Biological Resource Assessment and Recommendation Report

for the Lincoln/Butte Parcel
Sausalito, CA
August 2017

Prepared for Open Space Sausalito
by Biologist Jennifer Berry
106 Rodeo Ave, Sausalito
CA 94965

Jennifer Berry, biologist and landscape consultant
106 Rodeo Ave,
Sausalito, California
October 5, 2017

I. Introduction

The subject, known as the Lincoln-Butte site, is a 2.1 acre parcel located in the northwest area of Sausalito, California between the streets of Lincoln and Butte. It is owned by Open Space Sausalito which is a 501(c)(3) nonprofit. The property is zoned "Open Space" and is dedicated to being open space as a wildlife preserve. It has a recorded conservation easement protecting its zoning and use in perpetuity.

Of note is that this site sits within a chain of open space that stretches north from Cypress Ridge, a designated open space preserve owned and maintained by the city of Sausalito, to Stanford Way, the last ridge in Sausalito. Aerial surveys show that the undeveloped land along this corridor at the eastern edge of Highway 101 adds to more than 50 acres of contiguous open space with only one road to divide it. The Lincoln-Butte parcel has the only natural year-round source of water accessible to the wildlife living in the area so it attracts a substantial and diverse biological consortium.

Biological Survey

A preliminary biological survey of the subject property was conducted by biologist, Jennifer Berry, in the winter of 2015/2016 to determine the potential for species of concern and wildlife. This study is a follow-up to that report and includes a more in-depth survey of the biology, land and its resources and includes recommendations for the preservation of the land plus guidelines for habitat and wetland restoration.

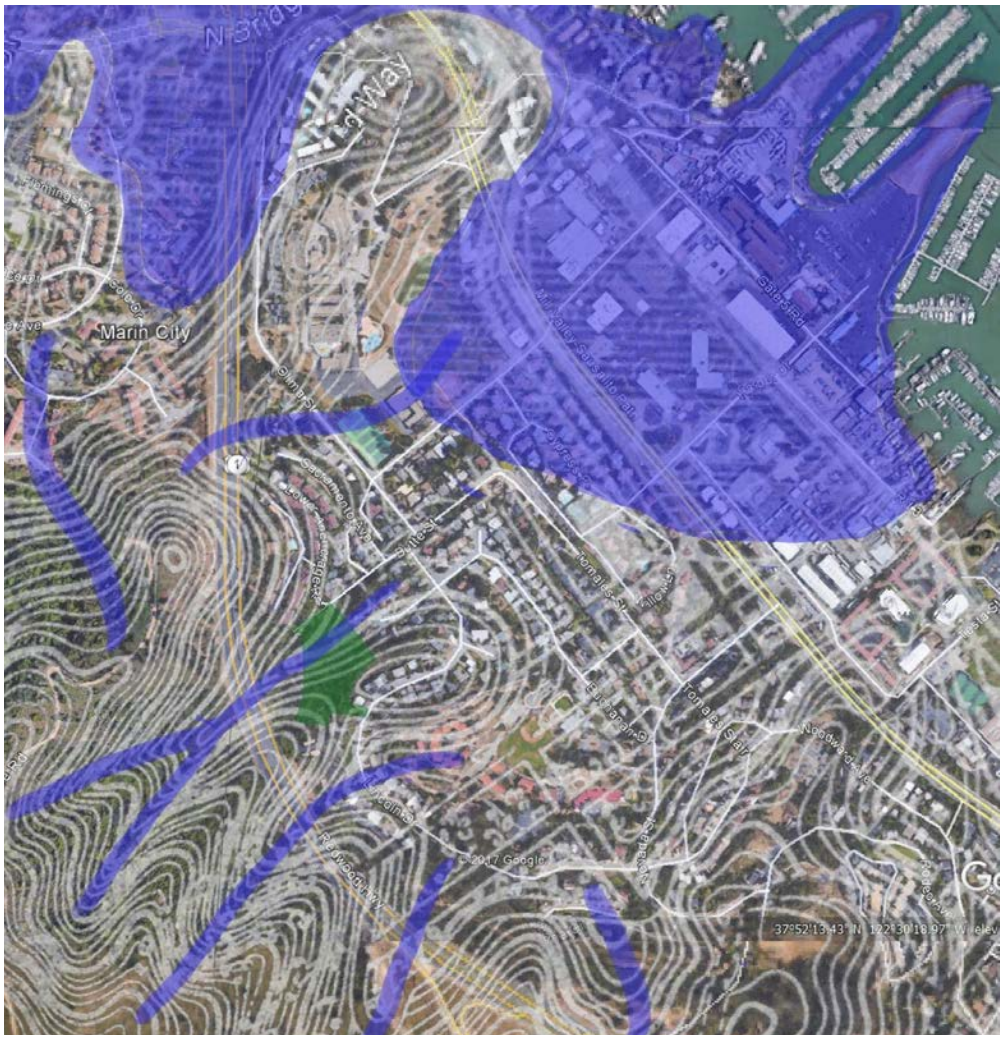
Field work for this report was conducted between the months of June to August of 2017. Site surveys were conducted on foot utilizing GPS, accurate to three meters, and Google Maps accessed from a smartphone device. Supporting documents were reviewed prior to site visits and can be found referenced in Appendix B of this report.

II. Characteristics of Nevada Valley

Big Changes in Nevada Valley

The earliest maps of Sausalito date from around the late 1800's, when most of southern Marin was inhabited by Portuguese cattle ranchers and their families. Much of lands that made up Rancho Saucelito at the time were sparsely occupied, with just a few families scattered between vast expanses of pasturage. The oldest map referenced in this report is dated 1868 and was commissioned by the Saucelito Ferry and Land Company for the purpose of selling off the lands for residential development. Many of the streets shown on this map did not exist at the time and were never built. Later surveys, from the 1890's to 1925, were done to produce nautical maps

and several, with the title of San Francisco Entrance, show carefully recorded topography for the Nevada Valley area.



Georeferenced topographic map layer from 1925 superimposed on 2017 Google map of the site. Lincoln-Butte Site is marked in green and historic wetland areas are shown in blue.

A survey of these historic maps of the land that make up Nevada Valley show an area with dramatic changes between 1886 and 1925, and then again during WWII for the Marinship development purpose of wartime shipbuilding. Many of the ridges and hills that made up Nevada Valley were excavated to fill the marsh lands that spanned the lower elevations of land between Waldo Point to the north and Cypress Ridge to the south. The marsh reached as far inland as the site where Martin Luther King School now sits, with a small stream inlet into this marsh between Ebbtide and Coloma streets. It is difficult to fathom the extent to which these lands have been altered but, in fact, Nevada Valley is at once wider north to south, steeper downhill and less deep east to west than it was historically. Changes to topology were made to land just south of the Lincoln-Butte parcel that may have changed the flow of water to the

parcel. Even more significant was a large ridge that once rose up from sea level to Cypress Ridge on Rodeo Avenue that was removed near the base of Nevada Street to level the land to make way for Bridgeway which began as a rail line through Sausalito. This ridge extended all the way into the Bay where the Marinship development now sits, so that if you were to stand where the local Post Office is and look south, you'd be standing in water and would have a ridge that blocked your view to the tennis courts.

Nevada Valley Cut and Fill Map (left) Georeferenced 1925 topographic map superimposed on 2017 google map of Nevada Valley. Cut is marked in red (with major excavations in dark red) and fill marked in yellow.

Using Historic Maps to Understand the Natural History of a Site

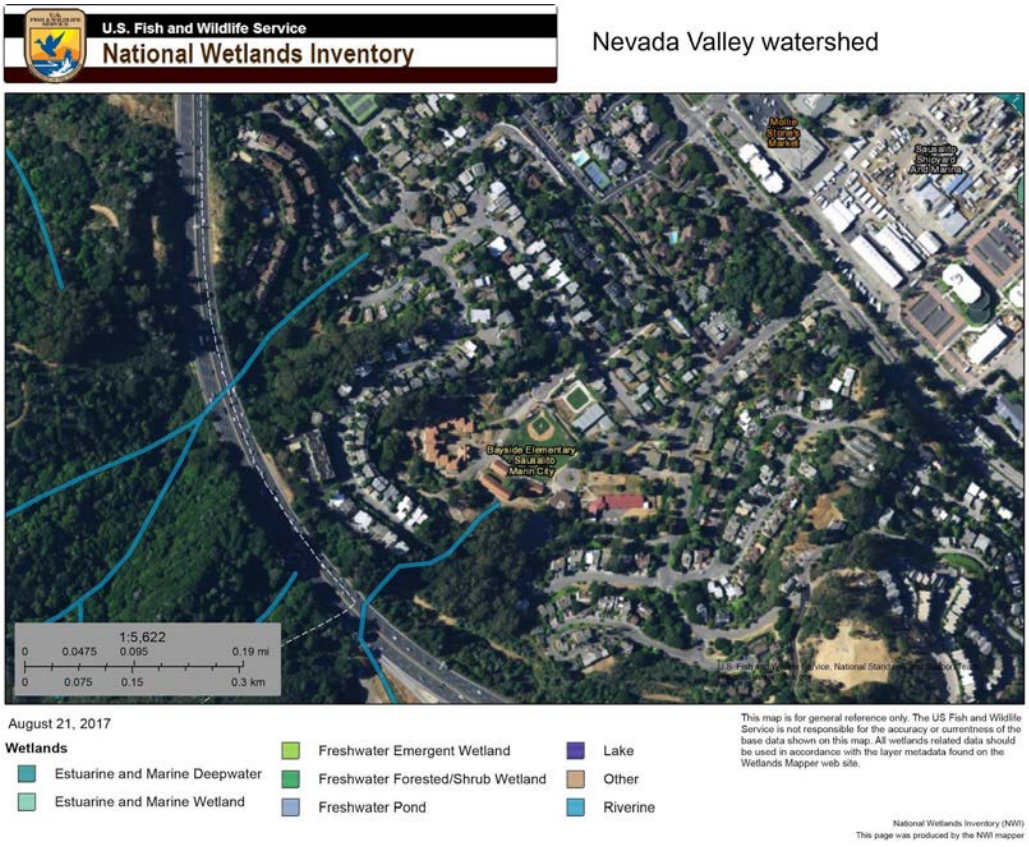
To date, the most useful information to glean the history of the site comes from these historic maps. Recent advances in technology and computer software have played an important role in understanding the extent of the changes to the land in Nevada Valley since it was first settled by Europeans in the late 1800's. Early cartographers based their maps by routes they took on foot, and often exaggerated or underestimated the scales of valleys, ridges, waterways and important landmarks, and those inaccuracies were carried forward from one map to another over time.

Satellite imaging has allowed for maps worldwide to be standardized and readily available to all, and has eliminated many of those early mistakes. Since the writing of the preliminary report on the Lincoln-Butte parcel in 2016, the David Rumsey Map Center in Stanford has released

hundreds of georeferenced historic maps in its collection, including more than a dozen depicting Sausalito, which are referenced in this author's original report.

Restoration Efforts for the Nevada Valley Watershed

Historic maps do not clearly indicate any creeks in Nevada Valley, though the mouth of an estuary is indicated near where the MLK recreation and dog park now sit. However, on a map of the San Francisco Entrance dated 1884, areas of trees are indicated in the small valleys above where the freeway is located today. If the trees noted on these historic maps indicated willow thickets or riparian areas, then it appears as if there were in fact five wetlands that drained the smaller valleys in Nevada Valley. And, according to a map published by DPW for the Highway Transportation agency, (undated but published some time shortly after Highway 101 was completed in 1937 and located in the history room of Sausalito City Hall), there are five main culverts that pass under the freeway that drain elevations above Nevada Valley. Two locations in the Valley are currently designated as wetlands by the US Fish and Wildlife (USFWS) Inventory of Wetlands, and one of them is on the Lincoln-Butte parcel.



