Assigning “forest wildlife value” for forest-interior wildlife at the landscape scale in rural King County, Washington, using GIS.

Policy Context

To comply with Washington State’s Growth Management Act, King County passed its Critical Areas package in 2004.

Critical Areas package contains three ordinances:

1. Critical Areas
2. Stormwater
3. Clearing and Grading

These pieces of legislation establish the standard code and outline options for flexibility.
As per Critical Areas legislation, Rural Landowner Must Follow One of Four Tracks when Clearing or Developing

Rural Landowners want to Clear or Develop Land. They may:

- Follow Standard Code
- Write Farm Plan, for Ag-based development
- Write Forest Plan, for development in FPD
- Create Rural Stewardship Plan
Rural Stewardship Planning applicable in Rural-zoned King County
Rural Stewardship Planning may offer flexibility in four key areas of CAO Code Standards.

- Rural Stewardship Planning – May provide Flexibility with:
  - Wetland Buffers
  - Aquatic Area Buffers
  - Wildlife Habitat Conservation Areas
  - Clearing and Grading → Properties with No Critical Areas
Methods for determining flexibility

Rural Stewardship Planning – May provide Flexibility with:
- Wetland Buffers $\rightarrow$ Flexibility in Code
- Aquatic Area Buffers $\rightarrow$ Flexibility in RSP Guidance docs
- Wildlife Habitat Conservation Areas $\rightarrow$ Flexibility yet to be developed
- Clearing and Grading $\rightarrow$ Properties with No Critical Areas
  The Challenge at Hand
Q: How do we determine flexibility on lands with no critical areas?

New analytical tool needed:
• that can be consistently applied to any RSP site.
• that works at the site scale yet considers the site’s context (the landscape).

We chose two components to focus on: Hydrology and Wildlife Value.
• Parameters within these components would need to be simple yet able to capture complexities of components.
• Parameters would need to be significant (i.e., outcome of one must contribute to change in level of flexibility)
A: The “FlexTool”

Hydrology Component’s four parameters:
• CAO Basin
• Soils
• Slope
• Location in the Basin

Wildlife Value Component’s four parameters:
• Forest Type
• Tree Size
• Proximity to Water
• Wildlife Forest Value
Building the Wildlife Forest Value Map: Goals & Objectives

Goal:
→ Use patch size and connectivity to assign high, medium, and low value to forest patches for forest-interior wildlife species.

Objectives:
→ Develop a “rapid assessment” tool using existing GIS data that:
  • Identifies patches of core interior forest in King County
  • Identifies forest connectivity at the landscape scale
Core Interior Forest Patch: a forested area that maintains habitat for a large diversity of native wildlife, including forest-interior species.

- Donnelly and Marzluff (2004) identified 42 ha as the minimum patch size required for most bird species associated with native forest habitat of the Puget Lowlands.

Stepping Stone Patch (could also be called a “secondary forest patch”): a separate and smaller patch of habitat that provides resources and refuge that assist animals moving through the heterogeneous landscape.

- A 6-ha patch with an internal buffer suggested by Donnelly and Marzluff (2004)

Habitat corridor: contiguous, vegetated, dispersal conduits of variable length and width that connect isolated habitat patches to other patches or larger landscape habitat components.

- OMNR (2000) suggests widths of 200 m.
Our Definitions

Core Interior Forest Patch:

- 40 hectares with a 90 m external buffer to account for edge effects (microclimatic attenuation, exotic species invasion and predation) of the interior forest.

Stepping Stone Patch:

- $\geq$4-ha patch (and <40 ha) with a 90 m external buffer.

Habitat corridor:

- $\geq$180 m for high-value corridors and $\geq$90 m (but <180 m) for moderate value corridors.
Building the Wildlife Forest Value Map: Assumptions

• In rural-zoned and developing King County, the presence of stands of core interior forest is assumed to be a limiting factor for interior-forest dependent species.

• Keeping the amount of conversion, clearing, and fragmentation of interior forest as low as possible is assumed to be a high conservation priority.

• Given protection and time, core interior forest will develop the habitat quality and structure of mature and old-growth forest.

• All roads through forests contribute to fragmentation.

• Connectivity between core interior forests is important to wildlife.

• Interior-forest dependent wildlife species require a certain amount (varying by species) of interior forest habitat to sustain their populations.

• Dispersal is critical for maintaining a functional metapopulation.
Who are these Forest Interior Species?

