**Category D: Vertebrates of Public Health Importance in California**

**Chapter 1: Snakes and Lizards**

**Rattlesnakes**

Class: Reptilia

Family: Viperidae

**Characteristics**: triangular head, heat-sensing loreal pit organ between the eyes and nostrils, keeled scales, rattle

-young rattlesnakes have only one rattle aka button

-A rattle segment is added each time the snake molts

-“cold-blooded”- depend on the environment to regulate their temperature and activities.

Therefore, they’re active during warm months and hibernate during winter months.

-Produce 4-15 live young instead of laying eggs like other reptiles (in summer months)

-usually, a female produces 1 litter per year, but in cold temp 1 litter every two years

**CA rattlesnakes:**

1. Western rattlesnake

2. Western diamondback rattlesnake

3. Mojave rattlesnake (*Crotalus scutulatus*): More venomous (toxic) than the other two.

**Public Health importance:**

-Bacterial infections may result from contact with reptile fecal matter, contaminated surfaces, or through bites.

-Est. 45,000 snake bites per year. 15-20 of these fatal

-Venom affect nerves

-Non-fatal bites can cause disfiguration and suffering (tissue damage, scars)

**Preventing rattlesnake bites:**

-Don’t handle or provoke rattlesnakes- maintain safe distance when encountered

-Watch your step and placing of hands, especially over rocks, logs, and twigs, ledges, crevices, animal burrows

-Wear sturdy leather boots or protective chaps in areas with high rattlesnake populations

-**Homeowners:** construct a “snake-fence.” Bottom fence should extend 4-6 inches below the surface of the soil & 2ft above ground. Seal, weather strip, screen access doors, vents, windows, and any other cracks and crevices on the property. Eliminate weeds, trash, lumber or wood piles.

**If and when bite occurs:**

-Keep the victim calm and covered in blanket and transport immediately to an emergency room

-Administer antivenin if available

-If possible ID the species of the snake

- DO NOT cut or suction venom from the bite site

-DO NOT apply tourniquets

-DO NOT attempt to kill or capture the snake that bit the victim

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**Lizards:**

Class: Reptilia

Note: Lizards in CA generally not a threat to public health

**CA lizards of public health importance**:

1. **Gila monster** (*Heloderma suspectum*)

-Moderately toxic venom

-Only venomous lizard in North America.

**Characteristics**: 9-14 inches, heavy body, large head, swollen tail, beaded appearance with blotches of red, orange, pink, and brown/black

**Range**: Extremely rare in CA. Historically found in eastern Mojave Desert in Clark, Kingstone, and Piute mountains in San Bernardino County.

2. **Western fence lizard** (*Sceloporus occidentalis*)

-It is of public health interest because it can be a secondary host to *Ixodes* ticks that transmit Lyme disease.

-Also known as “blue belly” or “fence swift”

**Characteristics**: 2-7 inches; back and legs covered in spiky tan, gray, brown scales; males have vibrant blue bellies, which are either faded or absent in females.

**Range**: throughout CA, except for hot/harsh deserts

**Habitat**: grasslands, chaparral, sagebrush, woodlands, coniferous forest, and farmland

3. **Southern alligator lizard** (*Elgaria multicarinata*)

-It is of public health interest because it can be a secondary host to *Ixodes* ticks that transmit Lyme disease.

**Characteristics**: large triangular head, short legged, heavy body, long prehensile tail [prehensile: tail that can grab on things]

**Range**: south Washington to Baja CA

**Habitat**: areas with shade and water and urban areas except hot/harsh desert

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**Chapter 2: Birds**

Around 10,000 species in Aves class. More than 600 bird species in CA. Public health significance: birds can get and transmit avian influenza, caused by RNA viruses. Pathogenicity and transmissibility determined by virus’s hemagglutinin (H1-H16) and neuraminidase (N1-N9).

