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February 1994

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GROUND SQUIRREL MANAGEMENT IN THE ANGELES NATIONAL FOREST

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ABSTRACT: In 1987 and 1988 there was a sharp rise in epizootics in the ground squirrel (*Spermophilus beecheyi*) population in the Arroyo Seco District of the Angeles National Forest. In response to these incidents, a proactive rather than a reactive approach was implemented in this area. This was the beginning of a ground squirrel management program in the Angeles National Forest. From 1988 to 1993 the program developed into a joint management program between the United States Department of Agriculture, Forest Service (USFS), Los Angeles County Department of Health Services (DHS), Los Angeles County Agricultural Commissioner's Office-Weights and Measures (CAC), and the concessionaires in this area. The number of epizootics has been reduced from seven in 1987 to zero in 1992 and 1993. Cost of field activities related to plague surveillance has been reduced 160%. The program is now being expanded to cover every district in the Angeles National Forest.

Proc. 16th Vertebr. Pest Conf. (W.S. Halverson & A.C. Crabb, Eds.) Published at Univ. of Calif., Davis. 1994.

INTRODUCTION

In this paper I will be discussing the development of a ground squirrel management program in the Angeles National Forest. There will be a little bit of philosophy, the how and why the program started, how it has changed, and a discussion of the results of the program. The focus will be on the Arroyo Seco District, where the program was started.

I would first like to thank the following people for all their hard work and their cooperation in the development of this program. My thanks to John Borrecco, Mike Waterman, Joe Gonzales, Terry Ellis, and Don Wopshall from USFS, Minoo Madon, Chuck Myers, Charles Smith and Vern Reichard from California DHS, Richard Wightman from CAC and Art Tilzer, Frank Hall, Los Angeles County DHS.

It may seem strange to start with acknowledgments, but there was another reason besides expressing my gratitude. I wanted to emphasize that in developing a program in an area where many agencies and their varied programs are involved, one of the obstacles that you will experience is the many different philosophies and individual agency regulations. However, on the positive side, the more agencies, the more resources you have to work with. Cooperation, patience and compromise is essential if the goal is to be accomplished.

How should a ground squirrel (*Spermophilus beecheyi*) population be managed and, as some have questioned, "Should it be done at all?" As I mentioned earlier, there are usually several different philosophies. Los Angeles County DHS's philosophy is based on the department's mission, which is to protect the public's health. Our statutory base is the California Health and Safety Code.

There is sometimes an outcry that we will be damaging the ecological balance of an area by suppressing the ground squirrel population. As soon as we humans develop an area, we change the balance. Easy food, water and shelter are provided for the ground squirrels and the predators are either eliminated, scared away, or provided with an easier food source. The major natural population controls are reduced, except for disease, which is our main concern. This change was created by humans and

it is our responsibility to solve it. As Schmidt proposed in his paper at the Vertebrate Pest Conference in 1992, "Modern wildlife damage management manipulates individual animals to reduce or eliminate damaging behaviors" (Schmidt et al. 1992) We are not recommending that all ground squirrels be eliminated, just control those individuals in areas of public use to minimize the disease potential.

STUDY SITES

In 1987 there was a sharp rise in plague (*Yersinia pestis*) epizootics in the ground squirrel population in the Arroyo Seco District of the Angeles National Forest. The district is located in the north central area of Los Angeles County in California. The area of the epizootics was along Hwy 2 from Barley Flats to Buckhorn Campground (Figure 1). Previous to 1987, only two sites on Hwy 2 had tested positive in 1981. This year there were seven. My discussion will be limited to four of the 1987 sites. They are Barley Flats Probation Camp, Charlton Flats Picnic Area, Chilao, and Buckhorn Campground. Although these sites are all on Forest Service land and are subject to their regulations, they each have different responsible parties. The first is Barley Flats Probation Camp and Sheriff's Heliport. This site is leased from Forest Service by Los Angeles County. The second is Charlton Flats Picnic Area, which is under the Forest Service. The third is Chilao. The campground is leased to a concessionaire and the residential, visitor center and picnic areas are under the Forest Service. The fourth is Buckhorn Campground which is leased to a concessionaire.

