A WALL OF LIGHTS THROUGH THE WILD

1,800 Stadium Lights on Arizona Conservation Lands Threaten Wildlife

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Border lighting at San Bernardino National Wildlife Refuge.

INTRODUCTION

Between 2019 and 2021, federal government contractors erected more than 1,800 stadium lights along the southern boundaries of some of the most biodiverse conservation lands in the United States, Center for Biological Diversity surveys estimate. The Department of Homeland Security authorized installation of these lights across more than 60 miles in Arizona along the U.S.-Mexico border without legal or scientific analysis. The Department failed to provide opportunity for meaningful engagement between border-protection and land-management agencies and the public.

If turned on, these high-intensity[1] stadium lights would cause severe light pollution impacting conservation lands, animal migration routes and wildlife, including more than a dozen endangered species. The Department of Homeland Security and Customs and Border Protection are evaluating lighting across the Southwest border,[2] which could lead to operationalizing existing lights and installing new lights. Artificial lighting would add to the harm already inflicted on wildlife and protected landscapes from border walls, roads and other infrastructure.

Public-records requests and phone calls to federal agencies indicate that officials lack an accurate account of the lighting infrastructure within or adjacent to their boundaries.

For this report, the Center inventoried border lighting installed on conservation lands along the Arizona border with Mexico to analyze potential harm to endangered species and wildlife habitat along the border. We found the following:

- **Cabeza Prieta National Wildlife Refuge:** 550 stadium lights across 18.9 miles
- **Organ Pipe Cactus National Monument:** 740 stadium lights across 24.6 miles
- **San Pedro Riparian National Conservation Area:** 12 stadium lights across one-third of a mile in the conservation area including five installed on the border wall bridge directly over the river
- **San Bernardino Valley and San Bernardino National Wildlife Refuge:** 500 stadium lights across 16.7 miles of the San Bernardino Valley, including 94 lights across the refuge

Border lighting installed on these conservation lands cuts across habitat for16 threatened and endangered species, including federally designated critical habitats for the yellow-billed cuckoo, Quitobaquito pupfish, Sonoyta mud turtle, beautiful shiner, Yaqui catfish, Yaqui chub and San Bernardino spring snail.

