

The Kindest Cut: Young Forest as Critical Bird Habitat



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What I'll talk about

- What is “young forest” from wildlifes’ perspective?
- Early-successional birds as YF habitat specialists
 - Population trends
- Late-successional birds as YF habitat specialists (?!?)
 - Seasonal habitat shifts
 - Condition consequences of habitat choice
- Conclusion: young forest critical for birds

What do we mean by “Young Forest”?

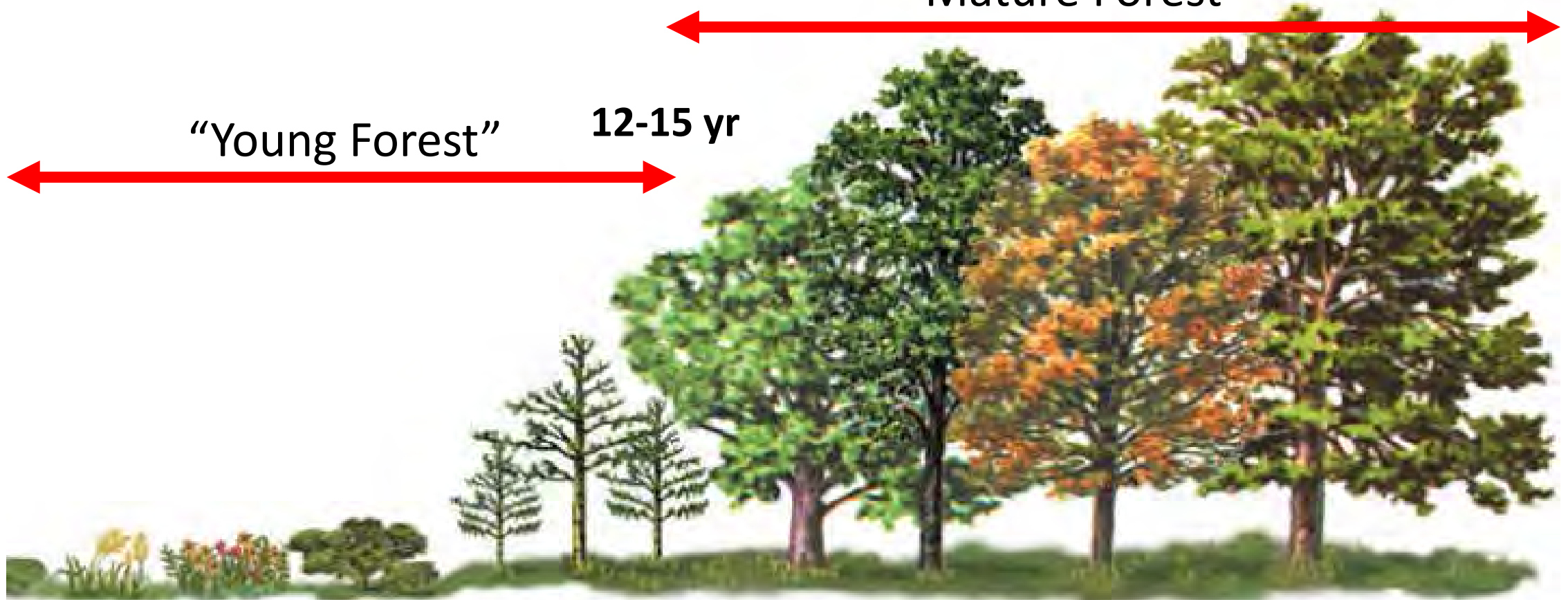
Ecological succession

100-300+ yr

“Mature Forest”

“Young Forest”

12-15 yr



Grasses and weeds	Mixed herbaceous	Shrubs	Young forest (tulip poplar)	Mature forest (white oak and hickory)	Climax forest (beech and sugar maple)
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Sources of Young Forest in the Northeast (PA)

- Abandoned beaver dams (very little!)
- Abandoned farms (33 k ac/yr)
- Severe weather & wildfire (e.g., tornados) (23 k ac/yr)

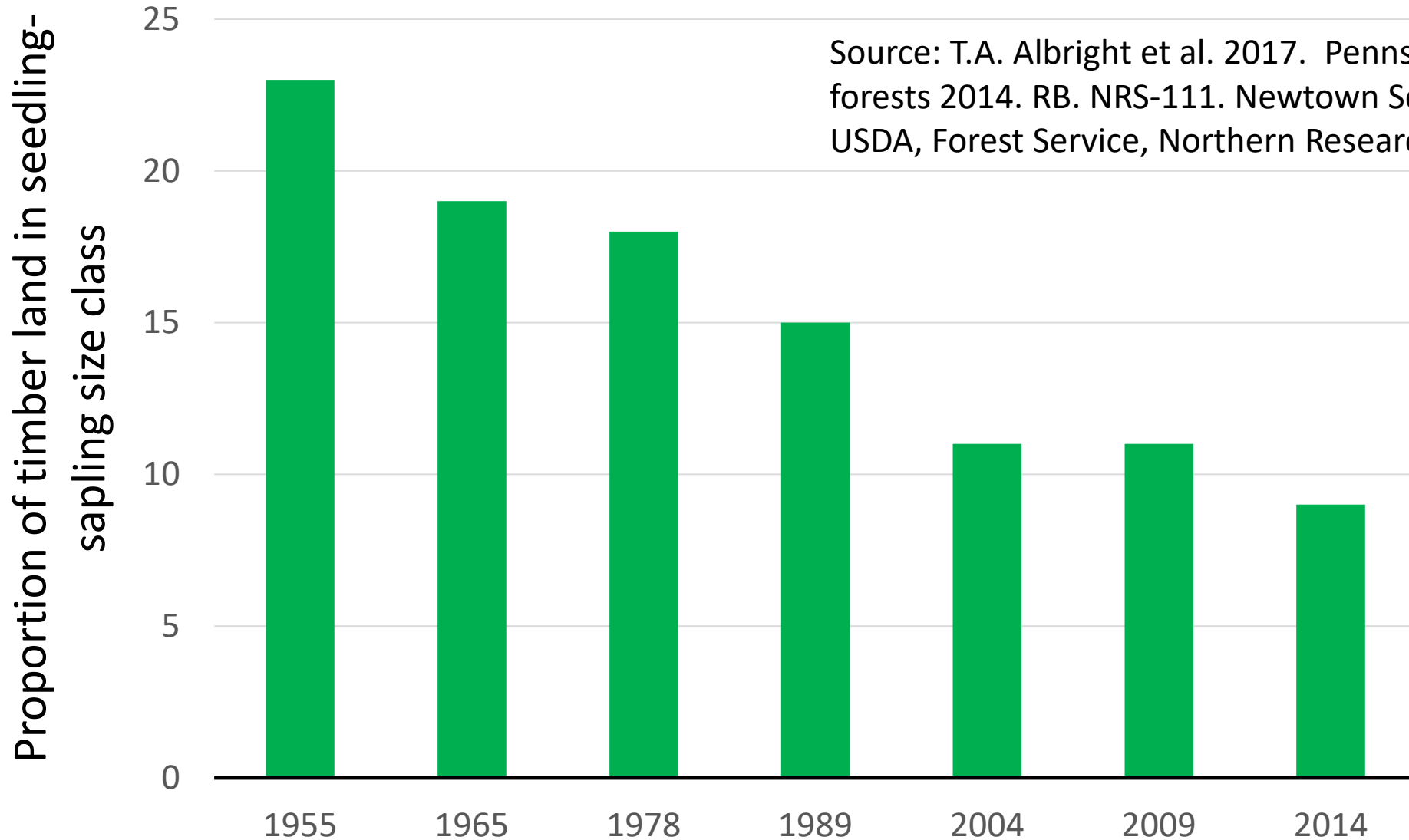
• **Timber Harvest** (213 k ac/yr)

Source: USDA Forest Service. 2020. Forests of Pennsylvania, 2019. Resource Update FS-251. Madison, WI: U.S. Department of Agriculture, Forest Service.



Why should we care about Young Forest?

Area in young forest in Pennsylvania by year



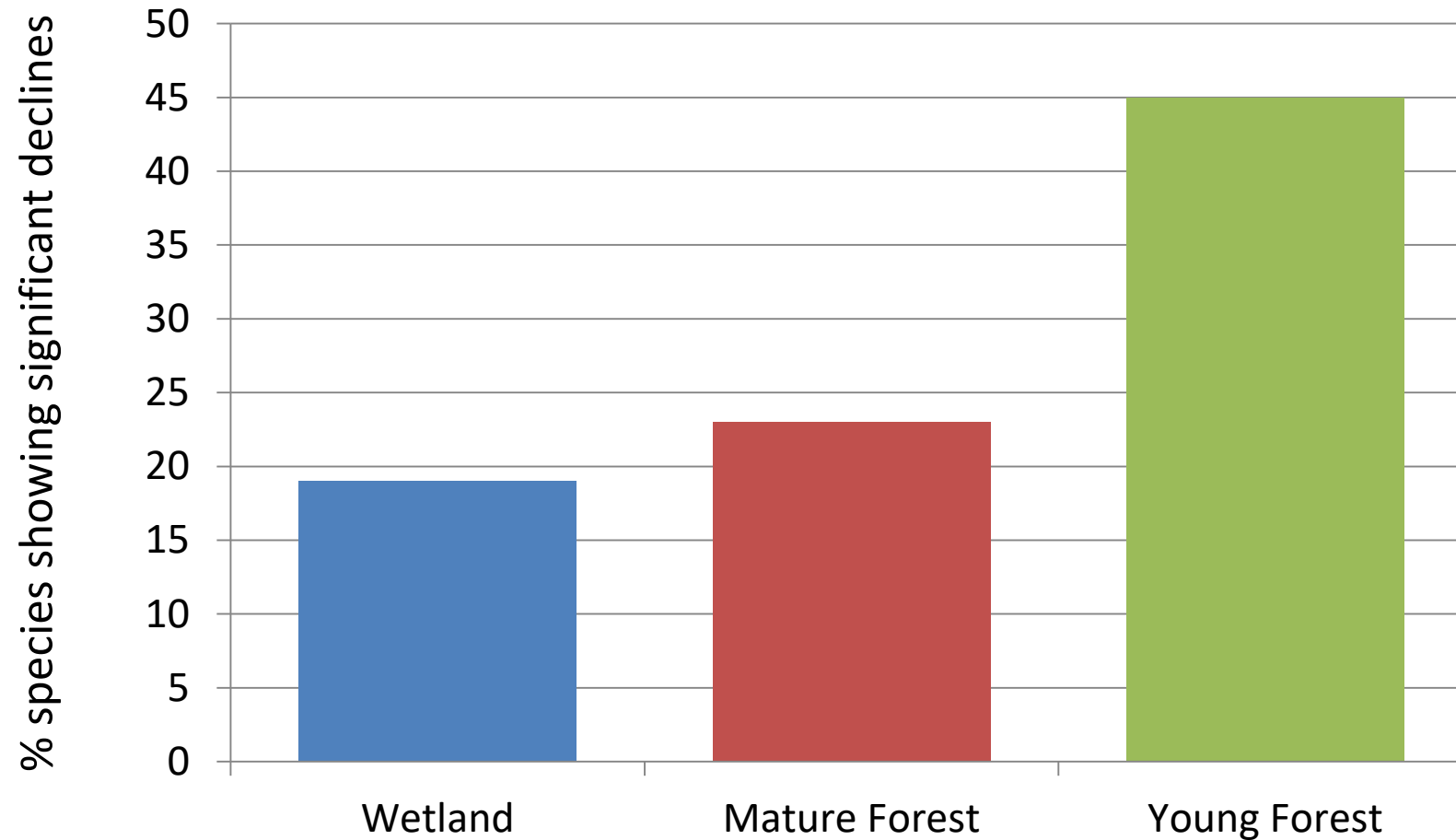
Source: T.A. Albright et al. 2017. Pennsylvania forests 2014. RB. NRS-111. Newtown Square, PA: USDA, Forest Service, Northern Research Station.

