Woodland Invasion
(expansion, encroachment, reclamation)
The distribution of woodland-sagebrush avian communities in the Intermountain West

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Objectives

- How do bird density and richness change across woodland ecosystems
- Identify primary gradients structuring bird communities in woodland ecosystems
- Do species differ among sites
Study Sites and Woodland Ecosystems

- Castlehead
- Spruce Mountain
- Scipio
- Blue Mountain
- Greenville Bench
- Seven Mile

- Western Juniper
- Pinyon - Juniper
- Utah Juniper
Point Transects (n = 466)
Point Transects - Methods

- 10 min. counts
- Surveyed all species
- Estimated distances using range finders
- Sampled twice during breeding season
- Sampled in 2006
Bird Species

- Retained all passerine and near passerine species (woodpeckers and humming birds)
- Removed rare raptor species (most were detected during flight) other than American Kestrel
- Removed ducks, shorebirds, cranes
Species Detected (n = 85)

3 species >500 detections
   Gray Flycatcher, Chipping Sparrow, Brewer’s Sparrow

4 species  200-499 detections
   Mountain Chickadee, Green-tailed Towhee, Spotted Towhee, Cassin’s Finch

9 species  100-199 detections

55 species  2-99 detections

14 species  1 detection
Bird Data

- Density estimates (Program Distance)
- Species richness (Program Ecosim)

- $n = 8,978$
- Detection Prob = 0.86
- Effective Sampling Distance = 86.9m

Discarded all observations
Bird Density

Density (Individual ha$^{-1}$)

West

Western Juniper

East

Pinyon-Juniper

Utah Juniper
Bird Species Richness

West                                                        East

Richness

0  5  10  15  20  25  30  35

Western Juniper  Pinyon-Juniper  Utah Juniper

West ←                             → East
Environmental Gradients

Nonmetric Multidimensional Scaling

Major Matrix: Bird abundance

Secondary Matrix: Environmental Gradients

Geographical location
Elevation
Land cover (LandFire – 13 classes)
Nonmetric Multidimensional Scaling

PC-ORD
  Sorensen Index (Distance measure)
  Random starting points
  Number of randomized runs = 250

Final Run
  34 iterations for final run
  Final stress: 8.7
  Plot of stress vs. iteration: stable
  Total Variation explained: 0.87
  (Axis 1 = 0.24; Axis 2 = 0.14; Axis 3 = 0.49)
Site Ordination

Axis 3 (0.49)
Axis 2 (0.14)
Axis 1 (0.24)

Western Juniper
Pinyon-Juniper
Utah Juniper
Sites and Environmental Gradients

- Axis 3 (0.49)
- Axis 2 (0.14)
- Axis 1 (0.24)

- Mountain Sage
- Low Sage
- Pinyon-Juniper
- Mixed Shrub
- Western Juniper
- Latitude
- Elevation

Sites and Environmental Gradients
Shared and Site-specific Species

- Virginia’s Warbler
- Gray Vireo
- McGillivray’s Warbler
- Cassin’s Vireo
- Dusky Flycatcher
- Orange-crowned Warbler
- Brewer’s Sparrow
- Chipping Sparrow
- Gray Flycatcher
Utah Juniper - Pinyon Juniper

Virginia’s Warbler
Gray Vireo
Black-throated Gray Warbler
Black-throated Sparrow
Mountain Chickadee
Brewer’s Sparrow
Chipping Sparrow
Gray Flycatcher

Axis 3 (0.49)
Axis 2 (0.14)
Axis 1 (0.24)
Summary

- Bird densities and species richness were similar
- Study sites were clearly distributed along ordination axes at scale of plot-level vegetation
- Bird communities differed across site network (3 of 85 species common to all sites)
- Primary gradients structuring birds in woodland-sagebrush ecotones were:
  - Geographic location (latitude)
  - Elevation
  - Land cover (sagebrush to woodland gradient)
Implications

- Ability to sample sites as replicates may be limited to a few species (Brewer’s sparrow, Gray flycatcher, Chipping sparrow) or other spatial scales.
- Coarse variables for birds (density, richness) or vegetation may be important.
- Identification of processes underlying changes in bird communities may rest on guild rather than species response (no canopy species in Western juniper).
- Management actions are likely to shift vegetation along primary gradient.
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