WILDLIFE CAMERA MONITORING REPORT

RESOLUTION COPPER MINING

Prepared for:



102 Magma Heights Superior, Arizona 85273

Prepared by:

WestLand Resources, Inc. Engineering and Environmental Consultants

4001 E. Paradise Falls Drive Tucson, Arizona 85712

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EXECUTIVE SUMMARY

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Mining, LLC (Resolution) to conduct wildlife monitoring surveys utilizing motion–sensitive cameras in the vicinity of Resolution's holdings near Superior, Arizona and in the broader area. Data were collected from 15 camera locations distributed in several areas including the Oak Flat area, the upper, middle, and lower portions of Devils Canyon, and the Near West tailings alternatives area. Data collected during this wildlife camera monitoring survey provides a preliminary inventory of wildlife species in the vicinity of the proposed project and in the broader area.

The wildlife monitoring cameras captured 9,816 events that recorded 72 taxa. Mammal taxa of all sizes (8,234 events) constitute 84 percent of capture events and 38 percent of recorded taxa. The most commonly observed mammal species (2,831 events) was domestic or feral cattle, representing 29 percent of all capture events. Captured events of domestic or feral cattle, dog, horse, and cat, are documented, but excluded from calculations regarding percentages and frequencies of wildlife taxa captured. No species listed as threatened or endangered under the Endangered Species Act were recorded.

Among wildlife events captured, a total of 23 mammal taxa were recorded, 20 of which were identified at least to the genus level (5,349 events). Avian taxa (1,495 events) constitute more than 21 percent of all capture events and 54 percent of recorded wildlife taxa. A total of 37 types of bird were recorded, 34 of which were identified at least to the genus level (1,462 events). Reptiles, amphibians, and invertebrates combined (87 capture events) account for less than 1 percent of all capture events, and approximately 12 percent of recorded taxa. Five reptile taxa were recorded, four of which (6 capture events) were identified to species. Two amphibian taxa were recorded, one of which was identified to species (1 capture event); one invertebrate taxa was recorded, however could not be identified to genus or species (27 capture events).

Species that account for the highest percentages of capture events include javelina (17.6 percent), white-nosed coati (14.0 percent), white-tailed deer (8.2 percent), raccoon (8.1 percent), turkey vulture (7.7 percent), mule deer (5.7 percent), Gambel's quail (5.6 percent) and gray fox (5.5 percent). Other species individually accounted for less than 5 percent of wildlife capture events.

The distribution of taxa varied widely across locations. Gray fox was recorded at 13 of the 15 locations, more than any other species. Javelina and white-nosed coati were recorded at 11 locations each, and white-tailed deer, hog-nosed skunk and rock squirrel were recorded at 10 locations each. Fourteen other species were recorded at 5 to 9 locations. On the low end, 40 of the wildlife taxa (more than half) were recorded at either one or two locations. In two cases, species that account for hundreds of capture events each (mule deer and turkey vultures) were recorded at only two or three locations. Ninety-eight percent of all raccoon capture events were recorded at one location. Most white-tailed deer capture events came from the Middle Devils Canyon locations accounting for 63 percent of all white-tailed deer capture events, the spotted skunk was recorded the least number of times and at the least number of sites, having only been recorded in the Lower Devils Canyon area.

1. INTRODUCTION

Resolution Copper Mining LLC (Resolution) is conducting pre-feasibility studies for the development of a copper mine and associated facilities near Superior, in Pinal County, Arizona (*Figure 1*). To support planning and anticipated permitting efforts, WestLand Resources, Inc. (WestLand) was contracted by Resolution to conduct wildlife camera monitoring surveys in the vicinity of the proposed project and in the broader area.

Wildlife camera monitoring surveys are designed primarily to detect medium to large mammal species, although small mammals, birds, amphibians, reptiles, and invertebrates were also detected during these surveys. The objectives of the survey are to document species occurrence (i.e., presence), species richness (i.e., the number of species encountered), and distribution of wildlife species recorded at survey locations in the vicinity of Resolution's holdings near Superior, Arizona (*Figure 2*). Surveys occurred from October 6, 2011 through November 06, 2013 (the Survey Period). These wildlife camera monitoring surveys build on information collected during similar surveys in the general vicinity during 2008 and 2011 (WestLand 2012) and provides a preliminary inventory of wildlife species in the vicinity of the proposed project and in Devils Canyon, east of the proposed mine.

2. SURVEY AREAS AND DESCRIPTION

Data (e.g. digital photographs with date and time stamp) were collected from motion-sensitive cameras deployed at 15 locations (*Figure 2*) distributed in the following areas: two at the Oak Flat Area (*Figure 3*); three each in the upper, middle, and lower portions of Devils Canyon (*Figure 3*); and four in the proposed Near West tailings alternatives area (*Figure 4*). Camera location numbers and wildlife monitoring areas are listed in *Table 1*¹.

Camera Location Numbers*	Wildlife Monitoring Areas
1 - 2	Oak Flat and vicinity
3 - 5	Middle Devils Canyon
6 - 8	Lower Devils Canyon
9 - 11	Upper Devils Canyon
12 - 15	Near West

 Table 1. Wildlife monitoring areas and camera location numbers

*Camera location numbers correspond to location numbers in Figures 2 - 4

2.1. OAK FLAT AREA

The Oak Flat Area, as defined for this report, is located in the mountains immediately east of Superior on Forest System lands managed by Tonto National Forest (TNF). This area is roughly bounded on the north by US Highway 60 and Queen Creek Canyon, on the east by cliffs along Devils Canyon, on the south by

¹ Camera location numbers in *Table 1* are relevant to the current study and do not correspond with previous camera trap survey locations from 2008 and 2011 (WestLand 2012).