**American crow** (*Corvus brachyrhynchos*)

-sentinel species for West Nile virus

-Nest between Feb-May; lay 3-9 eggs- incubation 18 days; common in CA

-migratory non-game bird

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**House finch** (*Carpodacus mexicanus*)

-reservoir of encephalitis viruses (Western equine and St. Louis)

-Nest between Mar-July; 2-6 eggs- incubation 13-14 days

-migratory non-game bird (permit required for control); common in CA

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**House sparrow** (*Passer domesticus*)

-reservoir of Western equine encephalomyelitis (WEE), St. Louis encephalitis, and many fungal and protozoal parasites

-Lay 2-7 eggs and up to 3 broods per year; non-game bird; common in CA

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**Canada goose** (*Branta Canadensis*)

-very low disease risk

-protected by state and federal law (permit required to kill)

-form lifelong breeding pairs; 3-7 eggs with incubation period of 25-30 days.

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**Pigeon** (*Columba livia*)

-Host of *Toxoplasma* and *Salmonella*. Feces provide growth medium for *Histoplasma* and *Cryptococcus* fungi (causes of respiratory illness). *Cryptococcus neoformans* is isolated from pigeon feces in CA- infection occurs following inhalation of aerosolized dust or soil contaminated with pigeon feces.

-1-2 eggs, which hatch in 16-19 days. ≥5 broods per year; common in CA; not protected by law

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**Avian pathogens**

**1.** **Psittacosis** (parrot fever or ornithosis): mostly in cockatiels and parakeets. Apporx. 75% cases result from caged pet birds.

**2. Dermatitis** (mites, *Ornithonyssus* spp)

3. **Hypersensitivity pneumonitis**

4. **Gastroenteritis** (*Salmonella* and *Campylobacter*): mostly through contaminated, undercooked meat and poultry

**Bird Control**: Habitat modification, waste management

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**Chapter 3: Opossums**

**Virginia Opossum** (*Didelphis virginiana*), the only marsupial living in North America

-Family: Didelphidae; sometimes called “living fossils”

-Usually have 2 litters of 4-10 young per year

-omnivores; solitary; nocturnal

**Public health significance**:

-Reservoir of *Trypanosoma cruzi* that causes Chagas diseases aka American trypanosomiasis, which is vectored by kissing bugs.

-Reservoir of murine typhus, which is transmitted by cat fleas (*Ctenocephalides felis*)

- Bacterial infection from bites and feces

-susceptible to rabies

-occasionally susceptible to *Baylisascaris* spp. that causes visceral and ocular larval migrans in humans.

**Control**: eliminate food sources, keep pets away, and do not touch opossums

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**Chapter 4: Bats**

The only flying mammal (warm blooded, give birth to live young). Nocturnal. Bats are found in all the continents except Antarctica. Most species are found in tropical areas, but they are also found in temperate areas. 42 species in the US and **23 species-3 families- in CA (all microchiroptera)**. Smallest bat in CA = western pipistrelle; largest = western mastiff bat.

Class: Mammalia

**Order**: Chiroptera (Greek meaning “hand wing”)

Suborders: Megachiroptera (big bats); microchiroptera (small bats)

Megachiroptera—don’t rely on echolocation, with large bodies and eyes, primarily eat fruits, found in Old World (most of Asia, Africa, and some parts of S. America) tropics.

Microchiroptera—use echolocation, small bodies and eyes, primarily eat insects, found throughout the world.

**Roosting**: dark, sheltered places

**Food**: mostly insects. In CA one species, Mexican long-tongued bat, primarily eats fruits

**Reproduction**: breed in spring; 1-2 babies per year

**Lifespan and Activity**: ~30 years; active during warm months when insects are abundant and hibernate or migrate to warmer areas during winter months

**Benefits of bats**: pollinators; eat insects; seed dispersal

**Public health significance**: transmit Rabies and Histoplasmosis. May also carry/feed parasites such as fleas, ticks, mites.

