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ROOF RAT POPULATIONS IN SANTA CLARA COUNTY, CALIFORNIA

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Historical Background

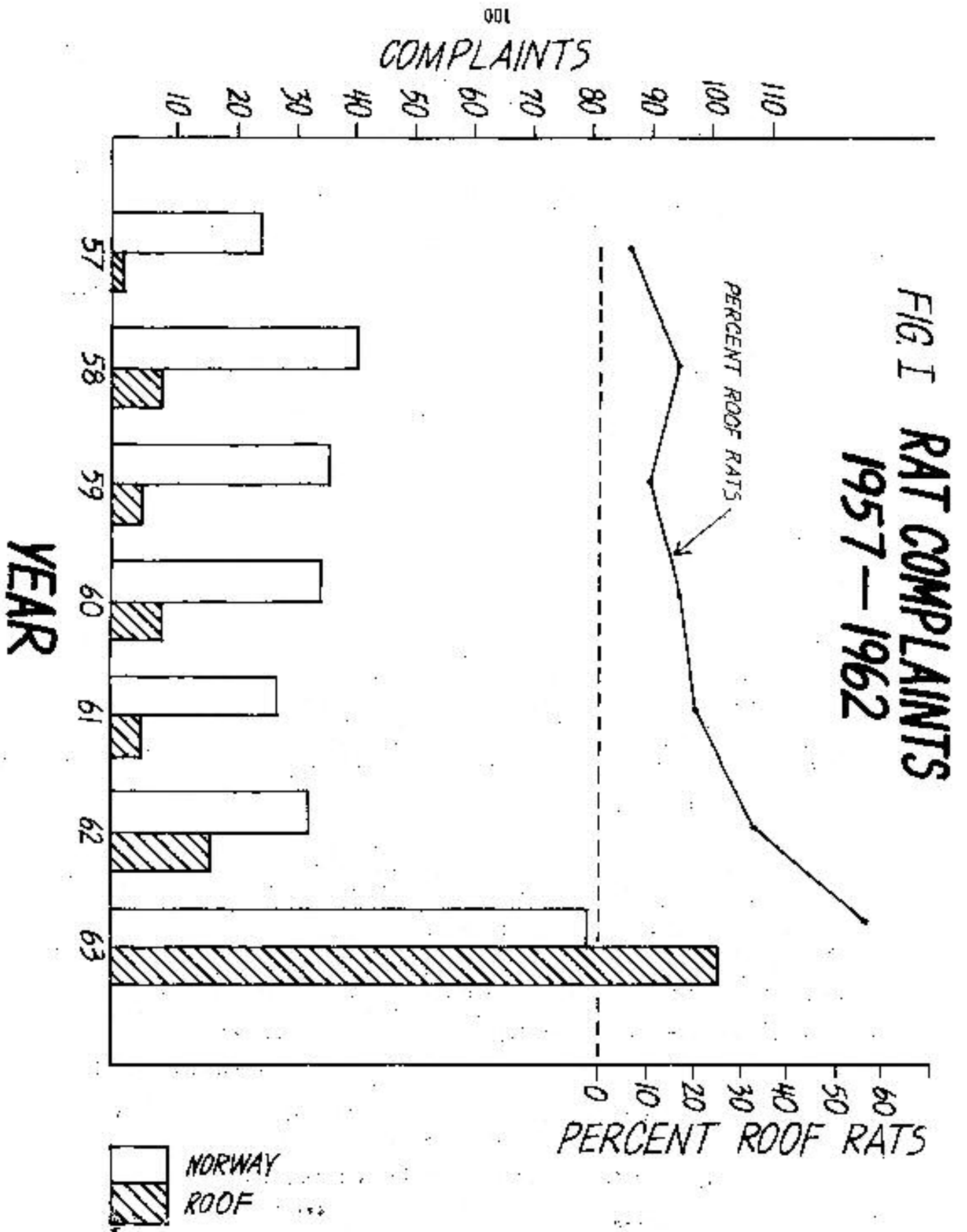
Northern Santa Clara County, California, was historically an agricultural community with orchard culture dominating the economy. Prunes, apricots, walnuts, and cherries were the principal crops. Orchards were disced clean during most of the summer growing season, and a cover crop of mustard or horse beans was grown beneath the trees in winter. About the only "natural" year around cover on the valley floor was the brush and grass which volunteered along the several creek banks. Under such conditions, roof rats (Rattus rattus) were not numerous. An occasional rat colony could be found in a fruit processing shed or in some of the older buildings of the several small towns, but wild or feral rats were rare.

