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The Central Coast Connectivity Project, Northern Monterey County Linkages: Report on the Mount Toro to Fort Ord Reserve Study 2008-2009

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The Central Coast Connectivity Project
Northern Monterey County Linkages:

Report on the Mount Toro to Fort Ord Reserve Study
2008-2009



Prepared by Connectivity for Wildlife LLC
For The Big Sur Land Trust
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Appendix A: Wildlife Movement Matrix

Abstract

The Big Sur Land Trust contracted Connectivity for Wildlife LLC (CFW), a wildlife research organization, to conduct a wildlife connectivity study in the Central Coast of California. Using extensive field work combined with Geographic Information System (GIS) modeling CFW documents species presence and ground-truths habitat suitability models to better understand wildlife movement patterns and identify lands and waterways that provide important connectivity between core habitat areas for wildlife between Central Coast mountain ranges including the Sierra de Salinas, Santa Lucia, Santa Cruz and Gabilan mountains. Data was collected by camera trap stations, wildlife track and sign surveys and documented road-kill incidents. Results may be used to inform the Land Trust's conservation initiatives, stewardship and education programs and to aid policy makers and planners in developing compensatory mitigation and infrastructure design considerations that protect and enhance critical wildlife linkages throughout California's Central Coast.

This study began in October 2008 and is ongoing. This report discusses data collected from a monitoring period of October 2008 through December 2009 and focused on the Highway 68 corridor and the area around Marks Ranch, Toro Park, and Fort Ord Natural Reserve – protected lands that sit at the north end of the Sierra de Salinas Mountains and level off to the north into the grassland, maritime chaparral, oak woodland, coastal scrub and dune habitats of the coastal plain along the southern end of the Monterey Bay. Understanding wildlife movement in this region is a priority for The Big Sur Land Trust because of the organization's investment in Marks Ranch and conservation initiatives within the Sierra de Salinas Mountain Range. Highway 68 separates Marks Ranch and Toro Park from the Fort Ord Natural Reserve. El Toro Creek passes under a bridge on Highway 68 providing safe passage and habitat for wildlife moving between the uplands of the Sierra de Salinas and the lowland habitats toward Monterey Bay.

A total of 404 individual detections were recorded using riparian habitat and safe passage afforded by the creek and bridge. Results of this portion of the study conclude that this region facilitates a high degree of wildlife movement. The data collected to date, combined with aerial imagery, habitat suitability models and other GIS tools graphically demonstrate that the narrow undeveloped gap that exists between the relatively dense housing along San Benancio Road and Toro Park Estates serves as an active linkage for animals moving between the uplands of the Sierra de Salinas mountains and the lowland, dune and other suitable coastal habitats of the Fort Ord Reserve and the shores of the Monterey Bay National Marine Sanctuary. Policy makers and planners seeking to sustain connectivity and minimize negative impacts on wildlife populations in this region should consider development configurations that accommodate existing movement paths for wildlife. Any proposed and future development in these relatively intact natural lands without primary regard for wildlife, their habitat requirements and movement patterns could effectively and completely isolate populations and individuals of such sensitive and large ranging species as the North American badger and mountain lion. The isolation of these populations could lead to their local extinction in otherwise viable lowland and coastal habitats along the southern portion of Monterey Bay.

Introduction

Background

In May 2007, The Big Sur Land Trust (BSLT) purchased the 816-acre Marks Ranch south of the city of Salinas. An important goal for BSLT was to protect the natural characteristics found on this property which offer important habitat for wildlife. Soon after the purchase, BSLT was contacted by Jessica Quinn, a UC Davis graduate student, studying American badger populations on the Fort Ord Natural Reserve (Fort Ord) with support from the California Department of Fish and Game. Using radio-telemetry tracking, her team determined that a young badger was crossing Highway 68 from Fort Ord, south east into Marks Ranch and back to Fort Ord several times during the mating season. Hoping to build upon this research and better understand wildlife activity and movement on Marks Ranch and surrounding areas, BSLT began documenting wildlife sightings and signs on the Ranch.

BSLT contracted wildlife connectivity biologist Tanya Diamond and wildlife track and sign specialist Casey McFarland of Connectivity for Wildlife LLC (CFW) to study vegetation, habitat and wildlife sightings and signs on Marks Ranch to determine likely movement patterns for wildlife based on habitat preference. The team documented wildlife movement on the ranch through track and sign identification and the use of photographic “trap” stations. Road-kill data was also acquired, evaluated and incorporated into the study. The CFW team used data collected from field observations to “ground-truth” habitat suitability models used to predict likely movement patterns of focal species. Information gathered through this process determined that Marks Ranch provides important habitat for wildlife, serving as both home range and corridor habitat for large ranging species, such as mountain lion, gray fox, bobcats, coyotes and deer, and North American badger.

Supporting Research

The Guide to Wildlands Conservation in the Central Coast Region of California (Thorne et al. 2002) written for the California Department of Fish and Game, is frequently cited in the California State Wildlife Action Plan, (CSWAP), and in habitat conservation plans, such as the Santa Clara Habitat Conservation Plan. This Guide consists of several habitat connectivity linkage models throughout the Central Coast. The Central Coast Connectivity Project is ground-truthing several of the linkage models from the 2002 report and is using the guide as a basis for research being conducted within the area. Through aerial imagery (Google Earth 2008) review, preliminary data analysis and reconnaissance of the region, the team determined that this area is a high conservation priority as Fort Ord is in danger of becoming an isolated habitat patch due to development and roads.

In the Central Coast region, the CSWAP, identifies several species of high concern: “Wildlife inhabitants of the outer coast mountains include wide ranging species such as mountain lion and bobcat and sensitive species that include the North American badger” (p. 198, CSWAP). These mammals are some of the focal species for this regional connectivity study. There is an increasing need to determine carnivore movement patterns among fragmented habitat patches (Walker & Craighead 1997).

Corridors can help to reduce the negative effects of habitat fragmentation (Soule and Terborgh 1999) by facilitating the movement of wildlife species through habitat patches (Hilty et al. 2006, Beier and Noss 1998). Corridors help in facilitating movement of juvenile carnivores through fragmented habitats so that they may establish their own home ranges (Lidicker and Koenig 1996, Noss et al. 1996).

It has also been shown that the connectivity provided by corridors has improved genetic heterozygosity within metapopulations of multiple species, including species with smaller home ranges, such as tiger salamanders (Noss 1987, Buza et al. 2000). Metapopulations are a discontinuous distribution of animal populations, which are distributed over a spatially disjunct landscape of habitat “patches”, separated by intervening unsuitable habitat in which the animals cannot survive (McCullough 1996). Genetic isolation, which results in loss of genetic diversity within a metapopulation, leads to an inbreeding depression within the population (Frankham et al. 2002). Genetic depression occurs when inbreeding results in reducing the reproduction and survival of a population (Frankham et al. 2002). Ultimately, populations can go locally extinct due to being unable to travel through a highly fragmented landscape to find mates (Beier 1993).

Focus Area & Objectives

In August of 2008, BSLT chose to expand this study beyond Marks Ranch using six animals as focal species (a complete list of the focal species can be found in the Methods section on page 6) for a regional connectivity study, the goal of which is two-fold:

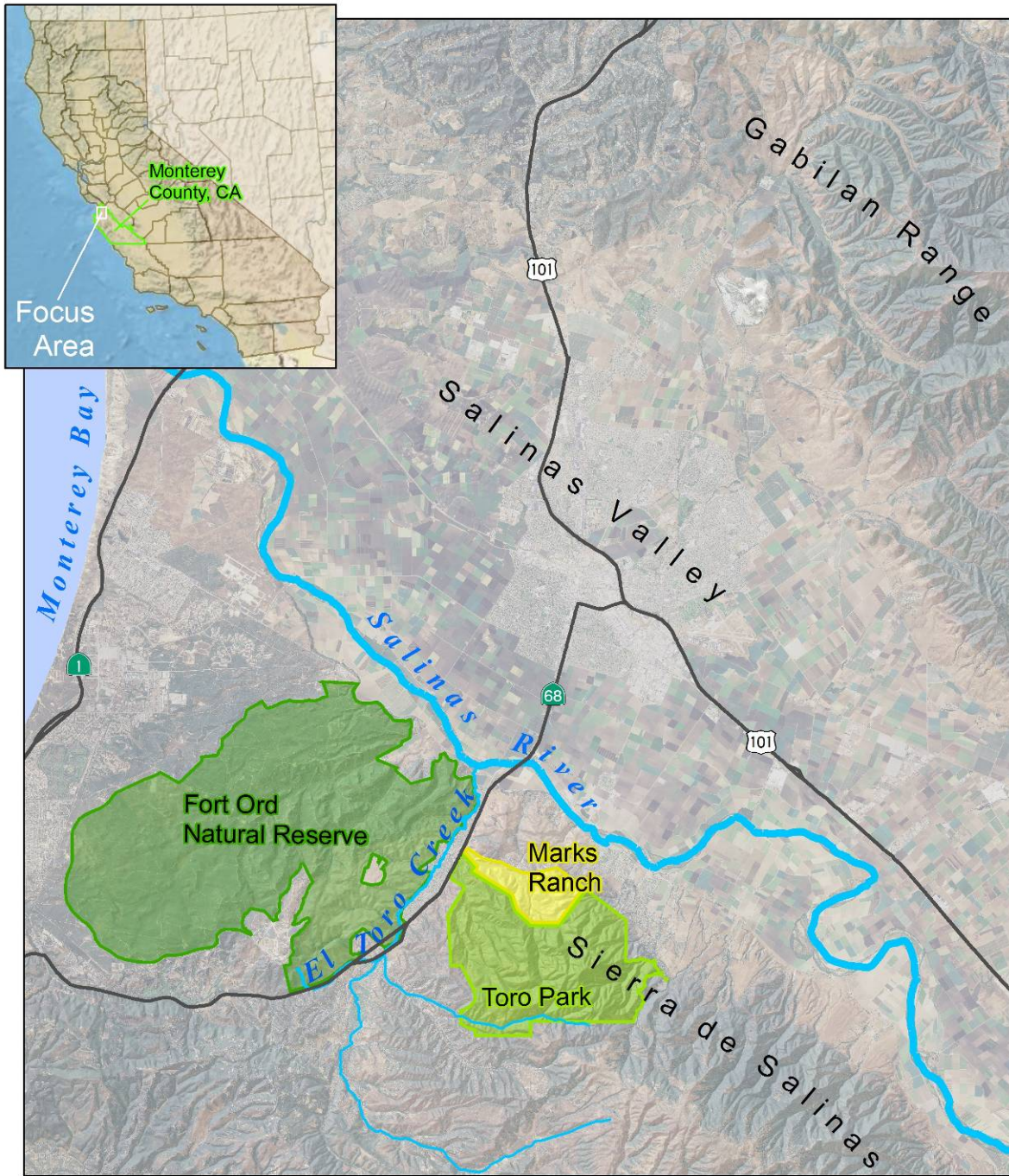
1. To document species richness and relative abundance, habitat preference and movement patterns in the area.
2. To use the gathered data to ground truth habitat suitability models and corridor analyses tools for the purpose of prioritizing and designing land protection strategies that protect critical habitat for species while recognizing the regions development pressures and needs. A habitat suitability model reflects habitat types a species is typically found in compared to areas they are least likely to be present in (Craighead et al. 2001). Habitat suitability models can be used to ascertain potential areas a species may be found in and also reflect the degree of core-habitat fragmentation throughout a landscape for a particular species.

