

# 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”?**

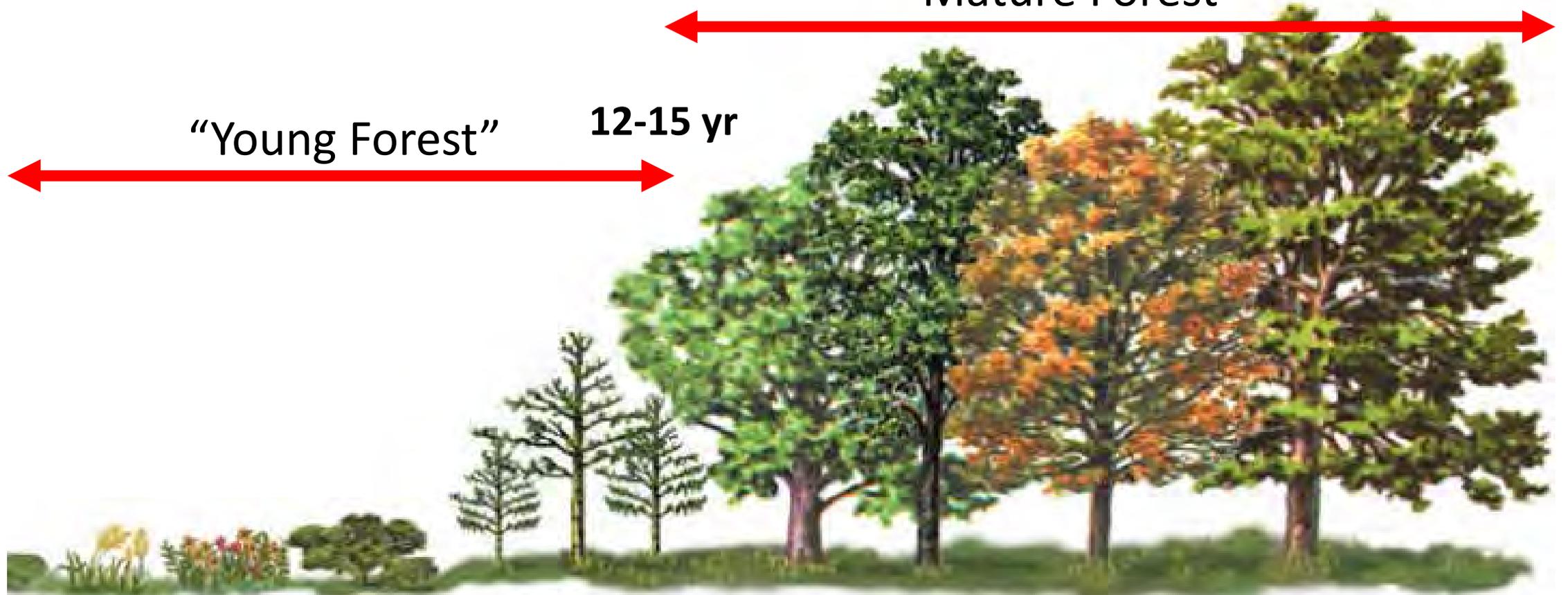
# Ecological succession

100-300+ yr

“Mature Forest”

“Young Forest”

12-15 yr



Grasses  
and  
weeds

Mixed  
herba-  
ceous

Shrubs

Young forest  
(tulip poplar)

Mature forest  
(white oak  
and hickory)

Climax forest  
(beech and  
sugar maple)

# 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)

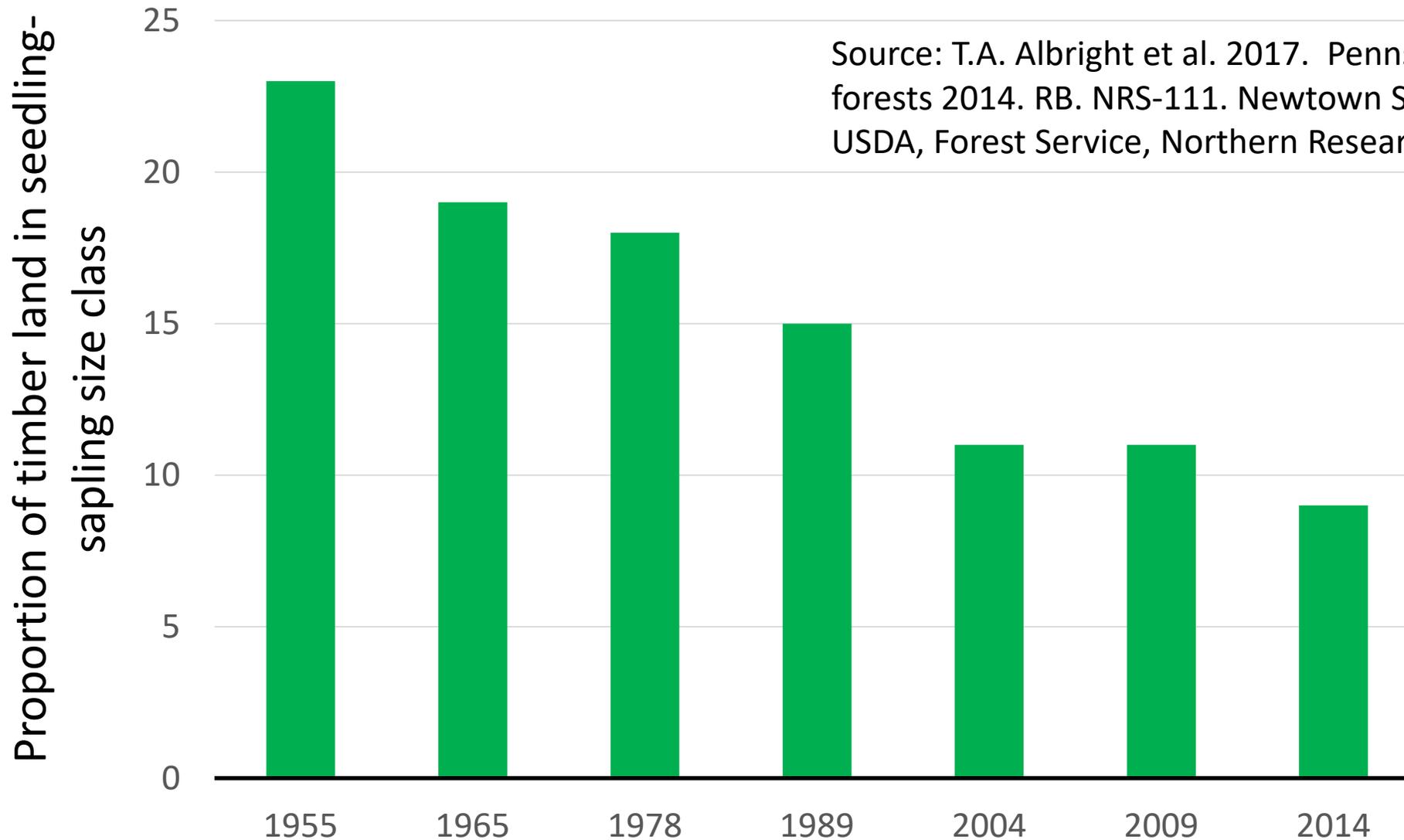
• **Timber Harvest** (213 k ac/yr)