Truly feral roof rat colonies are uncommon in most of the United States. Even in southwest Georgia where cover conditions would appear ideal, an intensive study of roof rat ecology failed to uncover any feral roof rat populations (Ecke-1955). On the other hand, studies on Guam by Baker in 1946; and on Hawaii by Spencer and Davis in 1950 and by Kartman and Lonergan in 1955 have shown that feral roof rat populations thrive in tropical climates, particularly where their introduction does not place them in competition with native rodent populations. This competition factor may well be an important clue to the recent rat build-up in suburbia California, including Santa Clara County.

Starting in the late 1940's and continuing at an ever accelerating pace, Santa Clara County has experienced a "flood tide" immigration of people. Defense plants have attracted people and people have demanded homes. Because space was available and the weather ideal, most of these homes were designed to include spacious lots with patios and landscaping that go toward making outdoor enjoyment a part of California living.

Inadvertently this trend in landscaping has greatly increased the available habitat--free of natural competition--for an increased roof rat population. In the past 10 years, beautifully landscaped yards have matured into vegetative harborage of vines and shrubs, and ornamental fruit trees together with remnants of old walnut and fruit orchards are supplying ample quantities of rat food. Such favorable habitat together with ideal climatic conditions has provided the stimulus for a roof rat population explosion in Santa Clara County.

Figure I illustrate the trends in rat populations for Santa Clara County since 1957. Granting that public complaints are not the best index to population numbers, such complaints do tend to show trends. Note that rat complaints averaged about 50 a year from 1957 through 1962, and at least until 1961, the percentage of complaints caused by roof rats remained below 20 per cent. Although the total number of complaints remained about the same in 1962, the percentage of roof rats had started to increase. Then, with almost explosive force, the total number of rat complaints tripled in 1963, and significantly, the number of roof rat complaints climbed to 56 per cent of the total.



Observations from several sources suggest 1963 as a peak year for many rodent populations in California, both native and domestic. The fact remains, however, that a trend in landscape gardening has created an ideal habitat for semi-wild roof rat populations in Santa Clara County. This rat increase is not the result of poor sanitation in the usual sense. These homes are not substandard. For the most part they are beautiful, clean, well-kept houses with backyards to match.

Not having been seriously concerned with rat problems, Santa Clara County Vector Control personnel suddenly encountered a major rat problem in 1963. How does a health department approach rodent control under such circumstances? Must we become landscape architects?

Control

The Santa Clara County Health Department has regularly followed the provisions of Section 1803 of the California Health and Safety Code with regard to rodent control. This section places the primary responsibility for rodent control on the "possessor" of property. Thus, when first confronted with this sudden increase in demand for rat control, we tried our usual "educational" or advisory approach. A compact 2-page bulletin on rat biology and control was mimeographed and hand delivered to about 2,000 homes in areas where complaints indicated serious rat problems. During delivery, home occupants were asked if they had experienced rat problems. Tabulations showed that rats were present at 30 per cent or more of the premises contacted. Knowing that some people would not be aware of rats and others would not admit to having them, it can be assumed that positive response probably fell on the low side of actual rat occurrence.

Circulation of this circular was coordinated with a similar effort by the San Jose City Health Department in areas under their jurisdiction and newspaper coverage was also utilized as an educational tool. Most of this work was done during June and July of 1963.

Continued complaints throughout the fall months and follow-up observations of rat problems convinced us that the educational approach was not stimulating enough effort to accomplish effective rat control. It was at this time that the Santa Clara County Health Department decided to alter its regular advisory procedure and engage in a limited demonstrational rat control program. This decision involved the department in an interesting legal interpretation which will be covered in a later section of this paper.

Having previously developed an all weather warfarin bait station for rat control in sewer systems (Ecke & Christofano-1959) the department was interested in testing a commercially produced wax block diphactne preparation. This product contains .005 per cent 2-Diphenylacetyl-1, 3 indandione.

A residential area of 431 homes in the 20 to 50,000 dollar economic bracket was selected for the demonstrational program. This area is bordered on the south and east by main thoroughfares, on the north by a creek and on the west by undeveloped orchard land (see Figure 11). A letter was prepared and distributed to all homes in this area about one week prior to the distribution of rat bait. The letter announced our objectives, described the bait we were to use, and stated that anyone not wanting to be included in the

control program should call or write their objections to the health department. Only 7 residents requested exclusion from the demonstration.

