

Rodenticide Training



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Chair, Rodenticide Task Force



Purpose of this training

- ☞ Support rodenticide stewardship
- ☞ Use IPM to maximize the effectiveness of rodenticides and minimize non-target impacts

RTF Members:

- BASF
- Bell Laboratories, Inc.
- Central Garden & Pet Co. (Farnam)
- JT Eaton
- Liphatech, Inc.
- Neogen Corporation
- PelGar International Ltd.
- Reckitt Benckiser
- Scimetrics Limited Corp.
- Unichem d.o.o.
- VM Products
- Wilco Distributors
- Woodstream Corporation

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Overview

- 🐭 Basic Rodent Biology
- 🐭 Rodenticide Baits / Types of Bait
- 🐭 Avoiding Bait Shyness and Aversion
- 🐭 Resistance to Anticoagulants
- 🐭 Rodenticide Label
- 🐭 Principles of IPM
- 🐭 Burrow Baiting
- 🐭 Compost Rat Control
- 🐭 Best Practices
- 🐭 What To Do and What Not To Do
- 🐭 Customer Communication
- 🐭 Minimizing Risk to Non-Targets
- 🐭 Wildlife Research
- 🐭 Summary



Rodent Biology

Commensal Rodents

- ☞ High reproductive potential
- ☞ Omnivorous
- ☞ Adaptable



Image: RTF

Rodent Biology

Three commensal species

- 🐭 House mouse
- 🐭 Roof rat
- 🐭 Norway rat

Native species

- 🐭 Deer mice
- 🐭 Voles
- 🐭 Other species (pack rats, wood rats, cotton mouse, kangaroo rats)



Rodents and Rodenticide Labels

- ☞ Different parts of the country have different species and different pressures
- ☞ Check the label to make sure you are baiting per label instructions



Image: farmanddairy.com



Image: Cleanlink.com



Image: RTF

House Mouse (*Mus musculus*)



Image: RTF

- ☞ Delicate and petite body form
- ☞ 0.5 ounces
- ☞ An adult is ~ 5-7 inches long (including tail)
- ☞ Skull height is $\frac{1}{4}$ inch
- ☞ Light brownish to grey
- ☞ Moderately large ears
- ☞ Small black eyes
- ☞ Almost hairless tail

Deer Mouse (*Peromyscus maniculatus*)

- Larger eyes
- White underside
- Bicolored and well-furred tail
- Approx. 7 inches long (including tail)



Vole Biology (*Microtus sp.*)

- ☛ Color varies from light to dark
- ☛ Eyes smaller than house mouse
- ☛ 5-8 inches in length (including tail)



