CHAPTER 8: RODENT MANAGEMENT

The Army natural resource program on Oahu (OANRP) has managed Makua Implementation Plan (MIP) and Oahu Implementation Plan (OIP) species that are subject to rodent predation with various strategies since 1997. This chapter discusses rodent control methods utilized over the past reporting year and highlights recent changes. Specifically, this chapter has five main sections: Section 8.1 provides an overview of the current rodent control program and discusses recent changes; Section 8.2 introduces tracking tunnel results from large scale grids; Section 8.3 describes results for an aerial broadcast of rodenticide at Lihue Management Unit (MU); Section 8.4 discusses a trial with the rodent birth control product ContraPest; and Section 8.5 lays out future plans for rodent control.

8.1 RODENT CONTROL PROGRAM SUMMARY

OANRP has traditionally managed rats seasonally or year-round, depending on rare taxa protection needs. For example, *Chasiempis ibidis* (Oahu Elepaio) were only protected during the nesting season, while *Achatinella mustelina* are protected from predation year-round. Other grids were 'rapid response' to address threats to endangered plant resources. In the history of our program methods of rodent control that OANRP has utilized include: kill-traps (Victor snap traps, Woodstream Corporation, Lititz, PA; Ka Mate Ltd. traps, Nelson, New Zealand; and GoodNature Ltd. A24 traps, Wellington, New Zealand), Diphacinone bait (including ramik), ContraPest birth control used for trials, and predator-proof fences.

Our program has been using A24s since 2013 at several MUs and has conducted numerous trials of the traps and bait. There have been some mechanical issues involving leaking seals and gaskets that have reduced the efficacy of these traps. GoodNature has addressed these malfunctions and now produces a trap that has very few issues. Bait longevity and attractiveness are also key to trapping success. Several reasons for decreased longevity/attractiveness include mold, ants, and slugs. It is not uncommon to see slugs remove all of the bait within weeks of placement. The old bait system used a "static" lure that would only last from one to four weeks at our MUs. GoodNature has now produced an Automatic Lure Pump (ALP) baiting system that provides continuous attractive bait for up to 6 months.

In 2017-2018 our program transitioned all trapping grids from older methods to A24s with Automatic Lure Pumps (ALPs). OANRP now has 25 rodent control areas consisting of 1,030 A24s managed year-round (Table 1). Because of the success of the ALP, the standard re-baiting interval for all grids is now every 4 months. We have also been working to optimize trap spacing. Currently, we are deploying traps in larger areas with 100 by 50 meter grids but will continue to investigate this design. This method of control is now our primary way to reduce rodents for the benefit of our managed species. We plan to limit changes to the grids for the next three years while we evaluate this approach.

Table 1. Rat control areas in 2017-2018

MU (Area)	Primary Spp. Protected	Description	# A24 Traps
Ekahanui	*Chasiempis ibidis, Achatinella mustelina, Cyanea grimesiana, Schiedea kaalae, Delissea waianaeensis*	Large-scale grid	306
Kaala Army	*Labordia cyrtandrae*	One small grid	33
Kahanahaiki	*A. mustelina*	Predator-proof fence	2
Kaluaa & Waieli	*A. mustelina*	One small grid	12

Table 1 (continued).

MU (Area)	Primary Spp. Protected	Description	# A24 Traps
Kaluaa & Waieli	*D. waianaeensis, C. grimesiana*	One small grid	30
Kaluaa & Waieli (Hapapa)	*A. mustelina*	Predator-proof fence	4
Kamaohanui (in Lihue)	*A. mustelina*	One small grid	25
Keawapilau (in Kapuna Upper)	*Hesperomannia oahuensis, Schiedea nuttallii, Cyanea longiflora*	One small grid	17
Lihue (Coffee and Guava)	*Drosophila obatai*	Two small grids	17
Lihue (Haleauau)	*A. mustelina*	Two small grids	24
Lihue (Mohiakea)	*D. waianaeensis*	One small grid	10
Makaleha East	*A. mustelina*	Two small grids	20
Makaleha West	*C. grimesiana*	One small grid	15
Makaha I	*A. mustelina, H. oahuensis, C. superba*	Large-scale grid	113
Makaha I	*H. oahuensis*	One small grid	6
Makaha II	*C. grimesiana, C. longiflora, H. oahuensis, S. nuttallii*	Many small grids	51
Manuwai	*D. waianaeensis*	One small grid	8
Manuwai	*D. obatai*	One small grid	6
Ohikilolo	*A. mustelina, Pritchardia kaalae*	Large-scale grid	61
Opaeula Lower	*Cyrtandra dentata*	One small grid	50
Palehua	*C. ibidis*	Large-scale grid	92
Palikea	*A. mustelina*	Predator-proof fence	4
Palikea	*A. mustelina*	Large-scale grid	108
Palikea North	*A. mustelina*	Predator-proof fence	4
Pualii North	*H. oahuensis*	One small grid	12
Total:			**1,030**

8.2 TRACKING TUNNEL RESULTS FROM LARGE-SCALE GRIDS

For this report and future reports, a graph of tracking tunnel results will be provided for all of our large-scale grids (Kahanahaiki, Ekahanui, Makaha, Ohikilolo, and Palikea) (see Figures 1-4). In general, these graphs should be used to look at the differences between years or between control and treatment sites. Small changes of ~20% or less between or within grids cannot be assessed accurately. At Kahanahaiki, there is an associated control site at Kapuna Upper MU where no rodent control is being conducted. At other grids, we collected control data for a nearby location where no rodent supression was conducted for

one year after the grid was installed. At Makaha MU, there were monitoring tunnels within the A24 grid. We compared these to tunnels that were outside of the trapping grid, however in May 2018 the grid expanded and there will no longer be a control site for this grid. The goal of OANRP rat control is to keep tracking levels at 10% or less throughout the year. This number is based on goals developed in New Zealand.

