

**BURROW REPORT
FOR
BOWMAN CANYON AT
MOUNT BURDELL OPEN SPACE PRESERVE**

Prepared by:

Marin County Parks
3501 Civic Center Drive, Suite. 260
San Rafael, CA 94903

MAY 2019

1 INTRODUCTION AND PURPOSE

1.1 Background

Marin County Parks (MCP) recently acquired a new parcel of land, Bowman Canyon Ranch, in November of 2018. Bowman Canyon is a 167-acre parcel of land located adjacent to the westside of Mount Burdell Open Space Preserve, located in Novato, California. Previous land use included cattle grazing with cattle continuing to be grazed through a lease. A fire road runs through the middle of the parcel and up the hillside. Vegetation types include grasslands, oak-bay woodlands, coastal scrub, and serpentine grasslands.

1.2 Purpose

A system of fire/ranch roads and/or trails will be established within the new parcel to allow public access. Following the Marin County Parks Road and Trail Management Plan (RTMP), a (1) sustainable system of roads and trails that (2) reduce environmental impacts on resources, and (3) improves visitor experience and safety will be created (MCOSD 2014). Surveys of natural resources will be conducted to determine what natural resources are present to determine baselines and to inform future decisions. This report summarizes burrow surveys conducted by Marin County Parks and Conservation Corp North Bay (CCNB) staff in the spring of 2019.

1.3 Focal Species

1.3.1 American Badger

The American badger (*Taxidea taxus*), a California Species of Special Concern, is a semi-fossorial mustelid that resides in open grassland and oak woodland areas. Badgers can be both nocturnal and diurnal. Found throughout western North America, they are known to occur in Marin County, with confirmed sightings in Mount Burdell, Lucas Valley, and Vince Mulroy Open Space Preserves (Townsend 2016) as well as McInnis Regional Park (Jim Slack personal communication). Outside of Marin County Parks land, they are also confirmed in the ranching areas of west and north Marin, Point Reyes National Seashore and the Marin Headlands (CDFW 2019). They are highly susceptible to habitat loss and fragmentation due to development and agriculture, as well as vehicle collisions and rodent control programs that reduce prey availability (Quinn 2008).

Adapted to underground life, badgers have poor eyesight but a strong sense of smell and hearing. Their large front paws and strong chests make them powerful and efficient diggers, creating wide burrows of about seven to 10.5 inches wide by six to 10.5 inches tall with large, wide aprons. Though solitary animals, their home ranges often overlap, with males generally managing a larger area (Quinn 2008). Home ranges vary from 1.6 – 6.5 km² depending on available resources (2008). Breeding occurs in the late summer and early fall. Males may begin seeking out reproductive females as early as July, expanding their home range up to two to three times its normal size. As mesocarnivores, the American badger preys on a variety of small rodents with a preference for fossorial mammals such as ground squirrels (*Spermophilus sp.*) and gophers (*Thomomys sp.*). They are also opportunistic foragers and will occasionally go after small birds,

eggs, amphibians, fish, insects, and wasp nests (Long 1973, Quinn 2008). In California, badger burrows are found in association with their main source of food: California ground squirrels (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Townsend 2016).

1.3.2 Western Burrowing Owl

Another California Species of Special Concern, the western burrowing owl (*Athene cunicularia*) is also found in association with California ground squirrels. They are protected by the Migratory Bird Species Act of 1918 and listed by the United States Fish and Wildlife Service (USFWS) as a National Bird of Conservation Concern (USFWS 2003). Burrowing owls can be both diurnal and crepuscular and are the only known owl to live and nest underground (Truilio 2007). They occupy grassland habitats in California and are also known to breed in sage brush, parklands, airports, and disturbed urban areas (Truilio 2007). Nesting owls are typically found at lower elevations under 200 ft above sea level (a.s.l.) with short grass of less than six inches around burrows and structural heterogeneity elsewhere (Truilio 2018). Though migratory, burrowing owls both breed and winter in the state of California. California is also considered an important wintering ground for migrants, with known year-round residency in the San Francisco Bay Area (CDFW 2008). In the early 1900's, burrowing owls were considered a year-round resident in some areas of Marin County with numbers having declined since then (Shuford 1993). Data on breeding burrowing owls in Marin County is limited, with at least one probable occurrence in Terra Linda (Shuford 1993). In Marin County Parks land, burrowing owls have been confirmed wintering in Lucas Valley Open Space Preserve (Townsend 2016), McInnis Regional Park, Terra Linda and Sleepy Hollow Open Space Preserves (Julian Geoghegan personal comm.), and Ring Mountain Open Space Preserve (ebird 2019). Other areas they have been confirmed in the County of Marin include the Farallon Islands, Bolinas Ridge, Petaluma Marsh Wildlife Area, Point Reyes National Seashore, and near the Las Gallinas Valley Sanitary District Public Shore (CDFW 2019)

