

# Barred Owl removal experiments: overview of a workshop convened at Fort Collins, Colorado

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Approaches  
identified by  
R.J. Gutiérrez at  
Arcata workshop

1. no action
2. ecological studies
3. removal experiments
4. habitat mgmt
5. divers./supp'l feeding
6. breeding disruption
7. ongoing control



# Summary of approaches

Option	Useful/feasible?	Cause & Effect
No action	No	No
Ecol. studies	Yes	Not likely ?
Removal	Yes	Yes
Hab. manage.	Unk; unlikely	Unknown
Suppl./diversion	Not likely	Not likely
Disrupt breed.	Not likely	Not likely
Maint. control	Unknown	Potentially

# Justification for Fort Collins workshop

- NSO issue remains controversial
  - Draft recovery plan
  - Habitat versus NBO debate
- NBO may significantly impact NSO
- Control identified as an option (e.g. Arcata meeting)
  - Legacy of control efforts
  - Some control efforts have been unpopular
- Public perception
  - Significant media attention
  - Important to develop and use the most scientifically credible approach

# Fort Collins workshop attendees

- Core Group
  - Doug Johnson
  - Gary White
  - Alan Franklin
  - Lowell Diller
  - Ian Blackburn
- Organizers/observers
  - John Pierce
  - Joe Buchanan
  - Gail Olson
  - Brian Woodbridge
  - Jim Thrailkill
  - Mark Ostwald

# Workshop agenda (overview)

- *2 May 2007*

- Hypotheses
- Predictions
- Response pattern / strength
- Type of design
- Study sites
- Decision points

- *3 May 2007*

- Power analysis
- Other menu options
- Outline report
- Assignments

# Possible responses to experiments

1. Relative density
2. Lambda
3. Dispersal (natal, breeding)
4. Home range (habitat use, home range size)
5. Breeding status
6. Physiological condition
7. Diet
8. Occupancy

# Measuring Spotted Owl responses to experiments

- Demography
- Population size
- Occupancy rates (landscapes)
- Site scale removals

# Examples of demography hypotheses

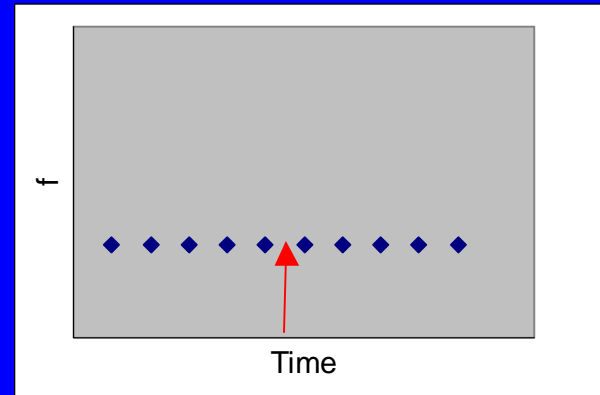
- $H_0$ : the demographics ( $\lambda$ , reflecting survival, recruitment, immigration, and emigration) of territory-holding NSO are not affected by the presence (or density) of NBO.
- $H_1$ : The presence of NBO creates “hidiers” among NSO, that is, owls that once held territories but no longer hold any, but which remain in or near the territory.
- $H_2$ : The presence of NBO increases the mortality rate or emigration rate among NSO.

# Anticipated responses:

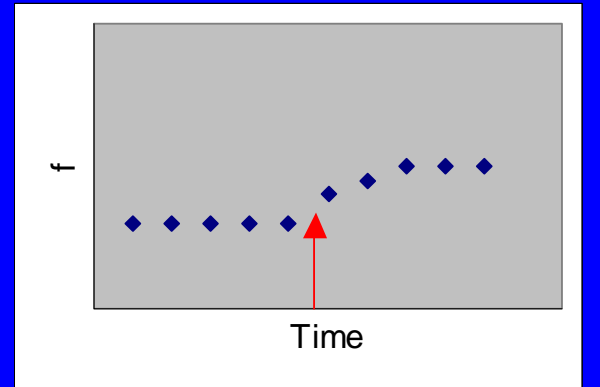
- If  $H_0$  is true, then no change in  $\lambda$  or its components (for NSO) is anticipated from a reduction in NBO.
- If  $H_1$  is true, the expectation is that the number of territory-holding NSO will increase following a reduction in NBO, and most of those will have held territories in the past.
- If  $H_2$  is true, the expectation is that the number of territory-holding NSO will increase following a reduction in NBO, and most of those will be novice territory-holders, either immigrants from other areas or recruits from the local area.