-Most rabies infected bats become paralyzed and die within a few days

-symptoms of **rabid bats**: active during the day

-**If bit by a bat**: wash the affected area with soap and water and seek medical attention; when possible retain the bat and send for rabies testing; call animal control for bat handling and removal

-**Histoplasmosis** is rare in CA, but if a person is working in areas with bats, proper respirator must be worm. Histoplasmosis **can be severe and sometimes fatal**.

**Control**: in CA, 8 species designated as Species of Special concern (Animal control personnel should be educated about the handling of each species). 6 bat sp. listed Endangered in the US.

-any opening more than ½ by 1” should be closed or sealed (attic or outer walls)

-1/4 or 1/2 inch mesh cloth over the top of chimney or air vent

-exclusion best to be conducted in late fall or winter when bats have migrated

-ultrasound devices, naphthalene (moth balls) not effective to control bats

-Don’t handle or provoke bats. If you must handle bats, wear proper PPE

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**Chapter 5: Carnivores**

In CA there are about 23 species of carnivores, including feral dogs and cats. Carnivores are mostly “flesh-eating,” but also consume fruits and vegetables (eg. Bear). Most kill prey, but some scavenge. They produce live young, which are born blind and need parental care for an extended period. Most produce 1 litter per year.

**Control**: don’t control or relocate carnivores without legal understanding or expert advice.

**1. Coyotes** (*Canis latrans*):

Class: Mammalia

Order: Carnivora

Family: Canidae

**Reproduction**: Pairs mate for life. 1 litter (5-6 babies) per year

**Food**: mostly eat mice, rats, ground squirrels, and carrion, but can also eat insects, birds, reptiles, amphibians, fruits

**Habitat/Distribution**: common in CA; inhabit mostly open plains; are very adaptive to changes in environment and tolerant to human activities.

**Public Health significance**: Important sentinel species for plague surveillance.

**Control**: fencing- 2m above ground and extend 0.8m below ground. Electrified fencing; irregular placement (to avoid coyotes from getting used to it) of lights around livestock enclosures; auditory, olfactory, and gustatory repellants less successful.

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**2. Red Fox** (*Vulpes vulpes*): small dog-like canines. Weighs approx. 8-15lbs; rust-red color, white chin, black feet.

Class: Mammalia

Order: Carnivora

Family: Canidae

**Food**: Opportunistic feeders- eat insects, earthworms, fruit, carrion, birds, and rodents

**Habitat/Distribution**: found in most of Canada and the US, except the southwest CA, northern Nevada, and Arizona. In CA: subspecies *Vulpes vulpes necator* is listed as a Threatened species. These are found in the Cascades, Siskiyou Co. and from Lassen Co. to Tulare Co.

**Public health significance**: can be a reservoir for diseases of humans and domestic dogs. Can prey on domestic pets and livestock.

**Control**: fencing- 2m above ground and extend 0.8m below ground. Electrified fencing; irregular placement (to avoid foxes from getting used to it) of lights around livestock enclosures; auditory, olfactory, and gustatory repellants less successful.

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**3. Kit Fox** (*Vulpes macrotis*): smaller than red foxes. Weighs approx. 3-6lbs.

Class: Mammalia

Order: Carnivora

Family: Canidae

**Reproduction**: One litter (about 4 babies) per year

**Food**: black-tailed hares, desert cottontails, rodents, insects, reptiles, small birds, and eggs

**Habitat/Distribution**: arid regions of southern CA; in open areas with low human disturbance and in areas with loose-textured soil with scattered shrubs

**Public health significance**: rarely a nuisance or disease threat

San Joaquin kit fox (*Vulpes macrotis macrotis*) is listed as Endangered (federal) and Threatened (CA)

**Control**: fencing- 2m above ground and extend 0.8m below ground. Electrified fencing; irregular placement (to avoid foxes from getting used to it) of lights around livestock enclosures; auditory, olfactory, and gustatory repellants less successful.

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**4. Gray Fox** (*Urocyon cinereoargenteus*): Weigh 7-13lbs. Grizzled gray top and red-brown bottom; white throat; tail black on top and the tip; feet rust colored.