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



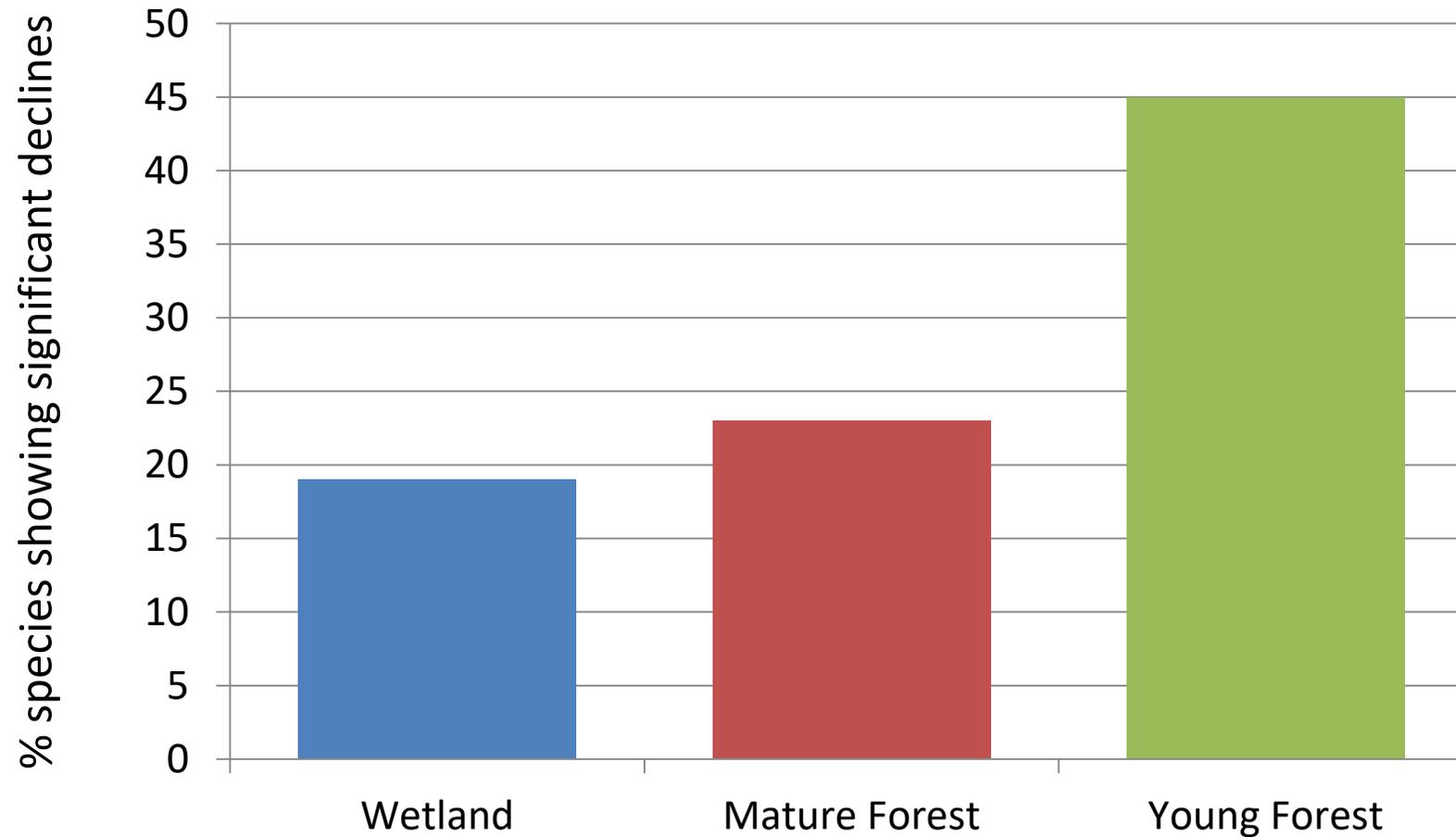
Source: T.A. Albright et al. 2017. Pennsylvania forests 2014. RB. NRS-111. Newtown Square, PA: USDA, Forest Service, Northern Research Station.