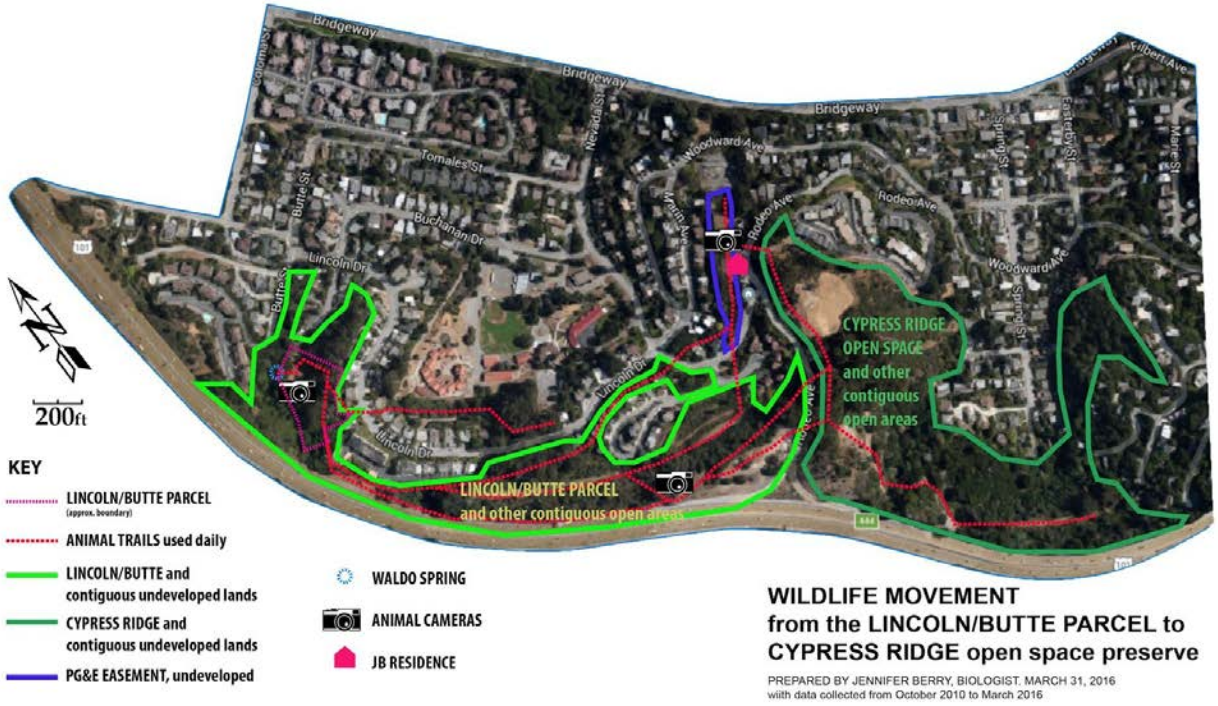
It appears that the riparian inventory listed by USFWS was not indicated on historic maps, nevertheless these have existed as wetland areas for approximately 75 years and are now well-established. These sites along with many other undeveloped areas in the valley host several wetland indicator species including two species of willow, elderberry, dusky-footed woodrat, and wetland forbes. It is presumed that, if indeed, these wetlands indicated by

USFWS are post-freeway and not historic, wetland habitat species found here occurred naturally in the region and were recruited from those unaltered wild lands.

III. Characteristics of the Lincoln-Butte Parcel

Site Significance

The Lincoln-Butte parcel is a small but important percentage of a tract of open land stretching more than 50 acres in size on the east side of Highway 101 in Sausalito, from Stanford Way in the north to south of the Toyon housing area on Monte Mar, and includes the Cypress Ridge, a designated open space by the city. The characteristics of this land are primarily willow riparian and mixed oak forest plus the open meadow of abandoned pasturage and edges comprised of a novel plant community with native and non-native species including eucalyptus, Monterey cypress, Himalayan blackberry and cotoneaster.



While the Lincoln-Butte parcel may only comprise the northern corner and only 2.1 acres of this entire open space, camera traps have determined that wildlife visit the Lincoln-Butte portion on a daily basis. Camera traps pick up members of a coyote pack, of which there is just one local family residing in Nevada Valley, at frequent intervals of several times per week. A study of the region by this author indicates that these animals travel between Monte Mar and Stanford Way via the chain of trails behind residences to the mouth of the culvert on the Lincoln-Butte parcel where they can access water year-round. This site appears to be a hub for the activity of many mammals, with trails that exit from all sides into lands of varying habitats, from open space to residential areas.

Water Resources

The creek currently found on the Lincoln-Butte parcel may have existed as two smaller wetlands instead of just one as it exists today. As noted in the previous section of this report, there was once a much taller ridge located southeast of the Lincoln-Butte parcel that was removed sometime between 1925 and 1950. Maps predating 1925 show two small valleys that once came together to run along the north edge of the parcel, with an additional valley to the south of the altered ridge. On historic maps there are no creeks indicated at any of those ridges, merely trees drawn in.

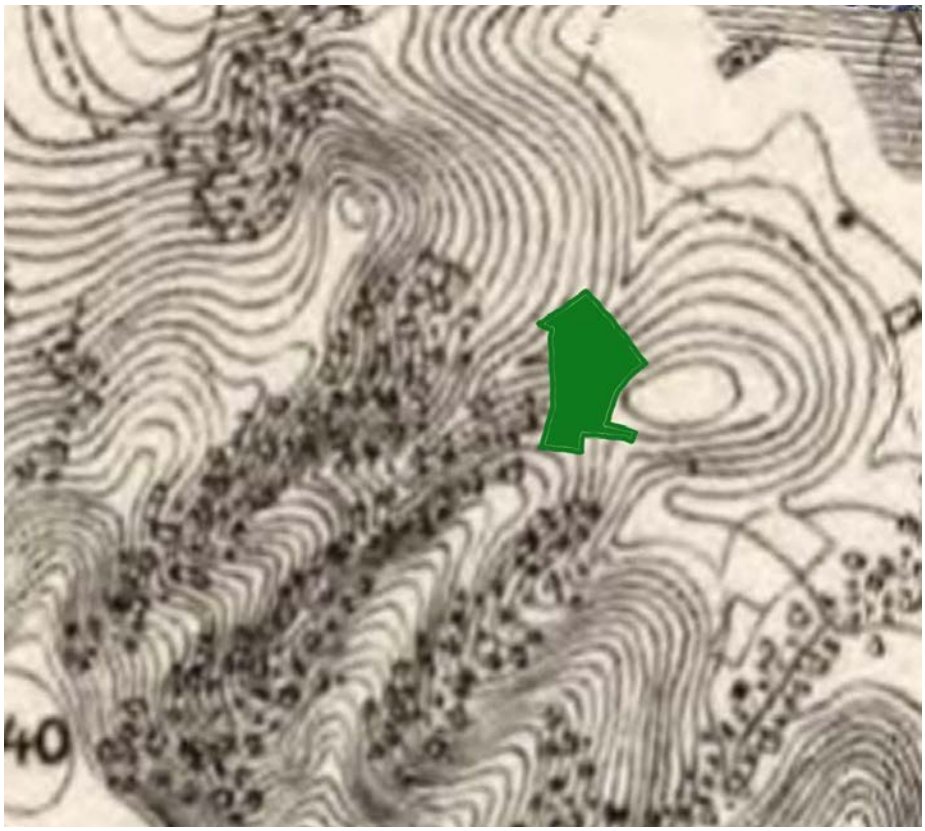


Image shows Lincoln-Butte Parcel in Green imposed on historic 1885 map.

To put it plainly, where once water flowed freely throughout these small valleys, these waters have been collected, diverted, and channelized so that they have cut a deep gouge into the hillside through erosion over time. As a result of the freeway, water from the two smaller northern valleys, plus surface water from the road, has been connected into one single culvert (referred to after as North Culvert). The North Culvert opens on the surface at the northwest corner of the Lincoln-Butte parcel where it flows on the surface into a steep channel lined with

willow trees. A second culvert on the southwest corner of the parcel (referred to after as the South Culvert) drains another valley uphill of the freeway. The South Culvert opens up at the southern edge of the property and runs northward on the surface to create a western boundary, until it meets the North Culvert and turns abruptly to meet the surface water from the North Culvert. Here, the water has gouged deeply into the hillside and created a steep embankment to either side as it flows downhill on the surface for approximately 800 feet until it is culverted again at the confluence of Sacramento and Butte streets.

Map of water resources on Lincoln-Butte site. Green marks property boundaries. Blue indicates surface waters, black indicates culverts.

When winter rains are at their peak, water overflows from the South Culvert and floods a small area of flat land, inundating it most of the rainy season. Based on aerial photos from 1950, it appears that this patch of flat land was cleared and leveled for the foundation of a building, its purpose yet unknown. Himalayan blackberry now covers much of the former building site, and in the summer the dry meadow is used regularly by juvenile coyotes and their parents. The meadow is a hub where many animals rest and occupy, and trails lead in all directions from this site.

Riparian Community

The creek that forms the west and northwest boundaries of Lincoln-Butte is lined by both arroyo willow, *Salix lasiolepi*s and Shining willow, *S. lucida*, which are a key plant community

supporting many other species, including several special status species that depend on riparian habitat for their survival. Among the willows are live oaks, alder, native maple, plus several non-native Mediterranean-adapted tree species. Woodrats are abundant throughout the entire open space, which is a riparian-associated keystone species that supports many other animals by creating habitat and as prey for carnivores and raptors. Pacific slope flycatchers are one species of bird found on the site that prefers wetland habitat for nesting. Yellow warbler, another species of concern in California that prefers willow habitat, has been identified at this location. An oak tree at the edge of the willow-lined embankment has been the nesting site of red-shouldered hawks, a riparian associated raptor, for many years. Next to that is a large pine snag that serves as potential habitat for several species of tree-roosting bats associated with wetlands. Pacific salamander and Pacific newt, both of which are present in the region, are listed as having special status for the state. Many other special status species could be determined to live here, including the valley long-horned elderberry beetle, other warblers and flycatchers, and red-legged frog, to name a few that are found in freshwater riparian habitat matching the characteristics of this site.

Nesting Habitat

Several species of birds have been documented nesting on the Lincoln-Butte parcel to date. Nesting species as of this report include Red-shouldered Hawk, California Scrub Jay, American Robin, Hairy Woodpecker, Northern Flicker, Chestnut-backed Chickadee, Yellow Warbler, House Wren, Black Phoebe, Pacific Slope Flycatcher, Tree Swallow, Fox Sparrow, Mourning Dove, Oak Titmouse, Anna's Hummingbird, California Quail, Turkey Vulture and Spotted Towhee.

For those species less adapted to urban environments such as warblers and flycatchers, the willow thickets have the highest nesting value. Again, the density and impenetrability of this particular habitat type increases the quality of nesting sites. These riparian species of birds are less gregarious and less likely to rely on anthropogenic food resources than the more generalist species found more often at feeders in backyards.

The non-riparian areas on this site are overgrown with eucalyptus, English Ivy, and Himalayan Blackberry, and nearly inaccessible to humans in most areas. While this plant community is not the highest quality habitat in comparison to native ones in that they do not offer the highest quality of food sources, it is not food source that determines choice of nest site for most passerines (Hinde). Rather, it is the density and impenetrability of these trees, brambles and thickets that increase the nesting success of many birds. Nest parasitization, predation by squirrels and jays, and habitat patchiness are the primary causes of decline in many bird populations in California (Shuford and Gardali), and the Lincoln-Butte parcel has qualities that mitigate many of those pressures.

Another factor of the land that can't be ignored is the value of traffic noise from the freeway. Many studies have shown that urban birds have been altering their calls over many generations to be heard around traffic, and they may seek these elevated sounds to mask the sound of their

own nestlings, making them safe from predators, particularly scrub jays. Jays have been recognized to prefer forest-edge habitats within and near human environments but will reach a threshold for noise tolerance when sounds interfere with the ability to communicate vocally and to hear the vocalization of other nestlings upon which they prey (Francis et al). A Red-Shouldered Hawk nest is located in a pine surrounded by willows along the northern boundary of the parcel, and has been used each spring for many subsequent years. Studies show this species is not as adapted to urban environments as the larger red-tailed hawks, but that they prefer riparian areas with enough open space and tree cover, and have adapted to choose eucalyptus trees when suitable oaks are not available (Rottenborn).

Nest parasitizing birds such as brown-headed cowbirds are also a major cause of nest failure for passerine, laying their eggs in the nest of others, and particularly those with open cup nests. While many of the birds nesting on the site are host to Brown Cowbirds, none were detected during surveys.

Nutrient Resources

The variation in plant communities on this site provides a variety of different food sources throughout much of the year, particularly those species of generalists who can adapt to novel sources for pollen and nectar, nuts, and berries. Some of those generalists may include foxes, squirrels, European Honeybees, jays, robins, rodents, deer, and coyotes, all of which can shift their diets to make use of novel foods when they become available.

Mono-species patches of blackberry and ivy create a flat horizon of evenness, a smooth flyway for animals that catch insects on the wing such as bats and flycatchers, and quality hunting grounds for raptors. Dense patches of trees and shrubs provide places for those birds that consume food by gleaning, a process of hunting for insects between leaves and stems of plants. While this site provides modest resources to support more generalist species of wildlife year-round, it is safe to speculate that supplemental resources are necessary to support most if not all animal populations on the site due to habitat quality and land size. The acres of contiguous land offer an opportunity for animals to gain the resources needed to sustain their populations. However, it cannot be understated that many of the species found on this site benefit, even if not directly, on foods sourced either by deliberate feeding of wildlife or the accidental feeding of wildlife that forage in residential neighborhoods. Even woodrats, shy animals who do not stray far from their dens, benefit from anthropogenic food sources (Post).

Studies have shown that backyard feeding of birds alters not only the behavior and biology of passerines, but entire ecosystems, from an increase in nesting success all the way to an increase in prey for predators (Robb). The proximity of residential areas to this site cannot be discounted as playing a significant role in the species found on this site, and no doubt residential bird feeders provide many of these animals with year-round food resources. Not only do anthropogenic food resources alter the evolution and populations of those animals making use of novel food sources, but urban forests are also affected. Studies of two different families of birds, geese and crows, have shown that these animals can increase available

nitrogen and phosphorus for urban ecosystems. In the case of geese in the Bosque National Wildlife Refuge near Albuquerque, NM, there is a 40% increase of nitrogen as a result of geese feeding from nitrogen-rich lawn grass in residential neighborhoods (Kitchell). And in Tokyo, a very densely populated metropolis, crows are responsible for providing crucial phosphorus to urban forests and their main food source is municipal food waste from restaurants and residencies (Fujita). Based on these findings, it is not difficult to imagine that animals visiting residential neighborhoods for food and returning to the parcel are increasing available soil nutrients for those local remnant forests.