Why should we care about Young Forest?

- We're losing it (not just in PA)!
- Most young forest is ephemeral (*it grows up so fast!*), so needs to be created constantly
- Reflects changes in forestry, farming practices
- **Provides critical habitat for many wildlife species**

Population trends of bird guilds

based on BBS data 1966-2014



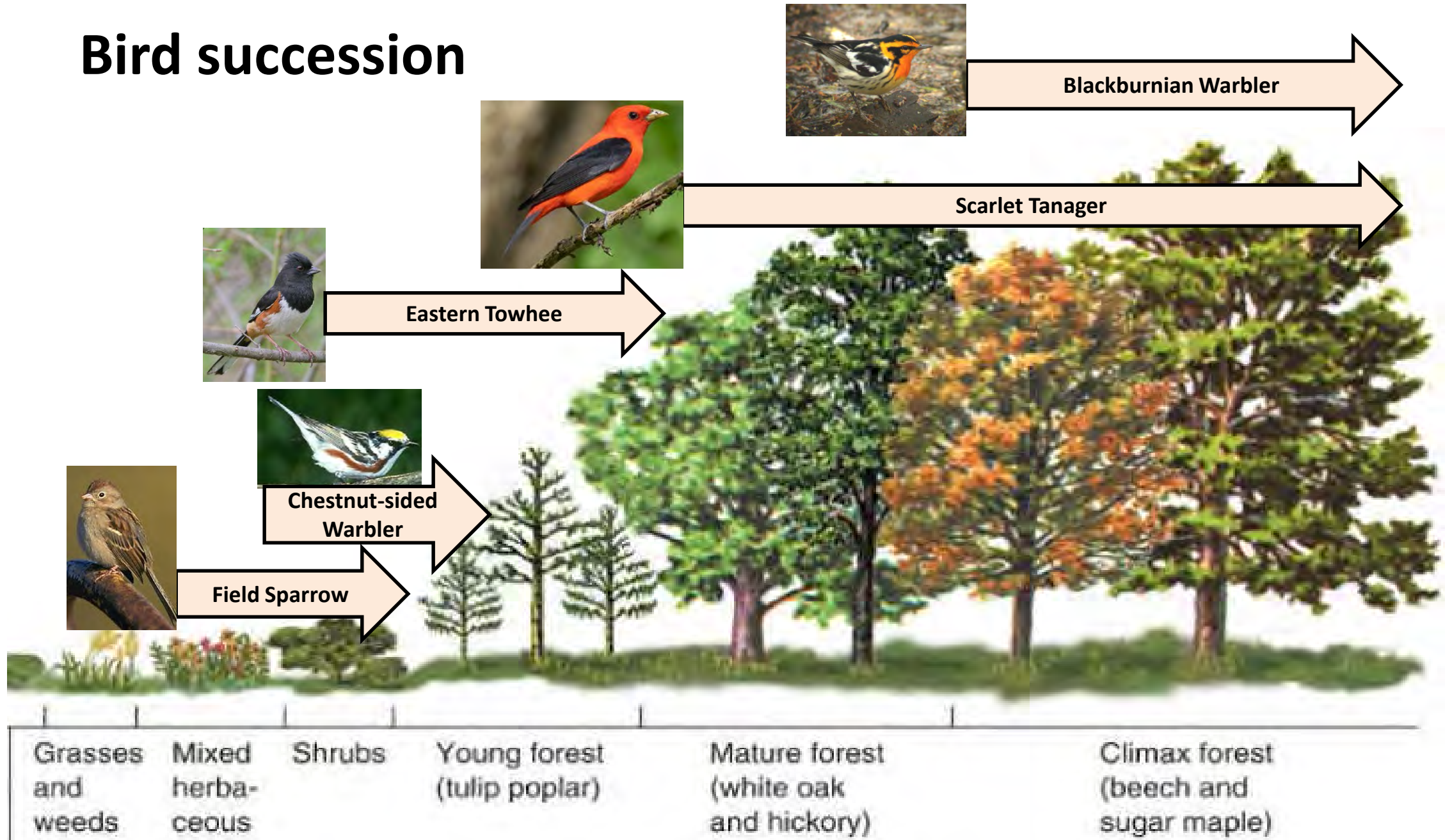
Young Forest Birds

- Most threatened suite of birds based on BBS-based population trends (*if we ignore grassland birds, anyway*)
- Habitat specialists in structure, composition, and time
- One size does not fit all, habitat-wise (and therefore management-wise)

Young Forest birds as habitat specialists



Bird succession



Early Successional Birds

Species	Years after cut		
	1 st appear	Common	Decline
Northern Flicker	1	1	7-10
Eastern Bluebird	1	1	2
Alder Flycatcher	1	2	5-7
Chestnut-sided Warbler	2	4	10
Mourning Warbler	2	5	10
Rose-breasted Grosbeak	3	15	-
Veery	3	10	20
Canada Warbler	5	15	-

From DeGraaf & Yamasaki, 2003 FEM 185:179-191

“Early successional” birds include a diverse group of habitat specialists with different habitat needs,
plus some generalist species

Young forests consist of combinations of 3 different vegetation components:

1. Herbaceous plants
2. Shrubby plants (including *Rubus* canes and tree seedlings)
3. Mature trees (residuals or on edges)

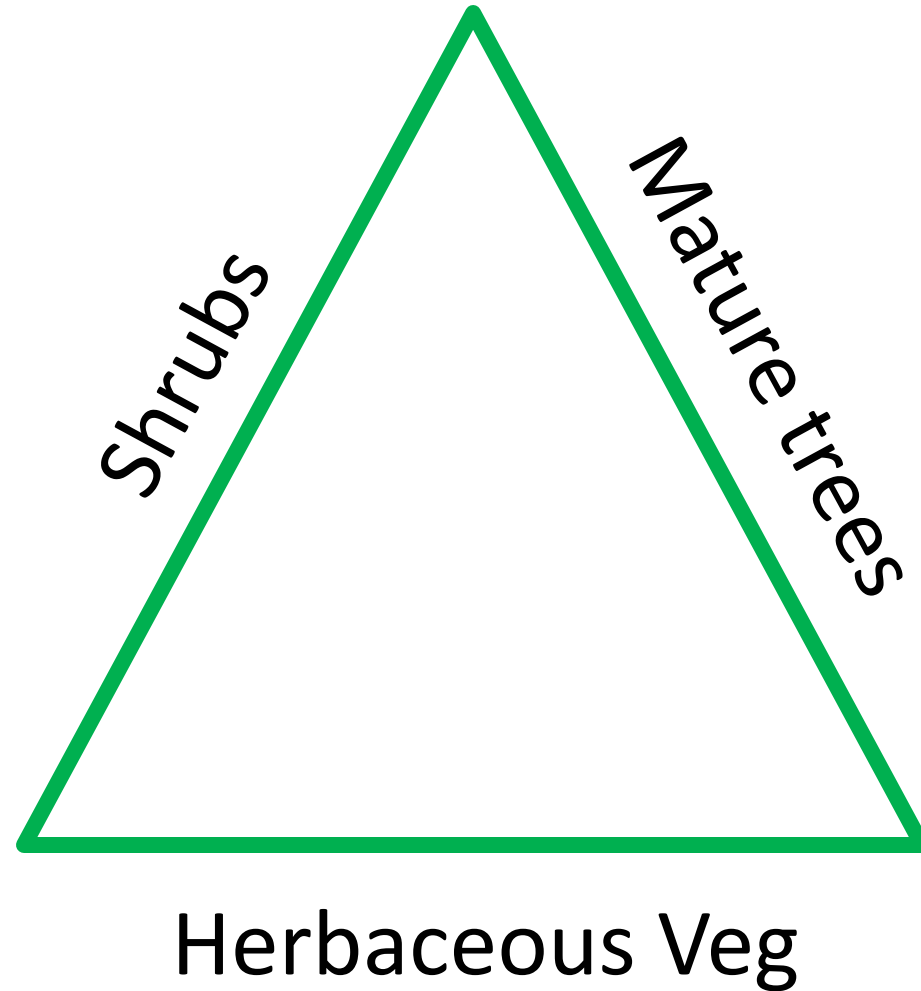


Mature trees

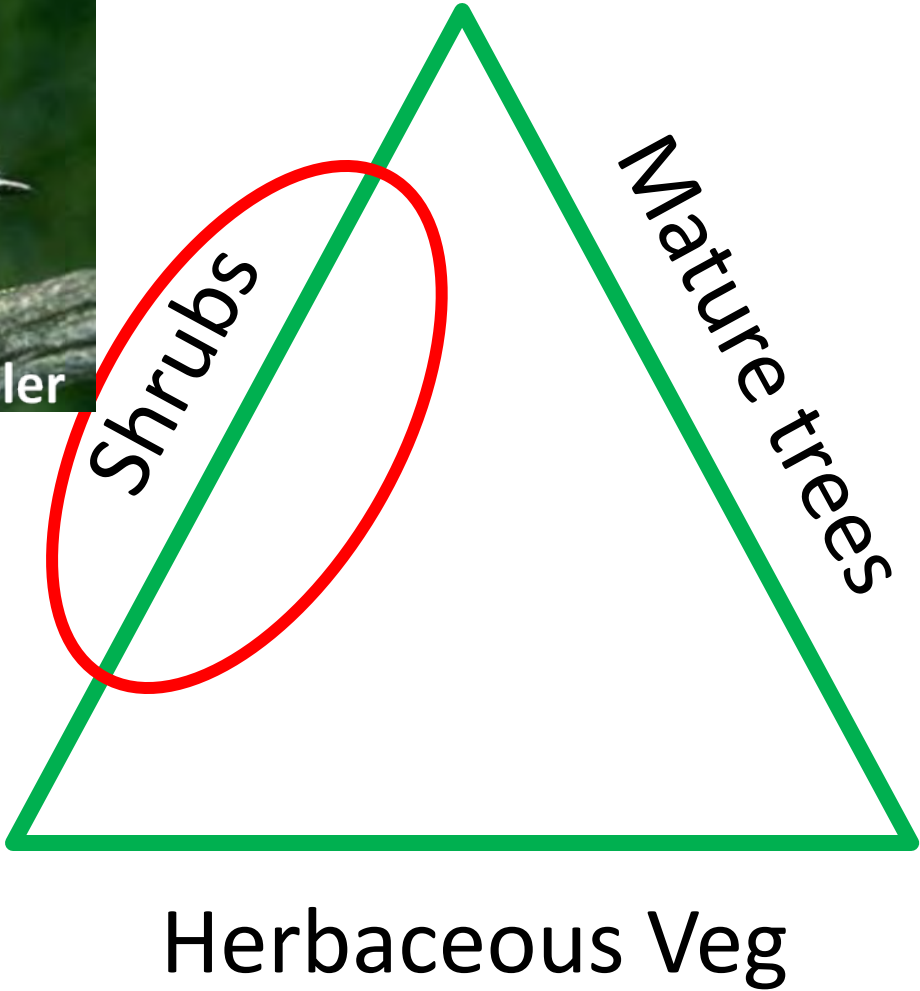
Shrubby veg

Herbaceous veg

Various combinations create habitats for
specific species



Species have specific habitat needs



But species differ in their habitat specificity!