# 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



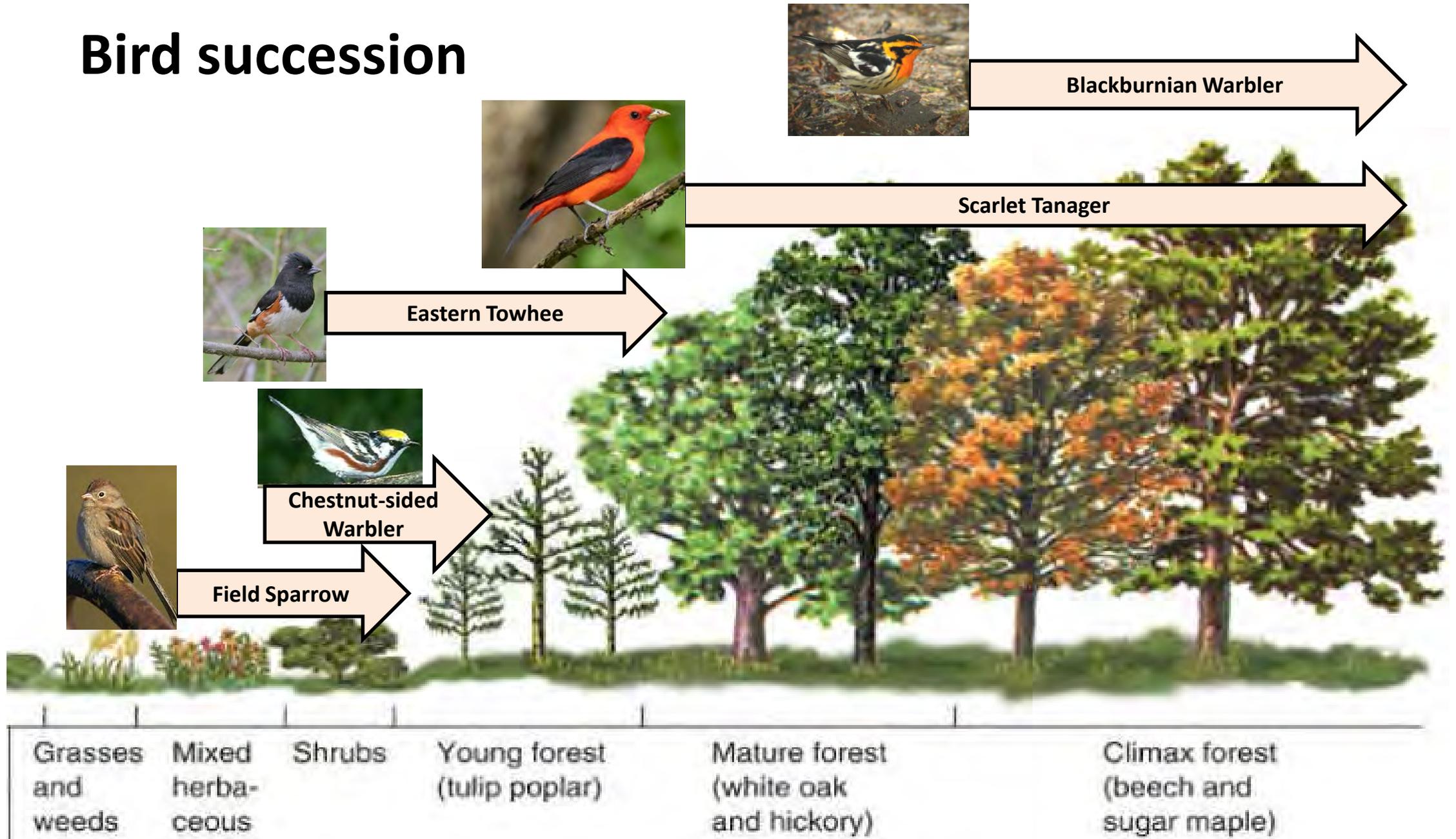
# Young Forest Birds

- 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

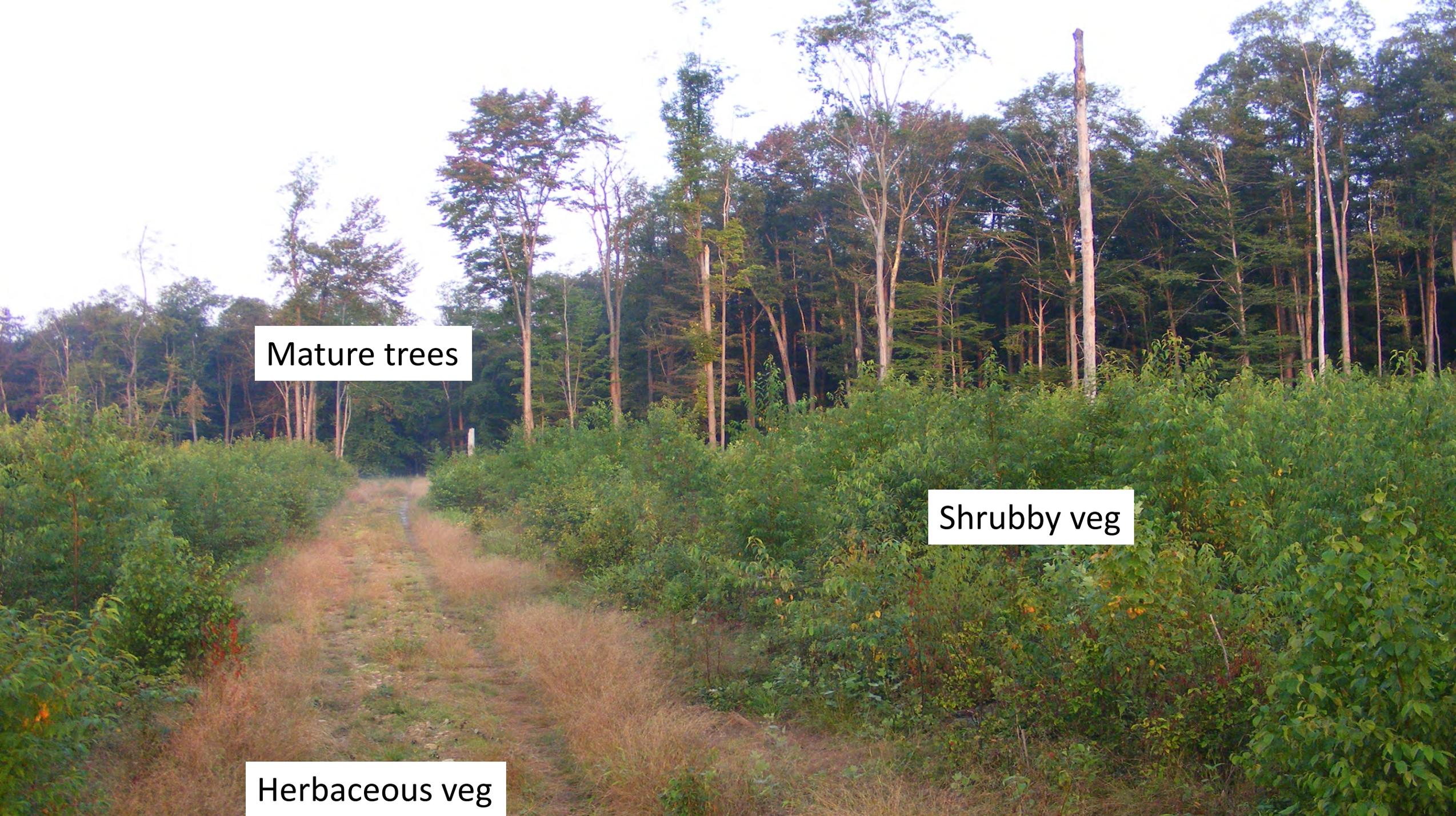
Species	Years after cut		
	1 <sup>st</sup> appear	Common	Decline
Northern Flicker	1	1	7-10
Eastern Bluebird	1	1	2
Alder Flycatcher	1	2	5-7
Chestnut-sided Warbler	2	4	10
Mourning Warbler	2	5	10
Rose-breasted Grosbeak	3	15	-
Veery	3	10	20
Canada Warbler	5	15	-

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)

