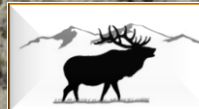


Pygmy Rabbit Population Monitoring in the Pinedale Anticline Project Area and Boulder Reference Area



HWA Wildlife Consulting

Pygmy rabbit

- Information on population status, trends and distribution is lacking
- Petitioned for listing in 2003
- Not warranted in 2010
 - Considered a species of concern or sensitive in most states where they occur.



Federal Register 2010



Monitoring Requirements

- Wildlife Monitoring and Mitigation Matrix, 2008 ROD:
 - “3 consecutive years of decline in presence or absence of a species”
 - “an average of 15% decline in numbers of individuals each year over 3 years”



Site-Occupancy Analysis

(MacKenzie et al. 2006)

- A powerful tool for monitoring presence/absence
- Changes in proportion of occupied sites will be correlated with changes in population size
- Strong application for cryptic species
- Generates unbiased estimates of occupancy



Objectives:



- Determine pygmy rabbit occupancy dynamics
- Determine presence or absence of pygmy rabbits between PAPA and Reference

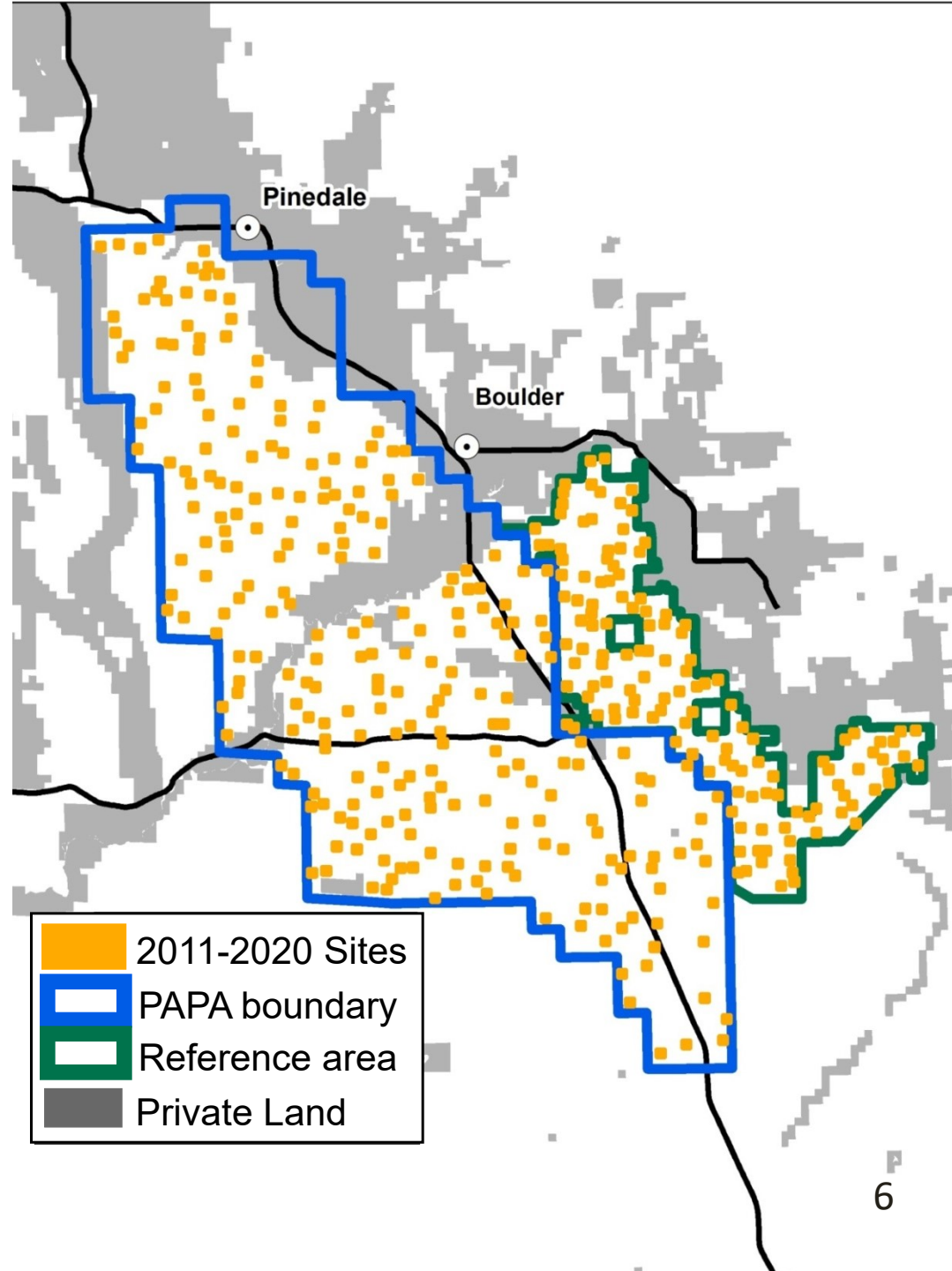


Methods

HWA surveyed 390
sample plots in
2011-2020

- 254 in the PAPA
- 136 in the Reference

(2 visits each)

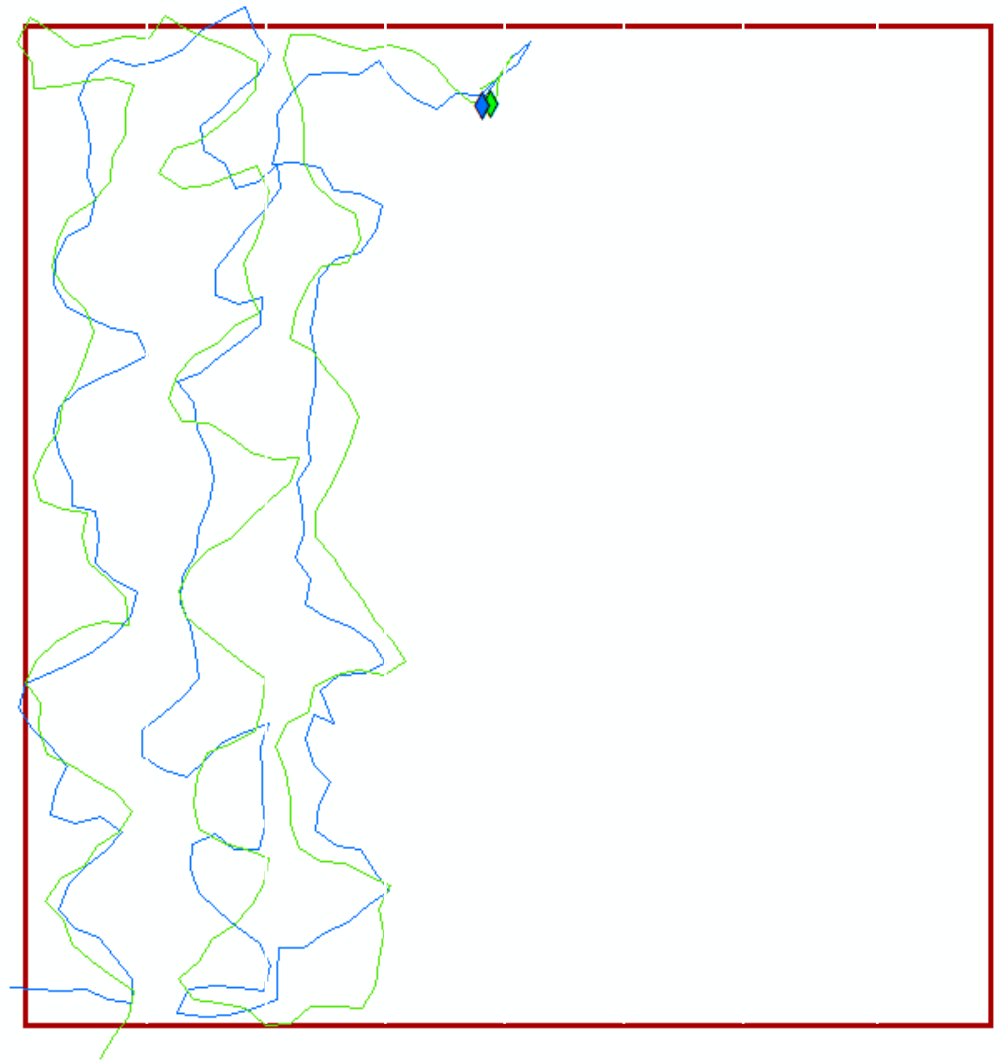


Methods

- Each sample plot 400 m x 400 m
- 8 belt transects, 50 m wide
- Survey visit 1 & 2:
 - Record presence/absence

Legend

- ◆ Round 1 Survey Detections
- Round 1 Survey Route
- ◆ Round 2 Survey Detections
- Round 2 Survey Route