Oak Creek, and on the west by the Apache Leap escarpment (*Figures 2 and 3*). The elevation ranges from 3,100 ft (950 m) above mean sea level (amsl) near Queen Creek to 4,648 ft (1,417 m) amsl at a high point on the Apache Leap escarpment, overlooking Superior. Parallel ridges and drainages trend toward the northeast from the Apache Leap ridgeline with a subtle topographic divide that separates drainages into those that drain north to Queen Creek and those that drain east to Devils Canyon through Rancho Rio, Hackberry and Oak creeks. Oak Flat proper, in the northeastern portion of this area, is a relatively level plateau with few incised drainages. Interior Chaparral (Pase and Brown 1982) is the dominant vegetation type represented by Sonoran scrub oak (*Quercus turbinella*), manzanita (*Arctostaphylos* spp.), and skunkbush sumac (*Rhus trilobata*), however, Madrean Evergreen Woodland (Brown 1982) is also present. The Oak Flat Area contains several manmade stock ponds and reservoirs, including the two Oak Flat Area camera locations; one overlooking a tinaja in a tributary of Queen Creek (Location 1) and the other along Rancho Rio Creek (Location 2; *Figure 3*).

2.2. DEVILS CANYON

Devils Canyon is a steep-walled north-south trending canyon located east of the Oak Flat Area on Forest System lands managed by TNF (*Figures 2 and 3*) and State Trust lands managed by Arizona State Land Department (ASLD). Surface water in the canyon is seasonally intermittent in the upper reaches and perennial in the middle and lower reaches. Elevations within the three segments of Devils Canyon where camera surveys occurred range from a maximum of approximately 4,200 ft (1,280 m) in the upper reach to a minimum of approximately 3,600 ft (1,100 m) in the lower reach. The middle and lower reaches of Devils Canyon support groves of Interior Riparian Deciduous Forest (Minckley and Brown 1982) dominated by Arizona alder (*Alnus oblongifolia*), velvet ash (*Fraxinus velutina*), Arizona sycamore (*Platanus wrightii*), and Fremont cottonwood (*Populus fremontii*). The upper reach of Devils Canyon is more xeric and is dominated by velvet mesquite (*Prosopis velutina*), white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), and scrub oak (*Quercus turbinella*). The Devils Canyon monitoring area includes nine camera locations; three each in the upper (Locations 9, 10, and 11), middle (Locations 3, 4, and 5), and lower (Locations 6, 7, and 8) reaches of Devils Canyon (*Figure 3*).

2.3. NEAR WEST AREA

The Near West Area is located adjacent to and north of US Highway 60, less than one mile (1.6 km) west of Superior (*Figures 2 and 4*) on Forest System lands managed by TNF. This area generally slopes downhill from the northeast to the southwest and is dissected by numerous ephemerally flowing washes. The highest elevation is 3,146 feet (959 m) at a ridge near its eastern boundary, and the lowest elevation is 2,240 feet (683 m) near the western boundary. Vegetation within the Near West Area is characteristic of the Arizona upland subdivision of Sonoran desertscrub (Turner and Brown 1982) and is dominated by mesquite (*Prosopis* spp.), palo verde (*Parkinsonia* spp.), and numerous species of cacti. The Near West monitoring area includes four camera locations; one in Roblas Canyon (Location 12), one at Bear Spring (Location 13), one at Happy Camp Spring (Location 15), and one near a large unnamed rock butte in the vicinity of the old Perlite Quarry (Location 14; *Figure 4*).

3. BACKGROUND ON WILDLIFE CAMERAS

The use of motion-sensitive wildlife cameras, commonly known as *camera traps*, is an established survey methodology in vertebrate ecology, particularly in studies of large or medium sized mammals. Camera trapping is a particularly useful survey technique for examining species richness of large mammals at a particular locality and comparing results with species richness from other localities in different but adjacent habitats (Stein et al. 2008). However, data from camera trap studies is of limited use in modeling overall species richness or relative abundance due to the inherent bias towards detecting larger over smaller bodied mammals (Dajun et al. 2006) and due to the bias towards detecting gregarious species that forage or travel in groups compared to solitary species (Treves et al. 2010).

Cameras detect the infrared heat signal in a cone-shaped zone in front of the camera (Dajun et al. 2006). The ability of a camera to detect a species is dependent on body size, temperature difference from the environment, distance from the camera, and presence of vegetation within the detection area of the camera. Thus, small species, such as mice and ground squirrels, are less likely to be "captured" by a camera trap compared to species that are 10 to 1,000 times larger. The cone-shaped zone of the infrared detector is more sensitive closer to the camera so small species tend to trigger the camera only when they are close enough to be captured in the most sensitive part of this zone. Small birds, amphibians, reptiles, and invertebrates captured in photographs are therefore considered incidental.

Trapping rates have been shown to respond to population manipulation (Bengsen et al. 2011) and to be strongly correlated to density estimates based on other established methodologies, such as capture-recapture analyses (Rovero and Marshall 2009). As such, a growing trend in large mammal ecology studies is to incorporate camera trapping along with capture-recapture analyses to estimate population densities (e.g., Ríos-Uzeda et al. 2007, Rovero and Marshall 2009). Because large mammals represent the top trophic levels in many ecosystems, camera trap surveys have even been proposed as the basis of a composite indicator of biodiversity for global monitoring efforts (O'Brien et al. 2010). In this survey, wildlife camera monitoring was employed to document species occurrence (i.e., presence), species richness (i.e., the number of species encountered), and distribution of the wildlife species (particularly large mammals) recorded at survey locations in the vicinity of Resolution's holdings near Superior, Arizona.