Though few studies have measured the impact of anthropogenic nutrient load on urban forests, studies have been done to determine general soil characteristics of urban forests. In a paper by Bryant C. Scharenbroch et al, urban soils were compared for available nutrients, microbial levels, and other characteristics, where they found that as urban land becomes recolonized by forest it slowly increases in quality through inputs by the biota inhabiting it. Basically, with life comes more ability to support life, especially over time. This certainly seems to be the case at the Lincoln-Butte parcel, with impacts to the land having occurred more than 75 years ago and now covered in dense habitat.

Predator Populations Indicate Ecological Health

Several species of predators indicate that this parcel in conjunction with surrounding lands can support a complex ecosystem, indicating ecological health for this region. One factor pointing to ecological health of this site is that since 2009 the site, in conjunction to other open space in the area, has supported a stable reproductive population of coyotes, a keystone predator in urban forests and an indicator of health in just such an ecosystem. Foxes are another urban adapted predator found to be utilizing the parcel. The use of this site for nesting by the Red-shouldered Hawk is further indication of ecological value of this land.

This patch of flat ground on the Lincoln-Butte parcel is inundated with water in the rainy season, but during the dry summer months becomes a site used daily by coyotes. Photo shows the activity of coyote pups, with scat and a ball. Coyotes will play with dog toys, stuffed animals, bits of irrigation, and other items as they "practice" hunting.

IV. Species Accounts

A. Nesting Birds

The following birds displayed breeding behavior during the June 2017 survey: Red-shouldered Hawk, California Scrub Jay, American Robin, Hairy Woodpecker, Northern Flicker, Chestnut-backed Chickadee, Yellow Warbler, House Wren, Black Phoebe, Pacific Slope Flycatcher, Tree Swallow, Fox Sparrow, Mourning Dove, Oak Titmouse, Anna's hummingbird, California Quail, Turkey Vulture, Cedar Waxwing, Spotted Towhee.

Many of these birds will nest up to three times per year. Therefore, it is recommended that there be restrictions on activity anywhere on the site involving tree trimming, plant removal, loud noises or vehicles from April 1 through August 1, with restrictions on human activity and noise within 100 feet of any identified nests and general avoidance within 20 feet of those nests until the young have fledged.

Many of these species nest in tree cavities and may make use of these nesting sites many subsequent years in a row. Any dead, diseased or dying trees should be left standing whenever possible and should only be pruned or removed when they pose a human safety risk. Any alteration of standing dead wood, fallen trees, or diseased plants should take place after the nesting period is over (August 1st) or when all the young birds have fledged.

1. California Scrub Jay, *(Aphelocoma californica)*
Scrub Jays, along with Stellar Jays, crows and ravens, are part of a family of birds known as corvids. Multiple studies of the nesting preference of corvids finds that this group competes with one another for the most choice nesting spots, and these spots are based around the nesting activity of other bird species. The diet of corvids during their nesting season is primarily nestlings of other species, which exerts pressure on other species around them, though this diet changes after the young birds have fledged. (Baicich and Harrison). Scrub jays are known to prey heavily on the eggs and nestlings of other bird species to feed their young, and for many of the birds found nesting in the parcel, predation by jays is their leading cause of nesting failure (Sieving and Willson).

Yellow warblers prefer to nest in willows such as found on this site in Shasta county.

2. Yellow Warbler, *(Setophaga petechia)*

Yellow Warblers are a “species of Concern” in the state of California. They typically occupy riparian vegetation in close proximity to water along streams and in wet meadows (Lowther et al, 1999). They prefer to nest in willows, cottonwoods, alder and Oregon ash, all of which are found in riparian zones within the Study Area. A study in Clear Creek, Shasta County showed that localized breeding was more successful as forest density increased (PRBO unpbl. data). Nest parasitization, predation by squirrels and jays, and habitat patchiness are the primary cause of decline in Yellow Warbler populations in California (Shuford and Gardali). Brown-headed Cowbird, a nest parasitizing species of bird (Molothrus ater) were not found on site, but squirrels and jays pose a potential for nest predation on the site.

Nesting period from nest-building to fledge is typically 32 days, with egg to fledge being up to 28 days. Sometimes they double brooded.

3. Pacific Slope Flycatcher, *(Empidonax dificilis)*
Willow Flycatchers have not been detected on the site to date, but Pacific Slope Flycatchers have been observed during dawn chorus surveys. This species can often be found nesting

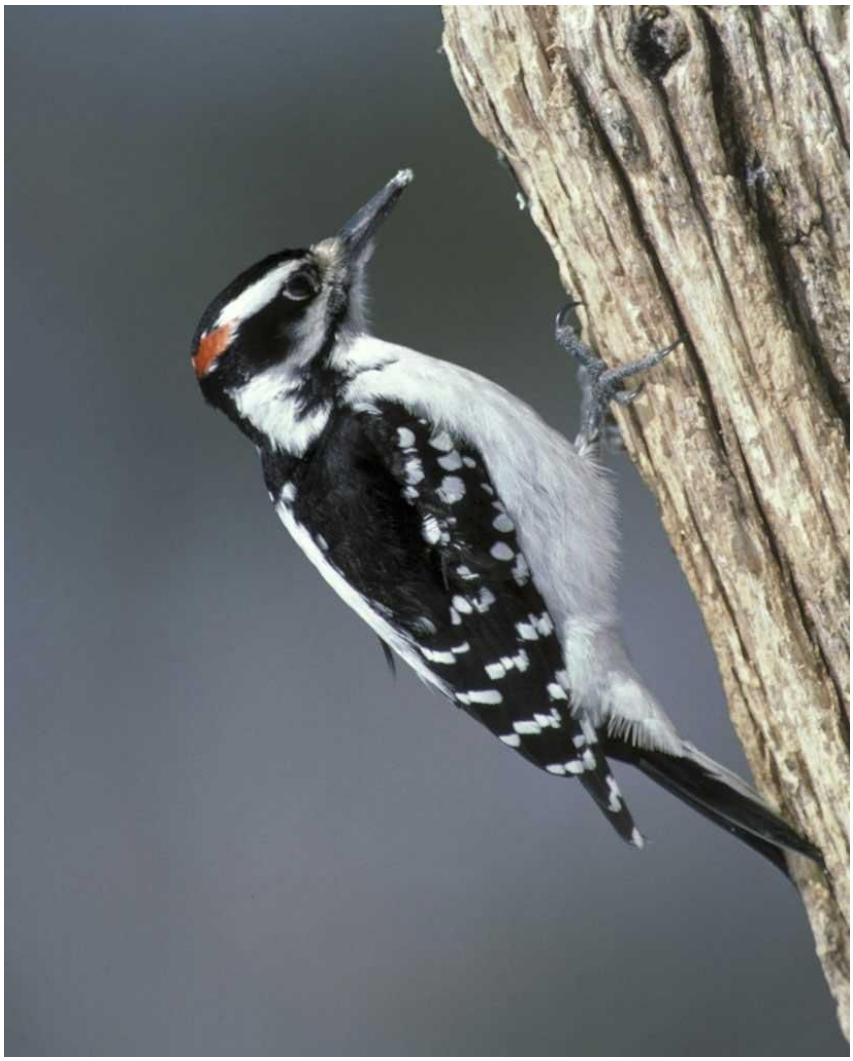
colonially amongst tree swallows in abandoned woodpecker nests, and is associated with wetland habitat.

Flycatchers are called such due to their tendency to hunt flying insects on the wing, and they prefer flat planes to fly over to catch their prey. They feed primarily on aquatic insects, including mosquitoes and blackflies and rarely visit bird feeders.

4. Northern Flicker, *(Colaptes auratus)*
Flickers will nest in a wide variety of trees, typically excavating cavities in live trees but occasionally in dead standing wood, stumps, utility poles, and nest boxes at a height of 3 to 30 meters. Their preference for living trees allows their nests to be used for many years by other cavity nesting species such as bluebirds, making them an important species for increasing

nesting potential on a site. This species is typically found in moderately developed habitats such as residential areas and the edges of open space. Both sexes incubate eggs and feed young, with a total nesting period of up to 59 days from hole excavation to fledge with a single brood. Nests are often lost to starlings and other species, and bluebirds typically nest in old holes when present.

The presence of flickers has been detected by branches ringed in sap holes and by insect predation in trees. This species will visit feeders with suet.



5. Hairy Woodpecker, *(Leuconotopicus villosus)*
Hairy Woodpeckers will excavate a new cavity every year in standing dead wood and live trees at 5-40 feet height with decay at their core. (Harrison) This characteristic makes the species important to support a variety of other cavity nesting species that do not excavate their own nests, such as bluebirds, swallows, and flycatchers. They are single brooded but may initiate

courtship behavior up to three months before nesting begins. The same recommendations apply for all nest cavities. An effort should be made to protect and retain all standing dead wood on site and avoid these trees during the nesting season.

Red-Shouldered Hawk nest found in a live oak on the Lincoln-Butte Parcel.

6. Red-Shouldered Hawk, *(Buteo lineatus)*
Red-shouldered Hawks were once on the decline throughout their historic range due to urbanization and habitat loss, especially that of hardwood riparian forests, but in the last four decades they have made a dramatic comeback. They are known to adapt to and thrive in wetland urban areas where they can find suitable nesting sites and abundant prey. While this habitat preference is more limiting than that of Red-tailed Hawks, a far more urban adapted species, Red-shouldered Hawks will adapt to a variety of tree types, including exotics, provided that these trees have a suitable diameter and height for nesting (Rottenborn). It has been suggested that the planting of eucalyptus trees in California has greatly increased the nesting and reproductive success of red-shouldered hawks (Bloom) and studies have gone so far as to show that eucalyptus, with the exception of oak trees, are the preferred tree for nesting for this species (Rottenborn).

Studies of urban Red-shouldered Hawks show they prefer riparian areas not only to breed, but to hunt in as well. The land characteristic of the Lincoln-Butte parcel offers an ideal site for Red-shouldered Hawks to hunt and to successfully reproduce. The riparian zone, with its native oaks and non-native eucalyptus, in combination with an isolated site away from regular human

activity, is ideal for this less-gregarious species of hawk. Nesting hawks can be seen hunting within the Nevada Valley neighborhood throughout the summer, and often perch atop the PG&E power lines where they search for prey.

Urban Red-shouldered Hawks are at high risk for vehicle collision which is their main cause of mortality in urban area (Hager). This author has witnessed one such incident in the early summer of 2017 when a fledgling hawk was killed after it attempted to fly from a carcass at the 101 freeway just west of the parcel. Many more Red-shouldered Hawks are killed annually along the stretch of Highway 37 where it passes through wetlands, and at times is the predominant species of roadkill for this road. Reducing the collision death of other animals, to prevent scavenging by raptors, would greatly reduce this impact.

7. Black Phoebe, *(Sayornis nigricans)*
This species prefers nesting near and on human settlements, where they typically hunt for insects on the wing in meadows and cleared vegetation. Nests may be on ledges, overhangs, wells and mine-shafts, and support beams of structures. Incubation lasts typically 15-18 days, followed by fledge at 21 days (Baichich and Harrison).

Phoebe typically prefer human sites for habitation. Nonetheless, it is recommended that wherever nests are in use that activity remain the same at those locations and that there be no increase in noise, night lighting, or occupation during this time or within 20 feet of nest until the young have fledged.

Phoebe are classified as belonging to the Tyrant Flycatcher family and like the Pacific Slope Flycatcher, hunts insects on the wing. These birds benefit from having vast level plains above which they can hunt insects, and are often seen hunting above grassy lawns of city parks.

8. Tree Swallow, *(Tachycineta bicolor)*
Tree Swallows typically nest colonially in groups, and colonize abandoned woodpecker nests when available. Their nesting period is typically finished by mid-July, and this species is single-brooded (Baicich and Harrison).

Tree Swallows prefer to catch their insect prey on the wing near dawn and dusk, avoiding the heat of the day. They benefit from a variety of habitats including broad flat planes of meadows and waterways where they can move about rapidly.

9. American Robin, *(Turdus migratorius)*
Robins were present at dawn chorus surveys at the time of the 2017 survey, but were largely silent, indicating that they had already begun nesting. Therefore, exact locations were not identified, though general areas of nesting were confirmed.

Robins exhibit nest site fidelity from year to year when successful. A North-Dakota study on nesting fidelity of robins determined that they return to successful nesting sites at a rate of 93% within a season, with median distances of 42 meters from those prior nests. Unsuccessful nests had an average of 71 meters distance from prior nesting sites (Haas). Studies of effects of noise pollution on nesting birds demonstrate that human-adapted birds may seek noisier areas to escape predation by jays, though species richness is reduced as anthropogenic noise intensifies (Francis et al.)

10. House Wren, *(Troglodytes aedon)*
During surveys, several males were observed defending territory in various separate locations, often accompanied by vocal females. Wrens nest in cavities, often competing with one another in occupying the same site year after year. Wrens will readily nest in human structures where available, and will also occupy abandoned woodpecker, chickadee, and other cavity nests.

This species is typically polygamous, with males competing heavily for territory and displaying predation on the nests of other males. Wrens are typically double-brooded. The nesting period for House Wrens is 42 days, with an overlap of 15 days for incubation of a new brood by the female only while the male continues to feed previous fledglings.

Chickadees nest in tree cavities such as this one.

11. Chestnut-backed Chickadee, Poecile rufescens, Parus rufescens.
This species typically nests in natural cavities or those excavated by the chickadees themselves in dead wood, and occasionally in woodpecker holes and nest boxes. The nesting period is 24-29 days. (Baicich and Harrison). Chickadees are known as gleaners, meaning that they hunt by inspecting the surfaces of leaves and branches for insects, often hanging upside down as they move from one branch to another. Their prey is most often of herbivorous insects and their insect predators.