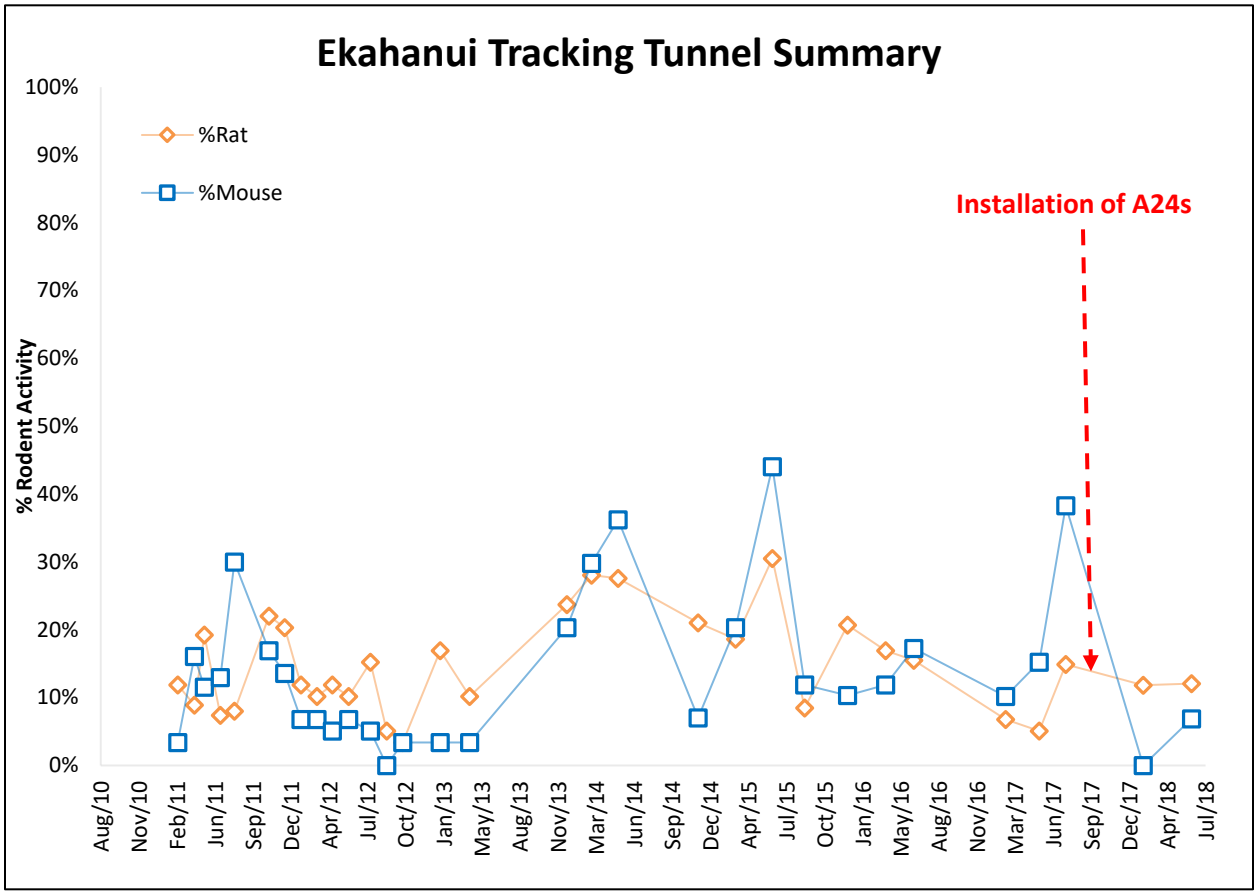

Figure 1. Percent of rodent activity at Ekahanui

The Ekahanui grid formerly consisted of ~600 Victors with a few A24s installed around snail areas from February 2011 to September 2017. Rat tracking has a relatively stable trend with a high of 30% in June 2015. Most tracking events show rates around the 10% goal (Figure 1). This grid was very labor intensive with a two week re-baiting interval that control was only conducted during the elepaio breeding season (December to June). Because of advancements in the performance of the GoodNature A24s the Victor grid was removed and 306 A24s were installed at a 100 by 50 meter spacing in September 2017.

