Assessing the relationship between urban development patterns and Oregon White Oak (*Quercus garryana*) dispersal processes at multiple landscape scales.

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Research Vision: How can we manage ecological systems to be resilient to urban development?

➤ Improve understanding of how urban landscape patterns influence ecosystem function of habitat remnants

➤ Plan and manage to protect ecological processes as well as structures

➤ Facilitate dispersal and movement between habitat areas

➤ Maintain and protect ecosystem processes that support biodiversity

Study Questions

1. Do acorn dispersal patterns vary depending on the landscape context?

2. Does the composition and configuration of landcover surrounding an oak fragment relate to the abundance and composition of animal species dispersing acorns from that fragment?

3. If relationships exist, what is the relevant scale?

Garry Oak Woodlands in Southern Puget Sound
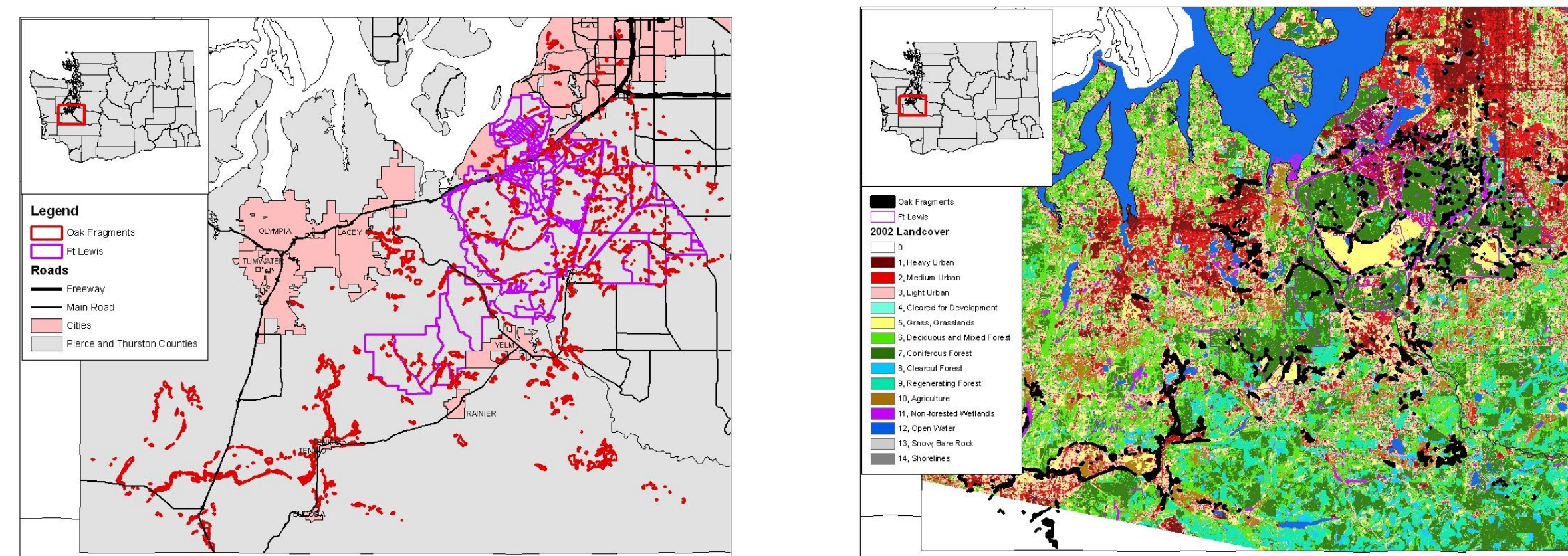
• A priority habitat for conservation in Washington State

• Threatened by urban development

• Provide acorns, a key food resource for a range of birds and mammals including the state-listed Western Gray Squirrel