4. METHODS

Two models of motion–sensitive cameras were used for this study, including the Cuddeback® Attack IR and the Reconyx® HC600 Hyperfire High Output Covert IR (Infrared) Camera. The 5.0 megapixel Cuddeback camera model has a trigger speed of 0.25 seconds and is capable of both daylight color digital photography and nighttime digital infrared photography. The Cuddeback cameras are powered by four D-cell alkaline batteries, and store images on 1-gigabyte (GB) or 2-GB CompactFlash memory cards (Transcend Information, Inc.). Cameras were programmed to take one photograph and a 30-second video after being triggered (i.e., the initiation of an event) and to delay one minute before camera could be triggered again. The Cuddeback cameras used in this study were attached to trees using large hose clamps, and were secured with chains and padlocks.

The Reconyx camera has a trigger speed of 0.2 seconds and takes both daylight color digital photographs and nighttime monochromatic infrared photographs (both at 3.1 megapixels). The Reconyx cameras were originally powered by rechargeable Lithium AA batteries. After several months of use these batteries would no longer retain a charge and were replaced with standard AA alkaline batteries. Images were stored on 4-GB Reconyx Certified SDHC Memory Cards (SanDisk Corporation). Cameras were programmed to take five photographs after being triggered (i.e., the initiation of an event) and to delay one minute before camera could be triggered again. To protect these cameras from animal damage and from human theft or vandalism, each camera was deployed in a Reconyx Hyperfire Security Steel Enclosure. Cameras were secured to trees or rock walls near water sources or game trails in thick vegetation. The steel security enclosures that held the Reconyx cameras were mounted directly with large lag bolts, and were secured with a Master Lock PythonTM Adjustable Locking Cable.

Riparian tree groves, vegetated springs, and game trails were selected as camera trapping locations because species are likely to access them for water, travel, and thermal cover. Eight of the ten camera locations used in the 2008 and 2011 wildlife monitoring studies (WestLand 2012) were used for the 2012 and 2013 studies (Locations 1 through 8). These included three locations each in the middle and lower portions of Devils Canyon, and two in the Oak Flat Area (*Figures 2 and 3*). A full listing of camera locations with camera types, days of deployment, and any gaps in the record is given in *Appendix A*.

Cameras were checked periodically, usually every eight to ten weeks, between October 6, 2011 and November 6, 2013. During checks, batteries were replaced, memory cards were changed, and maintenance was performed at each camera site as needed. Contents of the memory cards were uploaded onto the WestLand network and photographs captured by the cameras were reviewed carefully for the presence of animals.

Individual and groups of animals often triggered multiple events (i.e., sets of photographs) by lingering in front of cameras or continuously coming in and out of the frame during the same time period. These activities and the interpretation of resultant sets of photographs had the potential to skew the data by mistaking an individual animal's visit to a camera location at a discreet time (i.e., a single capture event) as multiple events. Whenever possible, WestLand biologists used timestamps on photographs and characteristics of the animals (e.g., size, unique markings, color, etc.) to help determine single capture events from multiple events and thus avoid skewing the data.

5. RESULTS AND DISCUSSION

Large- and medium-sized mammals are generally the target species of most wildlife camera monitoring surveys because these species are more likely to trigger camera traps due to their size. Therefore, we present results in the context of relative body size as referenced in *Table 2*. Species listed in *Table 2* are categorized² as large (greater than 40 lbs [18 kg]), medium (2 to 40 lbs [0.9 to 18 kg]), or small (less than 2 lbs; [0.9 kg]). Although smaller-sized species are not as likely to trigger cameras, small mammals, small- and medium-sized birds, reptiles, amphibians, and invertebrates were captured by camera traps

² Observations of species were placed in size categories based on reported masses for species and our best estimates from photographs.

during this study (*Table 2*). Combined, observations of species within the small body size category made up approximately 13 percent of the total capture events (i.e., single capture events; see *Section 4*) and 58 percent of the total taxa³. Results are therefore presented on all recorded taxa to provide a broader, more complete baseline dataset from which to inform future wildlife surveys in the area.

5.1. OVERVIEW BY TAXON GROUPS

The 15 wildlife monitoring cameras captured 9,816 events that recorded 72 taxa, 63 of which could be identified to at least the genus level (*Table 2*). Representative photographs of many of the taxa captured are presented in *Appendix B*. No images were captured of species listed as threatened or endangered under the Endangered Species Act.

Mammal taxa of all sizes (8,234 capture events) constitute 84 percent of capture events and 38 percent of recorded taxa. The most commonly observed mammal (2,831 capture events) was domestic or feral cattle (*Bos taurus*); representing 29 percent of all capture events. To provide information pertinent to wildlife species, capture events of 1) domestic or feral cattle, 2) domestic or feral dogs (22 events), 3) domestic horses (5 events), and 4) domestic or feral cats (5 events) are not considered further in this report. For the remainder of this discussion, the data represents capture events for wildlife taxa only (6,953 capture events).

Among wildlife events captured, a total of 23 mammal taxa were recorded (5,371 capture events), 20 of which could be identified to at least the genus level (5,349 capture events). Mammal taxa constitute 77 percent of all wildlife capture events and 34 percent of recorded wildlife taxa. Six of these taxa were classified as large, 11 were classified as medium, five were classified as small, and one was classified as unknown (*Table 2*). Avian taxa (1,495 capture events) constitute more than 21 percent of all capture events and 54 percent of recorded wildlife taxa. Cameras captured 37 types of bird, 34 of which could be identified at least to the genus level (1,462 capture events). Eight of the bird taxa were classified as medium, and the remaining 29 were classified as small (*Table 2*).