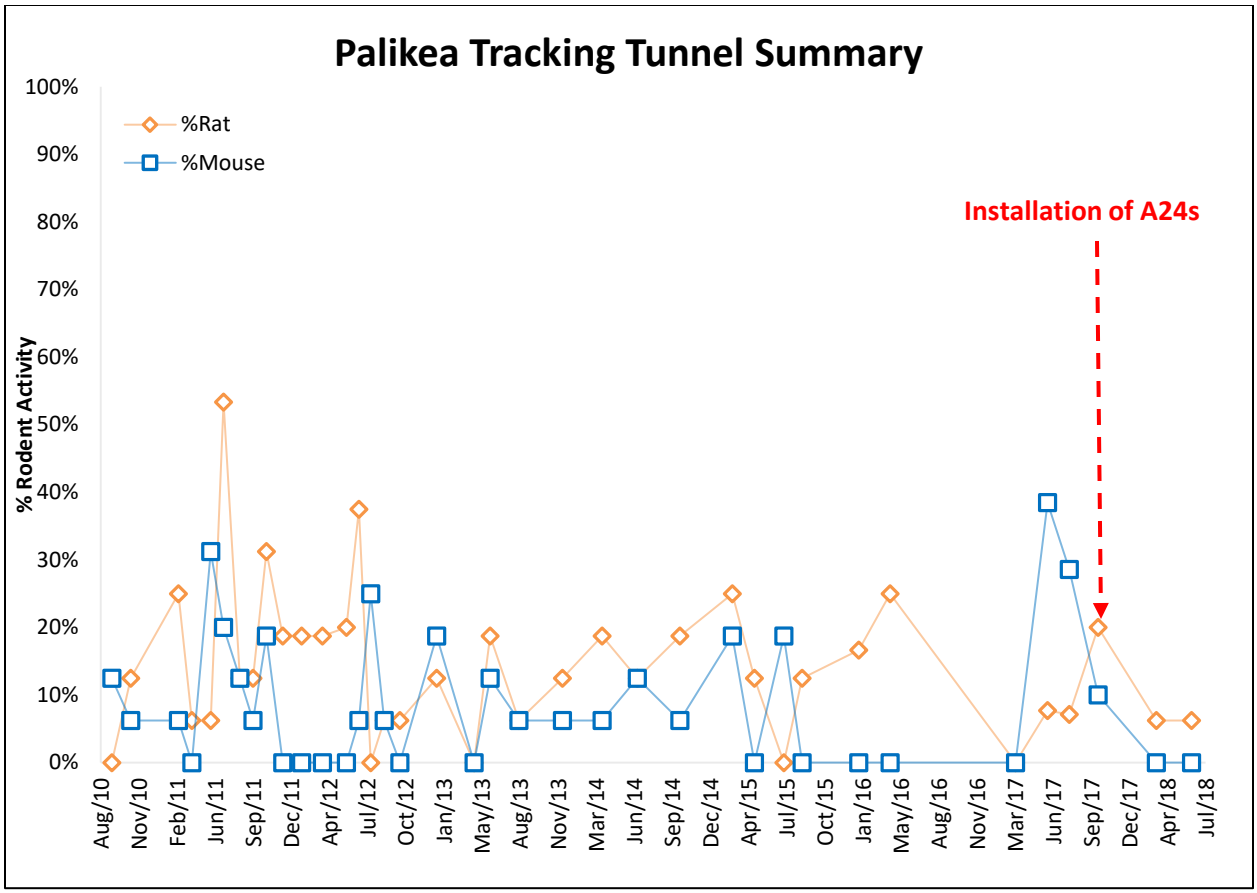

Figure 2. Percent of rodent activity at Palikea

The Palikea grid consisted of ~200 KaMate traps from August 2010 to October 2017. Rat tracking has a relatively stable trend with a high of 53% in June of 2011. Most tracking events show rates around the 10-20% level (Figure 2). In October 2017 all KaMate traps were removed and 108 A24s were installed. Since installation rat tracking has been below 10%.

