Raptor Pilot Study for Levee Protection

Integrated Pest Management Program

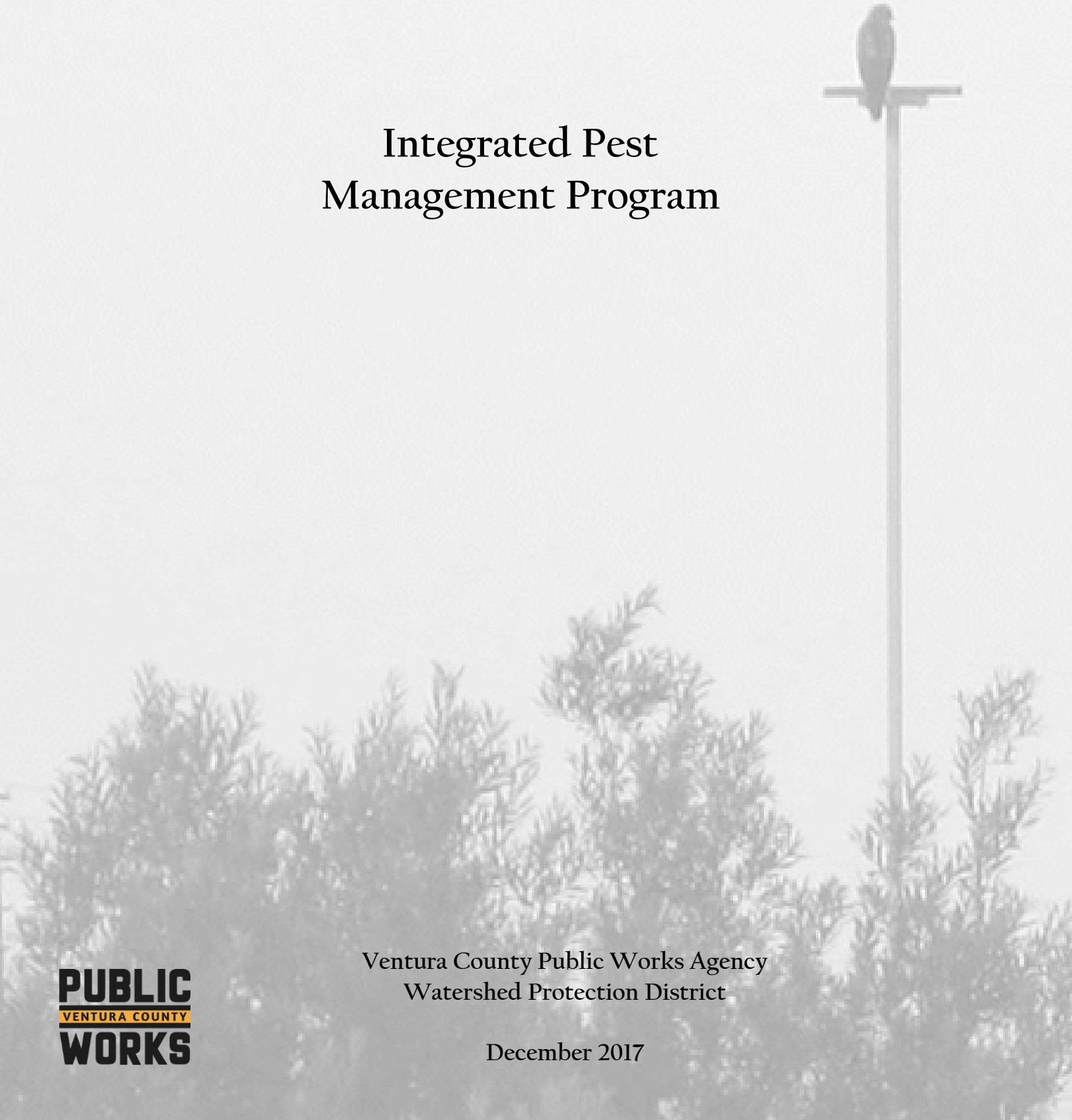

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Table of Contents

List of Tables

List of Figures

Appendices

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Acknowledgements
The study was completed by the Ventura County Watershed Protection District (WPD) under the guidance of the Raptor Pilot Study Advisory Committee. The Committee included representatives from the California State University Channel Islands Environmental Science Department, the California Department of Fish and Wildlife, the Ojai Raptor Center, and the Santa Barbara Museum of Natural History. The Director of the Raptor Pilot Study was Karl Novak and the Project Coordinator was David Torfeh with WPD.

In April of 2016 the WPD Raptor Pilot Study received the Environmental Sustainability Award from California State Senator Fran Pavley.

The Advisory Committee assisted in the study design and data review. Their expertise and involvement was great addition to the study. Dan Blankenship and Matt Chirdon of California Department of Fish and Wildlife, Curator of Vertebrate Zoology Paul Collins of Santa Barbara Museum of Natural History, Pam Lindsey of Watershed Protection District, Professor Kiersten Patsch of California State University Channel Islands, and Executive Director Kim Stroud of Ojai Raptor Center.

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Executive Summary

The Ventura County Watershed Protection District (WPD) developed and completed a Raptor Pilot Study to determine if owls and hawks can be attracted to flood-control facilities and reduce the ground squirrel populations on levees and dams. WPD maintains 56 dams and over 40 miles of levees which are highly susceptible to rodent burrow damage from ground squirrels and gophers. The Pilot Study was initiated in compliance with the Ventura County Board of Supervisors directive to reduce or eliminate the use of anticoagulant rodenticides.

The primary study goal was to compare the extent of ground squirrel damage along a levee reach where raptor perches were installed with a similar reach where traditional anticoagulant bait stations were used. Gopher burrow damage was observed but not included in the study data because anticoagulant bait is not applied to treat gophers.

WPD completed the Raptor Pilot Study in two phases. During Phase I, raptor perches and nesting facilities were installed along a 6,000 foot reach of Revolon Slough levee in Oxnard, California (Raptor Test Site). The enhancements were designed to attract owls and hawks from the vicinity to the levee. This reach was compared to a similar downstream 6,000 foot reach of Revolon Slough (Control Site) where diphacinone bait was applied through bait stations. During Phase II, the Control Site was modified by adding raptor perches and removing the bait stations.

Weekly monitoring of the perches, tracking of new rodent burrows, raptor sightings, adjacent agricultural use, scat, and collection of raptor pellets occurred at these reaches in 2016 and 2017.

Observations and raptor pellet collection found that Red-tailed Hawks, Great Horned Owls, and Barn Owls were actively using the perches. Bones from 8 ground squirrels, 44 gophers, and 1 muskrat were found in the 107 raptor pellets collected from the study area. This demonstrated active hunting by both hawks and owls.

Monitoring during Phase I of the Pilot Study in 2016 found that the Raptor Test Site had 145 new ground squirrel burrows and the Control Site had 430 new burrows. During corresponding monitoring periods between Phase I and Phase II, 206 burrows were observed at the Control Site and 110 new burrows were observed at the “Modified” Control Site (a 47% reduction).

Adjacent agricultural use was monitored but did not change significantly during the study. Ground squirrels preference for certain types of crops (such as berries and dark green vegetable) over diphacinone-treated oats appeared to have significantly limited the effectiveness of the rodenticide.

The study estimated an annual saving of $7,500 per levee mile by converting from the current rodenticide program to a raptor program. The net savings are primarily due to the reduction in damage repairs predicted from the study results also considered inspection, baiting, and perch installation costs.

It is recommended that WPD develop a system-wide raptor program by identifying flood-control facilities with adjacent raptor habitat areas and replacing their bait stations with raptor perches. Comprehensive inspection and grouting repairs of all facilities is also required to assure structural integrity.

1.0 Introduction

The Ventura County Watershed Protection District (WPD) maintains 216 miles of channels, 40 miles of earthen levees, and 56 dams which protect the public from flood hazards. Eight of these larger dams are regulated by the California Department of Safety of Dams (DSOD). The failure of any of these facilities during a major storm event could result in fatalities and serious damage to downstream communities.

Earthen flood-control facilities are highly susceptible to damage from burrowing rodents such as California ground squirrels and Botta's pocket gophers. Ground squirrels and gophers can weaken the compacted fill of levees and dams, undermine access roads; and cause erosion, sloughing, and other maintenance problems (Figure 1). A burrow can completely penetrate a levee or dam and cause a breach if rising storm water reaches the height of the burrow.

Figure 1. Exposed Ground Squirrel Burrows

WPD has used anticoagulant and fumigant rodenticides to control burrowing rodents, on debris basins since the mid-1980s. Environmental concerns over the use of anticoagulants led WPD to develop an Integrated Pest Management program (IPMP) and explore alternative rodent control methods. Raptors (hawks and owls) are known to prey on ground squirrels and gophers and were considered for use by WPD, but their widespread use has not been accepted by the public works community as a replacement for an anticoagulant rodenticide program. After reviewing the favorable results reported by the Santa Barbara County Flood Control District's Raptor Program (Appendix A), WPD assembled an expert advisory committee to develop a rigorous raptor study. This study compared ground squirrel burrow damage at a levee that was protected by a rodenticide bait program with a similar levee reach that had been refitted to attract and be protected by raptors.

1.1 Burrowing Rodents and Flood-Control Facilities

California ground squirrels and Botta's pocket gophers are common at earthen WPD flood-control facilities and they can excavate extensive burrows which damage the structural integrity of the facilities. Ground squirrel burrows can penetrate the full width of a levee or dam.

California Ground Squirrel – California ground squirrels (*Spermophilus/Otospermophilus beecheyi*) have a total length between 16 and 19 inches with the tail measuring 5 to 7 inches (Figure 2). They have gray and light brown fur and prefer hillsides or low earth banks as burrow sites because the tunnels can be excavated horizontally. Ground squirrels will continuously tunnel with most activity occurring in the spring. Burrows, which are about 4 to 5 inches in diameter, may vary in length from 5 feet to more than 35 feet and may be used by many generations of ground squirrels [*OVLC website*]. The longest burrow system ever recorded was unearthed in San Luis Obispo County and was 741 feet in aggregate length, had 33 entrances, displaced 5 tons of soil, and was inhabited by 11 adult squirrels. A burrow system was also unearthed in Fresno County that extended 28 feet below the surface [Salmon 2006].

Figure 2. California Ground Squirrel

The extensive network of squirrel burrows was demonstrated by the University of California, Berkeley when colored grout was injected into ground squirrel burrows on a levee, exposing the hardened grout (Figure 3). The photos show that the burrow system completely penetrated the levee with openings on both sides [Roa 2014].

California ground squirrels live in colonies and are diurnal, so are most active in the daytime. In colder climates, California ground squirrels hibernate for several months. In the Mediterranean climate of the Pilot Study on the Oxnard Plain, most squirrels are active year round. Ground squirrels forage within a few hundred feet of their burrow and eat nuts and seeds, fruit and berries, insects, and eggs from ground nesting birds. They will also eat fungi, roots, bulbs, and carrion [OVLC *website*].

Research has shown that adjacent crops can have a significant impact on the occurrence of ground squirrels on levees [Wildlife Bulletin 2014]. Ground squirrels were approximately four times more likely to occur on levees adjacent to land planted with annual crops than on levees

Figure 3. Colored Grout on Extensive Ground Squirrel Burrow Network

adjacent to grassland. Adjacent seeds, fruit and dark leafy vegetation crops demonstrated the highest ground squirrel occurrence.

The ground squirrel breeding season in southern California starts in December. After about a month long gestation period, a mother squirrel may have a litter of 3 to 11 pups. The pups can begin to burrow as early as eight weeks and reach sexual maturity at one year. California ground squirrels have an average life span in the wild of 3 to 4 years. Natural predators of ground squirrels in the Oxnard Plain include coyotes, bobcats, foxes, badgers, snakes, skunks, owls, and hawks [*OVLC website*]. The larger predators, their scat, and their tracks have been spotted at Revolon Slough, although they have become increasingly uncommon [Swenson 2000].

Botta's Pocket Gopher – Five species of pocket gophers are found in California, with Botta's Pocket Gopher (*Thomomys bottae*) being most widespread (Figure 4). They vary from 6 to 10 inches long with mostly brown fur. Gophers are active year-round and live underground in burrows that they dig themselves. While a gopher burrow system can occasionally be up to 6 feet deep when dug into a slope, most of their burrow systems average 18-20 inches deep. Only one gopher lives in each burrow system which consists of a main burrow and side branches. Pocket gophers expel the soil they excavate from the burrow in a fan shape radiating away from the burrow opening. A single gopher can excavate as much as one ton of soil per year.

Pocket gophers will eat most plant types including grasses, shrubs, seedlings, and trees. These gophers are most likely to consume plants from within their burrow system and may breed once or repeatedly throughout the year. Each litter typically consists of 2 to 5 young. Pocket gophers reach sexual maturity at 1 year of age and can live up to 3 years. Natural predators of gophers on the Oxnard Plain include coyotes, bobcats, foxes, weasels, snakes, skunks, and raptors [*OVLC website*].

Figure 4. Botta's Pocket Gopher

1.2 Integrated Pest Management Program

Due to concerns over secondary poisoning, the Ventura County Board of Supervisors (BOS) has directed all county agencies to minimize the use of anticoagulant pesticides. Secondary anticoagulant poisoning may occur when a targeted animal consumes rodenticide and then is eaten by a larger predator or scavenger. Studies completed by the National Park Service recorded secondary poisoning as a cause of fatalities of coyotes, bobcats, and mountain lions within Ventura and Los Angeles Counties (Appendix B).

WPD developed an Integrated Pest Management Program (*IPMP*) in 2006 to provide strategies and methodologies to promote environmentally sensitive rodent control. This plan was developed to specify rodent control procedures that protect WPD's earthen flood-control facilities, comply with application requirements, and minimize rodenticide use in accordance

with direction from the BOS. Rodenticide control methods were not eliminated, but were substantially altered to reduce both primary and secondary poisoning hazards to non-target species. The IPMP also recommended attracting raptors (hawks and owls) to WPD facilities where anticoagulant baits are not applied, but did not recommend replacing the anticoagulant rodenticide program with raptors because there was no definitive supporting data.

The IPMP was recently updated in 2015 and currently specifies that anticoagulant baits may only be used at WPD's critical facilities which consist of levees and dams. These facilities represent 19% of the WPD flood-control facility inventory. Use of anticoagulant bait is not allowed at any other WPD facility. Only first generation anticoagulants such as diphacinone and chlorophacinone may be used. More toxic second generation rodenticides such as brodifacoum and bromadiolone are not authorized.

The IPMP allows anticoagulant rodenticides, such as the diphacinone used by WPD, to be applied in bait stations (Figure 5). This allows squirrels to access the bait and prevents access to dogs and larger animals. However, smaller non-target rodents such as mice may still be able to access the bait stations and consume the rodenticide.

Figure 5. Bait Station

Data provided by the EXTOXNET website [Extension Toxicology Network 1993] and studies by University of Nebraska, Cornell, and the CA Department of Pesticide Regulation have found that the dose of diphacinone (as a percentage of body weight) required to produce a lethal effect in 50% (LD_{50}) of ground squirrels is 2.4 mg/kg. The LD_{50} for ground squirrels dosed with brodifacoum is only 0.13 mg/kg. Other test animals show a similar disparity between first and second generation rodenticides (Table 1).

Second generation anticoagulants such as brodifacoum also have a significantly longer half-life which remains toxic in the liver of an animal for up to a year. Diphacinone has a half-life in an animal liver of only two to three days. First generation rodenticides were selected for use by WPD over second generation rodenticides to minimize secondary poisoning due to their lower toxicity and limited persistence in the environment.

Diphacinone is also significantly less toxic to bird species than mammals. Studies also found the first generation rodenticide chlorophacinone to be less toxic to birds than diphacinone. However, the studies indicated that the long-term effects of exposures to raptors and other birds from first generation anticoagulants is not well understood and degradation of health and potential fatalities could be expected [Mendenhall & Park 1980].

The extent that gophers consume bait from bait stations is unknown. The WPD IPMP specifies aluminum phosphide fumigation to be used as needed to control gophers. When significant numbers of gopher burrows are observed, gas is released into the burrows as a fumigant.

This rodenticide is not an anticoagulant and is not persistent in the environment. Notices are posted at locations where fumigants are used. The effectiveness of aluminum phosphide fumigation is limited due to soil moisture requirements and difficulty in sealing the burrows.

Table 1. Toxicity of Anticoagulants to Target and Non-target Species

Species	*Rodenticide*	*LD_{50} (mg/kg)*	*Generation*
Ground Squirrel	Diphacinone	2.4	1
Ground Squirrel	Brodifacoum	0.13	2
Mice	Diphacinone	340	1
Mice	Brodifacoum	0.4	2
Dogs	Diphacinone	3 - 7.5	1
Dogs	Brodifacoum	0.25 - 3.6	2
American Kestrel	Diphacinone	97	1
Mallard Duck	Diphacinone	3158	1
Bobwhite Quail	Diphacinone	1630	1

The WPD rodenticide application program used at WPD levees incorporates the procedures stated in the IPMP. Each reach is inspected weekly by a pest control technician. When burrowing rodent activity is observed, clean bait is hand broadcast in the vicinity. If the bait is consumed, a bait station with diphacinone or chlorophacinone bait is placed. Bait stations are then left in place as a preventative measure while rodents are active. WPD used 0.005% diphacinone bait during the Raptor Study.

Although no vandalism occurred at the Raptor Pilot Study area, WPD has experienced vandalism of bait stations in publicly accessible areas. This has resulted in lost and damaged stations as well as spilled bait. The loss of service of the station also eliminates rodent control in that area until the station is replaced.

1.3 Santa Barbara County Flood Control District Raptor Program

In 2015, WPD O&M staff spoke with Santa Barbara County Flood Control District (SBCFCD) Public Works staff to learn about their use of raptor perches on levees near Santa Maria. SBCFCD staff were enthusiastic about the effectiveness of their Raptor Program and reported that:

- Perches were used since 2002 to control ground squirrels burrow damage
- Hawks immediately began hunting squirrels after installing raptor perches
- Rodenticide applications are not needed
- New poles are added as needed, where burrows occur
- No risk of secondary exposure to wildlife from rodenticides
- Substantial cost savings over rodenticide control methods
- The Santa Maria River levees are maintaining structural integrity [Victoria 2014]

SBCFCD also published an article on their Raptor Program in their county newsletter (Appendix A).

During a site visit of the Santa Barbara levees in 2015 with SBCFCD Superintendent Rick Tomasini, WPD staff observed numerous raptors using perches mounted on the levees, and less rodent burrows in these areas compared to levee reaches that had no perches. WPD observations indicated that the SBCFCD raptor perch program reduced but did not eliminate burrowing rodents, past burrow damage had been repaired by grouting, and no bait stations were being used.

2.0 Raptor Pilot Study

Due to the reported success in using raptor by SBCFCD, WPD assembled an advisory committee and developed a work plan for a Raptor Pilot Study. Members of this advisory committee included raptor experts, environmental scientists, and environmental regulators.

On-line searches for studies on raptors and discussions with pest control experts found no empirical studies on the effectiveness of raptors in reducing ground squirrel population, though these sources generally indicated that some reduction in rodent population was expected. No studies were found that compared the effectiveness of a raptor perch program directly with a rodenticide bait program.

Figure 6. Red-tailed Hawk

2.1 Avian Predators in Ventura County

Birds of interest to the Raptor Pilot Study include hawks, owls and other birds that hunt and consume ground squirrels and gophers. Hawks are diurnal, while the owls are primarily nocturnal.

The Red-tailed hawk (*Buteo jamaicensis*) is the most frequently seen large raptor in Ventura County. They hunt, in open areas, by watching for movement below as they circle in the air above (Figure 6). These hawks are often seen perched atop utility poles to view prey. They consume rodents of all sizes, but will eat other mammals, birds, reptiles, amphibians, and insects. A Red-tailed Hawk study conducted in Central California found that ground squirrels were a major part of this raptor's diet. Observation of actual prey items brought by adults to 14 nests (during 3 nesting seasons of roughly 45 days each) revealed that out of 625 prey items consumed, 380 ground squirrels were consumed (61%) [Fitch et al. 1946].

Cooper's Hawks (*Accipiter cooperi*) hunt by darting with agility through tree foliage and surprising their prey, which is mostly birds, but can also include some mammals (Figure 7).

Northern Harriers (*Circus cyaneus*) fly low to the ground slowly, mostly gliding as they hunt, in relatively open areas such as wetlands or grasslands (Figure 8). They use their hearing, like owls, rather than vision, to hunt. While they prefer small rodents and songbirds, they will also occasionally eat ducks and mammals as large as cottontail rabbits.