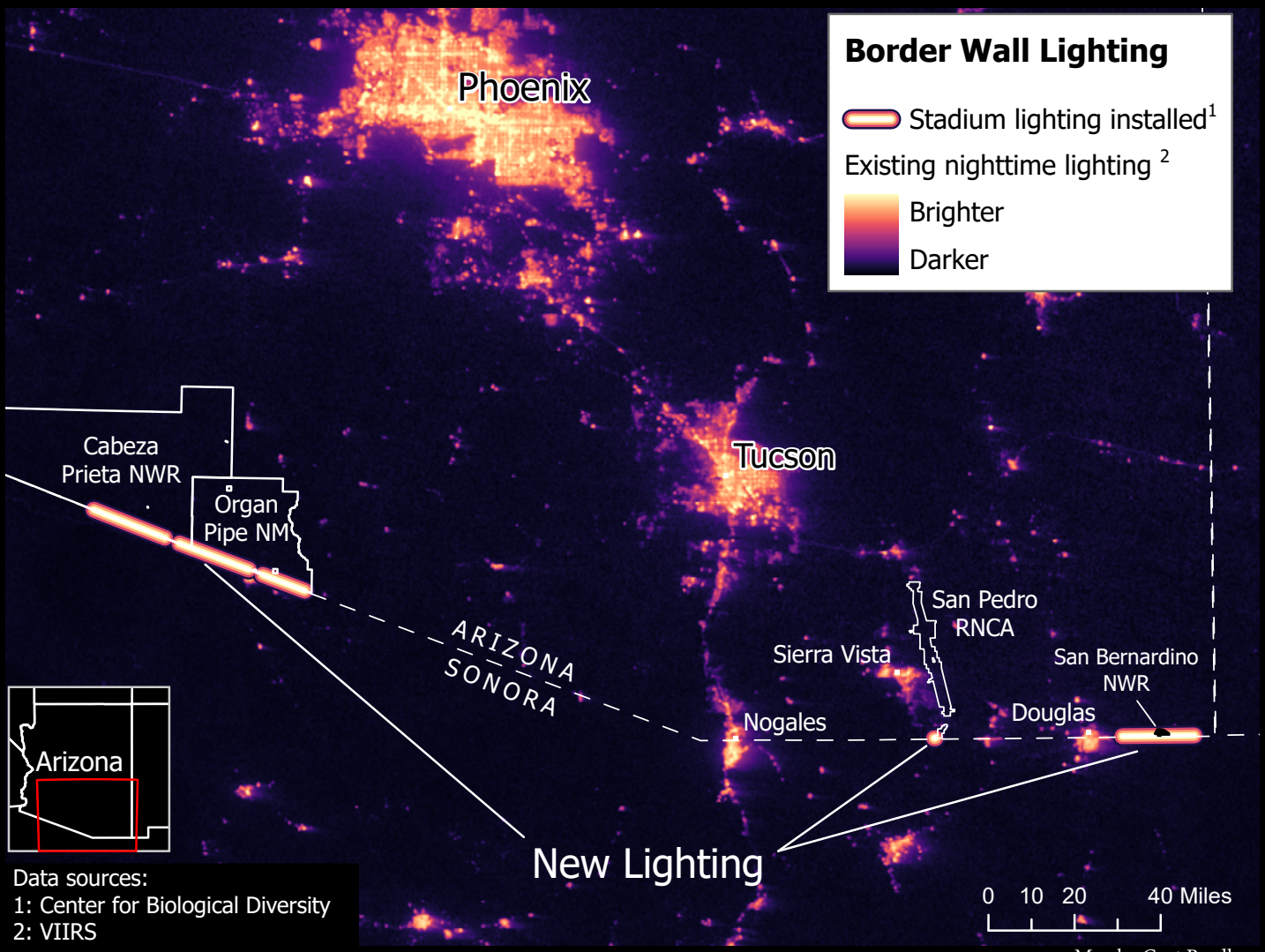
550 stadium lights across 18.9 miles of Cabeza Prieta National Wildlife Refuge.

740 stadium lights across 24.6 miles of Organ Pipe Cactus National Monument.

12 stadium lights across one-third of a mile in the San Pedro Riparian National Conservation Area.

500 stadium lights across 16.7 miles of the San Bernardino Valley, including 94 lights across the San Bernardino National Wildlife Refuge.

Photos by Russ McSpadden.



Map by Curt Bradley.

METHODOLOGY

We conducted field surveys and spatial analysis to determine a close estimate of where stadium lights have been erected along the Arizona border in priority conservation areas. We used on-the-ground transect mapping and satellite imagery analysis in Organ Pipe Cactus National Monument, the Cabeza Prieta National Wildlife Refuge, the San Pedro Riparian National Conservation Area, the San Bernardino Valley and San Bernardino National Wildlife Refuge. The estimates are based on average light pole spacing measured at each location.

Endangered and Threatened Species with Habitat at Surveyed Border Lighting Areas		
Common	Scientific	Status
Beautiful Shiner	Cyprinella formosa	Threatened
California Least Tern	Sterna antillarum browni	Endangered
Chiricahua Leopard Frog	Rana chiricahuensis	Threatened
Jaguar	Panthera onca	Endangered
Mexican Spotted Owl	Strix occidentalis lucida	Threatened
Northern Mexican Gartersnake	Thamnophis eques megalops	Threatened
Ocelot	Leopardus (=Felis) pardalis	Endangered
Quitobaquito pupfish	Cyprinodon eremus	Endangered
San Bernardino Springsnail	Pyrgulopsis bernardina	Threatened
Sonoran Pronghorn	Antilocapra americana sonoriensis	Endangered
Sonoyta Mud Turtle	Kinosternon sonoriense longifemorale	Threatened
Southwestern Willow Flycatcher	Empidonax traillii extimus	Endangered
Yaqui Catfish	Ictalurus pricei	Threatened
Yaqui Chub	Gila purpurea	Endangered
Yaqui Topminnow	Poeciliopsis sonoriensis	Endangered
Yellow-billed Cuckoo	Coccyzus americanus	Threatened

Endangered and threatened species with habitat at surveyed border lighting areas based on U.S. Fish and Wildlife Service Information for Planning and Consultation. Yaqui topminnow based on Arizona Game and Fish Department Heritage Data Management System.