# Response examples

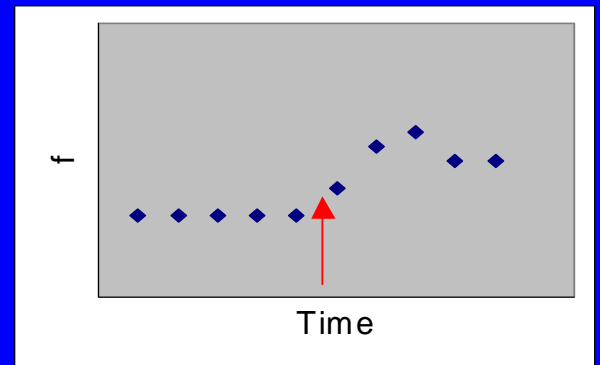
$H_0$ :

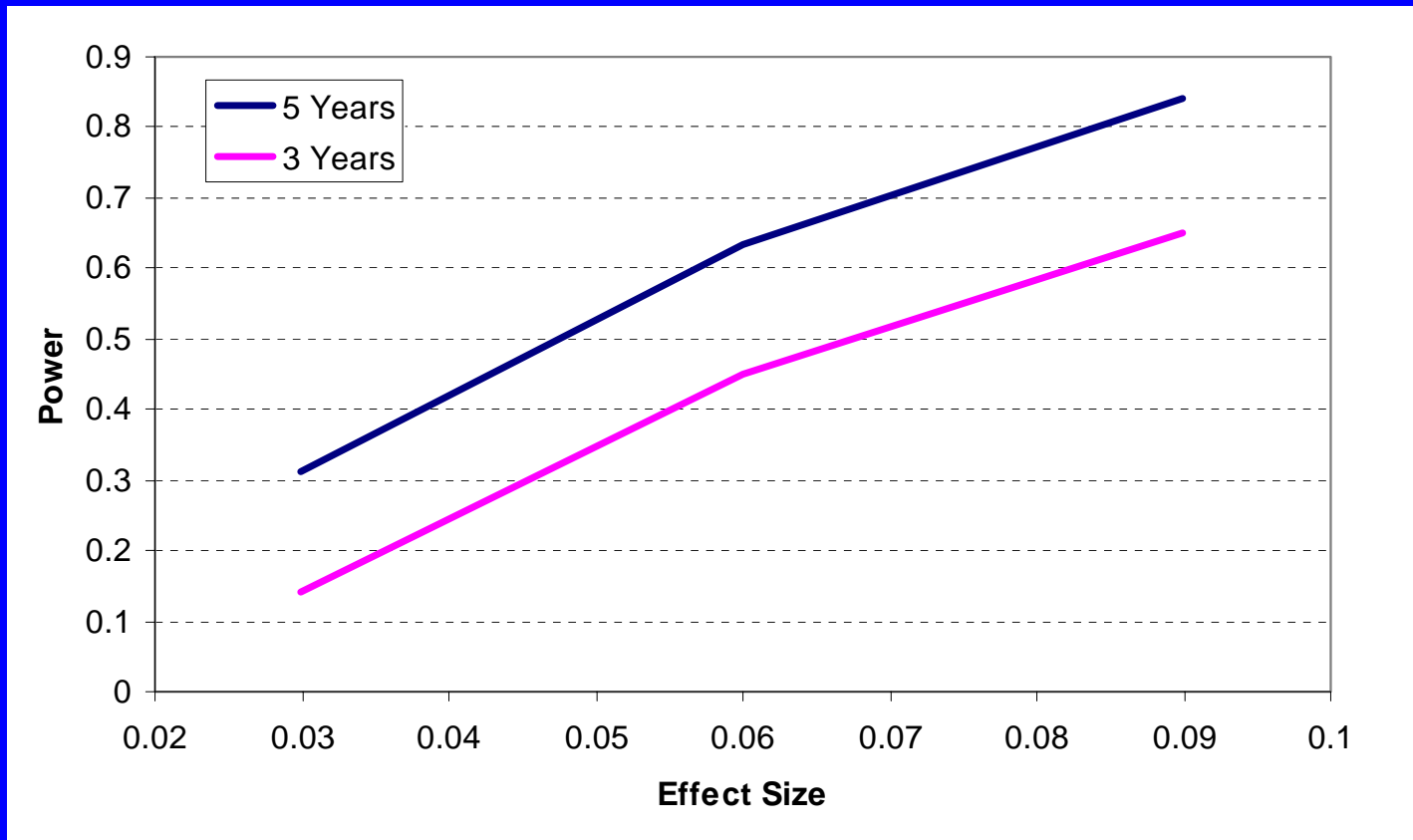


$H_1$ :