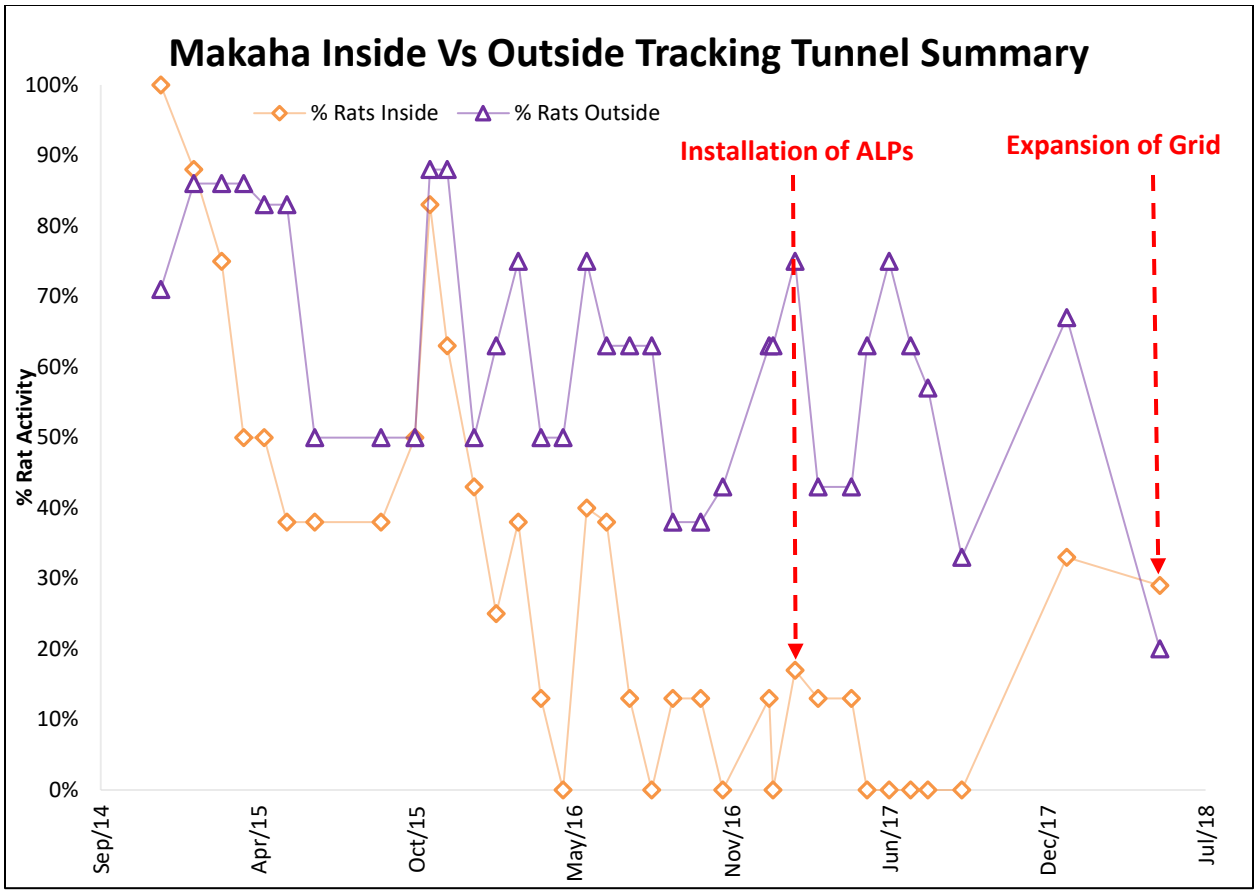

Figure 3. Percent of rodent activity at Makaha inside and outside of the A24 grid

The Makaha grid is all A24s with ALPs. Tracking within the grid has been very impressive with six 0% tracking events in 2016 and most other events close to the 10% goal following the installation of ALPs (Figure 3). In May 2018 the grid was modified due to concerns that the grid was small and did not protect all resources within the MU. The entire MU is now gridded with 113 A24s at a 100 by 50 meter spacing. The grid expanded into the area previously used to track activity outside the grid. From now on all tunnels will be within the trapping grid.