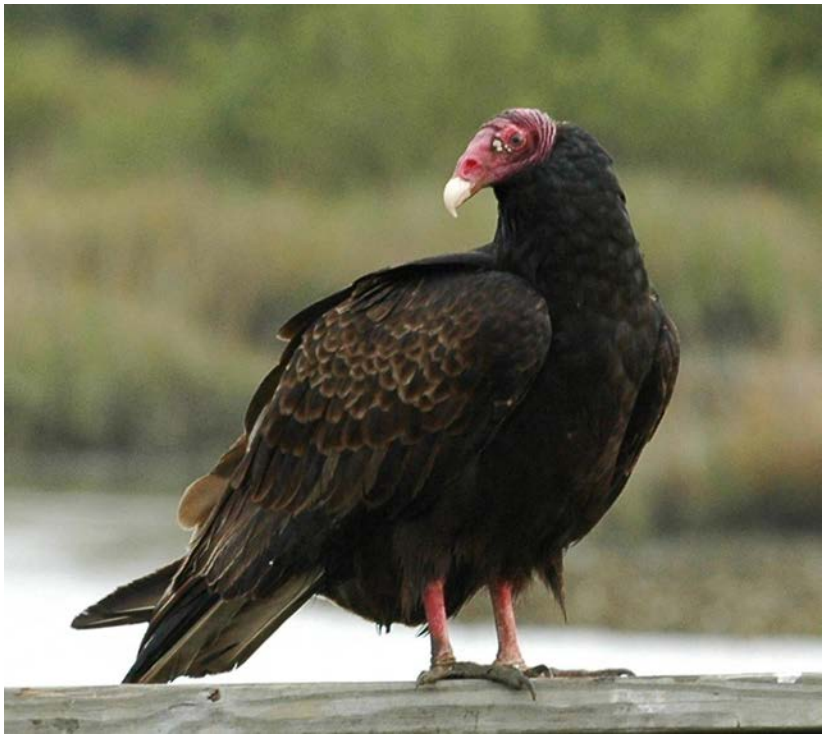
12. Fox Sparrow, *(Passerella iliaca)*
Fox Sparrows will occupy a variety of habitats including mixed forests, low shrubs, and chaparral. They typically nest in the ground in dense cover and thickets up to 7 feet. (Baicich and Harrison). A study of Fox sparrows in Fresno County, California reported that nests are typically near willows, manzanita, chinquapin, and gooseberries (Burns and Hackett). Fox sparrows prefer to hunt on the ground, and will eat a variety of ground insects during breeding season and as juveniles, switching to a vegetarian diet of seeds, nuts and small fruits as the season continues.

13. Spotted Towhee, *(Pipilo maculatus)*
This species nests on the ground or within 5 feet of the ground in dense cover such as brambles, poison oak, and chaparral. They will raise young birds two to three times per season. Towhees frequent dry thickets, brushy overgrowth, tangles brambles, and overgrown backyards, where they feed on the ground. Their diet includes insects during the breeding and nesting period, with seeds and berries making up their diet year round. They will visit backyard feeders but prefer seed that has fallen on the ground (Baicich).

14. Cedar Waxwing, *(Bombycilla cedrorum)*
These birds often nest colonially, in trees 4-50 feet above ground and in open woods, orchards, shade trees, or in residential areas. Often foraging in groups, this species will eat a variety of native and non-native fruits, including dogwood, blackberry, hawthorne, juniper, cotoneaster and toyon. They will raise two broods per season, during which time they have a mostly insect diet.

15. Anna's Hummingbird, *(Calypte anna)*
This is the most common hummingbird in urban coastal areas in California. It is found in yards, parks, cities, eucalyptus, native gardens and it readily adapts to feeders and non-native floral resources. It may nest as early as December in California, with multiple broods, and will build its nest between 17 inches to 50 feet from ground in crooks of small branches.

16. California Quail, *(Callipepla californica)*
These birds nest and forage on the ground and form large groups called coveys. They adapt to a variety of habitats, provided cover is sufficient, including parks, meadows, open spaces, and wilderness areas. They may be double-brooded, typically nesting under piles of brush including woodrats nests and fallen trees (Baicich). This species benefits from areas of dry exposed soil for dirt baths taken presumably to manage mites. They prefer to eat the seeds of the legume family but, studies report that this species will also eat the seeds of introduced broom in California including French and scotch brooms, (Blakely).



17. Turkey Vulture, *(Cathartes aura)*
This species has been observed roosting regularly in stands of eucalyptus in the southern border of the parcel. They do not typically build nests but, rather, lay eggs directly in the ground, on cliff sides, in caves, or hollow stumps. They are single-brooded, taking 50-60 days (Baicich) and are commonly found roosting in open space near roadsides, landfills, trash piles, and construction areas.

18. Oak Titmouse, *(Baeolophus inornatus*
This species of titmouse has strong ties to oak trees, though they will also live in patches of open pine and mixed-pine forest when they are dry and warm. They live year-round in the Bay

Area and mate for life (Baicich). They nest in boxes and cavities made by other birds. They frequent backyards to feed at feeders filled with suet or sunflowers but, they will also eat berries, seeds and acorns and are known for catching insects on the wing.

19. Mourning Dove, *(Zenaida macroura*)
One of most abundant birds in North America, they occupy a wide range of habitats, such as urban areas, farms, prairie, grassland, and lightly wooded areas. They construct nests at ground level to 100 feet, and will often re-use the nests of other species (Baicich). They raise up to six cycles of brood per year.

B. Mammals

1. Coyote, *(Canis latrans)*
Coyotes are the top predator in most urban ecosystems, including Nevada Valley. Anecdotal reports from several local experts suggest that coyotes were once extirpated from the region but began to make a comeback in the early 1990s to southern Marin. A stable population has been documented by this author since 2010, and coyotes occupy a territory ranging from Stanford Way in the north to Monte Mar in the south.

Coyote in Camera Trap on its way to Lincoln-Butte parcel from undeveloped land between Arana Court and the 101 freeway.

Coyotes offer both benefits and increased risks when in urban areas. Benefits include improvements to songbird populations through mesopredator release, improvement in habitat and nesting quality by predation on herbivores, reduction of disease with the predation on rodents, and the seed dispersal of fruits, nuts and berries through scat. Risks include predation on domestic pets, potential reservoirs for heartworm and parvovirus as wells as other diseases (Gehrt).

Coyotes typically group in family relationships consisting of one monogamous mating pair, the alpha male and female, plus immature females and juveniles who support the family in hunting and caring for any pups. Courtship and territorial conflict increase in the late winter and early spring, marked by more vocalization and activity. Pups are typically born in April or May, marked by a reduction of vocalization to defend territory. Young males typically disperse in the late summer or fall of their second year. Females may stay with home families or may also disperse to find mates. Coyotes typically mate for life.

The coyotes of Nevada Valley can be heard most frequently during the fall and winter, when competition for home territory is at its peak and young adults are dispersing to find new territory. They can be found regularly between Stanford Way and Monte Mar, and camera traps show they move regularly throughout this territory. This winter an unmated male who occupied territory from north of Sausalito began to enter the Nevada Valley area after an injury, where it received food from people who took pity on it. Until the pups were born sometime between April and May, there was an increase in territorial calling in Nevada Valley, especially near the dog park, leaving residents to assume, incorrectly, that the coyote population had increased.

Coyotes will dig their own dens, use dens abandoned by other animals such as badgers, and will readily adopt abandoned human infrastructure such as concrete slabs and culverts. The exact location of the den at this time is unknown, though pups were documented daily in early June on a site near the top of Spring Street by this author. At that time there were five pups. Beginning sometime in July, the coyotes have been more mobile, often frequenting the Lincoln-Butte parcel, where the scat of adults and pups alike is found upon all site visits by this author since returning to the site. Based on scat, tracks and items left on site, the coyotes are using this area for play, hunting, and as a general meeting place from which they travel together to other locations.

The 101 freeway has an important impact for this coyote population, acting as a hard boundary to their territory and as a driver of population dynamics for this region. Mortality appears to be driven solely by vehicle collisions for adults, juveniles and pups at this site. Since Jan 2017, the bodies of 6 adults/juveniles and two pups have been sighted on the freeway either directly above the parcel or within 1/4 mile south of that site, and at least three alphas from this family group have been killed in the past five years, based on observations made personally by this author.

Gray fox detected in Camera Trap placed at Lincoln-Butte parcel.

2. Gray Fox, *(Urocyan cinereoargenteus)*
Fox activity occurred at the parcel during intervals between surveys both years, but not as regularly or frequently as coyote activity. Foxes have been shown to avoid coyotes, visiting sympatric sites at different times of the day or avoiding them completely when resources are abundant elsewhere, due to predation by coyotes (Farias).

Foxes, like coyotes, are self-regulating, adjusting their populations to available territory and resources. They typically benefit their local ecosystem by dispersing the native seeds of fruit and nut trees, and reducing rodent populations. Predation on rodents in turn reduces the occurrence of Lyme disease. Risks associated with this species include a possible increase in parvovirus, a disease that causes harm to domestic dogs, and predation on nesting birds (Gehrt). This author has recovered feathers from the scat of foxes on the site. Foxes have increasingly suffered from mange, a disease associated with secondary rodenticide poisoning.

Fox dens as of yet have not been located on the site. They typically den in the hollowed cavities of large trees, preferring oak woodland over chaparral and urban sites. According to studies, den use is typically undertaken by breeding females when raising young, and when foxes are not rearing, the use of dens for rearing is replaced primarily by dense vegetation as the preferred resting place of foxes during the day (Fuller and Cypher). The breeding period for foxes is generally from January to April and gestation lasts approximately 60 days. The young remain with their mothers until they are around 8-10 months, and with males typically dispersing to their own territories the first year and females staying longer. Foxes are typically monogamous and occupy a family territory.

While it is assumed that this site does not support the denning of foxes, care should be taken to preserve any potential dens during all seasons. Therefore it is recommended that there be no clearing of vegetation or trees within 20 feet of potential dens, and the use of heavy equipment and noisy machinery be limited to areas more than 100 feet from dens at all times.

Wood rat nest at Lincoln-Butte Parcel

3. Woodrat, *Neotoma* species

Dozens of woodrat nests can be found throughout the parcel and within the stretch of open space in Nevada Valley. Nests of woodrats are typically five to eight feet tall and about the same in diameter. They are made of heaped branches and twigs with smaller nesting areas inside lined in moss, feathers, fur, and leaves. Females build nest mounds and may live in them for many generations with their female offspring. Males make their own nests and live solitary lives. Both types are located on the parcel.

Woodrats will eat a wide variety of foods, including plants, fungi and insects, bird eggs and other small animals (Bonadio). The riparian dusky-footed woodrat, a sub-species of woodrat is a federally listed endangered species. This species has been impacted by the loss of 90% of riparian corridors in the Central Valley, plus predation rodenticide use, wildfire, drought and flood (USFWS). Woodrats in general are considered a keystone species, providing habitat for many other species and they are an important food source for owls, raptors, mammals and perhaps snakes (Brylski).

It is recommended that woodrat nests be left in place and undisturbed wherever possible. Though woodrats typically do not frequent human habitation, this species, as well as predators on the site, would benefit from a neighborhood-wide effort to reduce rodenticide use to avoid inadvertent poisoning.


Trees with peeling bark and clear line of site are preferred roosts for many species of bats. Photo on right is found on the Lincoln-Butte Parcel

4. Bats and Bat Roosts

Bats can be seen hunting this site at dusk and are likely to find suitable roost sites on or near the parcel. The species roost beneath the peeling bark of standing dead wood, hollows in trees, the foliage, or in buildings and houses. California Myotis (Myotis californicus) is one such species most likely to be found on the site since it is the most common urban adapted bat in this area, and will utilize a number of different types of roosts including rock crevices, abandoned mines, under the bark of trees, and even human structures.

A study conducted to determine maternity roost preference for California Myotis in British Columbia determined that when bats chose tree bark sites, these trees exhibited particular characteristics. Ponderosa pines and occasionally Douglas firs were typically chosen for maternity roosts, and had a characteristic of being taller than nearby trees, partially dead or fully dead with bark intact, and without visual obstruction to roost entrance. These trees were typically close to fresh water sources, and had a canopy of shorter trees nearby (Brigham et al.). Other species of bats including Western Small-footed Bat (M. ciliolabrum), Little Brown Bat (M. lucifugus), Silver-Haired Bat (Lasionycteris noctivagans) and Long-legged Myotis (M. volans) will also frequent hardwood trees with peeling bark near water. Other bat species once common to poplar, such as Western Red Bat (Lasiurus blossevillii) have been shown to roost in eucalyptus trees, particularly those near water (anecdotal, David Johnston, bat specialist).

Those bats who nest in the hollow cavities of trees such as Yuma myotis (M. yumanensis), Long-eared Myotis (M. evotis) may find refuge at the parcel (ADW online access).

California Myotis exhibit roost fidelity depending upon the duration of a tree snag, which can be up to 40 years if left standing, with diminishing use as bark begins to peel off the tree and roosting sites are eliminated (Brigham et al.). These bats will utilize a number of different maternity roost locations, and often more than one per 24 hour period (Barclay and Brigham). The likelihood of more than one location for roosts in Nevada Valley is great.