Methods



- Analysis: MARK, Robust Design Occupancy (Mackenzie et al. 2003)
 - Estimates occupancy (Ψ) & change in occupancy (λ)
- AIC is a widely used model selection criterion
- Evaluated 9 models with AIC_c (Burnham & Anderson 2002)
- Separate occupancy and detection estimates for PAPA & Reference



Results 2011-2020

Occupancy (Ψ)

- 48% in PAPA (95% CI = 42-54%)
- 61% in Reference Area (95% CI = 52-69%)



Results (continued)

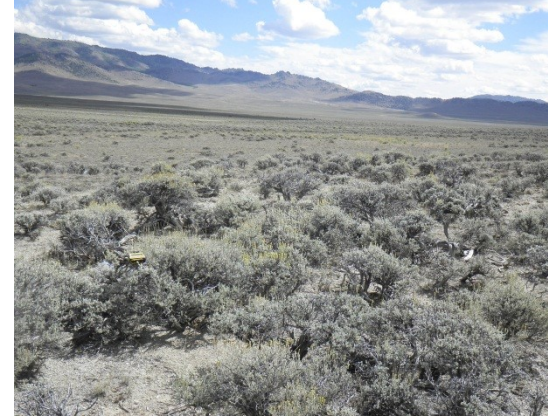
Rate of Change in Occupancy (λ)

- PAPA 2011-2012 1.18 (95% CI = 1.03-1.33)
- PAPA 2012-2013 1.12 (95% CI = 1.01-1.24)
- PAPA 2013-2014 1.06 (95% CI = 0.96-1.15)
- PAPA 2014-2015 1.14 (95% CI = 1.04-1.24)
- PAPA 2015-2016 0.97 (95% CI = 0.74-1.00)
- PAPA 2016-2017 0.89 (95% CI = 0.78-0.95)
- PAPA 2017-2018 1.09 (95% CI = 1.00-1.18)
- PAPA 2018-2019 0.79 (95% CI = 0.69-0.86)
- PAPA 2019-2020 1.04 (95% CI = 0.93-1.15)

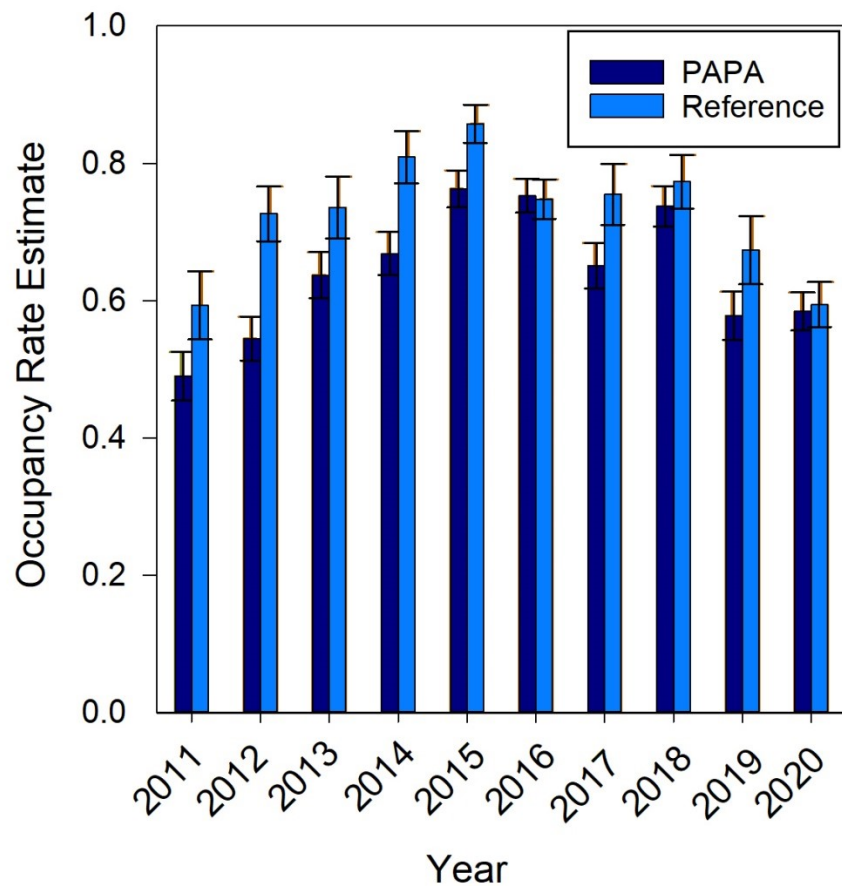
- PAPA 2011-2020 1.03 (95% CI = 0.93-1.13)