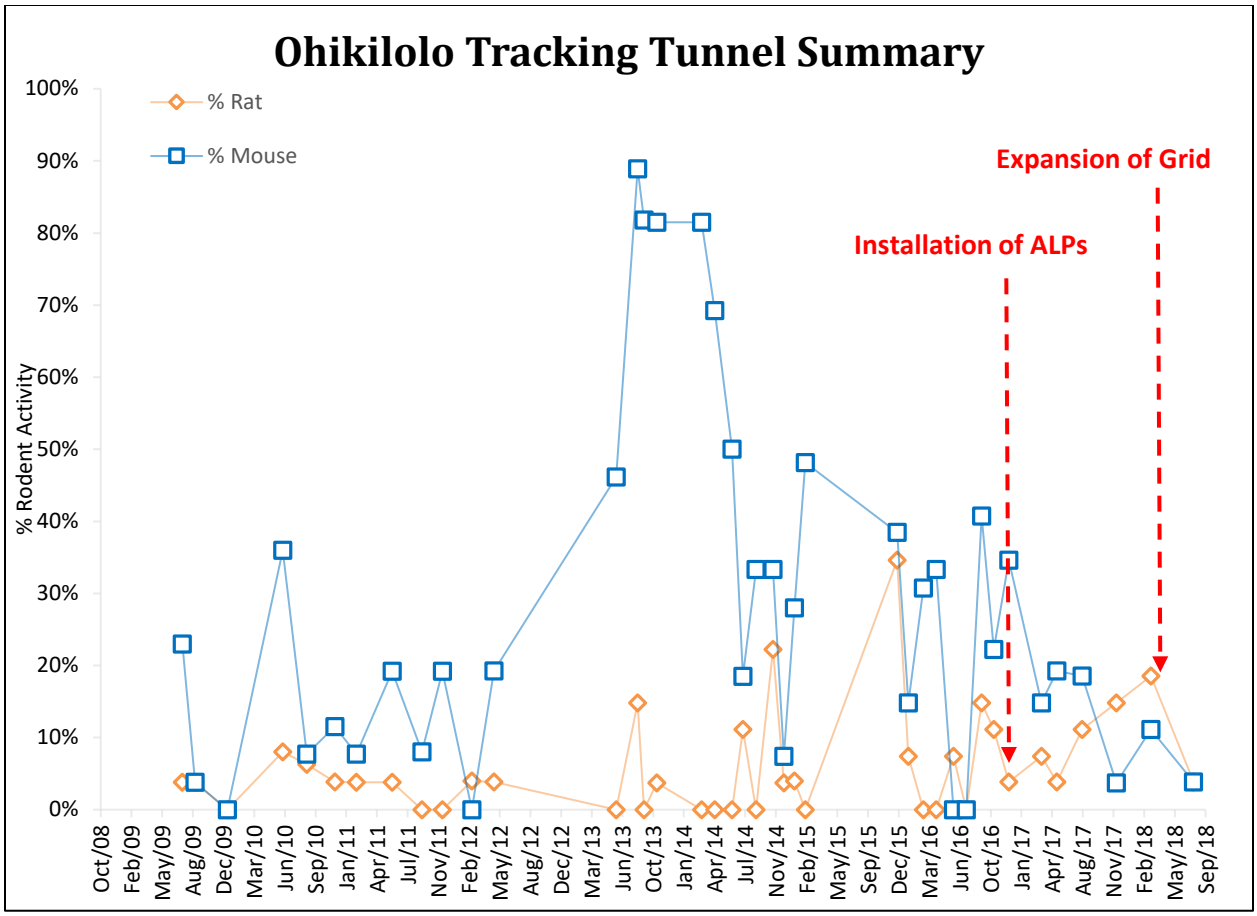

Figure 4. Percent of rodent activity at Ohikilolo

Management tools at the Ohikilolo MU have varied through the years including bait stations, hand broadcast, victor snap traps and A24s. In April 2018 the A24 grid was expanded for a total of 61 traps. The tracking trends generally indicate successful rodent suppression over the past year with all events under 20% (Figure 4).

8.3 Lihue Aerial Broadcast

In December 2017 we conducted an aerial broadcast of Diphacinone-50 over 430 hectares (ha) at the Lihue MU for the protection of the Oahu Elepaio. This action was covered by a Supplemental Environmental Assessment and Finding of No Significant Impact and includes a summary of the project, purpose & need, description of the action and affects to the environment (Appendix 8-1).

The goal of the operation was to reduce the rat activity on a management unit scale to less than 10% tracking and improve survival rates of Oahu Elepaio within Lihue MU. Standard methods of control that have been implemented include Victors, A24s, and bait stations. These methods have been very labor intensive and inconsistent due to the area only being available for re-baiting 5 days per month during range maintenance weeks.

To conduct this operation we entered into a cooperative agreement with The National Wildlife Research Center (NWRC) under the direction of Aaron Shiels. Objectives for the NWRC component of the study were to: determine the density and fate of bait from the applications, document non-target effects through

trail cameras and sample the water from the stream to test for diphacinone residues. More information can be found in Appendix 8-2. Results should be made available by the end of the year 2018.

According to the Diphacinone-50 label two applications were to be made 5-7 days apart (weather dependent). We completed the first application over two days, November 28th- 29th, due to contractual issues and weather delaying the initial start time. For the second application we were able to complete the entire area in one day on December 3rd (Figure 5). Bait was applied at a target application rate of 13.8kg/ha.

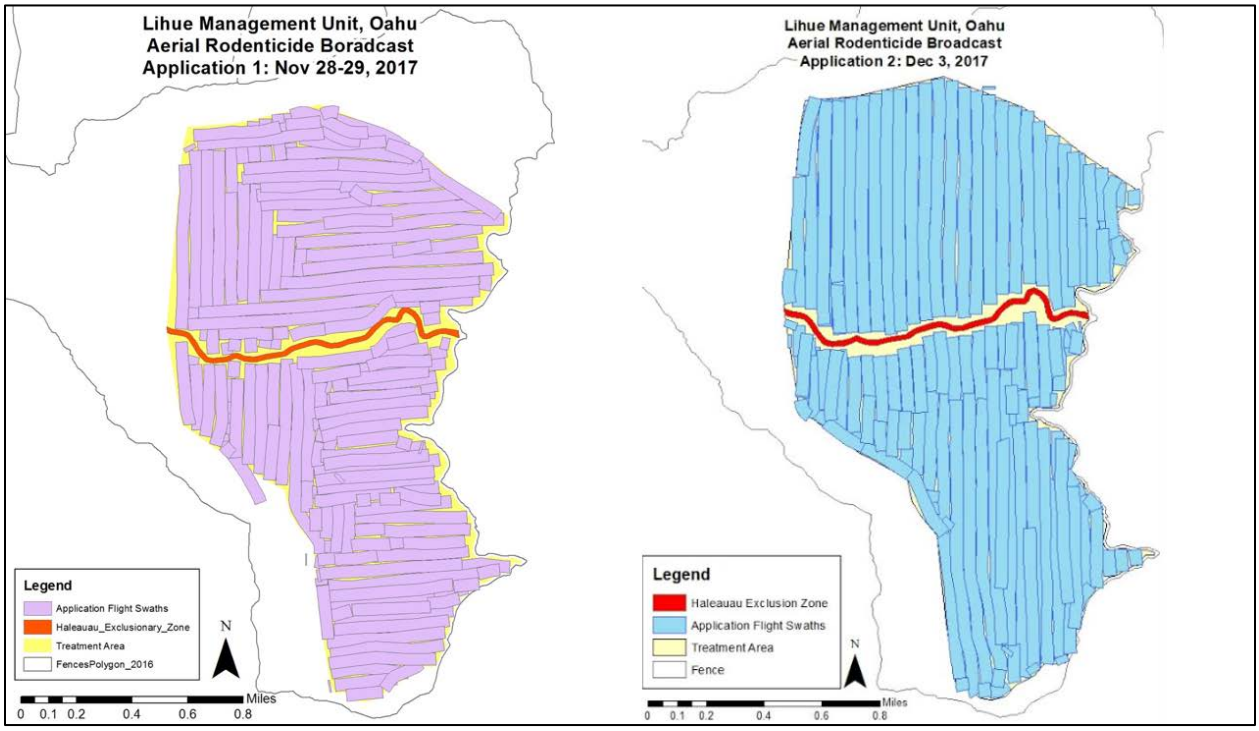

Figure 5. Aerial broadcast flight swaths for both applications showing nearly continuous coverage of the treatment area, and avoidance of the exclusion zone along the Haleauau stream bed.