A day of in-service training was then given to 7 members of our vector control staff, and on January 27, these 7 men divided up the area and proceeded to distribute the bait. Three bait stations were placed in each yard where conditions permitted, and a station consisted of 2, 2-ounce blocks (4 ounces) nailed in place along back fences, at the base of vines and shrubs, in stacks of fire wood, or near other likely rat harborages. The stations were revisited on Mondays and Thursdays for 3 weeks. Careful records were kept of all observations and additional bait was added as needed,

A total of 424 premises were baited of which 140 had rat acceptance at one or more of the 3 bait stations (see Figure II). Both meat and fish flavored blocks were used, but rats showed no appreciable preference to one over the other. The first dead rat was found about one week after the stations were placed; and although relatively few dead rats were actually found, feeding at the stations dropped off decidedly by the end of the second week and practically ceased by the end of the third week, presumably because the rats had died. Bait consumption at the 206 "active" stations totaled approximately 145 blocks or 7,120 grams of bait. At .005 per cent this is the equivalent of 356 milligrams of active ingredients eaten. Based on an LD 50 of 3 mg./kg. for acute oral toxicity (Correll et al., 1952) the total minimum kill was estimated at 76 kilograms of rats or 300 adult rats with an average weight of 225 grams each. The actual kill probably exceeded this number because most feeding was prolonged over several days under which circumstances lesser amounts of "poison" are needed to effect a kill.

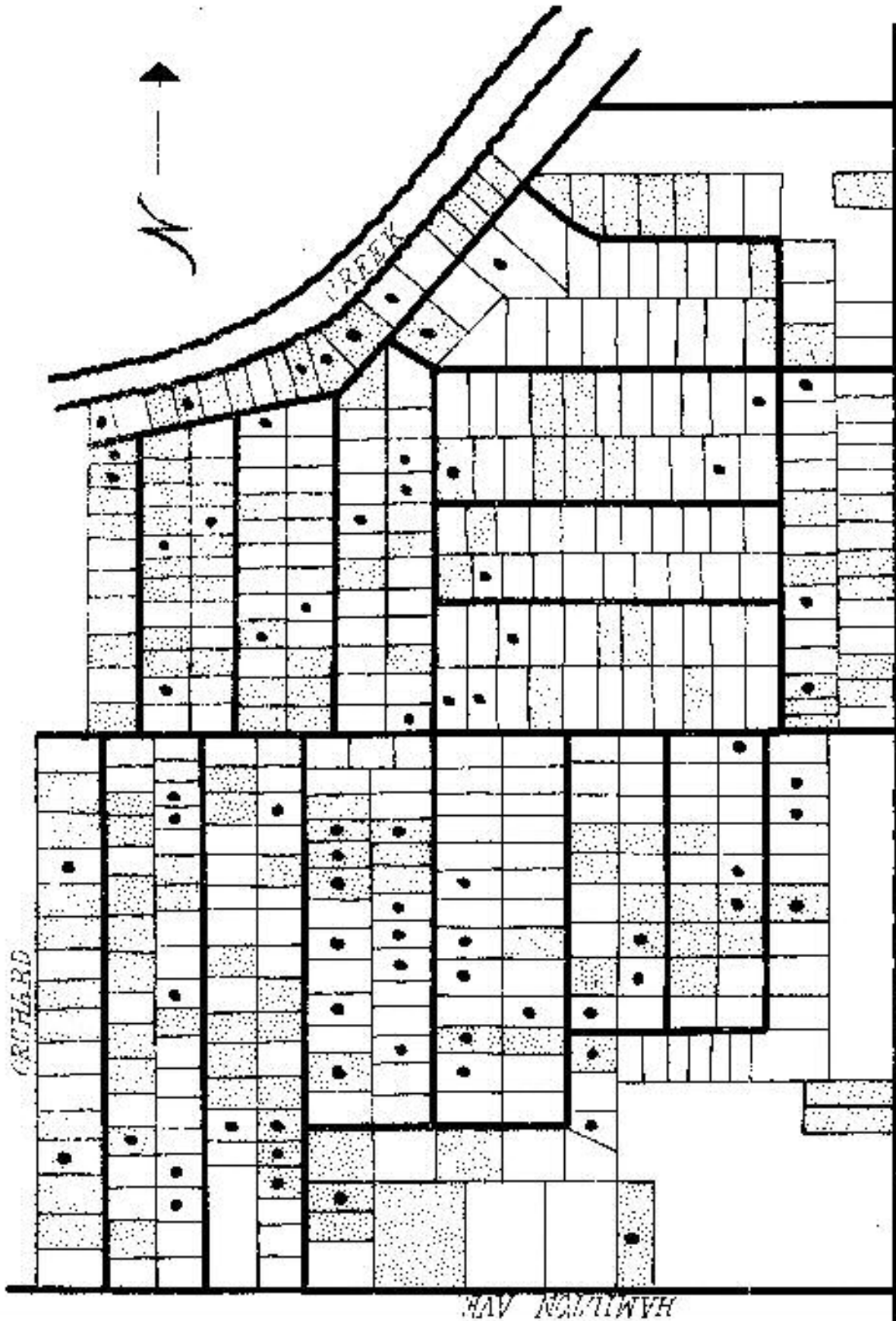
Because this bait had a fish and meat flavor, problems with cats and dogs were anticipated. However, when initial efforts to interest cats and dogs gave negative results, we confidently placed the bait in all backyards. It was soon learned that the initial test was misleading and some dogs were, in fact, readily attracted to the bait and consumed considerable amounts.

