

# National Wildlife Research Center

Wildlife Services  
Animal and Plant Health Inspection Service  
U.S. Department of Agriculture



**Mission**  
**Apply scientific expertise to resolve human-wildlife conflicts while maintaining the quality of the environment shared with wildlife**

United States Department of Agriculture  
Animal and Plant Health Inspection Service



# Carnivore Conflict in Urban Environments of Colorado: Black Bear and Coyote as Case Studies

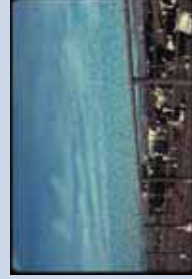


Stewart Breck  
Carnivore Ecologist  
USDA-WS-NWRC



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# WS Vision - Improve the coexistence of people and wildlife



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# Outline of Presentation

- n Brief Introduction of NWRC and Predator Ecology and Management Group
- n Urban Ecology, Conflict, and Management
- n Importance of Understanding Ecology-Urban Bear Study
- n Introduction to Denver Urban Coyote Study
- n Management of Urban Carnivore Conflict
  - Managing animals vs managing people

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## WS National Wildlife Research Center



- Ecological Information
  - Toxicants
- Economic Assessments
  - Repellents
  - Population modeling
  - Surveillance Methods
- Baits
  - Hazing Methods
  - Contraceptives
  - Capture Methods
  - Delivery Systems
  - Lures
  - Vaccines



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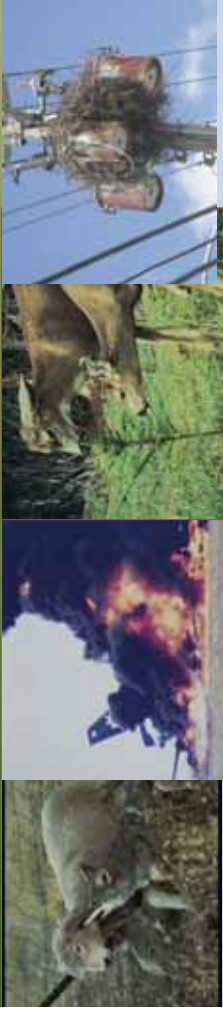
## NWRC Predator Projects

Project I: Documenting impacts, developing control strategies, and applying knowledge of predator behavior and demographics for the protection of livestock and natural resources

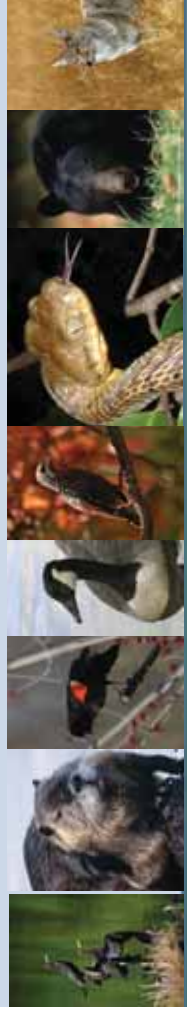
Project II: Improved technologies and non-lethal techniques for managing predation

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If the only tool you have is a hammer, you tend to see every problem as a nail  
---Abraham Maslow



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## National Wildlife Research Center - Expertise

- Wildlife Biology
  - Zoology
  - Physiology
  - Psychology
  - Pharmacology
  - Epidemiology
  - Virology
  - Wildlife Disease
  - Ecology
  - Chemistry
  - Toxicology
  - Ecology
  - Immunology
  - Statistics
- Chemical/Drug Registration (EPA & FDA)
  - Veterinary Medicine
  - Wildlife DNA Forensics
  - Population Modeling
  - Reproductive Physiology
    - Animal Care
    - Animal Behavior
    - Wildlife Telemetry
    - Computer Science
    - Electronics
    - Quality Assurance
    - Information Transfer
- Legislative & Public Affairs



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# Captive Work: Predator Behavior

Electrified fladry for preventing conflicts with wolves



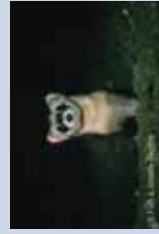
# How we accomplish our Mission

- I. Millville Predator Research Facility
- II. Graduate Student Research
- III. Tools and Techniques Development
- IV. Interaction with WS Operations
- V. International Collaborations and Impact
- VI. Publications



# Field Work: Predator Ecology and Management

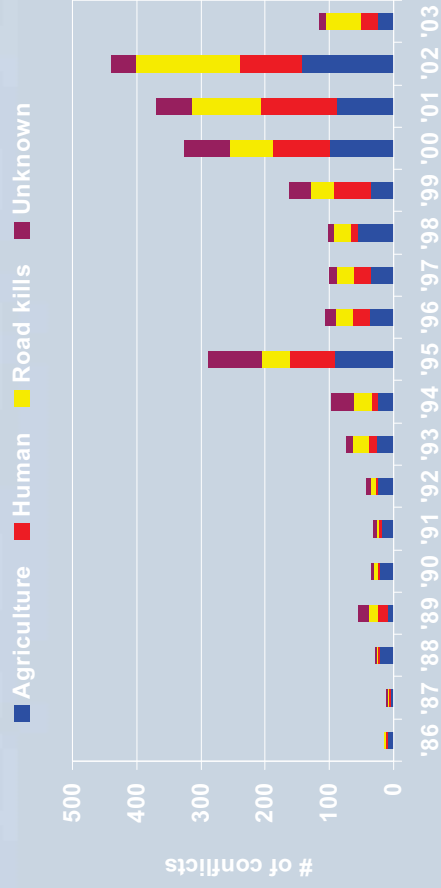
- n Wolf predation on livestock and native prey in U.S.
- n Interactions between wolves, coyotes, and ungulates
- n Coyote impacts on mesocarnivores
- n Jaguar predation on livestock and native prey in Brazil