Class: Mammalia

Order: Carnivora

Family: Canidae

**Reproduction**: One litter (about 4 babies) per year

**Food**: fruits, cottontail rabbits, mice, voles, insects

**Habitat/Distribution**: shrub lands and open to canopied forests that have creeks, streams, rivers, ponds, or lakes. Found in eastern US to many western states

**Public health significance**: can serve as disease reservoirs. Occasionally prey on domestic pets and livestock.

**Control**: fencing- 2m above ground and extend 0.8m below ground. Electrified fencing; irregular placement (to avoid foxes from getting used to it) of lights around livestock enclosures; auditory, olfactory, and gustatory repellants less successful.

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**5. Feral domestic dog** (*Canis lupus*): domestic dogs that haven’t had a commensal relationship with humans for more than one generation. More aggressive than stray or abandoned dogs.

Class: Mammalia

Order: Carnivora

Family: Canidae

**Reproduction**: form organized packs to rear litters communally.

**Food**: small to medium sized wild and/or domestic animals.

**Habitat/Distribution**: anywhere where domestic dogs are abandoned and uncontrolled

**Public health significance**: increased risk of injury and disease transmission because of their aggressive behavior towards humans.

**Control**: responsible ownership; if not separate them into distinct geographical areas and provide healthcare services such as vaccines, sterilization, etc.

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**6. Black Bear** (*Ursus americanus*): Weigh 200-600lbs. Game species.

Class: Mammalia

Order: Carnivora

Family: Ursidae

**Reproduction**: Give birth every 2 years, usually twins or triplets.

**Food**: Opportunistic feeders- can eat fruits, roots, nuts, insects, fish, rodents, and carrion

**Habitat/Distribution**: Most part of the US and Canada. West: found in forests and wooded mountains below 2100m elevation. East: found in forests and swamps.

**Public health significance**: Sentinel species for plague surveillance. May cause injury and become nuisance.

**Control**: removing food sources; electrified fencing, scarecrow/human effigies, repellents.

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**7. Ringtail** (*Bassariscus astutus*): relative of raccoons; mostly nocturnal. Fully protected in CA. Weigh about 2lb

Class: Mammalia

Order: Carnivora

Family: Procyonidae

**Reproduction**: one litter (about 3 babies) per year

**Food**: rodents, rabbits, birds, eggs, insects, fruits, nuts, and some carrion

**Habitat/Distribution**: southwestern Oregon, CA, and south Nevada. Live in forest and shrub lands with rocky areas or bodies of water.

**Public health significance**: minimal

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**8. Raccoon** (*Procyon lotor*): weigh 12-48lbs. Nocturnal.

Class: Mammalia

Order: Carnivora

Family: Procyonidae

**Reproduction**: 3-4 young per litter, birthed between March-May

**Food**: Opportunistic feeder. In Spring: fish, crayfish, insects, amphibians, small mammals, birds, eggs. In Summer and Fall: primarily feed on fruits, nuts, acorns, and grains.

**Habitat/Distribution**: most common along wooded streams, also inhabit wetlands, and forested area around water bodies. Found throughout the US, except for portions of Rocky Mtn states, central Nevada and Utah.

**Public health significance**: Risk of Rabies and *Baylisascaris procyonis* (intestinal roundworm). Also, tularemia, leptospirosis, Chagas diseases, trichinosis, and canine distemperCan be nuisance and destroy property or occasionally cause injury.

**Control**: remove food sources; exclusion- fences (electric), tightly closing entry points such as windows, doors

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**9. Striped Skunk** (*Mephitis mephitis*): Nocturnal; 2 white stripes on their back; thin white stripe down the center of the face; weigh 6-14lb

Class: Mammalia

Order: Carnivora

Family: Mephitidae

**Reproduction**: One litter (about 4 offspring) per year- April through June

**Food**: primarily insects, fruits, small mammals, birds, eggs, amphibians, and some carrion

**Habitat/Distribution**: Found in deserts, woodlands, grassy plains, and suburbs.

**Public health significance**: Reservoir of rabies in CA. Occasionally damage property and prey on laying fowl and their eggs.