To date the study has focused on the north end of the Sierra de Salinas Mountains and the area around Marks Ranch, Toro Park and the protected lands of Fort Ord Natural Reserve (Figure 1). Marks Ranch and Toro Park are at the northern terminus of the Sierra de Salinas range which bounds the west side of the highly productive Salinas Valley. Grassland, oak woodland, oak savannah, maritime chaparral and riparian habitats typify these two adjacent protected properties. To the north, across Highway 68 lies the Fort Ord Natural Reserve, a biological preserve and recreation area managed by the Bureau of Land Management (BLM). Leveling off into the coastal plain to the north, the Fort Ord Reserve landscape consists of maritime chaparral, oak woodland, coastal scrub, dunes and other maritime habitats.

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On both sides of the highway these protected lands are home to several listed plant and wildlife species and provide habitat for sensitive species such as tiger salamander, dusky footed woodrat, North American badger and burrowing owl as well as home range habitat for numerous wide-ranging species, including mountain lion, gray fox, bobcat, coyote, and deer (Michael Westphal, BLM Ecologist for Fort Ord, pers. comm.). Equally important, these protected areas are part of a larger matrix of habitats that form linkages for these large ranging species, allowing them to move between the upland habitats of the coast ranges and the lowland and coastal habitats fringing the Monterey Bay National Marine Sanctuary.

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Aerial photo source: NAIP 2005

0 Miles 5

Figure 1: Focus Area



Methods

Time Frame

This study began in October 2008 and is ongoing. This report discusses data collected from a monitoring period of October 2008 through December 2009. Data for this project was collected by camera trap stations, wildlife track and sign surveys, and documented and observed road-kill incidents. All camera stations and tracking transects were placed on properties with permission from the land managers and permits were obtained from Caltrans to monitor highway underpasses. Field camera stations were consistently monitored throughout the year. Data gaps, where present, were due to camera malfunctions (see Appendix A).

Focal Species

This study centers on six focal species: North American badger (*Taxidea taxus*), mountain lion (*Puma concolor*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), and Dusky-footed woodrat (*Neotoma fuscipes*). This focal species approach recognizes that species move through and utilize habitat in a variety of ways (Beier and Loe 1992). These focal species were selected based on their diversity of habitat requirements and movement patterns. These species represent a wide range of ecological interactions that can be sustained by successful linkage design (Penrod et al. 2006, Ng et al. 2004).

Site Selection

The placement of tracking transects and camera trap stations were determined via virtual fly-over (using Google Earth), existing GIS-based habitat suitability models and field reconnaissance. Candidate sites were selected based on potential landscape permeability by gauging topography, vegetation, existing infrastructure and animal sign. Sites were selected based on the habitat requirements for each focal species. Certain sites capturing a mosaic of grassland were targeted for focal species such as North American badgers. Other sites predominantly riparian were selected for species such as gray fox.

Cameras

The cameras used employ digital and infrared technology and were selected because they are the most noninvasive cameras available. Models used include: Stealth Cam Prowler, Cuddeback No Flash Infrared, and DLC Covert IR. The advantage of using cameras is that movement patterns, such as an animal traveling back and forth through highway culverts can be captured. Camera placement was based on identifying areas in which the topography and vegetation facilitate wildlife movement. Permeability (degree to which a landscape and its features foster or impede movement for a given species) was assessed by identifying different types of bottlenecks such as: culverts, underpasses, and medians that exist within a linkage (Conservation Biology Institute 2003). Adjacent habitat, topography, trails, road types, medians, and development are also recorded and ranked, demonstrating how each influence the permeability within a potential linkage. The degree to which roads and infrastructures such as culverts and underpasses restrict or facilitate wildlife movement through a landscape, are also assessed. For example, roads are characterized for their effects on target species movement as barriers, semi-permeable filters, or highly permeable filters based on the availability and effectiveness of crossing structures. Landscape features and vegetation are also recorded in

terms of gradation of passage from poor, fair, good, and excellent. Locations were selected and equipment placed with the intention to minimize affects on animal behavior (Long et al. 2008). Camera setup also took into account species size accommodated by the area and passage being monitored with camera stations set up for either large sized mammals or only small sized animals.

Tracking Transects

Tracking transect sites were chosen based a combination of factors including available good tracking substrate, vegetation, protection from weather and level of human activity to maximize the ability of collecting reliable and identifiable track data (Evans et al. 2009). For each data point (set of tracks), the location was recorded using a Garmin Etrex GPS. Direction of travel, sex of animal when discernable, number of individuals, proximity to human activity, and habitat type were also classified and documented. Each track was measured, photographed, and recorded into a datasheet. All data points were downloaded weekly and then mapped onto an orthophoto (1m resolution 2005 USGS). Digital habitat layers consisting of vegetation, riparian corridors, wetlands, soil type, slope, roads, and urban layers were also added into the map using GIS (ArcMap ERSI 9.1). Once species presence was established, tracks were only documented at a transect if a) a species was not also present on camera or b) a species that was not commonly detected at a transect left detectable tracks. While checking cameras, a sweep of the transects was made when applicable, within 100 feet of the camera location.

Road-kill Data

Road-kill observations documented by researchers and obtained from Monterey County Animal Control and from the Department of Transportation's statewide road kill database were also utilized. This data, which documents unsuccessful road crossing attempts, can help determine animal movement patterns and was integrated into the linkage maps (Clevenger et al. 2003).

Data Processing and Analysis

Data collected using camera traps, tracking transects and road kill documentation was integrated into habitat suitability models for connectivity analysis. Connectivity modeling was conducted using the CorridorDesign GIS tools developed by Paul Beier's lab in 2007, which was specifically created to design linkages between habitat reserve systems. A robust corridor design includes documenting how species use the landscape to immigrate and emigrate from one core habitat into another within the landscape (Beier et al. 2009). Our research documents wildlife presence throughout the landscape resulting in a ground-truthed corridor design. Many previous connectivity designs using GIS have created suitability and landscape connectivity models but do not include ground-truthing methods that incorporated documented wildlife locations within the connectivity analysis and habitats that species are using to travel through (Beier et al. 2009).

Results & Discussion

General Findings

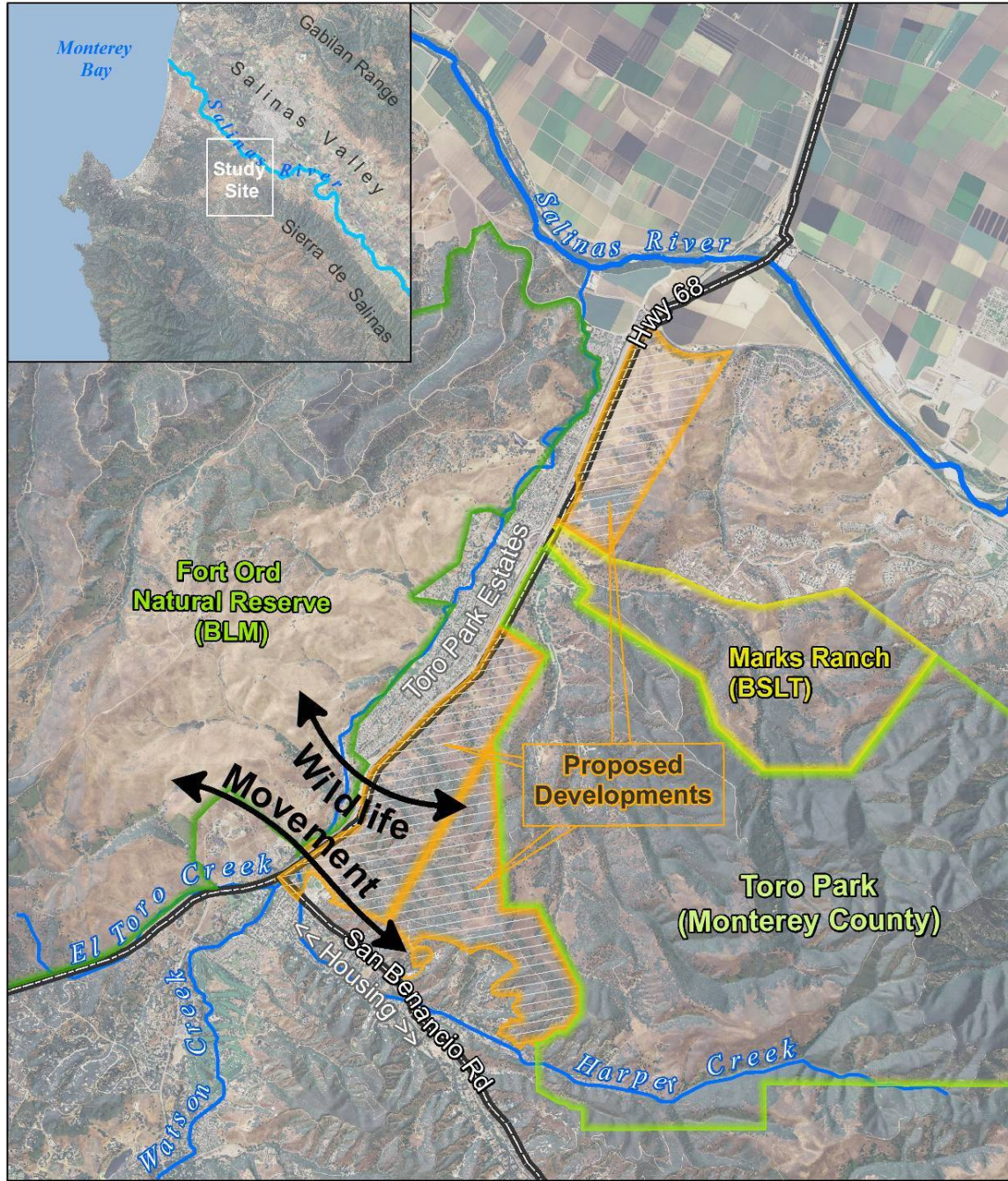
Utilizing aerial imagery, habitat suitability models and other GIS tools, we have identified two remaining undeveloped linkages between the protected upland habitats of the Sierra de Salinas within Marks Ranch and Toro Park to the protected lowlands of the Fort Ord Natural Reserve and the coastal and dune habitats beyond – the Highway 68/El Toro Creek bridge and the Salinas river corridor. This study focuses on the former, namely the Highway 68/El Toro Creek bridge linkage (Figure 2). Results of the study discussed in this report demonstrate that this linkage exhibits a high degree of wildlife activity.