# The Millville Predator Research Facility



## Bear Human Conflicts in Colorado



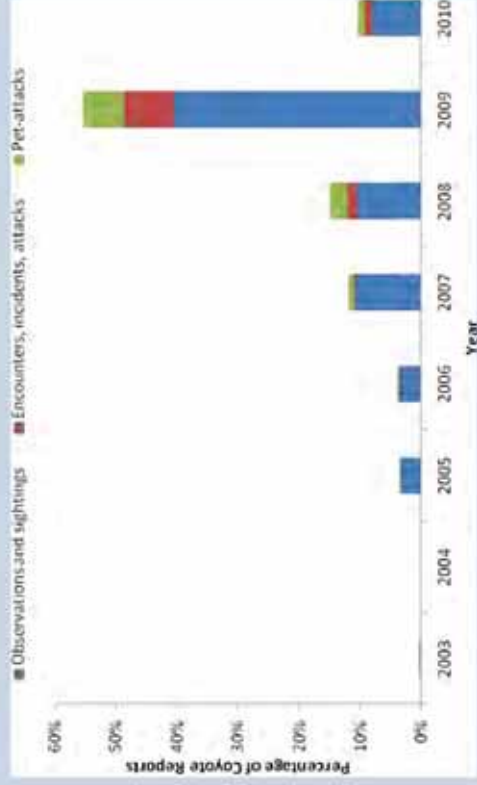
Baruch-Mordo, S., S. W. Breck, K. R. Wilson, and D. M. Theobald. 2008. Spatiotemporal distribution of black bear-human conflicts in Colorado. *Journal of Wildlife Management* 72:1853-1862.

## Human-Wildlife Conflict

It Takes Two to Tango

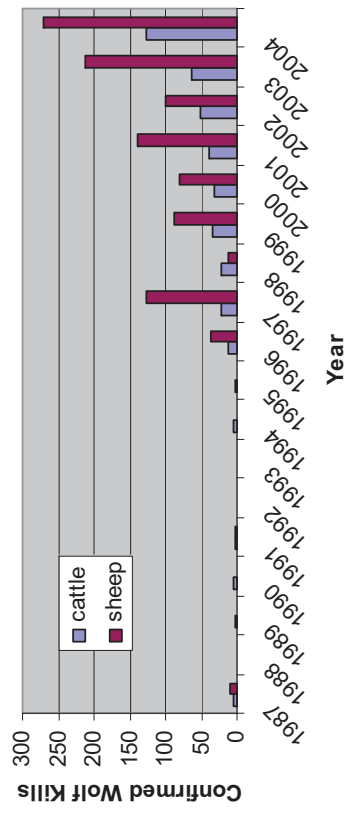


## Human-Coyote Conflict in Denver



## Livestock-Carnivore Conflict

### Confirmed Wolf Kills in Montana, Idaho and Wyoming



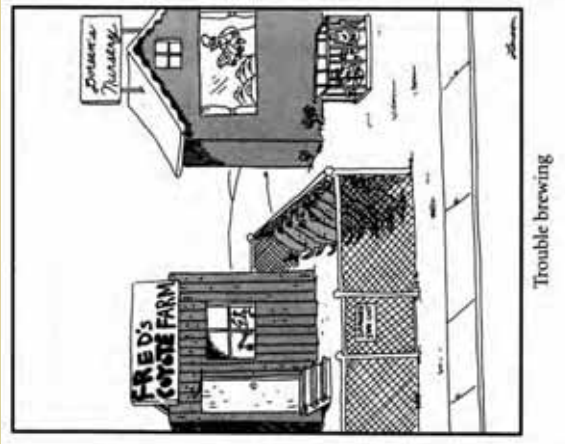
# The Predator Paradox

I want to have my predators and a cheap, available food supply too



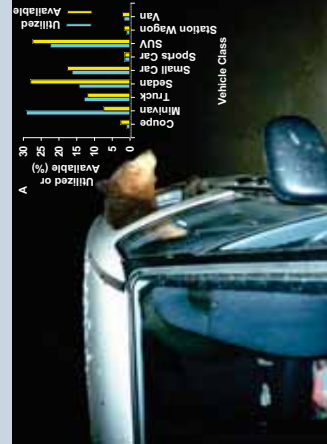
# Why the Increase in Conflict?