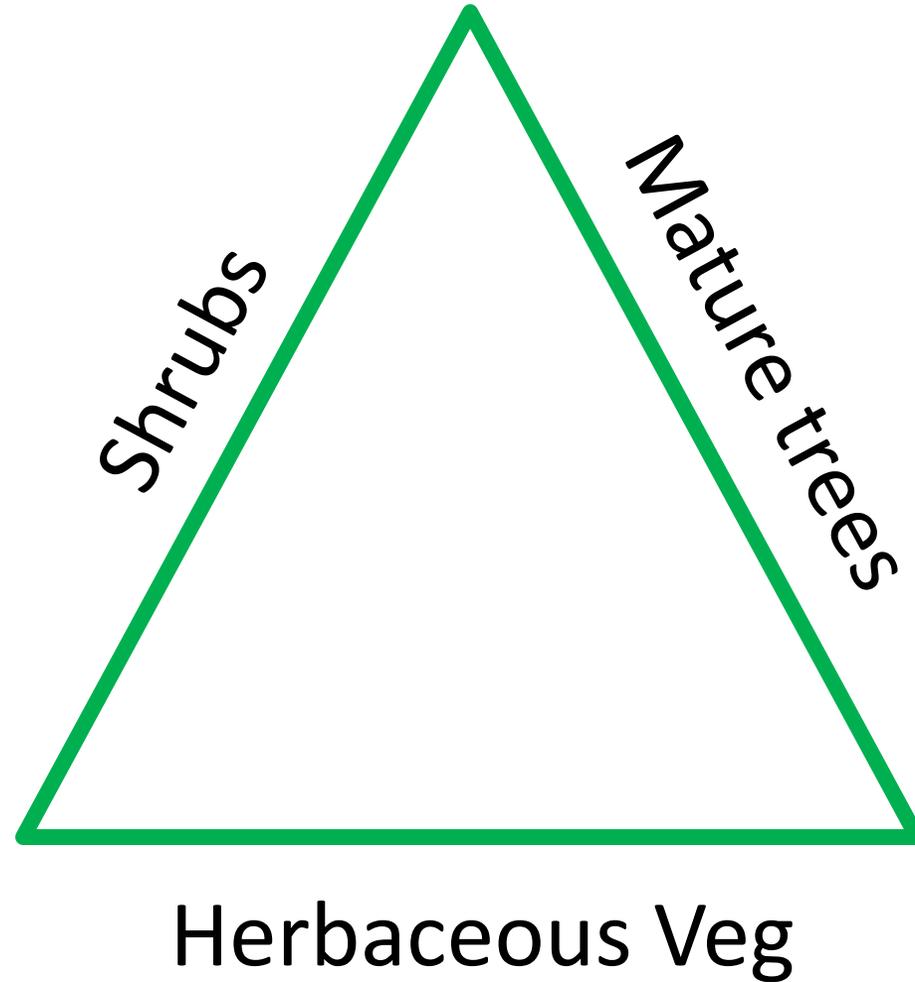


Mature trees

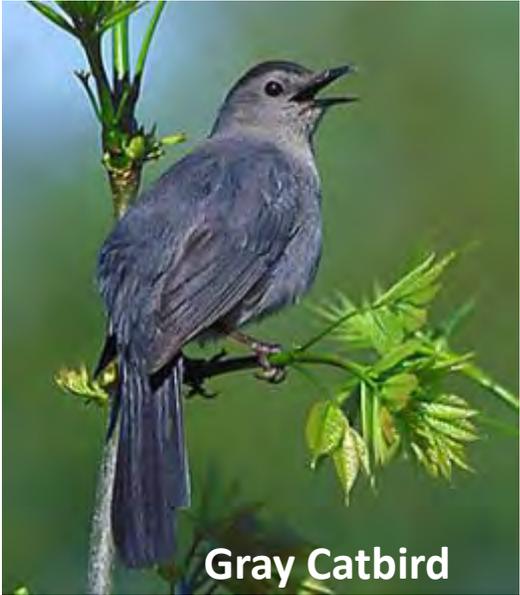
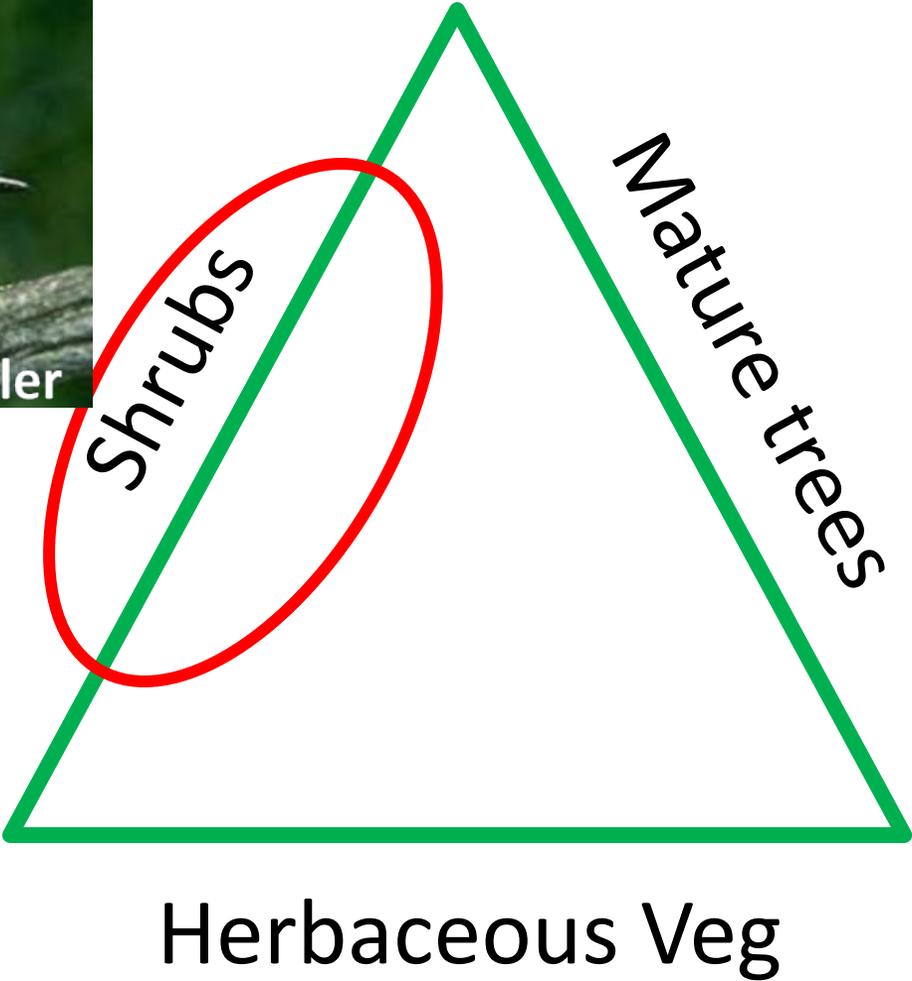
Shrubby veg