In general, bats would greatly benefit from the policy of keeping in place all hollow, standing dead wood and compromised live trees, including those with a trunk base diameter of 12" or greater so long as they do not pose a risk to humans or structures. Activity on the parcel should be limited to foot traffic and light machinery within 100 feet of these trees. It is recommended that heavy equipment and chippers not come within 100 feet of snags, stumps and partially dead trees 12 inches or more in diameter to ensure no impact to bats and access be limited to a post- September period.

5. Additional Mammals

In addition to the aforementioned animals, the Lincoln-Butte site supports a number of other mammals. This includes deer, raccoon, skunks, fox squirrels, and potentially others.

C. Species Accounts: Special Status Species Observed or with a Potential to be Present

1. Blue Elderberry shrubs, (Sambucus mexicana),

Elderberry is a host plant of the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus, VELB hereafter) and is common in riparian areas such as that found on the parcel. The VELB was listed as a threatened species in 1980 by USFWS. VELB utilizes only Sambucus species as its host plant, with a larval stage of one to two years inside the stems before emerging as a short lived adult. Adults emerge from late March through June. It is assumed that VELB are likely to be present on all plants with one or more stems measuring 1.0 inch or greater in diameter.

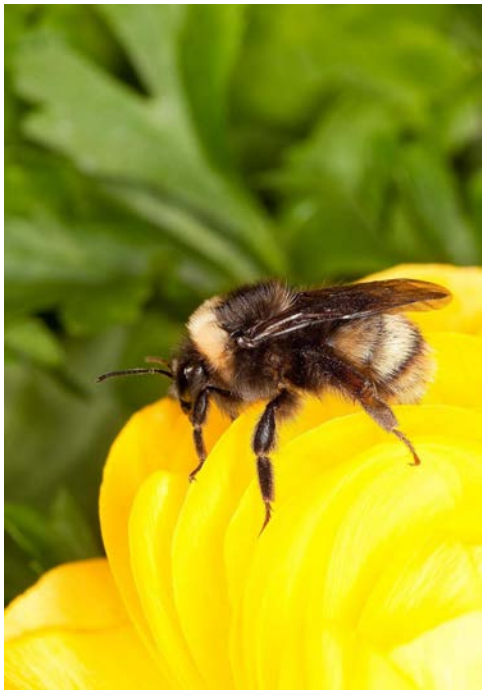
Per USFWS 1999 Conservation guidelines, complete avoidance may be assumed when a 100-foot buffer is established and maintained around elderberry plants, excluding firebreaks.

This author has experienced that VELB are usually found present when examining any elderberry found in and near riparian areas throughout California. Elderberry has not been sighted as of this report.

2. Bumblebees

Two species of bumblebees are listed as “species of concern” likely to occur in this region, Bombus Occidentalis and B. Caliginosus. Bumblebees are eusocial insects that live in colonies, and will nest in abandoned birds’ nests in trees and/or rodent tunnels in the soil. Based on studies conducted in San Francisco, urban bumblebees are most greatly impacted by nest competition between species and forage availability. Urban gardens benefit some species of bumblebee such as B. Vosnesenskii at the expense of other species because B. Vosnesenskii are more generalist, nest earlier and compete with many other Bombus species. Therefore, any efforts to include rare or threatened bee species must include the protection of nesting sites as well as deliberate planting of host species preferred by targeted bee species (McFrederick).

B. Caliginosus emerge in early spring from overwintering queens who live in abandoned rodent nests, old birds’ nests, rock piles, or cavities in dead wood. This species benefits from birds that excavate nests and standing-dead wood inventory. Habitat loss poses a threat to this species, as it is less likely to adapt to urbanization, preferring more specialized diet including Ceanothus, Cirsium, Clarkia, Keckiella, Lathyrus, Lotus, Lupinus, Rhododendron, Rubus, Trifolium, and Vaccinium (Hatfield).



B. Occidentalis, Western Bumblebee, has experienced a dramatic population decline of 40% over the past decade. They typically occupy abandoned rodent nests. In the past, this species was raised and sold commercially for pollination of greenhouse tomatoes and other crops. However, disease forced the industry to switch of another species of bumblebee for this purpose. They will forage on the following plants: Ceanothus, Centaurea, Chrysothamnus, Cirsium, Epilobium, Geranium, Grindelia, Heracleum, Lupinus, Melilotus, Monardella, Rubus, Solidago, and Trifolium.

3. Butterflies

A. Monarch, *(Danaus plexippus)*
Populations of one of North America's most iconic insect, the monarch, have declined by 78% in the last three decades, with habitat loss and insecticides as their main cause of decline. Monarchs are specialist to one family of host plants, the milkweed genus Asclepias, and make use of the plant's toxins to make themselves poisonous to potential predators, particularly birds.

The use of glyphosate, i.e. Roundup, on roadsides, fallow land, and vacant lots across the Midwest agricultural states has been blamed for the reduction of the species through habitat loss. Systemic insecticide neonicotinoids have also been blamed for monarch declines.

Monarchs typically have two cycles each year in the Bay Area, with adults expiring shortly after laying eggs. Monarchs that begin life in the spring lay at the end of summer, and the adults that hatch from their chrysalis in the fall fly south and overwinter, returning in the spring to begin the cycle again.

Monarchs overwinter along the Pacific coast in California from Mendocino County to Baja, Mexico, and prefer tall pines, Monterey Cypress, and eucalyptus for winter roosts. Monarchs begin to gather from all over the United States and Canada and fly to these overwintering areas in October. Studies have shown that these insects may have origins across the continental

divide and may fly to new locations when they migrate north in the spring. There are several overwintering sites in the Bay Area, and these populations have their origins mostly from B.C., Canada, Washington and Oregon. The site at Lincoln-Butte parcel and Nevada Valley, with its vast stands of cypress and eucalyptus, could possibly serve as a suitable winter roosting site for this species.

B. Mission Blue Butterfly, *(Aricia icarioides missionensis)*
Like monarchs, the Mission Blue larvae feed on a limited host plant that makes them bitter and less likely to be eaten by predators. Host plants include just three species of lupine, Lupinus albifrons, L formosus, and L. variicolor, which have been in decline due to the agricultural practice of eliminating them in favor of better cattle forage and the more recent conversion of coastal sage and chaparral plant communities to urban development. The mission blue is confined within the Bay Area and Santa Cruz, with the largest population on San Bruno Mountain in South San Francisco. Studies have shown that the Mission Blue typically disperse less than 64 miles from their original sites, but there are four sites within 10 miles of Lincoln-Butte, including Oakwood Valley just east of the parcel. The likelihood of finding this species on site is currently remote due to the absence of suitable host species. However, the potential to recruit this species is high if suitable sites for host lupines can be established.

4. Willow and Little Willow Flycatchers, Empidonax trailii & E. t. brewsterii.
Both species are listed as "endangered" by the state of California. Surveys of willow flycatchers are relatively difficult due to their nondescript appearance, infrequent vocalization, and limited breeding season. Based on historic literature and records, it is assumed that willow flycatchers were locally common along willow-dominated riparian corridors across California (Bombay et al).

Mitigation measures call for steps to reduce parasitization by cowbirds, management of feral domestic pets, management of trash, prevention of fire, prohibition of campfires within breeding areas, safe pesticide use and regular monitoring of water quality, and management of key invasive species, as well as limited or no access to breeding sites during breeding season (Finch et al.).

Cowbirds have not been detected on the site. Feral pets are currently not a problem on the site due to predators such as coyotes and foxes. This site is not readily accessible to humans or pets during the breeding season. Fire risk is moderate, and outdoor burning has been prohibited in this area.

5. **Amphibian Species**
The riparian nature of the Lincoln-Butte parcel provides potential habitat for several aquatic and semi-aquatic species listed for this site as "threatened," "rare" or "endangered." As stated in the sections above, this creek, in its current state, is the product of seasonal rains and runoff from upland natural and paved area. Therefore, water levels fluctuate greatly from season to season, with periods of standing water only in mid to late summer.

Amphibians are currently the most globally threatened group of vertebrates on the planet, with approximately 41% of all species in decline due to impact of anthropogenic activities (Egea-Serrano). Four species of protected amphibians are listed for this site, including two that have been observed within ¼ mile of the parcel: California Giant Salamander (Dicamptodon ensatus), and Coast Newt (Taricha torosa). Two species of frog, Foothill Yellow-legged Frog

(Rana boylii) and California Red-legged Frog (Rana draytonii) are listed as having potential for

this site. Out of the four species, the Coast Newt and Red-legged Frog are most likely to occur at this site due to their adaptive use of still water, seasonal ponds and artificial reservoirs including tanks, watering troughs, puddles and concrete water catchment basins. Newts will reproduce by laying eggs on the sides of basins, but the presence of submerged vegetation for this purpose indicates more likelihood of finding red-legged frogs (Calherpes, web). The creek in winter at Lincoln-Butte includes areas where vegetation and cover are available, as well as areas where water reaches a depth of greater than 24". However, a brief survey of the creek and four additional sites in Nevada Valley conducted by biologist, Rachel Anderson along with this author in February 2017 resulted in no detection of amphibian species.

Studies on the impact of roads on amphibians demonstrate negative impacts from pollutants such as benzenes and other long-chain polymers found in the chemicals used to pave, seal,

and de-ice roads (Egea-Serrano). As mentioned in the previous section on water resources on the Lincoln-Butte parcel, surface runoff from the 101 freeway joins waters from the upland areas as it flows through the parcel. Each of the two culverts has two associated drains that channel water from the eastbound and westbound sides of the freeway.

V. Recommendations

The Lincoln-Butte parcel has experienced many changes over the last 100 years, from topography, water regimes, urbanization, drought, and the colonization by novel plant and animal communities. This 2.1 acre parcel is surrounded on many sides by residential development and the 101 freeway, but is still connected directly to over 50 acres of open space lands in the Nevada Valley neighborhood. This novel ecosystem based on a self-generating combination of native and non-native plants and animals provides important habitat for over 17 species of birds, seven species of mammals, and countless other organisms.

Restoration Ecology is branch of ecology that began in the 1980's, and is the practice to repair and renew ecosystems that have been damaged, degraded, or destroyed, through active human intervention. In the last decade, there has been a growing movement towards Reconciliation Ecology, a practice that seeks to enhance the function and habitat quality of urban ecosystems for the adapted urban species that inhabit patches of open space and forest in cities. While this may seem as if both approaches share the same ideologies, there are fundamental differences to each. Reconciliation Ecology does not seek to restore ecosystems to pristine and historic wilderness, but is rather a more adaptive approach where a mix of native and urban adapted species are stewarded to allow novel ecosystems to thrive within an urban matrix. Reconciliation Ecology is a softer approach whereby each species on a site is evaluated, with two fundamental questions, "Who lives here?" and "What do those species need from us in order to thrive here?" Actions on the site are undertaken to allow wildlife to coexist in cities and enhance the natural systems that have assembled themselves despite the changes imposed on a site (Rosenzweig). Reconciliation Ecology is an approach this author believes accurately describes the viewpoint held by members of the Open Space Sausalito group on how to steward the Lincoln-Butte parcel.

In considering the future of this site, the first approach should be that of assessing the species on site, determining their needs, and focusing on improving and sustaining those populations *that need it most,* and to name those species as "targeted species." Particular emphasis should be to target for species that rely on the community most at risk in this neighborhood -- that of the riparian zone, plus other species that contribute to overall ecosystem robustness, eg. keystone species. While those species that may make use of more general plant communities and urban areas should be given consideration, their needs should not be given priority over those species that rely solely on the riparian areas and the qualities of this land that make it suitable for those less gregarious, more specialized species.

Wildlife stewardship must incorporate both the methods of conservation and restoration for a site, assessing what features of an ecosystem are to be preserved and those that require attention to prevent deterioration before so-called "improvements" should be undertaken. Such improvements, as increasing biodiversity or recruiting species of concern not currently found on site, must be done only in cooperation with the necessary measures to protect and foster those targeted species already found present on the site.

Any actions taken on site should be assessed for both positive outcomes and potential risk to targeted species. Timing should be taken into account for when those actions take place. For example, in deciding whether to reduce blackberry patches on the site, consideration should be given to species that make use of that plant for nesting and forage, the optimal time to undertake removal, and appropriate native substitutes that may be necessary to avoid impact to species on site using that plant. A strict policy of removing non-native species would be inappropriate for this site. Rather, a policy of evaluation and site-specific adaptability should be at the forefront of any actions taken for this land and its inhabitants.

Habitat Conservation

Conservation is the cornerstone of land management for wildlife. In many cases, simply doing nothing to the land may be appropriate action when considering the best actions to take for the land and its inhabitants.

Preserving the inventory of dead and dying trees benefits many species. Birds and mammals benefit directly from the policy of retaining dead and dying tree inventory by use of dead trees for perches, nesting, and roosting. Indirect benefits include habitat for crucial insect and fungal resources, especially those of termites. Nesting birds time their clutches to maximize the use of termite swarms, while other animals such as skunks rely almost solely on insects for their diets. Dead fallen trees absorb moisture and release nutrients as they decay, making ideal conditions for new trees to sprout and grow. It is said that sometimes the most important tree in the forest is the dead one.