Increased Tolerance for Carnivores



# The Predator Paradox—Urban Areas

Or I want to have my bears and live in a beautiful place with my minivans and garbage too



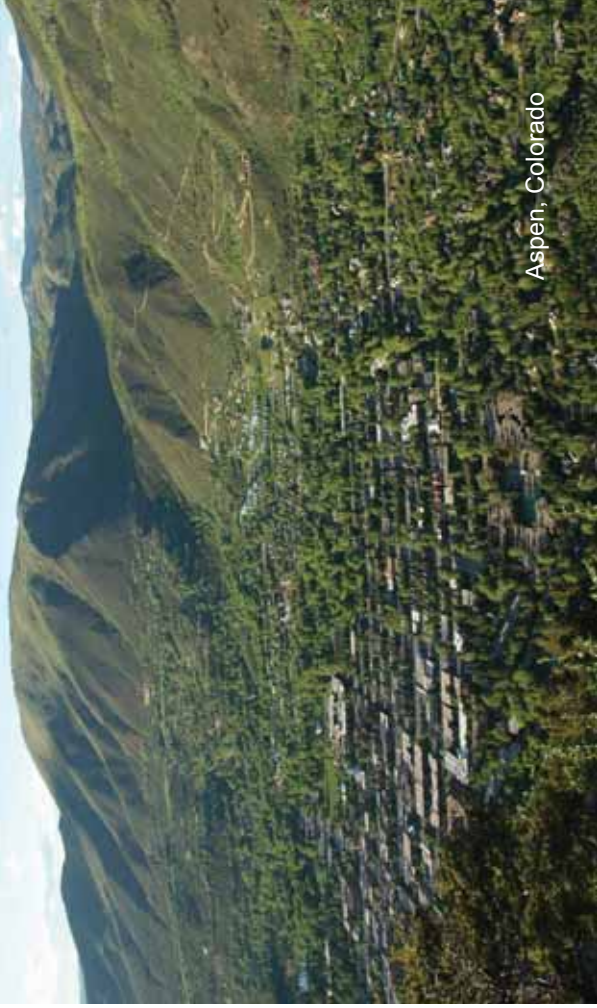
# The Cake Paradox Cliché:

I want to have my cake and eat it too





# Roaring Fork Valley Urban Black Bear Ecology Study



Aspen, Colorado

## Degrees of Synanthropy

### Irreversible synanthropy:

If synanthropy has (+) effects on fitness, then it is reasonable to hypothesize that behavioral changes are irreversible as individuals will continue to exploit anthropogenic resources and become dependent on living with humans.

### Fluctuating synanthropy:

If synanthropy has (-) effects on fitness, then use of anthropogenic resources will be beneficial only when natural resources are scarce and behavioral changes will be reversible and fluctuate in response to natural resource availability.

## Roaring Fork Valley Urban Black Bear Ecology Study – Who?

An inter-agency research conducted by:

**Sharon Baruch-Mordo**, Ph.D. Candidate, and **Dr. Ken Wilson**, Department Head, Dept. Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado

**Dr. Stewart Breck**, Researcher, USDA-WIS-National Wildlife Research Center, Fort Collins, Colorado

**John Broderick**, Senior Terrestrial Biologist, NW Region, Colorado Division of Wildlife, Grand Junction, Colorado



**Colorado State University**

*Knowledge to Go Places*

Wildlife Services

**NWRC**

National Wildlife Research Center

## Degrees of Synanthropy

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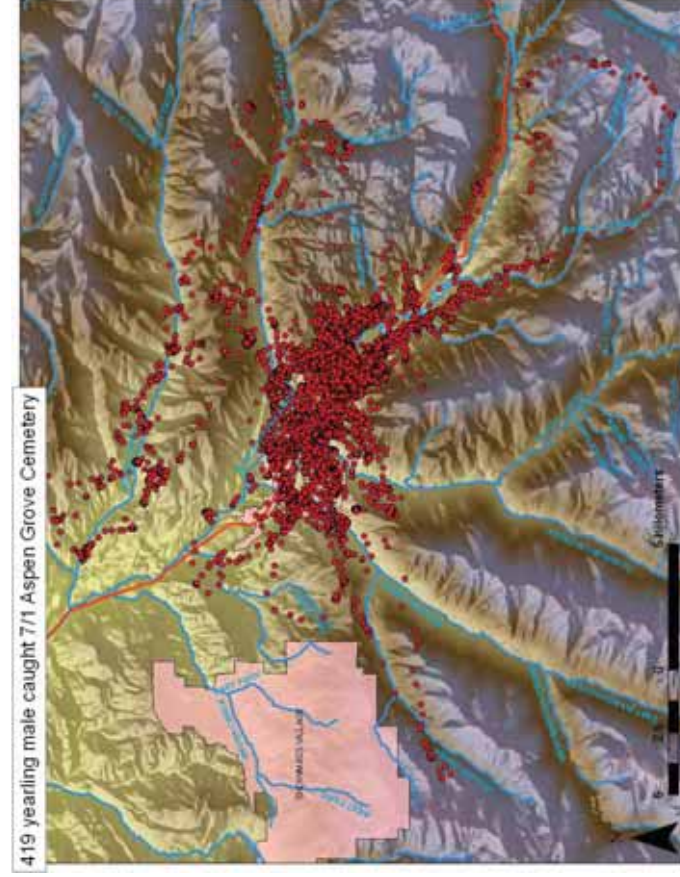
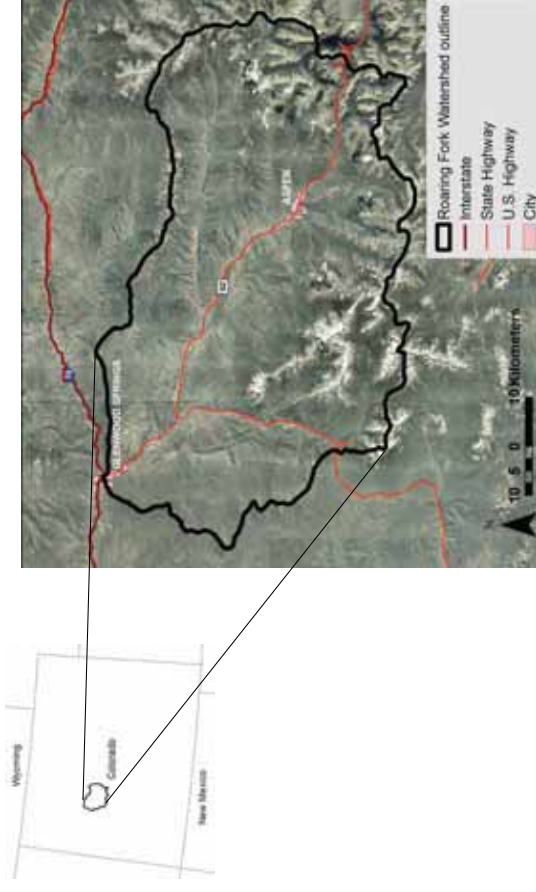
If synanthropy has (-) effects on fitness, then use of anthropogenic resources will be beneficial only when natural resources are scarce, and *behavioral changes will be reversible and fluctuate* in response to natural resource availability.