Herbaceous veg

Various combinations create habitats for  
specific species



# Species have specific habitat needs



# But species differ in their habitat specificity!

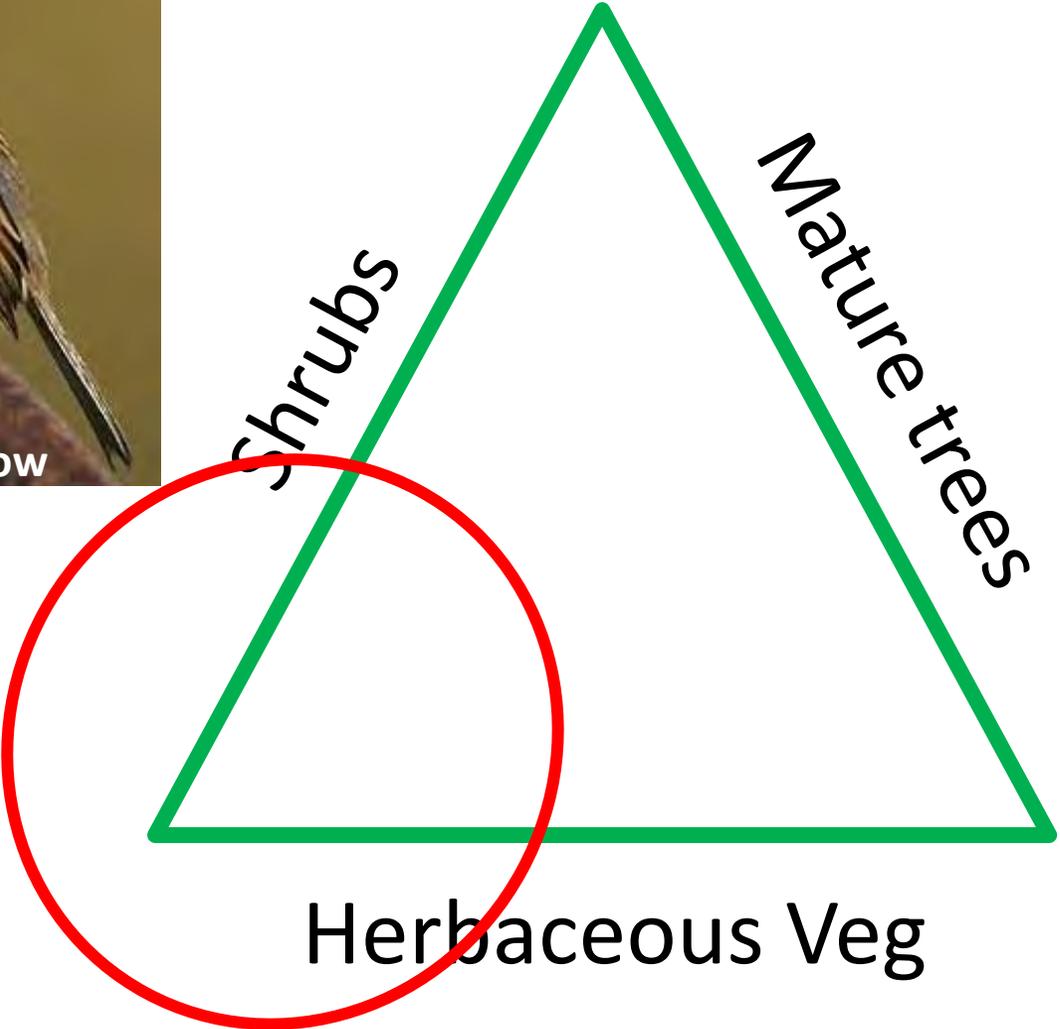
- For instance: Mourning Warblers require large patches (>3 ac) of young regen dominated by Rubus, preferably 6-9 yrs old, *but* within a forested landscape.