Reptile, amphibian, and invertebrate taxa were also recorded (87 capture events), all of which fall into the small body size category. Reptiles, amphibians, and invertebrates combined account for less than 1 percent of all capture events, and approximately 12 percent of recorded taxa. Five reptile taxa were recorded, four of which were identified to species (6 capture events), and one recorded as an unidentified lizard (6 events). Two amphibian taxa were recorded, one of which was identified to species (1 capture event); all others were recorded as unidentified toad species (47 capture events). Only one invertebrate taxa was recorded (27 capture events; *Table 2*); however could not be identified to genus or species.

³ Taxa were identified to the lowest taxonomic level possible.

Taxa ¹	Camera Location Number								Total	Total							
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
						LARG	E MAI	MMAL	'S								
American black bear Ursus americanus Ursidae	-	-	22	4	4	9	8	15	20	5	4	-	-	-	-	91	9
Coyote Canis latrans Canidae	3	-	1	-	-	-	-	-	-	1	5	-	322	-	4	336	6
Domestic/Feral cattle Bos taurus Bovidae	-	-	131	116	44	278	465	1023	-	-	171	239	364	-	-	2831	9
Domestic/Feral dogs <i>Canis lupus familiaris</i> Canidae	-	-	-	3	-	-	1	-	-	1	-	3	14	-	-	22	5
Domestic horse <i>Equus ferus caballus</i> Equidae	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	5	1
Javelina <i>Tayassu tajacu</i> Tayassuidae	-	4	205	295	132	110	67	275	2	-	1	-	133	-	2	1226	11
Mountain lion <i>Puma concolor</i> Felidae	-	5	26	4	4	5	4	16	-	2	4	-	-	-	-	70	9
Mule deer Odocoileus hemionus Cervidae	-	-	-	-	-	-	-	-	-	-	-	-	392	-	4	396	2
White-tailed deer Odocoileus virginianus Cervidae	-	2	143	99	117	9	13	39	57	-	85	-	4	-	-	568	10
					Μ	EDIU	M MA	MMA	LS								
Bobcat Lynx rufus Felidae	-	8	7	-	-	-	-	5	-	-	5	-	17	-	-	42	5
Cottontail rabbit Sylvilagus spp. Leporidae	-	11	18	18	-	-	-	1	-	-	1	-	2	7	1	59	8
Domestic/Feral cats Felis catus Felidae	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1

Table 2. Number of recorded events by taxa at camera locations within the study area

Taxa ¹	Camera Location Number										Total	Total					
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
Gray fox Urocyon cinereoargentus Canidae	20	10	59	2	1	13	1	131	6	101	28	6	5	-	-	383	13
Hog–nosed skunk Conepatus leuconotus Mephitidae	9	5	10	3	-	13	1	17	21	30	5	-	-	-	-	114	10
Hooded skunk Mephitis macroura Mephitidae	-	5	2	2	-	2	-	8	-	-	4	-	-	-	-	23	6
Raccoon Procyon lotor Procyonidae	550	4	-	1	1	-	-	-	-	-	8	-	-	-	-	564	5
Ringtail Bassariscus astutus Procyonidae	-	-	-	-	1	15	-	4	-	7	-	-	-	-	-	27	4
Spotted skunk Spilogale gracilis Mephitidae	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	5	1
Striped skunk Mephitis mephitis Mephitidae	9	12	18	-	-	1	1	13	1	-	26	-	-	-	-	81	8
Unidentified skunk Mephitidae	3	3	4	-	-	-	-	1	1	-	I	-	-	-	-	12	5
White–nosed coati Nasua narica Procyonidae	25	3	68	103	40	198	115	293	32	55	40	-	-	-	-	972	11
						SMAL	L MA	MMAL	S								
Cliff chipmunk <i>Tamias dorsalis</i> Sciuridae	-	33	-	-	-	1	-	-	7	90	1	-	-	6	-	138	6
Harris's antelope squirrel Ammospermophilus harrisii Sciuridae	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Rock squirrel Spermophilus variegates Sciuridae	29	39	-	-	-	37	1	47	-	5	7	8	23	54	-	250	10
Unidentified bat	5	-	-	-	1	-	-	-	-	-	-	-	3	-	-	9	3

Taxa ¹	Camera Location Number								Total	Total							
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
White-throated woodrat <i>Neotoma albigula</i> Cricetidae	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	3	2
				U	NKN	OWN-	SIZE	D MA	MMA	LS							
Unidentified mammal	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1
						MED	IUM I	BIRD	5								
Common black–hawk Buteogallus anthracinus Accipitridae	12	-	-	-	-	-	-	-	-	-	1	-	-	-	-	13	2
Common raven Corvus corax Corvidae	81	-	-	-	-	-	-	-	-	-	1	-	-	-	-	82	2
Great blue heron Ardea herodias Ardeidae	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Great horned owl Bubo virginianus Strigidae	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	8	1
Red-tailed hawk Buteo jamaicensis Accipitridae	1	-	-	-	-	-	-	-	-	-	1	-	23	-	-	25	3
Turkey vulture Cathartes aura Cathartidae	104	-	-	-	-	-	-	-	-	-	6	-	422	-	-	532	3
Raptor species Buteo sp. Accipitridae	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Zone–tailed hawk Buteo albonotatus Accipitridae	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	1
						SMA	LLB	IRDS									
Abert's towhee <i>Melozone aberti</i> Emberizidae	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	3	1
Ash–throated flycatcher Myiarchus cinerascens Tyrannidae	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	4	1