**Birds**

*Closely Associated:*
- Ruffed Grouse
- Blue Grouse
- Marbled Murrelet*
- Band-tailed Pigeon*
- Northern Pygmy-owl
- Spotted Owl*
- Barred Owl
- Northern Saw-whet Owl
- Anna's Hummingbird
- Olive-sided Flycatcher
- Pacific-slope Flycatcher
- Warbling Vireo
- Winter Wren
- Golden-crowned Kinglet
- Varied Thrush
- Black-throated Gray Warbler
- Hermit Warbler
- Wilson's Warbler
- Western Tanager

*Generally Associated:*
Long list of birds, including these King County priority species:
- Great Blue Heron*
- Northern Goshawk*
- Red-tailed Hawk*
- Pileated Woodpecker*
- Vaux's Swift*

**Mammals**

*Closely Associated:*
- Trowbridge's Shrew
- Shrew-mole
- Coast Mole
- Long-legged Myotis
- Silver-haired Bat
- Big Brown Bat
- Mountain Beaver
- Townsend's Chipmunk
- Douglas' Squirrel
- Northern Flying Squirrel
- Bushy-tailed Woodrat
- California Myotis
- Keen's Myotis
- Common Porcupine
- Fisher*

*Generally Associated:*
Long list of mammals, including these King County priority species:
- Roosevelt Elk*
- Townsend's Big-eared Bat*
- American Marten*
- Mink*

**Amphibians**

*Closely Associated:*
- Ensatina
- Red-legged Frog

*Generally Associated:*
Northwestern Salamander
- Long-toed Salamander
- Pacific Giant Salamander
- Rough-skinned Newt
- Western Red-backed Salamander
- Tailed Frog
- Western Toad*
- Pacific Chorus (Tree) Frog
Assessment Phase 1: Getting and Using the Data

Data sources:
• King County’s most current roads data (st_address)
• 2002 landcover data from UW (see Alberti et al. 2004)
  • Raster data
  • Classified into 17 landcover classes

Manipulation:
• All mapped roads considered barriers
• All currently non-forested classes of landcover were considered barriers
• Identifiable forest classes (conifer forest, mixed/deciduous forest) were used to form patches
## Phase 1 results

<table>
<thead>
<tr>
<th>Step of Assessment</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 2002 Landcover Data</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>71,949</td>
</tr>
</tbody>
</table>
Phase 2: Mapping the Forest Patches

Patches were mapped serially…

1. All forest patches at least 40 ha (100 acres) in size and with at least 90 m (300 ft) from any edge were identified.

→ By default, corridors 180 m (600 ft) or larger (90 m on all sides of any given point) would have been identified during this step.

→ These patches are labeled “core interior forest” and called High Value. Note the smallest possible high-value forest patch would be 64 ha (157 acres).
Phase 2: Mapping the Forest Patches, cont.

2. Remaining forest patches ≥4 hectares and <40 ha and with at least 90 m from any edge were identified.

These patches are labeled “stepping stone patches” and called Medium Value. Note the smallest possible moderate-value forest patch would be 13 ha (33 acres).

Example. Total area = 13 ha
Phase 2: Mapping the Forest Patches, cont.

3. Remaining forested areas ≥45 m from any edge were identified.

Unlike the first two steps, this step takes no minimum area size into account (well…one pixel).

Patches identified in this part of the analysis have a minimum width of 90 m (two adjacent buffers of 45 m each).

These polygons are potential corridors and are temporarily called Medium Value.
4. All remaining forest was added to the map and called Low Value.

Some patches were small (as small as a single tree), whereas other “remaining forest” was actually connected to patches described in steps 1-3 above but <45 m from any edge.
## Phase 2 results

<table>
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<th>Step of Assessment</th>
<th>Forest Wildlife Value in Hectares</th>
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<tr>
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<td>Total</td>
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<tr>
<td>1. 2002 Landcover Data</td>
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</tr>
<tr>
<td>2. Mapping Exercise</td>
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</table>
Phase 3: Assigning Forest Value

The final Forest Wildlife Value was assigned...

1. *High Forest Value* criteria:
   - All core interior forest.
   - Corridors $\geq 90$ m wide that connect to at least one patch of core interior forest.
   - Stepping stone patches that connect to core interior forest.

2. *Moderate Forest Value* criteria:
   - All remaining stepping stone patches.
   - Corridors $\geq 90$ m wide that connect to at least one stepping stone patch but do not connect to High-value forest.

3. *Low Forest Value*: all remaining mapped forest patches.
Examples of how connectivity affects valuation of forest patches.
Results

Forest wildlife value map compared to aerial photo of landscape matrix.
### Results, cont.

<table>
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<tbody>
<tr>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>71,949</td>
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<tr>
<td>2. Mapping Exercise</td>
<td>10,133 (14%)</td>
<td>9,492 (13%)</td>
<td>52,324 (73%)</td>
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<td>3. Reassessed Forest Value with Corridor Consideration</td>
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<td>11,145 (15%)</td>
<td>26,265 (37%)</td>
<td>71,949</td>
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Final Product

GIS map product accessible at:
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