Burrowing owls breed between March and August in California and will occasionally extend to February through December. They have a varied diet of arthropods, small rodents, birds, amphibians, reptiles, and carrion (CDFW 2008). Hawks and other owls are known to prey on burrowing owls as well as skunks, foxes, coyote, snakes, crows, dogs, cats, and badgers (Truilio 2018). Primary threats across the owls' range include habitat loss due to agriculture and urban development, habitat degradation from reduction of burrowing mammal populations, elimination of burrowing mammals from control programs, secondary poisoning, human recreation, and dogs (Klute 2003). In Marin and other Northern California populations, causes of population decline are due to rodent control programs, which reduce nesting sites, reduction of habitat due to development, and pesticides that reduce food supply and poison owls (Shuford 1993). All these factors are known to occur in Marin County and impact areas burrowing owls have been found. Except for the Imperial Valley and Florida where the soil is soft, burrowing owls do not dig their own dens but instead depend on fossorial mammals such as the California ground squirrel to create burrows for them to roost and nest in (Klute 2003). This reliance on California ground squirrels means that the health and status of ground squirrel populations in California is crucial for successful burrowing owl populations, as well as for badgers. Badgers depend on ground squirrels for their main food source and burrowing owls depend on ground squirrel burrows for habitat, intertwining the three species.

2 METHODS

2.1 Burrow Survey and Biological Inventory

Between February 19th and March 1st of 2019, Marin County Parks resource seasonal crew, wildlife technician, biomonitor, and Conservation Corp North Bay ecological crew conducted burrow surveys in Bowman Canyon to determine the likelihood and presence of special-status burrowing wildlife species. Surveys began and ended by recording cloud cover, temperature, and wind speed using a Kestrel 2000 weather meter. All open grassland areas were walked by staff in transect lines. Transect lines varied in distance from each other, depending on the landscape, but was approximately 50 feet apart. Every individual began their transect at the same time to ensure all areas were being covered. If a burrow was observed, all individuals would stop and wait for that burrow to be recorded before continuing. Burrows greater than three inches in diameter were recorded. Smaller burrows were not recorded because those were most likely made by mice and no special-status mice are found in the area. For each burrow, the width and height of the entrance was measured with a measuring tape, the soil apron size and shape were recorded, signs of species identification and burrow activity noted, a photograph taken of the burrow and apron (see Figures 2.1 – 2.4), and the coordinates recorded. All recordings were entered directly into a tablet using the Avenza Maps app. The data was then exported to ArcGIS. Active burrows were determined by signs of scat, tracks, and fresh soil on the aprons. For Western burrowing owls, active burrows were identified if whitewash, feathers, or owl pellets were observed. For American badgers, active burrows were identified if claw marks on the sides of burrows, scat, or a burrow apron fanning out from the entrance. Inactive burrows typically had vegetation growing in the apron, appeared older and weathered, had spider webs covering the burrows, and had no signs of recent activity. It should be noted that these burrow surveys were carried out after a recent rain storm, which washed away possible scat and tracks, and created water erosion at all burrow entrances.

3 RESULTS

3.1. Burrows Observed

Bowman Canyon consists of a mixture of open grassland and oak woodland and a south-facing ridgeline that reaches an elevation of about 972 ft at the summit. All open grasslands were surveyed for burrows, which were found between an elevation of 200 to 970 ft a.s.l.

Of the 116 burrows surveyed in Bowman Canyon, 46 were presumably American badger, one coyote (*Canis latrans*), 16 small rodent, and 53 California ground squirrel (*Otospermophilus beecheyi*) burrows or burrow complexes. Twenty-four of the badger burrows were determined active and the one coyote burrow was inactive. No active burrowing owl burrows were detected. Signs of badger foraging were seen at some of the smaller burrows, indicated by large, wide but shallow holes with large aprons and smaller burrows inside and around the foraging area.

