

## A Look at Future Tools to Control Free-roaming Cat Populations



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### Overview

- Definitions and terminology
- Use FL data to illustrate some population dynamics in cats
- Discuss the requirements and limitation of population dynamics modeling
- Present 3 year contraception model results



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### Populations

- Populations are a group of animals who live and reproduce together
- Populations are also “cats in a shelter”, “feral cats in the neighborhood”, “all cats living in a county”, etc.
- Different populations likely are different



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## Data for Populations: Vital Rates

- Closed populations have only:
  - Birth (fecundity, fertility)
  - Death (mortality, survival)
- Open populations also have:
  - Immigration (movement into the population)
    - Abandonment, adoption
  - Emigration (movement out of the population)
    - Lost, adopted, euthanized



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## Population Growth

- If births and immigration greater than deaths and emigration
  - Population grows with time
- If birth and death equal (and closed population), stable population
  - Zero growth
- If births/immigration are lower than deaths/emigration
  - Population will decrease: TNR goal

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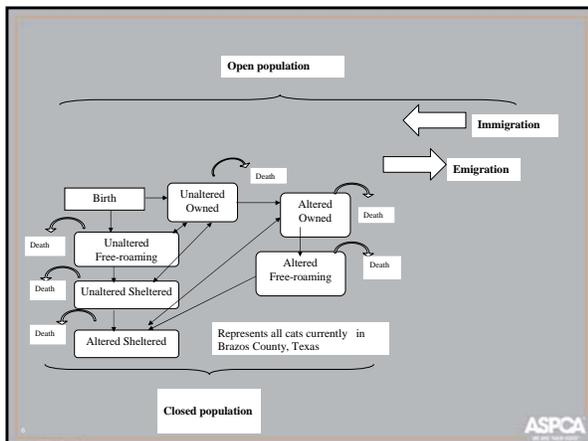
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## Alachua County Data

### •Community cats

- Human population  $\div 6 = 37,333$  cats
- I'll assume 50% are females
- Assume county is a closed population
- Operation Catnip sterilizes 3,500 cats/year
  - 57% female (1995 female cats spayed/year)
- This equals about 10% of females spayed each year
  - Population only continues to grow
  - With moderate survival and birth rates

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So how many cats do we need to spay in say, a 10 year period?



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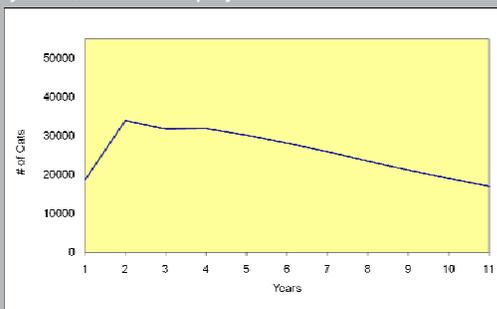
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To decrease the total population in 10 years, need to spay 40% of cats



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### Cat-related Factors Influence Models

- Different birth and death rates by age or life stage
  - We don't know about survival difference by spayed or not
- Seasonal effect on breeding
- Male behavior: there are enough males to breed all available females
  - Males aren't "rate limiting"



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### External Factors that Influence Models

- How long a time period are we studying?
  - Catastrophic events like weather and disease
- Carrying capacity of the environment
  - How many cats will food and shelter sustain?
  - In urban areas, very high populations are known
- Type of population are we looking at
  - One colony, one park, one community, one state
  - For population dynamics must be a single intermingling group that breeds together

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### Type of population Influences Models

- Closed or open population (immigration or emigration)
  - If the population is feral cats in a county
    - Immigration is:
      - Owned cats lost or abandoned
      - Feral cats that move in from neighboring counties
    - Emigration is:
      - Adoption of strays
      - Removal of ferals



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### The Previous Models:

- Apply the spaying, survival and births annually for a 10 year period
  - We assumed nothing catastrophic in that time
- Closed population
- No seasonal effect
- Unchecked population grows exponentially (based on data it does...)
  - But clearly other factors that prevent this