Images: RTF



House Mouse, Deer Mouse and Vole

- ☞ All these rodents can look very similar
- ☞ Identification is important



House mouse

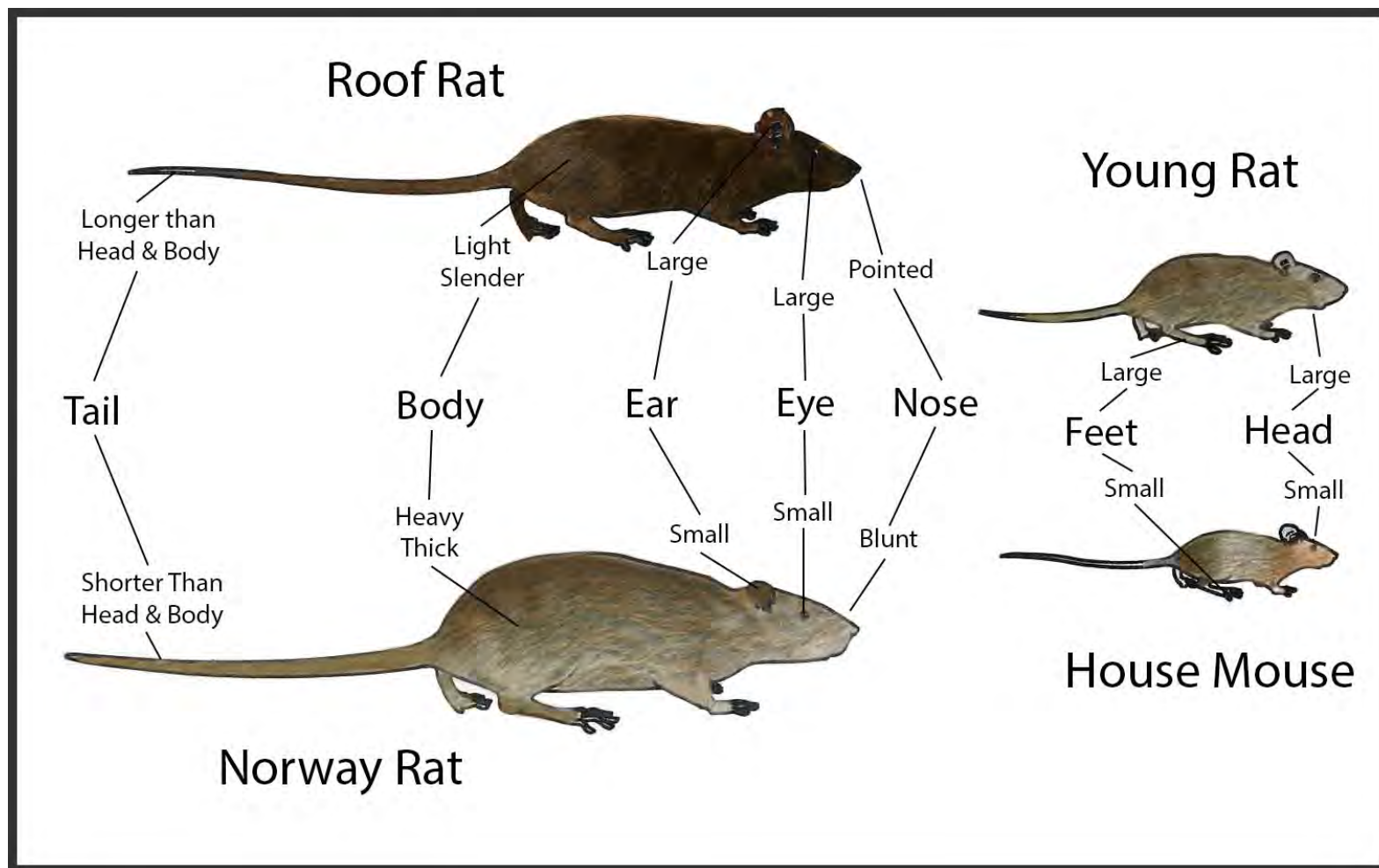


Deer mouse



Vole

Norway Rats (*Rattus norvegicus*) and Roof Rats (*Rattus rattus*)



Norway Rat vs Roof Rat

- ☞ Large and robust
- ☞ 7-18 ounces
- ☞ Adult is ~ 8-10 inches
- ☞ Small ears
- ☞ Small eyes
- ☞ Brownish or reddish gray above, whitish gray on the belly

- ☞ Sleek and agile
- ☞ 5-10 ounces
- ☞ An adult is ~ 6-8 inches long
- ☞ Tail is longer than head and body
- ☞ Uniformly dark tail with fine scales
- ☞ Very large ears
- ☞ Prominent black, beady eyes
- ☞ Three coat types: charcoal gray, brownish with white belly, brownish with gray belly

Droppings ID



Norway Rat Droppings



Mouse Droppings



Roof Rat Droppings

Rodenticide Baits

- Different formulations (pellets, blocks, soft bait) and multiple active ingredients
- Must be used according to label for safety and efficacy



**Liquid
Bait**

**Tracking
Powder**

**Bulk
Meal**

**Bulk
Pellets**

**Pellets
Place Packs**

**Molded
Blocks**

**Extruded
Blocks**

**Soft
Bait**

1st Generation Anticoagulant Rodenticides (FGARs)

Anticoagulants inhibit blood clotting

- Chlorophacinone
- Diphacinone
- Warfarin

 Rodents require multiple feedings for a lethal dose

2nd Generation Anticoagulant Rodenticides (SGARs)

More potent anticoagulants

- Brodifacoum
- Bromadiolone
- Difenacoum
- Difethialone



Rodents require fewer feedings and smaller doses for a lethal dose

Acute or non-anticoagulant Rodenticides

- Bromethalin – neurotoxin
- Cholecalciferol – hypercalcemia, renal failure, cardiovascular abnormalities
- Zinc Phosphide (ZP) - neurotoxin, forms phosphine gas after being ingested

Bait Shyness and Aversion

“When poison baits are exposed to the rodent populations, some of them consume a lethal quantity and succumb, whereas those which ingest only a sublethal dose of poison survive the poisoning. These survivors suffer a physiological disorder/gastro intestinal distress and are able to detect the poison and even the bait material after recovering from the illness. Further, they refuse to feed on the same for a considerable period. This phenomenon of rejecting the bait on subsequent exposures is termed as **bait shyness** and the **aversion** thus developed towards the poison is called **poison aversion**.”

➤ Prakesh 1988 Rodent Pest Management

Genetic Resistance to Anticoagulant Rodenticides

- FGARs, some SGARs (especially bromadiolone)
- In Europe, the UK, and the US
- In the House Mouse, Norway Rat, and the roof rat



Under-baiting is likely one of the conditions for developing resistant populations

COMMENSAL RODENTICIDE

FOR INDOOR AND OUTDOOR USE

KILLS NORWAY RATS, ROOF RATS,
HOUSE MICE, AND KILLS OTHER
RODENT SPECIES AS LISTED ON
THIS LABEL

KEEP OUT OF REACH OF
CHILDREN
CAUTION

Example Label

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. **READ THIS LABEL** and follow all use directions and precautions. Use only for the sites, pests, and application methods described on this label.

IMPORTANT: Do not expose children, pets or other nontarget animals to rodenticides.

1. Store product not in use in a location out of reach of children and pets.
2. Apply bait in locations out of reach of children, pets, domestic animals, and nontarget wildlife, or in tamper-resistant bait stations. These stations must be resistant to destruction by dogs and children under six years of age and must be used in a manner that prevents such children from reaching into bait compartments and obtaining bait. If bait can be shaken from stations when they are lifted, units must be secured or otherwise immobilized. Even stronger bait stations are needed in areas open to hooved livestock, raccoons, bears, other potentially destructive animals, or in areas prone to vandalism.
3. Dispose of product container, unused, spoiled, and unconsumed bait as specified on this label. Note: Bait stations are mandatory for outdoor, above-ground use. Tamper-resistant bait stations must be used if children, pets, non-target mammals, or birds may access the bait.