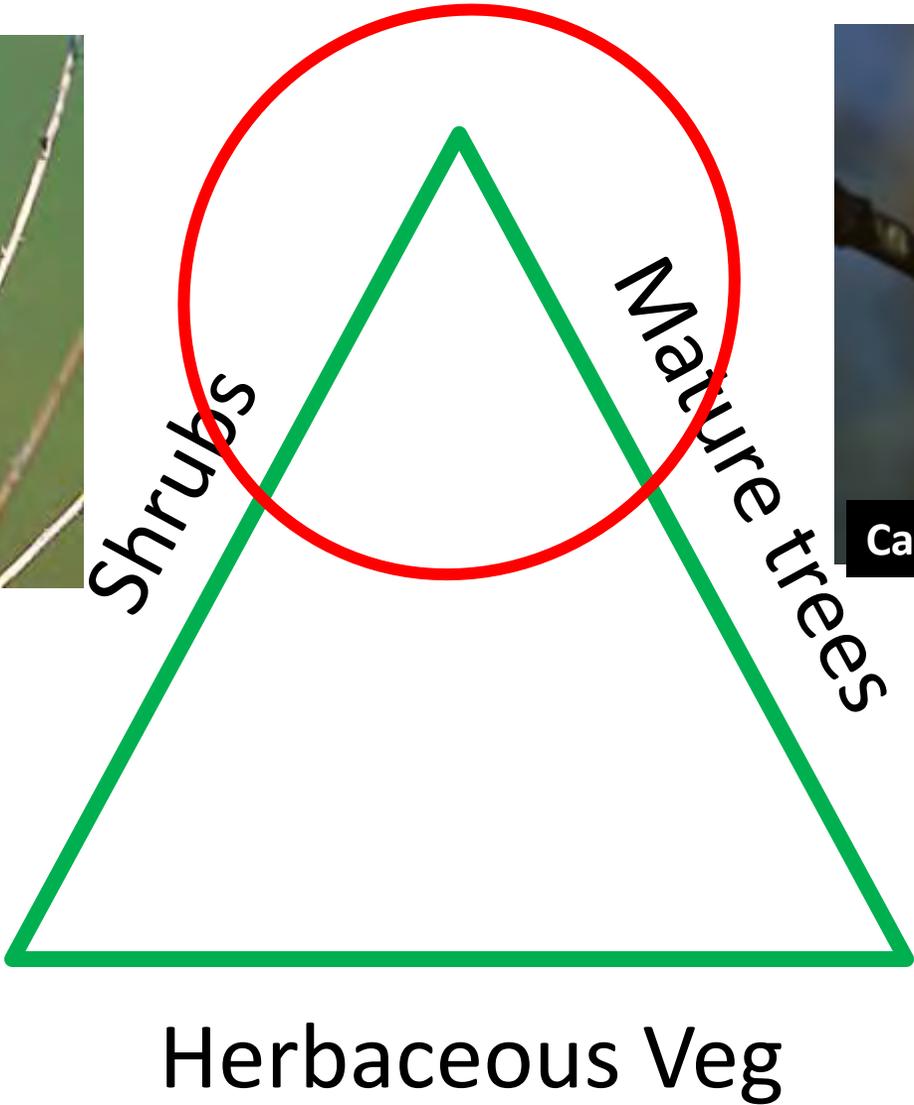
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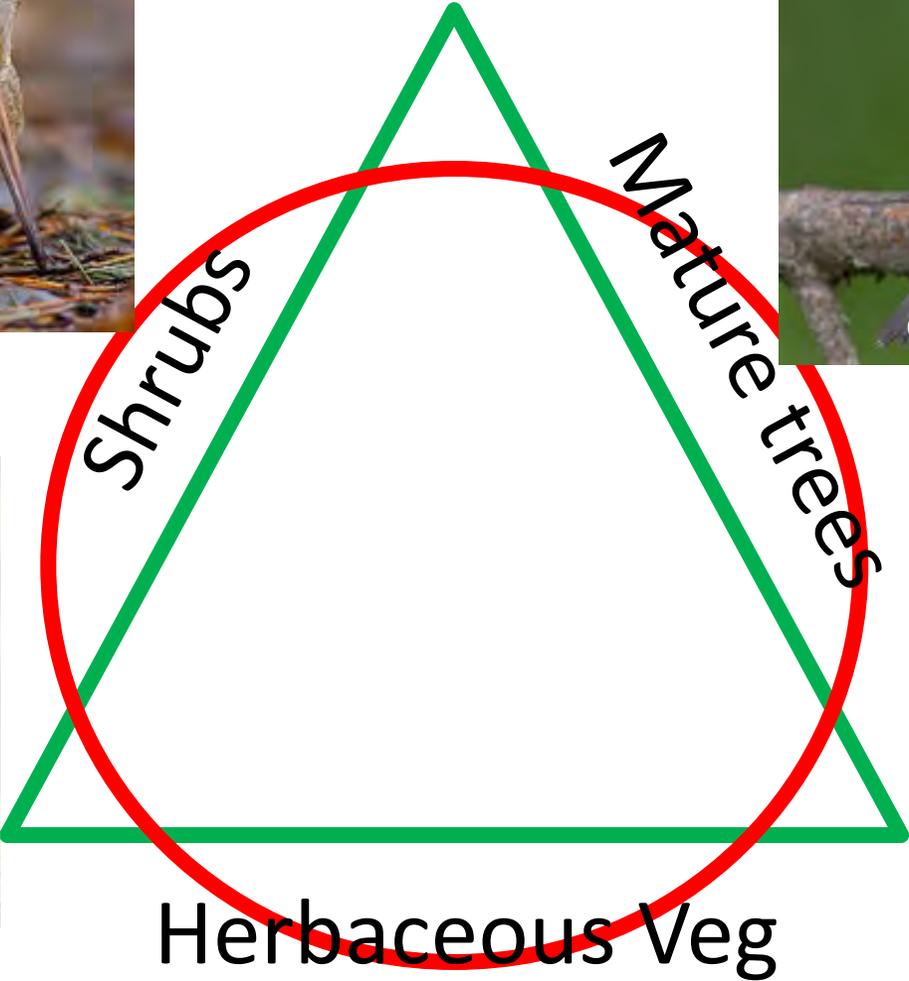
# Species have specific habitat needs



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# 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

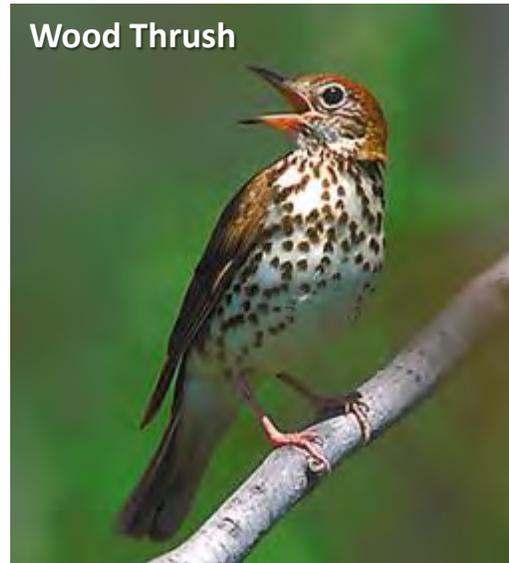
# Late successional birds as early successional specialists?