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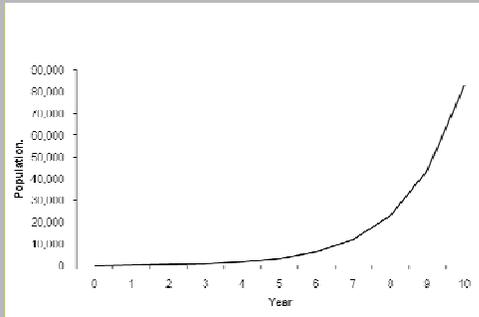
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### Hypothetical cat population (n=100 to start), no sterilization



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### Data for Previous Models from Literature

- Survival of < 1 year olds (juveniles)
  - 27% to 73% to their first birthday
- Survival of adults ( $\geq 1$  year)
  - 55 to 78% each year (average of 3 year life span)
- Birth rates
  - 0.4 to 1.6 female kittens/juvenile female/year
  - 2 to 3.8 female kittens/adult female/year
- Can do many combinations
  - The information before was for mid-range survival and fertility

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### What about 3 Year Contraception?

- Instead of no spaying or surgical (permanent) sterilization
- Cats become fertile after 3 years
- Can this sort of product be useful for feral cat population control?



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### 3 year Contraception Model

- Assume 100% effective
- Always works for full 3 years
- Closed population
- Used a variety of survival and fertility data
- Compared to permanent sterilization (eg surgical)
- Will 30% of the population treated stabilize the population?

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### 3 Year Contraceptive

- 30% isn't high enough
- Control of population very dependent of survival times
  - If average life span > 3 years, efficacy will go down
- Re-trapping of previously contracepted cats important with higher survival rates
- Much better than doing nothing
- Almost as good as surgical sterilization

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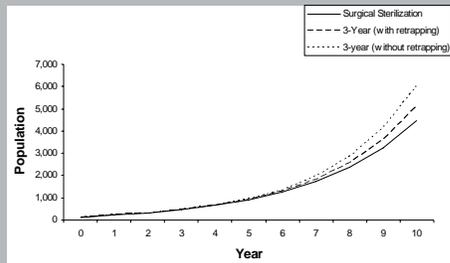
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## Results with 30% of Females "Treated"



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## To Halt Population Growth

- Annual female juvenile and adult 3 year contraception of 60% of intact cats
- If also re-trapped previously contracepted cats at 60%
- If don't re-trap contracepted cats at 60%, population slowly grows
- This is for mid-range fertility and a 3-year survival



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## With Permanent Sterilization

- Need 51% of adult and juvenile female cats be surgically sterilized annually
- Assumes mid-range fertility and ~3-year lifespan
- Or, ~71% of the total female and 81% of the adult female population sterilized at all times
  
- Without juvenile sterilization, 91% of adult intact cats would need to be sterilized annually
- After stabilized, would be sterilizing ~14% of the total female population per year

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## What We Learned

- There is a lot of variability in reported survival and birth rates of cats
- No data on:
  - Carrying capacity
  - Long-term “natural” cat populations
  - Survival following sterilization
- Little data on:
  - Immigration or emigration



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## Lessons to Remember

- Different populations of cats of interest likely also have high variability
  - Some knowledge of this is needed for models
- Closed populations rarely realistic
  - Can be useful for comparison purposes
- Usually survival, rather than birth rates, are most important factors for the results
  - Juvenile survival usual key...have to survive to breed



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## Key Lessons

- Juvenile (< 1 year old) cat reproduction much more important than adults
  - So focusing on < 1 year olds gives a great bang for the sterilizing buck
- Populations that can be spayed at reasonably high rates must be targeted
  - Doing a few cats from many separate populations won't help
  - Doing all the cats in small populations results in zero population growth



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## Acknowledgments

- Dr. Christine Budke
- ACC&D, Joyce Briggs

•Budke, Slater. Utilization of matrix population models to assess a 3-year single treatment nonsurgical contraception program versus surgical sterilization in feral cat populations. JAAWS, soon.

•Budke, Slater. Understanding Population Dynamics Models: Implications for Veterinarians. In: Consultations in Feline Internal Medicine, 6. Ed. JR August. W.B. Saunders: Philadelphia, Nov 2009.

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