APPLICATION DIRECTIONS

Rats: Apply 4 to 16 ounces (113 - 454 grams) of bait per placement, usually spaced 15 to 30 feet apart. Maintain an uninterrupted supply of fresh bait for at least 10 days.

House Mice: Apply 1/4 to 1/2 ounces (7 - 14 grams) of bait per placement, usually spaced 8 to 12 feet apart. Larger placement (up to 2 ounces or 57 grams) may be needed at points of very high mouse activity. Maintain an uninterrupted supply of fresh bait for at least 15 days.

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Follow Up: Replace contaminated or spoiled bait immediately. Collect and dispose of all dead animals and leftover bait properly. To prevent reinfestation limit sources of rodent food, water, and harborage as much as possible. If reinfestation does occur repeat treatment. Where a continues source of infestation is present, establish permanent bait stations and replenish as needed.

Example Label

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Image: J. Meyers

Example Label

Note: label mockup for display only – always read and follow printed label directions

Principles and Steps of Integrated Pest Management

IPM is . . .

An effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment, in combination with available pest control methods, to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

U.S. Environmental Protection Agency

IPM is . . .

A science-based, decision-making process that incorporates management goals, consensus building, pest biology, monitoring, environmental factors, and selection of the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment and preventing unacceptable levels of pest damage.

U.S. Fish and Wildlife Service 569 FW 1 Part B

Misconceptions about IPM

- **IPM is a strategy to eliminate the use of all pesticides**
- **Switching from chemical pesticides to organic alternatives**
- **IPM = Biological Control**

Principles of IPM

- Strategy can be used for any pest species
- **Site specific = Best Management Practices**
- Not the objective, but a pathway to an objective

Tools of the Trade

- Monitoring
- Prevention Methods
- Cultural Methods
- Physical Methods
- Biological Control
- Chemical Control

Integrated Pest Management

- 1) Monitor rodent populations and/or damage;
- 2) Evaluate available control methods, giving consideration to the environment;
- 3) Implement the selected method(s);
- 4) Monitor the target pest, non-target species, and the damage to determine the effects of the method(s)

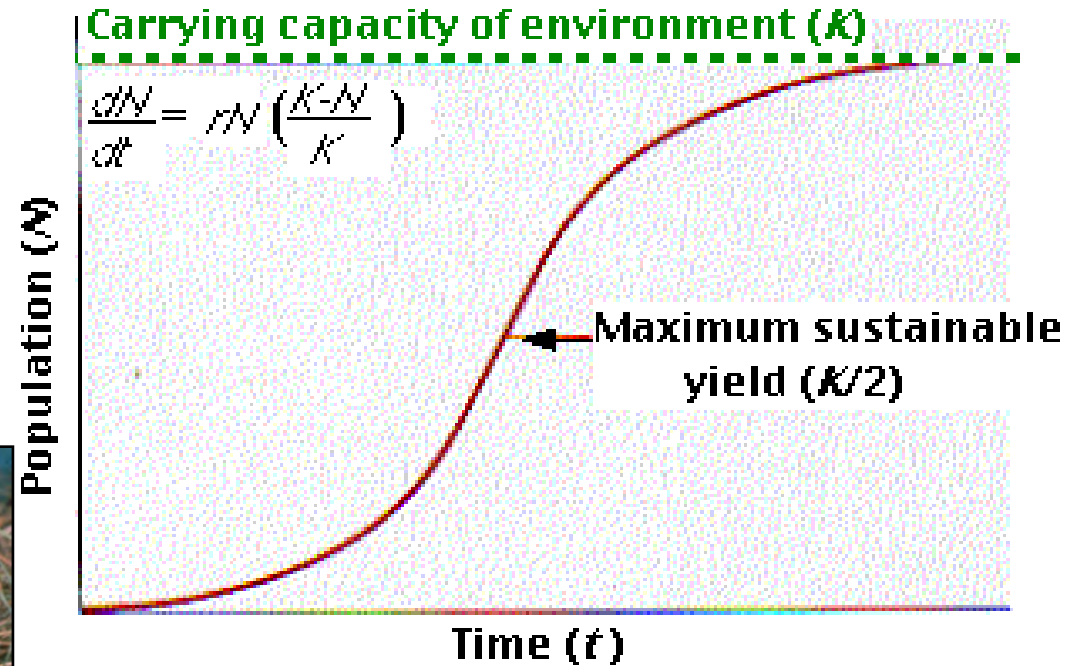
Principles of Rodent Control

Based on the understanding of the habitat use and population dynamics of the rodent pest:

- ❖ Timing of control (breeding cycle, season, availability of other food, continuous)
- ❖ Location of control (spot treatment, perimeter, indoor)