A total of 120 tracking tunnels within the treatment site and 30 tracking tunnels in the reference site were installed in November 2016 (Figure 6). Tunnels were monitored every two months until the broadcast in December and then ran monthly. Access to the Lihue MU was restricted due to a UXO stand-down from March to April 2018. Limited access was restored in May allowing us to resume tracking tunnel monitoring in three of the eight gulches that we were previously monitoring, including 60 of 120 tunnels within the treatment site.

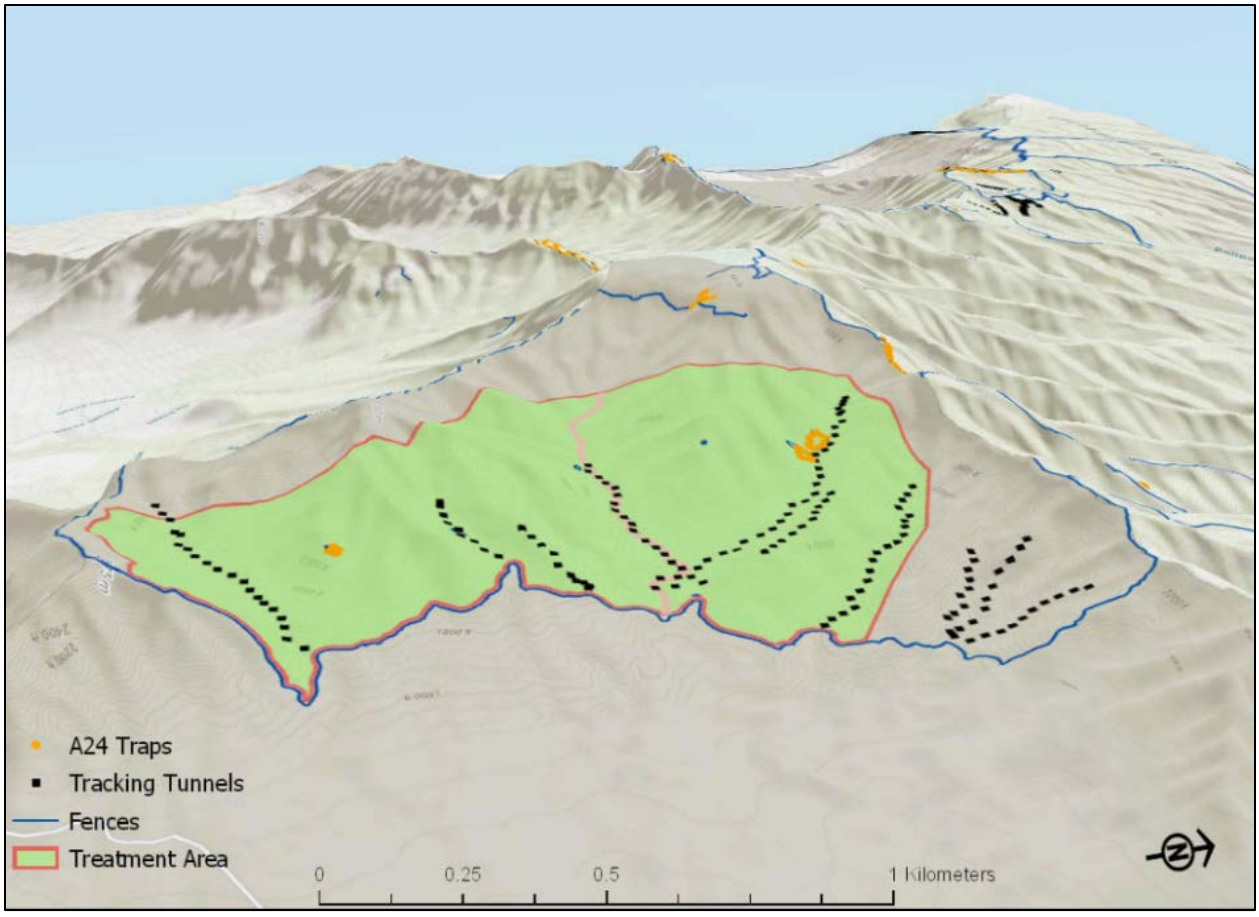

Figure 6. Tracking tunnel placement within the control and treatment sites

Rat activity was very similar at both the treatment and reference sites prior to the broadcast. Upon implementation, activity levels at the treatment site went from 49% to 6%, while levels remained high at the control site (Figure 7). Rat activity remained below or near our 10% tracking goal throughout the entire Oahu Elepaio breeding season. This is probably the best Oahu Elepaio rat threat protection that our program has conducted over our twenty year history. It will be very interesting to see how long suppression continues to be low. Unfortunately we were not able to get much Oahu Elepaio monitoring done this season due to the UXO stand-down. Access to this site should be made a priority and Oahu Elepaio monitoring should be increased. It is possible that aerial broadcasts could be conducted yearly and offer excellent protection. A cost benefit analysis between aerial application and a grid of A24s will be evaluated, as well as site access issues, in determining the future direction of rodent control within this MU.