Dispersal species are likely to respond to urban landscapes differently

Eastern Gray Squirrel
(*Sciurus carolinensis*)
• Highly urban tolerant
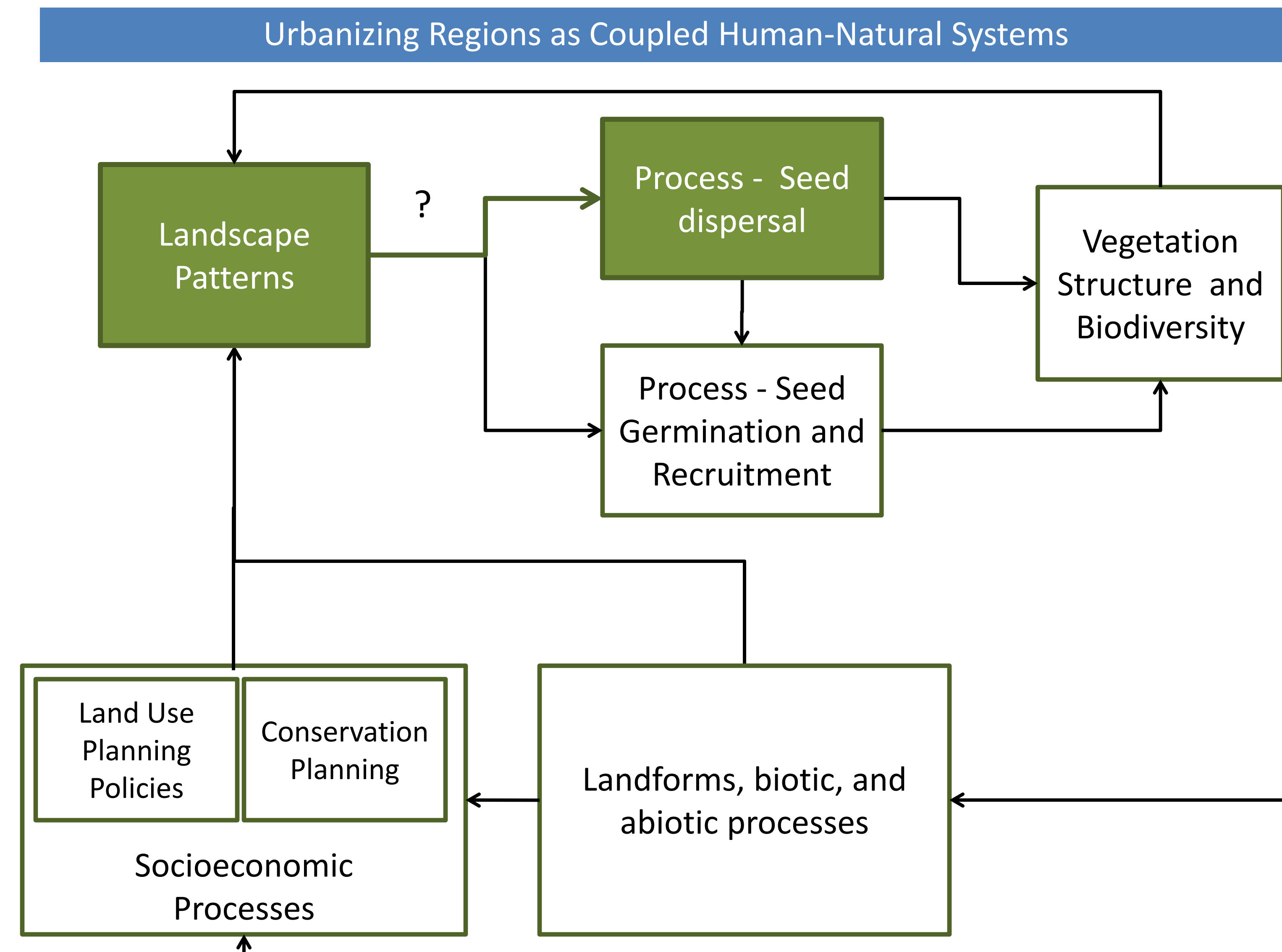• Short distance disperser
• Relevant scale – 0.5 km

Western Gray Squirrel
(*Sciurus griseus*)
• Within the study area, only found on Ft Lewis
• Short distance disperser
• Relevant scale – 0.5 km

Steller's Jays
(*Cyanocitta stelleri*)
• Moderately urban tolerant
• Long distance disperser
• Relevant Scale – 1 km

Urbanizing Regions as Coupled Human-Natural Systems

Hypothesis: Landscape patterns influence dispersal processes by altering the dispersal species assemblage and behavior

H1: Landscape variables correlate significantly with dispersal species assemblage (presence/absence and abundance) in a given oak fragment.

H2: Individual disperser species presence/absence and abundance correlate with landscape patterns at different landscape scales (either 0.5 km or 1 km).

H3: Disperser assemblage variables significantly predict variation in dispersal processes.