The highest concentration of burrows was found in the center of the area near the summit, with a smaller concentration in the northeast corner and the rest scattered from the northeastern corner to the southwestern corner of the area (see Figure 1.1). Badger burrows were detected

throughout the grassland areas in association with all other burrows, with the highest concentration in the center of the study area. Note that the main fire road passes through the highest concentration of burrows. No burrowing owl burrows were detected; however, all ground squirrel and badger burrows provide potential habitat for them. The nearest burrowing owl sighting is around Gness Field Airport in Novato about three miles away. According to Dr. Lynne Trulio's burrowing owl workshop presentation in 2018, nesting owls are mostly found at lower elevations of under 200 ft with a preference for flatter ground (Trulio 2018). This suggests that Bowman Canyon's steep slopes and elevation are not preferable to nesting burrowing owls. However, burrowing owls who are overwintering in the non-breeding season are not as particular about their habitat and are known to winter at higher elevations in the foothills of the San Francisco Bay Area, including Lucas Valley Open Space Preserve, and could winter here in Bowman Canyon (Trulio 2019). Wintering grounds are important for migratory bird species survival.

The high concentration of badger burrows found here make Bowman Canyon a badger hot spot, likely feeding off the high concentration of ground squirrels and other fossorial mammals occupying the space. The large quantity of burrows also provides potential wintering habitat for burrowing owls.

3.2 Other Fauna observed

Wildlife species detected during the field surveys by sight, calls, tracks, scat, or other sign were recorded directly. A list of wildlife species observed in the study area is presented in Appendix A. Latin and common names for vertebrate species referred to in this report follow Crother (2012) for amphibians and reptiles, Wilson and Reeder (2005) for mammals, and American Ornithologists' Union (AOU) Checklist of North and Middle American Birds (AOU 2015) for birds.

4 RECOMMENDATIONS

Based on burrow locations, recommended trail construction would occur on the western and southern sides of the Bowman Canyon area, as well as in the woodland areas. Most of the burrows are along the slope and ridge in the center of the map, occurring alongside a fire road used by the previous land owner. According to an assessment on conservation needs for badgers in California, badgers are not generally found close to trails (about 50 ft from trails or more). Being mostly nocturnal, badgers do not usually encounter direct human disturbance but may defer from olfactory cues left behind by humans, horses, and dogs (Quinn 2008). Badger deference from trails may also be in association to ground squirrel and other small burrowing mammals burrowing farther from active trails. In a study on the effects of domestic dogs on wildlife, areas around trails are found unsuitable for squirrels, rabbits, and deer and are generally avoided. Direct effects of dogs on ground squirrels include predation, flushing, and other forms of stress (Lenth et al 2006). With small fossorial mammals avoiding active trails, badgers who prey on them follow suit. Taking this into consideration, the fact that so many burrows surround the fire road in Bowman Canyon suggests the previous owner mostly drove along the road, and rarely hiked it [with a dog](#). As the public begins using the fire road and other

already established pathways in Bowman Canyon, human and dog disturbance will go up and we may see both ground squirrels and badgers migrate to other, less disturbed areas.

Another section that should be avoided is the drainage on the eastern border of Bowman Canyon. This drainage may provide a key water source and should be left open for wildlife to use. Meanwhile, trails can be built in the smaller western drainage and immediate surrounding grassland where fewer burrows were found.

Based on burrow surveys and until further assessments are completed, temporary public use of the Bowman Canyon fire road with the condition that dogs remain on-leash is acceptable for now, although no dogs is preferred. We may, however, see the migration of badger and ground squirrel burrows farther from the road as public use increases. If active badger and squirrel burrows have migrated by the time trail planning and construction begins, the already established fire road should be avoided and a new trail built in less burrow-dense areas. California ground squirrels are important ecosystem builders. They and their burrows should be protected because they are a key food source for the American badger, provide crucial burrowing owl habitat, as well as other ecosystem benefits.