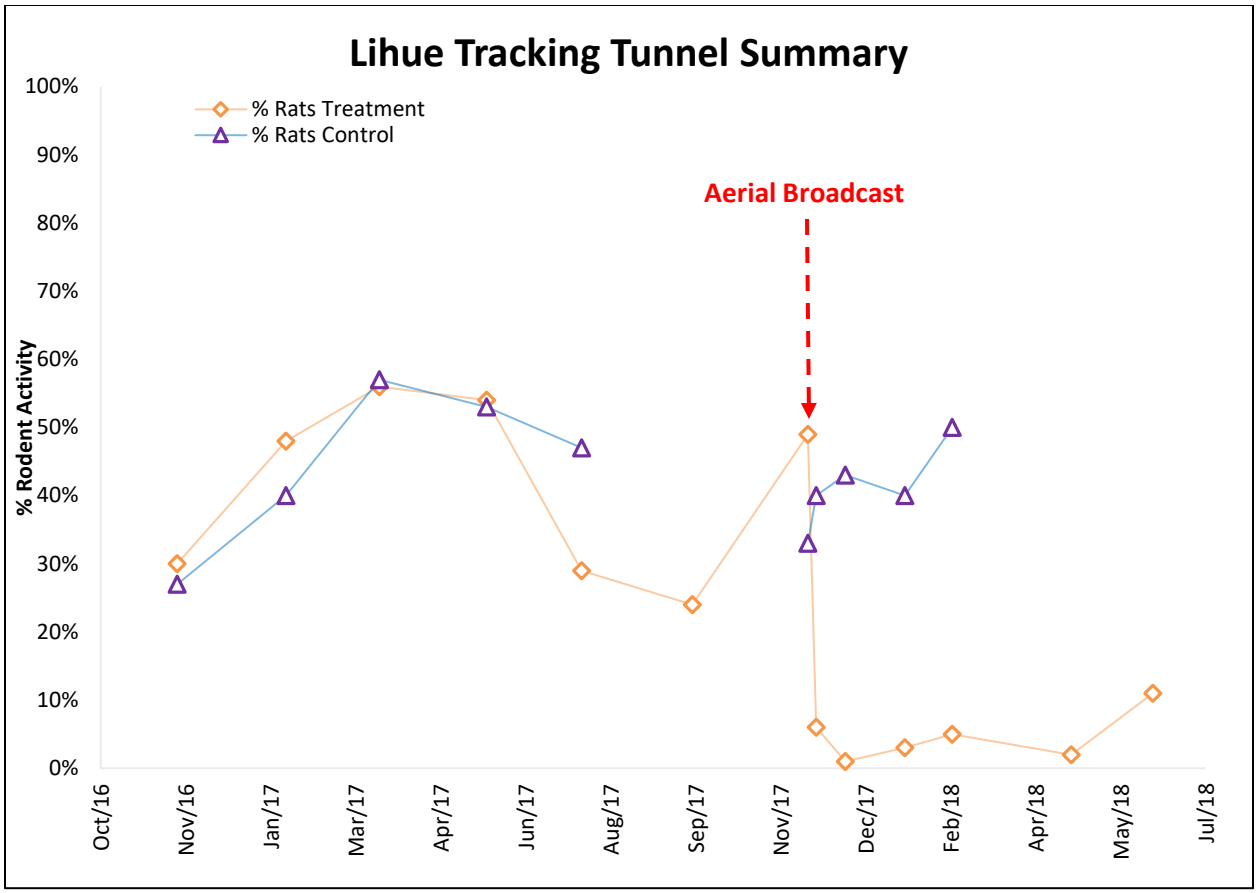

Figure 7. Percent of rat activity at Lihue

8.4 CONTRAPEST TRIAL

From August 2017 to August 2018 we conducted a trial with the rodent birth control product ContraPest. Tracking tunnel monitoring data at several sites has shown that rodent activity typically spikes in Dec-Feb despite the use of mechanical traps. In an attempt to reduce seasonal spikes and maintain low-levels of rodent activity year-round, we received an Experimental Use Permit (EUP) to trial ContraPest in a forest environment at Kahanahaiki MU. The treatment site was a 4 ha area within the gulch and an associated 4 ha control site at Maile Flats (Appendix 8-3). An additional off-site control area was established at Kapuna Upper MU for comparison, given the potential for a spill-over effect of the treatment into the nearby control site at Kahanahaiki.

