



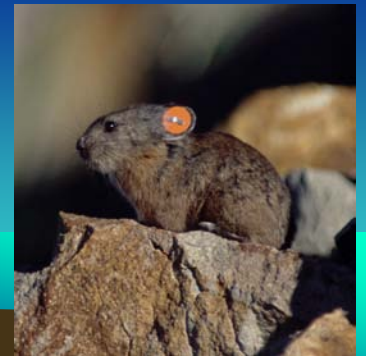
# BODIE PIKAS

WHAT THEY HAVE TO TELL US

ANDREW SMITH

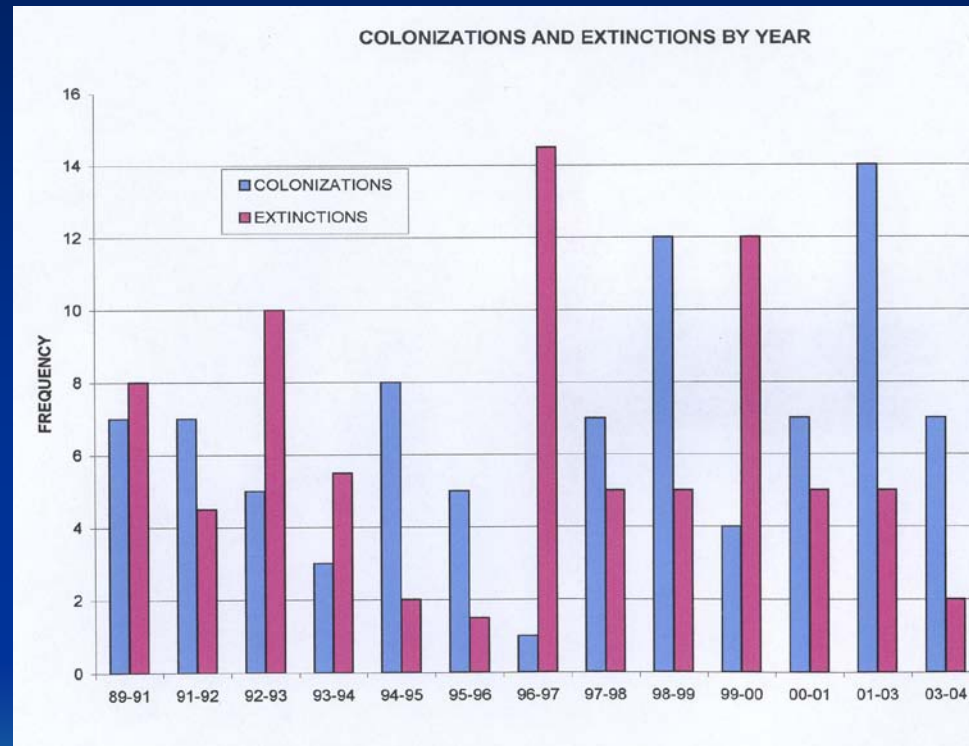
SCHOOL OF LIFE SCIENCES

ARIZONA STATE UNIVERSITY

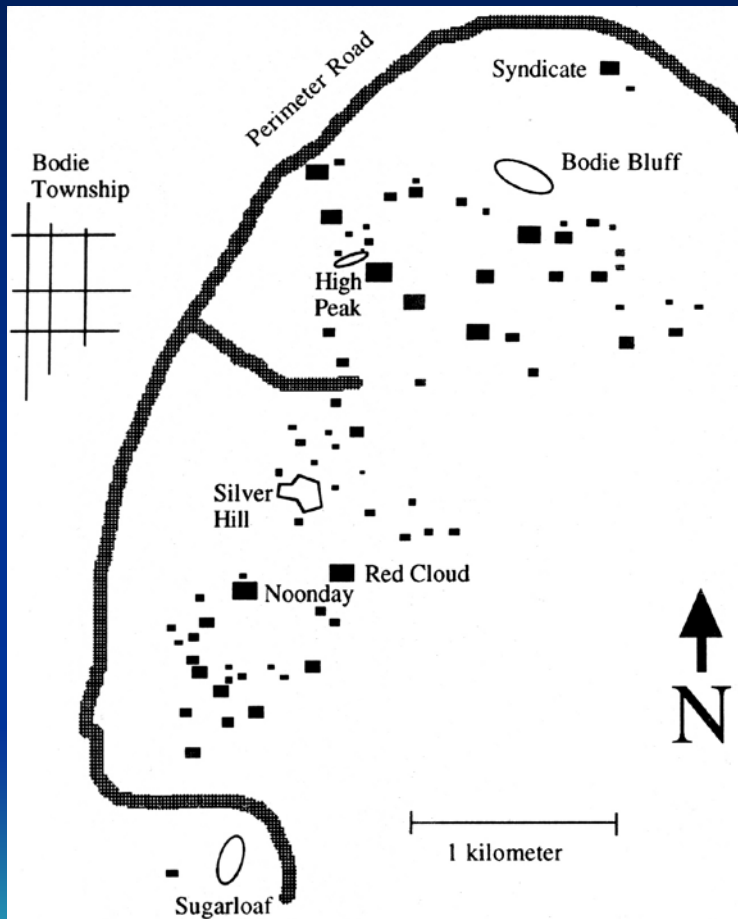


# PIKAS AT BODIE

Bodie pikas exhibit one of the best examples of a metapopulation – with a constellation of patches; each patch has a probability of occupancy, population extinction, and subsequent recolonization