If activated, border lighting would extend the devastating habitat fragmentation impacts of the border wall far into the sky, potentially disrupting seasonal migrations of the Sonoran Desert's chief pollinators.

Lesser long-nosed bat sips nectar and pollinates an agave flower.

HARM TO WILDLIFE

Artificial light pollution is one of the most widespread threats to biodiversity around the globe.[3] Light pollution has numerous and severe impacts on wildlife, especially harming nocturnal wildlife, species active during twilight, insects, and migratory birds and bats. Artificial light disrupts natural rhythms, influences predator-prey relationships, and hinders navigation, reproduction, nourishment and sleep.[4]

The scientific record clearly shows that artificial light at night can have costly, even deadly effects on a wide variety of species including amphibians, reptiles, birds, mammals, insects and plants. High-intensity lighting in these priority conservation areas would be devastating to the rich biodiversity of southern Arizona and northern Sonora, Mexico.

For example, artificial lighting along the Mexico border on the San Pedro River would disrupt wildlife movement through this critical north-south wildlife corridor. Half of all breeding bird species in North America are known to use the San Pedro River corridor, along with 82 species of mammals and 43 species of reptiles and amphibians.[5]

Three years of camera monitoring of a single location just north of the international border have documented 1,165 instances of wildlife traveling this river pathway. This shows the San Pedro's importance as a wildlife corridor for numerous species including badger, bobcat, javelina, mountain lion, mule deer, raccoon, several skunk species, turkey and white-tailed deer as they roam in search of food, water and mates.[6]

BATS

Artificial light disrupts the navigation, roosting and feeding of many species of bats. Some species change their behavior to hunt insects attracted to artificial lights and become exposed to predators. Other bats avoid lights and avoid feeding and watering sites within lighted areas. Lighting near bats' travel and migration routes can increase flight time and energy use and divert bats from important food and water resources along the way.[7]

The borderlands of southern Arizona and northern Mexico have a great diversity of bat species. At least 14 bat species have been documented at Organ Pipe Cactus National Monument[8] and 20 along the San Pedro River.[9] Bats play important roles in maintaining a functioning ecosystem in each of the conservation areas where we

Ocelot by Jitze Couperus, CC-BY.

surveyed border lights. Lighting near roosting, feeding, watering, travel and migration areas would harm bat species and the ecosystems they support.

Lesser long-nosed bats are critically important to Sonoran Desert ecosystems, acting as the principal pollinator of both saguaro and organ pipe cactuses. Each summer thousands of these bats follow seasonal cactus blooms northward, flying over the border wall to roost within Organ Pipe Cactus National Monument and the Cabeza Prieta National Wildlife Refuge.[10]

Artificial lighting is acutely harmful to slow-flying species like lesser long-nosed bats, who hover while feeding on cactus nectar. Studies have determined that lighting poses risks to migratory travel as well as nightly foraging activity, potentially disturbing or preventing entire migration patterns.[11] Turning on the existing border lighting infrastructure at Organ Pipe and Cabeza Prieta would be devastating for lesser long-nosed bats, shooting a massive wall of light into the sky stretching dozens of miles. If activated, border lighting would extend the devastating habitat fragmentation impacts of the border wall far into the sky, potentially disrupting seasonal migrations of the Sonoran Desert's chief pollinators.