H4: Landscape variables significantly predict variation in dispersal processes.
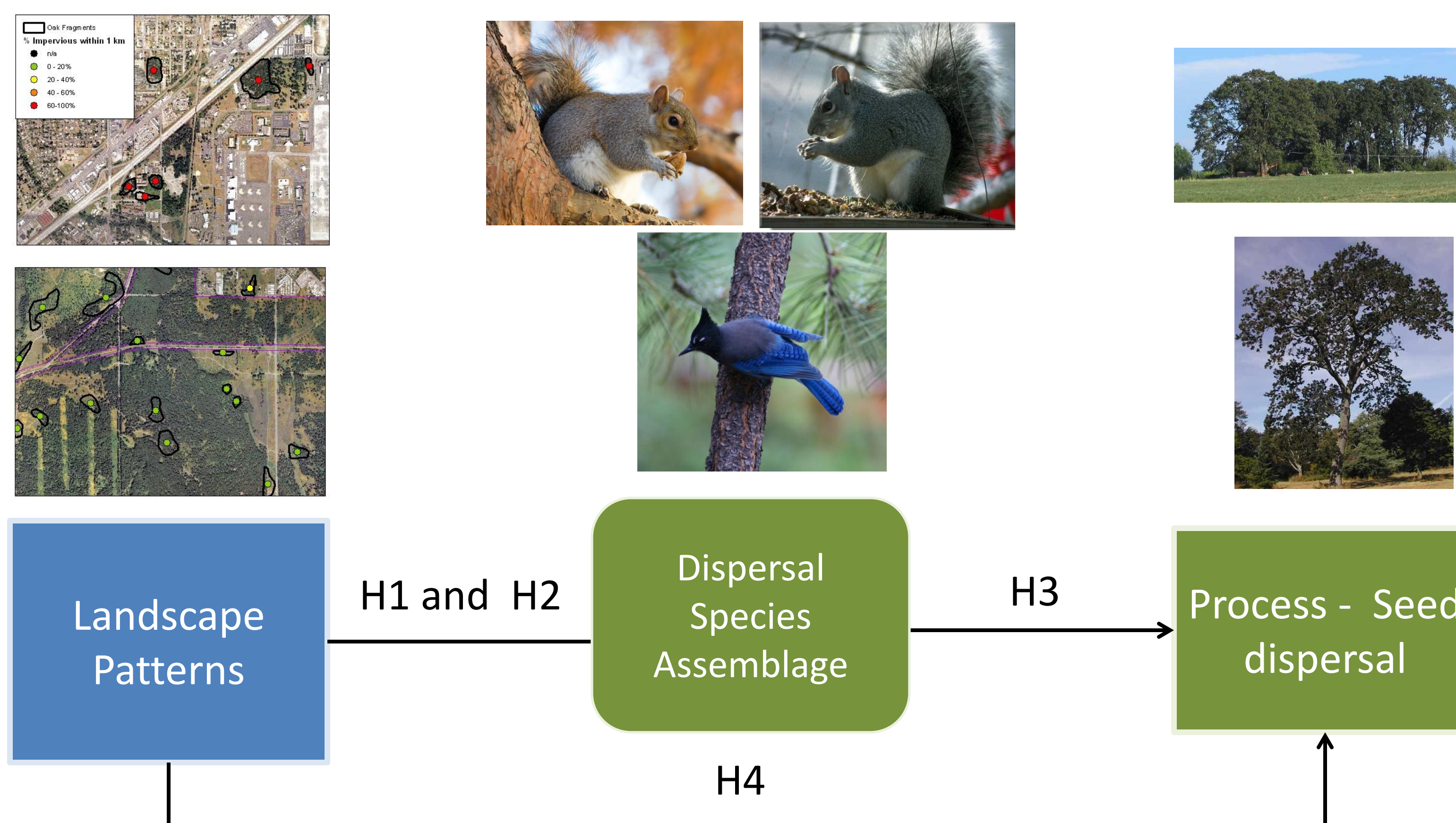
Methods

For 30 randomly selected, comparable oak fragments, quantify:

1. Oak fragment structure and acorn production
   • Age Class Structure
   • Acorn production (time-limited acorn counts)
   • Canopy cover
   • Understory composition

2. Dispersal species assemblage
   • Visual point counts of jays and squirrels
   • Hair snag traps to assess squirrels

3. Landscape context – measured as 0.5 and 1 km radii from the fragment's center (see Figure 1)
   • Land – cover composition and configuration
   • Land use composition
   • Proximity to other oak fragments
   • Road mileage