## Bear Trapping & Handling

- Trapping
- Immobilization
- Tagging
  - Collar
  - PIT tag
- Sampling
  - Blood (genetics)
  - Tooth (aging)
  - Measurements



## Roaring Fork Valley Urban Black Bear Ecology Study – **Where?**



## Roaring Fork Valley Urban Black Bear Ecology Study – **Why?**

**Need:** Urban black bear-human conflicts are increasing throughout North America, partially because human development has increased the availability of human-oriented (anthropogenic) food sources to bears.

**Goal:** To evaluate the effectiveness of management activities in reducing availability of anthropogenic food sources to bears therefore minimizing conflicts, and to better understand urban black bear ecology.

# Results: Space Use

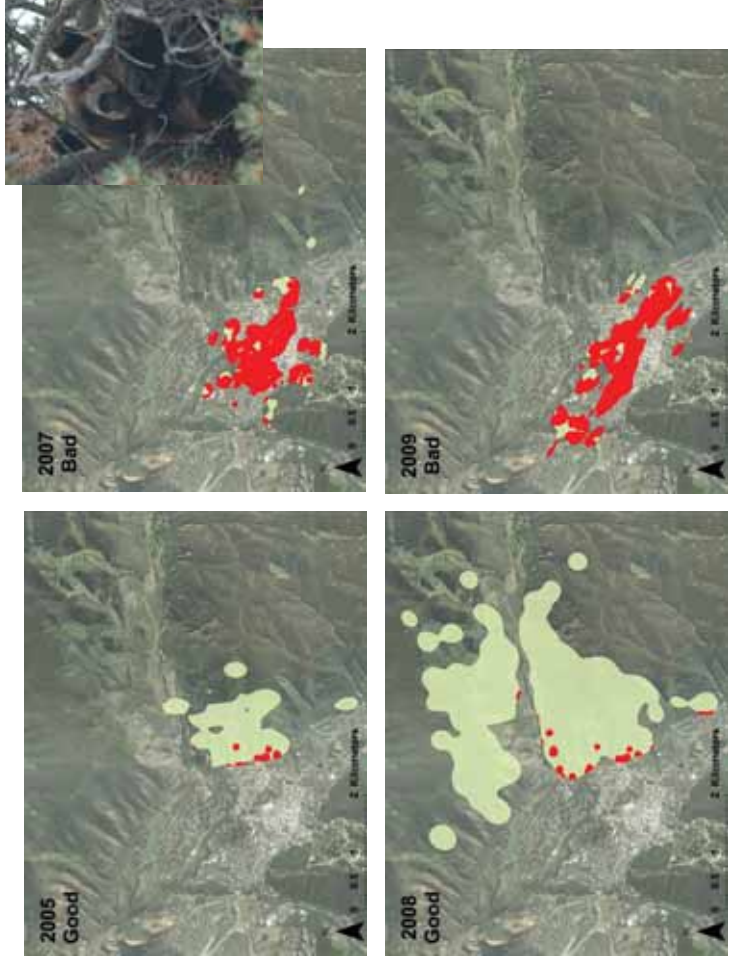
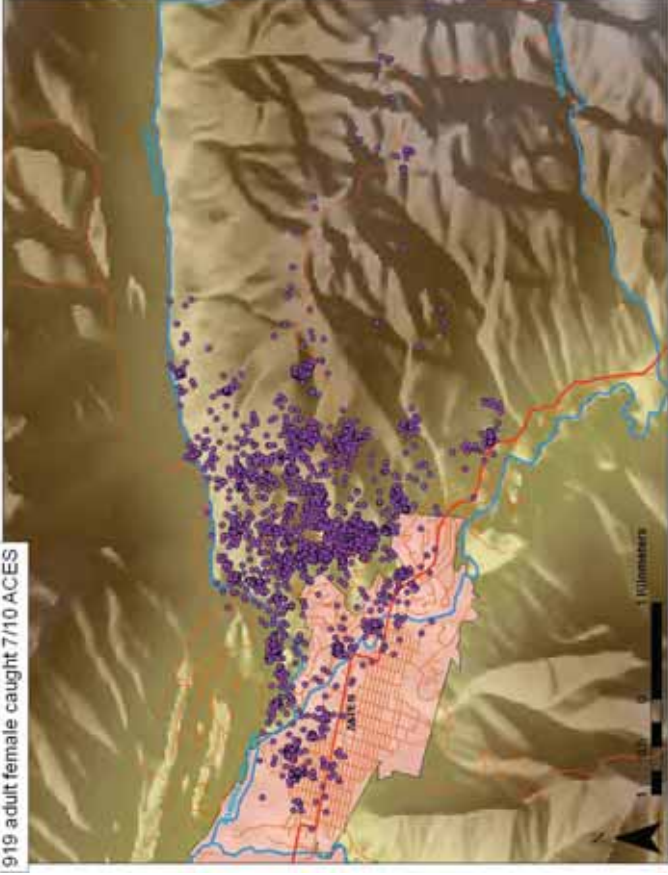
No.4 - 13 yrs old F (2005)