Figure 7. Cooper's Hawk

Great Horned Owls (*Bubo virginianus*) hunt in wooded or forested areas at night for rats and mice, however, they will eat larger mammals such as skunks, weasels, opossums, and occasionally birds, reptiles, and amphibians (Figure 8).

Burrowing Owls (*Athene cunicularia*) will take over and expand abandoned ground squirrel burrows on levees in Ventura County. These owls are large enough to catch and eat gophers [Wildlife Center of Silicon Valley].

Barn Owls (*Tyto alba*) hunt in open areas at night, and will also eat small mammals, invertebrates, and birds (Figure 8). They are common in Ventura County. A recent study showed that an average of one ground squirrel was consumed every 5 days per nesting pair of Barn Owls [Kross et al. 2016]. However, their preferred prey are gophers.

These raptors are already present in Ventura County. The installation of perches and nesting facilities at the Raptor Pilot Study Area was designed to attract them and facilitate hunting of rodents that inhabit the levee system.

Great Blue Herons (*Ardea herodius*) and Great Egrets (*Ardea alba*) are also common along wetlands and channels in Ventura County. They primarily feed on amphibians, fish, lizards, birds, insects, other invertebrates, and small rodents. These are birds of interest for the study because they will occasionally eat gophers and ground squirrels [Grantham 2016]. However, the study will neither increase nor decrease their population in the study areas, so their impact on their rodent population is static and is considered part of the baseline condition.

Figure 8. Great Horned Owl, Northern Harrier, Barn Owl

Raptor Pilot Study Location
Revolon Slough, Oxnard CA

Figure 9 – Raptor Pilot Study Regional Map

Figure 10 - Raptor Pilot Study Local Map

2.2 Study Goals

After discussions with the advisory committee and on-line research, WPD initiated a study to determine if placing raptor perches along a levee could reduce ground squirrel populations and burrow damage. The study focused on the reduction and control of ground squirrel populations rather than gophers since ground squirrels are treated by anticoagulant bait and gophers are treated through fumigation with aluminum phosphide.

The study had the following goals:

> ***Study Goal 1 –*** *Compare the extent of ground squirrel damage along a levee reach with raptor perches with a similar reach using traditional anticoagulant bait stations.*
>
> ***Study Goal 2 –*** *Determine if the use of anticoagulant bait can be reduced at WPD flood-control facilities through the adoption of a successful raptor perch program.*
>
> ***Study Goal 3 –*** *Calculate the financial impact of a successful and beneficial raptor perch program on the WPD budget.*
>
> ***Study Goal 4 –*** *Determine criteria for expansion of a successful raptor program to additional channels, levees, and dams.*

2.3 Raptor Study Site Selection

Revolon Slough was selected as the location for the pilot study (Figure 9). The Revolon Slough levee is located in Oxnard, California and is earthen with a vegetated bottom. The slough is surrounded by agricultural parcels and an elementary school. Several mature trees are present along the outskirts of the slough and on the school campus. The presence of rodents had been previously documented and a rodent control program using diphacinone and bait stations was on-going.

A 6,000 foot stretch of Revolon Slough, 537 feet from the south side of Wood Road to 1073 feet from the north side of Hueneme Road, was selected as the Raptor Test Site (Figure 10). Raptor perches replaced bait station as the method for rodent control.

A Control Site was selected for a direct comparison with the Raptor Test Site. The Control Site was maintained per the IPMP with rodenticide-containing bait stations, and also had a history of ground squirrel and gopher infestation. The Control Site, like the Raptor Test Site, was a 6,000 foot long reach of Revolon Slough. The Control Site and Raptor Test Sites were separated by a 3,000 foot long buffer zone that also had bait stations. Both sites have vegetation growing between the levee slopes and a two foot deep meandering stream (Appendix C).

2.4 Pilot Study Phases

During the initial monitoring period of the Raptor Pilot Study, it was noticed that there were differences in the neighboring agricultural uses between the Raptor Test Site and the Control Site. Ground squirrels are attracted to particular crops such as berries, nuts and green leaf vegetation at different times of the year. Blackberries and raspberries were present at the Control Site but were not grown adjacent to the Raptor Test Site.

To address this variable, the study was modified at the end of 2016 and a second study phase (Phase II) was added. The Control Site was modified by removing the diphacinone bait stations

and installing raptor perches (including the buffer zone). The Control Site was also renamed the "Modified Control Site" for Phase II. The variable of differing adjacent agricultural uses was eliminated during Phase II because there was little variation between the crops that were planted during Phase I in 2016 and Phase II in 2017. A direct comparison of bait station-protection of the Control Site in 2016 and raptor-protection of the Modified Control Site in 2017 was made.

During Phase II, monitoring of the original Raptor Pilot Study area was continued to see if observations were consistent between Phase I and Phase II (2016 and 2017).

2.5 Test Site Preparation

Before initiation of the study, WPD took steps to establish an initial baseline for the Raptor Pilot Study by identifying and filling all ground squirrel burrows within the Pilot Study area. Any burrows discovered during subsequent inspections were considered "new" for purposes of tracking. Grouting of all new burrows was carried out periodically after they were observed and flagged.

WPD built a low pressure grouting machine using a design suggested by the Sacramento West Levee District (Figure 11). In-house staff used the machine to repair rodent burrows flagged by the monitoring team. A grouting procedure was adopted that used the low-pressure grouting pump to inject a cement-bentonite grout into a single burrow entry hole. Nearby burrow system exits were blocked with rags when grout appeared.

Figure 11. WPD Grout Machine at Levee with water Truck and Hose

Initial grouting began March 2, 2016, and WPD injected 4,400 gallons (21.8 CY) of grout into burrows across the 2.56 mile length of the Revolon Slough pilot test site. This is more than the volume of two fully loaded cement trucks. This confirmed that extensive, previously undetected, rodent burrow damage had occurred within the test site area despite the active diphacinone bait rodenticide program. Baseline grouting was completed on March 18, 2016 and Phase I of the Raptor Pilot Test began.

Figure 12. Burrowing Owl at Camarillo Hills Levee

Phase II of the Raptor Pilot Test Study began March 3, 2017 after a baseline levee condition was reestablished in a similar manner to Phase I by inspection and burrow grouting of the entire test site. Grouting was postponed during the 2017 nesting season when a sensitive bird species was confirmed to be nesting within the boundaries of the study area. This prevented active maintenance activities until the birds vacated the area.

Prior to grouting, holes were inspected to ensure that non-target species such as burrowing owls were not present. A borescope camera was used to visually inspect burrows large enough to contain burrowing owls. Burrowing Owls have been observed at WPD flood-control facilities (Figure 12). These owls had greatly expanded the diameter of the rodent burrows they had taken over and were regularly observed near burrow entrances.

2.6 Design and Installation of Raptor Facilities

Discussions with Kim Stroud, Director of the Ojai Raptor [rescue and recovery] Center, guided WPD in the design of owl boxes and hawk nesting platforms for the study. In fall of 2015, a Barn Owl nest box, a hawk nest platform, and raptor perches were constructed by WPD staff (Figure 13).

Fourteen raptor perches were installed between Hueneme Road and Wood Road along the channel in an alternating pattern averaging 450-foot intervals in September 2015. A Barn Owl nest box and Red-tailed Hawk nesting platform were installed at 500-foot offsets to the channel along the southerly edge of Laguna Vista Elementary School. The setback was required because environmental regulations require a 500-foot setback from nesting raptors, which would restrict normal maintenance operations along the levee.

Figure 13. Hawk Nesting Platform and Owl Nest Box

2.7 Raptor Pilot Study Monitoring

Starting in mid-February 2016, weekly monitoring of the Raptor Pilot Study area for raptors and ground squirrels began. The Raptor Test Site and the Control Site were surveyed during alternating weeks. Monitoring typically began at 8:30 a.m. when hawks were more likely to be observed.

The monitoring team consisted of a lead biologist/birding expert and four monitors. At least two monitors walked along each side of the channel inspecting, flagging and inventorying new squirrel burrows, watching for raptors, and collecting owl and raptor pellets. Great Blue Heron and Great Egret observations were also recorded since they have also been reported to hunt gophers (Figure 14) [Grantham 2016].

Each perch was checked for evidence of use by raptors, including collecting pellets, scat, and remains of prey carcasses. The owl nest box and hawk nesting platform were also inspected. New ground squirrel burrows were counted and their locations noted. Adjacent crop types were also documented.

Gopher burrows, which are noticeably smaller in diameter, were not included in the burrow count since diphacinone bait stations were presumed to have no effect on their populations.

Time of day, weather, farming activity, and use of propane cannons were also recorded. Propane cannons were occasionally used to scare away birds from farming operations.

Figure 14. Great Blue Heron with Botta's Pocket Gopher

Night Observation – One night-time observation was held on July 7, 2017 to monitor owl activity. A monitoring team familiar with owl identification conducted monitoring with night-vision goggles, binoculars, and a spotting scope.

Pellet Collection – As part of the Monitoring Program suspected raptor pellets were collected from the Study Areas. Pellets are regurgitated masses of indigestible fur and bones. Pellets were collected, bagged, and inventoried by the monitoring team. WPD engaged Paul Collins, Curator of Vertebrate Zoology at the Santa Barbara Museum of Natural History to analyze the pellets to determine which raptors produced the pellets and what prey they consumed. Specimens were hand delivered to the museum laboratory. Mr. Collins used the museum's extensive specimen collection to identify individual animal species from bones and fragments in the pellets.

3.0 Pilot Study Results

The results of monitoring, data collection, and observations for Phase I and Phase II of the Raptor Pilot Study between March 18, 2016 and August 25, 2017 are provided.

Figures 16 through 21 present a comparison of data collected at the Raptor Site and the Control (Modified) Site during Phase I and II of the study. The number of new burrows observed during each inspection, locations of each burrow, raptor perches, and approximate locations of bait stations are provided.

In addition, compilations of raptor sightings and evidence of raptors, adjacent crops, rodenticide consumption, and burrow grouting data are provided along with the results of the analyses of all raptor pellets collected.

3.1 Raptor Observations

A variety of raptors capable of hunting ground squirrels or gophers were spotted flying near the Raptor Site, the Control Site, and the Modified Control Site from April 2016 to August 2017 during 65 separate monitoring dates.

Species	Total	Species	Total
Red-tailed Hawk	101	Peregrine Falcon	3
Cooper's Hawk	20	Merlin	3
Osprey	10	Swainson's Hawk	1
Northern Harrier	8	Burrowing Owl	3
White-tailed Kite	27	Great Horned Owl	2
Red-shouldered Hawk	3		

Red-tailed Hawks were the most commonly observed large hawk with 101 observations. These were likely the same three or four hawks that were resident in the area. This averages to one Red-tailed Hawk observed per mile which is typical for their territory and range. No Barn Owls were spotted, however, pellet analyses determined that Barn Owls and Great Horned Owls were actively hunting gophers during the study period.

Evidence of scat and/or pellets were found at most of the Modified Control Site raptor perches within two weeks of installation. Red-tailed Hawks were also observed using perches throughout the study areas (cover photo). Approximately two to three hawk or owl pellets were found during each inspection. Rarely, partial carcasses were found. The pellets and carcasses were usually found near WPD raptor perches, but occasionally near flat, raised aerial photo control point markers. Scat presence at perches was observed soon after the study began. Additionally, a Great Blue Heron was observed using a raptor perch.

Night Observation – A monitoring team of six looked for owls at the Pilot Study Area on July 7, 2017 from 8 to 11:10 p.m. Five locations were monitored for at least 30 minutes each. These

monitoring locations were selected based on the relatively high numbers of likely owl pellets found at the perches. Night vision goggles, standard binoculars, and a spotting scope were used to periodically scan the visited areas.

One juvenile (vocalizing) and one adult Great Horned Owl (Figure 15), as well as one juvenile Red-tailed Hawk were spotted at the Laguna Vista Elementary School yard northwest of Revolon Slough's Perch #9 (next to agricultural business buildings) at dusk. This corroborated the report from school staff that Great Horned Owls were nesting near the school.

A Barn Owl was observed south of Hueneme Road along the east side of Revolon Slough just south of Perch #22. At about 9:30 p.m., an unidentified owl flew over the eastern levee just south of Perch #26.

Figure 15. Great Horned Owl at Laguna Vista Elementary School

Owl Boxes and Hawk Nesting Platforms

The owl nest box and hawk nesting platform were unoccupied but used as perches. The presence of the Great Horned Owls at Laguna Vista School could explain why the Barn Owl box (Owl Box #1) at the southwest corner of the schoolyard was unoccupied. Great Horned Owls would not be expected to allow Barn Owls to nest near their own breeding territory.

3.2 New Ground Squirrel Burrow Observations

New ground squirrel burrows were observed in widely distributed locations across the Raptor Site and Control Site and also appeared in concentrated colonies near preferred crop types (Section 3.6). Table 2 provides a summary of the number of new ground squirrel burrows observed during the study by site and phase. The majority of ground squirrel burrows were observed in spring and fall of both 2016 and 2017 (Figures 16 and 20).

To assist with comparisons of ground squirrel burrows found between the Raptor Site and the Control Site, and between Phase I and II of the study, the numbers of new burrows per mile per month for each site and each phase of the study were also calculated. This provided normalized rates for direct comparisons.

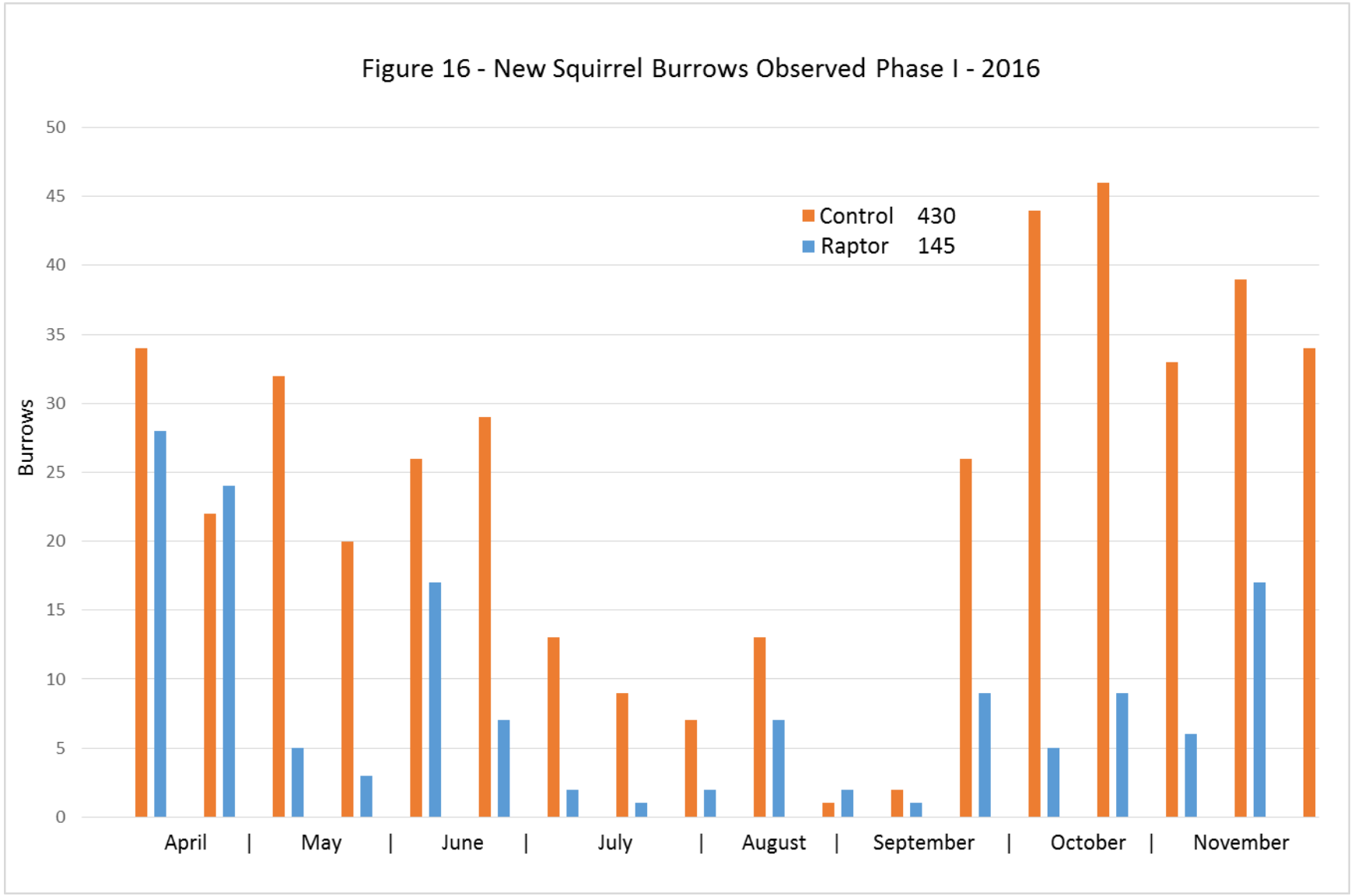


Figure 16 - New Squirrel Burrows Observed Phase I - 2016
Burrows
50
45
40
35
30
25
20
15
10
5
0
Control 430
Raptor 145
April
May
June
July
August
September
October
November

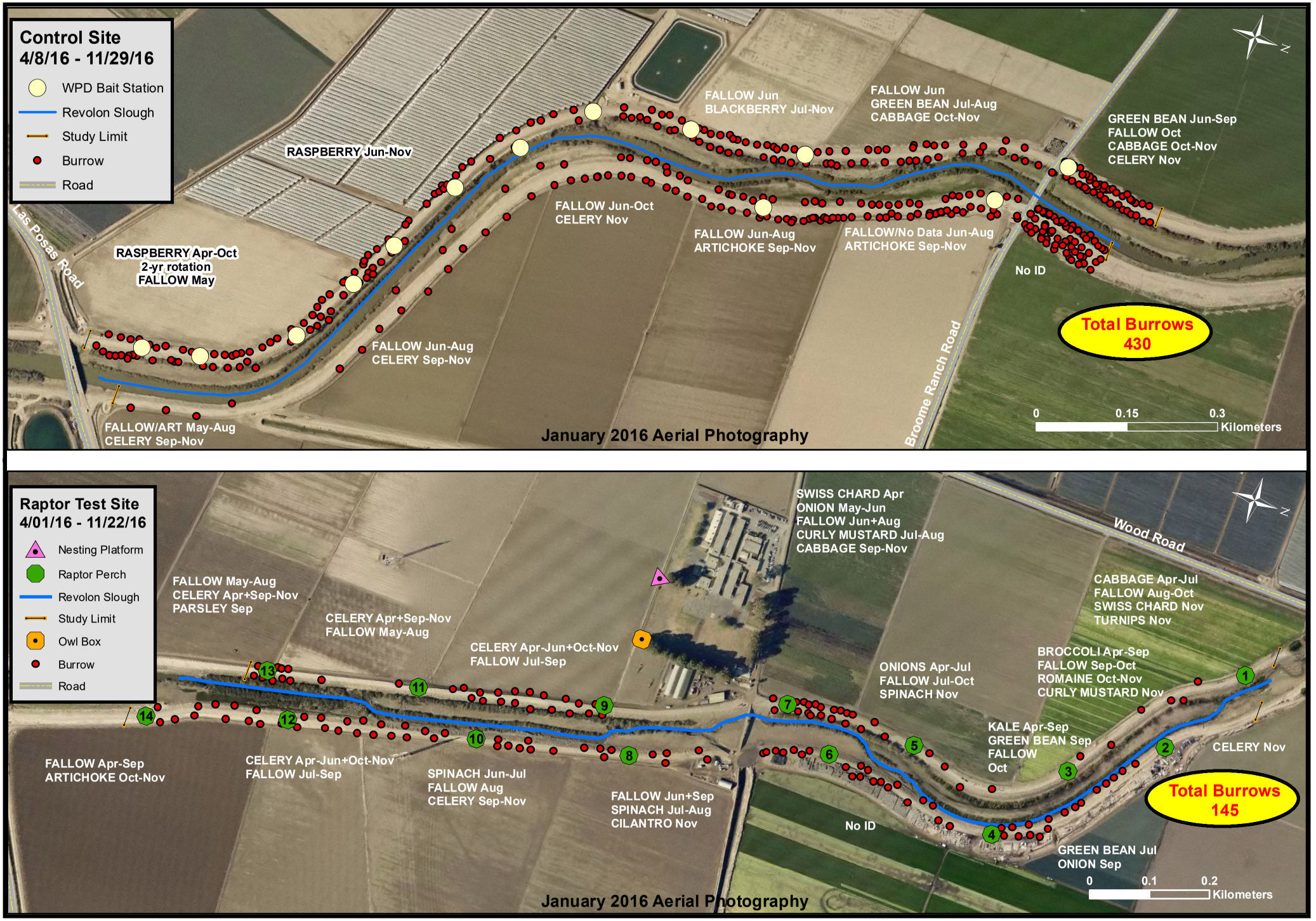


Figure 17 - Phase I Raptor Control and Pilot Test Sites

Table 2. New Ground Squirrel Burrows on 6000 ft. Reaches	Observed	Per/mile/month
Phase I *April to November 2016*		
Raptor Site	145	16.0
Control Site	430	47.3
Phase I *April to August 2016*		
Raptor Site	89	15.7
Control Site	206	36.3
Phase II *April to August 2017*		
Raptor Site	90	15.8
Modified Site	110	19.4

Three comparisons between sites and phases are provided for observations of new ground squirrel burrows.