4. Dispersal processes
   • Acorn removal rate (direct and indirect observation)
   • Dispersal distance (direct observation and mark and recapture)
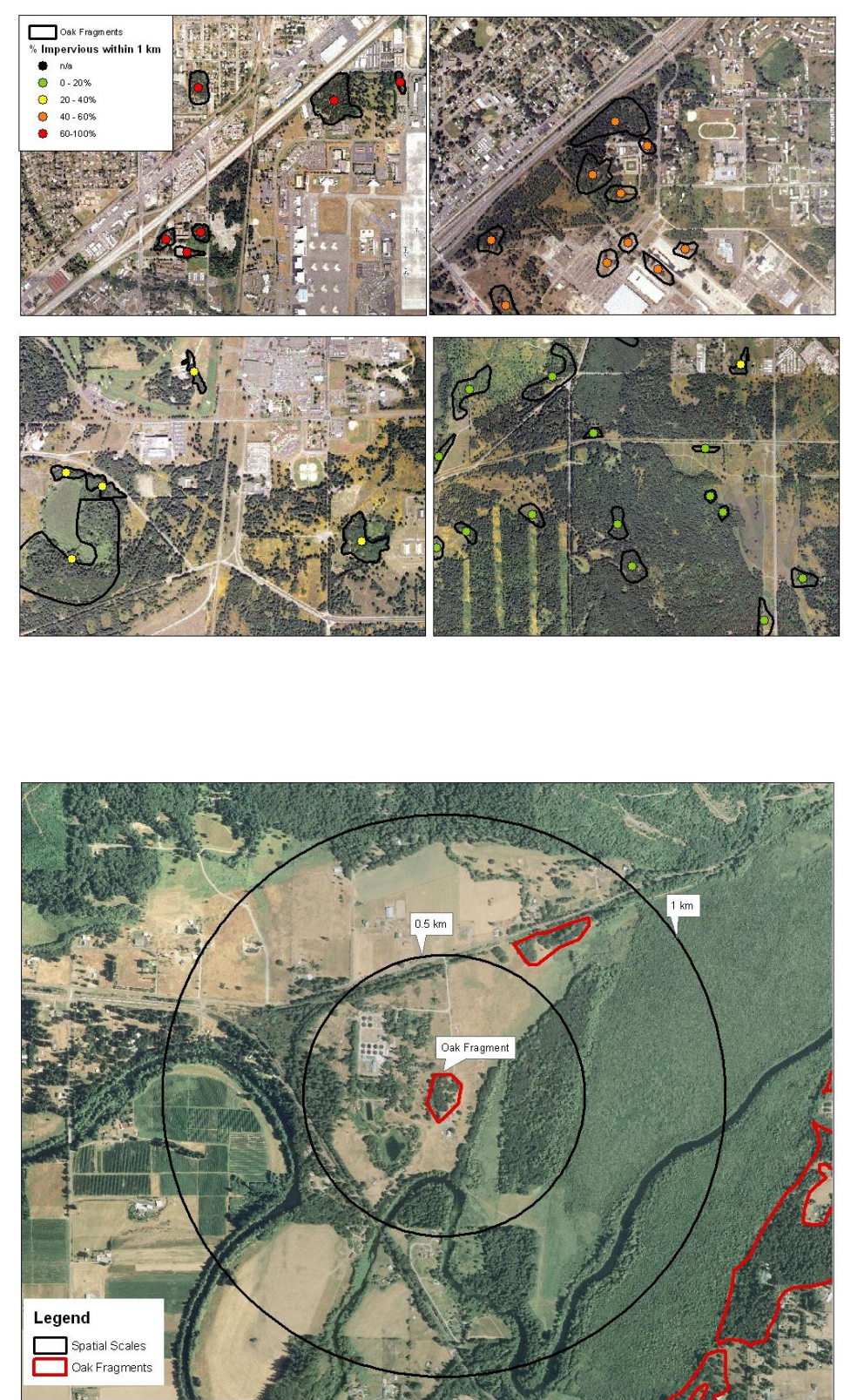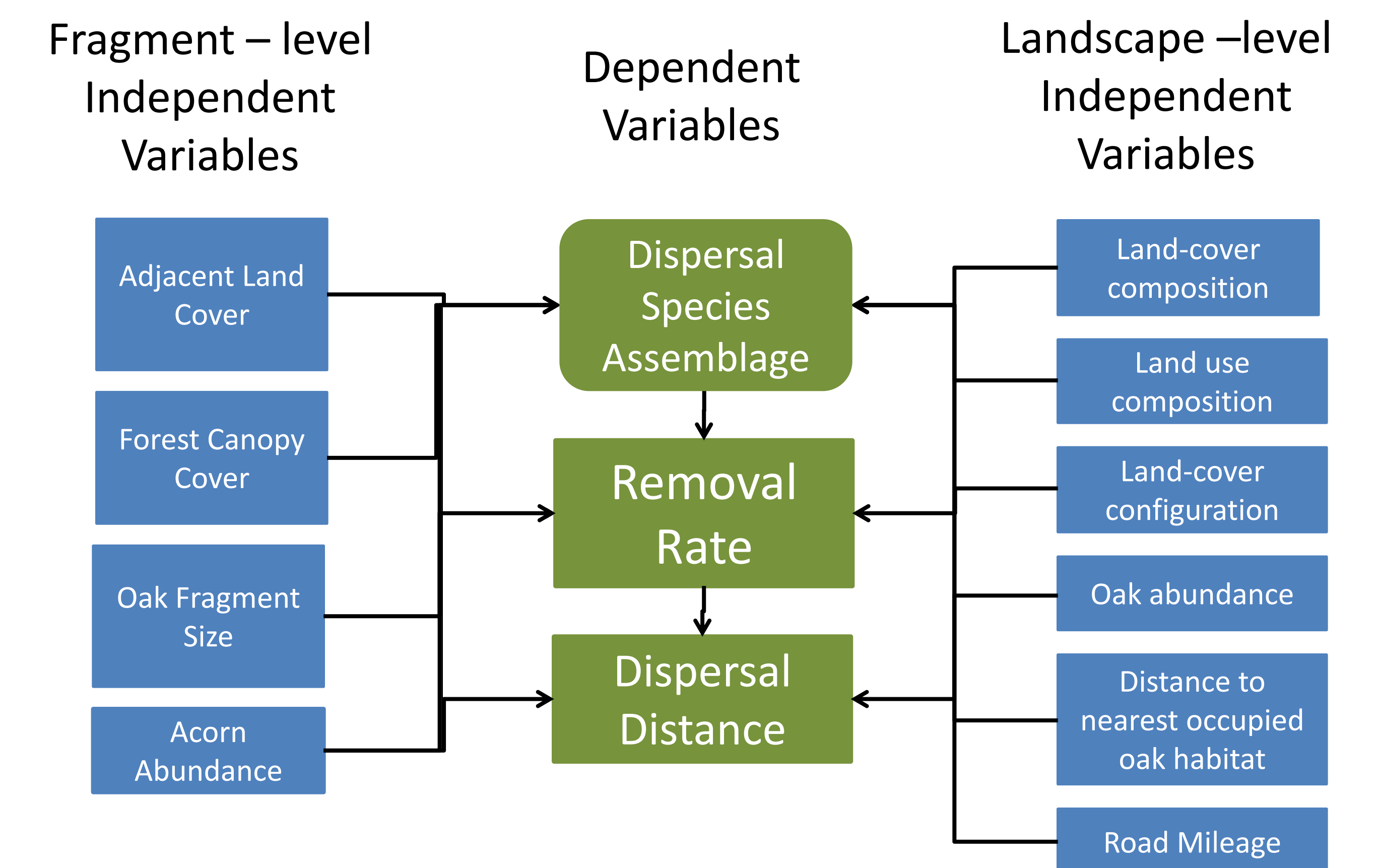

Figure 1

Use multivariate techniques to relate independent fragment and landscape variables to the dispersal species assemblage and to dispersal processes

Expected Responses

Disperser	Relevant scale	Impervious Cover	Forest Cover	Oak Cover	Road Mileage	Forest Connectivity
EGS	0.5 km	+	+	+	-	+
WGS	0.5 km	-	+	+	-	+
Steller's Jay	1 km	-	+	+	neutral	neutral

Dispersal Process	Acorn Abund.	Disperser Abund.	Jay Abund.	Squirrel Abund.	Impervious Surface	Forest Connectivity
Removal Rate	+	+	+	+	n/a	n/a
Dispersal Distance	+	-	+	-	+	+