No.32 - 14 yrs old M (2007)



919 adult female caught 7/10 ACES



## Knowledge gained – Bear behavior

- Can we answer the quintessential question about bears?

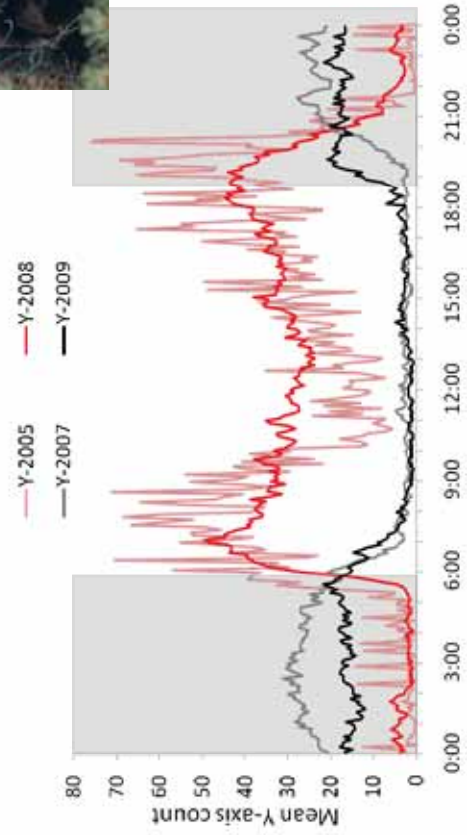
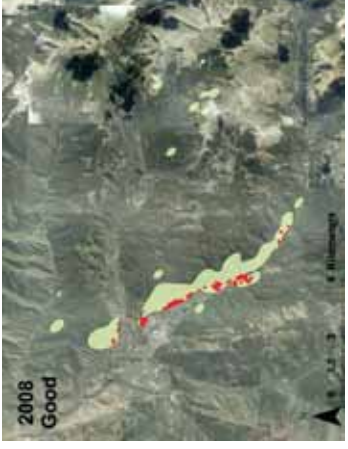
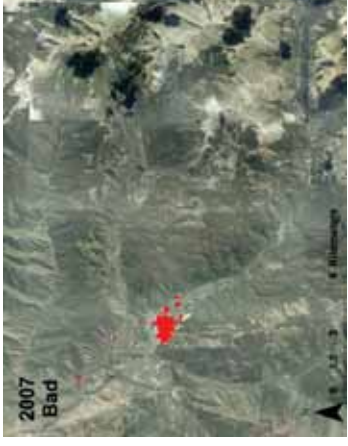


# Results: Activity Patterns

No.4 - 13 yrs old F (2005)



No.32 - 14 yrs old M (2007)



# Urban Bear Ecology

- Urban ecology & synanthropy
- Synanthropy & Bears
- Behavioral ecology
  - Space-use
  - Activity patterns
- Survival & reproduction
- Degree of synanthropy & implications to management



# What bears do in town--

## Backtracking Data

Scat with bird seed



Foraging at construction sites



Bedding site in town



## Backtracking – anthropogenic & natural food sources foraging



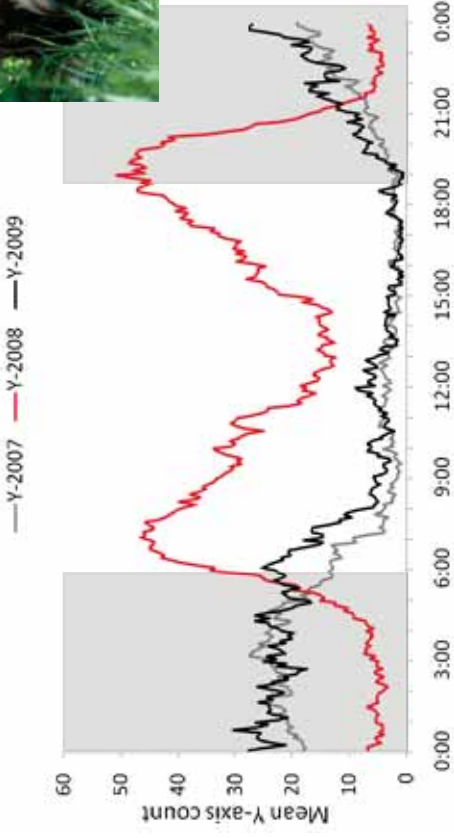
Feeding on trash



Feeding on deer carcass



Feeding on twin berry



## Behavioral Ecology: Key Pts

- Bears use downtown areas in poor natural food production years, but also shift back to “wildlands” in subsequent good years
- More nocturnal when they use downtown areas in poor food years, but also return to “normal” activity patterns in subsequent good years