**Control**: fencing (40-60cm or 1.5-2ft below surface); remove food sources (mainly garbage) and get rid of habitat sources such as wood and debris piles.

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**10. Western spotted skunk** (*Spilogale gracilis*): Nocturnal; smaller than other skunks. Horizontal, white stripes on the neck and shoulders, and irregular stripes on the sides. Weigh approx. 2lb. In CA: subspecies *S. g. amphiala* is listed under “Special Concern.”

Class: Mammalia

Order: Carnivora

Family: Mephitidae

**Reproduction**: One litter (~4 offspring) per year; born in April or May.

**Food**: primarily insects and small mammals, but also eat fruits, grains, reptiles, birds, eggs, and carrion

**Habitat/Distribution**: Found in moderately open shrub and forest habitats with water bodies; also found in areas with rocky lava rims and outcrops. They’re distributed in the western US, except in the high mtns and very dry areas such as Mojave and Colorado deserts.

**Public health significance**: Reservoir of rabies in CA. Sentinel species for plague surveillance in lava rim and rocky outcrop habitats.

**Control**: fencing (40-60cm or 1.5-2ft below surface); remove food sources (mainly garbage) and get rid of habitat sources such as wood and debris piles.

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**11. Badger** (*Taxidea taxus*): in the same family as weasels, minks, wolverines, otters, martens. Males larger than females. Weigh 8-25lbs.

Class: Mammalia

Order: Carnivora

Family: Mustelidae

**Reproduction**: 2-3 offspring per litter; born in Mar or April.

**Food**: Primarily rodents. Occasionally, reptiles, insects, earthworms, birds, eggs, and carrion

**Habitat/Distribution**: plains, farmlands, and sometimes edge of woods. Found in western US all the way to eastern TX, OK, northern IL, northern IN, and northern OH. And, southeastern Canada

**Public health significance**: sentinel species for plague surveillance. May damage property and cause injury.

**Control**: mesh fencing buried to a depth of 30-46cm (12-18in); using bright lights to frighten them, or eliminating their prey (gophers, squirrels).

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**12. Mountain Lion** (*puma concolor*): weigh 75-275lbs.; specially protected species.

Class: Mammalia

Order: Carnivora

Family: Felidae

**Reproduction**: one litter (1-6 offspring) every 2 years; born during summer

**Food**: primarily deer, but also eat coyotes, porcupines, beaver, marmots, rabbits, raccoons, mice, and insects

**Habitat/Distribution**: mountainous regions, hilly northern forests, semiarid regions, tropical and subtropical forests and swamps. Found in western North America- from BC and southern Alberta through western Wyoming, CA, and west & south TX, southern Louisiana, parts of TN, south Alabama, and south FL.

**Public heath significance**: sentinel species for plague surveillance. Occasional injury and loss of domestic pets and livestock.

**Control**: fence at least 2m tall; keeping shrubs and trees cleared around homes; temporary: loud noises and bright, flashing lights. Protected sp. so all control methods need to be done by US Fish and Wildlife dept.

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**13. Bobcat** (*Lynx rufus*): weigh 14-40 lbs.

Class: Mammalia

Order: Carnivora

Family: Felidae

**Reproduction**: one litter (2-3 offspring) per year; born April to May.

**Food**: rodents, young deer, birds, reptiles, amphibians, and inverts, also fruits and veggies.

**Habitat/Distribution**: scrubby areas, broken forests, swamps, farmlands, and rocky or brushy arid lands. Found from southern Canada to Mexico- absent or scarce in the Midwest and plentiful in the far west.

**Public health significance**: sentinel species for plague surveillance. Prey on domestic pets

**Control**: fence at least 2m tall; keeping shrubs and trees cleared around homes; temporary: loud noises and bright, flashing lights.

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**14. Feral Domestic Cat** (*Felis silvestris*): domestic cats that have been abandoned and adapted to the wild; slightly thinner than domestic cats.