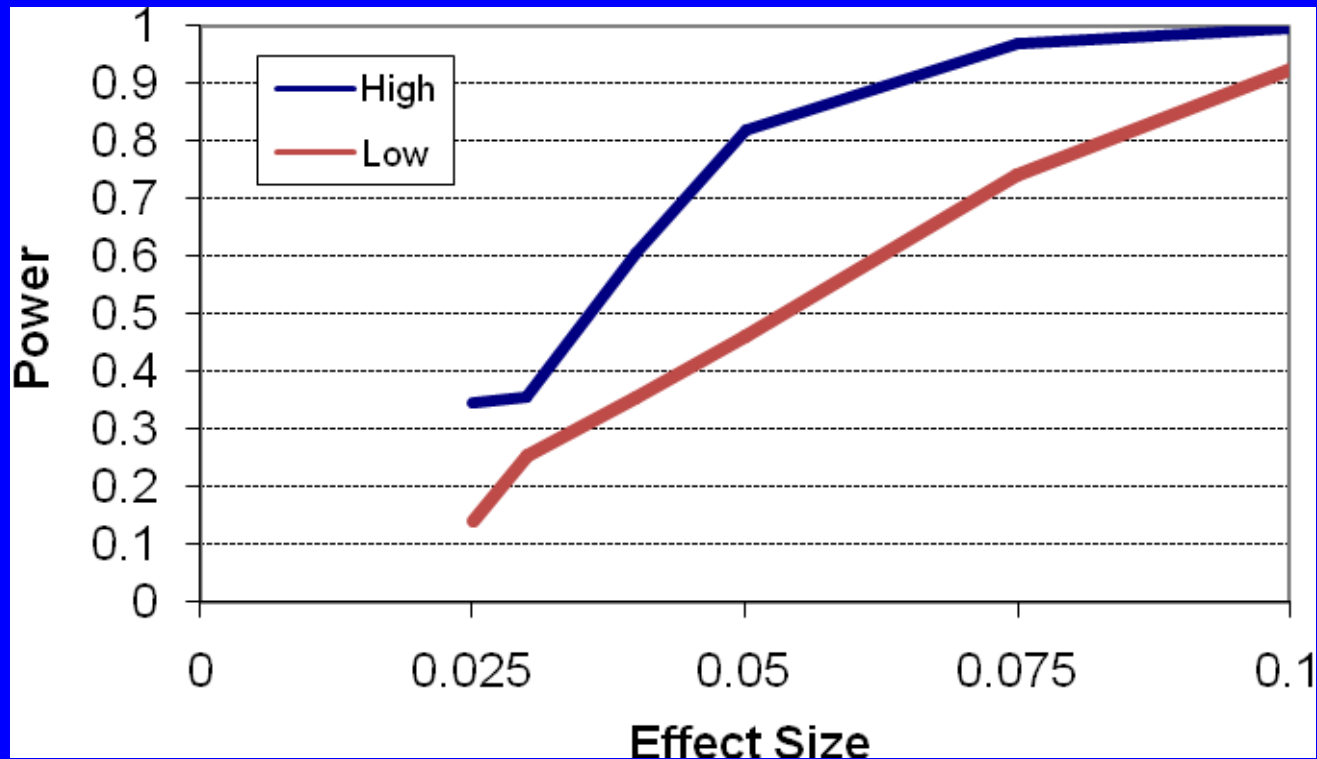


$H_2$ :





Monte Carlo simulation results for power to detect a treatment effect for a single study area with 10 years of pre-treatment data and either 3 or 5 years of post-treatment data. Pre-treatment number of owls = 87.



Monte Carlo simulation results for power to detect treatment effect for 3 study areas combined into a meta-analysis with 10 years of pre-treatment and 3 years of post-treatment data. High = 200, 150, 100 NSO; low = 100, 66, 50 NSO.

# Some considerations

- Removals during Sep-Mar allow for calculation of NSO response in 1<sup>st</sup> year.
- A robust design option provides comparable output and accounts for multiple secondary encounters.
- Paired control-treatment per landscape (and control for environmental attributes).
- Buffer area between control & treatment areas.
- Moderate / high density of NBO.
- Demography study areas.

# Population size

- For NSO landscapes with:
  - NBO clusters
  - Count or survey data
  - No demography data
- Control – treatment design
- Can't determine demographic factor (e.g. survival, fecundity) responsible for response

# Occupancy rates - landscape

- Same conditions and considerations as those for “population size” option, except:
  - Dispersed presence of NBO
  - With or without recent survey data
- Randomly select and survey within grids to detect changes in occupancy
  - Account for habitat conditions

# Site-scale removals

- Two scenarios
  - Sites with no recent detections
  - Active sites
- Need many sites (and control/treatment design)
- Occupancy (because sites generally have no recent data)
- Less likely than landscape approaches to account for “off-site” effects

# Summary

- Removal experiments have great potential scientific, conservation & management value:
  - To demonstrate an effect (if one exists)
  - To inform decisions (e.g. cost, effectiveness) about engaging a maintenance control strategy
- Several general options available
  - Demography approach is most powerful
  - Other opportunities also available

