the MSPA falls within nitrogen loads that

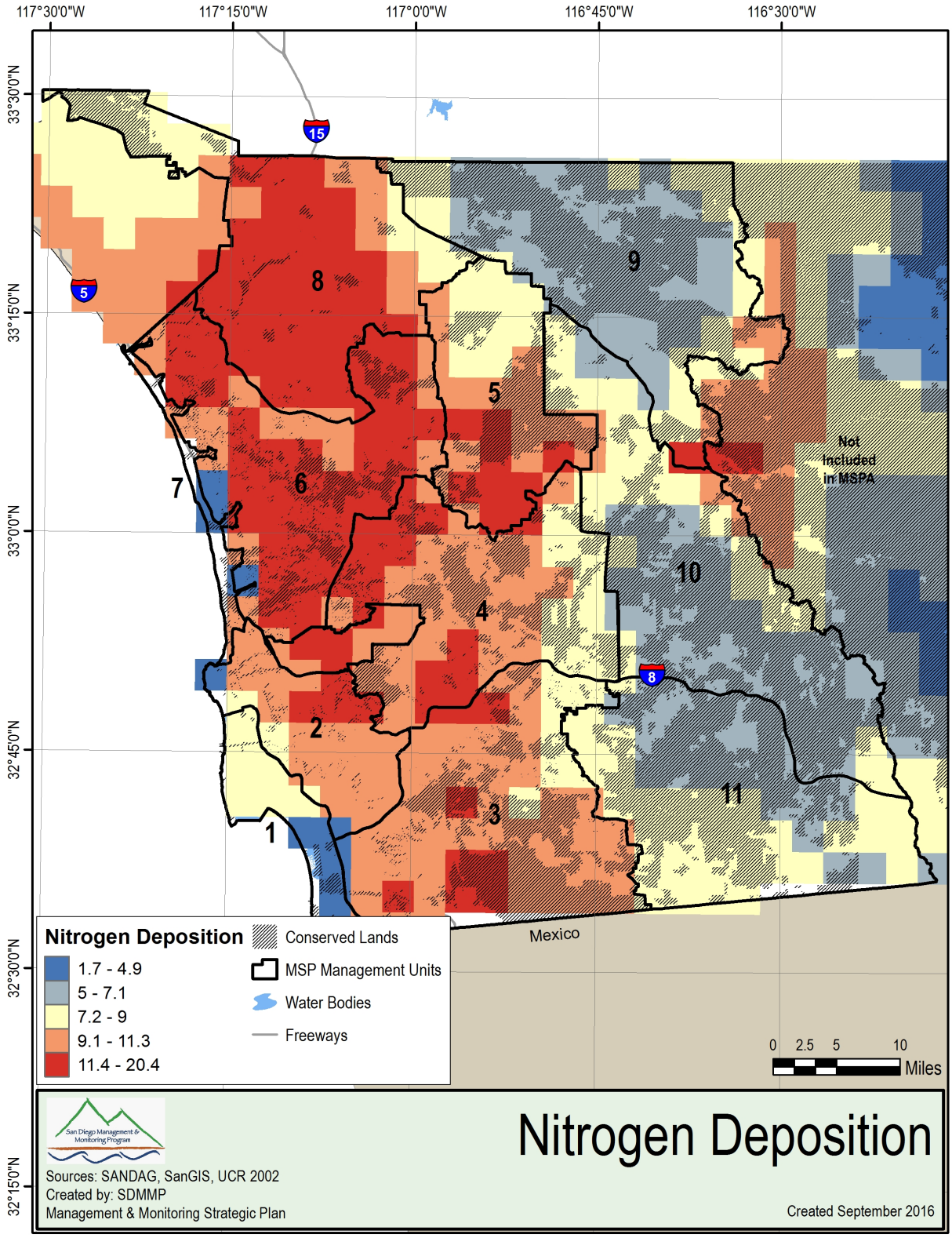

Figure V2B.13-3. Nitrogen deposition in kg ha-1 yr-1 (Fenn et al. 2009).

exceed 5 kg N ha/yr. Coastal valleys and foothills are dominated by nitrogen deposition loads of 9-20 kg N ha/yr, far exceeding levels associated with conversion of coastal sage scrub, grassland and chaparral to nonnative grassland over time.

13.1.4 Pollution

Various forms of pollution exist near urban development, which can include trash and other dry litter, chemical pollution, and noise pollination. In urban areas, trash can easily be transported by stormwater runoff. This could be material illegally dumped at preserves, or material that is blown or washed in from neighboring urban areas. Additional sources of pollution in the preserves can come from recreational users, ORVs, and target shooting.

Preserves in the MSPA that allow recreation, especially heavily trafficked ones, may accumulate large amounts of trash. It is important to provide waste and recycling bins at the trailheads to collect any trash that may otherwise find its way into the preserve. Household trash, such as plastic bags, cups, bottles, and containers, can be hazardous to any wildlife that ingests the plastic or gets caught and strangled. Homeless encampments are another source of pollution in preserves and can have detrimental effects on wildlife through increased refuse and raw sewage disposal (AMEC Earth & Environmental Inc. et al. 2003). The large volume of refuse from the living areas can attract black rats, which contribute to the decline of native rat populations.