# PIKAS AT BODIE



Total Percent Patch Occupancy from 20 Censuses 1972-2009 (almost every year since 1989; 76 isolated patches)

Average = 39.6% occupancy

Range 23.7-58.7%

Southern patch constellation began to collapse (meta-population collapse) in 1989; semi-complete collapse by 1991

Northern Constellation of Patches

Average = 70.2% occupancy

Range 48.6-88.2%

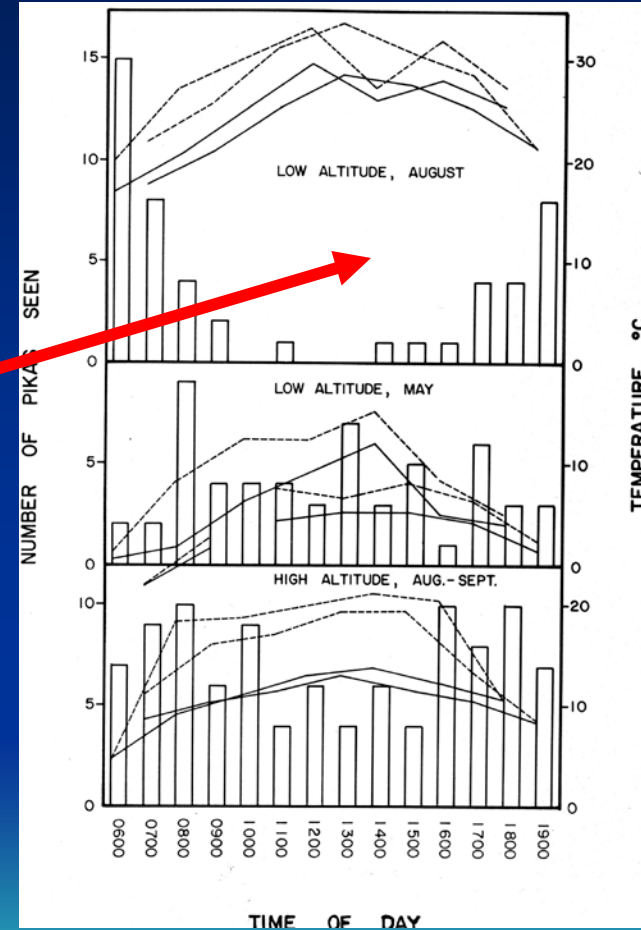
2009 = 83.8% occupied

# PIKAS ARE ADAPTABLE



Pikas adjust their activity to avoid warm temperatures

Pikas are generalized herbivores and at Bodie they subsist on sagebrush, bitterbrush, rabbit brush, etc. They do not need alpine meadow vegetation!



# PIKAS AND TEMPERATURE SENSITIVITY

- We know pikas, as alpine animals, are sensitive to warm temperatures – the reason we see the flexibility of daily activity schedules (previous slide)
- And, yes, I did conduct a caged lethality experiment in which Bodie pikas (but not pikas at 3,500 m) succumbed when confined in the sun; two Bodie pikas perishing at the low ambient temperatures of 78° and 85° F, respectively
- But, these animals were deprived of their normal behavior which would allow them to avoid overheating; it is incorrect (a lie) to assert that they will perish at these ambient temperatures (*viz.* recent testimony at the US Senate Energy & Natural Resources Committee by Herbert Frost, NPS Associate Director for Natural Resource Stewardship and Science; and Earthjustice press release, 28 October 2009)

# PIKAS AND CLIMATE-ENVELOPE MODELING

- The **outside** limit projected for warming in the range of the American pika is  $\sim 6^{\circ}\text{C}$  by the end of this century (most predictions = less)
  - We can use existing data on pikas to project how they could respond – using Bodie, the hottest locality where pikas have been continuously observed
  - Bodie ( $\sim 2,600\text{m}$ ) is  $\sim 35\text{km}$  from the Sierra crest ( $\sim 3,400\text{m}$ ). In the warmest month, August, the average mean maximum temperature differs by  $8.3^{\circ}\text{C}$  ( $25.9^{\circ}\text{C}$  at Bodie;  $17.6^{\circ}\text{C}$  at high elevation); the number of days over  $20^{\circ}\text{C}$  was 31 at Bodie versus 5.3 at high altitude; the number of days over  $25^{\circ}\text{C}$  was 25.5 versus 0 [temperature data from 1969-1972; Smith *Ecology* 1973]
  - We see that pikas are currently highly successful at Bodie, and we can use these observations to extrapolate how pikas could adapt at high elevations even given an  $8.3^{\circ}\text{C}$  temperature increase
  - I am highly suspicious of the assumptions (or lack thereof) in climate-envelope models that fail to incorporate these known responses of pikas and their ability to adapt to situations with warm temperatures (via behavior, utilization of micro-climates available to them, etc.)
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