BURROWS IN BOWMAN CANYON

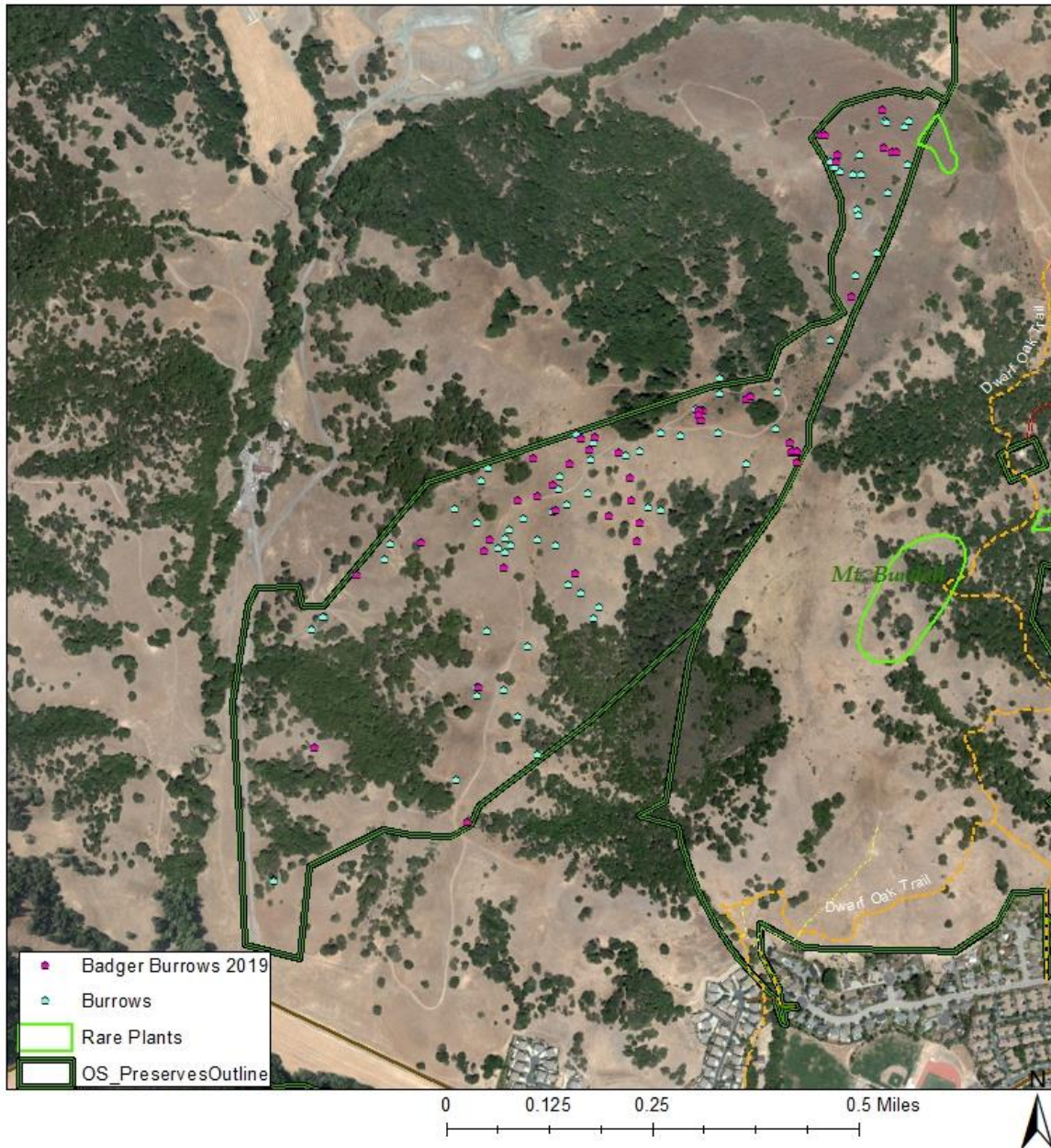


Figure 1.1 Map of burrows in Bowman Canyon. Preserve boundary is marked with thick, green line. Badger burrows are colored pink while all other burrow types are cyan.



Figure 2.1 Photograph of active American badger burrow at Bowman Canyon. Note the wide entrance and large apron with fresh soil. Yellow notebook is 6.5 inches long. Recent rains washed away any possible scat and track signs.



Figure 2.2 Photograph of inactive American badger burrow at Bowman Canyon. Note the vegetation growing on apron and around entrance of burrow.



Figure 2.3 Photograph of active California ground squirrel burrow cluster at Bowman Canyon with signs of American badger foraging. Note the large, wide openings with smaller squirrel burrows inside.



Figure 2.4 Photograph of inactive California ground squirrel burrow at Bowman Canyon. Note the vegetation growing in and around the entrance and apron of the burrow.