ORVs can cause adverse effects to preserves due to air pollution from automotive exhaust and the creation of dust, as well as the illegal dumping of trash (Dillingham and Miner 2009). On preserves where target shooting—whether legal or illegal—exists, spent ammunition and the abandoned targets can introduce harmful pollutants to the wildland areas. When irresponsible shooters use electronics as targets, they can leave behind cadmium, arsenic, selenium, and mercury (Tuell 2016). These heavy metals persist in the soil and can contaminate surface or subsurface water. While legislation has Californians moving away from lead bullets, they are still in use. 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.

13.1.5 Noise

Anthropogenic noise, especially near urban areas, differs from the pitch and amplitude in most natural habitats (Francis et al. 2009). For avian species, noise alone can reduce nesting species richness and alter community composition. However, noise can also disrupt predator-prey relationships, leading to a higher reproductive success for birds in noisy areas. "Chronic and frequent noise interferes with animal's abilities to detect important sounds, whereas intermittent and unpredictable noise is often perceived as a threat" (Francis and Barber 2013). Several impacts of noise exposure on wildlife have yet to be extensively studied, including behavioral and physiological responses. Future research should focus on these areas to help identify practical noise limits that can inform policy and regulation.

13.2 URBAN DEVELOPMENT IN THE MSPA

The percent area of a Conserved Land complex within the urban edge (250 meters) was calculated for all Conserved Land complexes (Table V2B.13-1; Figure V2B.13-1). MUs with Conserved Lands with very high levels of urban-wild interface (>40%) include MUs 1, 2, 6, and 7. The urban-wild interface area on Conserved Lands in MUs 9, 10, 11, and 5 is much lower although potential future development in the eastern part of the MSPA would increase the threat/stress from urban development. This potential increase in urban edge will be tempered by the larger patch sizes of lands conserved in the eastern MUs.

13.3 RESULTS OF URBAN DEVELOPMENT STUDIES IN THE MSPA

There are no known studies of urban development that have been conducted in the MSPA.

13.4 MANAGEMENT AND MONITORING APPROACH

The goal for managing the effects of urban development in the preserves is to better understand and reduce the impacts on Conserved Lands where urban development is reducing the population levels and/or viability of MSP species populations. The approach for managing urban development effects in the preserves is divided into 2 parts: general and species-specific. General objectives focus on supporting land managers in preventing or cleaning up trash across the MSPA. Species-specific objectives have been developed for those MSP species identified as at highest risk from loss due to urban development near the

preserves, and for which specialized objectives are required to ensure their persistence in the MSPA.

13.4.1 General Approach Objectives

Managing light and noise pollution and nitrogen deposition at the regional level is outside the scope of the MSP Roadmap and therefore no goals and objectives have been developed. Management of light pollution at the preserve level where it impacts MSP species should be taken into consideration by preserve managers where implementable management actions are possible. The general approach for managing urban development effects in the preserves is focused on preventing and cleaning up trash collection sites, as described below. For the most up-to-date goals, objectives, and actions, go to the MSP Portal Urban Development summary page: http://portal.sdmmp.com/view_threat.php?threatid=TID_20160304_1458.

Management for illegal dumping should focus on preventing future dump sites and cleaning up current trash problems. This could include supporting land managers on enforcement, signage or fencing, public outreach, or cleanup projects.

13.4.2 Species-specific Approach Objectives

Descriptions of urban development management approach and rationale as well as goals, objectives, and actions for at-risk MSP species are presented in the corresponding species sections. Links to species-specific urban development objectives are provided in Table V2B.13-2. Use the MSP Portal for the most updated list of species with Urban Development objectives.

Table V2B.13-2. MSP plant and animal species with specific urban development 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
	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
	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
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
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
	Orcuttia californica	California orcutt grass	SL	https://portal.sdmmp.com/view_species.php?taxaid=41970
	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
	Quercus engelmannii	Engelmann Oak	VF	https://portal.sdmmp.com/view_species.php?taxaid=19329
	Tetracoccus dioicus	Parry's tetracoccus	SS	https://portal.sdmmp.com/view_species.php?taxaid=28420
Invertebrates				
	Euphydryas editha quino	Quino checkerspot butterfly	SL	https://portal.sdmmp.com/view_species.php?taxaid=779299
	Euphyes vestris harbisoni	Harbison's dunn skipper	SL	https://portal.sdmmp.com/view_species.php?taxaid=707282
	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
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
Reptiles				
	Emys pallida	Southwestern pond turtle	SL	https://portal.sdmmp.com/view_species.php?taxaid=668677

	Scientific Name	Common Name	Management Category	Summary Page Link
	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
	Campylorhynchus brunneicapillus sandiegensis	Coastal cactus wren	SO	https://portal.sdmmp.com/view_species.php?taxaid=917698
	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

	Scientific Name	Common Name	Management Category	Summary Page Link
	Rallus obsoletus levipes	Light-footed Ridgway's rail	SO	https://portal.sdmmp.com/view_species.php?taxaid=176211
	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				
	Oak Woodland			https://portal.sdmmp.com/view_species.php?taxaid=SDMMP_vegcom_10
	Riparian Forest & Scrub			https://portal.sdmmp.com/view_species.php?taxaid=SDMMP_vegcom_7
	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

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