MAMMALS

Night lighting along the border is a significant concern for endangered ocelots, jaguars and Sonoran pronghorn, especially where lights encroach on designated critical habitat and important migration corridors. Lighting across the San Bernardino Valley is particularly troubling given its proximity to jaguar and ocelot migration corridors between Mexico and the United States. Exposure to artificial lighting has been demonstrated to substantially change behavior patterns of rodents and prey species, thereby altering predator-prey relationships and diminishing hunting opportunities for carnivores.[12] This is especially concerning for nighttime predators with habitat near border lighting infrastructure like endangered ocelots and jaguars.

Habitat fragmentation from existing border walls already threatens mammals in each of the conservation areas outlined in this report. These border walls destroy habitat, prevent genetic interchange and impede wildlife migration.[13] The addition of large-scale artificial lighting would worsen the already devastating harm caused by border walls, further altering behavior patterns and degrading habitat. Artificial lighting could affect all mammal species that live, travel through, forage and hunt in these wild, rugged areas.[14]

BIRDS

Western yellow-billed cuckoo courtesy Leo-Shapiro, USGS.

Artificial light is known to have significant impacts on a wide variety of bird species. Depending on the species, birds flying at night can be attracted to, repelled by, or disoriented by lights.[15] Collisions with lighted objects or nearby structures are a serious concern. Lights can also change birds' perceptions of habitat quality.[16] Many bird species use light cues in the environment for navigation, even using these cues to calibrate their sensitivity to the Earth's magnetic field. Artificial light interferes with this process.[17]

More than 270 bird species have been recorded in Organ Pipe Cactus National Monument. There are 36 species of resident birds, but the majority migrate through the area for the desert's seasonal flowers, fruits and warm winters.[18] Between San Bernardino National Wildlife Refuge and nearby Leslie Canyon National Wildlife Refuge, at least 335 bird species have been recorded.[19] The San Pedro Riparian National Conservation Area is home to more than 100 species of breeding birds and provides invaluable habitat for another 250 species of migrant and wintering birds.[20] Designated critical habitat for the rare yellow-billed cuckoo abuts border-wall lighting infrastructure where the San Pedro River crosses the border. If lights here were activated, artificial light pollution would blast into the cuckoo's habitat.

AQUATIC AND SEMI-AQUATIC SPECIES

Northern Mexican gartersnake courtesy USFWS.

Aquatic species show distinct sensitivities to light polarization as it reflects off water.[21] This raises questions about potential harm to threatened and endangered aquatic and semi-aquatic species along the border. These include Quitobaquito pupfish and Sonoyta mud turtles at Quitobaquito Springs in Organ Pipe Cactus National Monument and San Bernardino spring snails, Yaqui topminnow, beautiful shiner, Yaqui catfish, Chiricahua leopard frogs and Mexican garter snakes at San Bernardino National Wildlife Refuge. Border lighting infrastructure has been installed directly adjacent to spring-fed pools at both protected areas.

Aquatic species are particularly vulnerable to harm from artificial lighting. Amphibians detect light at extremely faint levels as much as 100 times dimmer than humans.[22] Artificial lighting is expected to cause a range of riparian ecosystem changes, altering predator-prey relationships, sexual selection and reproduction.[23] The spectacularly unique aquatic habitats of Quitobaquito Springs and the San Bernardino National Wildlife Refuge would be severely compromised if nearby border lighting were activated, further endangering the numerous federally protected species who call these places home.

INSECTS

Artificial lighting at night threatens insect biodiversity. Lighting can change nocturnal insect behaviors such as feeding, migration and dispersal, predator avoidance, and reproduction. Studies show a high likelihood that the effects of night lighting on insects can cause cascading effects on the larger food chain and ecosystem function.[24] Artificial lighting may even diminish pollination success by disrupting predator-prey relationships and natural rhythms. [25]

The borderlands between Arizona and Sonora, Mexico, contain some of the highest diversity of insects in the world. Though insects are poorly studied and tracked, scientists have highlighted Arizona as having the most species of insects presumed to be at risk of population declines.[26] Another study found that the highest diversity of bee species anywhere on Earth exists within just six square miles of San Bernardino Valley, including the San Bernardino National Wildlife Refuge.[27] The 10-year study found 497 species of bees, roughly 14% of all bee species found in the United States.

