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

Hayden-Wing Associates, LLC
Natural Resource Consultants

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
- Occupancy will be correlated with population size
- Accounts for imperfect detection
- Generates unbiased estimates of occupancy

Objectives:

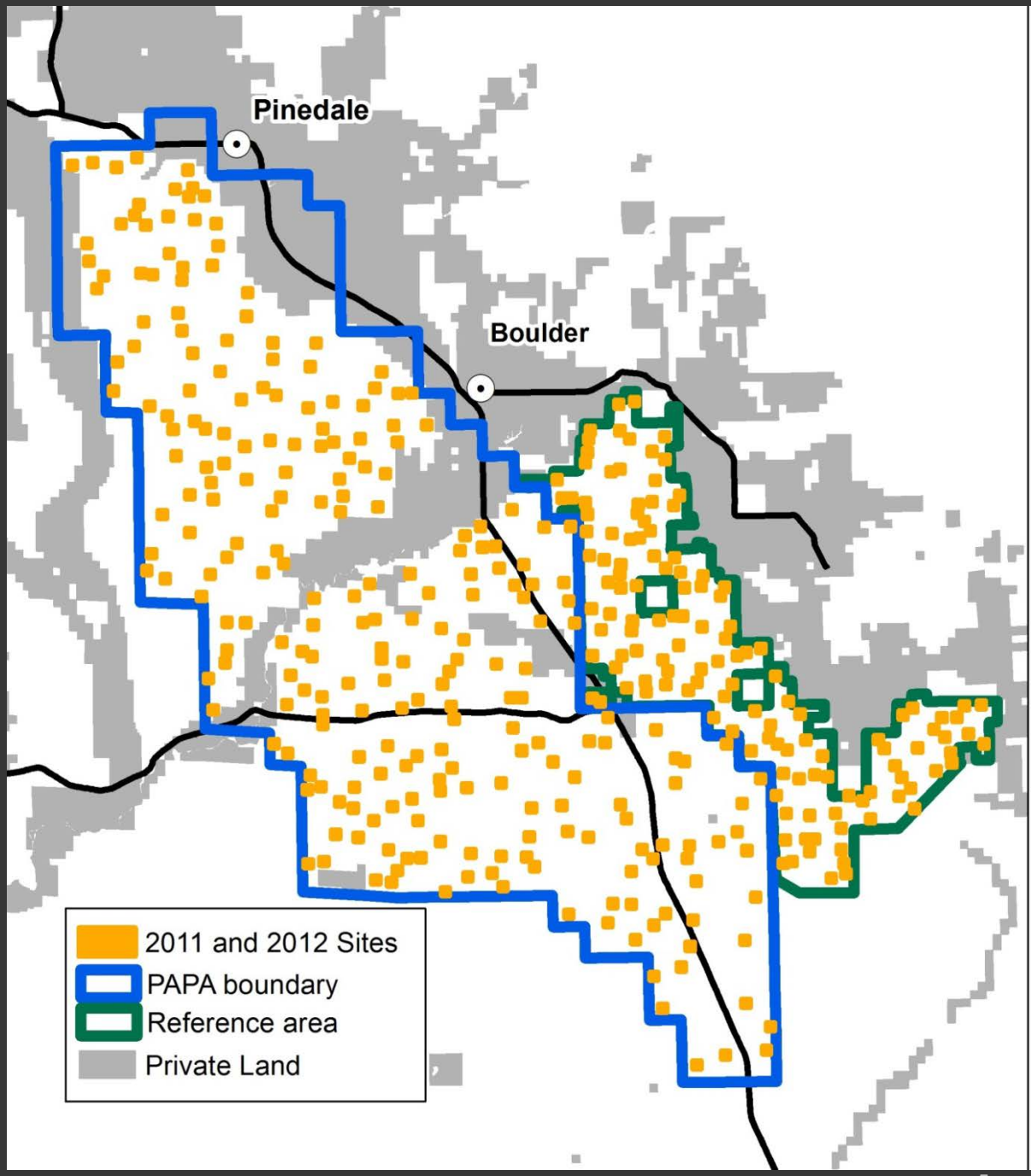
- Determine pygmy rabbit occupancy dynamics
- Determine presence or absence of pygmy rabbits between sites and over time