This narrow, roughly half-mile wide, undeveloped gap sits between the relatively dense housing along San Benancio Road and the Toro Park Estates subdivision. Toro Park Estates is separated from Highway 68 by a sound wall along its southeast boundary. Typical of residential developments the neighborhood contains a matrix of residential roads with fences separating each property. Many of the yards are lit up at night and domestic dogs and cats are present. In the vicinity of San Benancio Road, Highway 68 runs roughly north-south between Fort Ord, which is on the west side of the highway, and Marks Ranch/Toro County Park, which are on the east side of the highway.

Draining the north slopes of the Sierra de Salinas, Harper and Watson Creeks merge just west of this point before their confluence with El Toro Creek on its way to the Salinas River. El Toro Creek makes its fourth pass under Highway 68 at this location via a relatively wide highway bridge (Figures 3a and 3b). The riparian habitats along these creeks provide natural pathways for travel and the bridge creates a safe passage under the highway for wildlife movement. Many wildlife species, including mountain lions, deer, bobcats and gray fox travel along riparian corridors (Dickson et al. 2005).

Both topography and composition in the area provide suitable habitat and allow free movement for multiple species. The protected core habitats within the area include Fort Ord Natural Reserve, Marks Ranch (BSLT), and Toro County Park. Each site consists of a mosaic of grassland, oak woodland, chaparral, and riparian habitat. These different habitat types meet the needs of the focal species habitat preferences. For example, North American badgers are grassland specialists, while bobcats and gray fox are often associated with oak woodland and riparian habitats. The effect of the collective parameters of the Highway 68 bridge, riparian habitat adjacent to a grassland/oak woodland mix with gentle topographical features result in a highly utilized travel route for deer and wide ranging animals, such as mountain lions and bobcats. For example, species such as gray fox and mountain lions often travel along riparian corridors, because they provide water and cover (Dickson et al. 2005, Penrod et al. 2006). Thus, this gap was chosen for wildlife camera stations and animal track-survey transect locations because it is an area open for wildlife to move through to access core habitats in a landscape interrupted by areas of housing developments and roads with high volumes of traffic, such as Highway 68.

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Aerial photo source: NAIP 2005

0 Miles 1



Figure 2: North Monterey Connectivity Map
 Study Site with Proposed Development Boundaries

The data collected to date indicates that this gap serves as a vital connection for animals moving between the uplands of the Sierra de Salinas Mountains and the lowland, dune and other suitable coastal habitats toward the shores of the Monterey Bay National Marine Sanctuary. Between October 2008 and October 2009, 404 individual animal detections were recorded via remote sensor cameras at a single location within this gap (Figure 2 and Appendix A). One mountain lion, 198 bobcats, 117 deer, 14 coyotes, 45 feral pigs, 12 raccoons, 7 opossums, 3 brush rabbits, 4 Dusky-footed woodrats, and 3 skunks detections have been photographed coming from or headed into the underpass on either side. This linkage functions as a highly active wildlife corridor facilitating a high number of passages by multiple species as well as frequent use by individual animals. Previous connectivity studies have established that this high volume of detections is an indicator that this area is indeed providing connectivity for multiple species (Conservation Biology Institute 2003, Ng et al. 2004). For example, it was found that culverts facilitating a similar amount of multiple species detections under roads in San Diego helped provide connectivity between fragmented habitats (Penrod et al. 2006, Beier and Noss 1998). The majority of the species detected were bobcat, deer, and wild pig. These species regularly utilized the underpass to travel through. Dusky footed woodrats, a Species of Special Concern, were also detected using the underpass and on either side of the underpass there are existing dusky footed woodrat nests. One mountain lion was detected and is further discussed in the sections below.



Figure 3a: Highway 68 underpass at El Toro Creek



Figure 3b: Highway 68 underpass at El Toro Creek: east side

Bidirectional Movement

Out of the 404 animal detections recorded, 121 of these detections have been recorded moving east, while 172 animal detections have been recorded traveling west into and out of (respectively) areas proposed for development (Appendix A). In some cases this included photos of adult animals traveling with juveniles. This data indicates that this area is being utilized to travel between the upland habitats of the Sierra de Salinas to the lowland and coastal habitats of the Fort Ord Natural Reserve and beyond. This area is serving as a multiple species wildlife corridor for native wildlife species, the presence of suitable habitat on either side of the passage is a particularly important factor for maintaining permeability of wildlife movement throughout the landscape (Ng et al. 2004).

A mature buck has been identified traveling back and forth through the Highway 68 underpass (Figures 4 & 5). This individual was identified by the antler size and tines, and was documented 9 times. The buck was documented using the Highway 68 underpass, as well as the adjacent habitats on either side of the underpass on the same day, 6/4/09 (Figures 4 & 5). This establishes that this habitat is part of this deer's home range based on other documented home range sizes of male deer within California in a similar landscape (Nicholson et al. 1997, Gonser et al. 2009). From tree rubs, we were also able to document that mule deer have used this area in previous seasons as well.

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Figure 4: Male deer on west side of Highway 68 underpass heading east on 6/04/09 at 4:30:47 am



Figure 5: Male deer heading west on east side of Highway 68 underpass on 6/04/09 at 11:17:17am

Natal Home Range and Juvenile Dispersal

Juvenile bobcats, deer, and wild pigs were recorded traveling with their parents through the underpass between May and September, 2009. A female bobcat with 3 kittens, a deer with fawn, and a wild pig with 6 piglets, were recorded traveling under the Highway 68 bridge along El Toro Creek (Figures 6 -11). This is significant as it documents that this linkage also serves as a natal home range for multiple species (Crooks 2002, Beier 1993). Juvenile utilization of this linkage, specifically for wide-ranging wildlife species, may have important implications as safe passage between suitable habitats, allowing for juvenile dispersal from their natal area and parental home range (Woodroffe & Ginsberg 2000).

The female bobcat was recorded making 97 trips over a 110 day monitoring period, (Appendix A). This female was also documented traveling with her kittens (Figures 6 - 8). By viewing the spot patterns on her legs, we were able to identify her as the same individual in pictures in which she was not traveling with her kittens. This female bobcat was documented 61 times heading east and 36 times heading west. Four of these days she was documented carrying back prey items, a rabbit and ground squirrels, to her kitten natal den.

Based on previous habitat use and home range size studies on bobcats (Litvaitis et al. 1986) it was established that habitat east of the Highway 68 underpass serves as the female bobcat's natal den where she is rearing her three kittens. This was surmised based on camera-trap photo capture documenting 17 recorded trips with her kittens, 9 of which were of the female bobcat and her kittens returning east, after an earlier trip out heading west. On 6/5/09, the female bobcat and her kittens were documented traveling west at 8:56 am (Appendix A). Then at 12:58 pm, the bobcat family returned heading east, 3 hours and 54 minutes later (Appendix A). These bobcat kittens may also use this habitat as dispersal routes as they mature and disperse.



Figure 6: Female bobcat with kittens heading west towards Fort Ord on west side of Highway 68 underpass on 6/17/09 at 15:23:27 pm



Figure 7: Bobcat kitten heading east towards Toro County Park and Marks Ranch on east side of Highway 68 on 6/17/09 at 12:18 pm



Figure 8: Female bobcat with kittens heading west on east side of Highway 68 underpass on 6/19/09 at 12:18:40 pm



Figure 9: Female bobcat (mother of kittens based on unique pattern on left front leg) heading south on east side of Highway 68 underpass with ground squirrel kill 6/21/09 12:52:18



Figure 10: Female deer with fawn heading east on east side of Highway 68 underpass on 6/12/09 at 12:17:49 pm



Figure 11: Female deer with fawn heading east on west side of Highway 68 underpass on 6/19/09 at 19:59:02 pm

Mountain Lion

On 11/7/08 a mountain lion was recorded at Marks Ranch, heading northwest (Figure 12). This individual exhibits unique dark markings on its right front and hind feet. On 11/16/08 at a site near the El Toro Creek/Highway 68 bridge, another picture was taken of a mountain lion, which was heading east out of Fort Ord (Figure 13). Then again on 1/27/09 at Marks Ranch, a mountain lion was recorded heading northwest towards Fort Ord (Figure 14).