Taxa ¹	Camera Location Number									Total	Total						
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
Barn owl <i>Tyto alba</i> Tytonidae	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1
Black phoebe Sayornis nigricans Tyrannidae	8	-	-	-	-	-	-	-	-	-	1	-	-	-	-	9	2
Brown–crested flycatcher Myiarchus tyrannulus Tyrannidae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Canyon towhee Melozone fusca Emberizidae	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Chipping sparrow Spizella passerine Emberizidae	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	3	2
Cooper's hawk Accipiter cooperii Accipitridae	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	2
Crissal thrasher Toxostoma crissale Mimidae	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	4	2
Gambel's quail <i>Callipepla gambelii</i> Odontophoridae	-	182	-	-	-	3	-	35	-	8	10	-	45	103	6	392	8
Gila woodpecker Melanerpes uropygialis Picidae	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	30	1
Gilded flicker Colaptes chrysoides Picidae	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	1
Greater roadrunner Geococcyx californianus Cuculidae	-	-	-	-	-	2	-	25	-	-	-	-	12	-	1	40	4
House finch Haemorhous mexicanus Fringillidae	4	-	-	-	-	-	-	-	-	-	-	7	-	-	-	11	2
Mourning dove Zenaida macroura Columbidae	27	3	-	-	-	2	-	4	-	-	25	-	76	32	-	169	7

Taxa ¹	Camera Location Number								Total	Total							
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
Northern cardinal <i>Cardinalis cardinalis</i> Cardinalidae	-	-	-	-	-	1	-	-	-	-	-	2	3	-	-	6	3
Northern flicker <i>Colaptes auratus</i> Picidae	4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5	2
Northern mockingbird Mimus polyglottos Mimidae	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	3	3
Rock wren Salpinctes obsoletus Troglodytidae	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Spotted towhee <i>Pipilo maculatus</i> Emberizidae	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Flicker species Colaptes sp. Picidae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Flycatcher species Myiarchus sp. Tyrannidae	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Unidentified hummingbird Trochilidae	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Unidentified small bird	15	-	1	1	-	-	-	-	-	1	2	-	9	2	-	31	7
Unidentified swallow Hirundinidae	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Thrasher species <i>Toxostoma sp.</i> Mimidae	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1
Western screech–owl Megascops kennicottii Strigidae	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3	1
Western scrub–jay Aphelocoma californica Corvidae	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	4	2
White-winged dove Zenaida asiatica Columbidae	5	4	-	-	-	2	1	2	6	-	6	-	17	-	-	43	8

Taxa ¹	Camera Location Number									Total	Total						
Species and Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Events	Locations
				SMAI	LL AN	IPHI	BIANS	S AND	REP	TILE	S						
Clark's spiny lizard <i>Sceloporus c.f.</i> <i>clarkii</i> Iguanidae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Plateau fence lizard Sceloporus tristichus Phrynosomatidae	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Sonoran mud turtle <i>Kinosternon sonoriense</i> Kinosternidae	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1
Tiger whiptail Aspidoscelis tigris Teiidae	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Unidentified lizard	3	2	-	-	-	-	-	1	-	-	-	-	-	-	-	6	3
Sonoran desert toad Bufo alvarius Bufonidae	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1
Unidentified toad(s)	-	-	-	-	-	-	-	-	-	-	-	-	47	-	-	47	1
					SMA	LL IN	VER	TEBR	ATES	5							
Hover fly Syrphidae	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	27	1
TOTAL	990	350	715	651	346	707	678	1960	153	309	451	298	1984	206	18	9,816	-

¹ Taxa were identified to the lowest taxonomic level possible.

5.2. PERCENTAGE OF CAPTURE EVENTS BY SPECIES

A total of 17 wildlife species represent between 1 and 18 percent of all capture events (*Table 3*). Many of the species on this list are gregarious (e.g., javelina, white–nosed coati, turkey vulture, Gambel's quail) and therefore had an increased chance of being captured by cameras (Treves et al. 2010). Only two wildlife species represent more than 10 percent of all capture events: javelina and white–nosed coati. Six species—white-tailed deer, raccoon, turkey vulture, mule deer, Gambel's quail, and gray fox—each represent between 5 and 10 percent of all capture events (*Table 3*). Nine species accounted for between 1 and 5 percent of all capture events (*Table 3*). Remaining species were relatively rare, accounting for less than 1 percent of all capture events.

Species	Capture Events	Percentage of Capture Events
	>10% of Events	
Javelina	1226	17.6%
White-nosed coati	972	14.0%
>:	5 - 10% of Events	
White-tailed deer	568	8.2
Raccoon	564	8.1
Turkey vulture	532	7.7
Mule deer	396	5.7
Gambel's quail	392	5.6
Gray fox	383	5.5
1	l - 5% of Events	
Coyote	336	4.8
Rock squirrel	250	3.6
Mourning dove	169	2.4
Cliff chipmunk	138	2.0
Hog-nosed skunk	114	1.6
American black bear	91	1.3
Common raven	82	1.2
Striped skunk	81	1.2
Mountain lion	70	1.0

-1 (1K/1Cr s). WEINATHING SKAUDATURS WEITET HEINATHING SU KAUDURALITURALI, VI VICIKAUDATUR (2000)

5.3. DISTRIBUTION OF CAPTURE EVENTS

The number of capture events recorded at each location is heavily dependent on the number of days the cameras were recording (i.e., the number of camera days) at that location. The number of camera days per camera location varied due to several factors including different deployment dates for different locations, vandalism, and intermittent camera malfunctions caused by memory card error, dead batteries, flood damage, etc. When assessing the results of the survey, in particular the distribution of capture events among camera locations, the number of camera days should be considered. The number of camera days for each location and the period of record are presented in *Table 4*; further detail is provided in *Appendix A*.

Of the 15 camera locations, only 12 produced photographs for a substantial portion of the study (the primary locations). The 12 primary locations include all nine of the Devils Canyon locations, the two Oak Flat Locations, and one location at near West. Cameras at the remaining three locations were operational for only relatively short periods, ranging from a low of 22 camera days to a high of 75 camera days (*Table 4*). The locations with limited numbers of camera days include three of the four locations at Near West. In two cases (Locations 12 and 14) the cameras were stolen; and in one case (Location 15), the camera was redeployed to a different location. Cameras were sometimes redeployed in response to flooding, lack of wildlife capture events or other factors.