3.2.1 Phase I Raptor Site versus Phase I Control Site

Between April 2016 and November 2016, the monitoring team observed 430 new ground squirrel burrows at the Control Site. New burrows occurred at rate of 47.3 per month per mile for the full duration of Phase I.

During the same time period the monitoring team observed 145 new ground squirrel burrows at the Raptor Site (Figure 17). New burrows occurred at rate of 16.0 per month per mile. Weekly monitoring and recording of new squirrel burrows found that the Raptor Site incurred 66% less new burrows than the Control Site.

Crops planted adjacent to the Control Site during Phase I varied from those planted at the Raptor Site, although overall ground squirrel crop preference was found to be similar.

3.2.2 Phase I Control Site versus Phase II Modified Control Site

From April through August 2016, the monitoring team observed 206 new squirrel burrows at the Control Site. New burrows occurred at rate of 36.3 per month per mile for this period of Phase I.

During the corresponding five-month monitoring period in Phase II the team observed 110 new squirrel burrows at the Modified Control Site (Figure 19). New burrows occurred at rate of 19.4 per month per mile for this period of Phase II.

The Modified Site in Phase II had 47% less new burrows than the Control Site during the corresponding five-month period in Phase I.

Crops planted adjacent to the Control Site during Phase I were similar to those planted at the Modified Control Site during Phase II.

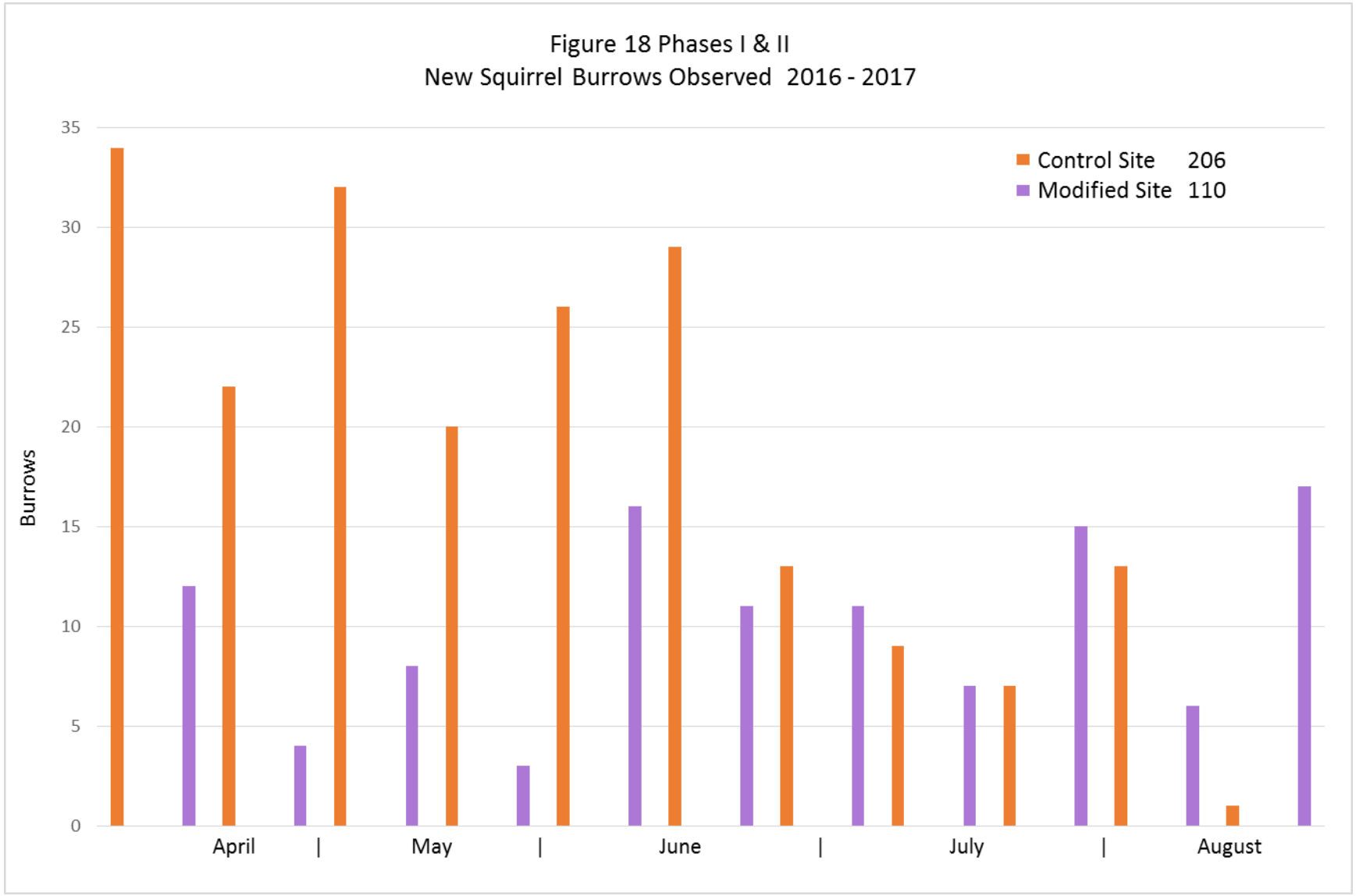


Figure 18 Phases I & II
New Squirrel Burrows Observed 2016 - 2017
Control Site 206
Modified Site 110
Burrows
35
30
25
20
15
10
5
0
April
May
June
July
August

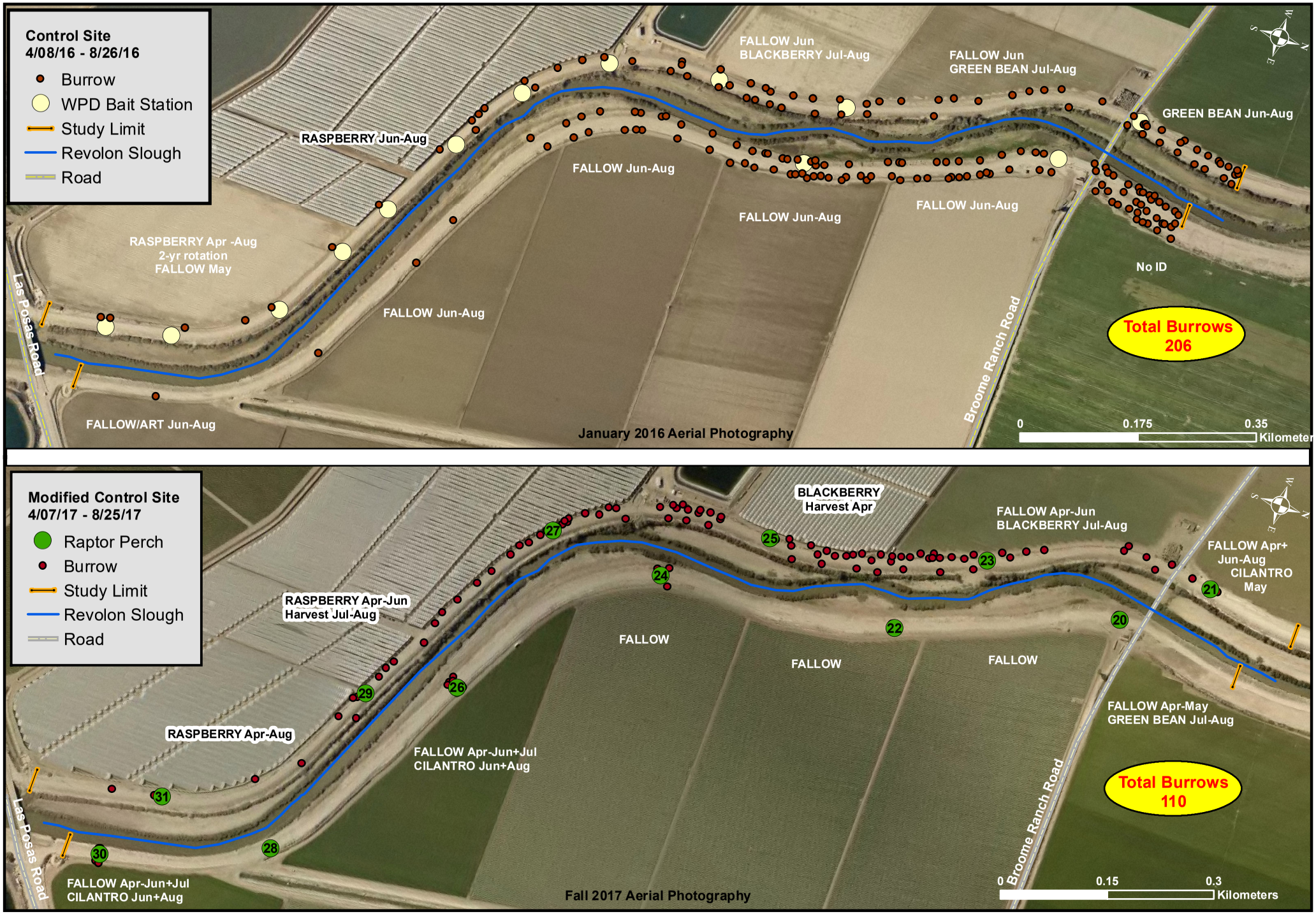


Figure 19 - Phase I Control Site & Phase II Modified Control Site

3.2.3 Phase I Raptor Site versus Phase II Raptor Site

From April through August 2016, the monitoring team observed 89 new squirrel burrows at the Raptor Site. New burrows occurred at rate of 15.7 per month per mile for this period of Phase I.

During the corresponding five month monitoring period in 2017, the team observed 90 new squirrel burrows at the Raptor Site (Figure 21). New burrows occurred at rate of 15.8 per month per mile for this period of Phase II.

The Raptor Site incurred 1% more new burrows in Phase II than during the corresponding five-month period in Phase I. Burrow counts occurred in a similar pattern in both phases.

Crops planted adjacent to the Raptor Site during Phase I were similar to those planted at the Raptor Site during Phase II.

3.3 Rodenticide Treatment

Weekly inspections at the Control Site were performed by a rodent control contractor, Cragoe Pest Services, who noted observations of ground squirrels in monthly reports (Appendix D) and placed bait stations at locations of squirrel activity (Appendix E). Oats infused with the first generation anticoagulant rodenticide diphacinone (0.005% concentration) were placed in the bait stations. During Phase I of the study (April to November 2016), 84.5 pounds of diphacinone bait was reported as consumed (Table 3). Ten to twelve bait stations were continuously present at the Control Site during the study period.

According to anecdotal comments in Cragoe's weekly reports, greater consumption of bait occurred after the harvesting of raspberries on the Control Site, suggesting a preference for berries over oats [Duell 2016].

Table 3.
Phase I Bait Application
Diphacinone (0.005%)

Month	*Lbs. Consumed*
April	7.0
May	2.5
June	14.8
July	8.8
August	16.0
September	11.8
October	5.0
November	18.8
Total	**84.5**

Two bait stations were also placed by neighboring farmers at the toe of the levee in the Control Site. The farm manager indicated that bait was not applied at these stations within the duration of the study. Field observations of the bait stations confirmed that the bait stations were inactive.

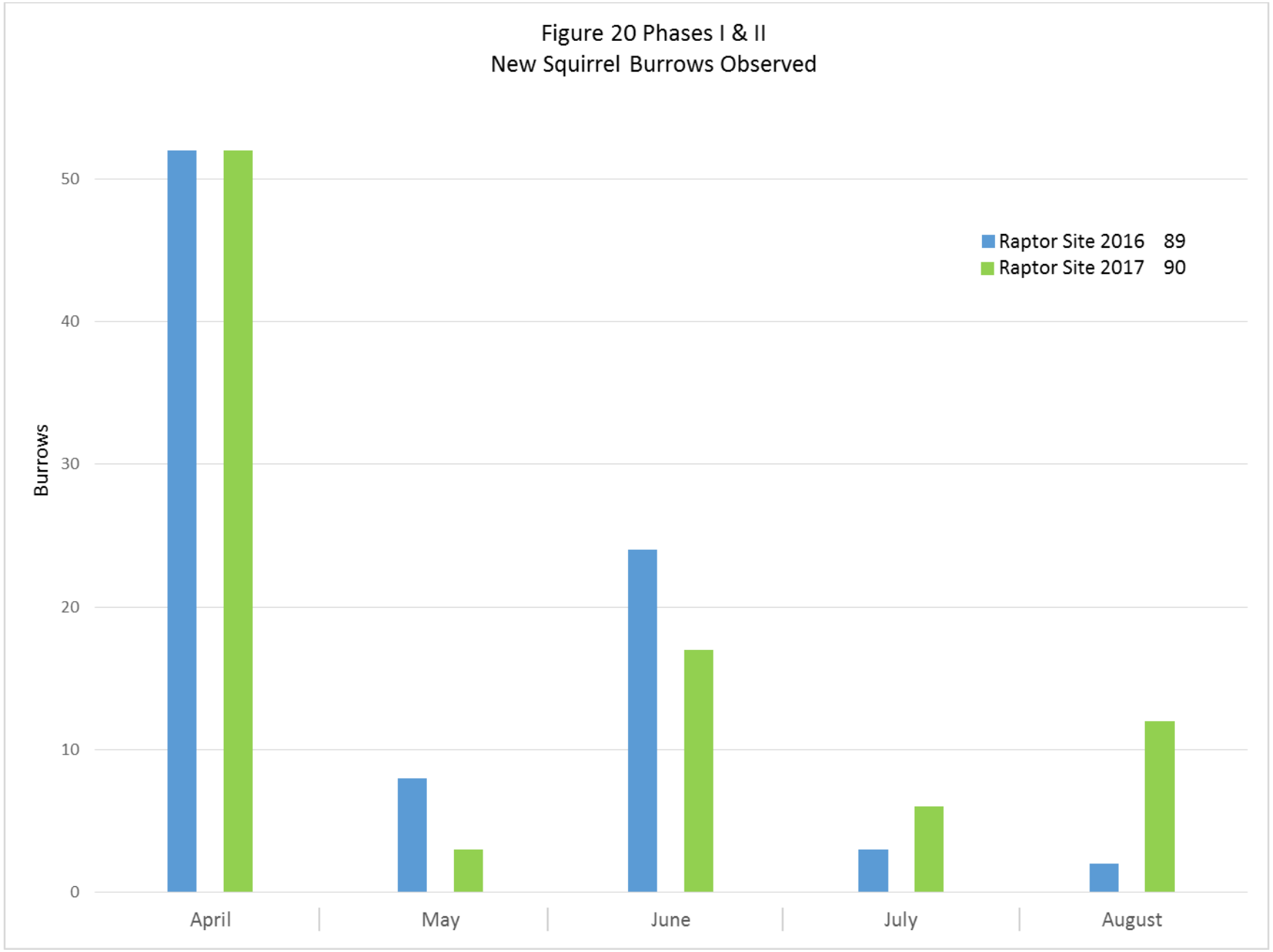
Phase II Rodenticide Treatment – In 2017, no diphacinone bait was applied to control ground squirrels on the Modified Control Site because bait stations had been removed and raptor perches installed in late December 2016. The Control Site was renamed the Modified Control Site for Phase II in 2017.

3.4 Burrow Grouting

Phase I – After all baseline grouting was completed, new burrows were grouted eight additional times in 2016. A total of 1400 gallons (6.9 CY) of additional grout was injected over the 2.56 mile study area.

Phase II – Grouting also occurred six times from March 3 to August 27 of 2017. A total of 700 gallons (3.5 CY) of grout was injected into new burrows across the 2.56 mile study area.

Figure 20 Phases I & II
New Squirrel Burrows Observed



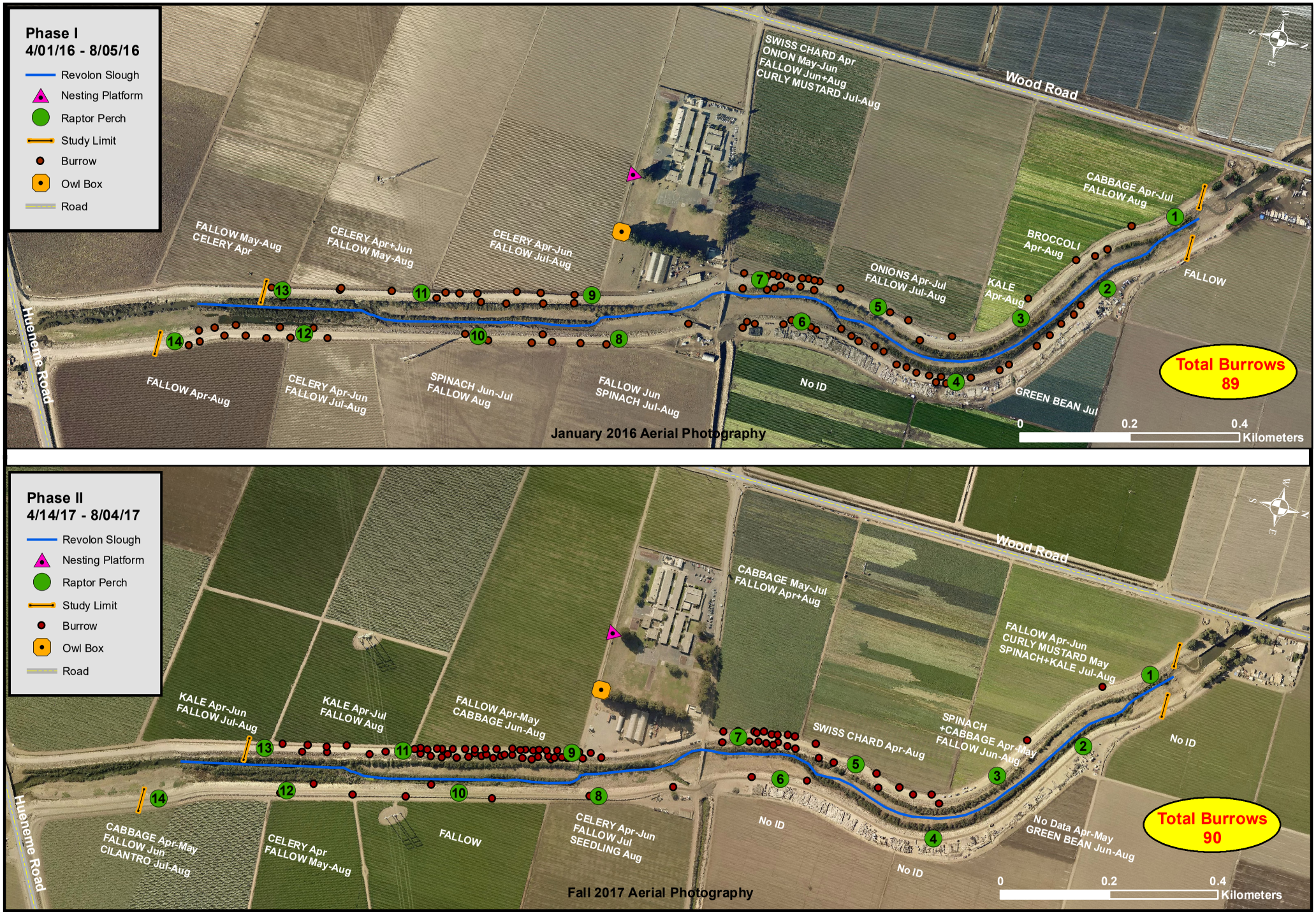


Figure 21 - Phases I & II Raptor Test Site

Fifty percent less grout was applied over the entire study area in 2017 than in the same time period of 2016. Grouting crews reported grouting both a smaller number of new burrows, and burrows with less levee penetration in 2017. This non-toxic process is also expected to have exterminated some rodents within their burrows, particularly during the spring and fall mating seasons. A burrow-scope observed no non-target species in the burrows prior to grouting.

