

## COMPLETED PROJECT REPORT

# **Assessing the efficacy of carbon monoxide producing machines at controlling burrowing rodents.**

Research Agency: University of California

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Summary:

## **RESULTS**

*Efficacy.*—For the Cheetah rodent control machine, we observed a greater number of California ground squirrels in both treatment ( $x$  efficacy =  $-15\%$ , SE = 8) and control ( $x$  efficacy =  $-17\%$ , SE = 1) sites post-treatment. We observed an even more extreme response with reopened burrow counts at treatment sites ( $x$  efficacy =  $-113\%$ , SE = 79), indicating no utility for this device when managing California ground squirrels.

For PERC applications in dry soil conditions, the number of observed California ground squirrels and unplugged burrow openings declined by an average of 66% (SE = 11) and 74% (SE = 26), respectively. Efficacy derived from burrow counts was not significantly  $>70\%$  ( $t_1 = 0.2$ ,  $P = 0.901$ ), due to substantial variability between sites. We did not observe any difference in California ground squirrel counts within the control plot ( $n = 14$  before and after treatment period) indicating that the observed reduction in ground squirrels was due to the applied treatment. For PERC applications in moist soil conditions, we observed a 100% (SE = 0) and 98% (SE = 2) reduction in California ground squirrel counts and unplugged burrow openings, respectively. These reductions were significantly greater than 70% ( $t_1 \geq 16.4$ ,  $P \leq 0.038$ ).

*Financial cost.*—Initial cost of using the PERC machine per treated burrow system was quite high when compared to the other burrow fumigant approaches. However, the cost of PERC machine

applications on a per-burrow system basis quickly dropped below that of gas cartridges given the substantial cost of repeatedly purchasing these cartridges over time. The only situation in which the cost of any of the alternative burrow fumigants fell below the cost of aluminum phosphide was after approximately 830 days when using the PERC machine with approximate 3-min application times.

### **Pocket gophers**

*Efficacy.*—Efficacy associated with the initial PERC treatment ranged from 40–55% across the two treatment plots. Efficacy values increased to a mean of 68% (SE = 2.5) after a second treatment. Although mean values never attained the desired 70% threshold, the resultant values were close to this threshold and indicate that this approach likely has some utility for pocket gopher management. Control plots exhibited little variability in occupancy across treatment periods, thereby indicating that the observed reductions in pocket gopher activity in treatment plots was due to the PERC applications.

*Financial cost.*—Initial costs per pocket gopher removed were quite high with the PERC machine given the substantial cost of the machine. However, costs rapidly diminished if used repeatedly, primarily due to the large number of burrow systems that were treated daily ( $\bar{x} = 276$ , SE = 55), and the subsequent large number of pocket gophers that were removed daily ( $\bar{x} = 117$ , 95% CI = 74–162). Although a rigorous comparison across study sites is not warranted given differences in soil type and pocket gopher density, the observed per-pocket gopher costs from this study were generally lower than those observed from a similar study in northern California given greater efficacy and quicker application rates.