# Denver Coyote Study

## n Objectives

- 1) **Conflict Mapping**
- 2) Human Dimensions and Education
- 3) Economic Analysis of Coyote Conflict in Urban Areas
- 4) Behavior of Urban Coyotes:
  - a) Determine How Bold/Aggressive Urban Coyotes Are
  - b) Response to Non-lethal Tools
- 5) Ecology of Coyotes and Testing Strategies to Minimize Conflict



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# Backtracking Results

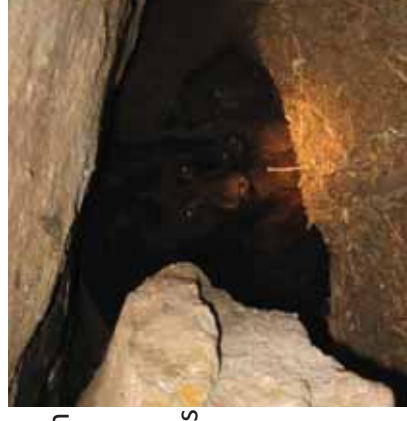
6-yr study of urban bear ecology in Aspen, Colorado

– Garbage main bear attractant



# Urban Bear Demographics




- Adult survival in good years comparable to “wildland” bears in CO, but lower in poor food years
- No difference in reproduction output in poor vs. good food years
- Currently Modeling this Problem
- Study in Durango



## Denver Coyote Study

n Objectives

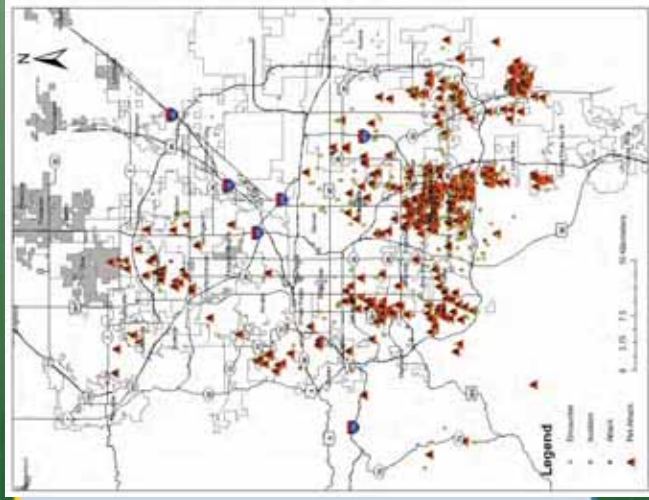
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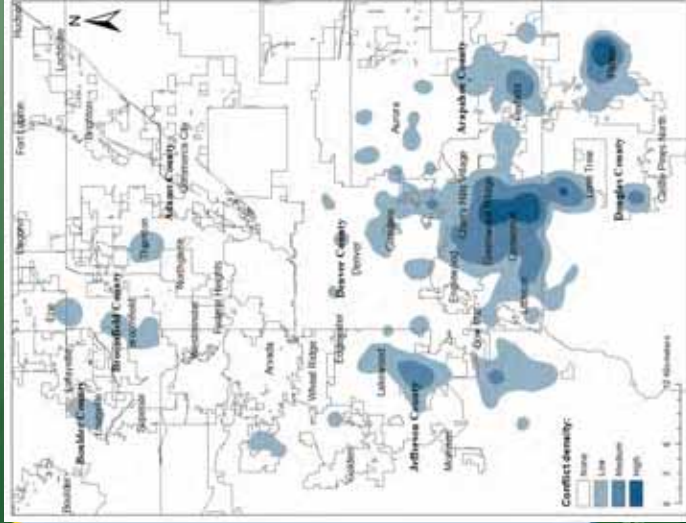
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Entity	Number reports	Number conflicts	Years reporting
City of Arvada	31	2	2
City of Aurora	75	41	4
Boulder County	45	1	8
City and County of Broomfield	20	20	2
Town of Castle Rock	5	0	1
City of Centennial	563	238	4
City of Cherry Hills Village	280	37	3
Colorado Division of Wildlife	296	115	8
City and County of Denver	263	70	2
Douglas County	5	3	2
City of Greenwood Village	1,448	79	6
Jefferson County	107	47	3
Ken Caryl Ranch	23	0	2
City of Lakewood	89	50	3
City of Lone Tree	144	34	6
City of Louisville	31	10	3
City of Northglenn	21	0	2
Town of Parker	210	92	6
South Suburban Parks	264	55	4
City of Thornton	34	10	3
City of Westminster	49	1	2
City of Wheat Ridge	3	0	1