HISTORY

In June of 1987 we were notified by the director of Barley Flats Probation Camp that he was finding an unusual amount of dead ground squirrels at the camp. I say unusual because one of the pet dogs at the camp loved to catch the ground squirrels, but didn't necessarily like eating them. When investigated we found evidence of an active dieoff. Blowflies were found around the opening of burrows and the odor of dead animals was present around the burrows located on the hillside above the

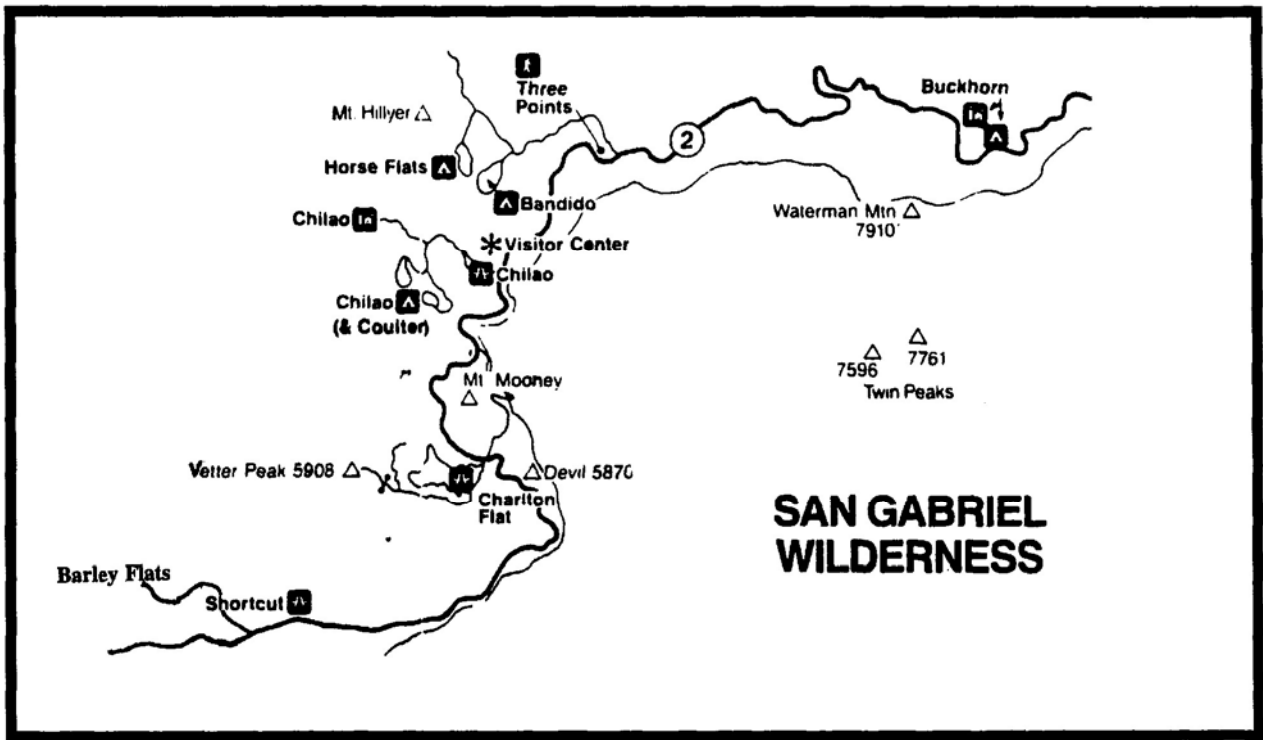


Figure 1. Map of the San Gabriel Wilderness.