3.5 Pellet Analysis

The monitoring team gathered 160 suspected pellets. Pellets were typically found under raptor perches but were also found under other vertical structures near the study area. Analyses found that 107 samples were raptor pellets and 39 of the suspected pellets were actually scat from predatory mammals or dogs.

Table 4. Target Species Found in Raptor Pellets

	Pellets	G. Squirrels	Gophers	Muskrats	Total	% of Pellets
Owls						
Barn Owl	35	0	19	0	19	54
Great Horned Owl	14	1	9	0	10	71
Burrowing Owl	3	0	0	0	0	0
Total	52	1	28	0	29	56
Hawks						
Cooper's Hawk	5	0	0	0	0	0
Red-tailed Hawk	14	2	4	0	6	43
American Kestrel	1	0	0	0	0	0
Non-Owl Raptors	35	5	12	1	18	51
Total	55	7	16	1	24	44

Table 4 provides a breakdown of the burrowing rodent species found in the pellets, analyzed by curator Paul Collins. An extensive list of all species found in the pellets is located in Appendix F. The species of pellet origination was determined based upon the pellet size, shape, and consistency. Barn Owls, Great Horned Owls, and Red-tailed Hawks were the primary source of the pellets. Forty-one pellets were from unidentified hawks or falcons. Small numbers of Burrowing Owl and Cooper's hawk pellets were also found.

Owls produced 52 of the 107 pellets. Bones from 28 individual gophers and one ground squirrel were found in the pellets.

Hawks and/or non-owl raptors produced 55 of the pellets. Bones from 7 ground squirrels and 16 gophers were present in the pellets. Other mammalian prey included a muskrat, rabbits, opossums, rats, and mice.

The results of the pellet analyses indicated that the raptor perches were being used extensively by owls to hunt and consume gophers and that gophers are a significant part of their diet. The pellet analyses also confirmed that hawks were successful in hunting gophers and ground squirrels.

3.6 Neighboring Land and Agricultural Use

The land adjacent to the Revolon Slough levee was primarily used for agriculture. Crop types were recorded by the monitoring team during each inspection. The location of concentrations of burrows near particular crops confirmed that ground squirrels prefer to occupy these more desirable sections. Ground squirrels typically forage on greens from January to April and prefer a mix of seed and fruit from May to October. Their preferred diet with respect to existing crops in this study consists of seeds, raspberries, blackberries, green beans and spinach; small tender

leaves of Swiss chard, broccoli, turnip greens, kale, and celery. The majority of creek vegetation (mulefat, willow, and mustard) is unlikely to be a primary food source, and provides a weak attraction similar to grasslands.

The crops were categorized by food preference as berries and dark green vegetation (strong), annual crops (medium), and fallow (weak). These categories are based on statistical results from a ground squirrel crop preference study [Wildlife Bulletin 2014] of grassland, annual crops, and perennial fruit crops.

In 2016, the Raptor Test Site was bordered by crops of celery, Swiss chard, cabbage, green beans, broccoli, kale, spinach, artichokes, and "curly mustard." The Control Site's adjacent land was planted in raspberries, blackberries, green beans, cabbage, celery, and artichokes.

The comparison of crops planted at each site demonstrates a similar overall attraction for ground squirrels between the Raptor Phase I Site and the Control Site Phase I (Table 5). The Control Site had 10.6% more berries and dark green vegetation than the Raptor Site, however, the Raptor Site had 15.9% more annual crops and 5.2% less fallow areas.

During Phase II of the study similar crops were planted adjacent to both the Control Site and the Modified Site with the exception that there was more fallow land (26%) adjacent to the Modified Site in 2017 and consequently 5.6% less berries and 20.3% less annual crops. The replacement of some annual crops with fallow land in 2017, will support fewer squirrels than in 2016, but is not likely to have had a significant impact on the squirrel population.

Table 5. Adjacent Crop Use	*Berries/Dark Green Vegetation*	*Annual Crops*	*Fallow*
Fig. 17 April to November 2016			
Control Site Phase I	34.5%	40.9%	24.5%
Raptor Site Phase I	23.9%	56.8%	19.3%
Fig. 19 April to August 2016 vs 2017			
Control Site Phase I	43.3%	33.3%	23.3%
Modified Site Phase II	37.7%	13.0%	49.3%
Fig. 21 April to August 2016 vs 2017			
Raptor Site Phase I	26.7%	43.3%	30.0%
Raptor Site Phase II	20.0%	43.8%	36.3%

The comparison of Raptor Site Phase I and Phase II data found a small change in adjacent crop use in 2016 and 2017. Dark green vegetation reduced 6.7%, annual crops increased 0.5%, and fallow land increased 6.3%.

3.7 Life-Cycle Cost Comparison between a Raptor and Rodenticide Program

Cost data from the Raptor Pilot Study provides the basis for developing a life-cycle cost comparison between a rodenticide program and a raptor program. Annual and life-cycle costs were calculated for a one-mile levee segment based upon actual costs tracked during the Raptor Pilot Study (Table 6).

Raptor Program Costs – The cost for a raptor program over one mile of levee include initial construction and installation of raptor perches every 500 feet. One owl nesting box and one raptor nesting platform will also be constructed and installed. A life-span of 30 years is selected for the raptor perches and nesting facilities based upon observations of the perches at the

Santa Barbara levees. These perches were up twelve years old at the time of observation and were in good condition. Additional raptor program costs include quarterly monitoring with a four person inspection team and semi-annual grouting. Grouting would occur prior to the winter season and mid-winter based on observations and need. Annual program management costs are also included.

Rodenticide Program Costs – Rodenticide program costs include the use of a contracted rodenticide contractor with a Qualified Applicators License. The contractor performs weekly inspections and apply anticoagulant bait in compliance with regulations for pesticide application. Based on current contract rates, the annual cost of bait and initial cost of bait stations is included. Contract management costs are included.

Table 6. Rodenticide Program vs Raptor Program Life Cycle Cost*	Qty/ Hrs	Unit Cost	Misc	1st Year	2-30 Years	30-Yr Cost
Rodenticide Program						
Weekly Contractor Inspections (1 Technician with vehicle)	52	$ 110		$ 5,720	$ 5,720	$ 171,600
GSA Overhead	1	$ 346		$ 346	$ 173	$ 5,363
Purchase Bait Stations	10	$ 65		$ 650	$ -	$ 650
Rodenticide Application (pounds)	100	$ 1.85		$ 185	$ 209	$ 6,246
Contract Management (hours)	10	$ 100		$ 1,000	$ 750	$ 22,750
Grouting (4 crew days per year)	4	$ 2,851		$ 11,404	$ 11,404	$ 342,120
Total Rodenticide Program cost per mile per year				**$ 19,305**	**$ 18,256**	**$ 548,729**
Raptor Program						
Capital Expenditure						
Build & Install Raptor Perches	11	$ 500		$ 5,500		$ 5,500
Build & Install 1 Hawk Nesting Platform	1	$ 700		$ 700	$ 10	$ 990
Build & Install 1 Owl Nest Box	1	$ 700		$ 700	$ 10	$ 990
Raptor Site Maintenance						
Inspection team (Quarterly Inspections)						
1 Biologist (4 hours per inspection)	16	$ 37		$ 592	$ 592	$ 17,760
3 Student Workers (4 hours per inspection)	16	$ 80		$ 1,280	$ 1,280	$ 38,400
1 Vehicle (4 hours per inspection)	16	$ 41	$100	$ 756	$ 756	$ 22,680
Maintenance Worker	16	$ 58		$ 928	$ 928	$ 27,840
Grouting (2 crew days per year)	2	$ 2,851		$ 5,702	$ 5,702	$ 171,060
Program Manager	20	$ 100		$ 2,000	$ 1,480	$ 44,920
Total Raptor Program cost per mile per year				**$ 18,158**	**$ 10,758**	**$ 330,140**
Raptor Program net savings (cost) per mile				**$ 1,147**	**$ 7,498**	**$ 218,589**

** Assumes raptor perches have a 30-year life span before replacement.*

Table 6 shows that the Raptor Program has a similar first-year-cost to the Rodenticide Program with annual costs of $18,158 per mile and $19,305 per mile respectively. The construction and installation of perches and nesting enhancements are included in the year-one costs. The subsequent annual cost for the Raptor Program during years 2 to 30 are significantly lower at

$10,758 per mile versus $18,256 per mile for the Rodenticide Program. This is due to an expected 50% reduction in burrow grouting cost after raptor perches are installed. Estimated annual savings per channel mile for the Raptor Program are $7,498.

Long term (thirty-year life cycle) savings for the Raptor Program estimates are $218,589 per channel mile.

4.0 Conclusions

The Raptor Pilot Study was designed to determine if placing raptor perches along a levee could reduce the ground squirrel population and burrow damage, and if they are a viable replacement for the anticoagulant rodenticide program.

Based upon the monitoring results of ground squirrel burrows during Phase I and Phase II, the Neighboring Land and Agricultural Use Analyses, the Raptor Pellet Analysis, and the Life-Cycle Cost Analysis, the following conclusions can be made for the Raptor Pilot Study goals.

Study Goal 1 – *Compare the extent of ground squirrel damage along a levee reach with raptor perches with a similar reach using traditional anticoagulant bait stations.*

Ground squirrel damage along the reach of Revolon Slough where raptor perches were installed was substantially less than that found along the reach protected by bait stations. During Phase I, the Raptor Test Site had 66% less burrows that the Control Site (145 vs 430). During Phase II, the Modified Site had 47% less burrows than observed during the same time period at the Control Site in Phase I (110 vs 206).

The study confirms ground squirrel burrow damage to be less than that found at the rodenticide protected site with both differing and similar agricultural uses on adjacent properties. Ground squirrel preference for alternative food sources (neighboring crops) is likely to be limiting the consumption of applied bait. Bait stations were less effective when adjacent properties grew crops that squirrels preferred, such as berries, to the diphacinone treated oats. In addition, pesticide application regulations require that bait applications begin only after squirrel activity is observed. This requirement limits the rodenticide program to reactive responses only. Installing perches provides a proactive approach as the presence of raptors can discourage rodents from establishing communities.

Study Goal 2 – *Determine if anticoagulant bait can be reduced at WPD flood-control facilities through the adoption of a successful raptor program*.

The results of the study demonstrate that if raptor perches are installed and quarterly inspection and grouting of new burrows occurs, anticoagulant baits can be reduced or eliminated at selected WPD flood-control facilities.

Study Goal 3 – *Calculate the financial impact.*

Results of the Raptor Pilot Test predict that substantial savings can be achieved by expansion of the Raptor Program. Savings are primarily achieved from a 50% reduction in levee damage repairs and elimination of contractor costs.

Estimated annual savings per channel mile for the Raptor Program are $7,498.

The 30-year savings estimate is $218,589 per channel mile.

Study Goal 4 – *Determine criteria for expansion to additional channels, levees, and dams.*

WPD flood-control facilities that are appropriate selections for addition to the Raptor Program will typically be earthen facilities that have natural areas on adjacent properties. This will allow existing raptor populations to be attracted to the facilities through the addition of raptor perches.

Currently anticoagulant bait stations are only allowed at high risk facilities such as levees and dams. All other WPD flood-control facilities that have natural habitat areas nearby would be considered good candidates for the Raptor Program.

Evaluation of flood-control facilities in rural and suburban areas for existing natural and man-made perches (i.e. trees and power poles) may indicate that new perches are not needed.

Earthen facilities in urban areas may not be good candidates for raptor perches though the installation of owl nest boxes may be appropriate. The selective placement of barn owl nest boxes can enhance gopher control though conflicts with Great Horned Owls should be avoided by inspection of potential box placement areas.

The discovery of numerous rodent burrows while establishing the baseline for the Raptor Pilot Study revealed the limitations of the existing rodenticide program. Ground squirrels preferred crops (such as berries and dark green vegetables) over diphacinone-treated oats. This appears to have significantly limited the effectiveness of the rodenticide.

The Raptor Pilot Study confirms that raptor perches outperformed WPD's rodenticide control program and reduced rodent burrow damage to the Revolon Slough levee system; although neither method has completely eliminated burrows. Regular inspection and burrow grouting are critical elements and should be further developed as part of any maintenance program.

5.0 Raptor Study Expansion

Favorable results during Phase I of the Raptor Pilot Study encouraged WPD to install raptor perches at three other WPD facilities where there was burrowing activity and adjacent raptor habitat. These sites are Conejo Mountain Basin No. 1 which has experienced bait station vandalism (Figure 22), a 2,500 foot reach of South Branch Arroyo Conejo (Figure 23), and a 7,000 foot reach of the Arroyo Simi channel.

Figure 22. Vandalized Bait Station at Conejo Mountain Basin No. 1

Monitoring was also initiated at Las Llajas Dam where raptor perches were installed in 2009 as part of a Boy Scout project. These new sites were monitored quarterly for raptor use and any new ground squirrel burrows. There was evidence of raptor use but a rigorous monitoring dataset was not collected so these sites were not included in the Raptor Pilot Study, but are considered part of an expansion of the study into a full Raptor Program.

There are currently 4.4 miles of WPD flood-control channels and levees, and 2 dams protected exclusively by raptors as part of the WPD Raptor Program.

Figure 23. Raptor Perch at South Branch Arroyo Conejo Levee

6.0 Gopher Control

During the Raptor Pilot Study gopher burrows were flagged for grouting but not inventoried. Tracking gopher burrows and damage was not a formal part of the Raptor pilot study because bait stations are not considered a deterrent to gophers, however, some observations on gopher control can be made based upon the inspections and control measures that occurred.

Aluminum phosphide gas was applied as a fumigant to gopher burrows seven times between January and March of 2017. Overall, 5.1 pounds of aluminum phosphide gas was used to fumigate gopher holes across the entire Pilot Study Area. After fumigation, however, new gopher burrows were still occurring at a similar rate as before fumigation. Fumigation seemed to be ineffective at reducing gopher populations though it may have prevented increases. Gopher populations appear to have held steady despite periodic grouting as well. Grouting and fumigation may be less effective with gophers because gophers can backfill their tunnels, limiting penetration.

Analyses of raptor pellets showed that hawks and owls extensively hunt gophers and that it is evident that they are helping to control gopher populations at locations where raptor perches were placed. The persistence of gophers despite fumigation and grouting demonstrated that aggressive inspection and eradication needs to take place when gophers are found.

Based upon the observations during the Pilot Study raptor perches and owl nest boxes should also be placed to help control gophers.

7.0 Recommendations

It is recommended that WPD move forward with the development of a system-wide Raptor Program which would include the following elements:

- Identify flood-control earthen facilities with adjacent habitat areas for expansion into the Raptor Program
- Remove anticoagulant bait stations at selected facilities to avoid secondary exposure to the raptors
- Install perches at 500-foot intervals at selected reaches
- Install owl nest boxes at facilities with gopher activity
- Install hawk nesting platforms
- Maintain comprehensive inspection and grouting to assure structural integrity of all WPD earthen flood-control facilities

Staffing for the raptor program would continue with the same monitoring approach used for the Raptor Pilot Study. A synergy can also be created by cross-training the engineering staff who currently perform WPD's annual structural and damage inspections of our levees and dams.

Appendices

RAPTORS PROTECT FLOOD CONTROL LEVEES

Submitted by Matt Victoria, Agricultural Biologist

Twelve years ago the Santa Barbara County Flood Control District had a serious problem with California Ground Squirrels infesting their Santa Maria River levees. Constructed in 1963 by the U.S. Army Corps of Engineers, the levees provide flood protection to the Santa Maria Valley and the City of Santa Maria. The levees are compacted sand covered with protective riprap (rock) and they are built on the south-facing river slopes. They extend 17 miles from the Sisquoc River to the CA Highway 1 bridge.

California Ground Squirrels

Ground squirrels were a problem from the beginning. They prefer to construct burrows in elevated areas with little nearby vegetation, which allows them to see and run away from predators. The miles of treeless levees made the prefect home for squirrels. They formed colonies of several dozen animals, digging burrows up to 5' deep into the earthen levees and their populations grew quickly. Flood Control worried that over time, the squirrels could weaken the structural integrity of their levees.

Rodenticides were used to control ground squirrels prior to 2002. Two full-time employees would apply 50 lbs of rodent bait a week along the levee's entire length at a cost of nearly $6500 per month! They used diphacinone, an anticoagulant rodenticide, which when eaten by squirrels causes lethal internal hemorrhaging. Unfortunately, diphacinone also has the potential to cause secondary exposure to non-target wildlife. This occurs when other animals eat dead or dying squirrels.

Red-tailed Hawk catching Squirrel

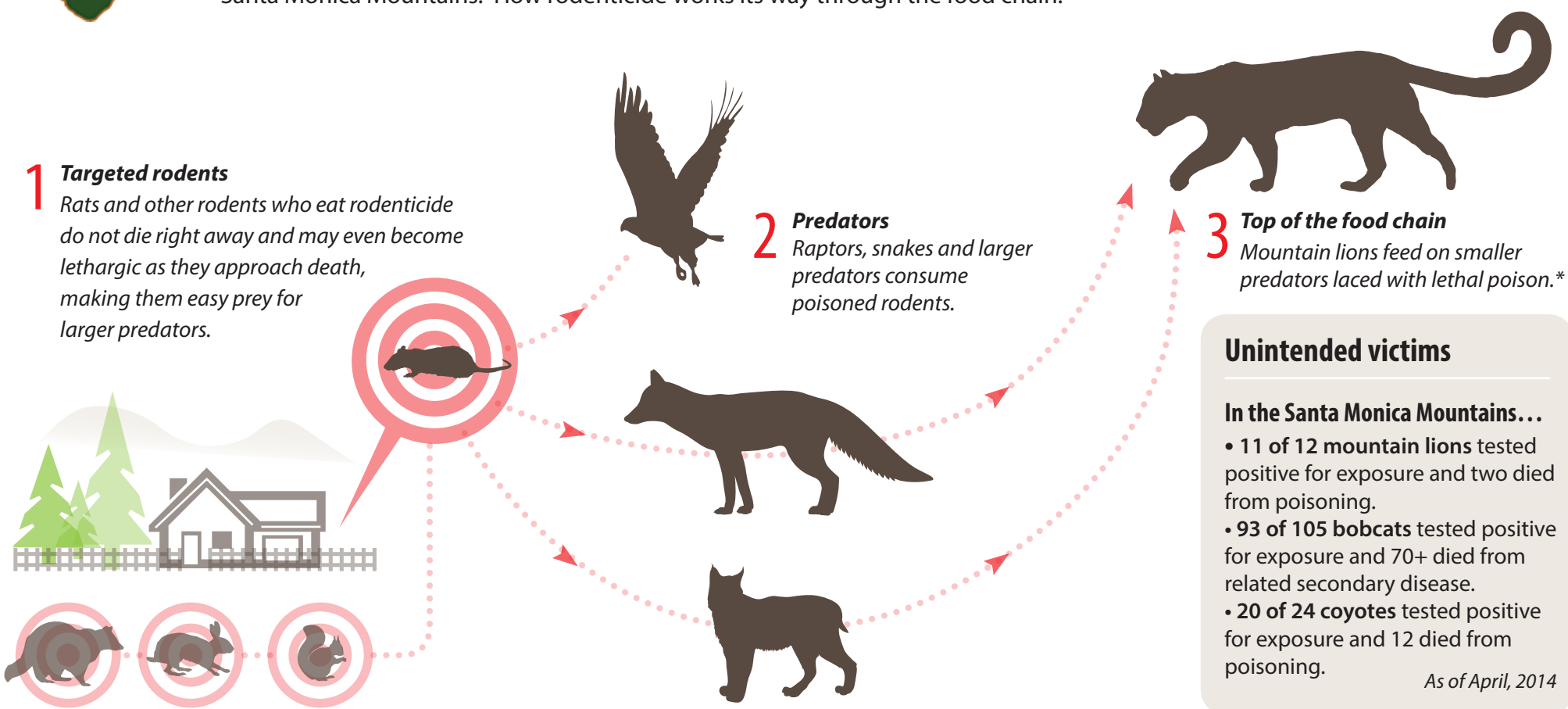
Red-tailed Hawk on "Levee Patrol"

County Flood Control hoped to find an alternative ground squirrel control method that would be safer than diphacinone and save money. In the spring of 2002 they began installing raptor poles. This simple solution lets nature do the rodent control. By installing 20 ft high poles with wooden T-bar perches, they provided birds such as red-shouldered and red-tailed hawks with a stationary platform from which to hunt squirrels. They spaced 74 raptor poles along the length of the levees. Materials and labor for each raptor pole were $275 and they took just 1 hour to install. Hawks moved in immediately and started hunting squirrels.