Class: Mammalia

Order: Carnivora

Family: Felidae

**Reproduction**: very fertile; 3-4 litters (3-6 offspring in a litter) per year.

**Food**: opportunistic feeders- birds, rodents, garbage, uneaten pet food.

**Habitat/Distribution**: vacant or infrequently used buildings in urban and suburban areas where domestic cats are abandoned.

**Public health significance**: injury or source of diseases for domestic cats and humans (Plague and Rabies). Fleas on these cats can transmit Murine typhus. Reduction in native bird species if high population of feral cats exist.

**Control**: separate them from stray cats; restrict colonies to defined areas; tag them and provide routine vaccines and other healthcare services. Prevent any entrance of abandoned/stray cats in the areas with feral cats.

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**Chapter 6: Rodents**

Globally >2000 spp and 28 families. Among vertebrates, one of the most adapted and notorious group. In CA: **commensal** (domestic) = Old world rodents and **wild** rodents

**Commensal rodents**: Nocturnal; prefer fresh food to old/spoiled food; acute hearing and sense of smell; sensitive whiskers and guard hairs on their bodies help them to get around- make up for poor vision; good swimmers; rats jump over 2ft vertically and house mice about 1ft. Most spp sexually mature in 3-5 wks. 1 litter can have 1-12+ offspring. In thw wild, live approx. 1 yr.

Family: Muridae

Subfamily: murinae

**1. Roof rats** (*Rattus rattus*): 2-6 litters (6-8 young/litter)/yr. *Salmonella*, *Streptobacillus*, *Leptospira*, hosts of *Ornithonyssus bacoti* (rat mite- **hantavirus**).

**2. Norway rat** (*Rattus norvegicus*): Largest of commensal rats. 2-7 litters (8-12 young/litter)/ yr., and live for 9-12 months. Host of oriental rat flea, *Xynopsylla cheopis* (**Plague**).

**3. House mouse** (*Mus musculus*): **less neophobic** than rats. Preferably feed on cereal grains, but can eat any other edible materials. Sexually mature in 1.5-2months. **As many as 8 litters (5-6 young/litter)/year**. Nesting sites close to food source (10-30ft away). Reservoir of lymphocytic choriomeningitis virus and often infected with *Salmonella* and mites that transmit rickettsial pox.

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| Roof Rat (*Rattus rattus*) | Norway Rat (*Rattus norvegicus*) |
| * Pointy nose * Eyes and ears large * Droppings pointy ends * Semi-arboreal (nest above ground- attics, walls, cabinets, etc.) * Tail long & uniformly colored * Omnivores, but prefer veggies, fruits, grains | -Blunt nose  -Small eyes  -Droppings blunt end  -Burrowing (nest in the ground- up to 18”)  -Tails shorter than body; bi-colored  -Omnivores, but prefer meat, poultry, fish, garbage, grain  -Ascend vertical pipes up to 7cm in diameter |

**Control of commensal rodents**:

1. **Population reduction**: short-term solution

i. **Trapping**: snap traps are most effective. Pre-baiting without setting traps helps to get the neophobic rats used to the traps

ii. **Glue boards**: available in market, but not recommended- inhumane and also risk of handlers getting exposed to hanta-virus.

iii. **Tracking powder**: containing toxic chemicals (eg. Diphacinone, chlorophacinone, zinc phosphide) -- collected on fur and later ingested while grooming.

iv. **Anticoagulants**: toxicants that disrupt blood clotting and cause internal hemorrhages.

v. **Rodenticides**: varying level of toxicity- follow labels

vi. **Ectoparasite control**: control ectoparasites such as mites, fleas before or during rodent control.

2. **Environmental modification**: long-term solution

Alteration of the environment to exclude favorable food and habitat sources. Also require: Environmental sanitation and Exclusion (rodents such as mice can enter openings as narrow as 2cm (0.75”) in diameter.

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**Wild rodents**: In CA- 28 spp. of **Sciuridae family**. They are diurnal (active during the daytime).