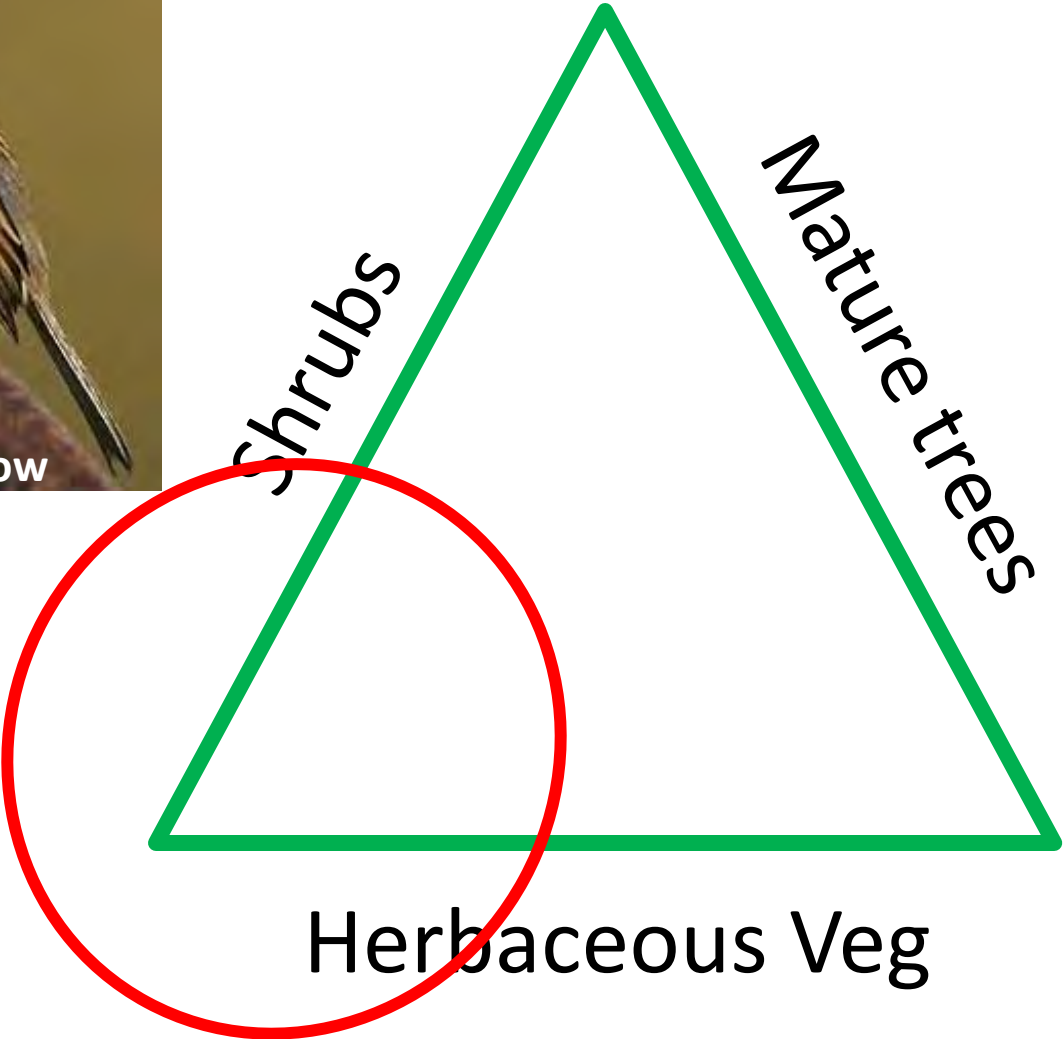
- For instance: Mourning Warblers require large patches (>3 ac) of young regen dominated by Rubus, preferably 6-9 yrs old, *but* within a forested landscape.



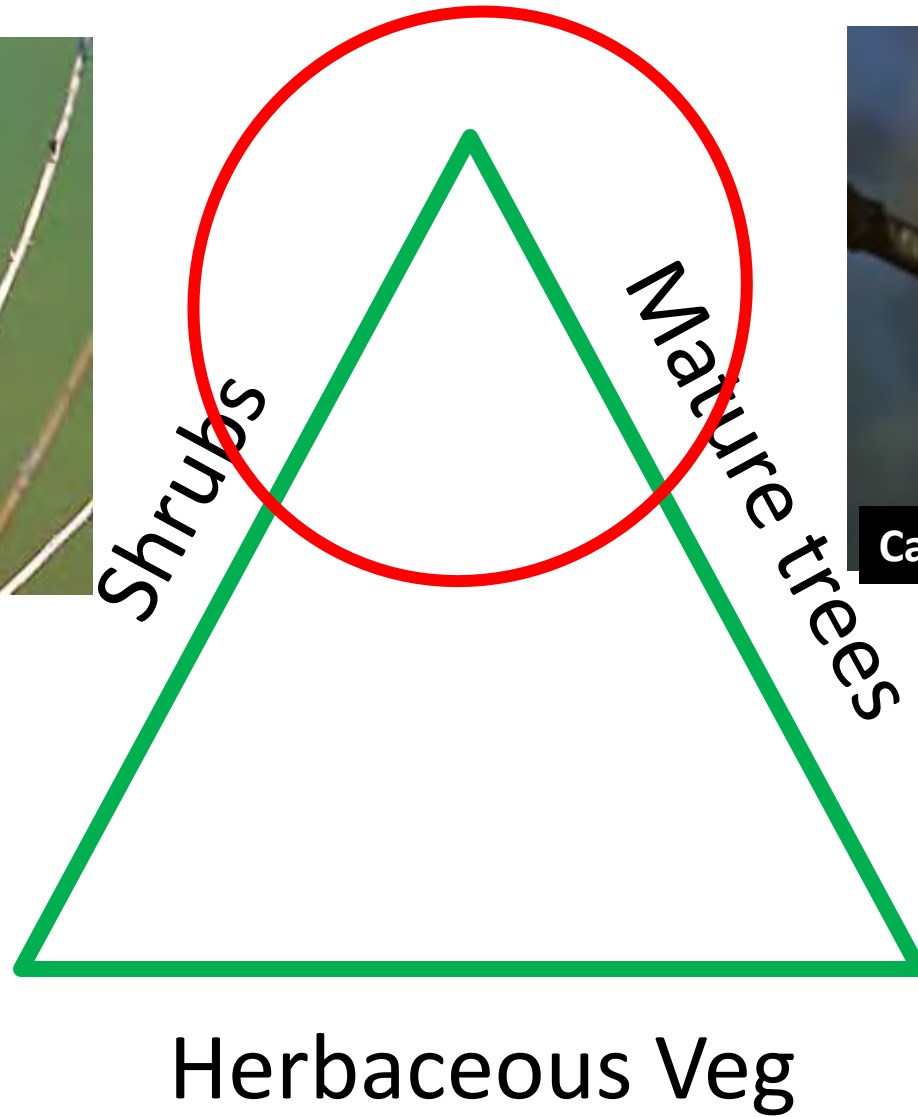
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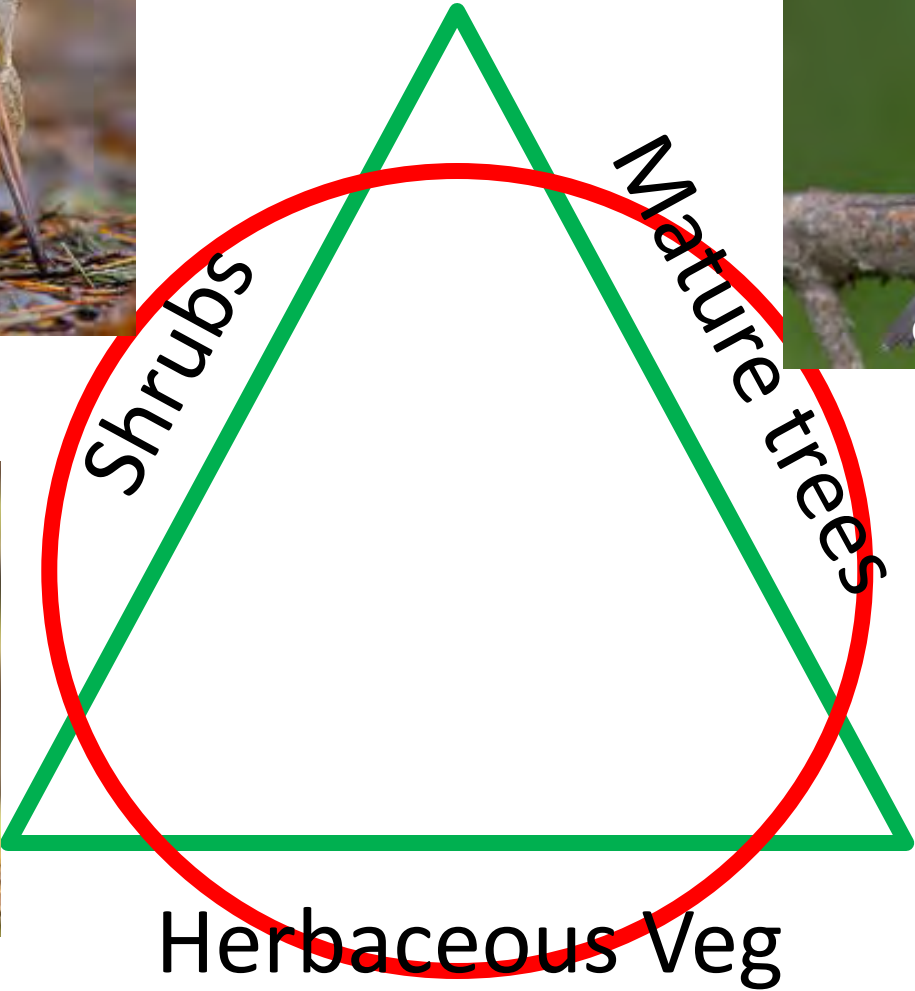
Species have specific habitat needs



Species have specific habitat needs



Species have specific habitat needs



See Williams talk @ 9:20!

See Bolton talk @ 1:00

Some species use different components at different times during the day

See talk by Larkin the Younger @ 1:40



Eastern Whip-poor-will

So what makes good YF breeding habitat?