With the success of the raptor pole program, County Flood Control has not needed to apply rodenticides. Fewer squirrels were noted within a year, and hawks were often seen flying off with ground squirrels in their talons. Flood Control continues to add new poles as needed, whenever fresh mounds of soil indicate squirrels are burrowing. Today the Santa Maria River levees are mostly squirrel –free. The risk of secondary exposure of wildlife to rodenticides is gone and the cost savings to the County are substantial. Most importantly, the Santa Maria levees are maintaining solid structural integrity .

Lethal Dose: Rat Poison & Local Wildlife

Local residents may inadvertently be poisoning wildlife. National Park Service researchers have found a direct link between exposure to anticoagulant rodenticides, commonly known as rat poison, and the deaths of wildlife in and around the Santa Monica Mountains. How rodenticide works its way through the food chain:



1 *Targeted rodents*
Rats and other rodents who eat rodenticide do not die right away and may even become lethargic as they approach death, making them easy prey for larger predators.

2 *Predators*
Raptors, snakes and larger predators consume poisoned rodents.

3 *Top of the food chain*
*Mountain lions feed on smaller predators laced with lethal poison.**

Unintended victims

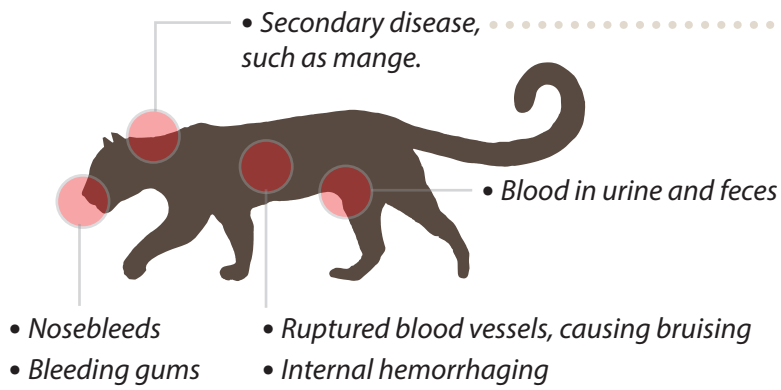
In the Santa Monica Mountains…

- **11 of 12 mountain lions** tested positive for exposure and two died from poisoning.
- **93 of 105 bobcats** tested positive for exposure and 70+ died from related secondary disease.
- **20 of 24 coyotes** tested positive for exposure and 12 died from poisoning.

As of April, 2014

How anticoagulant rodenticide kills

These compounds interrupt blood-clotting, which leads to uncontrolled bleeding and death. They may also suppress the animal's immune system, making it susceptible to other diseases. **Symptoms include:**



What is mange?

A microscopic mite that burrows into the skin and causes...

1. Extreme itchiness and skin lesions.

2. Fluid and nutrient loss through the skin.

3. Infection, starvation, hypothermia or other complications, eventually leading to death.

Check the label

Here are the most common anticoagulant compounds:

- ***Bromadiolone***
- ***Brodifacoum***
- ***Diphacinone***
- ***Difethialone***

SOURCES: Santa Monica Mountains National Recreation Area research, L.E.K. Serieys, UrbanCarnivores.com

CREDIT: National Park Service
nps.gov/samo

Appendix C
Channel Vegetation Species

Raptor Site

West Side	Mulefat	Arroyo Willow	Poison Hemlock	Summer Mustard	Horseweed	White Sweet Clover	Castor Bean	Nettle	Cocklebur	Narrowleaf Willow	CA Bulrush	Sedge	Grasses	Wild Radish	Giant Reed	Vine	Unknown	**Total %**
Perch 1	18	30	20	20	10	0	2	0	0	0	0	0	0	0	0		0	100
Perch 3	14	50	20	10	5	0	1	0	0	0	0	0	0	0	0	0	0	100
Perch 5	30	25	8	7	15	10	5	0	0	0	0	0	0	0	0	0	0	100
Perch 7	25	25	10	5	5	15	15	0	0	0	0	0	0	0	0	0	0	100
Perch 9	63	25	5	0	5	0	2	0	0	0	0	0	0	0	0	0	0	100
Perch 11	70	25	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 13	75	20	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 15*	77	15	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	100
Averages	46.50	26.88	8.75	5.63	5.00	3.13	3.13	0.63	0.38	0	0	0	0	0	0	0	0	100
East Side																		
Perch 2	50	22	7	0	4	0	4	0	0	10	3	0	0	0	0	0	0	100
Perch 4	65	0	4	4	0	0	5	0	4	0	0	0	5	0	5	4	4	100
Perch 6	0	0	5	5	0	0	10	0	10	0	0	0	70	0	0	0	0	100
Perch 8	0	40	1	0	1	0	8	0	0	0	0	0	50	0	0	0	0	100
Perch 10	35	35	3	15	0	0	2	3	0	0	0	0	5	0	2	0	0	100
Perch 12	25	25	0	0	6	12	4	5	15	0	5	3	0	0	0	0	0	100
Perch 14	0	0	0	6	0	0	0	0	0	0	0	0	91	3	0	0	0	100
Averages	25.00	17.43	2.86	4.29	1.57	1.71	4.71	1.14	4.14	1.43	1.14	0.43	31.57	0.43	1.00	0.57	0.57	100
Average (both sides)	35.75	22.15	5.80	4.96	3.29	2.42	3.92	0.88	2.26	0.71	0.57	0.21	15.79	0.21	0.50	0.29	0.29	100

* Buffer Zone

Most Dominant Species:

Mulefat, Grasses, Poison Hemlock, Summer Mustard, Castor Bean, Horseweed, White Sweet Clover, Cocklebur

Channel Vegetation Species

Modified Control Site

West Side	Mule fat	Arroyo Willow	Poison Hemlock	Summer Mustard	Horse weed	White Sweet Clover	Castor Bean	Stinging Nettle	Cockle bur	CA Bul rush	Pepper weed	Helio trope	Grasses	Wild Radish	Salt bush	Sun flower	Tree Tobacco	Coyote Brush	CA Sage brush	Lamb's Qtrs.	Bare	**Total %**
Perch 17*	60	25	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 19*	35	50	5	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 21	60	25	10	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	100
Perch 23	45	22	0	10	0	10	10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 25	20	20	10	0	0	28	0	0	0	0	0	0	0	0	20	2	0	0	0	0	0	100
Perch 27	30	15	20	5	0	0	0	0	0	0	0	0	0	0	10	0	5	0	0	0	15	100
Perch 29	50	10	25	5	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	100
Perch 31	10	5	30	5	0	0	0	0	0	0	0	0	0	0	20	0	0	0	5	0	25	100
Averages	38.75	21.50	12.50	3.75	0.00	4.75	3.13	1.00	0	0	0	0	0	0	6.88	0.25	1.25	0.63	0.63	0	5.00	100
East Side																						
Perch 16*	10	5	10	60	0	0	10	0	0	5	0	0	0	0	0	0	0	0	0	0	0	100
Perch 18*	20	0	5	30	0	0	10	15	15	5	0	0	0	0	0	0	0	0	0	0	0	100
Perch 20	45	5	5	30	5	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Perch 22	20	0	3	5	0	0	3	10	0	2	0	0	50	5	0	0	2	0	0	0	0	100
Perch 24	60	0	20	10	0	0	5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	100
Perch 26	15	0	10	2	0	0	0	0	0	0	0	3	40	0	0	0	0	0	0	30	0	100
Perch 28	30	0	10	20	0	0	0	0	0	0	20	5	0	0	15	0	0	0	0	0	0	100
Perch 30	0	0	0	95	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Averages	25	1.25	7.875	31.5	1.25	0	4.13	3.75	1.88	1.50	2.50	1.00	11.25	1.25	1.88	0	0.25	0	0	3.75	0	100
Average (both sides)	31.88	11.38	10.19	17.63	0.63	2.38	3.63	2.38	0.94	0.75	1.25	0.50	5.63	0.63	4.38	0.13	0.75	0.31	0.31	1.88	2.50	100

* Buffer Zone

Most Dominant Species:

Mulefat, Summer Mustard, Arroyo Willow, Poison Hemlock, Grasses, Saltbush, Castor Bean, White Sweet Clover, Stinging Nettle

Appendix D

Inspection Summary, Weather Conditions, and Monthly Site Inspections of Revolon Slough

Summary of Site Inspections at Revolon Slough

April: The total bait consumed during this month was 7 pounds of D1 - Diphacinone (0.005% concentration). The first week of the month experienced moderate feeding levels, with bait station 1 undergoing the largest consumption. The peak in consumption levels occurred in week 3, with 2.5 pounds of bait consumed. The last week of the month experienced the lowest consumption, with only 0.5 pounds consumed. Overall, ground squirrel populations seem to have come under control near the raspberry crops. Non-target bird species and mammals are witnessed within the region.

May**:** Total bait consumption for the month of May equated to 2.5 pounds of D1 - Diphacinone (0.005% concentration) and 1 pound of C – Untreated crimped oat groats. The amount of consumed bait substantially decreased since the following month. Weeks 1 and 3 experienced a total consumption of zero pounds. The second week of the month reported 0.5 pounds of bait consumption, with 1 pound of untreated crimped oat groats being applied for bait acceptance trials. None of the trial bait was consumed. The final week of the month amounted to 2 pounds of D1 bait consumption. By months end, total consumption of C - Untreated crimped oat groats (for bait acceptance trial) amounted to 1 pound. Non-target bird species and mammals are witnessed within the region.

June: Total bait consumption for the month of June amounted to 14.75 pounds of D1 - Diphacinone (0.005% concentration). Week 1 amounted to 2 pounds of D1 consumption, with station 11 having the highest consumption rate. Week 2 had 0.5 pounds of C – Untreated crimped oat groats applied and 3.25 pounds of D1 consumed. A California Least Tern was observed in the region. Week 3 underwent the highest amount of consumption, with 7.75 pounds of D1. Stations 1 through 4 all experienced moderate levels of feeding. The final week of the month witnessed the lowest consumption rates of D1, with just 1.75 pounds. Several California Least Terns were witnessed around the adjacent ponds, along with other non-target species in the region.

July: July bait consumption amounted to 8.75 pounds of D1 - Diphacinone (0.005% concentration). Week 1 accounted for 2.5 pounds of D1 - Diphacinone (0.005% concentration) consumed. Moderate to low feeding in stations 2 through 4. Week 2 experienced no bait consumption, nor application. Week 3 had 4.75 pounds of D1 bait consumption, with high feeding occurring at station 3. Week 4 had 1.5 pounds of D1 consumption. Non-target bird species and mammals are witnessed within the region.

August: Total bait consumption for the month of August amounted to 16 pounds of D1 - Diphacinone (0.005% concentration). Week one had a consumption level of 4 pounds of D1, with moderate feeding in 6 stations. Week 2 had 4.5 pounds of D1 consumed, with moderate to low feeding in just 5 stations. Week 3 accounted for 4 pounds of D1 consumption and week 4 had 3.5 pounds of D1 consumption. Week 3 experienced raspberry fruit ripening. Non-target bird species and mammals are witnessed within the region.

September: The month of September accounted for 11.75 pounds of D1 - Diphacinone (0.005% concentration) bait consumption. Week 1 had the highest consumption of D1, 4 pounds in total. Station 1 experienced the highest levels of feeding. Two California Least Terns observed, one was dead. Week 3 amounted to 0.75 pounds of D1 - Diphacinone (0.005% concentration) consumption. 2 non-target hawk species observed, and moderate feeding in station 1. The final week of the month accounted for 3.75

pounds of D1 consumption. One Osprey species observed and other non-target species within the region, throughout the month.

October: Total bait consumption of D1 - Diphacinone (0.005% concentration) for the month of October equated to 5 pounds. Week 1 experienced the highest amount of consumption for the month, with 2.75 pounds of D1. Week 2 and 3 amounted to 0.75 pounds of D1 bait consumption, with multiple non-target raptor species. The final week of the month had 1.5 pounds of D1 consumed, no target species observed.

November accounted for 18.75 pounds of D1 - Diphacinone (0.005% concentration) bait consumption, with 1 pound of C - Untreated crimped oat groats (for bait acceptance trial) consumed during weeks 3 and 4. Week 1 was the highest amount of D1 bait consumption, with 6.75 pounds in total. Feeding increased after raspberry harvesting. Week 2 and 3 each totaled to 3.75 pounds of consumed bait and 1 total pound of crimped oat groats. Overall, feeding increased following harvest and bush trimming, burrow openings were grouted and raptor perches to be installed.

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

April

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	4/9/16 3:55pm	10	D1	2	2	Inspected area; moderate feeding in 1 bait station; refilled 1 bait station; bait stations 2 - 6 are all about half full; non-target birds, ducks, and 1 hawk on site; did not observe the burrowing owl; found garbage dumped on the channel side near the eastern gate off of Hueneme Road (notified Roger Boross via email); active farming on adjacent land; cool, cloudy, and light rain.
Week 2	4/15/16 7:06pm	10	D1	2	4.5	Completed service 4/15 6-7pm, completed work order on phone 4/18 due to phone dying, inspected, low feeding in bait stations 2-6; refilled 2-6, no targets, non-target birds, active farming, replace stickers on 7-10, warm, dusk
Week 3	4/21/16 6:17pm	10	D1	2.5	2.5	Inspected, moderate feeding in #2, 3, refilled stations, no feeding in stations with untreated bait, 1 ground squirrel near adj. pond, non-target birds, rabbits, 1 hawk, active farming, warm, sunny
Week 4	4/26/16 6:25pm	10	D1	0.5	0	Inspected, low feeding in #2, 4, did not use bait, low mouse feeding at stations with untreated bait, no targets, non-target birds, ducks, active farming, cool, sunny, windy
Monthly Evaluation Summary and Recommendations			D1	7	9	Ground squirrel populations seems to be under control near the raspberry rows, no other active areas

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

May

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	5/3/16 7:20pm	10	D1	0	3	Inspected, no feeding, used untreated bait in #4, low mouse feeding in station #7 with untreated bait, 1 ground squirrel in buffer area b/t Hueneme and control site sign, removed bait and replaced #4 due to vandalism, non-target birds, ducks, rabbits, active farming, cool, cloudy. C- Applied 0.5 lbs, Consumed 0.25 lbs
Week 2	5/12/16 12:15pm	11	D1	0.5	0	Inspected, low feeding in #6, installed 1 bait station, used untreated bait, no targets, non-target birds, ducks, rabbits, 1 hawk, active farming, cool, cloudy. C- Applied 1 lbs, Consumed 0 lbs
Week 3	5/16/16 1:42pm	11	D1	0	3	Inspected, high feeding in #11, filled station, no targets, non-target birds, ducks, rabbits, 1 hawk, active farming, mild, sunny. C- Applied 0 lbs, Consumed 0.75 lbs
Week 4	5/25/16 5:47pm	11	D1	2	1	Inspected, high feeding in #11, refilled, low in #3, no targets, non-target birds, ducks, 1 hawk, active farming, cool, mostly sunny, windy
Monthly Evaluation Summary and Recommendations			D1	2.5	7	Units are in pounds (lbs.), continue ground squirrel control near west side entry. C Totals- Applied 1.5 lbs, Consumed 1 lbs

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

June

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	6/7/16 5:00pm	11	D1	2	1	Inspected, high feeding in #11, refilled partially, low in #3, no targets, non-target birds, active farming, cool, mostly cloudy, breezy
Week 2	6/15/16 3:24pm	11	D1	3.25	5.25	Inspected, high feeding in #3, refilled, moderate in #6, refilled, no targets, non-target birds, 1 California Least Tern, active farming, mild, sunny, windy. C- Applied 0.5 lbs
Week 3	6/21/16 4:31pm	11	D1	7.75	5	Inspected, moderate feeding in #1-4, refilled halfway, low in #6, no targets, non-target birds, active farming, warm, cloudy, very windy
Week 4	6/28/16 1:56pm	11	D1	1.75	1.75	Inspected, low feeding in stations #2-4, refilled halfway, no targets, non-target birds, several California Least Terns around adjacent pond, active farming, warm, mostly sunny, breezy
Monthly Evaluation Summary and Recommendations		11	D1	14.75	13	Units are in pounds (lbs.), continue ground squirrel control around raspberry field. C Totals- Applied 0.5 lbs

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

July

General description of site: Adj. farm fields, new raspberry plants planted (June 2016), more to be planted; active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	7/6/16 4:43pm	11	D1	2.5	2.5	Inspected, moderate to low feeding in stations #2-4, 11, refilled halfway, no targets, non-target birds, active farming, warm, sunny, breezy
Week 2	7/13/16	11		0	0	Inspected, did not use bait, no targets, non-target birds, active farming, warm, sunny
Week 3	7/21/16 4:15pm	11	D1	4.75	4.5	Inspected, high feeding in stations #3, refilled, low in 3 others (#1, 2, 7, 8), refilled 2 halfway, no targets, non-target birds, active farming, warm, sunny, breezy, new gate installed on the east side
Week 4	7/26/16 6:58pm	12	D1	1.5	0	Inspected, low feeding in 4 stations (#3-6), 1 ground squirrel, non-target birds, rabbits, 1 hawk, 1 coyote, active farming, warm, sunny, someone tampered with station #1, installed 1 station on east side. C- Applied 0.25 lbs
Monthly Evaluation Summary and Recommendations			D1	8.75	7	Units are in pounds (lbs.), weeds are high on the east levee road bank on the channel side, several flags on site are marking old gopher burrows or very old squirrel burrows. C Totals- Applied 0.25 lbs

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

August

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	8/2/16 4:26pm	12	D1	4	8	Inspected, moderate to low feeding in 6 stations, filled 5 halfway, 1 full, non-target birds, active farming, warm, sunny. C- Consumed 0.25 lbs
Week 2	8/9/16 1:30pm	12	D1	4.5	4.5	Inspected, moderate to low feeding in 5 stations, filled 4 halfway, non-target birds, active farming, warm, mostly cloudy, 3 White-tailed Kites
Week 3	8/17/16 9:49am	12	D1	4	3.5	Inspected, moderate to low feeding in 6 stations, filled 4 halfway, 1 ground squirrels, non-target birds, rabbits, active farming, warm, sunny, raspberry fruit has ripened
Week 4	8/24/16 12:27pm	12	D1	3.5	3	Inspected, high to moderate feeding in 2 stations, refilled partially, low in 3 others, non-target birds, 1 hawk, active farming, warm, sunny, 3 White-tailed Kites
Monthly Evaluation Summary and Recommendations			D1	16	19	Units are in pounds (lbs.), several flags on site are marking old gopher burrows or very old squirrel burrows. C Totals- Consumed 0.25 lbs

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

September

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	9/7/16 5:18pm	12	D1	4	3.75	Inspected, high feeding in 1 station, refilled partially, moderate to low in 4 stations, filled 2 halfway, non-target birds, active farming, warm, sunny, 1 California least tern, 1 dead California Least Tern (notified Dan Blankenship of the California Department of Fish and Wildlife)
Week 2	9/13/16 5:36pm	12	D1	3.25	2.5	Inspected, moderate to low feeding in 6 stations, filled 1, no targets, non-target birds, 1 hawk, active farming, warm, sunny, breezy
Week 3	9/22/16	12	D1	0.75	0	Inspected, moderate feeding in 1 station, refilled, 1 ground squirrel, non-target birds, 1 hawk, 2 White-tailed Kites, active farming, warm, sunny, windy, replaced old lock on new gate
Week 4	9/27/2016 6:05pm	12	D1	3.75	5.75	Inspected, low feeding in 6 stations, filled 2, 1 ground squirrel, non-target birds, 1 hawk, 1 osprey, active farming, warm, mostly cloudy, breezy
Monthly Evaluation Summary and Recommendations			D1	11.75	12	Units are in pounds (lbs.), several open burrows on site

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

October

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	10/5/16 4:29pm	12	D1	2.75	2	Inspected, low feeding in 4 stations, filled 2 halfway, non-target birds, active farming, warm, mostly sunny, breezy
Week 2	10/11/16 11:30am	12	D1	0.5	1	Inspected, low feeding in 2 stations, filled 1 halfway, no targets, non-target birds, 1 osprey, active farming, cool, cloudy, breezy
Week 3	10/18/16 12:54pm	12	D1	0.25	0	Inspected, low feeding in 1 station, did not use bait, no targets, non-target birds, 5 White-tailed Kites, 1 hawk, active farming, mild, sunny, breezy
Week 4	10/24/16 1:02pm	12	D1	1.5	0	Inspected, low feeding in 6 stations, did not use bait, no targets, non-target birds, 1 hawk, active farming, mild, mostly cloudy, breezy
Monthly Evaluation Summary and Recommendations			D1	5	3	Units are in pounds (lbs.), several open and closed burrows on site, most of the burrows are old gopher burrows, the feeding has been very minimal for several weeks, raspberries are being harvested

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Las Posas Rd to Hueneme Rd

Number: 45103 Type: Levee

November

General description of site: Adj. farm fields, active channel

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	11/1/16 6:15pm	12	D1	6.75	1.5	Inspected, high to low feeding in 7 stations, filled 1 halfway, no targets, non-target birds, ducks, 2 hawks, 2 White-tailed Kites, feeding increased after the raspberry harvest, active farming, mild, dusk, breezy. C- Applied 0.5 lbs
Week 2	11/10/16 1:07pm	13	D1	3.75	5.5	Inspected, moderate to low feeding in 7 stations, filled 4 halfway, 1 ground squirrel, non-target birds, ducks, 3 hawks, 1 White-tailed Kite, feeding increased after the raspberry bush trimming, active farming, warm, sunny, windy, installed 1 station. C- Applied 0.5 lbs
Week 3	11/15/16 12:23pm	13	D1	3.75	3	Inspected, moderate to low feeding in 5 stations, filled 1, no targets, non-target birds, ducks, 1 hawk, 1 White-tailed Kite, active farming, warm, sunny, breezy. C- Consumed 0.5 lbs
Week 4	11/22/16 1:02pm	13	D1	4.5	3	Inspected, high feeding in 1 station, refilled, low in 4, no targets, non-target birds, ducks, 2 hawks, active farming, mild, sunny, breezy. C- Consumed 0.5 lbs
Monthly Evaluation Summary and Recommendations			D1	18.75	13	Feeding increased following harvest and bush trimming. Burrow openings were grouted by O&M. Raptor perches will be installed in December and bait stations removed by Tech.