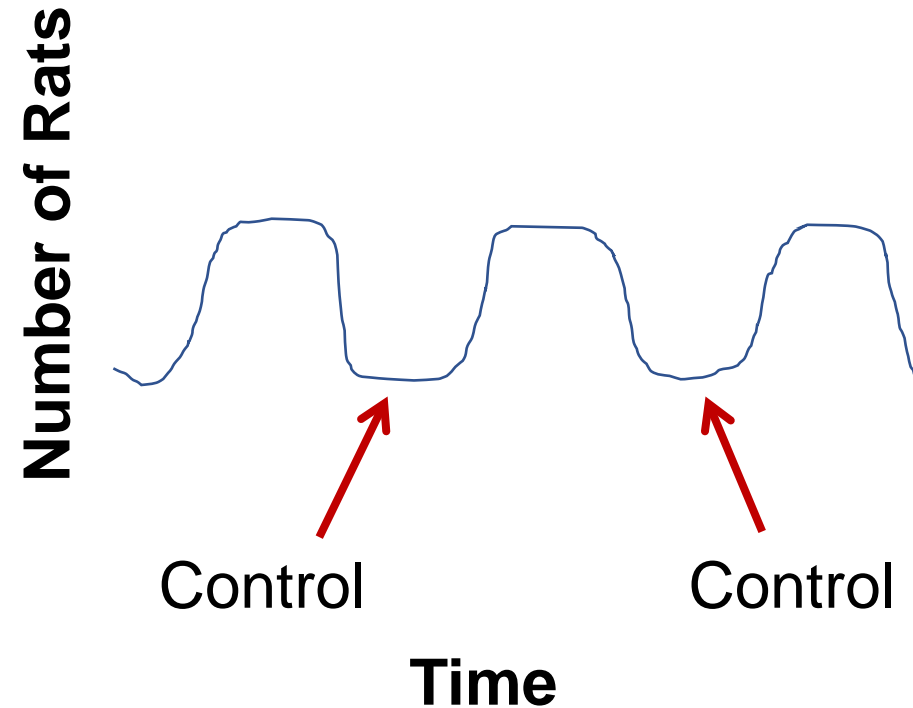
Rodents are r-Strategists

- Omnivorous
- Adaptable
- High population densities



Ecologically-based Rodent Management

Uses knowledge of breeding timing to conduct control activities:



Components of an Effective Baiting Program

- Area covered
- Station spacing
- Frequency of restocking bait
- Station placement
- Rodent abundance assessment



Monitoring efficacy should be part of a baiting program:

Periodically assess rodent numbers/activity using tracking tunnels, snap-traps, or nontoxic census blocks.

Troubleshoot high bait take or low bait take when compared to activity (Resistance? Shyness?)

Minimizing risks to nontarget wildlife



USDA National Wildlife Research Center

Monitor the rodent population to assess control effectiveness => inconsistent or poor control increases the risk that nontarget species will be exposed to poisoned rodents

Use multiple methods:

- Place nontoxic monitoring bait away from bait stations (some individuals might not enter stations)
- Place snap traps (covered to exclude nontargets) to check for reproduction (juveniles, pregnant females)
- Check for fresh damage and signs of activity

Burrow Baiting

- Only some products are labelled for burrow application
- Bulk pellet and meal bait products only; check the label
- NO blocks, place packs, soft bait, liquid, tracking powder



Images: RTF

IPM for Burrow Baiting

- Place bait at least 6 inches down the burrow
- Do not cave in burrow openings
- Make notes and sketches of the burrow locations
- Check treated areas frequently to make sure the bait has not been pushed out of the burrows
- Monitor for activity; new rats will recolonize the burrows so new applications may be needed



Best Management Practices

Compost Rat Control



Worm composting in a school

Best Management Practices

Compost Rat Control



Requires frequent monitoring:

- Recommend multiple methods (exclusion, trapping, baiting)
- Customer participation
- Check for issues:
 - Bait dragged into the open
 - Damaged bait stations
 - Dead and dying rodents
 - Nontarget animals (crows, squirrels, raccoons, possums)

Reducing risk to children, pets and wildlife

- How to assess the risks
- Selecting a control method
- Vigilance during and after application
- Emergency support (what to do in the event of an exposure)
- Real-life examples

When applying bait outside of bait stations indoors, remember that “inaccessibility” can change



COMMENSAL RODENTICIDE

USE RESTRICTIONS: This product can only be used to control Norway rats, roof rats and house mice in and within 100 feet of man-made structures constructed in a manner so as to be vulnerable to commensal rodent invasions and/or to harboring or attracting rodent infestations. Examples of such structures include homes and other permanent or temporary residences, food processing facilities, industrial and commercial buildings, trash receptacles, agricultural and public buildings, transport vehicles (ships, trains, aircraft), docks and port or terminal buildings, and related structures around and associated with these sites. Fence and perimeter baiting beyond 100 feet from a structure, as defined above, is prohibited. Do not place near or inside ventilation duct openings. Do not contaminate water, food, feed, food or feed handling equipment, or milk or meat handling equipment. Do not apply directly to food or feed crops.

Example Label



Do not apply near home gardens



Do not place near ventilation ducts



Do not place without easy retrieval



Do not use for burrow baiting, except when on the label

Images: RTF

Best Management Practices

Minimizing risks to nontarget wildlife for outdoor placements in bait stations



Image: Karey Windbiel-Rojas UCIPM



Image: Niamh Quinn UCANR

Regularly visit the treatment area to check for issues:

- Bait dragged into the open
- Damaged bait stations
- Dead and dying rodents
 - dispose of in a secure trash receptacle
- Nontarget animals (crows, squirrels, raccoons, possums)

Secure bait in bait stations (and check them!)



Check the site for carcasses



What not to do...

NEVER abandon bait placements after an account is no longer active.

You are responsible for retrieving all the bait and bait stations that you applied.



Images: Niamh Quinn

Taken outside a “Dog & Child Friendly” brewery in Los Angeles, CA

Customer Communication

Important part of your job!