- Obviously, depends on the bird species!
- Must consider all vegetative components
 - Area of each
 - Spatial arrangement of total
- Ecologically relevant scale: note that breeding birds are territorial!
 - Limits utility of group selection for breeding birds
 - See Larkin (the Elder) talk @ 11:30

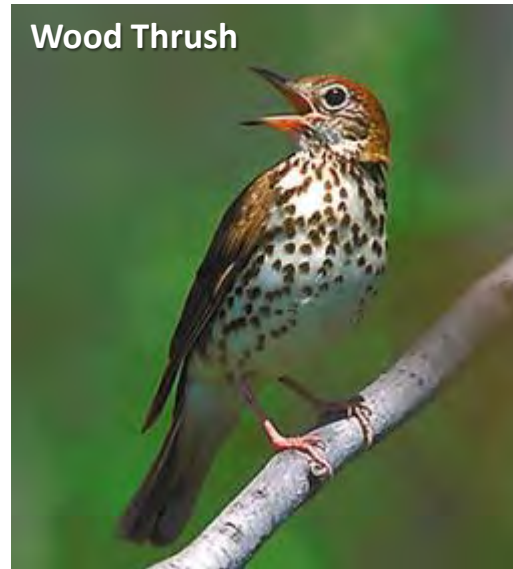
Late successional birds as early successional specialists?



Concern over suite of birds breeding in *mature* deciduous forests, usually referred to as:

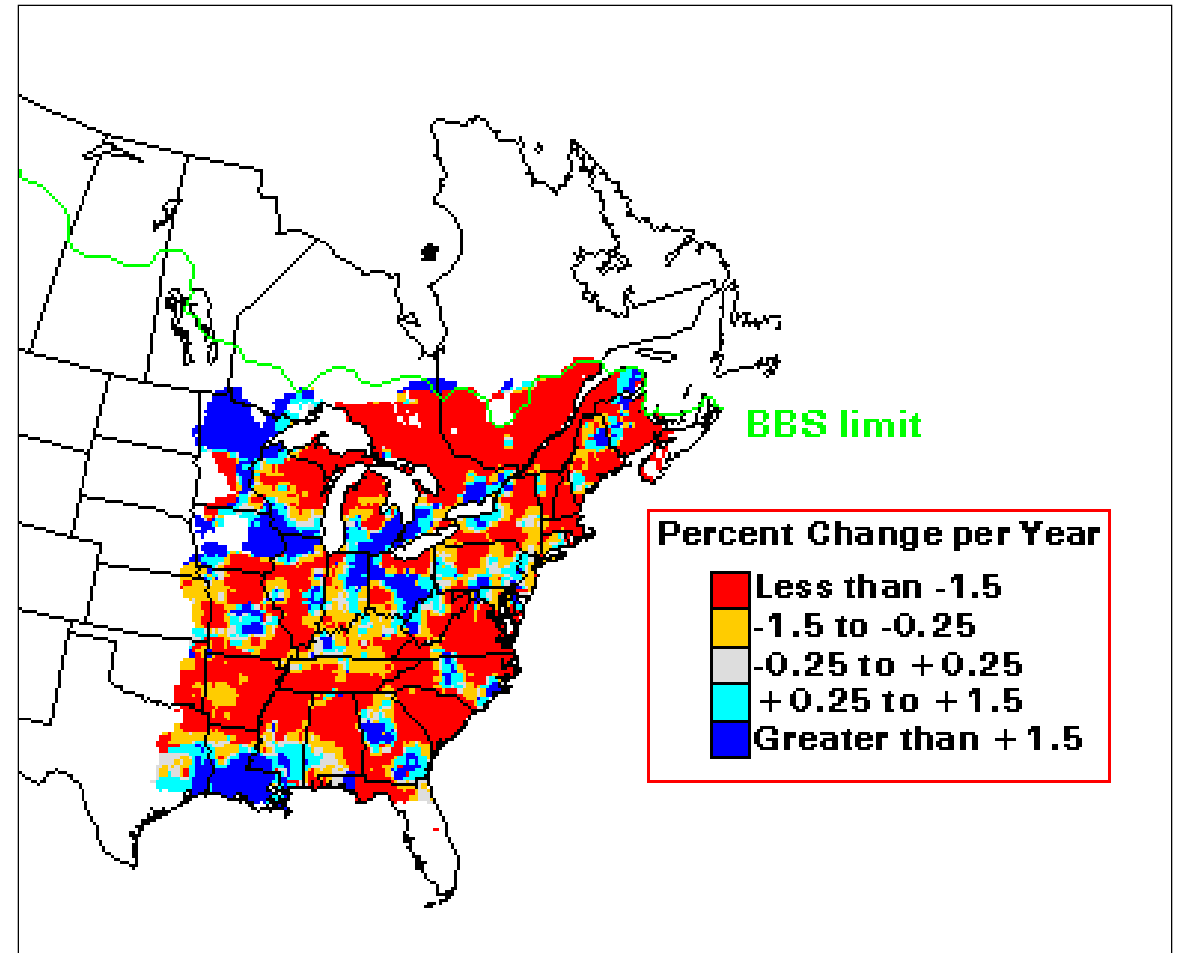
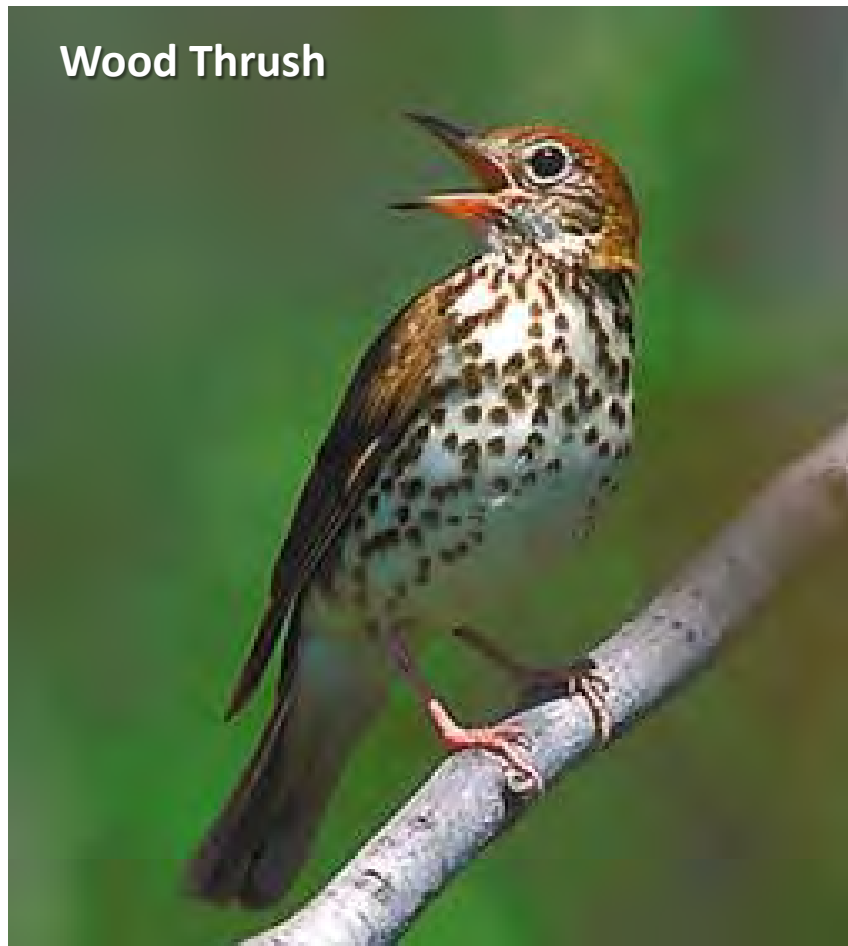
- Forest-interior species,
- Late-successional species, or
- Mature forest species

Some forest-interior species in PA



Why the concern over forest birds?

- Populations of many are declining across North America

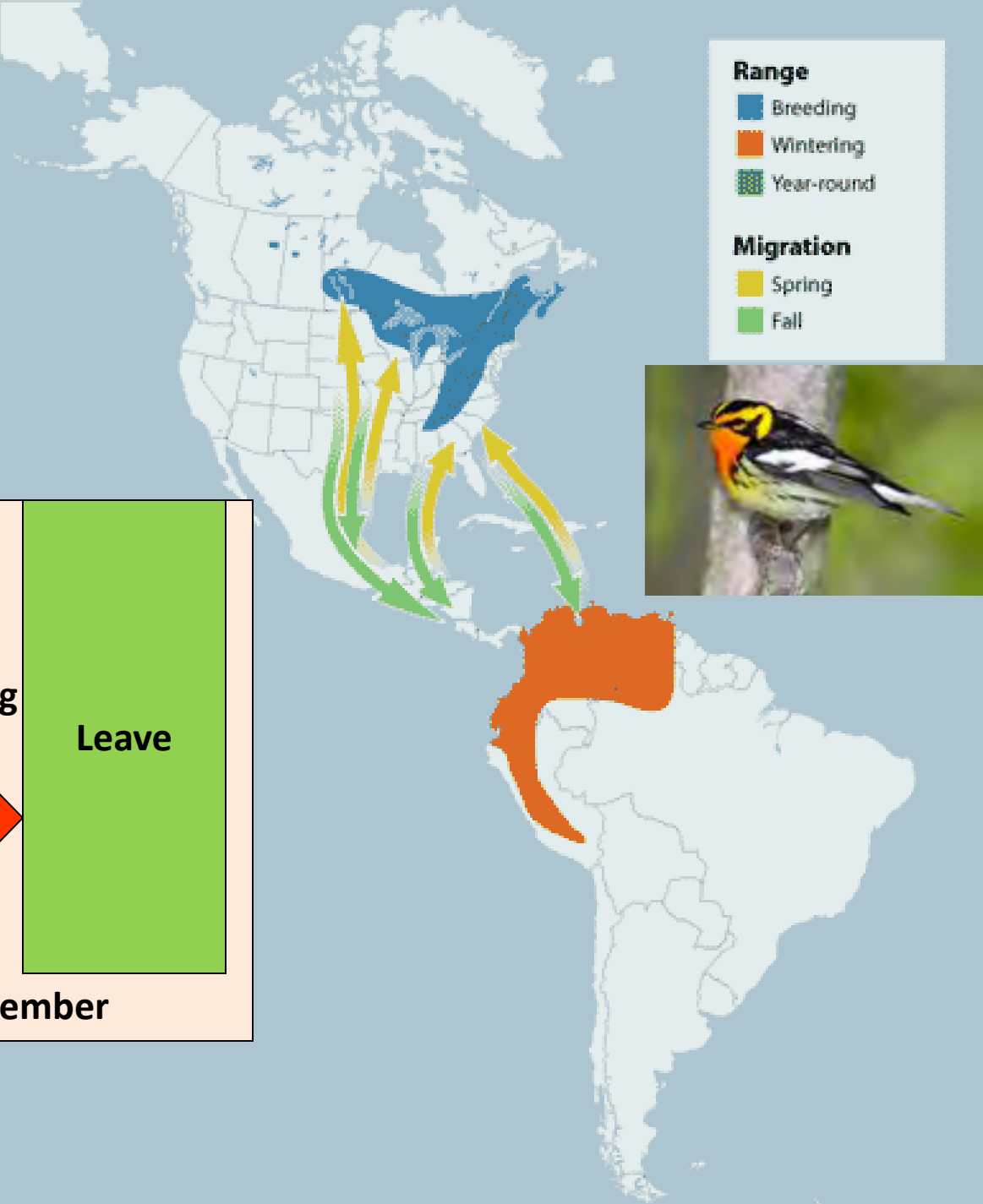
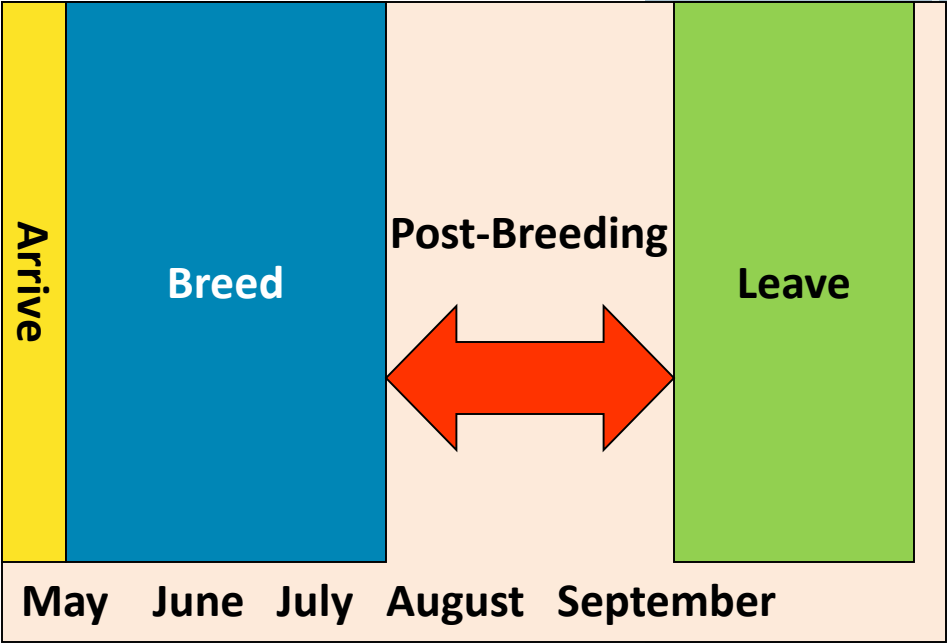