**Family: Sciuridae**

**I.** **CA ground squirrel (***Otospermophilus beecheyi***)**: found throughout CA, except Mojave and Colorado deserts. Large rodents; weigh 11-22 oz.

**Reproduction**: one litter (6-8 young)/yr. Gestation 25-30 days. Young weaned in 6wks and fully grown in 7-8 months. Live for 5+ years in the wild.

**Food**: omnivores (seeds, nuts, fruits, insects, bird eggs, carrion)

**Habitat**: burrow dwellers; ground cover as well as open areas. Avoid thick chaparral.

**Public health significance**: most important rodent involved in plague epizootics in CA. Sudden decrease in population a good indication of disease transmission, so control measures should be implemented.

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**II. Belding’s ground squirrel (***Urocitellus beldingi***)**: very short tail. Weigh 5-10 oz.

**Reproduction**: one litter (3-8 young)/yr. Gestation 23-31 days. Young weaned at 27 days old.

**Food**: Omnivores- feed on grasses, leaves, stems, fruits, bulbs, seeds, insects, carrion

**Habitat**: burrows in meadows, grassy areas near water sources

**Public health significance**: Plague epizootic

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**III. Golden-mantled ground squirrel** (*Callospermophilus lateralis*): medium sized with a distinct white stripes bordered by black stripes on their sides. Found at elevations 4800-11000 ft.

**Reproduction**: 1-2 litters (~5young)/yr. Gestation about 4wks. Young mature in 1 yr.

**Food**: prefer fungi, pine nuts, seeds, bulbs, insects, flowers, bird eggs, carrion.

**Habitat**: burrow under rocks, logs, and tree stumps.

**Public health significance**: plague epizootic

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IV. **Yellow-bellied marmot** (*Marmota flaviventris*): large squirrel; weigh 3-8lbs.

Reproduction: 1 litter (4-6 young) per year.

Food: grasses, shrubs, seeds, flowers, leaves, and insects (forage mid-morning and late afternoon).

Habitat: burrows under rocks or tree bases. Home range of 0.5-5 acres.

Public health significance: minimal

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V. **Tree squirrels** (Western gray, Eastern gray, Eastern fox, Douglas’s): long and bushy tails; uniformly grayish in color. *Sciurus* spp.

**Reproduction**: 1-2 litter (1-5 young/litter) per year. Live up to 6 years in the wild.

**Food**: seeds and nuts plus occasionally leaves, buds, and fruits.

**Habitat**: arboreal (nest in tree holes, enlarged woodpecker holes, and cavities in trees).

**Public health significance**: Reservoirs of relapsing fever and plague in mountainous northern CA. Western gray squirrels can be infected with Western equine encephalomyelitis virus (WEE).

Also, can damage trees and buildings and structures.

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VI. **Chipmunks** (Alpine, yellow-pine, least, redwood, long-eared, Siskiyou, lodgepole, Merrian’s, California, Panamint, shadow, Sonoma, Uinta): *Tamias* spp. Dark stripes on the sides of their face; four lightly colored stripes on their backs.

**Reproduction**: 1-2 litters (2-7 young per litter) per year.

**Food**: seeds and nuts and occasionally leaves, buds, and fruits.

**Habitat**: deciduous forests, areas of thick brushes, common where food is abundant such as in campgrounds and outdoor recreational areas.

**Public health significance**: indicator spp. for plague, however, susceptibility varies per species. Northern CA, *T. senex* and *T. quadrimaculatus* relatively resistant to infection, but act as reservoirs. Central and South CA: similar for *T. amoenus*, and *T. merriami*.

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**Family: Heteromyidae: Nocturnal**

CA: Approx. 10 spp. of pocket mice and 14 spp. of kangaroo rats. Reduced forelimbs and enlarged hind limbs. Cheeks with fur lined pouches.