Conserving the overall land use patterns will be appropriate for this site. This means maintaining the characteristics which animals find to meet their needs, such as open spaces for coyotes to gather and play, dense underbrush for birds to hide and nest, and flat open sky between forested areas for birds to hunt on the wing. While the plants that make up these characteristics may change, the overall habitat characteristics should strive to be consistent.

Reducing the use of pesticides in the Nevada Valley neighborhood would greatly benefit the Lincoln-Butte parcel. Rodenticides intended to kill household rats and mice have been shown to accumulate in the food chain of non-targeted species, particularly predators that help control their populations such as coyotes, foxes, owls and raptors. Wildcare in San Rafael reports that the most common cause of death in owls and raptors is poisoning by rodenticide, and secondary poisoning is the leading cause of aggression in coyotes in urban areas. Coyotes with rodenticide poisoning are more susceptible to sarcoptic mange, a disorder caused by mites that is normally mild but when an animal’s immune system is compromised, can cause acute problems that lead to starvation and aggression. Rodenticide poisoning is even showing up in urban puma populations in the greater Los Angeles metropolitan area.

Recent studies have demonstrated that the use of systemic insecticides in the neonicotinoid group, those commonly used on ornamental plants in the landscape, may be responsible for dramatic decline in insect species across the globe, including honeybees, bumblebees, and butterflies (Whitehorn et al). In addition to the impact on insects, aquatic invertebrates and amphibians also appear to be significantly impacted by neonicotinoids in the environment (Goulson). Efforts to educate the public on reduction, best uses and most appropriate application rates and timing would greatly benefit insect species that live in and visit the Lincoln-Butte site.

Conservation alone will not be sufficient for this site, as there are several problems with the site that left unaddressed may lead to further degradation of the site and detriment to its inhabitants. There are also a number of enhancements that may be undertaken to improve the overall habitat quality for existing species. And, finally, steps can be taken to encourage the recruitment of species not currently found on site but may move in from surrounding open spaces. The following section on Reconciliation outlines these potential goals and gives recommendations on how to achieve them.

Reconciliation

This section will address, in order, those issues that are most pressing and need attention in order to allow the continued use of the land by wildlife that are already found on site. Some species of concern not currently found on site may benefit from these actions, and when this is the case it will be stated in that section. This section will conclude with any actions taken solely to recruit species not already described in sections to improve the ecosystem for extant species.

1. Fences

There are several fences currently impeding movement to/from the Lincoln-Butte site and creating unsafe conditions for wildlife. There are three locations where fences have been breached and animals scrabble under them in order to access the year-round water resources of the creek at this site.

Animal movement and fences on the Lincoln-Butte site.

Fences are marked in yellow, with fence breaches indicated as yellow squares. Purple indicates year round trails and frequently used areas, and green lines indicate trail accessible only when seasonal water flow has subsided. Note the close proximity of the site to the 101 freeway and current fence locations. It is obvious that trails frequently used by wildlife have no physical boundaries to protect animals from entering the roadway. This particular site sees dozens of collisions with wildlife, far more than any other location within 20 miles, (anecdotal, author's observations).

In a study of the effects of habitat fragmentation on foxes and bobcats in GGNRA along the 101 freeway in

southern Marin in 1992-1995, ecologist Seth Riley found that the freeway acts as a hard boundary between the urban area of Sausalito and the wildlands of the park.

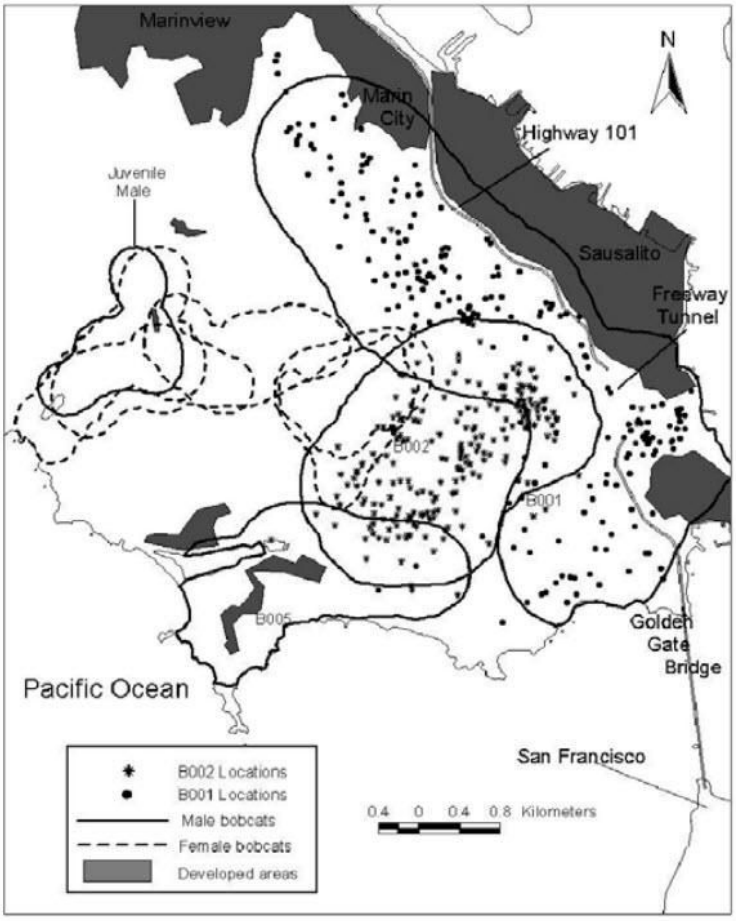


Figure 2. Radio-locations and home ranges (95% adaptive kernels) of bobcats relative to development in the urban zone of Golden Gate National Recreation Area, Marin County, California, USA, 1992–1995.

Map from *Spatial Ecology of Bobcats and Gray Foxes in Urban and Rural Zones of a National Park* by Seth P.D. Riley, 2006.

Wildlife, and possibly people, would benefit from relocation of these fences to within a few feet of the freeway for ,the entire length of the city of Sausalito with no open places, thereby, preventing any animals from entering the roadway where they are struck and killed. Current fences on the Lincoln-Butte parcel should be removed to allow the free movement within the parcel's surrounding open space and to allow for better access to the creek in multiple locations. Should it be necessary to mark property boundaries with fences, steps can be taken to minimize

their impact by making them lower in height with gaps to allow passage or by increasing the height from the ground so that animals can pass under the fences.

2. Riparian Inventory

As mentioned in an earlier section of this report on water resources, the creek at Lincoln-Butte, in its current state, is a result of channelized waters flowing from uplands above and paved areas on the 101 freeway through culverts that daylight on the parcel. The creek exhibits characteristics common in urbanized areas where water sources have been put into catchments and channelized. Sections of daylighted creek have caused deep erosion of the streambank during seasons of increased water flow, with periods of ponding and very little water flow as surface waters dry in the summers. The process of erosion has created a gully whereby the water continues to scour the channel deeper and deeper over time. This in turn lowers the water table, making it more difficult for riparian species like the willows to get their roots into the water. Trees will decline over time as a result of this erosion. In fact, the dead trees as mentioned in the previous section could likely be the result of the lowered water table compromising the ability of trees to access water in the drought experienced over the last five years for the area. Steps to reverse and repair the damage could greatly benefit riparian tree species on site.

Steps to slow the erosion of the creek can happen in many forms, and would require a whole separate report to describe them in detail. Steps to slow erosion from embankments could include the planting of additional understory vegetation to hold soil, willow stakes and wattles to slow water as it runs over slopes, mulching, brush mats, or even contour trenches. To slow water flow once it's entered the creek, low check dams of no more than 2 feet tall, placed at frequent intervals along the length of the creek may be sufficient to slow water without stopping it or posing risk of causing downstream flooding should any fail.

Breaking the fall of water as it exits the culvert is another important step to stopping erosion. Rocks, broken concrete, or riprap at the mouth of each culvert may slow water sufficiently to make a big difference as it runs down into the creek.

Due to the fact that some water in this creek has origins on the freeway, water quality must be sampled and those results must be taken into consideration to determine whether or not to make any alterations to the creek for the purpose of increasing habitability for local species of amphibians. Should the water be found suitable for amphibians, then a few deeper dams may be all that is necessary to recruit such species as Red-legged Frogs and California Newts that will breed in still water so long as it is deep enough and has some vegetative cover. Should the water be found to carry contaminants that make it unsuitable for amphibian such as polycyclic aromatic hydrocarbons (PAHs), which are associated with runoff from paved surfaces, (Chaudhry) consideration should be given to assessing if this site could support the remediation of such chemicals through soil microbes and whether this site would serve well to decontaminate water on its way to the Bay. It is recommended by this author that any such actions to slow water by building check dams or any other methods in the attempt to recruit amphibians be guided by soil testing and input from a qualified hydrologist and/or soil engineer.

3. Improving Freeway Crossings

Roads serve as hard physical boundaries for wildlife and can create island populations prone to genetic bottlenecks, high risk of animal mortality by vehicles, and potential human safety hazard through collision with animals (Gehrt). Studies have determined that animals will readily use

those culverts under freeways originally installed to allow for the passage of water, provided these culverts have specific characteristics. Those characteristics are that the diameter is greater than 36" to accommodate different types of animals, there is the ability to see light from the other side, there is vegetation on both sides and low disturbance by humans (Grilo). Enlarging and enhancing the two existing culverts under the 101 freeway at the site could result in far fewer animal deaths and greater ability of animals to leave Sausalito in order to seek new territories. Caltrans and California's Department of Transportation, and the Federal Highway Administration have undertaken such projects to improve wildlife crossing by enlarging culverts in many places in California. For a project along Highway 118 in Ventura County, six under-crossings were retrofitted for wildlife. Another project in San Diego determined that simple gaps in concrete freeway barriers allowed animals to exit the roadway once on it. These efforts would also serve our local wildlife in Marin.

4. Recruiting Species of Concern

A. Insects

Several species of concern were highlighted as having the potential to inhabit the Lincoln-Butte site. Among those species, insects such as bees and butterflies have a great potential to be recruited to the site with minimal effort through plantings. The effort to improve the site's insect population would have a positive cascading effect in that insects support a number of bird species, particularly when those that are raising their young, which is done with a diet almost entirely composed of insects.

It is the opinion of this author that efforts to introduce the three lupine species that serve as the host for Mission Blue butterflies would be a win-win situation for not only the butterflies, but for quail that are currently found on site. Quail are known to adapt to foraging for broom plants, and on site there is a stand of French Broom, Genista Monspessulana. The replacement of this plant with lupine species would be a simple and inexpensive way to improve habitat quality to both the quail and the butterfly. Bumblebee species may also benefit from introducing lupine to the site.

The planting of milkweed species suitable to the site would also be a simple and effective way to enhance habitat to recruit monarch butterflies. It has been the observation of this author that monarchs readily adapt to new locations for egg laying when Asclepias are planted in masses. This action has also reflected a gradual increase in monarch caterpillars as more plants are planted and over time. Bees are also attracted to milkweed. One note of caution in considering the planting of milkweed for monarchs concerns a protozoan called Ophryocystis Elektroscirrha (OE) that can cause deformed wings, smaller adults, and death in adult monarchs, and this disease can be passed on in vitro from mother monarchs to her eggs.

Concerns have been raised that some Asclepias species may pose a potential risk to monarchs because OE will overwinter on plants that are not pruned in the spring or retain their foliage through the winter. Studies have shown that some Asclepias species are better for monarchs than others, including A. curassavica and A. physocarpa, two species of milkweed that do well in our coastal climate and tolerate dry full sun (Sternberg). Both these plants may maintain foliage throughout winter, so it is recommended that this species be pruned to the ground each spring to reduce disease load.

B. Birds

The Lincoln-Butte site currently supports nineteen species of nesting birds, including the Red-shouldered Hawk. Many of these species have adapted to make use of urban habitat, and may even prefer building nests on and around human structures. Those species less adapted to urban environments, such as warblers and flycatchers, may benefit most from human intervention. Such intervention may include the replacement of non-native species such as blackberry and broom with native elderberry *(Sambucus californica* and *mexicana*), toyon (*Heteromeles arbutifolia*), coffeeberry (*Rhamnus* species), and manzanita (*Arctostaphylos)* species. The meadow on this site is composed of non-native annual grasses common to former pasturage, which become dry and dead in the late summer, and the introduction of native grasses to this area may extend seed availability for native birds.

Increasing the density of underbrush within forested areas, especially those with willow, may serve to improve nesting habitat for riparian species. Density may be increased simply by selectively pruning established willows or by interplanting understory plants under the canopy of willows.

Improving habitat for insects, such as planting species to attract pollinators, maintaining dead tree inventory, reducing pesticide use, may benefit other species. Plants such as native blackberry and thimbleberry (*Rubus* species), huckleberry (*Vaccinium*), native Vetches and Clovers (*Lathyrus, Lotus, Trifolium*) support not only birds with their berries and seeds, but are host plant for bumblebees.

C. Bats

Simply doing nothing may be best for the recruitment of native bat species to the site. Allowing for dead and dying trees on the site to decay naturally may provide roosting sites for those species that roost under peeling bark. Selected trees may be deliberately girdled by removing the bark at the base to kill the tree in order to replace any roosting trees lost through attrition and storms. Many species of bats have adapted to use eucalyptus, and any efforts to prune or remove eucalyptus should include the evaluation of trees for bat species. However, many species of bats prefer to forage above bodies of water. The creek is currently mostly covered by blackberry and is inaccessible for mammals so removing some of the vegetation covering the creek may benefit bats species as well as other mammals.