- Educate the customer
 - Sanitation
 - Exclusion
- Communicate information to the customer
 - Bait station placement or site map
 - Basic safety information
- When customer needs to notify you
 - Open, broken or displaced stations
 - Bait outside stations



SMALL ANIMAL INSPECTION REPORT AND EXCLUSION ESTIMATE

NAME: _____ PHONE #: _____
ADDRESS: _____ CITY: _____ ZIP: _____

Inspection Site: Residence (single family) Residence (multi-family) Commercial Other

Type of Roof: Shake Rock Comp Tile

Abutments: Adj. Units Deck Patio Cover Birds

Evidence of: Rats Mice

GROUND LEVEL	BUILDING EXTERIOR				BUILDING INTERIOR			
	ENTRY POINT	ACCESS YES/NO	EXCLUSION MATERIALS	UNITS	ENTRY POINT	ACCESS YES/NO	EXCLUSION MATERIALS	UNITS
A1	Doors				C1	Vent Screens		
A2	Windows				C2	Blocking		
A3	Chimney				C3	Vent Stacks		
A4	A/C Lines				C4	Wiring pass thru		
A5	Water Pipes				C5			
A6	Plumbing							
A: Subtotal					C: Subtotal			
B1	Louvers				D1	Water Pipes		
B2	Vent Stacks				D2	Furnace Ducting		
B3	Roof				D3	Drywall		
B: Subtotal					D4			
					D: Subtotal			
					E: Subtotal			
					SUBTOTAL			
					GARAGE			
					SUBTOTAL			
					SUBTOTAL			

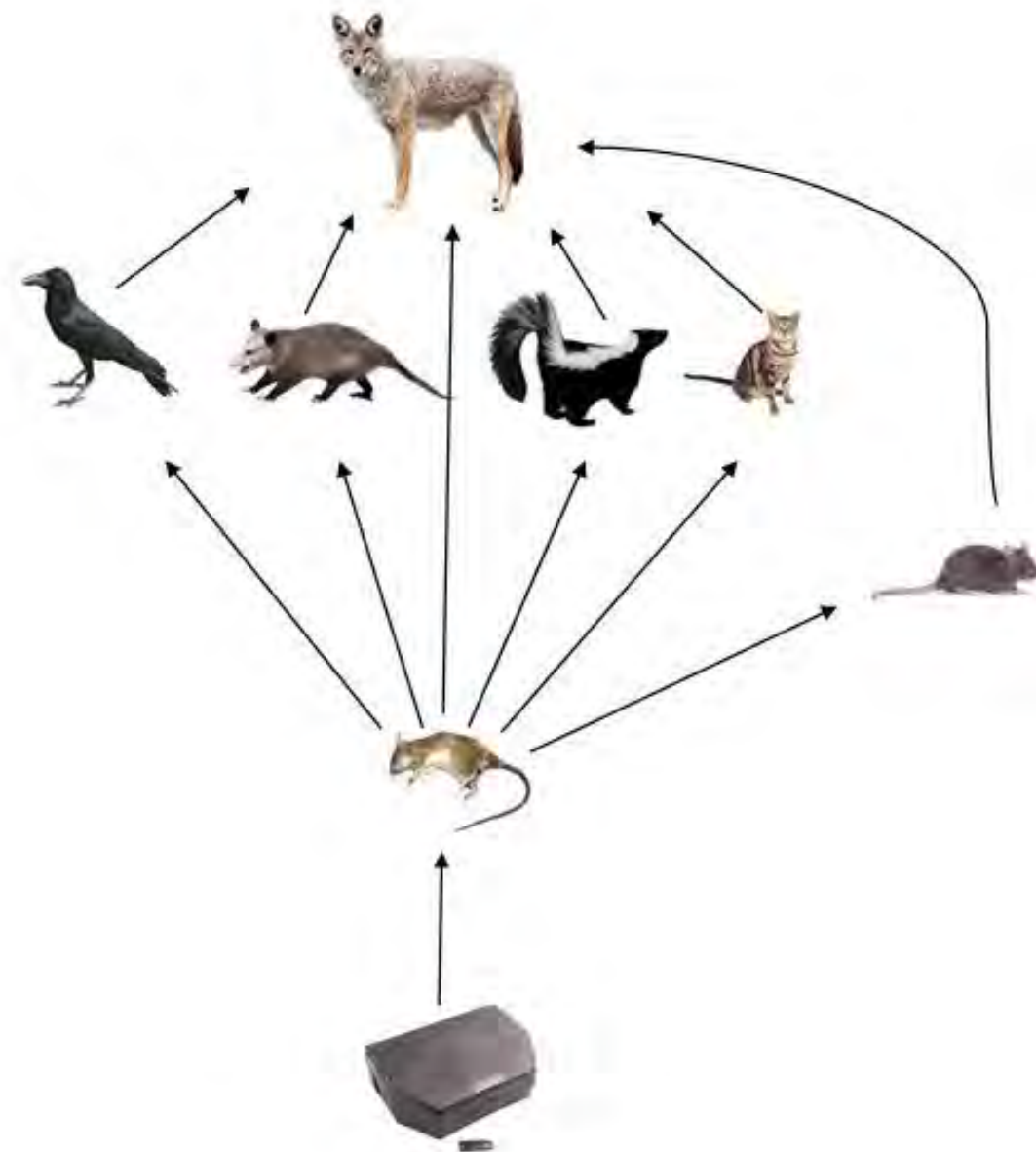
Unit Cost _____ X \$/Unit _____
Exclusion Price \$ _____
Guarantee (Days) Circle One: 0 30 60 90 120 180
Date _____