Additionally, the San Pedro River Basin is home to the Southwest spring firefly, one of only two flashing firefly species in Arizona. The charismatic firefly was recently petitioned for federal protection.[28] Artificial light pollution has been documented as one of the main threats to fireflies, diminishing reproductive success by interfering with courtship displays, temporally disorienting individuals and effectively blinding them by saturating dark-adapted photoreceptors.[29]

CONCLUSION

Artificial lighting at night would be devastating to wildlife and conservation lands in Arizona along the U.S.-Mexico border. In addition to replacing border walls with wildlife-friendly vehicle barriers, lights and electrical infrastructure should be removed from Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge, the San Pedro Riparian National Conservation Area, the San Bernardino Valley, and San Bernardino National Wildlife Refuge.

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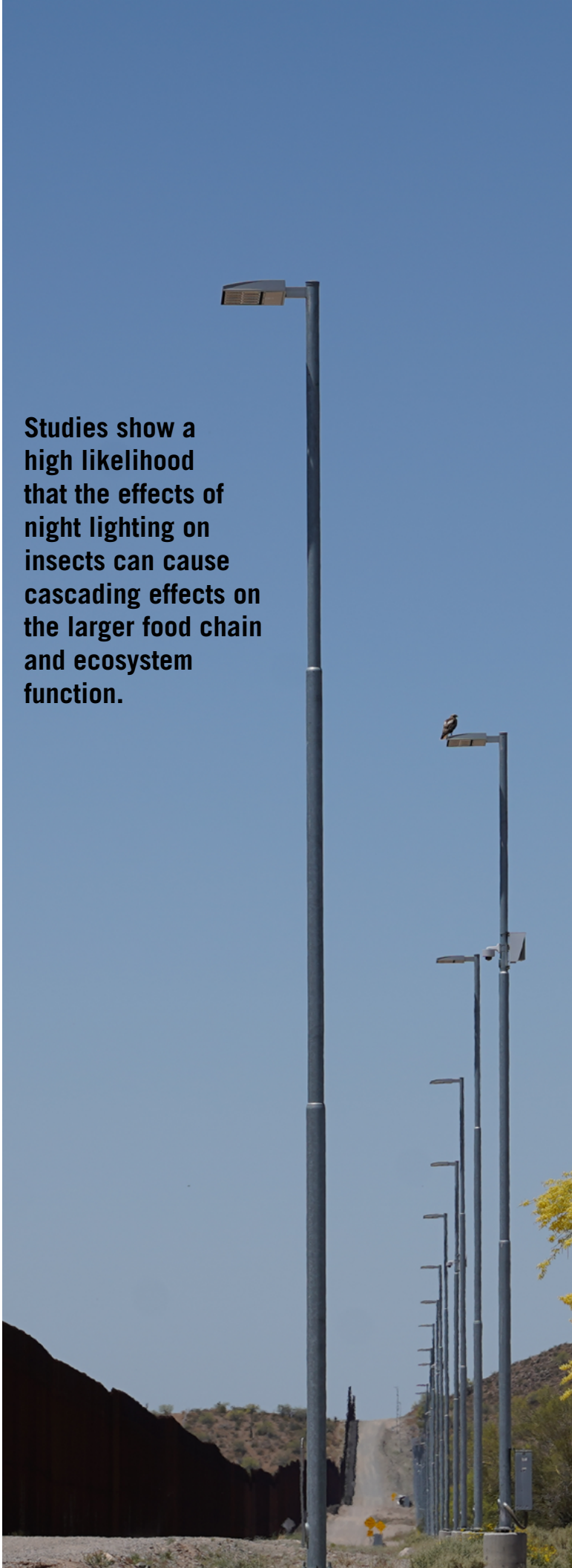

ENDNOTES

[1] The International Dark-Sky Association estimates these 500-watt lights would output at least 50,000 lumens, which is substantially more light than standard urban street lights. See: International Dark-Sky Association. Lights at the Border. https://www.darksky.org/lights-at-the-border-protecting-some-of-the-darkest-places-in-north-america/

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