One 60 pound Golden Retriever ate between 8 and 10 ounces of bait at one time. No further bait was made available to this dog and she showed no ill effects.

One small Dachshund, weighing about 7 pounds, consumed at least 2 and probably 4 squares of bait (from 4 to 8 ounces). This dog showed no ill effects from her meal either. Altogether 8 or 10 dogs consumed small quantities of the bait and none displayed symptoms of dicumeral poisoning.

At the end of 3 weeks, after rats had stopped feeding, all bait was removed and the occupants were given a letter thanking them for their cooperation, The letter advised them that the rat population had been reduced, and urged them to remove harborage, food supply, and to rat proof their homes.

There are some interesting comparisons between the educational effort and the actual bait surveillance-poisoning effort. Thirty-two per cent of the 232 people interviewed in July admitted having rats, as compared to 33 per cent that actually had them in February. However, 27 or nearly 40 per cent of the original 73 infested premises did not have rats at the latter



RESIDENTS WITH RATS
 JULY 1963
 US NACA ACTIVITY
 FEBRUARY 1964

FIG. II
 ROOF RAT INFESTATION IN RESIDENTIAL
 AREA OF SANTA CLARA CC

survey (see Figure II). This demonstrates two things (1) a significant number, possibly half of the people originally interviewed either didn't know or wouldn't admit to having rats; and (2) of those admitting rat problems, 40 per cent eliminated their problem. Apparently less than half of the people with rodent problems successfully responded to the educational effort--far too few to effect adequate area wide rodent control.

In an effort to evaluate probable harborage and food supply, a survey was made of 96 "active" premises listing those types of harborage and food supplies available. Table I lists these favorable habitat factors in descending order of their frequency occurrence. It is suggested from this table that wood piles, ivy growth, and sheds were the 3 most common harborages and that deciduous fruit, citrus, and walnuts were the 3 most available food supplies.

Table I
 Harborage and Food Supply Found on 96 Rat
 Infested Premises in Santa Clara County

<u>Harborage</u>	<u>Number</u>	<u>Food Supply</u>	<u>Number</u>
Wood Piles	51	Deciduous Fruit Trees	45
Ivy	34	Citrus Fruit Trees	33
Sheds	27	Walnut Trees	25
Miscellaneous Shrubs	19	Pyracantha	24
Juniper Beds	16	Garden Vegetables	12
Vine Growth	16		
Junk	11		
Succulent Growth	8		
Brick or Stone Piles	7		

Legal Complications

When drafting the first letter for the demonstrational control program, the Health Officer, Dr. W. Elwyn Turner, was concerned that the negative approach to obtain householders' permissions for bait placement could make the department legally liable; i.e., asking people to notify the department if they did not want bait placed on their premises. Our field personnel argued that it was very difficult to obtain positive permission from some 400+ residents and that thorough coverage precluded a successful demonstration. Consultation was then held with Santa Clara County Legal Counsel who rendered the opinion that the county would not be liable if opportunity were given for objection and county personnel took proper precautions in placing the bait. In reviewing the California Health and Safety Code the County Counsel stated that the department could not proceed with a rodent control program on private

property unless an authorizing resolution were passed by the Board of Supervisors. This was an interpretation of Section 1805 of the State Health and Safety Code which reads in part: "The Board of Supervisors of each county... whenever it may by resolution determine that' it is necessary for the preservation of the public health or to prevent the spread of contagious disease... may appropriate money... for the purpose of exterminating and destroying rodents...."

Knowing full well that passing such a resolution would entail further red tape and delay, we argued strenuously with Counsel that the intent of this law was not to delay but to facilitate obtaining adequate rodent control. The County Counsel agreed but postulated that the intent of many laws is obscured by the language used in writing them and that this law was such a law. He insisted that to properly protect the county's interest, it would be necessary to obtain the said resolution and we had no choice but to wait for it to be drawn up and passed by the Santa Clara County Board of Supervisors. Fortunately for our program, this was done rapidly and the Board ruled favorably. Had they not acted, I could only have presented you with half of this paper which may, in the final analysis, have been the best course of action. Thank you very much.

Summary

Northern Santa Clara County, California, has changed from an agricultural to an industrial-residential community in the past 10 to 15 years. Maturing shrubbery and fruit bearing trees in residential areas have provided ideal habitat for increased populations of roof rats.

Advisory or educational control measures only met with partial response and little success in actually exterminating rats. It took an actual organized health department effort with diphacine bait to achieve adequate control in a given area of 400+ homes.

An interesting legal complication is described as related to public rodent control on private property.

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Figure III. Diplocine Bait blocks placed in wood pile.



Figure IV. Typical vegetative harborage and food supply in a residential back yard.