Methods

HWA surveyed 390 sample plots in 2011-2012

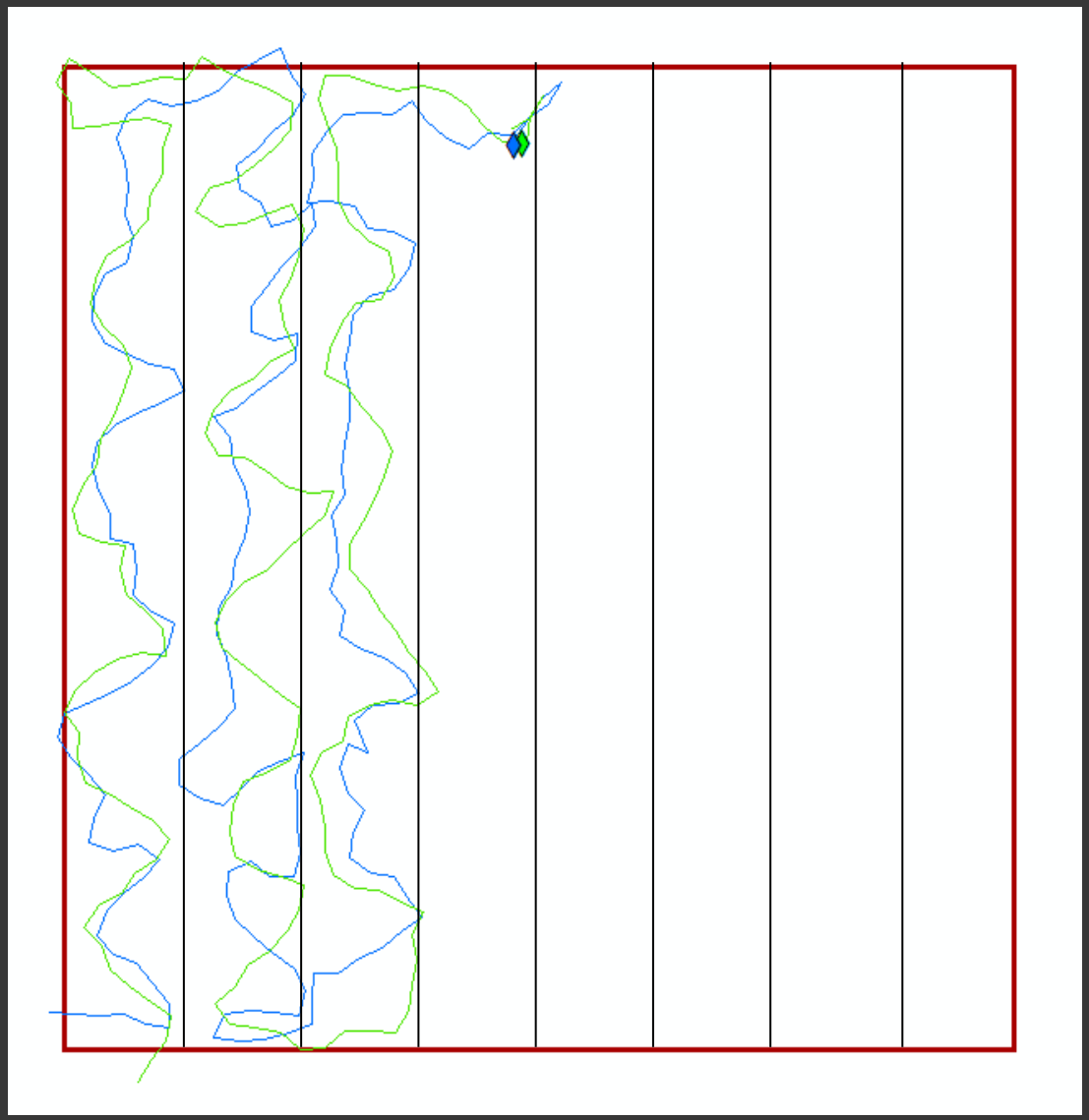
- 254 in the PAPA
- 136 in the Reference