**Reproduction**: Dependent on food availability. With abundant food: 2-3 litters (5-7 young per litter) per year.

**Food**: seeds and vegetation. Water obtained from oil in seeds.

**Habitat**: Underground burrows in sparsely vegetated, sandy soils (desert areas).

**Public health significance**: Kangaroo rats reservoir of *B. burgdorferi* (Lyme disease)

**Note**: 6 spp. and subspecies of kangaroo rats are endangered.

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**Family: Muridae [now, Cricetidae]**

**Subfamily: Sigmodontinae [now, Neotominae] -** in CA,27 spp. in this subfamily.

**Genus: *Peromyscus* (White footed mice)**

CA: *Peromyscus* mice (6 spp. namely, Brush, California, Canyon, Cactus, Deer, Pinon). Deer mice are most abundant and relatively small with tail that is <50% of body length. Pinon mouse is moderately large with large ears; California mouse the largest of *Peromyscus* spp. and found along the coast of SF bay to Mexican border.

**Reproduction**: breed year-round. 1-4 litter (1-8 young per litter) per year. Gestation 22-25 days.

**Food**: Omnivores. Seeds, nuts, acorns, fruits, leaves, fungi, and insects.

**Habitat**: variety of habitats, but primarily woodlands, grasslands, brush, and chaparral.

**Public health significance**: Reservoirs of many diseases, including plague; enzootic maintenance of *B. burgdorferi* (Lyme disease bacteria). May also be involved in the maintenance of other tick borne diseases such as Anaplasma.

**Deer mice**- primary reservoir of Sin Nombre virus (Hantavirus) in Western US (urine and feces)

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**Genus: *Neotoma* (Woodrats):** mostly nocturnal.

CA: Four spp. of woodrats (namely, dusky-footed, desert, bushy-tailed, big-eared). Resemble a large deer mouse. Dusky-footed absent from ag. and open grasslands of central valley CA.

**Reproduction**: Usually 1 litter (3-4 young per litter) per year. Dusky-footed (*N. fuscipes*) however can produce up to 5 litters in conditions permit.

**Food**: Forage on ground as well as trees/bushes- feed on vegetation.

**Habitat**: dusky-footed- moderate canopies of forest and chaparral; *N. lepida* in desert; *N. cinerea* rocky outcrops, rockslide areas in montane habitats and lava rim and lava cave in N. CA. Create conical shaped huts that can reach up to 8ft tall.

**Public health significance**: Principal reservoir of *B. burgdorferi*. Indicator spp. of plague (*N. cinerea* involved in plague epizootics in lava rim habitats). Maybe reservoirs of *Ehrlichia* and Whitewater Arroyo mammarenavirus. **Dusky-footed** are important hosts of kissing bugs, Triatoma spp., so **possibly involved in transmission of Chagas disease**. Possible reservoir of rickettsiae (*Anaplasma* spp.)

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**Genus: Reithrodontomys** (Western harvest mouse- *R. megalotis*): found throughout CA.

**Reproduction**: 1 litter (3-5 young per litter) per year.

**Food**: Grasses and seeds

**Habitat**: grasslands and other uncultivated areas

**Public health significance**: Reservoir of El Moro canyon virus and a Hantavirus that is not yet associated with human disease.

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**Family: Muridae [now, Cricetidae]**

**Subfamily: Arvicolinae**

**California vole (***Microtus californicus***):** small, partially furred ears, tail less than 1/3 of body length.

**Reproduction**: may breed throughout the year. 2-5 litters (~4 young per litter) per year. Gestation period 20 days; females sexually mature in 1 month.

**Food**: Herbivores (leaves, grasses, seeds)

**Habitat**: wet meadows, montane riparian, dense annual grasslands. Build shallow burrows in soft soil with obvious pathways

**Public health significance**: Reservoir of Isla Vista virus and Hantavirus that is not yet associated with human disease. Reservoir of plague and tularemia in some regions of CA.

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**Chapter 7: Safety guidelines for handling and sampling rodents**

Collection and processing:

-humane methods and using the least individuals necessary

-follow local, state, and federal regulations (some spp. might be threatened or endangered)

-wear correct PPE

------------------------------------------------- *The End* --------------------------------------------------------