Figure 12: Mountain lion 11/7/08 8:47pm: Marks Ranch heading northwest



Figure 13: west side Highway 68 Underpass, Mountain lion 11/16/08 11:35 pm
(incorrect time setting on camera): heading east out of Fort Ord



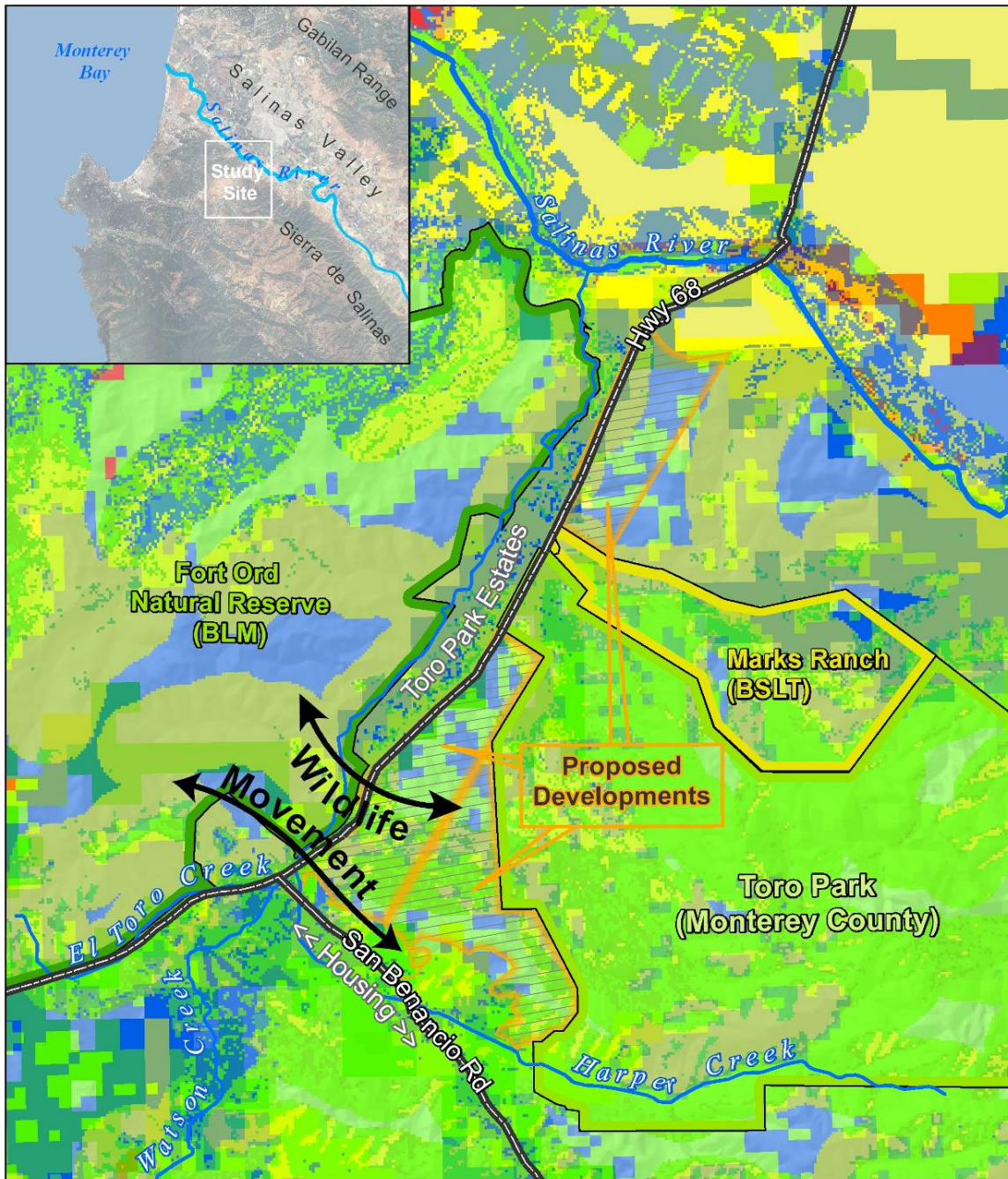
Figure 14: Marks Ranch: Mountain lion 1/27/09 8:50 pm: heading northwest

The last two pictures of the mountain lion also exhibit the same dark patterns on the paws as the first picture of the mountain lion. These markings on the paws indicates that this is most likely the same individual mountain lion, as mountain lions typically do not have dark patterns or marking on their paws (P. Beier and R. Noss, pers. comm. 2009). These images demonstrate that one or more mountain lion(s) are moving through the area and may be taking advantage of the safe passage afforded by the El Toro Creek/Highway 68 crossing structure. This indicates connectivity between Fort Ord, Toro County Park, and Marks Ranch.

Dusky-footed Woodrat

While working along El Toro Creek it was noted that the underpass is serving as a home range habitat for Dusky-footed woodrats, which are a Species of Special Concern in California (Williams, 1986). Woodrat nests have been recorded on both sides of the underpass and woodrat tracks have also been identified several times under the underpass.

A habitat suitability map was created for Dusky-footed woodrats, (Figure 15). GIS data layers including: vegetation, soil, slope, urban areas, and roads were used to create the suitability model. Based on these factors, John O. Matson, a small mammal expert at San Jose State University specializing in woodrats, classified woodrat habitat from highly suitable to unsuitable (J. Matson, pers. comm. 2008).



Habitat Suitability:

- 1 High
- 2 Moderate
- 3 Poor
- 4 Unsuitable

0 Miles 1

Figure 15: Dusky footed woodrat
 Habitat Suitability



Suitability modeling shows that the areas proposed for development consist of highly suitable woodrat habitat (Figure 15). This map shows that proposed development areas encompass highly suitable woodrat habitat along with the linkage running through it. Evidence of woodrat use of habitat on west side of the Highway 68 underpass was recorded on 6/27/09 (Figure 16).



Figure 16: Dusky-footed woodrat: west side of Highway 68 6/27/09

North American Badger

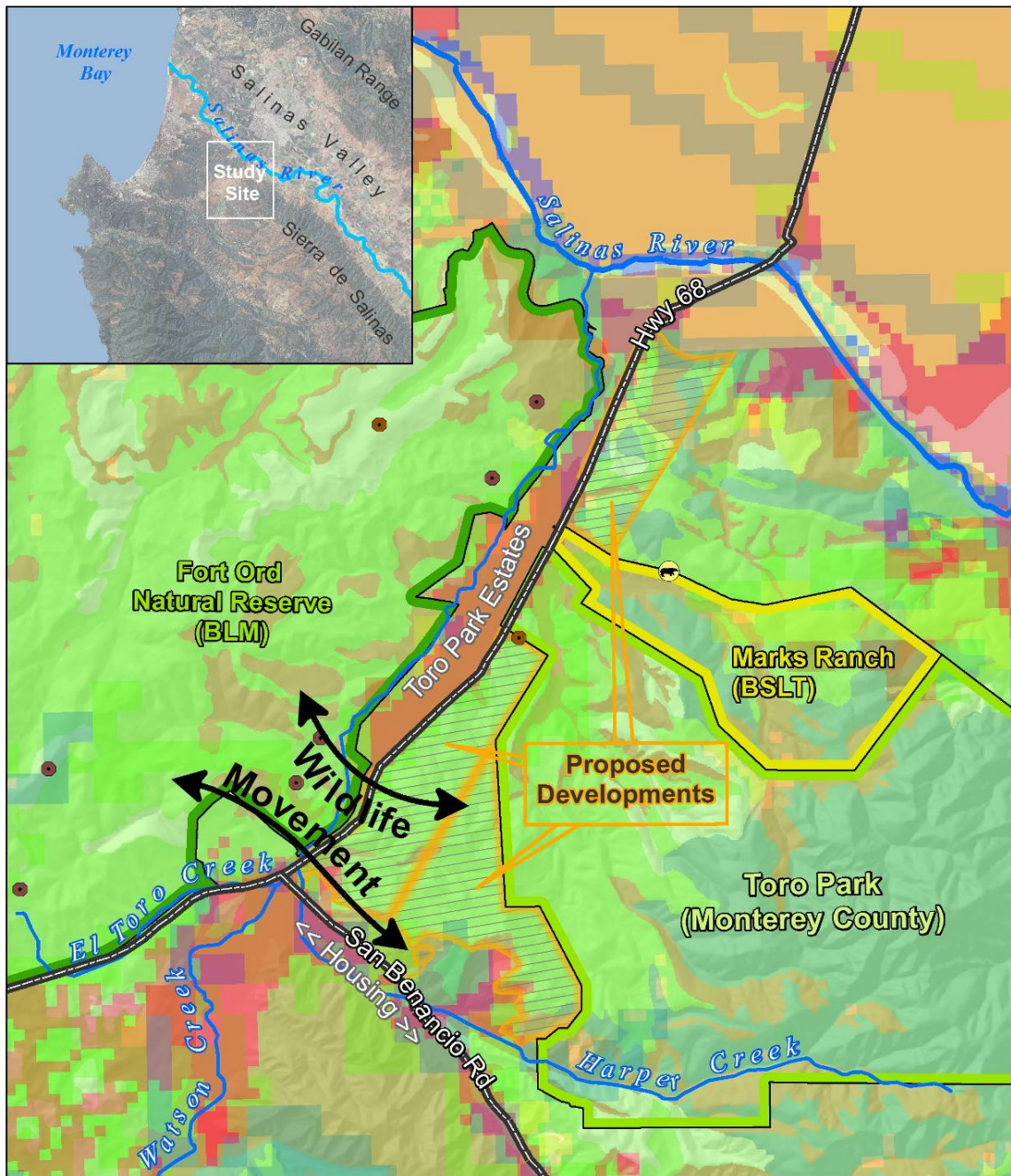
North American badger is a Species of Special Concern in California (Williams 1986). The status of badgers is regarded as poor (Long and Killingley 1983). Badger populations in California have drastically declined in the last century due to loss of habitat from urban development, road mortalities, cultivation, trapping, and poisoning (Williams 1986). In Northern California, badgers exist in low numbers in the Central Valley, the San Francisco Bay Area, Monterey, San Benito, and San Luis Obispo counties (Williams 1986).

Badgers have been found to be sensitive to habitat fragmentation, with a lower probability of occurrence and relative abundance in small and isolated patches (Crooks 2002). They are also very susceptible to road mortality from cars because they have poor vision and tend to travel by olfactory cues (Minta 1993). However, they are capable of dispersing up to 110 km (approximately 68 miles). Wildlife corridors play an important role in badger conservation because they have resulted in decreasing badger mortality from road kills (Bekker and Canters 1997). The implementation of corridors in the Netherlands has resulted in nearly doubling the badger populations (Bekker and Canters 1997) and has improved genetic heterozygosity within metapopulations (Noss 1987; Buza et al. 2000).

The Fort Ord Natural Reserve is west of Marks Ranch, with only Highway 68 separating the two habitats. Fort Ord Natural Reserve consists of core habitat for badgers in which ten known badgers currently reside (Quinn 2008). From 2004-2006, Jessica Quinn, PhD through UC Davis had tracked a population of badgers at Fort Ord via a radio telemetry study. It was found that twice an individual badger traveled back and forth from Fort Ord Natural Reserve, across Highway 68, to Las Palmas and back. Las Palmas is a neighborhood adjacent to Marks Ranch (Figure 17). Corridor analyses were also utilized to link up core habitat patches and badger populations (Figure 18).

The habitat suitability map (Figure 17) indicates potential for badgers in fragmented habitats within Monterey County. Fort Ord is core habitat to at least ten badger residents. Marks Ranch and Toro Park also provide highly suitable core badger habitat. Ensuring existing connectivity between these core habitats is critical to maintain the source badger populations residing in Fort Ord, which helps support the regional badger metapopulation (Diamond in review).

Badger road kills surround the perimeter of the core badger population residing at Fort Ord (Figure 18). These badger road kills could have been juveniles attempting to disperse out of Fort Ord or males trying to immigrate into the population seeking potential mates. Implementing corridor designs in this region is critical to conserve existing badger populations (Quinn 2008).



