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Post-Drought Rodent Population Explosion in Alameda County

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ABSTRACT: Alameda County Vector Control Services District (ACVCSD) receives ‘requests for service’ (RFS) relating to a variety of potential vectors of disease; one of the major program groups is rodents, which include house mice, deer mice, Norway rats, roof rats, wood rats, tree and ground squirrels, and meadow voles. This is an overview of the events of 2016, and some data from 2017, which began with much-needed rain and Alameda County bloomed. Along with an increase in biomass came an overabundance of rodents. The much-needed rainfall has historical correlation to meadow vole RFS and led to new records of meadow vole requests for services, and then to an unprecedented influx of house mice from open fields into neighborhoods. Our 2009 record-high 31 meadow vole requests for service was dwarfed by our 46 requests for service in 2016, which is almost a 50% increase over the 2009 high and over 4 times higher than the 10-year average of 9 RFS (some years had no meadow vole RFS). Additionally, in 2016 we received an astounding 637 house mouse RFS, an increase of over 73% of any of the previous 10 years which averaged 312 per year; the next-highest house mouse year generated 367 RFS. What seems to have accelerated the skyrocketing house mouse calls for service was one severely-affected Livermore neighborhood’s use of a neighborhood-networking website, which a neighborhood activist used to spur the residents to contact us for intervention. Our first indications of unusual problems for residents living in Livermore, and to a lesser extent in Fremont, followed three days of heavy rainstorms in mid-October produced nearly 10 inches of rainfall in some parts of the Bay Area, which exceeding the average monthly rainfall. We subsequently we received 257 rodent-related service requests.

KEY WORDS: biomass, house mouse, *Microtus californicus*, *Mus musculus*, Norway rat, *Rattus norvegicus*, *Rattus rattus*, rodents, roof rat, vole

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INTRODUCTION

Rodent abundance varies yearly with climatic conditions that support vegetation growth, which is the fuel for reproduction, increasing the carrying capacity of the environment. Hong Yan et al. (2015) illustrated the importance of precipitation on the increase of biomass, and David Clark (1980) documented that “both density and biomass of rats were significantly correlated with an index of vegetation mass”. While our gauge of rodent populations in Alameda County is only speculative, based

upon Requests for Service (RFS) received from the public, though these increased vermin complaints are a reasonable indicator of yearly population variations and trends. According to Winter and Proulx (2010), “Abundant rainfall, especially after a period of drought, can result in a flush of vegetation growth. Rodent populations can respond quickly to the improved forage and cover provided in these situations. Abundant rainfall when combined with a mild winter and a warm spring can lead

Figure 1. Rainfall data for San Francisco Bay Area, 2005-2017. Rainfall total inches (source - Golden Gate Weather Service, <http://ggweather.com/sf/monthly.html>).

to high reproduction and survival in some species of rodents.”

Rodent abundance and rodent-associated zoonoses are a major concern at ACVCSD, and as a group, rodents constitute nearly half of our RFS activities, with roof rats (*Rattus rattus*) receiving most complaints, followed by house mice (*Mus musculus*), and Norway rats (*R. norvegicus*). Most of our efforts go to educating the public on-site during rodent inspections, focusing on pest-proofing, environmental modification to reduce the attractiveness to rodents, rodent suppression, and cleanup. Our aim is to aid our constituents in solving these rodent problems themselves and in cooperation with their neighbors, or with other interested parties.

METHODS

Our rodent control program has several components. While we engage in sewer-based Norway rat control and shoreline surveillance, the majority of our activities are in response to requests for service by the public. Of the 6,323 RFS we received in 2016, 2,464 (about 39%) were for rodent problems. Residents may call our office, send an email, or make a request for service on-line. The RFS is assigned to an inspector based on their geographic assignment, and the staff member calls and schedules an appointment for an inspection. This inspection takes about 30 minutes or longer, depending on the size of the home or property. Additional time may be devoted to contacting the neighbors and for expanding the search for causal conditions. Recommendations will be provided, sometimes in a report that will detail environmental modifications, pest-proofing measures, and control strategies needed. Some situations may involve landlord-tenant relations, and some may require city code enforcement to resolve some issues.