Location No.	Monitoring Area	Camera Days ¹	Period of Record ²	Comments
1	Oak Flat	567	1/27/12 - 11/05/13	Multiple gaps in record due to flood events (camera was temporarily submerged).
2	Oak Flat	356	2/11/12 - 11/05/13	Gap from 4/18/12 - 5/13/12 due to camera failure. Only 1 photo (corrupt) taken between 6/25/12 and 7/4/12 Additional gaps in coverage are unexplained. Camera failed and was replaced.
3	Middle Devils Canyon	475	1/27/12 - 11/05/13	Gaps from 4/07/12 - 5/07/12 and 4/30/13 - 8/05/13 from battery failure.
4	Middle Devils Canyon	581	10/06/11 - 10/09/13	Substantial gaps due to camera malfunction. Camera replaced on 8/02/12. Batteries failed on 10/09/13.
5	Middle Devils Canyon	601	1/27/12 - 11/05/13	Malfunction between camera servicing on 5/07/12 and 6/25/12.
6	Lower Devils Canyon	567	1/26/12 - 11/06/13	Gap from 5/15/13 - 8/8/13 due to battery failure.
7	Lower Devils Canyon	651	1/26/12 - 11/06/13	
8	Lower Devils Canyon	617	1/26/12 - 11/06/13	Gaps from 4/11/12 - 5/08/12 and 8/07/12 - 8/16/12 due to battery failure.
9	Upper Devils Canyon	287	6/05/12 - 11/04/13	Gap between 10/31/12 and 3/21/13 due to battery failure. Camera was inaccessible during this time because of hazardous weather conditions. Additional gaps in coverage are unexplained.
10	Upper Devils Canyon	373	6/05/12 - 11/04/13	Malfunction between camera servicing 8/17/12 - 10/31/12 and between camera servicing 1/08/13 - 3/21/13.
11	Upper Devils Canyon	400	6/04/12 - 11/05/13	Gaps from 8/14/12 - 8/25/12, from 1/08/13 - 2/12/13, and additional lapses due to flood events (camera was temporarily submerged). Flash nonfunctional between 8/25/12 and 10/30/12.
12	Near West	75	12/19/12 - 3/13/13	Gap between 12/28/12 and 1/08/13 is from battery failure. Camera was stolen sometime after 3/13/13.
13	Near West	322	12/18/12 - 11/04/13	On 6/20/13 the camera direction was adjusted to increase the field of view.
14	Near West	39	3/13/13 - 4/20/13	Camera was stolen sometime after 4/20/13.
15	Near West	22	12/18/12 - 1/08/13	Malfunction between camera servicing on 1/08/13 and 3/13/13. Camera was redeployed to Location 14 on 3/13/13.

Table 4. Total number of camera days and period of record for camera locations

Note: Survey Period is defined as October 6, 2011 through November 06, 2013.

¹ Camera days are defined as the number of days during the survey period that a camera was functioning at that location.

² The Period of Record is defined as the period of time during the survey period that a camera was functioning at that location.

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Location 15 has the shortest number of camera days (22), and captured only 18 events, the lowest number of events captured at any location. The highest number of wildlife capture events (1,601), was at Location 13; but this location ranks eleventh in the number of camera days (322) for all locations (*Tables 2 and 4*). The number of identifiable taxa observed also varied among the 15 camera locations. Location 1 recorded 30 wildlife taxa, the highest number recorded at any of the camera locations. The lowest number was at Camera Location 12 and Camera Location 15, each having only six taxa recorded (*Table 2*).

The distribution of taxa varied widely across locations. Gray fox was recorded at 13 of 15 locations, more than any other species. Javelina and white-nosed coati were recorded at 11 locations each, and white-tailed deer, hog–nosed skunk and rock squirrel were recorded at 10 locations each. Fourteen other species were recorded at 5 to 9 locations. On the low end, 40 of the wildlife taxa (more than half) were recorded at either one or two locations.

In two cases, species that account for hundreds of capture events each were recorded at only a few locations; mule deer were recorded in 396 capture events at two locations, and turkey vulture were recorded in 532 capture events at three locations. Ninety–eight percent of all raccoon records were from capture events at Location 1. Most white–tailed deer records came from the Middle Devils Canyon cameras (359 capture events) accounting for 63 percent of all white–tailed deer records. Mountain lions (*Puma concolor*) and black bear (*Ursus americanus*) were captured at a majority of camera locations. Of the four skunk species, the spotted skunk (*Spilogale gracilis*) was captured the least number of times and at the least number of camera locations, having only been recorded in the Lower Devils Canyon area.

The wildlife camera survey of 2012 - 2013 (this report) employed more camera locations than the 2008/2011 surveys and cameras operated for a longer time period. A few differences among the surveys are worth noting. There were many more avian capture events in the 2012 and 2013 surveys than during the 2008/2011 surveys. WestLand's previous monitoring efforts recorded only 11 bird taxa, which combined accounted for 5 percent of all capture events (WestLand 2012). In the current study 37 avian taxa were recorded and constituted greater than 21 percent of all capture events and 54 percent of recorded wildlife taxa. Turkey vulture and Gambel's quail were the two most common avian species in both surveys, but Gambel's quail was recorded at 8 locations in the current surveys as opposed to at one location in earlier surveys. In both surveys, white–nosed coati were among the most commonly recorded species, but unlike the current surveys, javelina were rare, accounting for only 9 capture events (WestLand 2012). In the current survey, javelina was the most commonly recorded species with 1,226 capture events accounting for 17.6 percent of all capture events.