Habitat Suitability:

- High
- Moderate
- Poor
- Unsuitable

- Badger Locations
- Las Palmas Badger moving from Fort Ord

Figure 17: North American Badger
 Habitat Suitability



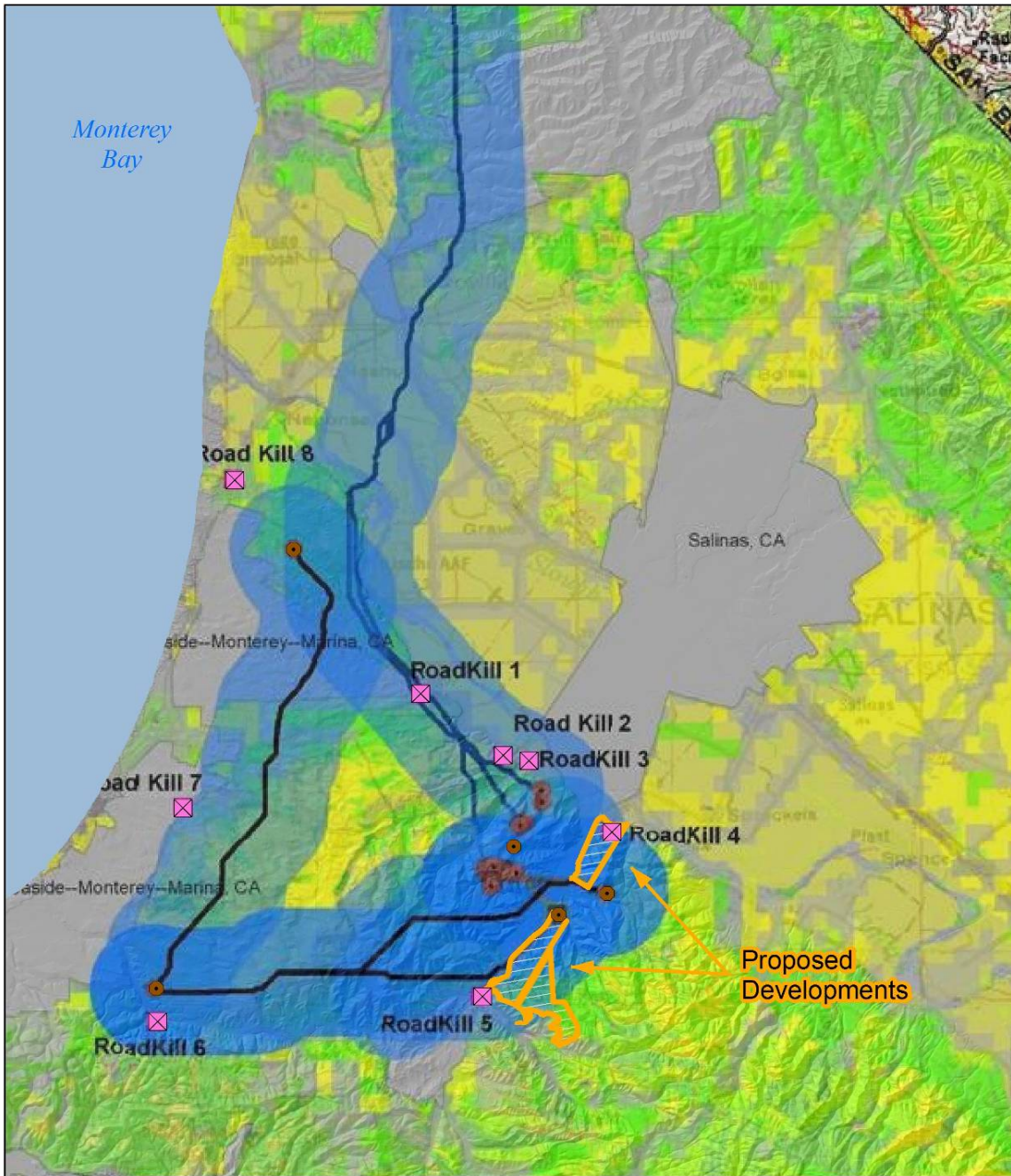


Figure 18: North American Badger
 Least Cost Path Analysis

Ease of Movement:

High

Moderate

Poor

Least Cost Paths

Corridor Buffer Width = 1.8 km

Badger Locations

Badger Road Kill Sites



Conclusion

Work to date at Marks Ranch, Fort Ord and the gap between the Toro Park Estates and San Benancio Road residential developments demonstrates that the lands extending along the south side of Highway 68 and upslope along El Toro Creek and adjacent watersheds exhibit a high degree of wildlife movement for the focal species recorded and suggests that this area and the safe passage afforded by the Highway 68/ El Toro Creek bridge serves as a linkage for wildlife to move between core habitats (Conservation Biology Institute 2003, Ng et al. 2004). The southern boundary of Fort Ord (Highway 68) is adjacent to the northern reaches of the Sierra de Salinas Mountains, which provide habitat for multiple species. Numerous features in that particular area also allow for wildlife connectivity: distinct lack of human development, effective crossing structures, viable and diverse habitat, and topographical access. The other boundaries of Fort Ord are enclosed by agriculture, or urban and suburban development, which limits movement of species sensitive to human infrastructure.

With camera stations on either side of Highway 68 we have documented wildlife traveling both east and west under the Highway 68/Toro Creek underpass. Each month multiple species were recorded using the underpass on a consistent basis. The routine use of this linkage by these wildlife species establishes connectivity between Fort Ord and the coastal habitats along the southern margin of the Monterey Bay National Marine Sanctuary with that of Toro County Park, Marks Ranch and the upland habitats of the Sierra de Salinas range (Clevenger et al. 2003, Hilty et al. 2006, Beier and Noss 1998).

This habitat and the safe passage afforded by the El Toro Creek/Highway 68 underpass is facilitating movement of wildlife species between Fort Ord, Toro County Park and Marks Ranch. This movement between habitats is critical for wildlife to find viable mates and resources, and provides habitat for the dispersal of juveniles to travel out of their parental home ranges to establish their own. This is also a highly utilized linkage for wide ranging species, which is reflected in the high number of detections of bobcats and deer (Ng et al. 2004).

Currently, as animals move from Fort Ord and disperse into the Sierra de Salinas via the El Toro Creek underpass, they have unimpeded access through the areas currently considered for development. This presently undeveloped gap and the El Toro Creek/Highway 68 bridge provides one of the last two remaining safe linkages for wildlife moving between the lowland, dune and other coastal habitats of the Fort Ord Reserve and Monterey Bay National Marine Sanctuary with the upland habitats of the Sierra de Salinas. Of the entire border of Fort Ord, this is the only remaining connection with large enough tracts of suitable habitat for a wide range of species (Penrod et al. 2006).

Current designs for the proposed development east of Highway 68 would result in a significant decrease in wildlife habitat and substantial fragmentation of the remaining habitat at this current safe linkage. It would severely impair access for wildlife between the protected areas at Fort Ord and core habitat at Toro County Park and Marks Ranch. Limited space for wildlife to move from one side of Highway 68 to the other via El Toro Creek bridge may have significant negative impact on viable populations of focal species in this region as this area represents the only crossing where no development currently exists.

As depicted in the Dusky-footed woodrat map (Figure 15) the land proposed for development also consists of riparian habitat that is highly suitable for Dusky-footed woodrats, a Species of Special Concern in California. The habitat is also highly suitable for other state and federal listed species such as California tiger salamander (Michael Westphal, BLM Ecologist for Fort Ord, pers.comm.).

Fort Ord Natural Reserve serves as habitat for multiple species including mountain lion, North American badgers, Dusky-footed woodrat, bobcats, deer, coyote, gray fox, burrowing owls, and tiger salamander. However, to maintain viable populations of different species, juveniles must be able to disperse out to establish their own home range, while immigrants must be able to travel into the Reserve to maintain genetic diversity within populations (Beier 1993). As Fort Ord Natural Reserve is already significantly isolated by existing development and roads, the habitat east of Highway 68 is critical in that it is facilitating movement of vulnerable species and numbers of animals seeking access to and from the habitats within the Reserve.

Policy makers, planners and developers concerned about negative impacts on wildlife in this area should consider development configurations that accommodate and enhance existing movement paths for wildlife. Future development in this critical area without primary regard for wildlife, their habitat requirements and movement patterns could effectively and completely isolate populations of such sensitive species as the North American badger, potentially leading to their local extinction in otherwise viable lowland and coastal habitats along the southern portion of Monterey Bay (Foster and Humphrey 1995).

Next Steps & Future Work

Results from the first year of this study demonstrate that this linkage exhibits a high degree of wildlife movement within the study area. Next steps in this study should consider conducting a relative abundance calculation with this data for each focal species, along with integrating the data into multiple species habitat suitability maps to run a connectivity analysis using Paul Beier's CorridorDesign tool. A hot spot analysis may also be conducted in GIS to identify locations in which many animals are unsuccessfully trying to cross roads.

Author Biographies:

Tanya Diamond, Principal Investigator, Wildlife Biologist. Author of Species of Special Concern Report for North American badgers. Masters research in identifying wildlife corridors for North American badgers (in review). Has developed a company, Connectivity for Wildlife LLC, which monitors wildlife in multiple settings, with particular emphasis on identifying suitable road crossing locations. Instructor at De Anza College, designed and implemented a Wildlife Corridor Technician/Stewardship certificate.

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James Thorne, Ph. D. Landscape Ecologist, Principal Investigator. Author of report on Wildlands Conservation in the Central Coast Region of California. Dr. Thorne is a research scientist based at the University of California, Davis. He also developed the ‘Regional Advanced Mitigation Planning’ (RAMP) framework, which state agencies responsible for infrastructure are adopting. This approach will permit the integration of wildlife connectivity plans into transportation planning for this project, through the anticipated mitigation needs of our transportation agency partners.