PINK - CUSTOMER

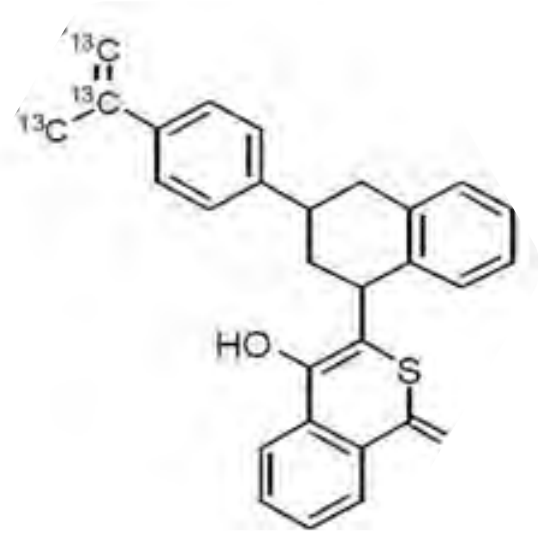


Minimizing Risks to Non-Targets

- Primary exposure
- Secondary exposure
- Tertiary exposure







Investigation of Rodenticide Pathways in an Urban System Through the Use of Isotopically Labelled Bait

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Rodenticide
TASK FORCE

LIPHATECH

Wildlife Services
NWRC
National Wildlife Research Center