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FIGURES



WestLand Resources, Inc. Tucson • Phoenix • Flagstaff 4001 E. Paradise Falls Drive Tucson, Arizona 85712 (520) 206-9585



RESOLUTION COPPER MINING Wildlife Monitoring in the Resolution Project Area

VICINITY MAP Figure 1













NEAR WEST WILDLIFE CAMERA LOCATIONS Figure 4

APPENDIX A

WILDLIFE CAMERA LOCATIONS AND DURATION OF RECORD

Camera Location ID	Wildlife Monitoring Area	Camera Name	Period of Record	Total Number of Camera Days	Comments
1	Oak Flat	Reconyx 4	 1/27/12—12/12/12 12/19/12 12/30/12 1/09/13 1/17/13 1/27/13—1/28/13 3/09/13 3/12/13—11/05/13 	567	• Multiple gaps in record due to flood events (camera was temporarily submerged).
2	Oak Flat	Cuddeback 4	 2/11/12—4/18/12 5/13/12—7/4/12 11/04/12 12/03/12 12/17/12 3/12/13—11/05/13 	356	 Gap in record between 4/18/12 and 5/13/12 due to camera failure. Only one photo taken between 6/25/12 and 7/4/12; however, photo cannot be opened. Additional gaps in coverage are unexplained. Camera failed and was replaced.
3	Middle Devils Canyon	Reconyx 6	 1/27/12—4/07/12 5/07/12—6/25/12 8/14/12—4/30/13 8/05/13—11/05/13 	475	• The gap in record between 4/07/12 and 5/07/12, as well as the gap between 4/30/13 and 8/05/13 are due to camera battery failure.
4	Middle Devils Canyon	Cuddeback2	• 10/6/11—1/10/12 • 3/14/12—5/02/12	- 581 -	• Gaps in record due to camera malfunction.
		Cuddeback 6	• 8/2/12-10/09/13		 Cuddeback 2 was replaced with Cuddeback 6 on 8/02/12. Camera batteries failed on 10/09/13.
5	Middle Devils Canyon	Reconyx 5	 1/27/12—5/07/12 6/25/12—11/05/13 	601	• Malfunction between camera servicing on 5/07/12 and camera servicing on 6/25/12. The only photos taken during this period were of camera set–up on 5/07/12.
6	Lower Devils Canyon	Reconyx 1	• 1/26/12 —5/15/13 • 8/08/13—11/06/13	567	• Camera batteries failed on 5/15/13.
7	Lower Devils Canyon	Reconyx 2	• 1/26/12—11/06/13	651	
8	Lower Devils Canyon	Reconyx 3	 1/26/12—4/11/12 5/08/12—8/07/12 8/16/12—11/06/13 	617	• The gap in record between 4/11/12 and 5/08/12, as well as the gap between 8/07/12 and 8/16/12 are due to camera battery failure.
9	Upper Devils Canyon	Reconyx 9	• 6/05/12—10/31/12 • 3/21/13 • 6/21/13—11/04/13	287	 The gap in record between 10/31/12 and 3/21/13 is due to camera battery failure. Biologists were not able to access or service the camera during this time because of hazardous weather conditions. Additional gaps in coverage are unexplained.

Appendix A. Wildlife Camera Locations and Period of Record

1

Camera Location ID	Wildlife Monitoring Area	Camera Name	Period of Record	Total Number of Camera Days	Comments
10	Upper Devils Canyon	Reconyx 10	 6/05/12—8/17/12 10/31/12—1/08/13 3/21/13—11/04/13 	373	 Malfunction between camera servicing on 8/17/12 and camera servicing on 10/31/12. The only photos taken during this period were of camera set–up on 8/17/12. Malfunction between camera servicing on 1/08/13 and camera servicing on 3/21/13. The only photos taken during this period were of camera set–up on 1/08/13.
11	Upper Devils Canyon	Reconyx 13	 6/04/12—7/12/12 8/14/12 8/25/12—12/12/12 12/16/12—12/19/12 12/25/12—1/08/13 2/12/13—3/05/13 3/09/13—7/02/13 8/05/13—11/05/13 	400	 Gap in record between 8/14/12 and 8/25/12, as well as between 1/08/13 and 2/12/13, and additional lapses due to flood events. (camera was temporarily submerged). Camera took many more photos consecutively than it was programmed to. Flash nonfunctional between 8/25/12 and 10/30/12, however, resumed working on its own. These malfunctions were likely a result of camera being submerged after flood events. Note: Camera was replaced under warranty.
12	Near West	Reconyx 11	 12/19/12—12/28/12 1/08/13—3/13/13 	75	 Gaps in record between 12/28/12 and 1/08/13 are due to Camera battery failure. Camera was stolen sometime after 3/13/13.
13	Near West	Reconyx 12	• 12/18/12-11/04/13	322	• On 6/20/13 the camera direction was adjusted to increase the field of view
14	Near West	Reconyx 7	• 3/13/13-4/20/13	39	• Camera was stolen sometime after 4/20/13.
15	Near West	Reconyx 7	• 12/18/12—1/08/13	22	 Malfunction between camera servicing on 1/08/13 and camera servicing on 3/13/13. The only photos taken during this period were of camera set-up on 1/08/13. Camera was deployed to Location 14 on 3/13/13.

APPENDIX B

REPRESENTATIVE PHOTOGRAPHS



Photo 1. Camera Location 3 American black bear. Brown color phase.



Photo 2. Camera Location 8 Bobcat.



Photo 3. Camera Location 8 Mountain lion.



Photo 4. Camera Location 1 Raccoons are known for "washing" their food.





Photo 5. Camera Location 15 Coyote.