(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



Identification of pygmy rabbit presence

Identification of pygmy rabbit presence

- Use fresh sign (positively < 1 year)
- Did not use old sign (possibly > 1 year)

Trimble
Juno series
ok

Methods

- Analysis: MARK, Robust Design Occupancy (Mackenzie et al. 2003)
  - Does not assume independence between years
  - Explicitly accounts for local extinction & colonization rates, and detection
  - Estimates occupancy & change in occupancy
- Evaluated 9 models with AIC_c (Burnham & Anderson 2002)
- Separate occupancy and detection estimates for PAPA & Reference

Results

Model[1]	AIC_c	ΔAIC_c	AIC_c wt	K	Deviance
Ψ(group) ε(group) γ(.) p(group)	1533.74	0.00	0.355	7	1519.59
Ψ(group) ε(group) γ(group) p(group)	1534.14	0.40	0.291	8	1517.95
Ψ(group) ε(group) γ(group) p(year)	1535.64	1.90	0.137	7	1521.49
Ψ(group) ε(group) γ(group) p(year)	1536.15	2.41	0.106	8	1519.96
Ψ(group) ε(group) γ(.) p(.)	1537.28	3.54	0.061	7	1523.13
Ψ(group) ε(.) γ(.) p(group)	1538.27	4.53	0.037	6	1526.16
Ψ(group) ε(.) γ(.) p(.)	1540.47	6.73	0.012	5	1530.39
Ψ(.) ε(.) γ(.) p(year)	1545.06	11.33	0.001	5	1534.99
Ψ(.) ε(.) γ(.) p(.)	1548.94	15.20	0.000	7	1534.80

[1] Standard notation: Ψ = probability of occupancy, ε = probability of extinction, γ= probability of recolonization, *p* = probability of detection

Results 2011 and 2012

Occupancy (Ψ)

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

Re-colonization (γ)

- 38% in PAPA (95% CI 30%-46%)
- 41% in Reference (95% CI 30%-54%)

Extinction (ε)

- 24% in PAPA (95% CI 17%-33%)
- 11% in Reference (95% CI 5%-21%)

Results (continued)

Detection probability

2011

- Round 1 PAPA 88% (95% CI = 84-91%)
- Round 2 PAPA 88% (95% CI = 84-91%)
- Round 1 Reference 91% (95% CI = 85-94%)
- Round 2 Reference 91% (95% CI = 84-91%)

2012

- Round 1 PAPA 88% (95% CI = 84-92%)
- Round 2 PAPA 88% (95% CI = 84-92%)
- Round 1 Reference 91% (95% CI = 87-94%)
- Round 2 Reference 91% (95% CI = 87-94%)

Conclusions

- Effect of detection probability was minimal
- PAPA has lower occupancy
- No meaningful difference among recolonization between PAPA and Reference
- However, there is a difference among occupancy and extinction

Future Work

- Potential field work in 2013
- Preparing manuscript for peer review
- Incorporating covariates
  - Landscape features
  - Anthropogenic disturbance
- Long-term sustainability of populations

2012-08-12 5:08:34 AM M 5/5
37°F
HC600 COVERT
RECONYX

2012-08-12 7:33:18 AM M 1/5
37°F
RECONYX

2012-08-12 7:33:39 AM M 1/5
37°F
HC600 COVERT
RECONYX

2012-08-12 7:03:07 AM M 2/5
35°F
HC600 COVERT
RECONYX

RECONYX

2012-08-23 7:53:59 PM M 1/3
76°F
HC600 COVERT
RECONYX

PM M 2/3
77°F
RECONYX

2012-09-02 9:07:24 AM M 4/5
54°F
HC600 COVERT
RECONYX

2012-08-26 7:22:52 AM M 5/5
38°F
HC600 COVERT
RECONYX

2012-08-07 2:53:13 PM M 3/5
115°F
HC600 COVERT
RECONYX

M 1/3
42°F
RECONYX

2012-08-26 6:29:51 AM M 2/3
42°F
HC600 COVERT
RECONYX