garden and dog kennels, and in the adjacent quad area. Several dead animals were found under the bushes, with no signs of trauma to the bodies. We canceled out the possibility of the dog being responsible and there had not been a program of poisoning. A plague emergency was declared and the site was closed to visitors for ten days to conduct emergency ectoparasite activities. Bait stations were maintained, and burrows were dusted with insecticidal dust. Bait stations are open ended rectangular boxes where bait is placed in the center of the box and flea dust is put on both ends. The ground squirrels, entering to feed, give themselves a flea powder shower, and the dust is also carried back into the burrows. These stations are replenished with dust and bait every other day for ten days, and is labor intensive. After ten days animals were trapped and combed for fleas to determine a flea index number. The index is determined by dividing the number of fleas by the number of animals. The acceptable level is 1.0, established by the State DHS and the Center for Disease Control (CDC). Once the acceptable flea index was reached, ground squirrel suppression was initiated and the area was reopened. A dieoff was not observed at the other three sites, however serological testing indicated plague was present in the ground squirrel population. The same emergency procedures were performed as with Barley Flats.

THE PROGRAM

Previous protocol in this area was to perform suppression activities only after a site was found positive. Our view is that this is like closing the barn door after the cows have already gone. The risk of human exposure in an area that has shown to be endemic for plague is a risk we don't like taking. Before 1987 this area was monitored, but considered one of the low risk areas. With the explosion of epizootics in 1987, Hwy 2's risk rating was definitely changed, USFS agreed. It was decided to take a proactive approach rather than reactive approach to ground squirrel management in this area.

In January of 1988 the first of what was to become an annual meeting was held between the USFS, Los Angeles County CAC and DHS. It was agreed at this meeting that an early season suppression program would be instituted in those areas which pose the greatest risk. The dusting and suppression was to be performed by the CAC, and DHS was responsible for the surveillance, testing and emergency activities (Table 1).

In 1988, despite the early suppression activities, three of the four study sites-Charlton Flats, Barley Flats and Buckhorn-were found positive (Figure 2).

In the 1989 meeting, the concessionaire was included. The concessioner was angry about the closure of the campgrounds, due to his loss of revenue during the

Table 1. Field activity responsibilities for the years 1988 to 1993 by agency.

Year	CAC	DHS	USFS	Concession
1988	Suppression Dusting	Serology Emrg. Dusting Surveillance	None	None
1989	Suppression Dusting	Serology Emrg. Dusting Surveillance	Assist CAC	Assist CAC
1990	Suppression Dusting	Serology Emrg. Dusting Surveillance	Assist CAC	Assist CAC
1991	Suppression Dusting	Serology Emrg. Dusting Surveillance	Late Suppression	Late Suppression
1992	All Dusting Suppression- Barley Flats	Serology Emrg. Dusting Surveillance	Suppression	Suppression
1993	All Dusting Suppression- Barley Flats	Serology Emrg. Dusting Surveillance	Suppression	Suppression

Plague Positives
Arroyo Seco Study Sites

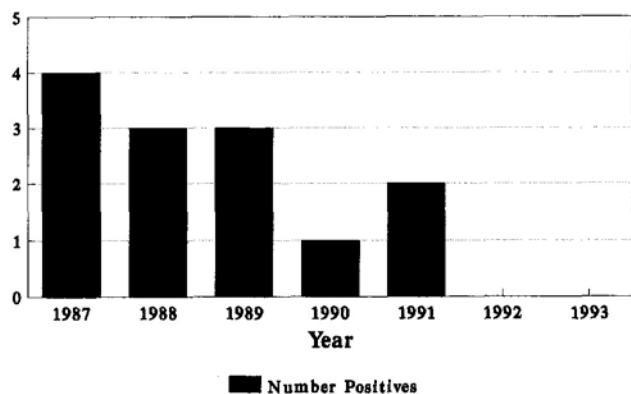


Figure 2. Plague positives at Arroyo Seco study sites from 1987 through 1991.