Photo 6. Camera Location 1 Zone-tailed hawk.



Photo 7. Camera Location 1 Feral/domestic cat.



Photo 8. Camera Location 1 Raccoon foraging.

Wildlife Camera Monitoring Report APPENDIX B





Photo 9. Camera Location 1 Turkey vulture comes in for a drink.



Photo 10. Camera Location 8 American black bear has an itch.



Photo 11. Camera Location 6 Mountain lion walks along a game trail in Devils Canyon.



Photo 12. Camera Location 3 White-tailed deer with fresh scars likely from a mountain lion.

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PHOTOSHEET 3



Photo 13. Camera Location 4 Domestic dog. The vest indicates that this is some kind of service dog.



Photo 14. Camera Location 2 Cliff chipmunk.



Photo 15. Camera Location 1 Cooper's hawk visits a tinaja pool.



Photo 16. Camera Location 6 Mountain lion rests in Devils Canyon.







Photo 17. Camera Location 2 Bobcat.



Photo 18. Camera Location 12 Rock squirrel swimming in a cattle tank.



Photo 19. Camera Location 8 Javelina in Devils Canyon.



HC600 HYPERFIRE Photo 20. Camera Location 13 Sonoran mud turtle leaves a tinaja pool.

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Photo 21. Camera Location 10 American black bear stops to sniff.



Photo 22. Camera Location 10 Gray fox walks along Devils Canyon.



Photo 23. Camera Location 13 Turkey vultures visit a tinaja pool.



Photo 24. Camera Location 13 Sonoran desert toad (*Bufo alvarius*) hops toward a tinaja pool.

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Photo 25. Camera Location 7 American black bear investigates the camera in Devils Canyon.



Photo 26. Camera Location 8 Greater roadrunner in Devils Canyon.

2012-09-18 10:52:43 AM M 1/5



Photo 27. Camera Location 11 White-tailed deer buck.



Photo 28. Camera Location 3 Mountain lion investigates the camera.





PHOTOSHEET 7



Photo 29. Camera Location 13 Great horned owl perched on a fallen tree branch.



Photo 30. Camera Location 13 Mule deer fawn.

2013-06-28 12:51:28 PM M 3/3





Photo 32. Camera Location 11 White–tailed deer bucks sparring.





PHOTOSHEET 8



Photo 33. Camera Location 11 Striped skunk.



Photo 34. Camera Location 8 Hooded skunk. Normal color phase.



Photo 35. Camera Location 11 Hooded skunk. Unusual color phase



Photo 36. Camera Location 2 Hooded skunk. Unusual color phase.







Photo 37. Camera Location 3

Hooded skunk. On rare occasions, this species is melanistic. Melanism is a development of dark colored pigmentation resulting in black colorization and is the opposite of albinism.



Photo 38. Camera Location 11 Great blue heron visits Devils Canyon.



Photo 39. Camera Location 6 American black bear.



Photo 40. Camera Location 4 Javelina herd visits a spring in Devils Canyon.

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PHOTOSHEET 10



Photo 41. Camera Location 2 Cottontail rabbit.



Photo 42. Camera Location 6 Ringtail aware of the camera in Devils Canyon.



Photo 43. Camera Location 1 Coyote visits a tinaja pool.



Photo 44. Camera Location 11 White-tailed deer buck.

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Photo 45. Camera Location 3 Mountain lion gazes at the camera.



Photo 46. Camera Location 8 Bobcat with rock squirrel.

2013-10-09 12:14:05 PM M 1/3



Photo 47. Camera Location 11 Unidentified bird chasing an insect.



Photo 48. Camera Location 13 Mule deer buck.

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Photo 49. Camera Location 9

American black bear. This old animal has fresh wounds on its face that were likely from a fight with a larger male. This bear was recorded running away a short time later.



Photo 50. Camera Location 9 American black bear. This large male was running at full speed and may be the animal responsible for the face wounds of the bear recorded in *Photo 49* above.



Photo 51. Camera Location 3 Series (Photo 51 and 52). This series depicts a mountain lion pouncing on prey under the tree.



Photo 52. Camera Location 3 Mountain lion.

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Photo 53. Camera Location 13 White-tailed deer buck with herd of mule deer.



Photo 54. Camera Location 8 Mountain lion likely chasing prey.



Photo 55. Camera Location 8 Western screech–owl capturing prey.



Photo 56. Camera Location 13 Coyote with what appears to be the remains of a greater roadrunner.





PHOTOSHEET 14



Photo 57. Camera Location 13 Coyote with dove.



Photo 58. Camera Location 8 Gray fox with white–throated wood rat.



Photo 59. Camera Location 1 Common black hawk capturing prey.



Photo 60. Camera Location 10 White–nosed coati mothers with their young.





PHOTOSHEET 15



Photo 61. Camera Location 1 Common black hawk clutching what appears to be a tadpole in its left talon.



HC600 HYPERFIRE Photo 62. Camera Location 9 White-nosed coati babies.



Photo 63. Camera Location 4 Javelina family with young.



Photo 64. Camera Location 13 Coyote pups were often recorded playing in this tinaja pool.





PHOTOSHEET 16



Photo 65. Camera Location 1 Raccoon mother with young.



Photo 66. Camera Location 4 White-tailed deer doe with her fawn.



Photo 67. Camera Location 2 Gambel's quail pair with brood.



Photo 68. Camera Location 2 Male Gambel's quail and three young.

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Photo 69. Camera Location 6 White-tailed deer fawns.



Photo 70. Camera location 8 Gray fox with two kits.



Photo 71. Camera Location 3 Series (Photo 71 and 72). Series depicts a mountain lion mother with two cubs.



Photo 72. Camera Location 3 Mountain lion and cub.

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PHOTOSHEET 18