5 REFERENCES

- AOU (American Ornithologists' Union). 2015. "AOU Checklist of North and Middle American Birds." AOU website. <http://checklist.aou.org/taxa/>. Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, eds.
- CDFW (California Department of Fish and Wildlife). 2019. "CNDDDB Rare Find." Version 5.2.14. Accessed June 20th, 2019. <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx>
- CDFW (California Department of Fish and Wildlife). 2008. "California Species of Special Concern: Burrowing Owl." CDFW website. <https://www.wildlife.ca.gov/Conservation/SSC/Birds>.
- Crother, B.I. 2012. *Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding*. 7th ed. Herpetological Circular No. 39. Prepared by the Standard English and Scientific Names Committee. Shoreview, Minnesota: Society for the Study of Amphibians and Reptiles. August 2012.
- Geoghegan, Julian, Burrow Datasheet for TLSH. October 30, 2017.
- Grinnell, J., Wythe, M.W. 1927. "Directory to the Bird-Life of the San Francisco Bay Region." *Pacific Coast Avifauna*. Issue 18. Cooper Ornithological Club. pp 86.
- Jim Slack (Park Ranger), personal communication to Serena Hubert (Environmental Compliance and Monitoring Specialist). May 2, 2019.
- Klute, D.S., et al. 2003. "Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States." *US Fish & Wildlife Publications*. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003. Pp
- Marin County Open Space District (MCOSD) 2014. *Road and Trail Management Plan*. December.
- Quinn, J.H. "The Ecology of the American Badger *Taxidea taxus* in California: Assessing Conservation Needs on Multiple Scales." PhD diss. University of California, Davis. 2008.
- Shuford, David. *The Marin County Breeding Bird Atlas: A Distributional and Natural History of Coastal California Birds*. Avifauna Series 1. Bolinas: Bushtit Books. 1993.
- "Ebird" (The Cornell Lab of Ornithology). 2019. Accessed July 17, 2019. <https://ebird.org/home>.
- Townsend, S.E. 2016. *Badger, Bats and Other Wildlife: Mount Burdell Open Space Preserve*. Marin County Parks.
- Townsend, S.E. 2016. "Badger, Mesocarnivores, and Other Wildlife: Lucas Valley Open Space Preserve." Prepared for Marin County Parks.

Trulio, L.E., Chromczak, D.A. 2003. "Burrowing Owl Nesting Success at Urban and Parkland Sites in Northern California." *California Burrowing Owl Symposium*. San Jose State University.

Trulio, Lynne. "Western Burrowing Owl Workshop." Lecture, Western Burrowing Owl Workshop, San Jose-Santa Clara Regional Wastewater Facility, San Jose, July 19, 2018.

Trulio, Lynne. "Western Burrowing Owl Workshop." Lecture, Western Burrowing Owl Workshop, San Jose-Santa Clara Regional Wastewater Facility, San Jose, July 18, 2019.

Wilson, D.E., and D.M. Reeder, eds. 2005. *Mammal Species of the World: A Taxonomic and Geographic Reference*. 3rd ed. Online version. Baltimore, Maryland: Johns Hopkins University Press. <http://www.bucknell.edu/msw3/>.

APPENDIX A
Wildlife Species
Observed During Field Surveys

APPENDIX A

Wildlife Species Observed During the Field Survey

WILDLIFE SPECIES – VERTEBRATES

AMPHIBIANS

PSEUDACRIS – CHORUS FROG

Pseudacris regilla – Sierran tree frog

REPTILES

LARCERTILIA – LIZARDS

Sceloporus occidentalis – Western fence lizard

MAMMALS

SCIURIDAE – SQUIRRELS AND ALLIES

Otospermophilus beecheyi – California Ground Squirrel

Lepus californicus – black-tailed jackrabbit

BIRDS

ACCIPRITRIDEA – DIURNAL BIRDS OF PREY

Buteo jamaicensis – red-tailed hawk

CATHARTIFORMES – NEW WORLD VULTURE

Cathartes aura – turkey vulture

CERTHIIDAE – TREECREEPERS

Certhia Americana – brown creeper

CORVIDAE – JAYS AND CROWS

Aphelocoma californica – California scrub-jay

Corvus corax – common raven

EMBERIZIDAE – EMBERIZIDS

Junco hyemalis – dark-eyed junco

FALCONIDAE – FALCONS

Falco sparverius – American kestrel

APPENDIX A

Wildlife Species Observed During the Field Survey

REGULIDAE – KINGLETS

Regulus calendula – ruby-crowned kinglet

PHASIANIDAE – PHEASANTS

Meleagris gallopavo – wild turkey

TURDIDAE – THRUSHES

Sialia Mexicana – Western bluebird

TYRANNIDAE – FLYCATCHERS

Sayornis nigricans – black phoebe

TYTONIDAE – HEART-SHAPED FACE OWLS

Tyto alba – barn owl

INSECTS

RHOPALOCERA – BUTTERFLIES

Euphydryas editha – checkerspot butterfly

Nymphalis antiopa – mourning cloak