D. Plants

Several plant species of concern could be introduced into the Lincoln-Butte parcel, particularly those found only in wetlands which could substitute the non-native annual grasses that currently dominate the meadow area. Reintroducing species such as juncus, carex and grass species could extend seed availability in the meadow for birds and small mammals.

Other species of concern, including manzanita, aster family plants, polemonium species, native buckwheat and ceanothus, could enhance polline resources for insects and attract native pollinators to the site. Many of these species also serve birds with edible seed and fruits. Most of these species would need dry, sunny areas for optimum survival but, may be a suitable replacement for blackberry, ivy, and French Broom stands.

E. On Intervention

When undertaking restoration, many groups approach the effort through a sense of wanting to “do the right thing”, and using volunteer work. Though they may have the best intention, studies

have shown that often human intervention into a plant community results in further degradation through increased soil disturbance, soil compaction, erosion, the disturbance of resident wildlife, and the inadvertent planting of non-native seeds from years of seed bank accumulation by those non-native species already found present on the site.

Often times brush clearing and the removal of non-native species becomes the key focus for restoration efforts on a site. While these efforts can improve habitat quality, efforts to remove any brush or plants must be undertaken in ways that do not cause inadvertent negative impacts. It is recommended that any necessary removal of existing plants should be undertaken when that plant is not being used by resident birds or bats, such as late fall, winter, and early spring when seeds or berries are not present and/or nesting cover is no longer needed.

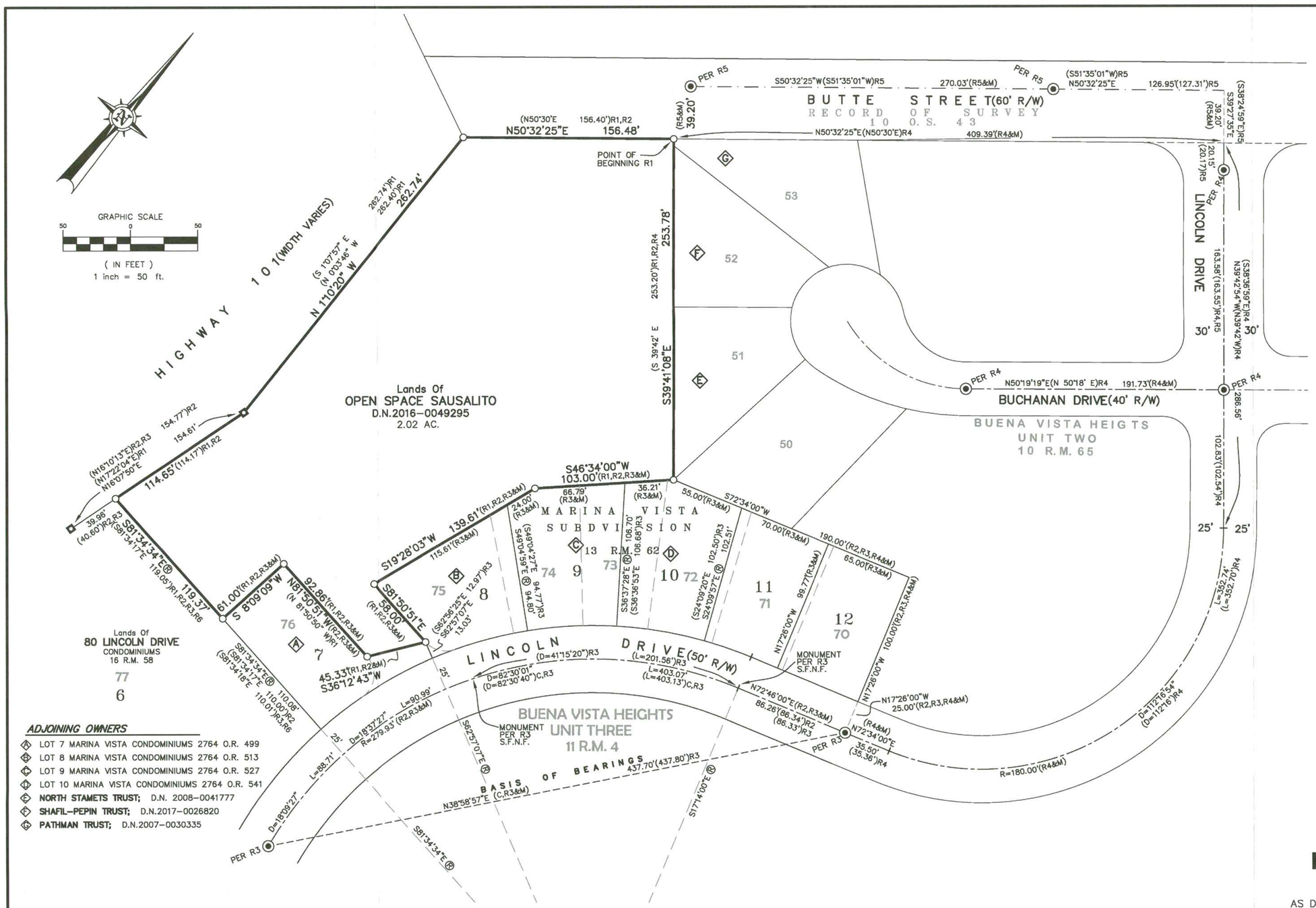
On undertaking vegetation removal, groups often make the mistake of starting in the most heavily degraded areas and working their way toward the more intact areas. It is the experience of this author that most success is gained when areas with the least amount of degradation and most intact plant communities are addressed first, using a combination of vegetation removal, minimizing soil disturbance, working slowly over many years, and planting desired species to replace the vegetation that has been removed. This method is called the Bradley Method, first developed by two naturalists in Australia when they were reclaiming degraded native habitats in the bush (Bradley).

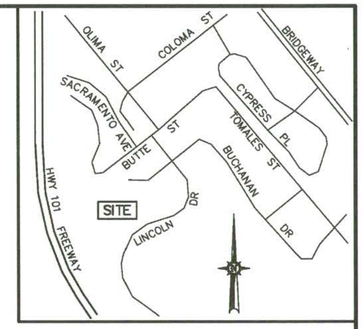
Care should be taken when planting native plants to time efforts to coincide with the rainy season so that plants become better established and need little supplemental watering. Plants raised from seed on site and plants raised from four inch plants, in the experience of this author, become established in their first year when planted in early spring just before the end of the rainy season, in January, February and March. Timing must be planned so that human activity does not disturb nesting birds or roosting bats.

A comprehensive plan for any intervention should be made before work begins, and that plan should include goals of intervention, timing, and specific locations of where those alterations will take place. It is recommended that this project seek the council of experts in the field urban ecology and land stewardship. Any efforts to improve habitat should be undertaken slowly, over time, to minimize inadvertent negative impacts to allow native systems to recover gradually. Evaluation of success for each undertaking should be made at regular intervals, and the criteria for success should not be visual appeal, but rather by evaluating improvements such as increased ecosystem function and better habitability for wildlife, particularly these species who rely on the riparian habitat found on site.

Appendices

Appendix A: Record of Survey





VICINITY MAP
NO SCALE

REFERENCES

R1	QUITCLAIM DEED; D.N.2016-0049295
R2	BUENA VISTA HEIGHTS, UNIT 3; 11 R.M. 4
R3	MARINA VISTA SUBDIVISION; 13 R.M. 62
R4	BUENA VISTA HEIGHTS, UNIT 2; 10 R.M. 65
R5	RECORD OF SURVEY; 10 O.S. 43
R6	80 LINCOLN DRIVE CONDOMINIUM; 16 RM 58

LEGEND

○	SET 1/2" IRON PIPE TAGGED LS 7237
◉	FOUND STANDARD STREET MONUMENT
■	FOUND 6"x6" CONCRETE MONUMENT PER R2
( )	RECORD DATA
M	MEASURED
C	CALCULATED
®	RADIAL BEARING
Ⓐ	ADJOINING OWNER REFERENCE
S.F.N.F.	SEARCHED FOR. NOT FOUND

ADJOINING OWNERS

- Ⓐ LOT 7 MARINA VISTA CONDOMINIUMS 2764 O.R. 499
- Ⓑ LOT 8 MARINA VISTA CONDOMINIUMS 2764 O.R. 513
- Ⓒ LOT 9 MARINA VISTA CONDOMINIUMS 2764 O.R. 527
- Ⓓ LOT 10 MARINA VISTA CONDOMINIUMS 2764 O.R. 541
- Ⓔ **NORTH STAMETS TRUST;** D.N. 2008-0041777
- Ⓕ **SHAFIL-PEPIN TRUST;** D.N.2017-0026820
- Ⓖ **PATHMAN TRUST;** D.N.2007-0030335

BASIS OF BEARINGS:

SOUTH 38°58'57" WEST (CALCULATED) BETWEEN FOUND STANDARD STREET MONUMENTS AS SHOWN ON MARINA VISTA SUBDIVISION FILED IN BOOK 13 OF RECORD MAPS AT PAGE 62, MARIN COUNTY RECORDS.

NOTES:

ALL DIMENSIONS ARE SHOWN IN FEET AND DECIMALS THEREOF.
ALL TIES ARE PERPENDICULAR UNLESS OTHERWISE NOTED.

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYOR'S ACT AT THE REQUEST OF BILL MONNET IN MARCH, 2017.

PRELIMINARY
DATED: 10 - 4 - 17

MICHAEL E. FORD, PLS 7237

DATED

COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE PROFESSIONAL LAND SURVEYORS ACT THIS_____DAY OF_____, 2017.

CRAIG TACKABERY
COUNTY SURVEYOR

DEPUTY COUNTY SURVEYOR

RECORDER'S STATEMENT

FILED THIS_____DAY OF_____, 2017. AT____ M. IN BOOK_____OF MAPS, AT PAGE(S)_____, AT THE REQUEST OF THE COUNTY SURVEYOR.

COUNTY RECORDER — DOCUMENT NO.

DEPUTY COUNTY RECORDER — FEES

RECORD OF SURVEY

THE LANDS OF
OPEN SPACE SAUSALITO
AS DESCRIBED BY DEED RECORDED AS DOCUMENT NUMBER 2016-0049295 OFFICIAL RECORDS OF MARIN COUNTY

SAUSALITO

COUNTY OF MARIN — **STATE OF CALIFORNIA**
SCALE: 1" = 50' — DATE: OCTOBER 2017

michael ford land surveying inc.
2300 bethards drive, suite J
santa rosa • california 95405
p 707.542.8513 - f 707.542.1825
www.michaelfordinc.com

APN 064-321-01 — JOB #172990 — THIS SHEET ONLY

Appendix B: Bibiolgraphy

Shuford, W.D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Burns, Kevin J and Hackett, Shannon J. 1993. Nest and Nest-Site Characteristics of a Western Population of Fox Sparrow (Passerella iliaca). The Southwestern Naturalist Vol. 38, No. 3 (Sep., 1993), pp. 277-279

Paul Baicich and Colin Harrison, 1997. Nests, Eggs, and Nestlings of North American Birds. Princeton Field Guides.

Peter B. Moyle, 1973. Effects of Introduced Bullfrogs, Rana Catesbeiana, on the Native Frogs of the San Joaquin Valley, California. Copeia Vol. 1973, No. 1 (Mar. 5, 1973), pp. 18-22. Published by: American Society of Ichthyologists and Herpetologists (ASIH).

Helen L. Bombay, Teresa M Ritter, Brad E. Valentine, 2000. A Willow Flycatcher Survey Protocol for California. California Department of Fish and Game Archives.

Finch et al., 2000. Chapter 10, Management Recommendations (Temporary Recovery Plan for the southwestern willow flycatcher.) USDA Forest Service Gen. Tech. Rep. RMRS-GTR-60. 2000

Bonadio, C. 2000. "Neotoma fuscipes" (On-line), Animal Diversity Web. Available: http://animaldiversity.org/accounts/Neotoma_fuscipes/ [2015, May 10]

U.S. Fish & Wildlife Service, Sacramento Fish & Wildlife Office Species Account, Riparian Woodrat. Available: fws.gov/sacramento/es_species/Accounts/Mammals/Documents/riparian_woodrat.pdf [2015, May 10]

P. Brylski, California Wildlife Habitat Relationships System, California Department of Fish and Wildlife California Interagency Wildlife Task Group, Dusky-Footed Woodrat. Updated by CWHR Program Staff, August 2005 and January 2008.

Bogan et al. 2005. Species accounts for Myotis californicus. Prepared by Western Bat Working Group Colorado committee, for 2005 Portland Biennial Meeting.

Pierson et al. 1999. Species Conservation Assessment and Strategy for Townsend's Big-eared Bat. Idaho Conservation Effort, Idaho Department of Fish and Game.

Constantine. 1998. An Overlooked External Character to Differentiate Myotis californicus and Myotis ciliolabrum (Vespertilionidae). Journal of Mammalogy. Vol. 79, No. 2 (May, 1998), pp. 624-630.

Barclay and Brigham. 2001. Year-to-year Reuse of Tree-roosts by California Bats (Myotis californicus) in Southern British Columbia. Am. Midl. Nat. 146:80-85.

Brigham et al. 1997. Roosting Behavior and Roost-Site Preferences of Forest-dwelling California Bats (Myotis californicus). J. of Mammology, Vol. 78, No. 4, pp. 1231-1239.

Bolster. 1997. Living with Bats. California Department of Fish and Game.