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	Camera Model	Animal	Sex	# Indvls	Date	Time	Direction of Travel	Temp (F)	Notes
H68 Cam 1	Main game trail								
H68 Cam 1	Cuddeback NoFlash	Coyote	Unknown	1	11/2/2008	11:13 PM	east		
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	5	11/3/2008	9:49 PM	east		First pig has spots for individual recognition
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	3	11/4/2008	2:38 AM	west		First pig has spots for individual recognition
H68 Cam 1	Cuddeback NoFlash	Coyote	Unknown	1	11/5/2008	6:45 PM	west		
H68 Cam 1	Cuddeback NoFlash	Deer	Male	1	11/7/2008	5:28 PM	east		
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	3	11/7/2008	4:24 PM	west		First pig has spots for individual recognition
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	3	11/7/2008	11:24 PM	east		First pig has spots for individual recognition
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	11/9/2008	6:29 PM	east		
H68 Cam 1	Cuddeback NoFlash	Coyote	Unknown	1	11/10/2008	11:36 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	11/11/2008	10:18 PM	east		
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	11/14/2008	1:20 AM	east		
H68 Cam 1	Cuddeback NoFlash	Mountain lion	Female	1	11/16/2008	11:35 PM	east		Mountain lion: Possible dark marking on front feet, track =female
H68 Cam 1	Cuddeback NoFlash	Coyote	Unknown	1	11/22/2008	5:49 AM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	11/22/2008	7:57 PM	west		
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	11/24/2008	11:23 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Male	1	12/9/2008	3:30 AM	west		
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	12/10/2008	12:13 AM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Male	1	12/30/2008	11:04 PM	west		
									Data gap for 1 month for February, camera malfunctioned, see Cam 2 for data
H68 Cam 1	Cuddeback NoFlash	Opossum	Unknown	1	3/4/2009	9:28 PM	north		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/4/2009	10:32 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/5/2009	12:45 AM	west		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/7/2009	1:58 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/17/2009	11:56 AM	west		looks like a juvenile
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/17/2009	12:38 PM	east		looks like a juvenile, possible same individual
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	3/20/2009	7:21 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Unknown	1	3/22/2009	5:44 PM	east		
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	3/26/2009	9:10 PM	north		
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	1	3/27/2009	9:20 PM	west		
H68 Cam 1	Cuddeback NoFlash	Feral Pig	Unknown	1	3/28/2009	11:27 PM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	4/2/2009	4:01 AM	east		
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	4/6/2009	1:17 AM	west		
H68 Cam 1	Cuddeback NoFlash	Bobcat	Unknown	1	4/6/2009	1:24 AM	east		
H68 Cam 1	Cuddeback NoFlash	Deer	Female/Juvenile	1	4/17/2009	7:43 AM	east		
H68 Cam 1	Cuddeback NoFlash	Opossum		1	4/18/2009	7:53 PM	south		
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	4/22/2009	5:20 AM	west		looks like previous individual from 4/17/09
H68 Cam 1	Cuddeback NoFlash	Deer	Female	1	4/23/2009	3:20 AM	east		
H68 Cam 1	Cuddeback NoFlash	Wild pig	Unknown	1	4/26/2009	8:05 PM	west		
H68 Cam 1	Cuddeback NoFlash	Wild pig	Unknown	1	4/27/2009	1:23 AM	west		looks like previous individual from 4/26/09
H68 Cam 1	DLC Covert	Deer	Female/Juvenile	1	5/6/2009	8:20 AM	east		data gap foliage covered rest of pictures

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H 68 Cam 2	Game trail on west side (Fort Ord), feeder trail								
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	1/29/2009	6:44 PM	east		video
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/13/2009	12:02 PM	west		video
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/20/2009	6:48 PM	east		video
H68 Cam 2	Stealth Cam Prowler	Feral Pig	Unknown	1	2/22/2009	12:16 AM	west		video
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/23/2009	6:07 PM	east	53	checked out camera
H68 Cam 2	Stealth Cam Prowler	Bobcat	Unknown	1	2/24/2009	6:09 PM	west	51	marked on trail, spot pattern for individual identification
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/24/2009	9:11 PM	east	45	second set of eye shine in background, possible deer-same height
H68 Cam 2	Stealth Cam Prowler	Coyote	Unknown	1	2/25/2009	2:04 AM	west	44	checked out bobcat marking on trail
H68 Cam 2	Stealth Cam Prowler	Bobcat	Unknown	1	2/26/2009	1:32 AM	north	41	
H68 Cam 2	Stealth Cam Prowler	Bobcat	Unknown	1	2/26/2009	5:11 AM	south	45	Probable same bobcat from 1:32 am
H68 Cam 2	Stealth Cam Prowler	Bobcat	Unknown	1	2/26/2009	5:28 AM	west	45	Probable same bobcat from 5:11 am
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/26/2009	8:18 PM	east	49	same day as bobcat
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/27/2009	4:44 AM	east	45	
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	2/27/2009	6:17 PM	east	49	same day as previous deer, same direction
H68 Cam 2	Stealth Cam Prowler	Audubon's cottontail	Unknown	1	3/1/2009	7:38 PM	west	59	
H68 Cam 2	Stealth Cam Prowler	Bobcat	Unknown	1	3/7/2009	9:46 AM	east	52	
									gap in data, camera moved to east side of underpass until 4/26/09
H68 Cam 2	Stealth Cam Prowler	Deer	Male	1	4/29/2009	12:37 PM	east	40	large antlers, with velvet
H68 Cam 2	Stealth Cam Prowler	Deer	Female	1	4/30/2009	6:34 PM	west	46	
H68 Cam 2	Stealth Cam Prowler	Deer	Male/Juvenile	1	5/1/2009	11:18 PM	east	59	
H68 Cam 2	Stealth Cam Prowler	Deer	Male	1	5/3/2009	8:07 AM	west	56	large antlers, with velvet
H68 Cam 2	Stealth Cam Prowler	Deer	Female	1	5/5/2009	6:43 PM	west	51	
H68 Cam 2	Stealth Cam Prowler	Deer	Male	1	5/10/2009	5:25 PM	west	46	large antlers, with velvet
H68 Cam 2	Stealth Cam Prowler	Deer	Unknown	1	5/12/2009	6:31 PM	east	40	
H68 Cam 2	Stealth Cam Prowler	Deer	Male	1	5/18/2009	5:21 PM	west	50	large antlers, with velvet, great picture
H68 Cam 2	Stealth Cam Prowler	Deer	Male	1	5/20/2009	8:22 AM	west	51	large antlers, with velvet, great picture
H68 Cam 2	Stealth Cam I 540	Deer	Unknown	1	5/27/2009	7:20 AM	west	45	
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	5/27/2009	8:18 AM	east	48	
H68 Cam 2	Stealth -	Deer	Male	1	5/29/2009	8:45 PM	west	55	large antlers, with velvet

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	Cam I 540								
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	6/4/2009	4:30 AM	north	45	large antlers, with velvet
H68 Cam 2	Stealth Cam I 540	Deer	Unknown	1	6/7/2009	6:00 AM	north	41	
H68 Cam 2	Stealth Cam I 540	Bobcat	Unknown	1	6/19/2009	10:14 AM	east	64	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	6/22/2009	4:57 AM	north	39	large antlers, with velvet
H68 Cam 2	Stealth Cam I 540	Dusky-footed woodrat	Unknown	1	6/23/2009	3:12 AM		41	
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	6/23/2009	7:04 AM	north	43	
H68 Cam 2	Stealth Cam I 540	Deer	Female	2	6/23/2009	7:10 AM	south	43	probably same deer as above with new individual
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	6/23/2009	7:20 AM	south	45	same day within same hour
H68 Cam 2	Stealth Cam I 540	Coyote	Unknown	1	6/25/2009	9:04	west	54	
H68 Cam 2	Stealth Cam I 540	Dusky-footed woodrat	Unknown	1	6/27/2009	1:28		45	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	6/28/2009	5:46	east	46	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	6/28/2009	20:22	west	59	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	7/3/2009	20:37	south	59	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	7/8/2009	14:28	south	75	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	7/10/2009	9:47	south	59	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	7/15/2009	3:22	west	46	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	7/15/2009	18:16	south	70	
H68 Cam 2	Stealth Cam I 540	Dusky-footed woodrat	Unknown	1	7/16/2009	1:33		54	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	7/20/2009	6:03	north	50	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	7/27/2009	19:05	south	61	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	7/29/2009	14:17	south	73	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	8/2/2009	20:57	south	59	large antlers
H68 Cam 2	Stealth Cam I 540	Wild Pig	Unknown	1	8/3/2009	3:13	south	54	
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	8/3/2009	4:45	north	54	large antlers
H68 Cam 2	Stealth Cam I 540	Deer	Fawn	1	8/5/2009	7:48	west	50	
H68 Cam 2	Stealth Cam I 540	Deer	Female-with fawn	2	8/5/2009	7:50	west	52	Mother with fawn from previous photos
H68 Cam 2	Stealth Cam I 540	Deer	Male	1	8/9/2009	0:18	east	52	large antlers
H68 Cam 2	Stealth Cam I 540	Dusky-footed woodrat	Unknown	1	8/10/2009	21:22		57	
H68 Cam 2	Stealth Cam I 540	Coyote	Unknown	1	8/12/2009	2:36	north	52	
H68 Cam 2	Stealth Cam I 540	Deer	Female	1	8/12/2009	12:09	south	77	
H68 Cam 3	Game trail on east side								
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	3/26/2009	11:04 PM	west	45	unknown mesocarnivore at 22:17
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/11/2009	7:25 PM	east	53	Spot pattern for individual identification
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/11/2009	8:30 AM	west	49	Traveled into underpass