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

April

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	4/9/16 2:54pm			0	0	Inspected area; no targets; non-target birds and ducks on site; active farming on adjacent land; cool, cloudy, and light rain.
Week 2	4/18/16 1:30pm			0	0	Inspected, no targets, non-target birds, ducks, active farming, warm, sunny
Week 3	4/21/16 5:17pm			0	0	Inspected, no targets, non-target birds, ducks, active farming, warm, sunny
Week 4	4/26/16 5:23pm			0	0	Inspected, no targets, non-target birds, active farming, cool, sunny, windy
Monthly Evaluation Summary and Recommendations				0	0	Bait is not being applied in area?

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

May

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	5/3/16 6:17pm			0	0	Inspected, no targets, non-target birds, ducks, 1 hawk, active farming, cool, cloudy
Week 2	5/11/16 1:58pm			0	0	Inspected, no targets, non-target birds, ducks, 1 hawk, active farming, cool, cloudy
Week 3	5/16/16 12:56pm			0	0	Inspected, no targets, non-target birds, active farming, mild, sunny
Week 4	5/25/16 4:37pm			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, mild, sunny, windy
Monthly Evaluation Summary and Recommendations				0	0	No ground squirrels observed.

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

June

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave Duell	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	6/7/16 4:09pm			0	0	Inspected, no targets, non-target birds, active farming, mild, mostly cloudy, breezy
Week 2	6/15/16 2:24pm			0	0	Inspected, no targets, non-target birds, active farming, mild, sunny, breezy
Week 3	6/21/16 3:32pm			0	0	Inspected, no targets, non-target birds, active farming, VCWPD crew on site, warm, mostly sunny, very windy
Week 4	6/28/16 12:47pm			0	0	Inspected, no targets, non-target birds, active farming, VCWPD crew on site, warm, sunny, breezy
Monthly Evaluation Summary and Recommendations				0	0	Continue to observe ground squirrel activity.

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

July

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	7/6/16 3:37pm			0	0	Inspected, no targets, non-target birds, active farming, VCWPD crew on site, warm, sunny, windy
Week 2	7/13/2016			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny
Week 3	7/21/16 3:18pm			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny, breezy
Week 4	7/26/16 5:54pm			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny, breezy
Monthly Evaluation Summary and Recommendations				0	0	Several flags on site are marking old gopher burrows or very old squirrel burrows

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

August

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	8/2/16 3:06pm			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny, windy
Week 2	8/9/16 12:27pm			0	0	Inspected, no targets, non-target birds, active farming, warm, mostly cloudy
Week 3	8/17/16 8:45am			0	0	Inspected, 1 ground squirrel on west side near Hueneme Rd. gate, non-target birds, rabbits, active farming, cool, cloudy
Week 4	8/24/16 10:57am			0	0	Inspected, 1 ground squirrel on west side near nursery buildings, non-target birds, rabbits, active farming, warm, sunny
Monthly Evaluation Summary and Recommendations				0	0	Several flags on site are marking old gopher burrows or very old squirrel burrows

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

September

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	9/7/16 3:48pm			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, warm, sunny, windy
Week 2	9/13/16 4:15pm			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, warm, sunny, breezy
Week 3	9/20/16 1:04pm			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny, breezy, reported back to Karl Novak regarding the gophers at the bridge crossing in the levee channel below the turnout adjacent to the Nunes Vegetables buildings
Week 4	9/27/16 4:40pm			0	0	Inspected, no targets, non-target birds, 2 hawks, 1 osprey, active farming, warm, mostly sunny, breezy
Monthly Evaluation Summary and Recommendations				0	0	Several flags on site are marking old gopher burrows or very old squirrel burrows, graffiti in several locations

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

October

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	10/5/16 3:31pm			0	0	Inspected, no targets, non-target birds, active farming, warm, sunny, breezy, VCWPD brush clearing crew on site
Week 2	10/11/16 10:21am			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, cool, cloudy, VCWPD brush clearing crew on site
Week 3	10/18/16 11:20am			0	0	Inspected, no targets, non-target birds, active farming, mild, sunny, weed/brush abatement complete
Week 4	10/24/16 10:38am			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, mild, mostly sunny, breezy
Monthly Evaluation Summary and Recommendations				0	0	A few flags mostly marking old gopher burrows, graffiti in several locations

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

IPMP Monthly Inspection Summary/Report for Zone 3

Facility Name: Revolon Slough

Location: Wood Rd to Hueneme Rd

Number: 45105 Type: Levee

November

General description of site: Raptor pilot test area, active channel w/ veg., adj. farm fields, no bait stations on site

Zinc P. applied:

Wildlife Species (3): Coastal California Gnatcatcher, California Least Tern, California Red-Legged Frog, Least Bell's Vireo, Western Snowy Plover, Southwestern Willow Flycatcher, Tidewater Goby

Dave D.	Visit Date/Time	No. of Bait Stations	Bait Code	Bait Consumed (1)	Bait Applied (1)	Comments and Evaluation (2)
Week 1	11/1/16 4:43pm			0	0	Inspected, no targets, non-target birds, 2 hawks, active farming, warm, sunny, breezy, a few new burrows have been marked with flags
Week 2	11/10/16 10:54am			0	0	Inspected, no targets, non-target birds, 3 hawks, active farming, warm, sunny, breezy, a few new burrows have been marked with flags
Week 3	11/15/16 10:53am			0	0	Inspected, no targets, non-target birds, 3 hawks, active farming, warm, sunny, breezy, VCWPD crew on site
Week 4	11/22/16 11:17am			0	0	Inspected, no targets, non-target birds, 1 hawk, active farming, mild, sunny, VCWPD site inspection crew on site (Steve), he asked about us being notified about stopping our inspection, which I responded "No", he planned to talk to Cynthia
Monthly Evaluation Summary and Recommendations				0	0	A few flags mostly marking old gopher burrows, graffiti in several locations

Notes

(1) Note amount of bait consumed since previous visit and the amount placed at current visit

(2) Note any carcass found, rodent activity on site or on adjacent properties, vandalism, general conditions, rodent food sources

(3) Circle endangered wildlife species observed during visit

D1 - Diphacinone for bait stations (0.005% concentration)

D2 - Diphacinone for broadcast (0.01% concentration)

Z3 - Zinc Phosphide

A4 - Aluminum Phosphide (fumigation -moist soil)

C - Untreated crimped oat groats (for bait acceptance trial)

Weather Conditions and Bait Consumption

Months with unusual bait consumption:

May 2016	days	bait consumed	avg high	avg low	avg wind	max gusts	precip
Week 1 (Apr 26 - May 3)	7	0.00	65.1	50.5	5.0	46	0.0
Week 2 (May 4 - 12)	9	0.50	65.8	56.4	5.6	17	0.0
Week 3 (May 13 - 16)	4	0.00	67.3	55.8	4.0	21	0.0
Week 4 (May 17 - 25)	9	2.00	67.1	54.2	6.0	30	0.0
All May	29	2.50	66.3	54.2	5.1	46	0.0

June 2016	days	bait consumed	avg high	avg low	avg wind	max gusts	precip
Week 1 (May 26 - June7)	12	2.00	70.1	59.2	5.2	22	0.00
Week 2 (June 8 - 15)	8	3.25	68.3	57.3	4.6	22	0.00
Week 3 (June 16 - 21)	6	7.75	73.8	57.5	5.8	18	0.00
Week 4 (June 22 - 28)	7	1.75	71.1	60.3	3.7	-	0.00
All June	33	14.75	70.8	58.6	4.8	22	0.00

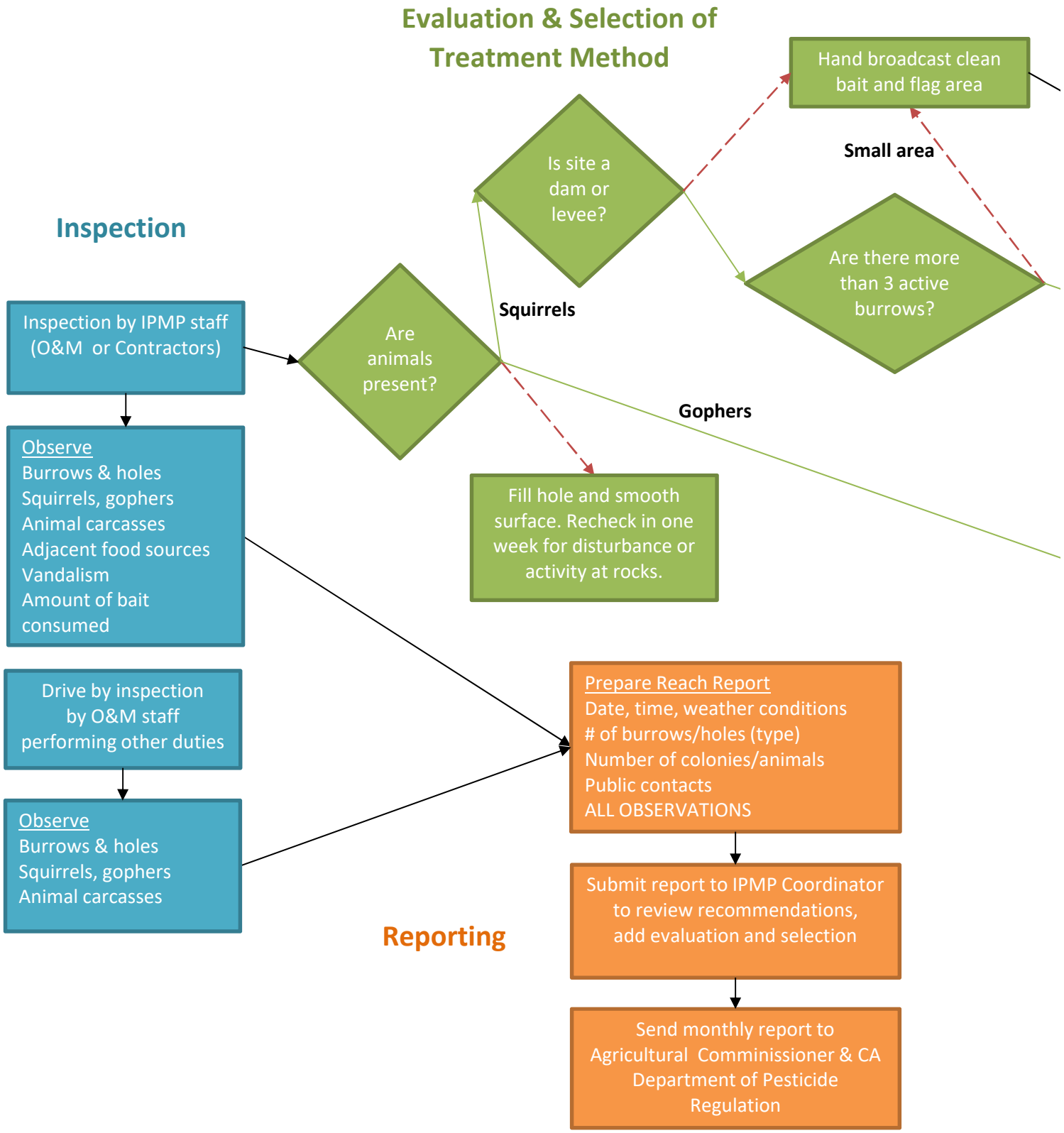
July 2016	days	bait consumed	avg high	avg low	avg wind	max gusts	precip
Week 1 (June 29 - July 6)	8	2.50	71.9	62.3	6.0	23	0.0
Week 2 (July 7 - 13)	7	0.00	73.0	61.0	5.0	20	0.0
Week 3 (July 14 - 21)	8	4.80	74.1	61.3	5.9	16	0.0
Week 4 (July 22 - 26)	5	1.50	77.8	63.5	4.3	21	0.0
All July	28	8.75	74.2	62.0	5.3	23	0.0

October 2016	days	bait consumed	avg high	avg low	avg wind	max gusts	precip
Week 1 (Sept 28 - Oct 5)	8	2.75	74.25	58.5	4.6	18	0.01
Week 2 (Oct 6 - 10)	5	0.50	80.4	56.0	4.8	-	0.00
Week 3 (Oct 11 - 18)	8	0.25	69.9	57.0	5.1	18	0.12
Week 4 (Oct 19 - 24)	6	1.50	70.5	57.1	4.5	31	0.37
All October	27	5.00	73.8	57.2	4.8	31	0.50

November 2016	days	bait consumed	avg high	avg low	avg wind	max gusts	precip
Week 1 (Oct 25 - Nov 1)	8	6.75	70.5	57.1	4.5	-	0.37
Week 2 (Nov 2 - 10)	9	3.75	78.4	56.0	4.8	29	0.00
Week 3 (Nov 11 - 15)	5	3.75	78.0	55.8	5.2	29	0.00
Week 4 (Nov 16 - 22)	7	4.50	70.1	51.0	7.0	41	0.48
All November	29	18.75	74.3	55.0	5.4	41	0.85

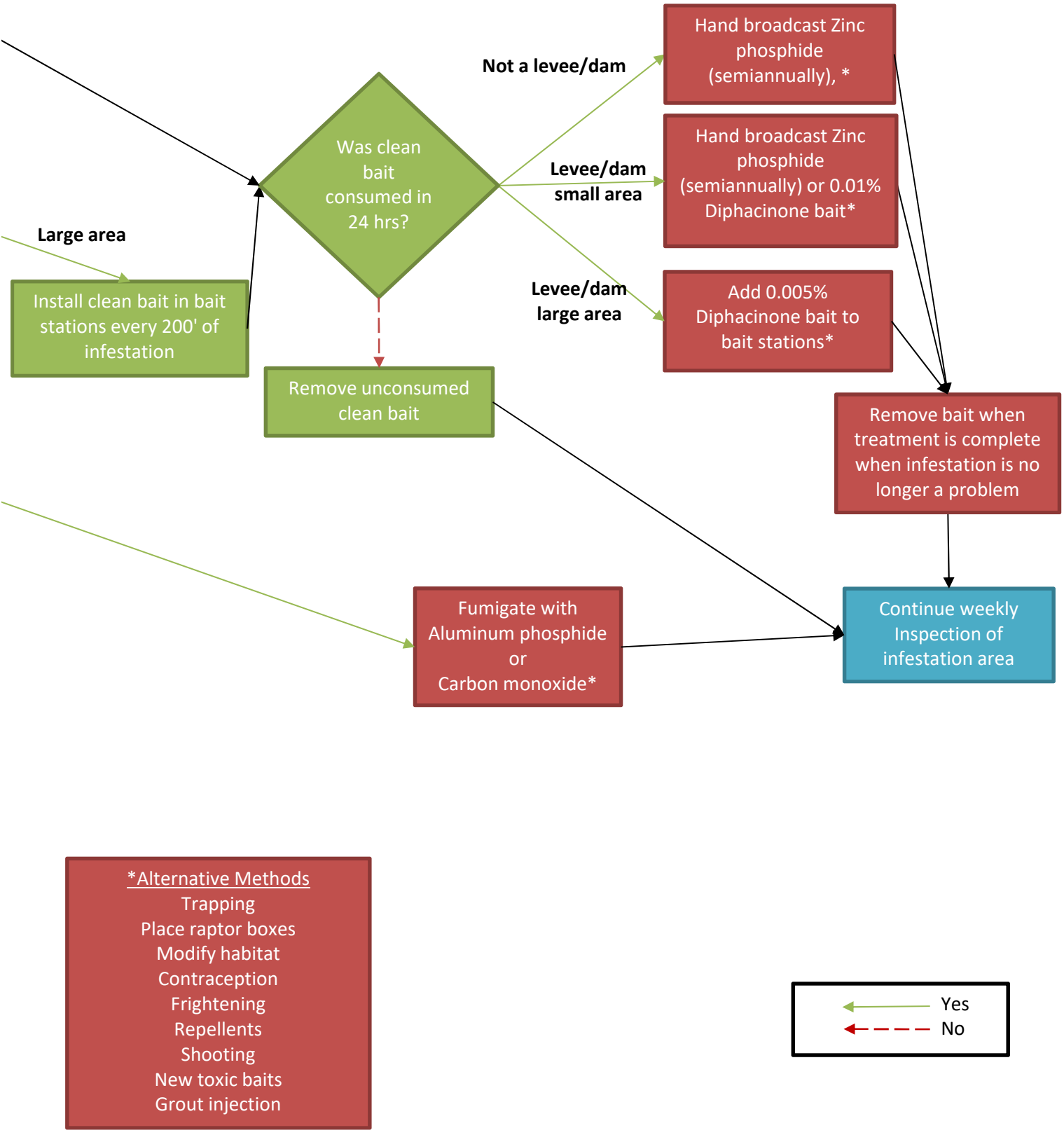
Appendix E
IPMP Rodent Control Chart

IPMP Rodent Control Flowchart



Evaluation & Selection of Treatment Method

Application of Rodenticide



*Alternative Methods
Trapping
Place raptor boxes
Modify habitat
Contraception
Frightening
Repellents
Shooting
New toxic baits
Grout injection

Yes
No

Appendix F
Pellet Analysis

Master Table

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
1	2/19/16	Test	Perch 2		RTHA		1 partly destroyed pellet	Lost	0
2a	3/4/16	Test	Hawk Platform 1	Owl	BAOW	Black Rat	4 pellets (Barn Owl?)		4
2b	3/4/16	Test	Hawk Platform 1	Owl	BAOW	House Mouse-3			
2c	3/4/16	Test	Hawk Platform 1	Owl	BAOW	American Coot			
2d	3/4/16	Test	Hawk Platform 1	Raptor	COHA	Aves sp.			
2e	3/25/16	Mod	E. side, S. end of Control Site	Raptor		Gopher; House Mouse	Bones		1
3	4/8/16	Test	North of Bait Station 1	Raptor		Ground Squirrel	1 upper skull part (ground squirrel?)	Labelled "Near Perch 1"	1
4	4/8/16	Test	Between Bait Stations 6 & 7	Raptor		American Coot; Desert Cottontail	Small bones of ?		1
5a	1/6/17	Test	W side of Revolon Slough	Raptor		American Coot	Bone and muscle		1
5b	4/15/16	Test	Hawk Platform 1	Owl	BAOW	Gopher	1 small pellet		1
6	4/15/16	Test	Owl Box 1	Scat	Carnivore	Desert Cottontail	1 pellet	West Side Revolon Slough	1
7	4/15/16	Test	Perch 11	Raptor		Desert Cottontail, Red-winged Blackbird	1 spine & 1 bone	Bone lost	1
8	4/15/16	Test	Perch 6				1 pellet	Lost	1
9	4/15/16	Test	Perch 14	Raptor		House Mouse	1 pellet		1
10	4/22/16	Test	North of Bait Station 1	Raptor			1 skull (ground squirrel?)	Possibly confused with #3	1
11	4/29/16	Test	Perch 8				1 small pellet (Lost)	Lost	1
12a	5/13/16	Test	Perch 6	Raptor		Ground Squirrel	Bones		1
12b	5/13/16	Test	Hawk Platform 1	Scat	Carnivore	Virginia Opossum; Desert Cottontail	Ground squirrel remains		1
13	5/20/16	Mod	300 ft from flat stand	Raptor		Rana sp.; Muskrat	Bone		1
14	5/20/16	Mod	50 ft. from flat stand	Raptor		Ground Squirrel	Bone		1
15	5/20/16	Mod	Directly under flat stand 1	Owl	BAOW	Desert Cottontail; Jerusalem Cricket			
15	5/20/16	Mod	#1 Flat Stand	Owl	BAOW	Desert Cottontail	1 pellet	E side of Control Site	1