Martin. May 13, 1992. Nest Predation among Vegetation Layers and Habitat Types: Revising the Dogmas. The American Naturalist, Vol 141, No 6, pp 897-913.

Belles-Isles and Picman. May 13, 1986. Nesting Losses and Nest Site Preferences in House Wrens. The Condor, Vol 88, pp 483-486.

Pribal and Picman. October 15, 1990. Why House Wrens Destroy the Clutches of other Birds: A Support for the Nest Site Competition Hypothesis. The Condor, Vol 93, pp 184-185.

Hass. March 12, 1998. Effects of Prior Nesting Success on Site Fidelity and Breeding Dispersal: An Experimental Approach. The Auk, Vol 115(4), pp 929-936.

Francis et al. August 25, 2009. Noise Pollution Changes Avian Communities and Species Interactions. Current Biology, Vol 19, pp 1415-1419.

Fuller and Cypher. 2004. Gray Fox, Urocyon cinereoargenteus. Canid Specialist Group of the International Union for the Conservation of Nature (IUCN).

Filler et al. July 2005. Survival and cause-specific mortality of gray foxes (Urocyon cinereoargenteus) in southern California. Journal of Zoology, Volume 266, Issue 3, pages 249–254, July 2005

Gotfried et al. 1985. Breeding Robins and Nest Predators: Effect of Predator Type and Defense Strategy on Initial Vocalization Patterns. Wilson Bull., Vol 97(2), pp 183-190.

Rottenborn, Stephen C. 2000. Nest-Site Selection and Reproductive Success of Urban Red-shouldered Hawks in Central California. Journal of Raptor Research. 34(1):18-25 The Raptor Research Foundation, Inc.

Hager, Stephen B. 2009. Human-Related Threats to Urban Raptors. Journal of Raptor Research 43(3):210-226. https://doi.org/10.3356/JRR-08-63.1. The Raptor Research Foundation, Inc.

Hinde, A. 1956. The Biological Significance of the Territories of Birds. Ibis, the International Journal of Avian Science. DOI: 10.1111/j.1474-919X.1956.tb01419.x

Post D.M, Hawkins B. L.. Eldridge J. A. 2015. The effects of nutrition-induced abnormal food metabolism in the Southern Plains woodrat (Neotoma micropus): comparisons of variations of the Western diet. Journal of Animal Physiology and Animal Nutrition, Volume 99, Issue 1. Pages 29–36. DOI: 10.1111/jpn.12224

Farias Veronica, Fuller Todd K., Sauvajot Raymond M. 2012. Activity and Distribution of Grey Foxes (Urocyon cinereoargenteus) in Southern California. THE SOUTHWESTERN NATURALIST 57(2): 176–181

Gehrt Stanley, Riley Seth, Cypher Brian. 2010. Urban Carnivores: Ecology, Conflict, and Conservation. Johns Hopkins Press. ISBN-13: 978-0-8018-9389-6.

McFrederick Quinn S, LeBuhn Gretchen. 2005 Are urban parks refuges for bumble bees Bombus spp. (Hymenoptera: Apidae)? Biological Conservation Magazine.
Kitchell, James, et al. 1999. Nutrient cycling at the landscape scale: The role of diel foraging migrations by geese at the Bosque del Apache National Wildlife Refuge, New Mexico. Limnology and Oceanography. DOI: 10.4319/lo.1999.44.3_part_2.0828

Fujita M, Koike F. 2007. Birds transport nutrients to fragmented forests in an urban landscape. Ecol Appl. 2007 Apr;17(3):648-54.

Blakely, Kevin L. et al. 2009. Response of Key Foods of California Quail to Habitat Manipulations. Wildlife Society Bulletin (1973-2006)

Hatfield, R., Jepsen, S., Thorp, R., Richardson, L. & Colla, S. 2014. Bombus caliginosus. The IUCN Red List of Threatened Species 2014: e.T44937726A69000748. http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T44937726A69000748.en. Downloaded on 15 August 2017.

Rosenzweig, Michael. 2003. Win-win Ecology, How the Earth's species can survive in the midst of human enterprise. Oxford, UK: Oxford University Press.

Whitehorn et al, Penelope. 2012. Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. Science 20 Apr 2012: Vol. 336, Issue 6079, pp. 351-352. DOI: 10.1126/science.1215025

Chaudhry, Q., Blom-Zandstra, M., Gupta, S. et al. Env Sci Poll Res Int (2005) 12: 34. https://doi.org/10.1065/espr2004.08.213
Goulson, D. (2013), REVIEW: An overview of the environmental risks posed by neonicotinoid insecticides. J Appl Ecol, 50: 977–987. doi:10.1111/1365-2664.12111

Grilo, Carlo et al. 2008. Response of carnivores to existing highway culverts and underpasses: implications for road planning and mitigation. Biodiversity and Conservation. June 2008, Volume 17, Issue 7, pp 1685–1699

Sternberg, E. D., Lefèvre, T., Li, J., de Castillejo, C. L. F., Li, H., Hunter, M. D. and de Roode, J. C. (2012), FOOD PLANT DERIVED DISEASE TOLERANCE AND RESISTANCE IN A NATURAL BUTTERFLY-PLANT-PARASITE INTERACTIONS. Evolution, 66: 3367–3376. doi:10.1111/j.1558-5646.2012.01693.x

Bradley, Joan (1988). Bringing Back the Bush. Sydney: Lansdowne Press.

Appendix B: Bibliography

Shuford, W.D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Burns, Kevin J and Hackett, Shannon J. 1993. Nest and Nest-Site Characteristics of a Western Population of Fox Sparrow (Passerella iliaca). The Southwestern Naturalist Vol. 38, No. 3 (Sep., 1993), pp. 277-279

Paul Baicich and Colin Harrison, 1997. Nests, Eggs, and Nestlings of North American Birds. Princeton Field Guides.

Peter B. Moyle, 1973. Effects of Introduced Bullfrogs, Rana Catesbeiana, on the Native Frogs of the San Joaquin Valley, California. Copeia Vol. 1973, No. 1 (Mar. 5, 1973), pp. 18-22. Published by: American Society of Ichthyologists and Herpetologists (ASIH).

Helen L. Bombay, Teresa M Ritter, Brad E. Valentine, 2000. A Willow Flycatcher Survey Protocol for California. California Department of Fish and Game Archives.

Finch et al., 2000. Chapter 10, Management Recommendations (Temporary Recovery Plan for the southwestern willow flycatcher.) USDA Forest Service Gen. Tech. Rep. RMRS-GTR-60. 2000

Bonadio, C. 2000. "Neotoma fuscipes" (On-line), Animal Diversity Web. Available: http://animaldiversity.org/accounts/Neotoma_fuscipes/ [2015, May 10]

U.S. Fish & Wildlife Service, Sacramento Fish & Wildlife Office Species Account, Riparian Woodrat. Available: fws.gov/sacramento/es_species/Accounts/Mammals/Documents/riparian_woodrat.pdf [2015, May 10]

P. Brylski, California Wildlife Habitat Relationships System, California Department of Fish and Wildlife California Interagency Wildlife Task Group, Dusky-Footed Woodrat. Updated by CWHR Program Staff, August 2005 and January 2008.

Bogan et al. 2005. Species accounts for Myotis californicus. Prepared by Western Bat Working Group Colorado committee, for 2005 Portland Biennial Meeting.

Pierson et al. 1999. Species Conservation Assessment and Strategy for Townsend's Big-eared Bat. Idaho Conservation Effort, Idaho Department of Fish and Game.

Constantine. 1998. An Overlooked External Character to Differentiate Myotis californicus and Myotis ciliolabrum (Vespertilionidae). Journal of Mammalogy. Vol. 79, No. 2 (May, 1998), pp. 624-630.

Barclay and Brigham. 2001. Year-to-year Reuse of Tree-roosts by California Bats (Myotis californicus) in Southern British Columbia. Am. Midl. Nat. 146:80-85.

Brigham et al. 1997. Roosting Behavior and Roost-Site Preferences of Forest-dwelling California Bats (Myotis californicus). J. of Mammology, Vol. 78, No. 4, pp. 1231-1239.

Bolster. 1997. Living with Bats. California Department of Fish and Game.

Martin. May 13, 1992. Nest Predation among Vegetation Layers and Habitat Types: Revising the Dogmas. The American Naturalist, Vol 141, No 6, pp 897-913.

Belles-Isles and Picman. May 13, 1986. Nesting Losses and Nest Site Preferences in House Wrens. The Condor, Vol 88, pp 483-486.

Pribal and Picman. October 15, 1990. Why House Wrens Destroy the Clutches of other Birds: A Support for the Nest Site Competition Hypothesis. The Condor, Vol 93, pp 184-185.

Hass. March 12, 1998. Effects of Prior Nesting Success on Site Fidelity and Breeding Dispersal: An Experimental Approach. The Auk, Vol 115(4), pp 929-936.

Francis et al. August 25, 2009. Noise Pollution Changes Avian Communities and Species Interactions. Current Biology, Vol 19, pp 1415-1419.

Fuller and Cypher. 2004. Gray Fox, Urocyon cinereoargenteus. Canid Specialist Group of the International Union for the Conservation of Nature (IUCN).

Filler et al. July 2005. Survival and cause-specific mortality of gray foxes (Urocyon cinereoargenteus) in southern California. Journal of Zoology, Volume 266, Issue 3, pages 249–254, July 2005

Gotfried et al. 1985. Breeding Robins and Nest Predators: Effect of Predator Type and Defense Strategy on Initial Vocalization Patterns. Wilson Bull., Vol 97(2), pp 183-190.

Rottenborn, Stephen C. 2000. Nest-Site Selection and Reproductive Success of Urban Red-shouldered Hawks in Central California. Journal of Raptor Research. 34(1):18-25 The Raptor Research Foundation, Inc.

Hager, Stephen B. 2009. Human-Related Threats to Urban Raptors. Journal of Raptor Research 43(3):210-226. https://doi.org/10.3356/JRR-08-63.1. The Raptor Research Foundation, Inc.

Hinde, A. 1956. The Biological Significance of the Territories of Birds. Ibis, the International Journal of Avian Science. DOI: 10.1111/j.1474-919X.1956.tb01419.x

Post D.M, Hawkins B. L.. Eldridge J. A. 2015. The effects of nutrition-induced abnormal food metabolism in the Southern Plains woodrat (Neotoma micropus): comparisons of variations of the Western diet. Journal of Animal Physiology and Animal Nutrition, Volume 99, Issue 1. Pages 29–36. DOI: 10.1111/jpn.12224

Farias Veronica, Fuller Todd K., Sauvajot Raymond M. 2012. Activity and Distribution of Grey Foxes (Urocyon cinereoargenteus) in Southern California. THE SOUTHWESTERN NATURALIST 57(2): 176–181

Gehrt Stanley, Riley Seth, Cypher Brian. 2010. Urban Carnivores: Ecology, Conflict, and Conservation. Johns Hopkins Press. ISBN-13: 978-0-8018-9389-6.

McFrederick Quinn S, LeBuhn Gretchen. 2005 Are urban parks refuges for bumble bees Bombus spp. (Hymenoptera: Apidae)? Biological Conservation Magazine.
Kitchell, James, et al. 1999. Nutrient cycling at the landscape scale: The role of diel foraging migrations by geese at the Bosque del Apache National Wildlife Refuge, New Mexico. Limnology and Oceanography. DOI: 10.4319/lo.1999.44.3_part_2.0828

Fujita M, Koike F. 2007. Birds transport nutrients to fragmented forests in an urban landscape. Ecol Appl. 2007 Apr;17(3):648-54.

Blakely, Kevin L. et al. 2009. Response of Key Foods of California Quail to Habitat Manipulations. Wildlife Society Bulletin (1973-2006)

Hatfield, R., Jepsen, S., Thorp, R., Richardson, L. & Colla, S. 2014. Bombus caliginosus. The IUCN Red List of Threatened Species 2014: e.T44937726A69000748. http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T44937726A69000748.en. Downloaded on 15 August 2017.

Rosenzweig, Michael. 2003. Win-win Ecology, How the Earth's species can survive in the midst of human enterprise. Oxford, UK: Oxford University Press.

Whitehorn et al, Penelope. 2012. Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. Science 20 Apr 2012: Vol. 336, Issue 6079, pp. 351-352. DOI: 10.1126/science.1215025

Chaudhry, Q., Blom-Zandstra, M., Gupta, S. et al. Env Sci Poll Res Int (2005) 12: 34. https://doi.org/10.1065/espr2004.08.213
Goulson, D. (2013), REVIEW: An overview of the environmental risks posed by neonicotinoid insecticides. J Appl Ecol, 50: 977–987. doi:10.1111/1365-2664.12111

Grilo, Carlo et al. 2008. Response of carnivores to existing highway culverts and underpasses: implications for road planning and mitigation. Biodiversity and Conservation. June 2008, Volume 17, Issue 7, pp 1685–1699

Sternberg, E. D., Lefèvre, T., Li, J., de Castillejo, C. L. F., Li, H., Hunter, M. D. and de Roode, J. C. (2012), FOOD PLANT DERIVED DISEASE TOLERANCE AND RESISTANCE IN A NATURAL BUTTERFLY-PLANT-PARASITE INTERACTIONS. Evolution, 66: 3367–3376. doi:10.1111/j.1558-5646.2012.01693.x

Bradley, Joan (1988). Bringing Back the Bush. Sydney: Lansdowne Press.

END