Barred Owl Habitat Selection in West Coast Forests

NSO Stakeholder Forum, Santa Rosa, CA

Laurie A. Clark

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• Barred owl westward expansion of the 20th century
• Downward NSO demography trends (Anthony et al. 2006, Forsman et al. 2011) linked to increasing barred owl density
• Reviews (Buchanan et al. 2007, Gutierrez et al. 2007, Dugger et al. 2016) and revised recovery plan (USFWS 2011) identify barred owls as a primary threat to NSO
**Goal:** Identify combinations of vegetative and environmental factors associated with foraging habitat selection across varied landscapes

- Radio 8-10 pairs of barred owls per study area (WA, OR, CA)
- Quantify detailed habitat and physical environmental conditions available within home ranges
- Develop Resource Selection Functions (RSFs) for foraging and compare among study areas (between nesting/non-nesting seasons)
- Develop a general RSF, pooled across 3 study areas
- Estimate cumulative home ranges and core-area sizes
Chehalis, WA
- Washington DNR, Weyerhaeuser
- Douglas-fir-western hemlock zone

Springfield, OR
- BLM (10%), private, USFS
- Douglas-fir-western hemlock zone

Arcata, CA
- Redwood National & State Parks, Green Diamond Resource Company, city of Arcata, BLM (Arcata Headwaters Reserve), Humboldt Redwood Company
- Redwoods, mixed redwood/Douglas-fir, mixed Douglas-fir/oak woodlands
Radio-Tracking (Consistent Design Across Study Areas)

Telemetry Data:
• Chehalis-2007-2010
• Springfield-2007-2011
• Arcata-2008-2012

METHODS

• Barred owls were captured via nets, noosepole
• VHS backpack transmitters
• Located 1-3X/wk, nocturnal (foraging)
• Quantified seasonal and annual foraging habitat choices
  • Abiotic factors
    • Distance from streams, roads, nests
    • Slope, aspect
  • Forest vegetation structures
  • Tree density, species composition, DWD

• Used 120m grid within 95%MCP home ranges
• Plot density=1 plot/1.6ha, variable radius forest inventory plots, 40BAF
Resource Selection Functions (RSFs)

- Created discrete-choice RSF models
  - Linked forest-telemetry data across landscapes & habitat
  - Used home ranges w/ >30 locations/season or year
  - Each bird = independent sample

- RSFs constructed in stages
- Seasonal influences
- Applied top RSF for each area to habitat plots within territories of other 2 areas
# RADIO-TRACKING RESULTS

<table>
<thead>
<tr>
<th>Territories</th>
<th>Chehalis, WA</th>
<th>Springfield, OR</th>
<th>Arcata, CA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Females Tracked</td>
<td>6</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Males Tracked</td>
<td>10</td>
<td>12</td>
<td>9</td>
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<tr>
<td>Telemetry Points</td>
<td>2803</td>
<td>2810</td>
<td>2454</td>
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<tr>
<td>Habitat Plots</td>
<td>3978</td>
<td>2431</td>
<td>1919</td>
</tr>
</tbody>
</table>
## Median Home Ranges (>150 locations)

<table>
<thead>
<tr>
<th>95% MCP</th>
<th>95% FK</th>
<th>50% FK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chehalis = 564 ha (n=16)</td>
<td>• Chehalis = 559 ha</td>
<td>• Chehalis = 88 ha</td>
</tr>
<tr>
<td>• Springfield = 446 ha (n=11)</td>
<td>• Springfield = 347 ha</td>
<td>• Springfield = 34 ha</td>
</tr>
<tr>
<td>• Arcata = 290 ha (n=13)</td>
<td>• Arcata = 195 ha</td>
<td>• Arcata = 35 ha</td>
</tr>
</tbody>
</table>
HABITAT SELECTION RESULTS

RSF models shared two common covariates among the 3 sites:

- Distance from nests/site centers (-)
- Elevation (-)
- Barred owls preferred areas closer to nests/site centers and at lower elevations
- Otherwise, covariates in top RSF models varied among study sites
Chehalis-Douglas-fir, Western Hemlock Zone

HABITAT SELECTION RESULTS

INCREASED PROBABILITY OF SELECTION
- Greater basal area of western redcedar/alder
- Increased basal area of trees 25-55cm dbh

DECREASED PROBABILITY OF SELECTION
- Density of young trees (<12.7 cm dbh)
- Increased distance from roads
- Higher elevation and steeper slopes

NEUTRAL/UNIMPORTANT
- Distance to streams
- Heatload
- BA of hemlock, Douglas-fir, Sitka spruce, hardwoods

INTERACTION TERM
- Basal area of large diameter trees (>66cm dbh) became important with proximity to nests
Springfield-Douglas-fir, Western Hemlock Zone

**HABITAT SELECTION RESULTS**

**INCREASED PROBABILITY OF SELECTION**
- Low lying areas (lower slope positions)
- Increased basal area of bigleaf maple
- Increased basal area Douglas-fir, western hemlock

**OTHER POSITIVE ASSOCIATIONS**
- Increased densities of western redcedar
- Greater basal area of bigleaf maple with distance from nests

**DECREASED PROBABILITY OF SELECTION**
- Higher elevations
- Increased distance to streams
HABITAT SELECTION RESULTS

Arcata-Redwoods, Douglas-fir, Mixed Douglas-fir, Oak Woodlands

INCREASED PROBABILITY OF SELECTION

- Increased basal area of California redwood

INTERACTION TERM

- Increased basal area of trees >66cm dbh with increased proximity to nests

DECREASED PROBABILITY OF SELECTION

- Increased elevation
- Increased density of Douglas-fir
- Increased basal area of tanoak
Probability of selection increased with:
• Increased slope, southerly aspects, increased QMD, and basal area of alder

Probability of selection decreased with:
• Increased distance from nests, streams, and increased density of small diameter trees
Seasonal Effects

Nesting
- Foraging concentrated near nest sites and at lower elevations
- Large diameter trees important
- Small trees (-) association (Arcata)
- Alder important (Chehalis, Arcata)
- Tanoak (-) association (Arcata)

Non-Nesting
- Less restricted to low areas
- Large trees remained important (Chehalis, Arcata) or Douglas-fir (Springfield) near nest sites
- Probability ↑ w/greater basal area of trees 25.5-56 cm dbh and greater basal area alder (Chehalis)
- Basal area of bigleaf maple, western hemlock, Douglas-fir important (Springfield)
Conclusions

• Location-location...availability affected use

• Barred owls exhibit strong patterns of habitat selection

• Use concentrated near nesting sites, flat, low elevations (also Wiens et al. 2014), proximity to permanent streams (mixed hardwoods, more prey)

• Patches w/greater basal area of alder (Chehalis), bigleaf maple (Springfield) important

• Foraging strongly associated w/dense patches large conifers near nest sites (thermal/predation benefits)

• Minimal seasonal shifts in habitat selection

• Most foraging on southerly aspects

• Barred owls showed associations w/specific tree species

• (-) association w/young, dense Douglas-fir (also Wiens et al. 2014)
What Does This All Mean?

- Fine-scale habitat details matter
- General RSFs are useful
- Thinning young conifer to increase tanoak/madrone may benefit NSO,

BUT...

- No studies evaluating barred owl response to reduced tree densities
THANK YOU TO ALL COOPERATORS AND FIELD CREWS
Questions, Comments?

Laurie Clark
Associate Scientist

(541)378-7880  www.ncasi.org  lclark@ncasi.org