UC DAVIS
UNIVERSITY OF CALIFORNIA





Rats are a major part of the rodenticide pathway

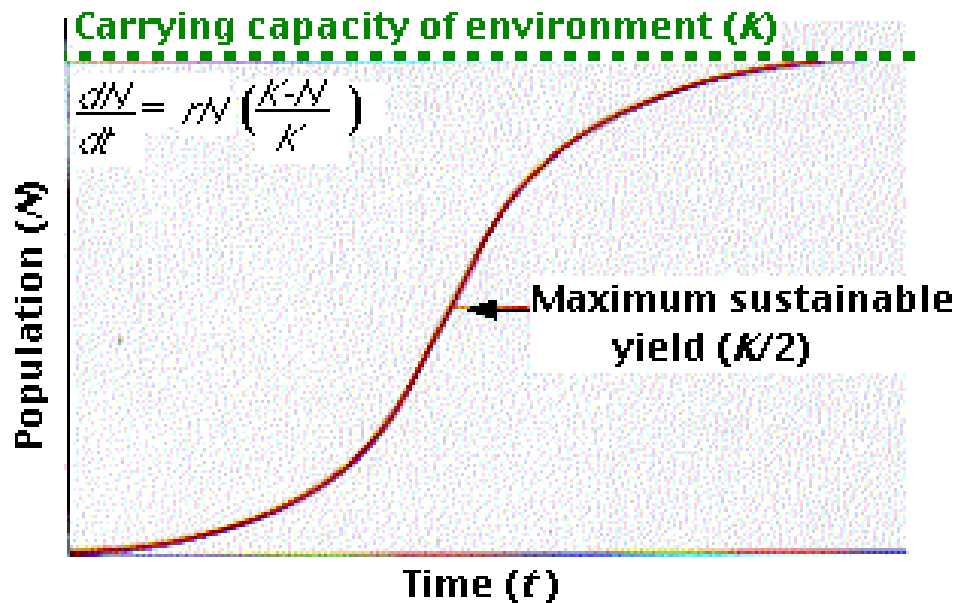
Minimizing Risks to Non-Targets



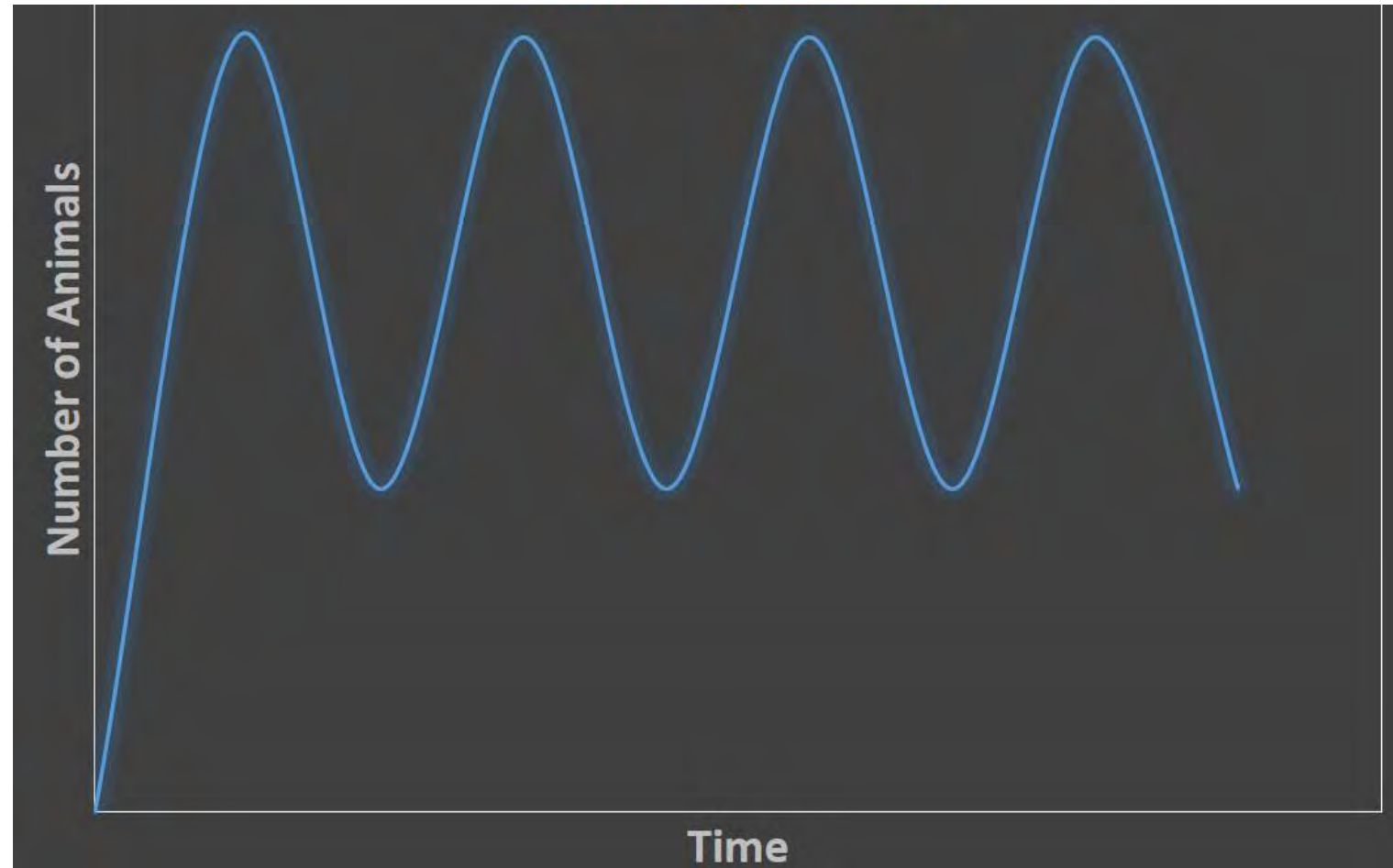
Kestrel Nest Box, HawkWatch International

Population Ecology

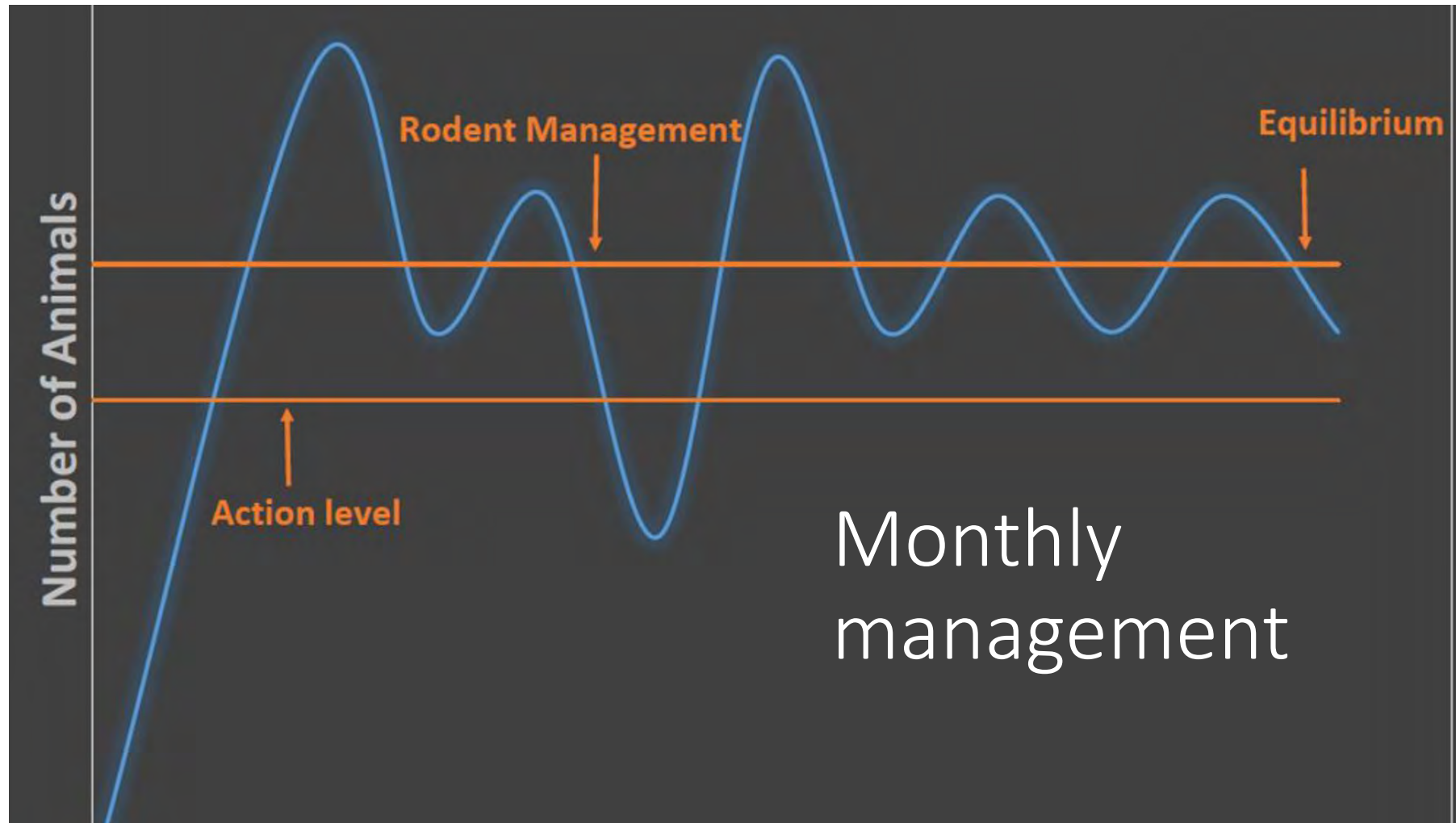
- Omnivorous (Commensal)
- Adaptable
- High population densities