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H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/12/2009	3:54 AM	west	43	Spot pattern for individual identification, traveled into underpass
H68 Cam 3	Stealth Cam Prowler	Rabbit	Unknown	1	4/12/2009	8:49 AM	north	50	
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	4/13/2009	11:33 PM	west	41	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/15/2009	2:58 PM	west	65	Traveled into underpass
H68 Cam 3	Stealth Cam Prowler	Opossum	Unknown	1	4/15/2009	2:42 PM	east	45	Traveled across creek
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/15/2009	11:32 AM	east	52	Spot pattern for individual identification, traveled across creek into underpass
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	4/17/2009	12:01 PM	west	46	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/19/2009	7:36 AM	east	64	Grooming, spot pattern for individual identification
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/20/2009	8:53 PM	east	63	Spot pattern for individual identification
H68 Cam 3	Stealth Cam Prowler	Rabbit	Unknown	1	4/21/2009	5:55 PM	south	56	
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	2	4/22/2009	9:06 PM	west	53	
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	2	4/22/2009	11:28 PM	west	52	in the creek
H68 Cam 3	Stealth Cam Prowler	Opossum	Unknown	1	4/22/2009	12:35 PM	west	52	Traveled into underpass
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/22/2009	11:27 AM	west	63	Grooming, spot pattern for individual identification, traveled into underpass
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	4/23/2009	2:31 PM	west	45	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	4/23/2009	6:41 PM	east	47	Spot pattern for individual identification, traveled across creek
H68 Cam 3	Stealth Cam Prowler	Deer	Unknown	1	5/11/2009	10:13 PM	east	50	moved camera to other side of trail
H68 Cam 3	Stealth Cam Prowler	Deer	Male	1	5/13/2009	5:52 AM	west	40	antlers
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	5/26/2009	5:55 AM	east	47	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/26/2009	9:21 AM	west	55	Spot pattern =mother of kittens: front left leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	5/26/2009	11:00 AM	east	63	can't see spot pattern but most likely mother of kittens, same day 1hr 40 min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	5/26/2009	2:20 PM	west	77	can't see spot pattern but most likely mother of kittens, same day 5hours later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/26/2009	6:07 PM	east	72	Spot pattern =mother of kittens: left hind leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	5/27/2009	7:13 PM	east	62	can't see spot pattern but most likely mother of kittens
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/28/2009	4:43 AM	east	50	Spot pattern =mother of kittens: front right leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	5/28/2009	7:41 AM	west	51	can't see spot pattern but most likely mother of kittens
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/28/2009	12:37 PM	west	66	Spot pattern =mother of kittens: front left leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/28/2009	1:21 PM	east	70	Spot pattern =mother of kittens: front right leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/28/2009	3:39 PM	east	74	Spot pattern =mother of kittens: front right leg: pict 55
H68 Cam 3	Stealth Cam	Bobcat	Unknown	1	5/28/2009	6:30 PM	west	64	can't see spot pattern but most likely mother of kittens

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	Prowler								
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	3	5/30/2009	7:52 AM	east	55	Mother with 2 kittens, first detection: pict 63
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/30/2009	9:10 AM	west	55	Spot pattern =mother of kittens: front left leg: pict 67
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/30/2009	9:15 AM	east	57	Spot pattern =mother of kittens: left hind leg, 5 minutes later with a rabbit: pict 70
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/30/2009	12:46 PM	west	64	Spot pattern =mother of kittens: front left leg: pict 73
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/31/2009	6:02 PM	west	66	Spot pattern =mother of kittens: front right leg: pict 86
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	5/31/2009	9:09 PM	west	56	can't see spot pattern but most likely mother of kittens, 3 hours later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/1/2009	1:21 PM	west	74	Spot pattern =mother of kittens: front left leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/1/2009	1:39 PM	east	74	can't see spot pattern but most likely mother of kittens, 18 min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/1/2009	2:31 PM	west	74	Spot pattern =mother of kittens: front right leg: pict 103
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/1/2009	3:51 PM	east	72	Spot pattern =mother of kittens: front left leg: 1hr 21min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/1/2009	4:29 PM	east	72	Spot pattern =mother of kittens: left hind leg, 38 minutes later with a ground squirrel: pict 109
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/1/2009	5:50 PM	west	70	Spot pattern =mother of kittens: front left leg
H68 Cam 3	Stealth Cam Prowler	Deer	Male	1	6/4/2009	11:17 AM	west	66	large antlers, with velvet: pict 132
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	2	6/5/2009	8:56 AM	west	58	Female with kitten (camera only on 3 pict) second detection of kittens: pict 136-138
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	3	6/5/2009	12:58 PM	east	69	Female with 2 kittens, return trip 3hrs 54 min later, third detection of kittens: pict 139-141
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juvenile	1	6/5/2009	1:36 PM	east	69	3rd kitten alone, returning 38 minutes after mother and 2 kittens: pict 145
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	6/6/2009	1:17 AM	west	49	
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	6/6/2009	4:24 AM	east	46	same day
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/6/2009	12:24 PM	east	69	Spot pattern =mother of kittens: hind right leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/6/2009	7:25 PM	west	63	can't see spot pattern but most likely mother of kittens, 7 hours later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/6/2009	7:34 PM	east	62	Spot pattern =mother of kittens: front right leg: 9 min later: pict 160
H68 Cam 3	Stealth Cam Prowler	Deer	Unknown	2	6/7/2009	4:34 AM	west	46	Same individuals on other side of H68 on Cam 1 at 4:39: pict 180
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/8/2009	8:46 PM	west	57	Spot pattern =mother of kittens: front left leg: pict 191
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/9/2009	11:52 AM	west	68	can't see spot pattern but most likely mother of kittens, see next pict notes
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/9/2009	2:46 PM	east	72	Spot pattern =mother of kittens: front right leg: 2hr 38 min later: pict 197
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/10/2009	8:01 PM	west	63	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/11/2009	2:58 PM	east	74	Spot pattern =mother of kittens: left hind leg: pict 211
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	6/12/2009	11:00 AM	west	64	
H68 Cam 3	Stealth Cam Prowler	Deer	Female with juvenile	2	6/12/2009	12:17 PM	east	66	Female with fawn: pict 223-224: Cam 1 female with fawn on 6/19/09 heading east

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H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/12/2009	1:42 PM	west	72	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/12/2009	5:05 PM	east	72	Spot pattern =mother of kittens: front right leg: pict 229: 3hr 23min later
H68 Cam 3	Stealth Cam Prowler	Raccoon	Unknown	1	6/12/2009	8:52 PM	west	58	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/13/2009	11:41 AM	west	66	Spot pattern =mother of kittens: front left leg Cam 1:pict of her on other side at 6/13/09 11:46 =front left leg: 5 min later
H68 Cam 3	Stealth Cam Prowler	Deer	Unknown	1	6/13/2009	8:40 PM	west	62	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/14/2009	6:47 AM	east	55	Spot pattern =mother of kittens: front left leg, sat and cleaned: pict 251
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/14/2009	9:09 PM	west	58	Spot pattern =mother of kittens: front right leg pict 257
H68 Cam 3	Stealth Cam Prowler	Wild Pig	Female with juveniles	3	6/14/2009	10:40 PM	west	53	same day
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/15/2009	12:42 PM	west	69	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/15/2009	7:58 PM	west	61	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	3	6/16/2009	5:29 PM	west	66	Female with 2 kittens, fourth detection of kittens: pict 280-282: kittens stopped to small scat
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/16/2009	9:06 PM	west	58	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/16/2009	11:11 PM	west	57	Same day, 2hrs 5min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/17/2009	5:36 AM	west	53	
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	6/17/2009	12:47 PM	west	72	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	4	6/17/2009	3:17 PM	west	75	Female with 3 kittens, fifth detection of kittens: pict 304-306: H68 Cam 1 pict of all 4 bobcats on 6/17/09 at 3:23: 6 min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	4	6/19/2009	12:18 PM	east	71	Female with 3 kittens, sixth detection of kittens: pict 313-315: Family came back, second time, 2 days later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/19/2009	3:56 PM	west	74	same day, 3hrs 38min later, pict 319. H68 Cam 1 female heading back (east) 22 minutes later: 6/19/09 at 16:18
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/20/2009	1:58 AM	west	55	Spot pattern =mother of kittens: front right leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/20/2009	5:24 AM	west	53	same day, 3hrs 22min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/20/2009	7:55 AM	west	55	same day, 2hrs 19 min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juveniles	2	6/20/2009	2:35 PM	east	59	same day, 6hrs 30 min later, 2 kittens: seventh detection
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/21/2009	3:26 AM	west	53	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/21/2009	5:26 AM	west	52	same day, 2hrs later
H68 Cam 3	Stealth Cam Prowler	Coyote	Unknown	1	6/21/2009	9:48 AM	west	56	same day, pict 373
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/21/2009	12:52 PM	east	66	Female mother returning with ground squirrel: front right leg: pict 376
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	6/21/2009	7:12 PM	west	61	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/22/2009	6:43 AM	east	43	Spot pattern =mother of kittens: left hind leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	4	6/22/2009	1:11 PM	west	78	Female with 3 kittens, eight detection of kittens: pict 403-405 H68 Cam 1 pict of bobcats on 6/22/09 at 13:16: 5 min later
H68 Cam 3	Stealth Cam	Deer	Female	1	6/23/2009	6:33 AM	west	46	

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	Prowler								
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juveniles	2	6/23/2009	4:27 PM	east	77	Bobcat kittens back next day, ninth detection: pict 415
H68 Cam 3	Stealth Cam Prowler	Coyote	Unknown	1	6/25/2009	4:45 AM	west	55	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juvenile	2	6/25/2009	12:02 PM	west	66	Female with kitten, tenth detection of kittens: pict 430 H68 Cam 1 pict of bobcat on 6/25/09 at 12:07: 5 min later
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/27/2009	9:22 AM	west	58	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/27/2009	9:39 AM	east	61	Same day, 17 min later. Spot pattern =mother of kittens: hind right leg
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juveniles	2	6/28/2009	12:02 PM	east	76	Series of three pictures of juveniles
H68 Cam 3	Stealth Cam Prowler	Deer	Unknown	1	6/28/2009	7:36 PM	west	69	Series of nine pictures of deer going west
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/29/2009	10:32 AM	east	64	Spot pattern for ID (Right hind)
H68 Cam 3	Stealth Cam Prowler	Bobcat	Unknown	1	6/30/2009	3:19 PM	east	78	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	6/30/2009	9:09 PM	east	61	Scent rub, Series of nine pictures
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	7/1/2009	3:17 PM	west	76	Series of nine pictures of female deer with fawn going west
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juvenile	1	7/2/2009	4:31 AM	west	56	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	7/6/2009	12:00 PM	east	70	
H68 Cam 3	Stealth Cam Prowler	Wild Pig	Female with juveniles	6	7/7/2009	4:01 AM	west	46	New Moon, series of nine picture of wild pig with piglets (5)
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	7/7/2009	9:41 AM	east	59	New Moon
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	7/8/2009	10:53 AM	east	65	New Moon
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	7/15/2009	3:24 PM	west	82	Series of eight pictures of deer
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	7/15/2009	3:24 PM	west	81	Series of seven pictures of deer
H68 Cam 3	Stealth Cam Prowler	Deer	Female with juvenile	2	7/15/2009	1:12 AM	east	56	Series of seven pictures of deer with fawn
H68 Cam 3	Stealth Cam Prowler	Deer	Female with juvenile	2	7/17/2009	6:44 PM	east	75	Series of nine pictures of deer with fawn
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juvenile	2	7/22/2009	7:07 PM	west	63	Series of nine pictures (Second bobcat appeared on H68 Cam 3 292), Pic 295 good for ID Right hind)
H68 Cam 3	Stealth Cam Prowler	Skunk		1	7/27/2009	5:21 AM	east	52	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juvenile	2	7/27/2009	4:07 PM	east	74	Female with kitten
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	7/30/2009	8:55 PM	west	59	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	7/31/2009	8:39 AM	east	56	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juvenile	1	7/31/2009	12:56 PM	west	70	Single bobcat kitten heading west into underpass
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/1/2009	10:21 AM	east	61	
H68 Cam 3	Stealth Cam Prowler	Skunk		1	8/1/2009	8:28 PM	west	58	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/3/2009	1:58 AM	west	56	