Research has identified problems in:

- Breeding season
 - Fragmentation => increases in nest predation, brood parasitism; loss of habitat for area-sensitive spp.
- Wintering grounds
 - Habitat destruction & degradation
- Migration
 - Loss of critical stop-over habitat

Little attention to *post-breeding* season

Birds spend only a portion of their time on the summering grounds actually breeding



Post-breeding ecology

- Critical time for migratory birds:
 - Young become independent, learn vital survival skills (e.g., foraging, predator avoidance)



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Magnolia Warbler

Post-breeding ecology

- Critical time for migratory birds:
 - Young become independent, learn vital survival skills (e.g., foraging, predator avoidance)
 - Adults grow new feathers (molt) prior to migration
 - Adults and young accumulate fat as fuel just prior to and in migration
- Little studied (because it's difficult!)

Evidence of habitat shifts: Radio-tagging

- Follow radio-tagged young birds (Wood Thrush, Ovenbird)
- After leaving natal territory, young settle disproportionately in early successional habitats
- Sources: Anders & Faaborg 1998 *Auk*; Vega-Rivera & Rappole 1998 *Condor*; King et al. 2006 *J. Zool.*; Dellinger 2007 MS Thesis



Wood thrush fledgling with radio collar
Photo by T. Dellinger

Evidence of habitat shifts: Mist nets

- Forest-interior species begin appearing in nets in clearcuts midsummer
- Can become among most abundant species caught in clearcuts
- Sources: Rappole & Ballard 1987 *Wilson Bull.*; Pagen et al. 2000 *Condor*; Marshall et al. 2003 *FEM*; Vitz & Rodewald 2006 *Biol. Cons.*; Stoleson 2013 *Auk*.



Question remaining

Do mature forest birds use young forest habitats disproportionately?

- vs. more abundant in mature forest (e.g., if just passing through between mature forest patches)
- vs. being randomly distributed across landscape (equal abundance in young vs. mature forest)

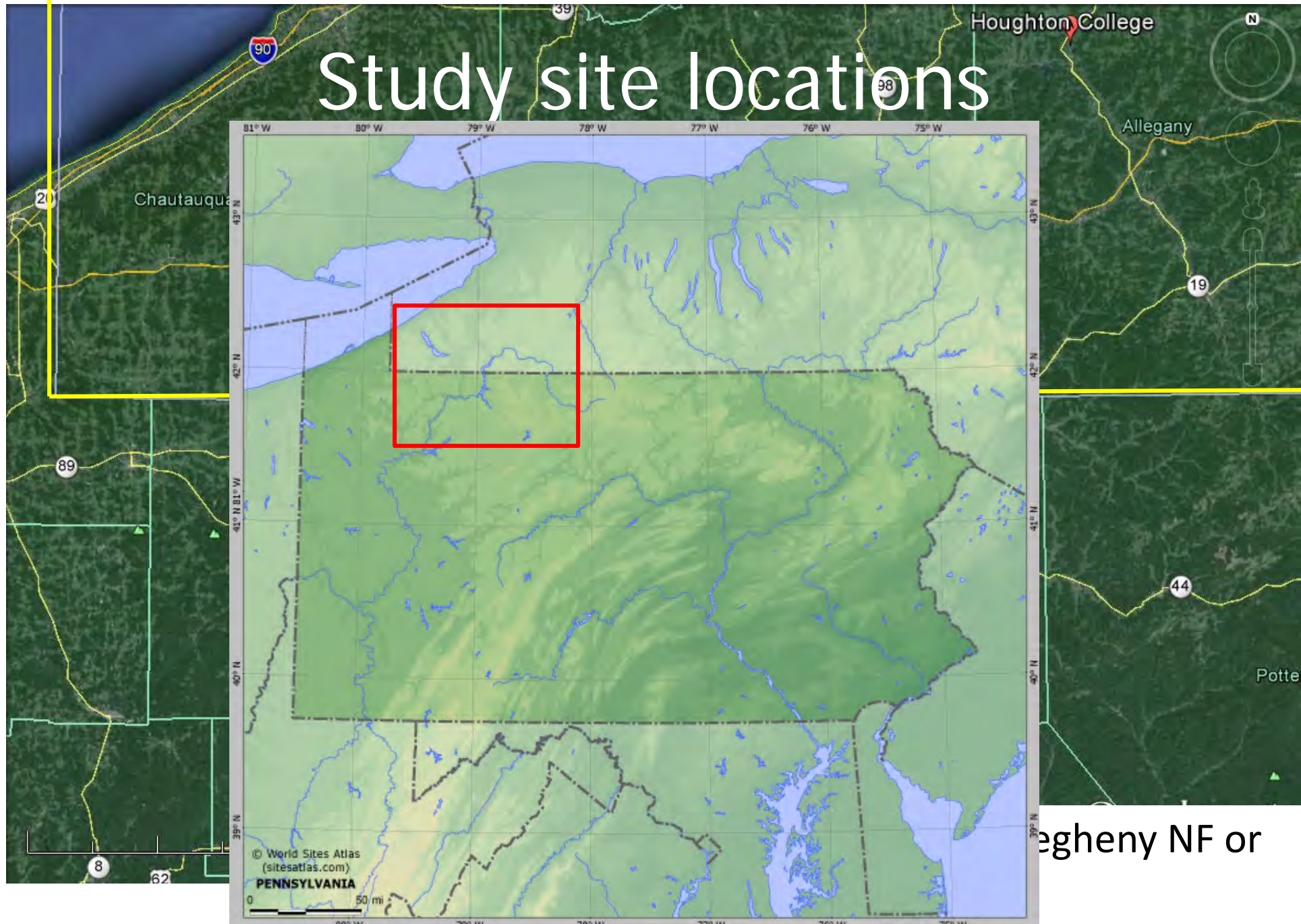
Study Goals

- Compare usage of regenerating clearcuts and mature forest understory by birds
 - in relation to species and guild (i.e., forest interior vs. others)
- Assess physiological condition of birds caught to determine whether use of clearcuts carries fitness costs or benefits

Methods

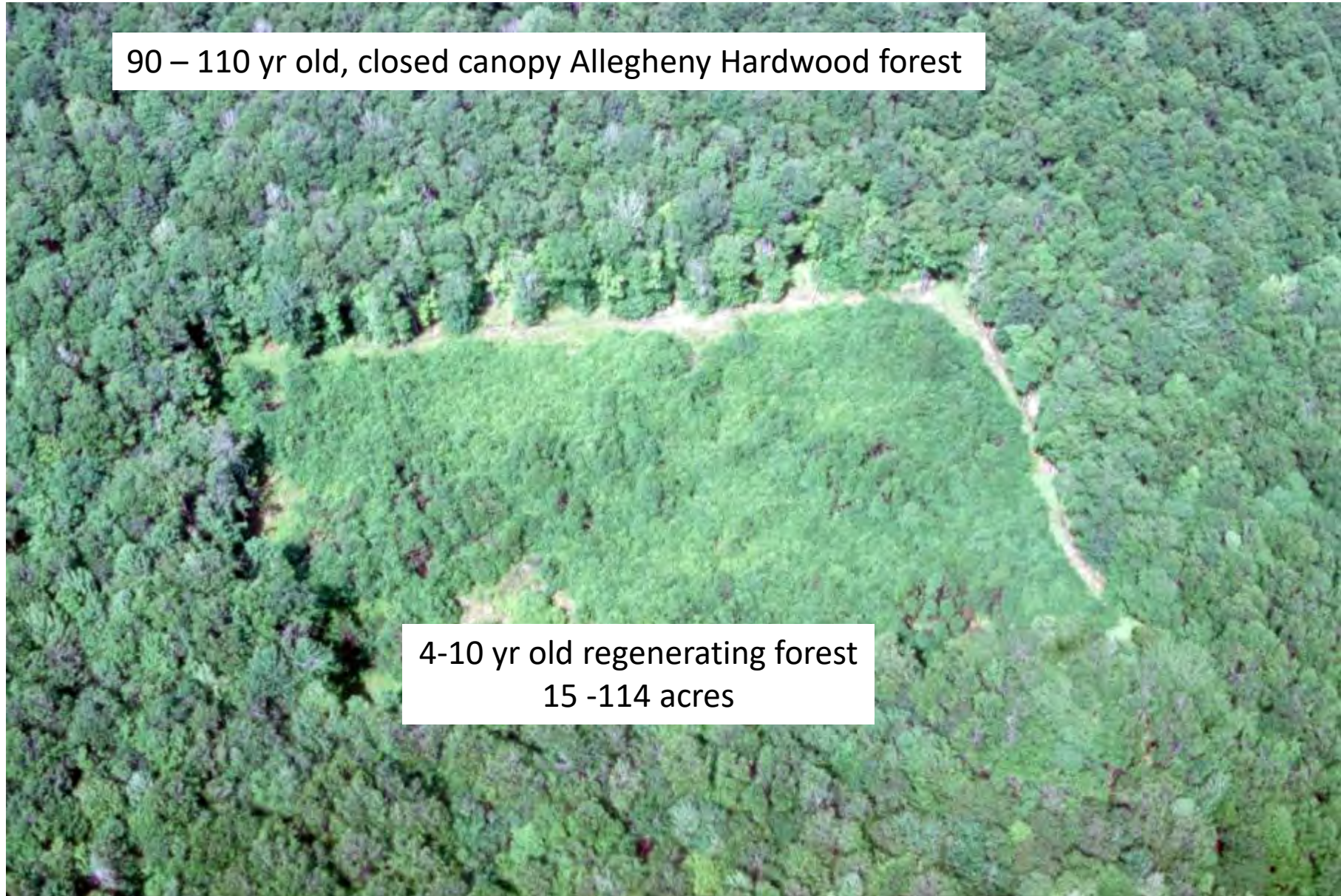
- Constant-effort mist-netting
 - 4 nets each in regenerating clearcut, forest interior with substantial understory - simultaneous netting corrects for day-to-day variation in captures
 - Nets run daily 6 hrs starting 20 min. before dawn
 - Each site run for 1 week at a time, weather permitting, rotated among 3 sites/yr July through Sept.
 - 4 sites used in total from 2005 - 2008