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
15a	5/20/16	Mod	#1 Flat Stand	Scat	Carnivore	American Coot; African Clawed Frog; Kelp Crab	1 pellet	E side of Control Site	1
15b	5/20/16	Mod	#1 Flat Stand	Scat	Carnivore	Gopher-3; American Coot; Kelp Crab	Bones only	E side of Control Site	
16	5/20/16	Mod	Under 2nd flat stand	Raptor		American Coot	1 pellet		1
17	5/20/16	Mod	Flat stand 3	Owl	GHOW	Ornate Shrew; House Mouse; Gopher; Virginal Rail; American Coot-3; Passerine sp.; Crayfish	2 pellets & remains		2
18	5/27/16	Test	Hawk Platform 1	Raptor	COHA	Passerine sp.	1 small pellet of fur & feathers		1
19a	6/10/16	Test	Owl Box 1, on fence	Scat	Carnivore	Desert Cottontail	1 large irregularly-shaped pellet		1
19b	6/10/16	Test	Perch 12	Raptor		Gopher	1 Gopher Ulna	E side of Revolon Slough	
20a	7/29/16		East side near Las Posas Rd.	Scat	Carnivore		1 possible pellet		1
20b	7/29/16	Mod	near Las Posas Rd	Raptor		Gopher	Bone (partial skull)	on control Site	
21	8/5/16	Test	Perch 2	Scat	Carnivore	Pseudacris sp.; House Mouse; Black Rat;	1 large pellet		1
22	8/19/16	Test	Perch 10	Raptor	RTHA	American Coot; House Mouse; Jerusalem Cricket	1 pellet?		1
23	8/19/16	Test	Between Perchs 8 & 10	Heron	GBHE	Crayfish-9	1 pellet		1
24a	9/2/16	Test	Perch 14	Scat	Carnivore	Virginia Opossum	1 [ground squirrel remains] pellet		1
24b	9/2/16	Test	Perch 6	Owl	BAOW	Rodent sp.; Passerine sp.	1 pellet	East side	1
24b	9/2/16	Test	Perch 6	Owl	BAOW	Passerine sp.	1 pellet	East side	1
25	9/16/16	Test	Perch 9	Scat	Carnivore	Desert Cottontail	1 large fluffy pellet		1
26	9/16/16	Test	Perch 6	Scat	Carnivore	Desert Cottontail; Black Rat; Jerusalem Cricket	2 pellets		2
27	9/30/16	Test	Perch 5	Raptor		Gopher; Passerine sp.	1 small loose pellet of fur		1
28	10/14/16	Test	Perch 7	Scat	Carnivore	Virginia Opossum	1 pellet (mostly fur)		1
29	11/8/16	Test	Perch 14	Owl	GHOW	Gopher; Jerusalem Cricket	1 pellet		1
30	11/22/16	Test	Perch 7	Owl	GHOW	Virginia Opossum; Ground Squirrel; Gopher; Deer Mouse; Eurasian collared Dove	1 fresh pellet		1

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
30b	12/6/16	Test	Perch 11	Scat	Carnivore		Carnivore scat		
31	12/20/16	Test	Perch 6	Owl	BAOW	House Mouse; Black Rat	1 pellet & 1 gopher bone		2
32	12/20/16	Test	Perch 8	Scat	Carnivore		1 pellet		1
33	12/29/16	Buffer	Perch 16	Owl	BAOW	Gopher-3; American Coot	1 pellet	Buffer zone	1
34	12/29/16	Buffer	Perch 18	Owl	BAOW	Gopher	1 pellet	Buffer zone	1
34b	12/29/16	Mod	Perch 22	Owl	BAOW	Gopher; Jerusalem Cricket	1 pellet		1
34b	12/29/16	Mod	Perch 22	Owl	BAOW	Gopher; Jerusalem Cricket	1 pellet		1
35	12/29/16	Mod	Perch 28	Owl	BAOW	American Coot	1 pellet		1
35b	7/8/05		E of Revolon Slough	Scat	Carnivore	Gopher	Carnivore scat		
36	1/6/17	Test	Hawk Platform 1	Scat	Carnivore	Gopher; House Mouse	3 scat segments (wet from recent rain)		
36a	1/6/17	Test	Hawk Platform 1	Raptor	RTHA	American Coot; Desert Cottontail	1 pellet		1
37	1/6/17	Test	Perch 7	Owl	BAOW	House Mouse-3; Virginia Rail	1 pellet		1
38	1/6/17	Test	Perch 13	Scat	Carnivore		1 pellet (wet from recent rain)		1
39	1/6/17	Test	Perch 6	Owl	BAOW	House Mouse; American Coot; Crayfish	1 pellet		1
40	1/13/17	Mod	Perch 22	Scat	Carnivore	Black Rat; Crayfish	2 pellets (large & medium, fur inside)		2
41	1/13/17	Mod	Perch 24	Owl	BAOW	Gopher	1 pellet containing bones (gopher?)		1
42	1/13/17	Mod	Perch 28	Scat	Carnivore		1 pellet (medium-sized, light-colored, with bones)		1
43	1/13/17	Buffer	Perch 17	Owl	BAOW	Rodent sp.; Fish sp.	1 pellet	Buffer zone	1
43	1/13/17	Buffer	Perch 17	Owl	BAOW	American Coot	1 pellet	Buffer zone	1
44	1/13/17	Mod	Perch 31	Owl	BAOW	House Mouse; Black Rat-2	1 pellet		1
44	1/13/17	Mod	Perch 31	Owl	BAOW	Gopher; House Mouse	1 pellet		1
45	1/27/17	Mod	Perch 22	Owl	GHOW	Gopher	1 pellet (medium-sized, with fur & bones)		1
46	1/27/17	Mod	Perch 24	Owl	GHOW	Black Rat	1 pellet (large, fresh, with fur & bones)		1
47	2/3/17	Test	Hawk Platform 1	Owl	GHOW	Gopher-2; Big-eared Woodrat; Aves sp.	1 pellet		1
47	2/3/17	Test	Hawk Platform 1	Owl	GHOW	American Coot; Desert Cottontail	1 pellet		1
48	2/3/17	Test	Perch 7	Owl	BAOW	Gopher; House Mouse	1 pellet		1
49	2/3/17	Test	Perch 4	Raptor		Desert Cottontail	Bones (2 skull bones)		1

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
50	2/3/17	Test	Perch 6	Raptor		Desert Cottontail	Fur (2 pieces)		2
51	2/3/17	Test	50 ft. south of Perch 14	Raptor		Black Rat; Song Sparrow	1 pellet (small, with fur & bones)	Buffer zone	1
52	2/9/17	Mod	Perch 21	Owl	BAOW	Gopher	1 pellet (medium-sized, partly disintegrated, with bones)		1
53	2/9/17	Mod	Perch 27	Owl	BAOW	House Mouse; Jerusalem Cricket	2 pellets (one irregularly-shaped)		2
54	2/9/17	Buffer	Perch 18	Scat	Carnivore	Desert Cottontail	3 pellets (medium-sized, with fur & bone)	Buffer zone	3
55	2/9/17	Mod	Perch 24	Raptor	COHA	American Coot; Desert Cottontail	1 pellet (large, with fur)	Red-tailed Hawk perch	1
56	2/24/17	Mod	Perch 21	Raptor	RTHA	Desert Cottontail-2	1 pellet (disintegrated)		1
57	2/24/17	Mod	Perch 29	Scat	Carnivore	Desert Cottontail; Snake sp.	1 pellet (large, with fur)		1
58	2/24/17	Mod	Perch 31	Owl	GHOW	Peromyscus sp.; Bryant's Woodrat	1 medium pellet		1
58	2/24/17	Mod	Perch 31	Owl	GHOW	Bryant's Woodrat	1 tiny pellet		1
59	2/24/17	Mod	Perch 20	Raptor	RTHA	Brush Rabbit	1 pellet (large, with many bones)		1
60	2/24/17	Mod	Perch 22	Raptor	RTHA	Brush Rabbit; Deer Mouse	1 pellet (medium, with fur & bones)		1
61	2/24/17	Mod	Near Perch 28	Scat	Carnivore	Desert Cottontail	3 pellets (large, clumped together)	Red-tailed Hawk perch	3
62	3/3/17	Test	Hawk Platform 1	Owl	BAOW	Desert Cottontail; Gopher	1 large dried pellet	School fence	1
62	3/3/17	Test	Hawk Platform 1	Owl	GHOW	Bryant's Woodrat; Aves sp.; Jerusalem Cricket	1 fresh large pellet	School fence	1
62	3/3/17	Test	Hawk Platform 1	Raptor		Gopher; Black Rat, Passerine sp.	1 old medium pellet	School fence	1
63	3/3/17	Test	Hawk Platform 1	Raptor	RTHA	Ground Squirrel	1 dried carcass?	On school fence	1
64	3/3/17	Test	Perch 11	Raptor	RTHA	Desert Dottontail	1 pellet (medium-sized)		1
65	3/3/17	Test	Perch 14	Owl	BAOW	Desert Cottontail; Gopher	1 pellet (medium-sized)		1
65	3/3/17	Test	Perch 14	Owl	BAOW	Desert Cottontail; Gopher	1 pellet (medium-sized)		1
66	3/10/17	Mod	Perch 23	Owl	BAOW	Deer Mouse; House Mouse	1 pellet (large, oval)		1
67	3/10/17	Buffer	Perch 16	Owl	BAOW	Virginia Opossum	1 pellet (medium-sized, dry, with fur)	Buffer zone	1
68	3/10/17	Mod	Perch 30	Raptor		Lizard sp.	1 pellet (tiny, with bone)		1
69	3/24/17	Mod	Perch 25	Raptor		Gopher	1 pellet (medium-sized)		1
70	3/24/17	Mod	Perch 29	Scat	Carnivore	Ground Squirrel; Fish sp.	1 possible pellet	Wood chip?	1
71	3/24/17	Mod	Perch 22	Scat	Carnivore	Desert Dcottontail; California Vole; Deer Mouse	4 pellets (1 large, 3 medium, with fur)		4
72	4/7/17	Mod	Perch 25	Scat	Carnivore		1 possible pellet (tiny)		1

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
73	4/7/17	Mod	Perch 27	Scat	Carnivore		1 pellet (medium, broken up)		1
74	4/7/17	Mod	Perch 31	Raptor		Brush Rabbit	ground squirrel fur swatches?		1
75	4/7/17	Mod	Perch 24	Raptor	COHA	Passerine sp.	1 pellet (medium-sized, with fur)		1
76	4/7/17	Mod	Perch 26	Scat	Carnivore	Mammal sp.	2 pellets (large, crushed, with fur)		2
77	4/14/17	Test	Hawk Platform 1	Raptor	RTHA	Desert Cottontail; Ground Squirrel; Gopher	1 pellet (large)		1
78	4/14/17	Test	Owl Box 1	Owl	GHOW	Desert Cottontail; Bryant's Woodrat; American Coot	1 pellet (large)		1
79	4/14/17	Test	Perch 11	Raptor		Desert Cottontail	1 jaw bone		1
80	4/14/17	Test	Perch 12	Raptor		Brush Rabbit	ground squirrel fur tufts?		1
81	4/14/17	Test	Perch 14	Raptor		Ground Squirrel; Passerine sp.	1 pellet (small, with bones & fur)		1
82	4/21/17	Buffer	Perch 19	Raptor	Kestrel	Passerine sp.; Grasshopper sp.	1 pellet (medium-sized, fur)	Buffer zone	1
83	4/21/17	Mod	300 ft. south of Perch 31	Scat	Carnivore		6 pellets (3 small, 3 medium, fur)	Under power pole	6
84	4/21/17	Mod	Perch 28	Scat	Carnivore		1 pellet (medium, broken, fur & bone)	Red-tailed Hawk perch	1
85	5/5/17	Mod	75 ft. north of Perch 23	Raptor		Gopher	1 top of jaw bone with teeth	Under power pole	1
86	5/5/17	Mod	Perch 25	Scat	Carnivore		1 small pellet?		1
87	5/5/17	Buffer	Perch 18	Raptor		Gopher	1 jaw bone & 1 paw		2
88	5/5/17	Mod	Perch 20	Raptor		Ground Squirrel	ground squirrel fur & skin?		1
89	5/5/17	Mod	Perch 28	Scat	Carnivore		2 pellets (medium-sized w/ fur)		2
90	5/12/17	Test	Hawk Platform 1	Raptor		Gopher	1 set upper gopher teeth?		1
91a	5/12/17	Test	Hawk Platform 1	Scat	Carnivore	Desert Cottontail; Brush Rabbit; Black Rat; House Mouse, Gopher-4; Passerine sp.; Jerusalem Cricket	10 pellets	School yard	10
91b	5/12/17	Test	Hawk Platform 1	Owl	BAOW	Gopher	1 pellet		1
92	5/12/17	Test	Perch 2	Raptor		House Mouse; Black Rat	1 bone & 1 tuft of fur		2
93	5/19/17	Mod	Perch 31	Owl	BUOW	Insecta sp.; Passerine sp.; Lizard sp.	1 pellet (medium-sized)		1
94	5/19/17	Mod	Perch 26	Scat	Carnivore		1 pellet (medium-sized with fur)	Small bone nearby	1
95	6/2/17	Buffer	Perch 19	Scat	Carnivore		1 pellet (loose, medium-sized)		1
96	6/2/17	Buffer	Perch 18	Owl	BUOW	Deer Mouse-2	1 pellet (small)		1
97	6/9/17	Test	Hawk Platform 1	Raptor	RTHA	Desert Cottontail; Passerine sp.	3 pellets (2 large, 1 medium) & 1 bone	School yard	4

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
98	6/9/17	Test	Perch 11	Scat	Carnivore	Mammal sp.; Rodent sp.	1 pellet (medium-sized)		1
99	6/9/17	Test	Perch 13	Scat	Carnivore		3 pellets (large smashed)		3
100	6/9/17	Test	Perch 2	Owl	BAOW	Gopher; Ca Pocket Mouse; Passerine sp.; Beetle	1 pellet (large with fur & bones)		1
101	6/9/17	Test	Perch 8	Owl	BAOW	Bryant's Woodrat	1 pellet (medium with fur & bones)		1
102	6/9/17	Test	Perch 10	Raptor	RTHA	Gopher Snake; Gopher	1 pellet (medium with fur & a straw?)		1
103	6/9/17	Test	Perch 12	Raptor	RTHA	Snake sp.; Desert Cottontail; House Mouse; Passerine sp.; Crayfish	1 pellet & tufts of fur & small rodent remains		1
104	6/9/17	Test	Perch 6	Raptor		Passerine sp.	1 swatch of feathers (bloody)		1
105	6/16/17	Mod	Perch 23	Raptor		Deer Mouse	1 kill (portion of rodent)		1
106	6/16/17	Mod	Perch 29	Raptor	COHA	Phalarope sp.	1 pellet (small)		1
107	6/16/17	Buffer	Perch 16	Scat	Carnivore		3 pellets (with fur, bones & claw)		3
108	6/16/17	Mod	Perch 24	Owl	BUOW	Reptile sp.; Grasshopper; Ladybird Beetle-3; Beetles-2	1 pellet (with crayfish, insects & bones)		1
109	6/16/17	Mod	Perch 26	Raptor	RTHA	Black Rat; Ladybird Beetle-2; Beetles-2; Lepidopteran Larvae	1 pellet		1
109	6/16/17	Mod	Perch 26	Raptor	RTHA	Gopher; Passerine sp.	1 pellet		1
109	6/16/17	Mod	Perch 26	Raptor	RTHA	Gopher; Passerine sp.	1 pellet		1
110	6/30/17	Mod	Perch 24	Raptor		Deer Mouse	1 swatch of rodent fur		1
111	6/30/17	Mod	Perch 28	Raptor		Passerine sp.; Deer Mouse	1 pellet (small with fur & bones)		1
112	7/7/17	Test	Hawk Platform 1	Owl	GHOW	Aves sp.	1 large pellet		1
112	7/7/17	Test	Hawk Platform 1	Owl	GHOW	Aves sp.; Gopher	1 large pellet		1
113	7/7/17	Test	Perch 11	Owl	GHOW	Gopher-2	1 pellet (large)		1
114	7/7/17	Test	Perch 13	Owl	BAOW	Gopher	1 pellet (medium-sized)		1
115	7/7/17	Test	Perch 10	Scat	Carnivore		3 pellets (large, with fur & bones)		3
116	7/7/17	Test	Perch 12	Owl	BAOW	Gopher	1 pellet		1
116	7/7/17	Test	Perch 12	Owl	BAOW	Gopher	1 pellet		1
117	7/14/17	Mod	Perch 27	Scat	Carnivore		5 pellets (medium)		5
118	7/14/17	Mod	Perch 27	Raptor		Gopher-2	3 jaws (gopher)		3
119	7/14/17	Mod	Perch 29	Scat	Carnivore		4 pellets (medium)		4
120	7/14/17	Mod	Perch 22	Scat	Carnivore		1 pellet (large, with bones & fur)	Looks moist.	1

Bag	Date	Site Loc.	Location Found	Sample Type	Species of Pellet	Prey Remains	Description	Comments	Item Count
121	7/14/17	Mod	Perch 26	Raptor		Gopher	1 upper skull & 1 jaw (with blood…)	Ground squirrel or gopher	2
122	7/14/17	Mod	Near Perch 26 under*	Scat	Carnivore		2 pellets (broken, with bones & fur)	*aerial photo point platform	2

Prey Compilation		Test		Control	
Category	Common Name	Pellets (MNI) *	Scat (MNI)	Pellets (MNI)	Scat (MNI)
Invertebrates	Insects sp.			1	
	Crayfish			12	1
	Kelp Crab (*Pugettia producta*)		2		
	Lepidopteran larvae			1	
	Jerusalem Cricket	1		6	1
	Grasshopper			11	
	Ladybird Beetle			5	
	Beetles sp.			5	
Fish	Fish sp.			1	1
Amphibians	*Rana* sp.	1			
	Pseudacris sp.				1
	African Clawed Frog		1		
Reptiles	Lizard sp.			3	
	Snake sp.			1	1
	Gopher Snake			1	
Birds	Aves sp.			7	
	Passerine sp.			17	1
	Virginia Rail			2	
	American Coot	3	1	13	1
	Eurasian Collared-Dove			1	
	Red-winged Blackbird	1			
	Song Sparrow			1	
Mammals	Mammal sp.				1
	Rodent sp.			2	2
	Virginia Opossum		1	3	2
	Ornate Shrew			1	
	Desert Cottontail	3	2	17	8
	Brush Rabbit			5	1
	Botta's Pocket Gopher	2	3	45	6
	California Ground Squirrel	3		5	1
	California Pocket Mouse			1	
	Deer Mouse			11	1
	Bryant's Woodrat (=Desert Woodrat)			5	
	Big-eared Woodrat			1	
	California vole				1
	Muskrat	1			
	House Mouse	1		20	4
	Black Rat			8	4