closure. He argued that there had not been a human case in the 35 years he had been in the area, so why worry about it now. Besides, he had insurance. In California in the years of 1970 to 1990, 48% (14/30) of the human cases were in campgrounds and public recreation sites. General policy did not change, but it was decided that the Forest Service and the concessionaire should be involved in the field activities of the suppression program. Individuals would be trained and supervised by CAC to assist in suppression activities (Table 1). There was a

three-fold reason for this action. First, because they have continuous exposure to the sites they could guide CAC to problem areas. Second, the recession. Our department could no longer provide the time and all the funding for the work that needed to be done. Third, other areas in Los Angeles County were being neglected.

In 1989 Charlton Flats, Chilao and Barley Flats were tested positive (Figure 2). Although three sites were positive, we only closed two. One of the sites, Charlton Flats, did not need to be closed because the flea index was already below the state acceptable level of 1.0. and was deemed safe for human activity. This was also an indication that the program was starting to work.

The program stayed the same for 1990 (Table 1). One site, Chilao, was tested positive (Figure 2), but like Charlton the year before, the index was below the acceptable level and it remained open.

Although the program was showing signs of success, there were still some problems. Under USFS regulations the area of treatment was limited to the human use areas. This is an understandable regulation, but this limited the buffer zone. The sites would be treated early in the season, but by the end of the season ground squirrels from outside the treated area would have migrated in. Another problem was the trash area at Barley Flats. Bears were getting into the trash bins and spreading the trash everywhere. Trapping and relocation was tried, but the bears came right back. Attempts were made at bear proofing the bins, but they were still able to gain access. The bears would spread the trash each night providing an endless supply of food for the ground squirrels. To solve the migration problem it was decided in 1991 to institute a late suppression program (Table 1). After the early suppression in 1991 by CAC, USFS and the

concessionaire would take over the suppression of the ground squirrels. CAC would provide training and would still perform the dusting in all areas. One other change that was made was in DHS's method of evaluating testing. If areas within a larger site were separated by a buffer zone, we would consider those areas separately in our evaluations.

Two sites, Barley Flat and Chilao, were positive in 1991 (Figure 2). Because of the new evaluating methods we were able to keep all but one loop of the campground open.

RESULTS

The program has stayed the same since 1991 (Table 1) and it appears to have worked. There has not been a positive in 1992 or 1993 (Figure 2).

In this case late suppression was the final step needed. We can't take credit for solving the problem at Barley Flats. Because of budget cuts the probation camp was closed down and the endless food source is gone. The ground squirrel activity is now very low. It is another method of management though. If you take away the people, nature takes care of regulating the ground squirrel population.

COST ANALYSIS

To compare cost of years with and without positives and different levels of treatment, I have taken three years and compared the cost of field activities (Table 2). The

first year 1988 we had three plague emergencies. The cost was approximately \$17,000. The second is 1991 when we had two positive sites. As mentioned previously, we only had to treat one loop of Chilao due to new methods. This cut the cost of treatment considerably. The cost for the year was \$13,000. But look at 1992, the total cost for field activities was \$6500, 160% lower than 1988. Outside of the public's safety, that's the best news we could have.

CONCLUSION

I want to emphasize that the public safety is at greater risk if ground squirrel or other rodents are allowed to over populate an endemic area. Individual populations must be controlled before conditions lead to an explosion of epizootics similar to those in 1987. We were fortunate to have had no human cases occur.

Due to the success of this program, it has now been instituted into the remainder of the Arroyo Seco District and is in the process of being instituted into the other districts of the Angeles National Forest.

LITERATURE CITED

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Table 2. Cost comparison by agency and year.

Year	Agency			Total
	DHS	CAC	USFS	
1988 (3 emergencies)	\$14,476	\$2,404	\$ 0	\$16,800
1991 (2 emergencies)	\$ 9,494	\$2,628	\$840	\$12,962
1993 (0 emergencies)	\$ 4,523	\$1,115	\$840	\$ 6,469