Study site locations



Allegheny NF or

Study site layout

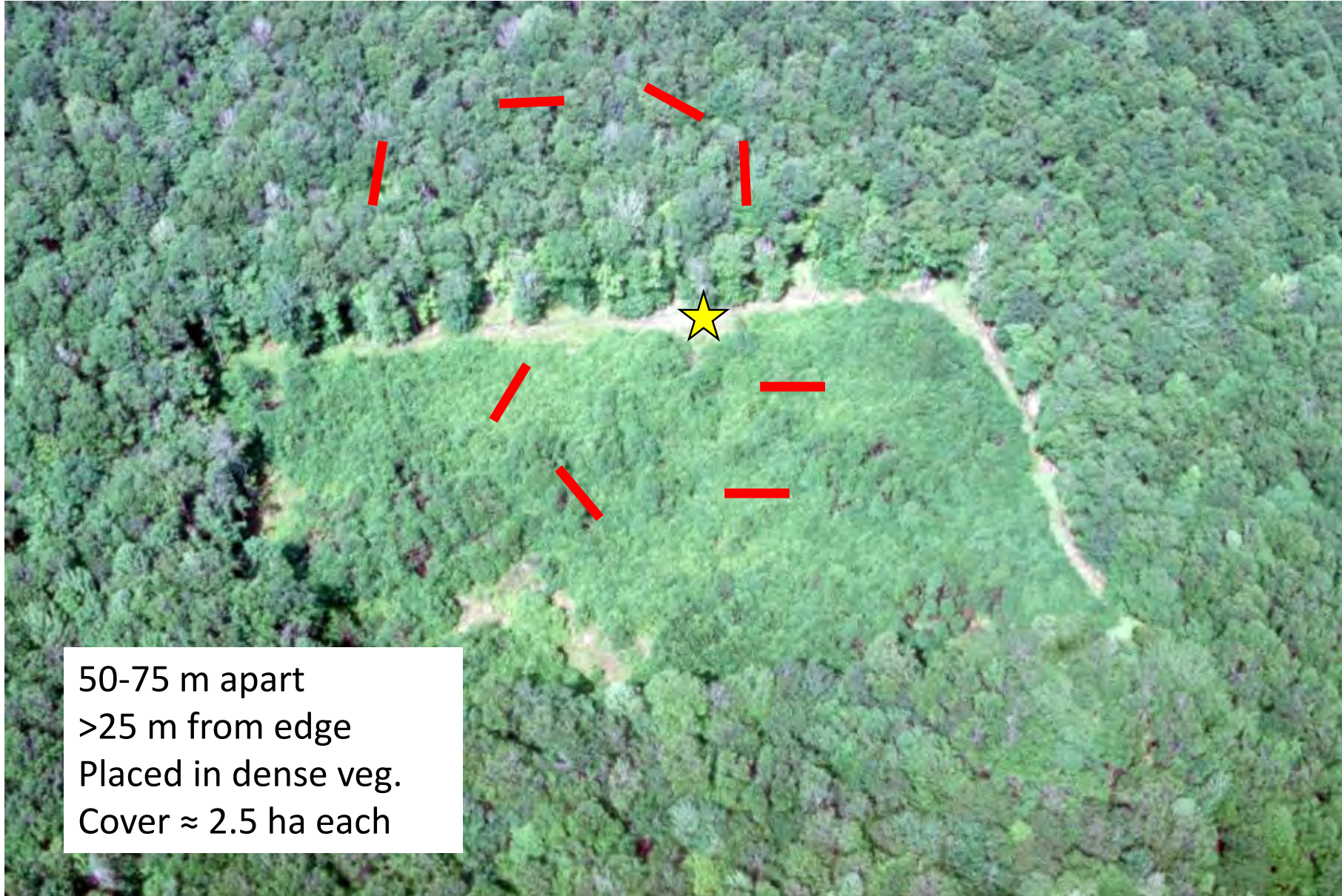


90 – 110 yr old, closed canopy Allegheny Hardwood forest

4-10 yr old regenerating forest
15 -114 acres



Net setup



50-75 m apart
>25 m from edge
Placed in dense veg.
Cover \approx 2.5 ha each



Bird data collected

- Wing length (unflattened)
- Tail length
- Weight
- Sex
- Age class

All birds banded with USGS numbered aluminum band



Condition measures

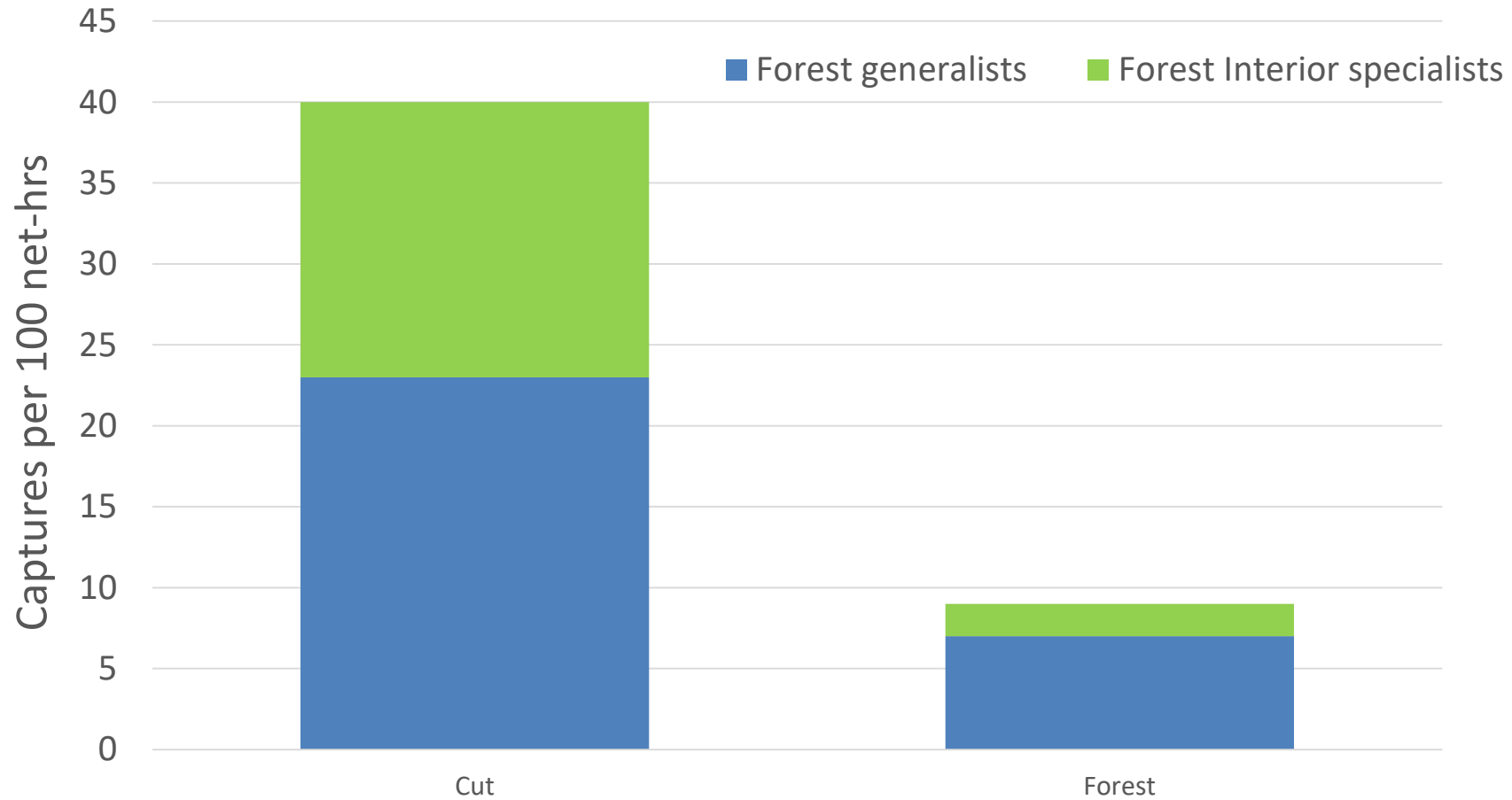
- Molt scored on scale of 0-5 for body, wing, tail (newer = higher)
- Fat score 0-3
- Presence of ectoparasites noted
- Calculated Body Condition Index:
 - Weight-size residuals, like human BMI