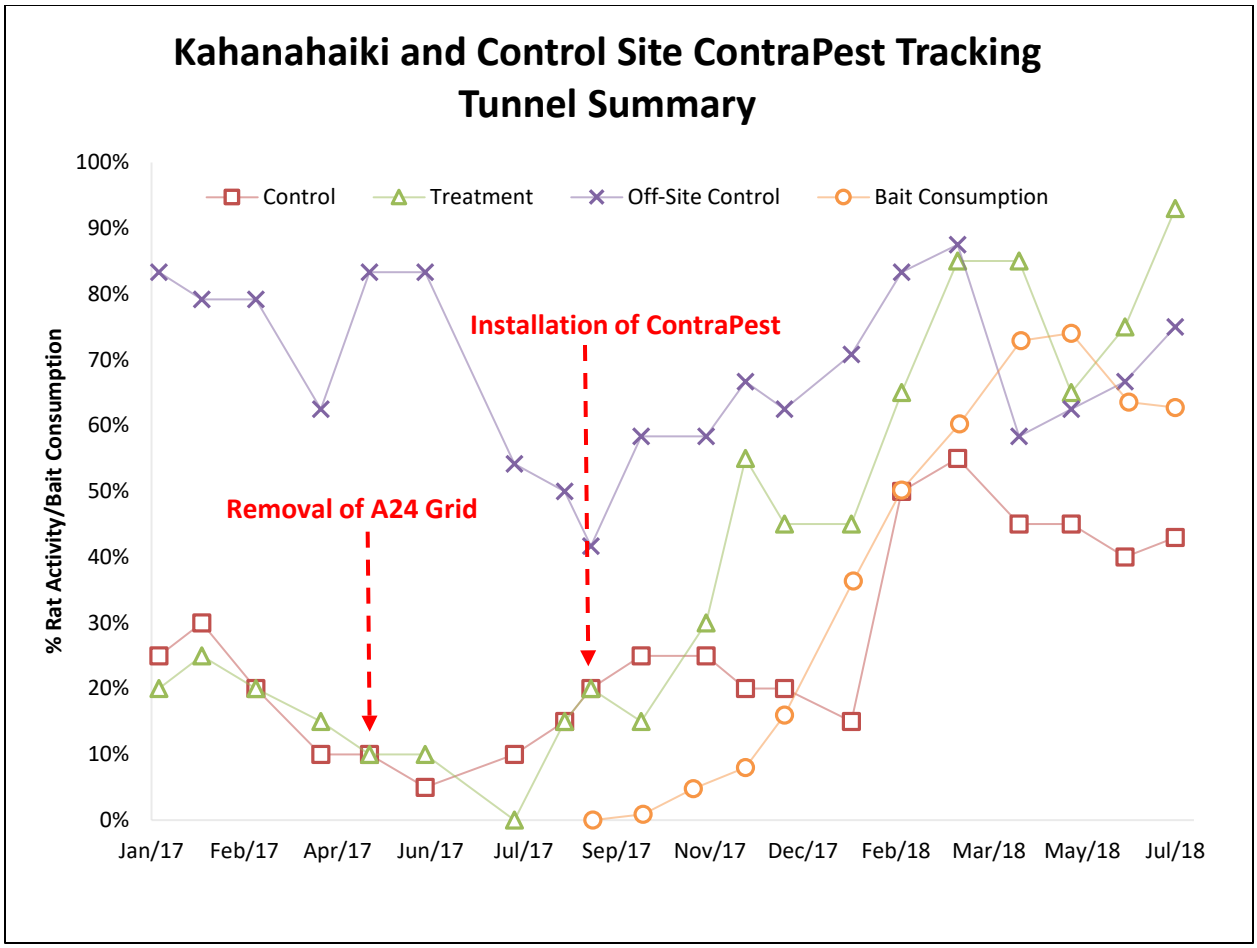

Figure 8. Percent of rat activity in the treatment and control sites at Kahanahaiki and Kapuna in relation to bait consumption

Prior to the trial, the treatment and control sites at Kahanahaiki had similarly low rodent activity in association with a large-scale A24 grid. In comparison, activity at the Kapuna off-site control, where no rodent control occurs, was considerably higher. A24 baiting ceased in May months prior to initiating the trial. Tracking tunnels were run monthly at all sites for the duration of the trial. The rat activity increased in both the treatment and control areas and was unacceptably high from February-July 2018 (Figure 8). These results indicate that ContraPest was not successful at reducing rat activity. It is presumed that this was likely due to the small size of the treatment area, resulting in a confounding influence of rat ingress from the surrounding areas, if not due to an outright failure of the treatment itself to cause infertility. More definitive results of the potential efficacy of ContraPest may be determined from histological analyses. Tracking tunnels may not be the best monitoring method for a small area and for a suppression method that keeps rats alive

Bait consumption was low for the first several months. It is believed that the presence of abundant strawberry guava fruits from September to December contributed to the delay in consumption and decrease in associated tracking activity. Consumption generally increased from December to July.

In August 2018, rats were collected from snap traps at both the control and treatment sites for histological examination. Future findings will include what percentage of rats captured in the area were consuming ContraPest, how far from the treatment area rats traveled, and information about rat densities within the

sites. A total of 130 rats were necropsied and samples will be analyzed at the SenesTech facility. Results will be in next year's report.

8.5 FUTURE PLANS

We will continue to work with the A24 trap and bait to maximize its full potential. Trials with citric acid bait ALPs (used as a slug deterrent) have begun and will be checked every four months for the next year. Hopefully results from these trials will show that adding citric acid to the bait will extend the checking interval to 6 months at all sites. Now that the checking interval is every 4 months, we may be able to expand protection to more areas for less cost. It would be worth evaluating if MU grids should be installed at some sites that have isolated or Elepaio territory-based grids.

We will investigate an alternative to our current monitoring methods using tracking tunnels. It is becoming difficult to purchase the tracking cards that are designed for our environment and the current method requires two consecutive days of labor. Motion triggered game cameras may be an option that could cut labor in half. Camera locations will be baited and the cameras set to take pictures for one day. We will not return to retrieve the pictures until the next monitoring period, thus saving labor. The only downside would be the loss of real time data as we would be seeing the activity three months after it was collected. A trial will be conducted to see how results from cameras compares to results from tracking tunnels. We have purchased 80 relatively cheap game cameras (<$100each). The number of cameras will be the key limiting factor, as equipment costs could be high for this type of project.