After several years of drought, the San Francisco Bay Area received an above average amount of rain to start 2016 (Figure 1). During the 2015-2016 rainfall season (July 2015 - June 2016) we received over 23 inches of rain, which is 5 to 10 inches more than the previous four years.

This ample rainfall fed withered plants and began the creation of biomass (food for rodents).

RESULTS

Series of Events

Our first indication that 2016 would be an unusual year for rodent activity was receiving a couple of meadow vole (*Microtus californicus*) calls in early April. Most years pass with very few meadow vole calls, but when there is a sharp spike in vole population, affected homeowners quickly become frustrated and seek outside help. The typical situation is a neighborhood adjacent to open area, the natural habitat for meadow voles. As the grasses dry out, the voles begin to enter the greener pastures of the adjacent neighborhood, subsequently devouring the foliage in the residents’ irrigated yards. This invasion gained momentum in June with 7 Requests for Service, and it plateaued in July-August with 30 RFS during that period, totaling 46 RFS spanning April through November.

House mouse calls were on the rise and until June 2016 the service requests did not seem out of the norm; however, they continued to rise well beyond normal and set a new record in August with 64 RFS. Another record of 53 RFs was set in September. Then on October 14, it began to rain, and it rained steady for three days, with some areas receiving over 10 inches of rain (ABC 7 News 2016). This torrent of rain displaced a large population of house mice when some fields adjacent to neighborhoods became flooded and the house mice fled into the safer suburbia, startling residents who witnessed dozens of mice scampering down the streets. Calls and emails began to pour in. The Altamont Creek neighborhood in Livermore inundated us with emails and Requests for Service. One resident, while ordering at a drive-through, reported seeing several mice climbing the side of the MacDonald’s restaurant. In the next 30 days, we received 204 requests for service. During the same time frame the previous year, we had only received 45 RFS.

Figure 2. Vole requests for service, 2007-2017.

Figure 3. Habitat for house mice and meadow voles in fields adjacent to residential neighborhoods.

It is noteworthy that we were providing the services that residents wanted: residents wanted reassurance that the flood of mice would stop, as well as wanting advice on pest-proofing to exclude the mice and advice on their control. Local hardware stores sold out their mouse traps, and we were told many times that when residents contacted pest control services, they wanted residents to sign a year-long contract, which most did not want to do.

The Altamont Creek neighborhood was not the only area where the mice were flooded from their happy homes in the fields; some residents in Fremont were alarmed by the influx of house mice, often gaining entry into garages. The year 2016 was a banner year for house mouse requests for service: 637 for the year, compared to an annual average of 312 RFS for the previous 10 years, an increase of over 200%.

Roof rat requests for service also set a new record with 666, compared to the previous 10 years average of 469 requests for service each year, or about 42% over average. Overall, we received 2,464 rodent requests for service,

much higher than the average of the previous 10 years of 1,690, a 46% increase.

DISCUSSION

It is clear that the rainfall year and pattern for 2016, preceded by several years of drought conditions, had a significant impact on the rodent populations in Alameda County by providing sufficient biomass to support an unusually large rodent population. Additionally, an unprecedented three days of heavy rainfall in the middle of October, where some locations in the San Francisco Bay Area received almost 10 inches of rainfall, created flooding that pushed house mice from the fields into neighborhoods. Certainly, other factors such as winter rainfall timing and duration could be important factors in high rodent populations.

The year 2017 brought a rather rainy winter and early spring, and our rodent Requests for Service were another 26% above the 2016 level, which in turn was 32% higher than 2015 rodent RFS. This does lend to speculation that

Figure 4. House mouse requests for service 2007-2017.

Figure 5. Rodent Requests for Service 2006 to 2017.

other factors are contributing to this unprecedented and dramatic increase in rodent problems. One potentially significant factor may be the ban of the sale of second-generation anticoagulant rodenticides to the public, which went into effect July 1, 2014. The remaining first-generation rodenticides are sold only with tamper-resistant bait stations, and no longer as pelletized baits. Anecdotal comments from the public question “where the d-Con went” and suggest the remaining products do not seem to work well. We rely on the public to do their part in vector control, and when significant tools are removed, the overall effort by the public may have become reduced significantly, leading to a rise in rodent numbers.

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