Results: Summary stats

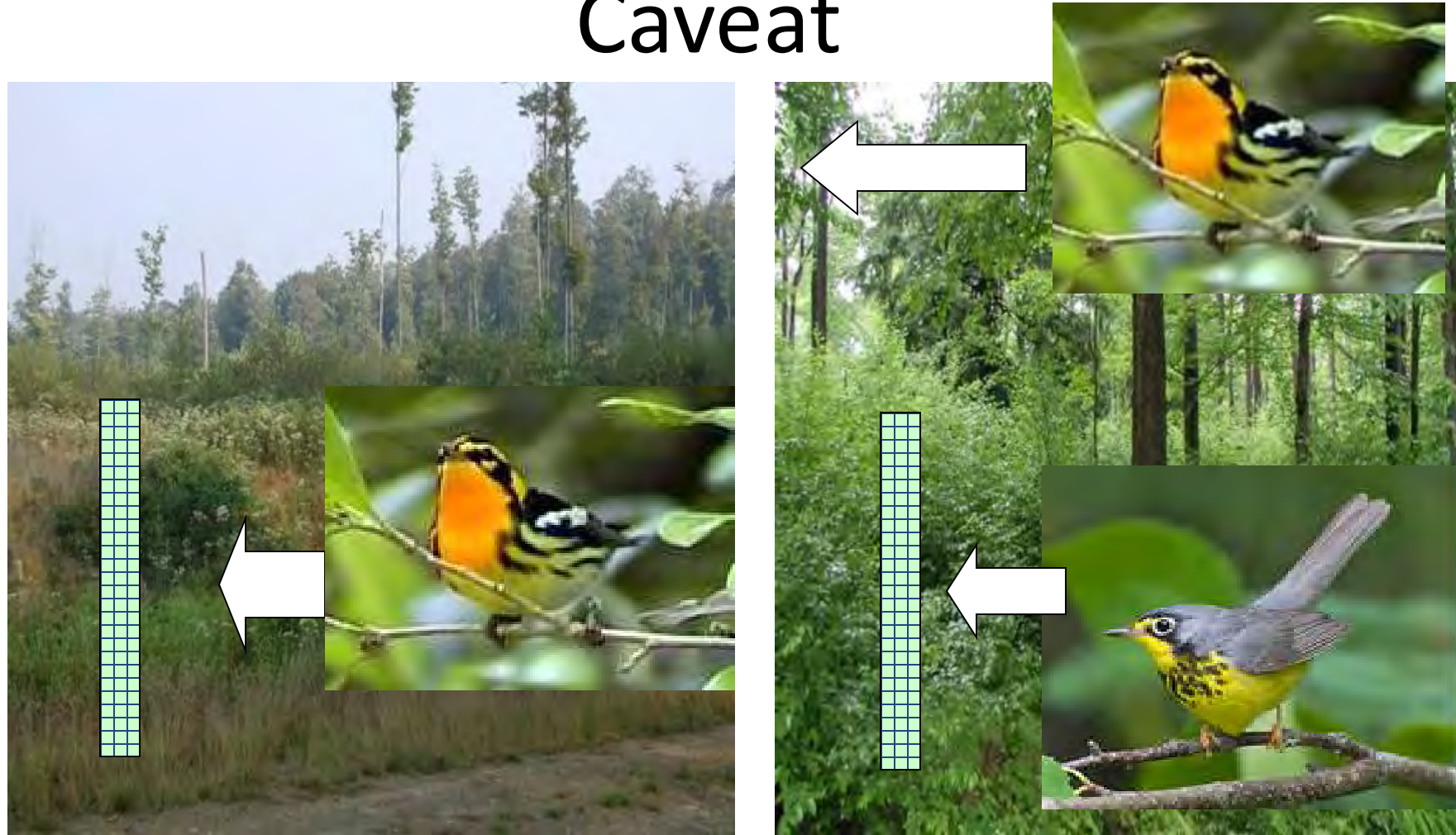
- 10,616 net-hrs total: 5514 in cuts, 5102 in forest
- **3846 birds** captured & banded, of 84 species
 - Ave. capture rate of 36.2 birds/100 net-hrs
- Of those, 237 in breeding condition, 2030 post-breeding, & 1578 apparent migrants
- Of post-breeding birds, 605 were forest generalists, 514 were forest-interior specialists

Capture rates post-breeding



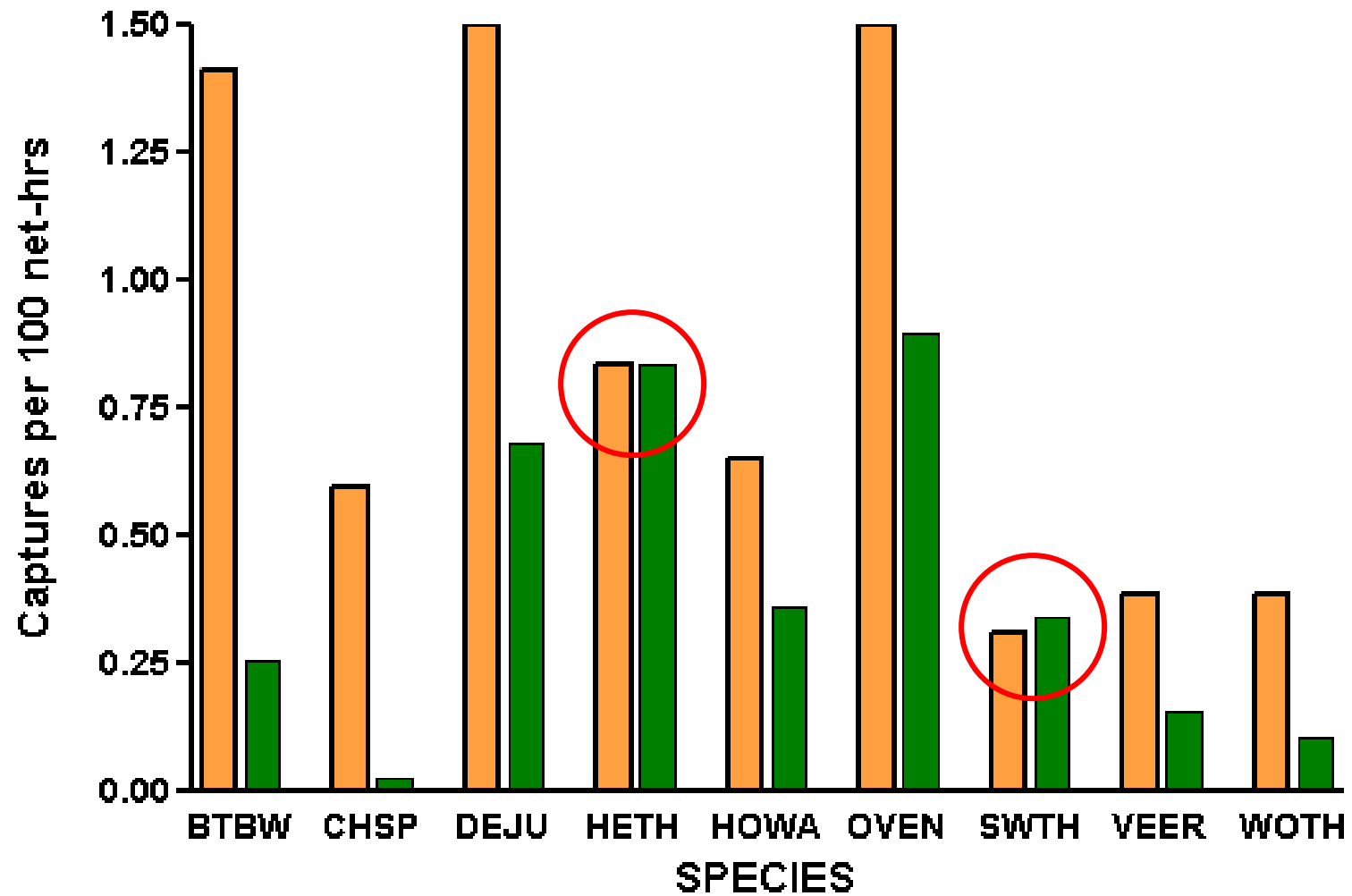
Forest birds were significantly more abundant in clearcuts than in forest interiors in the post-breeding season

Caveat



So, we can compare capture rates only for species of forest understory and ground

Understory species



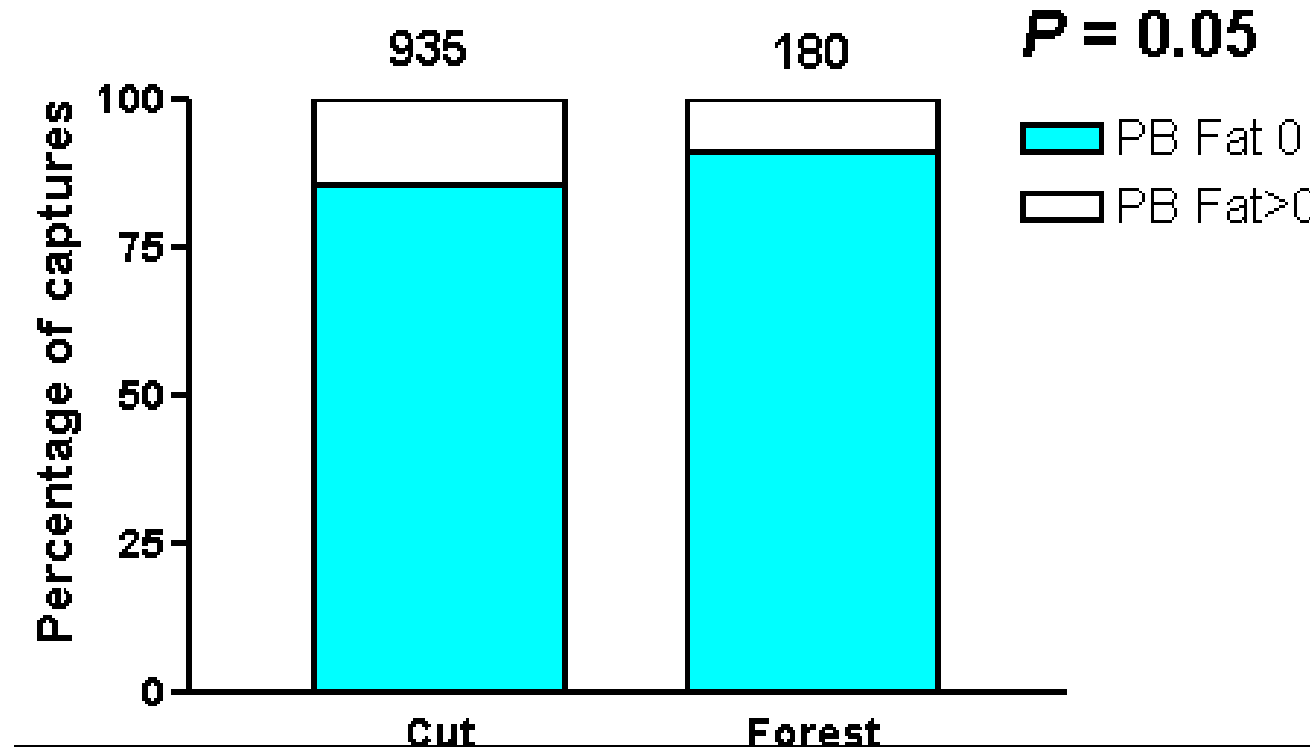
But might we be missing

- David King, NRS-Amherst, MA, conducted similar study
- Did point counts from ground *and in canopy* w/ deer stands
- Found ground counts NOT biased
- Really, there are few birds in mature forest at this time!



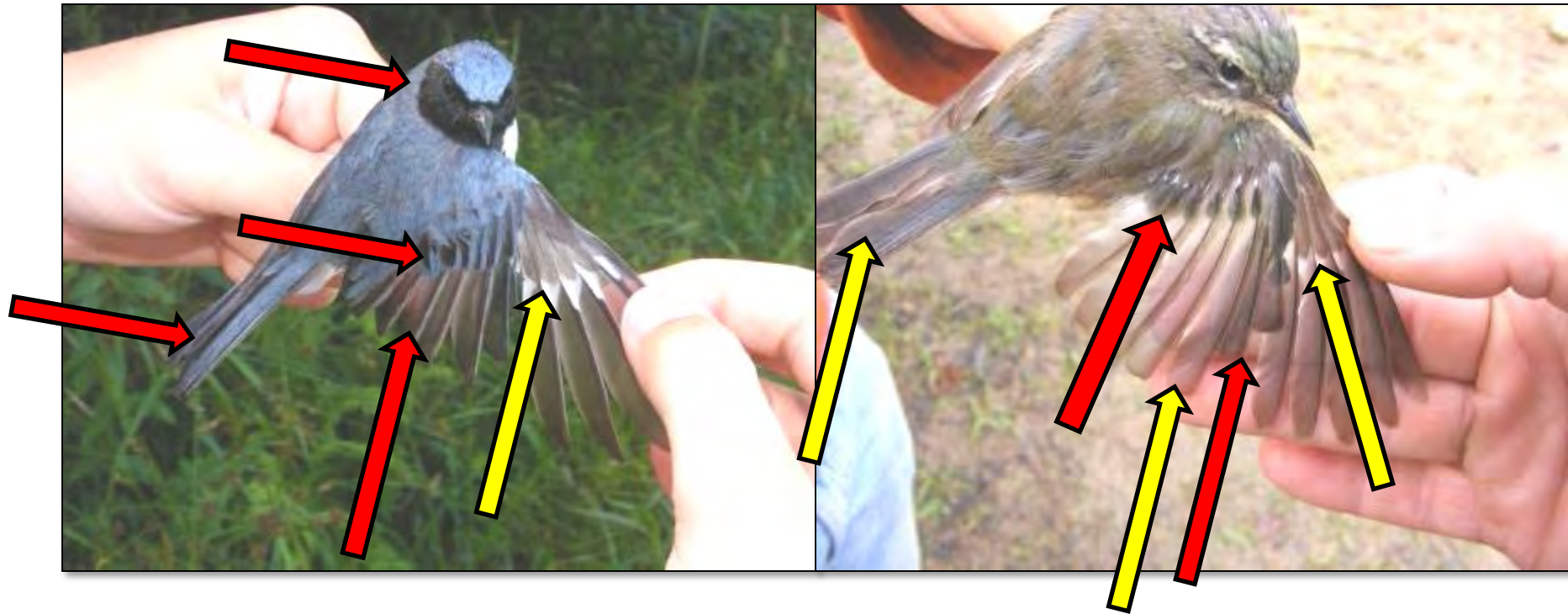
Did habitat use affect measures of condition?