- Reference 2011-2012 1.15 (95% CI = 1.03-1.27)
- Reference 2012-2013 1.08 (95% CI = 0.99-1.17)
- Reference 2013-2014 1.07 (95% CI = 1.00-1.14)
- Reference 2014-2015 1.07 (95% CI = 1.00-1.14)
- Reference 2015-2016 0.88 (95% CI = 0.78-0.94)
- Reference 2016-2017 0.99 (95% CI = 0.90-1.07)
- Reference 2017-2018 1.04 (95% CI = 0.95-1.13)
- Reference 2018-2019 0.87 (95% CI = 0.76-0.93)
- Reference 2019-2020 0.88 (95% CI = 0.71-0.95)

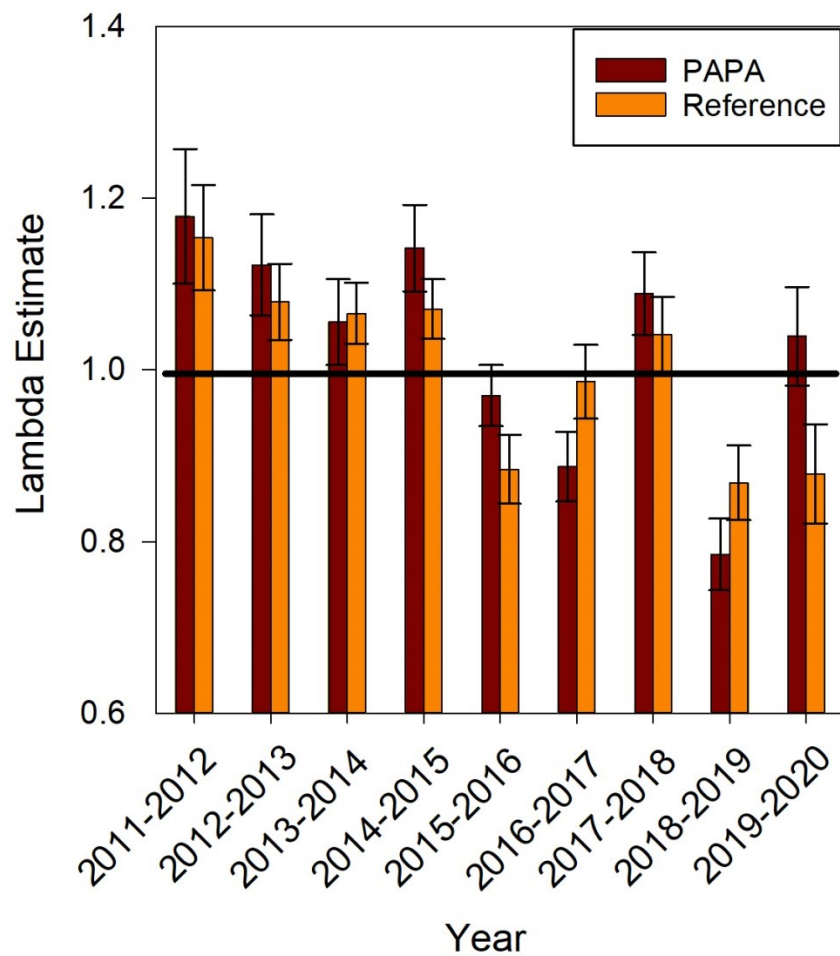
- Reference 2011-2020 1.00 (95% CI = 0.92-1.09)



Single Season Occupancy Rates



Lambda Rates (Rate of Change in Occupancy)



Discussion



- PAPA has had lower occupancy than reference, but difference is not statistically significant
- 2016 was the first year that occupancy rates were similar between PAPA and reference
- From 2018 to 2019, the rate of change was below 1. In 2019 we found more than a 15% decline in occupancy for the **first time** in the PAPA.
- From 2019 to 2020 there was an increase in occupancy of 4%, **avoiding** the 2nd year of a 15% decline in the PAPA.

Discussion

- Rate of change in occupancy (λ) in the PAPA
 - Decrease in occupancy in 2016, 2017, and 2019
 - 1st time decline more than 15% in 2019
 - Found slight increases in 2018 and 2020
 - No 2nd year of decline in 2020
 - Rate of change has fluctuated since 2011





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