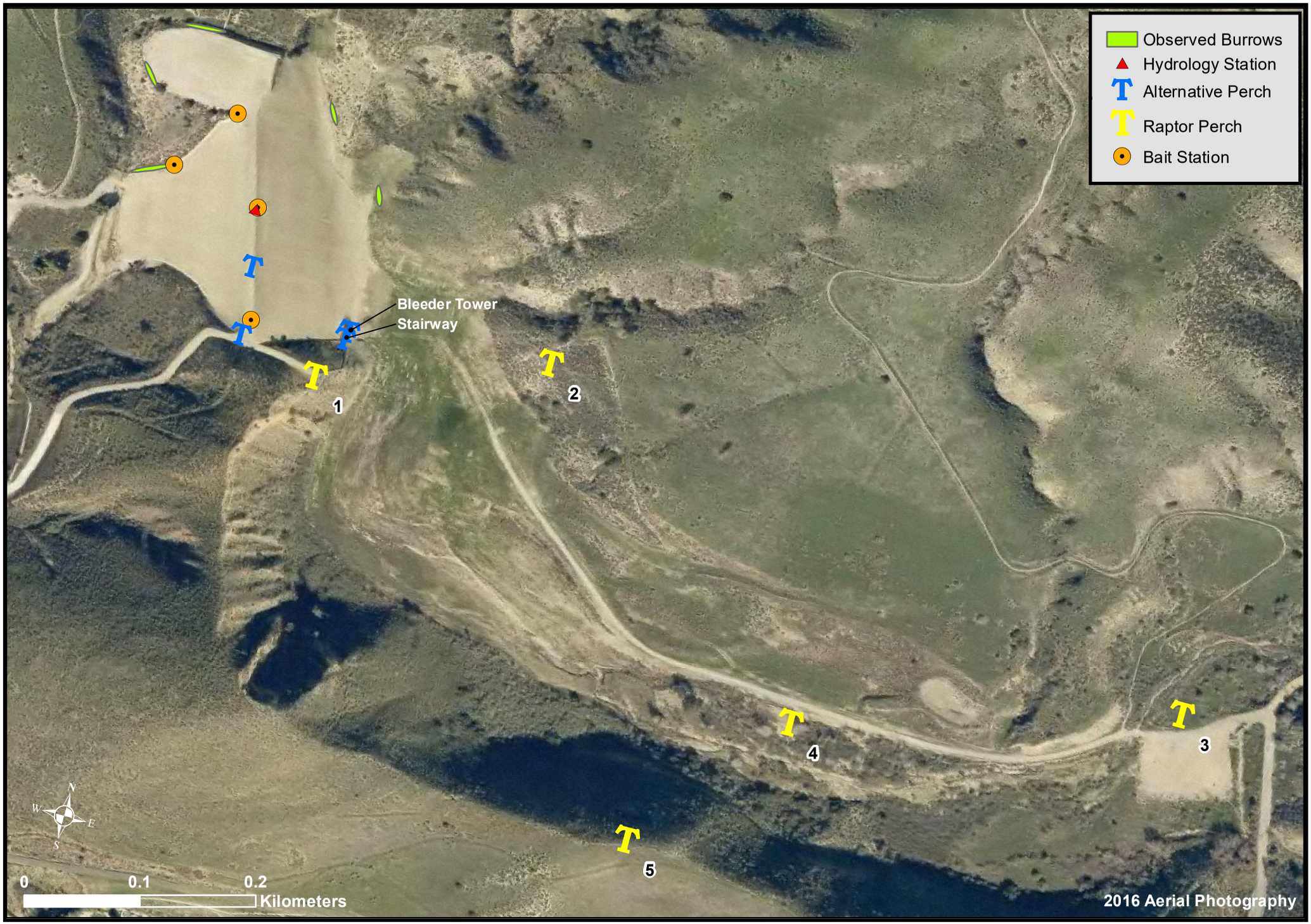
* Minimum Number of Individuals

Appendix G
Conejo Mountain Basin No. 1, South Branch Arroyo Conejo
& Las Llajas Dam Perches

Ventura County Watershed Protection District

Prepared by Operations & Maintenance Division

State Plane Coordinate System California Zone V - NAD 27



Las Llajas Dam Perches

South Branch Arroyo Conejo Perches - Wendy Dr. to Borchard Dr.

Appendix H
Diphacinone Bait Label

PRECAUTIONARY STATEMENTS

Hazard to Humans and Domestic Animals

CAUTION

Keep away from children, pets, and domestic animals. Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing. Wear long-sleeved shirts and long pants, socks and shoes, and gloves. Wash thoroughly with soap and water after handling. Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Any person who retrieves carcasses or unused bait following application of this product must wear gloves. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. Keep and wash PPE separate from other laundry. Follow manufacturer's instructions for cleaning/maintaining personal protective equipment (PPE). If no such instructions for washables, use detergent and hot water.

Environmental Hazards

This product is toxic to fish, birds, and other wildlife. Bait exposed to soil surfaces may be hazardous to birds and other wildlife. Dogs and other predatory and scavenging animals might be poisoned if they feed upon animals that have eaten this bait. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the high-water mark. Do not contaminate water when disposing of equipment wash water or rinsate.

ENDANGERED SPECIES CONSIDERATIONS

Notice: Killing of an endangered species may result in fine and/or imprisonment under the Endangered Species Act. The use of this product may pose a hazard to a Federally designated endangered/threatened species. For protection of federally listed species, users shall consult the U.S. EPA Endangered Species Bulletin for the county in which the application will occur. A copy of the bulletin may be obtained from the county agricultural commissioner or downloaded from the internet at the following website: http://www.cdpr.ca.gov/docs/es/colist.htm.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage and disposal.

Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available.

Pesticide Storage: Store in a dry place. Do not store around the home. Store in a locked enclosure or other location not accessible to children, pets, domestic animals or wildlife.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by the use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Handling: Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill, or by incineration, or if allowed by State or Local authorities, by burning. If burned, stay out smoke.

RESTRICTED USE PESTICIDE

Due to Hazard to Nontarget Organisms

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

RODENT BAIT
DIPHACINONE
TREATED GRAIN (0.005%)

Active Ingredient:

Diphacinone 2-diphenylacetyl-1, 3-indandione:……..	0.005%
Inert Ingredients.....……..	99.995%
Total:.....…… ….....	100.000%

CAUTION

KEEP OUT OF REACH OF CHILDREN

FIRST AID

Anticoagulant (Bis-hydroxycoumarin class)

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

If Swallowed	▪ Call a poison control center or doctor immediately for treatment advice. ▪ Have person sip a glass of water if able to swallow. ▪ Do not induce vomiting unless told to do so by the poison control center or doctor. ▪ Do not give anything by mouth to an unconscious person.
If on Skin	▪ Take off contaminated clothing. ▪ Rinse skin immediately with plenty of water for 15-20 minutes. ▪ Call a poison control center or doctor for treatment advice.
If in Eyes	▪ Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. ▪ Call a poison control center or doctor for treatment advice.

For more information on this pesticide product (including health concerns and medical emergencies), call the National Pesticide Telecommunications Network at 1-800-858-7378.

NOTE TO PHYSICIAN

This product contains diphacinone, an anticoagulant of the bis-hydroxycoumarin class. Vitamin K is antidotal. If ingested, administer Vitamin K intramuscularly or orally, as indicated in bis-hydroxycoumarin overdoses. Repeat as necessary based on monitoring of prothrombin times.

NOTE TO VETERINARIAN

If a pet or other unintended animal ingests bait call a veterinarian or 1-800-858-7378 at once. Contains diphacinone, an anticoagulant with a half-life in the dog of unknown days. For dogs that have ingested or that are suspected of having ingested diphacinone, and/or have obvious poisoning symptoms, such as bleeding or have elevated prothrombin times, give Vitamin K as follows: intramuscular injection. For anticoagulants with long half-lives, if known, it might be necessary to check prothrombin times every 3 days until values return to normal. See 'Note to Physician' for additional information.

Manufactured for:
California Department of Food and Agriculture
1220 "N" Street, Room 341
Sacramento, CA 95814

EPA SLN No. CA 890020
EPA EST. No. 11071-CA-001
California Reg. No. 10965-50001 Net Contents:_____ lbs.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

THIS PRODUCT MAY ONLY BE DISTRIBUTED AND USED IN CALIFORNIA AND MAY ONLY BE SOLD BY THE OFFICES OF CALIFORNIA'S COUNTY AGRICULTURAL COMMISSIONER

READ THIS LABEL: Read this entire label and follow all directions and use precautions.

IMPORTANT: Store product not in use at a location out of reach of children, pets, domestic animals, and wildlife. Dispose of product container, unused, spoiled, and unconsumed bait as specified in the "**STORAGE AND DISPOSAL**" section of this label.

USE RESTRICTIONS – FOR ALL USES

This product may only be used to control CALIFORNIA GROUND SQUIRRELS (*Spermophilus beecheyi,)*, NORWAY RATS (*Rattus norvegicus*), ROOF RATS (*R.. rattus*), WOOD RATS (*Neotoma spp.*), MEADOW MICE (Voles, *Microtus californicus*, *M. montanus*), JACKRABBITS (Black-tailed hare, *Lepus californicus*), COTTONTAIL RABBITS (*Sylvilagus audobonii ssp.*), *CHIPMUNKS (Tamias alpinus, T. amoenus, T. merriami, T. minimus, T. ochrogenys, T. panamintinus, T. quadrimaculatus, T. senex, T. siskiyou, T. sonomae, T. speciosus and T. umbrinus)*, MUSKRATS (*Ondatra zibethica*) and DEER MICE *(Peromyscus maniculatus, P. californicus, P. truei, and P.boylii)* and at the use sites and using the application methods identified in the **"USE DIRECTIONS"** paragraphs indicated below for the target species groupings. Contact your local County Agricultural Commissioner's office if you need help in identifying the target species you intend to control or are not sure about the limits of site designations.

Do not contaminate food or food stuffs.

Do not apply this product in or around homes or other human residences. **Do not** apply this bait at sites or to control pests not indicated on this label. **Do not** apply this product by application methods that are not specified on this label. **Do not** pile bait.

For certain use patterns, this product may be applied by use of spot baiting techniques as described below. For all other applications, bait must be used in covered or enclosed bait stations designed to minimize spillage and to limit or prevent access by nontarget species. Use bait stations which have entrances large enough to accommodate target species but not larger animals. Depending on the claimed pest being targeted, bait stations may include tamper-resistant designs, other types of covered or enclosed feeders or dispensers, covered nursery flats, or, for muskrats only, floating covered or enclosed bait stations. Where necessary to protect endangered rodents or where otherwise applicable, use the modified bait station designs described at http://www.cdpr.ca.gov/docs/es/co/list.htm. Secure bait stations to prevent overturning and bait spillage.

Apply baits in locations out of reach of children, pets, and domestic animals. If this is not possible, baits shall be used only in tamper-resistant bait stations that are resistant to destruction by dogs, wildlife, domestic animals, and children under six years of age. If bait is to be used in and around agricultural buildings and facilities for domestic animals the bait must be placed in tamper-resistant bait stations which shall be secured indoors or within 10 feet of farm buildings (other than farm or ranch house), fence lines, food or feed storage areas, lumber piles, or trash and garbage containers,.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Keep all other persons out of the treatment area during application.

Do not place bait in areas where contaminating food, or surfaces that may contact food or feed, is likely.

Do not graze livestock or plant food or feed crops in spot-treated areas while bait is present. Applications in vineyards, orchards, and groves may only be made after harvest and during the dormant period and may not be made after tree and vine growth resumes in the spring.

BAIT STATION APPLICATIONS - GENERAL INSTRUCTIONS

It may take several days or longer for target animals to become accustomed to a bait station and to begin to accept bait from it. Maintain an uninterrupted supply of bait in the bait stations for as long as target species are taking bait, which often will last from 1 to 4 weeks after feeding begins. Check stations one or more times per week and replace consumed, spoiled or contaminated bait. Properly dispose of bait that is removed from bait stations or is spilled or scattered from bait stations.

PLEASE SEE BACK PANEL FOR CONTINUATION OF DIRECTIONS FOR USE

(CONTINUED FROM FRONT PANEL)

When feeding of toxic bait by targeted species discontinues and there is not a threat of continued reinvasion, remove and dispose of bait from the station properly. Bait stations may be removed at the time or left in place if reinfestation is likely. Stations left in place may be baited periodically with nontoxic feed to aid in the detection of target species attempting to recolonize the site and to condition them to feeding in the bait stations. If target rodents return, census baits may be replaced by this product.

FOLLOW-UP OPERATIONS – FOR ALL USES

Collect dead rodents and dispose of them by deep burying, burning (if permitted in your County or community), or double plastic bagging or by wrapping in newspaper and discarding in the trash. Wear disposable plastic gloves or other suitable hand protection if you must pick up carcasses by hand.

IN/AROUND AGRICULTURAL BUILDINGS, AGRICULTURAL CROPS, RANGELAND, FORESTRY PLANTATIONS AND SELECTED NONCROP AREAS

CALIFORNIA GROUND SQUIRRELS

USE RESTRICTIONS: This product may be used to control California Ground Squirrels *(Spermophilus beecheyi)* in bait station applications in and around livestock buildings (e.g., cattle barns, poultry houses); around (but not within) livestock pens; in and around vineyards, orchards, and groves; in rangelands, noncrop borders, and fallow lands; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; and in campgrounds, recreational areas, horticultural nurseries, and plantations of forest trees.

This product may also be used in spot-treatment applications in vineyards, orchards, and groves after harvest and during the dormant season, and in rangeland. Do not graze livestock or plant food or feed crops in spot-treated areas while bait is present.

BAIT ACCEPTANCE TRIALS: Before applying toxic bait, test for target species' readiness to accept this product by applying untreated crimped oat groats, to portions or all of the infested area, using the same application method (bait station or spot baiting) that is to be used for toxic baiting. Observe prebaited areas to determine whether nontarget species have found and consumed the oats. Adjust treatment methods to minimize nontarget hazards. Do not apply toxic bait if it appears that nontarget species are primarily responsible for consuming the oats. Apply toxic bait only if ground squirrels appear to have accepted the oats readily. Untreated crimped oat groats may be obtained form the County Agricultural Commissioner's office.

BAIT STATION BAITING: Secure tamper-resistant bait stations near active ground squirrel burrows or runways. Place stations at intervals of 20 to 100 feet. Load 1 to 5 pounds of bait into bait station. Inspect stations at least weekly and replenish bait as needed. Remove and properly dispose of spoiled or fouled bait.

SPOT BAITING: Using a bait spoon, evenly scatter 1/3 cup (0.1 lb) of bait over 40 to 50 square feet near active squirrel burrows and runways. Do not over-bait. Do not place bait in piles. Using the same procedure, make a second application 4 days after the first. Do not apply more than 10 pounds of bait per acre per treatment.

NORWAY RATS and ROOF RATS

USE RESTRICTIONS: This product may be used to control Norway rats (Rattus norvegicus) and roof rats (R. Rattus) in and around agricultural buildings and facilities for domestic animals (e.g., cattle barns, poultry houses); around (but not within) livestock pens; after harvest and in dormant season applications only in orchard, groves, and vineyards; rangeland, noncrop borders, and fallow lands; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; and in campgrounds, recreational areas, horticultural nurseries, and plantations of forest trees.

BAIT STATION BAITING: Place 4 to 16 ounces of bait in a secure tamper-resistant bait station. Place bait stations in dry locations such as in concealed places, in corners, along walls where rats feed, drink, or frequent. For Norway rats, put bait stations at or near ground level and at burrows and harborages. For roof rats, place bait stations at ground floor and top floor, or attic levels. Inspect stations at least weekly and replenish bait as needed. Remove and properly dispose of spoiled or fouled bait.

WOOD RATS

USE RESTRICTIONS: This product may be used to control wood rats (Neotoma spp.) in and around agricultural buildings and facilities for domestic animals (e.g., cattle barns, poultry houses); after harvest and in dormant season applications only in orchard, groves, and vineyards; rangeland, noncrop borders, and fallow lands; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; and in campgrounds, recreational areas, horticultural nurseries, and plantations of forest trees.

BAIT STATION BAITING: Place 4 to 16 ounces of bait in a secure tamper-resistant bait station. Bait stations should be located near existing wood rat runways or dens, and generally spaced no further than 100 feet apart. Inspect stations at least weekly and replenish bait as needed. Remove and properly dispose of spoiled or fouled bait.

AGRICULTURAL CROPS, RANGELAND, FORESTRY PLANTATIONS AND SELECTED NONCROP AREAS

MEADOW MICE (VOLES)

USE RESTRICTIONS: This product may be used to control California voles and montane voles after harvest and in dormant season applications only in orchard, groves, and vineyards; in noncrop borders and fallow lands; along the outside of fence rows and rights–of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; in campgrounds, recreational areas, horticultural nurseries and plantations of forest trees, and in rangelands. Do not graze livestock or plant food or feed crops in spot-treated areas while bait is present.

SPOT BAITING: Using a bait spoon, evenly scatter one to two tablespoons of bait (1/4 to ½ ounce) near active burrow openings or in runways. Do not over-bait. Do not place bait in piles. Using the same procedure, make a second application 4 days after the first. Do not apply more that 10 pounds of bait per acre per treatment.

BLACK-TAILED JACKRABBITS

USE RESTRICTIONS: This product may be used to control black-tailed jackrabbits (*Lepus californicus*) using self-dispensing feeders situated along borders of agricultural crops; in rangelands and fallow land; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; in horticultural nurseries and plantations of forest trees; and in campgrounds and recreational areas.

BAIT STATION BAITING: Place 1 to 5 pounds of bait in a covered or enclosed self-dispensing feeder or a covered or enclosed nursery flat near runways, or nesting or feeding areas used by jackrabbits. Replenish bait as needed to control jackrabbits. Move feeders to new locations in permitted use sites if necessary to achieve acceptance of bait by jackrabbits. Remove and properly dispose of spoiled or fouled bait.

COTTONTAIL RABBITS

USE RESTRICTIONS: This product may be used to control cottontail rabbits (*Sylvilagus audobonii ssp.*) using self-dispensing feeders situated along borders of agricultural crops; in rangelands and fallow land; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; in horticultural nurseries and plantations of forest trees; in campgrounds and recreational areas; and in industrial, institutional, and commercial landscaped areas.

BAIT STATION BAITING: Place 1 to 5 pounds of bait in a covered or enclosed self-dispensing feeder or a covered or enclosed nursery flat near runways, or nesting or feeding areas used by cottontails. Replenish bait as needed to control cottontails. Move feeders to new locations in permitted use sites if necessary to achieve acceptance of bait by cottontails. Remove and properly dispose of spoiled or fouled bait.

FORESTRY PLANTATIONS AND SELECTED NONCROP AREAS

CHIPMUNKS

USE RESTRICTIONS: This product may be used to control chipmunks *(Tamias alpinus, T. amoenus, T. merriami, T. minimus, T. ochrogenys, T. panamintinus, T. quadrimaculatus, T. senex, T. siskiyou, T. sonomae, T. speciosus and T. umbrinus)* in tamper-resistant bait station applications in and around campgrounds and recreational areas; along noncrop borders; in fallow lands; along outsides of fence rows and rights-of-way adjacent to canal banks, ditch banks, highways, levees, railroad lines, and utilities; and in horticultural nurseries and plantations of forest trees.

BAIT STATION BAITING: Secure tamper-resistant bait stations near active chipmunk burrows or runways. Place stations at intervals of 20 to 50 feet. Load 4 to 16 ounces of bait into each bait station. Inspect stations at least weekly and replenish bait as needed. Remove and properly dispose of spoiled or fouled bait.

NATURAL/MANMADE WATERWAYS AND WETLANDS ADJACENT TO AGRICULTURAL CROPS, RANGELAND, FORESTRY PLANTATIONS AND SELECTED NONCROP AREAS

MUSKRATS

USE RESTRICTIONS: This product may be used to control muskrats (*Ondatra zibethica*) in floating bait station applications in natural and manmade waterways and wetlands adjacent to agricultural crops, rangelands, noncrop borders, uncultivated agricultural areas and rights-of-way.
Do not apply baits to control muskrats in the crops, rangeland, noncrop borders, uncultivated agricultural areas, and rights-of- way themselves

BAIT STATION BAITING: Secure covered or enclosed bait station to a small raft. Anchor or secure floating bait station to bank or bottom. Load 1 to 5 pounds of bait in a floating covered or enclosed bait station. Check stations at least weekly and replenish bait as needed to control muskrats. Remove and properly dispose of spoiled or fouled bait.

AGRICULTURAL CROPS

DEER MICE

USE RESTRICTIONS: This product may be used to deer mice (Peromyscus maniculatus, P. californicus, P. truei, and P. boylii) after harvest and in dormant season applications only in orchards, groves, and vineyards. Do not graze livestock or plant food or feed crops in spot-treated areas while bait is present.

BAIT STATION BAITING: Secure tamper-resistant bait stations near active infestation. Place stations at intervals of 70 to 100 feet. Load 4 to 8 ounces of bait into bait station. Inspect stations at least weekly and replenish bait as needed. Remove and properly dispose of spoiled or fouled bait.

SPOT BAITING: Using a bait spoon, evenly scatter one to two tablespoons of bait (1/4 to 1/2 ounce) near areas where active feeding has occurred. Do not over-bait. Do not place bait in piles. Using the same procedure, make a second application 4 days after the first. Do not apply more than 10 pounds of bait per acre per treatment.

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Appendix I

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