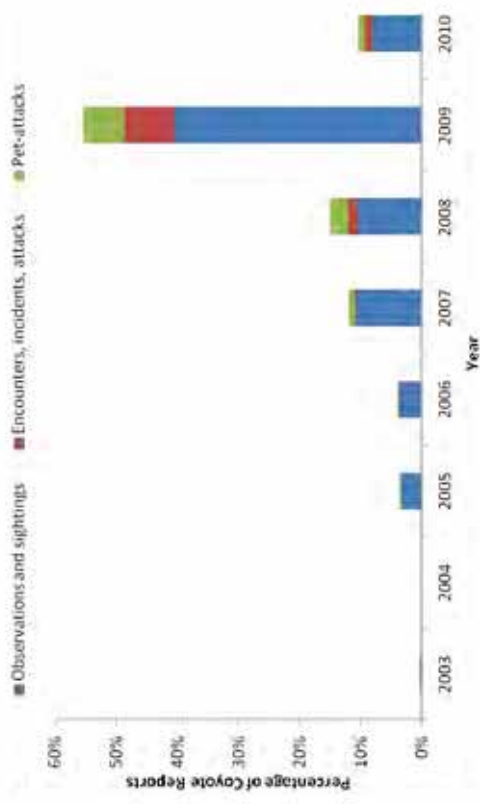
## Spatial Patterns of Conflict



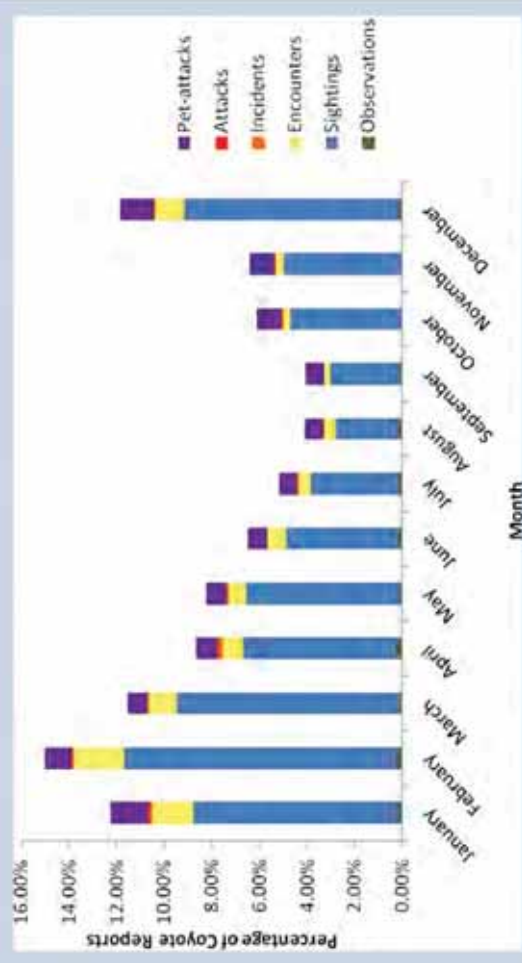
## Spatial Patterns of Conflict



## Human-Coyote Conflict in Denver



## Conflict Through the Year



## Denver Coyote Study---Next Steps

### n Objectives

- 1) Conflict Mapping
- 2) **Human Dimensions and Education**
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- 4) **Behavior of Urban Coyotes:**
  - a) Determine How Bold/Aggressive Urban Coyotes Are
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### 10 – HIGH ACCEPTABILITY

#### NON-LETHAL TECHNIQUES

GUARD ANIMALS – 7.1  
REPELLENTS – 7.0

FERTILITY CONTROL – 5.8

4.3 – SHOOTING FROM THE GROUND  
4.3 – FAST-ACTING POISONS

PAY RANCHERS FOR LOSSES – 3.2

2.5 – AERIAL GUNNING  
2.3 – DENNING

PAY RANCHERS NOT TO  
RAISE SHEEP – 1.8

1.6 – LEG-HOLD TRAPS  
1.3 – SLOW-ACTING POISONS

### 0 – LOW ACCEPTABILITY

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## Conflict Management---Take Home

- Each depredation event requires an assessment of the legal, social, economic, biological, technical, and ethical aspects
- Successful resolution of conflicts involves an analysis of the efficacy, selectivity, and efficiency of the various management scenarios available
- No one technique solves all problems

## Schools of thought on conflict management:

**Preventative (before problems occur)**

**Corrective (after predation begins)**

**Lethal and non-lethal techniques for both strategies**



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## The Human Approach



## Urban Carnivore Management ---Take Home Message

- Issues are complex and controversial
- Predation management is complex endeavor
- Selectivity, efficiency, compatibility need to be considered
- Social climate is changing (e.g., trap bans in several states)
- Methods need rigorous testing
- There is no magic bullet to solve all problems (need a toolbox)



## The carrot or the stick? Evaluation of education and enforcement as management tools for urban human-bear conflicts

Sharon Baruch-Mordo, Dr. Ken Wilson – Colorado State University  
Dr. Stewart Breck – USDA-WS-National Wildlife Research Center  
John Broderick – Colorado Division of Wildlife