Minimizing Risks to Non-Targets

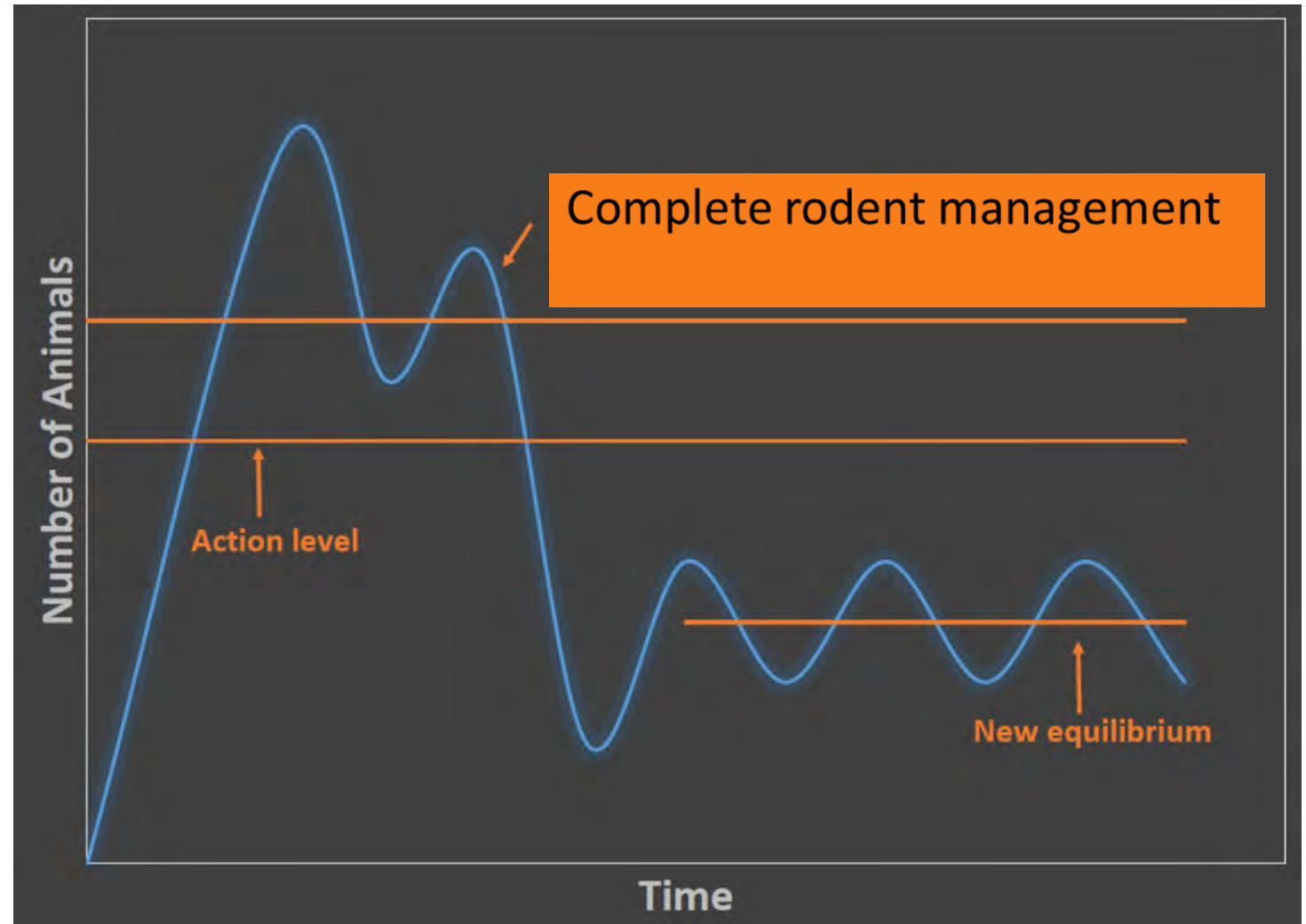


Minimizing Risks to Non-Targets



Minimizing Risks to Non-Targets

Ideal scenario



Summary

- Rodenticides can be used within an IPM program: monitor rodent activity frequently and respond to increases promptly, adapting methods as needed
- Sanitation is key to remove food sources and make bait more attractive to rodents
 - It's also important in reducing their habitat, making bait stations more attractive and driving populations away from structures
- Exclusion will help to keep rodents outside of structures; rodenticide placements around the exterior provide an additional layer of protection
- Bait and station placement is essential – getting the rodenticide close to where they are and in their pathways
- Communicate with the customer to let them know what you did and what they need to do to help with the management program
- At all times, be aware of non-targets in the area and prevent them from accessing rodenticides, and poisoned rodents

Questions?



responsiblerodenticides.org