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H68 Cam 3	Stealth Cam Prowler	Wild Pig		1	8/3/2009	2:44 AM	west	56	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	8/3/2009	9:43 PM	east	57	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juvenile	1	8/5/2009	2:37 PM	east	76	Single bobcat kitten traveling east from underpass
H68 Cam 3	Stealth Cam Prowler	Skunk		1	8/9/2009	3:36 AM	west	49	
H68 Cam 3	Stealth Cam Prowler	Deer	Male	1	8/9/2009	9:06 PM	west		Male buck, velvet is shed
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	3	8/11/2009	6:27 PM	west	70	Female with 2 kittens, group photo, compare to 6-12-09 pict 63
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	3	8/13/2009	9:41 PM	west	63	Female with 2 kittens
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	8/14/2009	7:47 PM	west	62	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/18/2009	8:36 AM	west	55	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	8/18/2009	6:06 PM	east	69	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	8/18/2009	6:58 PM	west	65	Female bobcat made 3 trips in 1 day
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	8/20/2009	5:16 AM	east	56	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	8/20/2009	7:25 PM	west	63	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/21/2009	7:02 PM	west	68	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/22/2009	7:47 PM	east	62	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	8/24/2009	1:38 PM	west	70	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juvenile	2	8/25/2009	9:21 AM	east	55	Female with kitten heading east from underpass
H68 Cam 3	Stealth Cam Prowler	Bobcat	Juveniles	2	8/26/2009	3:29 PM	west	78	Two kittens traveling west to underpass
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female with juveniles	3	8/29/2009	6:12 AM	west	56	Female with 2 kittens traveling west to underpass
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	9/3/2009	7:44 AM	west	53	
H68 Cam 3	Stealth Cam Prowler	Deer	Female	1	9/6/2009	5:29 AM	west	52	
H68 Cam 3	Stealth Cam Prowler	Deer	Female	2	9/9/2009	12:00 AM	west	57	
H68 Cam 3	Stealth Cam Prowler	Bobcat		1	9/9/2009	11:52 AM	east	65	
H68 Cam 3	Stealth Cam Prowler	Bobcat	Female	1	9/12/2009	7:31 AM	east	52	
Marks Ranch C1	Main road on upper south side of property								
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	10/30/2008	12:15 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	10/31/2008	3:25 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Mountain lion	Unknown	1	11/7/2008	8:47 AM	west		Mountain lion: Possible dark marking on front feet
Marks Ranch C1	Cuddeback NoFlash	Bobcat	Unknown	1	11/18/2008	8:25 AM	east		spots for individual identification

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Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	11/21/2008	11:07 PM	east		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	11/22/2008	8:33 PM	west		smelling bobcat scat
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	11/22/2008	6:23 PM	east		
Marks Ranch C1	Cuddeback NoFlash	Deer	Male	1	11/23/2008	6:15 AM	north		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	11/24/2008	6:22 AM	south		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	11/29/2008	12:33 AM	south		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	11/29/2008	7:17 PM	west		smelling bobcat scat
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	12/10/2008	8:58 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	12/11/2008	9:37 PM	west		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	12/11/2008	7:47 AM	south		Gray fox same day as Coyote
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	12/12/2008	4:07 PM	west		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	12/16/2008	3:46 PM	north		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	12/21/2008	10:24 PM	north		
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	12/27/2008	8:55 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/2/2009	9:57 PM	west		smelling bobcat scat
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/7/2009	2:20 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/8/2009	4:57 AM	east		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/12/2009	5:46 AM	east		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/13/2009	3:18 AM	east		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	1/13/2009	12:17 PM	south		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/15/2009	9:22 PM	west		great video
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/15/2009	9:30 PM	west		Gray fox on same day
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	1/17/2009	4:35 PM	north		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/17/2009	10:19 PM	west		
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/17/2009	10:49 AM	west		Gray fox on same day
Marks Ranch C1	Cuddeback NoFlash	Skunk	Unknown	1	1/19/2009	6:37 AM	east		first skunk picture on Marks ranch
Marks Ranch C1	Cuddeback NoFlash	Coyote	Unknown	1	1/24/2009	9:10 AM	west		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	1/24/2009	6:06 PM	north		
Marks Ranch C1	Cuddeback NoFlash	Mountain lion	Unknown	1	1/27/2009	8:50 PM	west		Mountain lion
Marks Ranch C1	Cuddeback NoFlash	Gray fox	Unknown	1	1/28/2009	1:24 AM	east		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	2/5/2009	4:38 PM	south		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	2/7/2009	7:48 AM	east		great photo
Marks Ranch C1	Cuddeback NoFlash	Bobcat	Unknown	1	2/11/2009	2:33 PM	west		spots for individual identification, video of hunting & great picture
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	2/12/2009	8:11 AM	east		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	2/14/2009	6:25 PM	north		
Marks Ranch C1	Cuddeback NoFlash	Deer	Unknown	1	2/18/2009	5:18 PM	north		
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	3/23/2009	7:24 AM	north	33	
Marks Ranch C1	Stealth Cam Prowler	Coyote	Unknown	2	3/23/2009	10:35 PM	west	43	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	3/29/2009	10:35 AM	south	62	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/1/2009	7:55 AM	south	49	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/5/2009	6:47 PM	north	65	

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Marks Ranch C1	Stealth Cam Prowler	Deer	Female	2	4/6/2009	7:26 AM	south	45	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/6/2009	7:33 AM	north	49	same day
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	4/6/2009	7:34 AM	south	49	same day, deer running, 1 minute later opposite direction
Marks Ranch C1	Stealth Cam Prowler	Coyote	Unknown	1	4/7/2009	8:35 AM	west	52	looked at camera
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/7/2009	9:13 PM	north	44	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/8/2009	8:33 AM	south	49	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/9/2009	10:16 AM	south	58	possible juvenile
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/18/2009	6:39 PM	north	74	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/19/2009	7:23 AM	north	58	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/20/2009	4:23 PM	north	99	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	4/21/2009	4:57 AM	north	62	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	4/23/2009	10:47 AM	west	62	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	4/18/2009	6:40 PM	north	74	possibly pregnant
Marks Ranch C1	Stealth Cam Prowler	Deer	Male	1	4/27/2009	9:07 AM	north	49	antlers
Marks Ranch C1	Stealth Cam Prowler	Deer	Male	1	4/27/2009	7:47 PM	south	49	antlers, looks like previous individual
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	4/29/2009	11:41 AM	north	66	Fawn still has spots
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/1/2009	6:09 AM	north	47	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/1/2009	5:27 PM	south	57	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/2/2009	6:01 PM	south	69	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/5/2009	7:53 PM	south	64	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/7/2009	4:44 PM	north	77	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/8/2009	4:19 AM	north	43	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	5/10/2009	7:46 AM	east	53	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/11/2009	3:20 AM	north	50	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	2	5/12/2009	6:21 AM	south	43	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	5/12/2009	8:27 PM	south	53	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/13/2009	5:29 PM	north	76	
Marks Ranch C1	Stealth Cam Prowler	Coyote	Unknown	1	5/14/2009	7:47 AM	west	58	
Marks Ranch C1	Stealth Cam Prowler	Deer	Juvenile	1	5/15/2009	8:20 AM	north	63	
Marks Ranch C1	Stealth Cam	Deer	Female-with fawn	3	5/15/2009	8:22 AM	west	64	3rd deer is also a juvenile, possibly previous individual

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	Prowler								
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/15/2009	10:12 PM	south	50	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/16/2009	12:17 AM	south	45	
Marks Ranch C1	Stealth Cam Prowler	Deer	Male	1	5/16/2009	6:46 AM	south	56	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/17/2009	11:43 PM	south	47	
Marks Ranch C1	Stealth Cam Prowler	Deer	Fawn	1	5/17/2009	11:44 PM	south	47	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	5/18/2009	1:32 AM	west	46	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/19/2009	12:34 AM	west	51	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	2	5/20/2009	7:02 AM	south	50	both adult females
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	5/25/2009	8:26 AM	east	49	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Male with Unknown	2	5/25/2009	9:50 AM	west	71	antlers for individual identification
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/26/2009	7:20 AM	east	50	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/27/2009	4:47 PM	east	74	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	5/28/2009	7:09 PM	west	51	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/29/2009	6:19 AM	north	68	
Marks Ranch C1	Stealth Cam Prowler	Bobcat	Unknown	1	5/31/2009	12:45 AM	west	50	front left leg for individual identification
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	5/31/2009	8:15 PM	west	62	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	6/2/2009	12:36 AM	west	52	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	6/2/2009	8:36 PM	south	52	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female-with fawn	2	6/9/2009	6:11 PM	west	56	Female-with fawn
Marks Ranch C1	Stealth Cam Prowler	Deer	Female with 2 fawns	3	6/12/2009	8:02 AM	east	62	Female with 2 fawns
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/12/2009	8:22 PM	west	61	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/13/2009	10:55 PM	east	53	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/13/2009	4:22 PM	east	56	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/17/2009	8:40 AM	east	57	
Marks Ranch C1	Stealth Cam Prowler	Deer	Fawn	1	6/17/2009	8:09 AM	east	58	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/18/2009	7:56 AM	north	78	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	6/19/2009	2:47 PM	south	81	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/22/2009	10:06 PM	east	65	
Marks Ranch C1	Stealth Cam Prowler	Deer	Female	1	6/24/2009	8:51 PM	south	57	

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Marks Ranch C1	Stealth Cam Prowler	Deer	Females	2	6/26/2009	9:40 AM	north	74	
Marks Ranch C1									
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	7/27/2009	7:43 AM	South	53	Series of two pictures going south
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	7/27/2009	7:47 AM	South	053 F	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	7/31/2009	7:11 AM	South	053 F	
Marks Ranch C1	Stealth Cam Prowler	Deer	Unknown	1	8/10/2009	2:49 AM	South	053 F	Series of three pictures of deer
Marks Ranch C1	Stealth Cam Prowler	Mountain Lion	Unknown	1	8/11/2009	9:13 PM	East	056 F	Mountain lion, turns south into trail that deer went in day before