Baruch-Mordo et al. 2011. PLoS ONE 6:e15681

## Changing Behavior: Who Is Smarter?



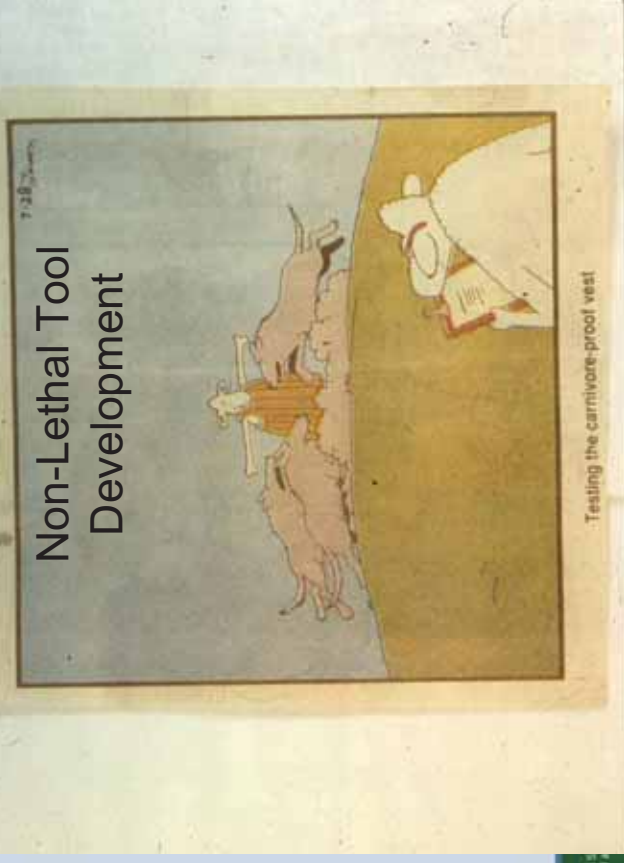
## Non-lethal techniques

### Animal-Activated Effigy



## The Carnivore Approach

### Non-Lethal Tool Development



## Non-lethal techniques

### Frightening devices:

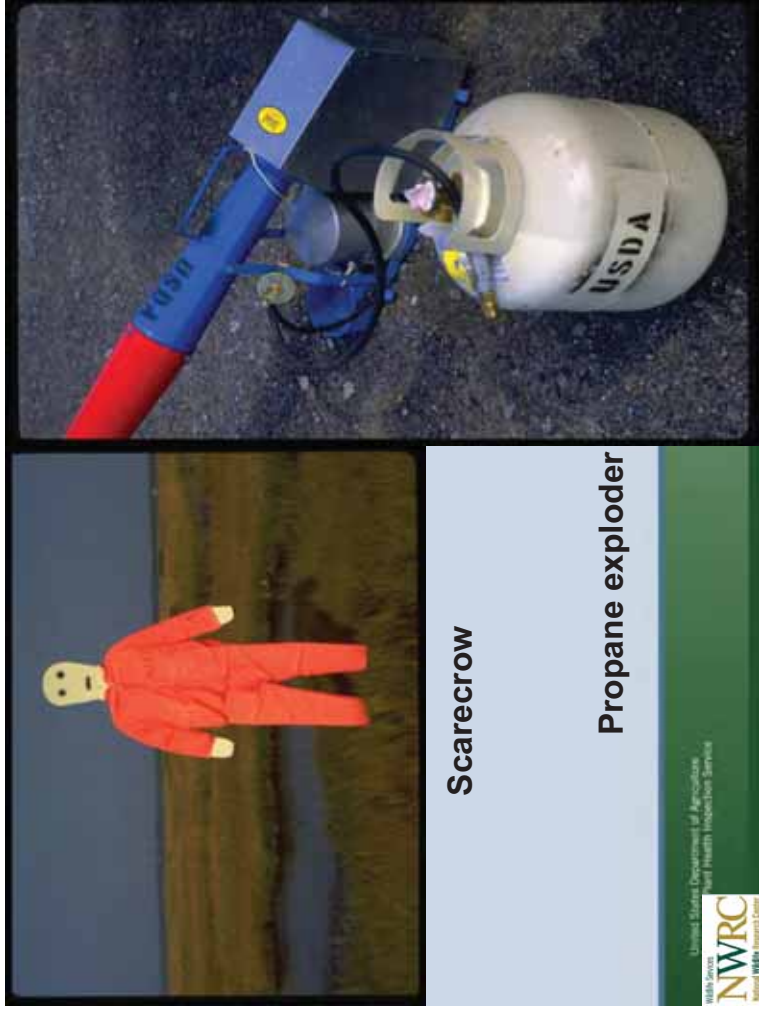
- Lights, distress calls, devices that make loud noises, scarecrows, propane exploders, aluminum pie pans, lanterns
- Extensively tested with coyotes

#### Advantages:

- Can provide temporary relief from predation

#### Disadvantages:

- Costs of materials, installation, and maintenance
- Animals can habituate to stimulus; benefits short-lived
- Not applicable to large pastures or range operations
- Loud devices and strobe lights generally not accepted in close proximity to people



Scarecrow

Propane exploder

## Electric training collar

- Commercially available dog-training collar
  - Tested with captive coyotes
- Advantages:
- Interrupted predatory sequence
  - Caused avoidance of lambs
  - Lasted up to 6 months

Disadvantages:

- Costs and maintenance
- Coyotes must be captured and radioed
- Batteries need frequent replacement



Radio activated guard (RAG box)

Utah Wildlife Research Center

Radio-activated Scare Device



## Reproductive interference

- Motivation for killing lambs is provisioning of pups
- Tested with wild coyotes using surgical sterilization leaving reproductive organs intact

Advantages:

- Kill rates of intact packs were 6x higher than sterile packs
- Lasted up to 3 years
- Social behaviors and territoriality intact

Disadvantages:

- Initial cost; but lasted 3 years – actually came out ahead
- Coyotes must be captured and sterilized
- No chemical sterilants yet available
- Increased interest in immunocontraception

## Repellents

- Presently, there are no commercially available repellents that deter predation
- Extensively tested with coyotes (i.e., lithium chloride)

Advantages:

- Noxious compounds can reduce consumption
- Could provide temporary relief from predation, if it worked

Disadvantages:

- Animals learn to recognize compound
  - Reduces food consumption, but not predation
- Not in use for deterring carnivores**

# Then When All Else Fails We Can Kill Them



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