Fat in post-breeding birds



Slightly but significantly more birds captured in cuts had some fat than did birds captured in forest

Molt progression



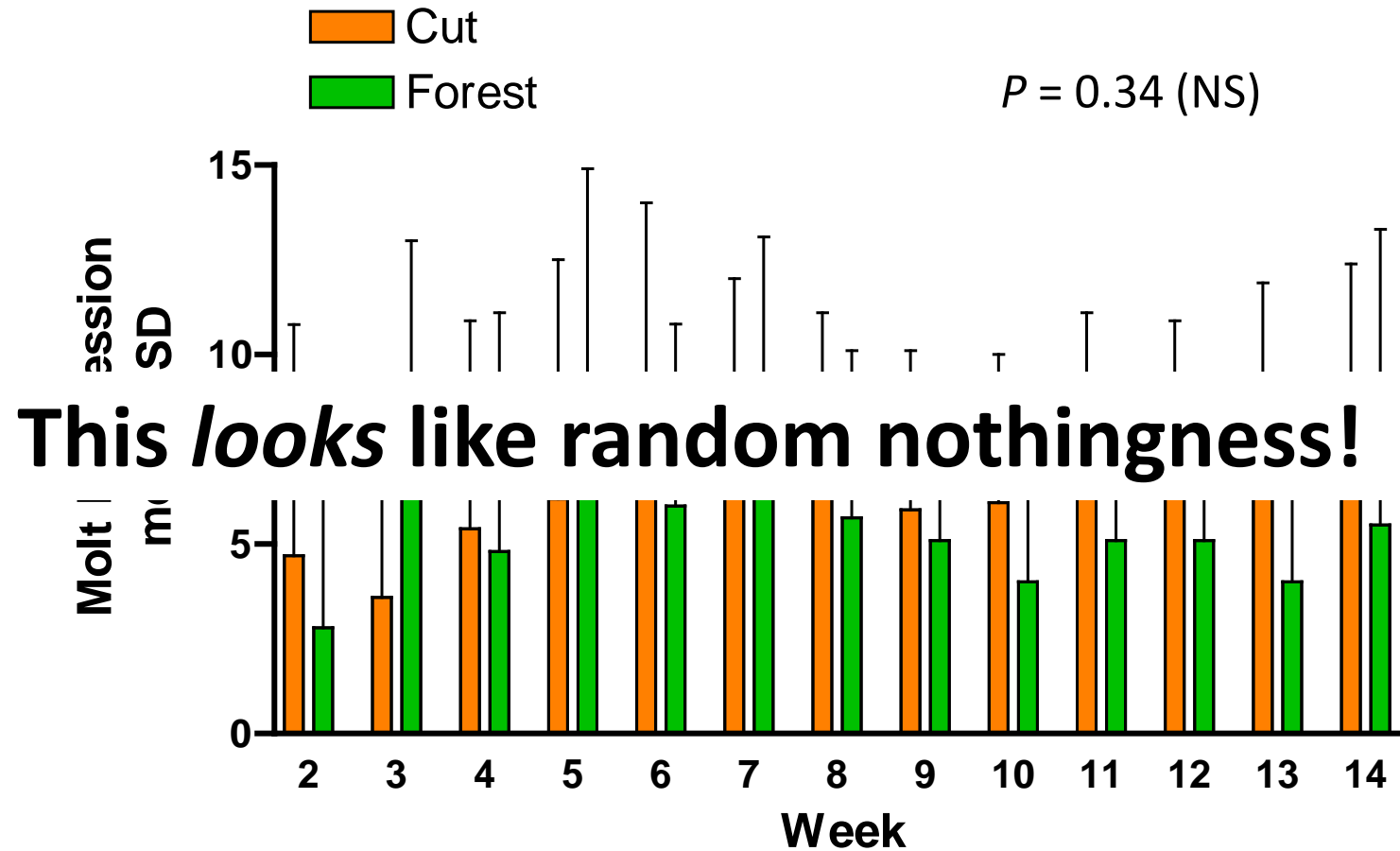
Black-throated Blue Warblers

Red arrows = new feathers, yellow arrows = old feathers

Male (left) has multiple tracks of new, while female (right) has just 2:

So male further progressed in molt

Molt progression



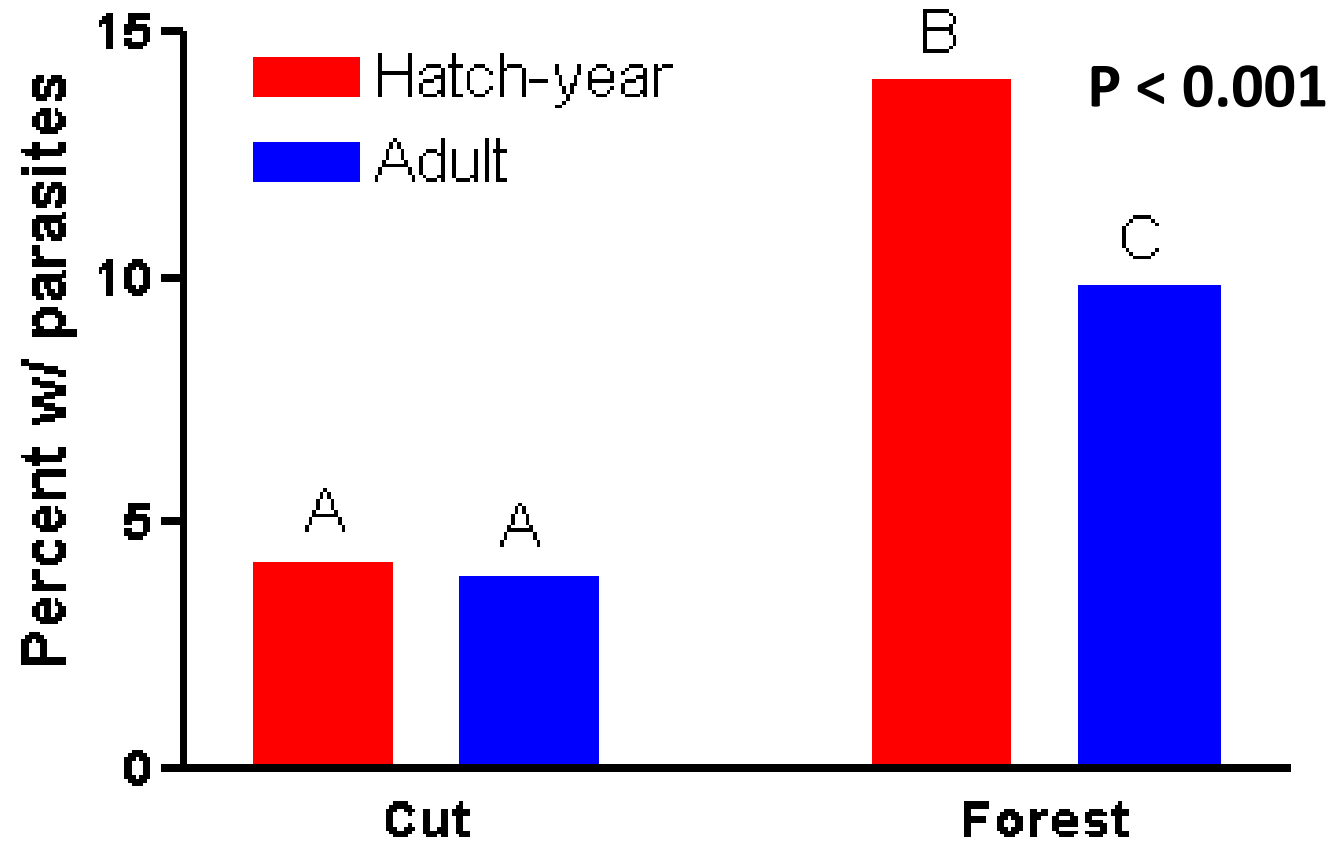
But statistically...

Variable	Model	K	Log-likelihood	AIC	Δ AIC	w_i
Molt Score						
	Age + sex + habitat×species + date + yr	6	6351.25	6363.25	0.00	0.99

Method: Information-theoretic model selection process, using general linear mixed models (SAS PROC GLIMMIX), with a Gamma distribution and log link function, the restricted maximum-likelihood (REML) method and the Kenward-Roger procedure to adjust denominator degrees of freedom.

What this means: When corrected for species, age, sex, and date, the habitat a bird was caught in (forest or cut) was strongly correlated with how advanced its molt was – further in cuts.

Ectoparasites: post-breeding



Birds caught in clearcuts were significantly less likely to have parasites than those in forest interiors

Why?

Why do birds use young forest so much??

Birds' needs:

- Food
- Shelter

Shelter in young forests

- They're thickets!!
- Many early-successional plants are *thorny*, making rather effective predator deterrent



Food in young forests

- Most early successional species spiny so few chemical defenses: many tasty insects!
- By 6 yrs post-harvest, total leaf volume equivalent to mature forest (Keller et al. 2003) : lots of bugs in small space!
- Pin cherry has highest biomass of insects/leaf area of local trees
- Many ES plants produce fruit (*Rubus*, *Aralia*, *Smilax*...)

So, young forests create smorgasboard for birds!

Results Summary

- Regenerating clearcuts are used disproportionately by (most) forest-interior species in the post-breeding season
- Birds appear to *increase* fitness by using cuts, relative to those remaining in forest

Management Implications

- Some early successional habitat within large forest tracts may be *necessary* to sustain some forest-interior bird species
- Area in early successional habitat in NE at lowest point since records kept
 - might this be a stressor affecting mature forest birds?

Conclusions

- Early successional habitat vital for early-successional birds
- Early successional habitat may be vital for many mature-forest birds in the post-breeding season
- Therefore, early successional habitat critical for songbirds!

Thank you