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

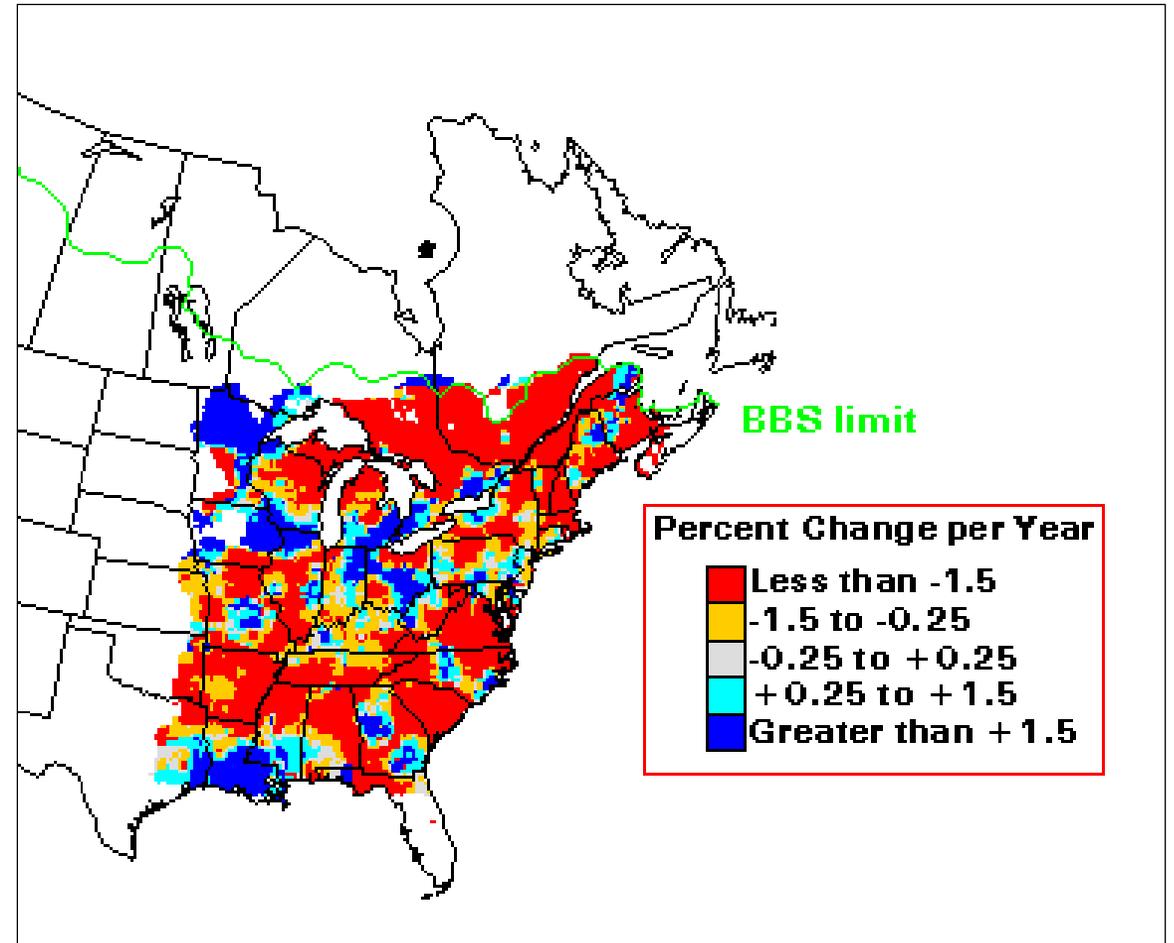
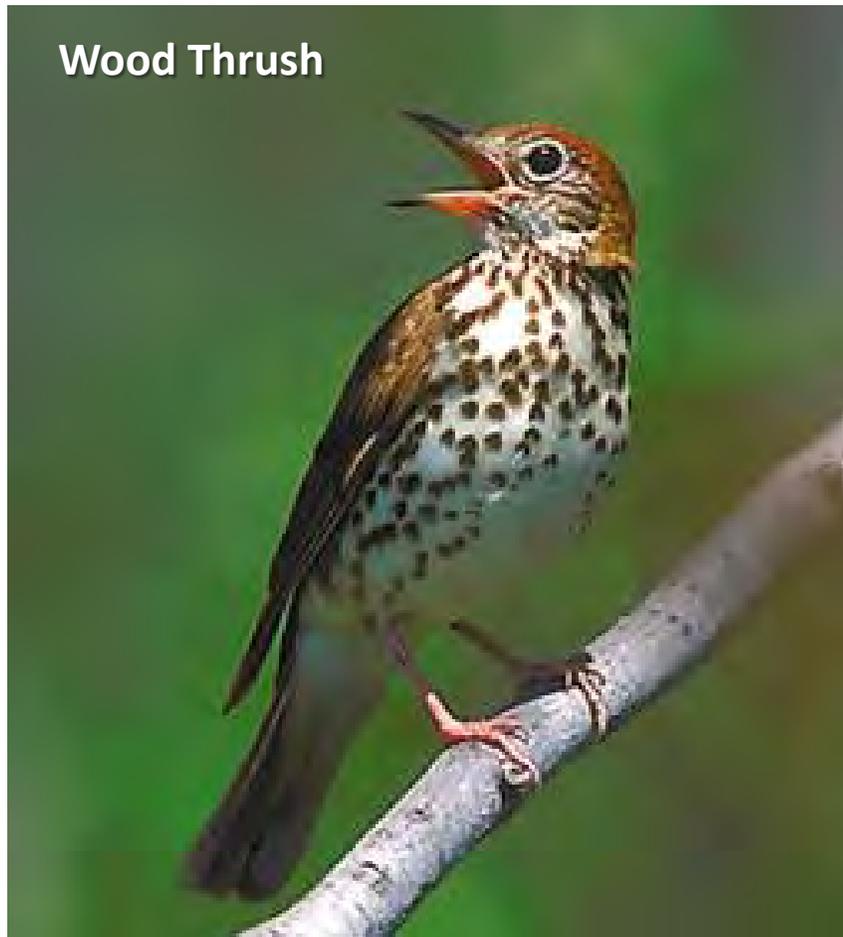
- Forest-interior species,
- Late-successional species, or
- Mature forest species

# Some forest-interior species in PA



# Why the concern over forest birds?

- Populations of many are declining across North America

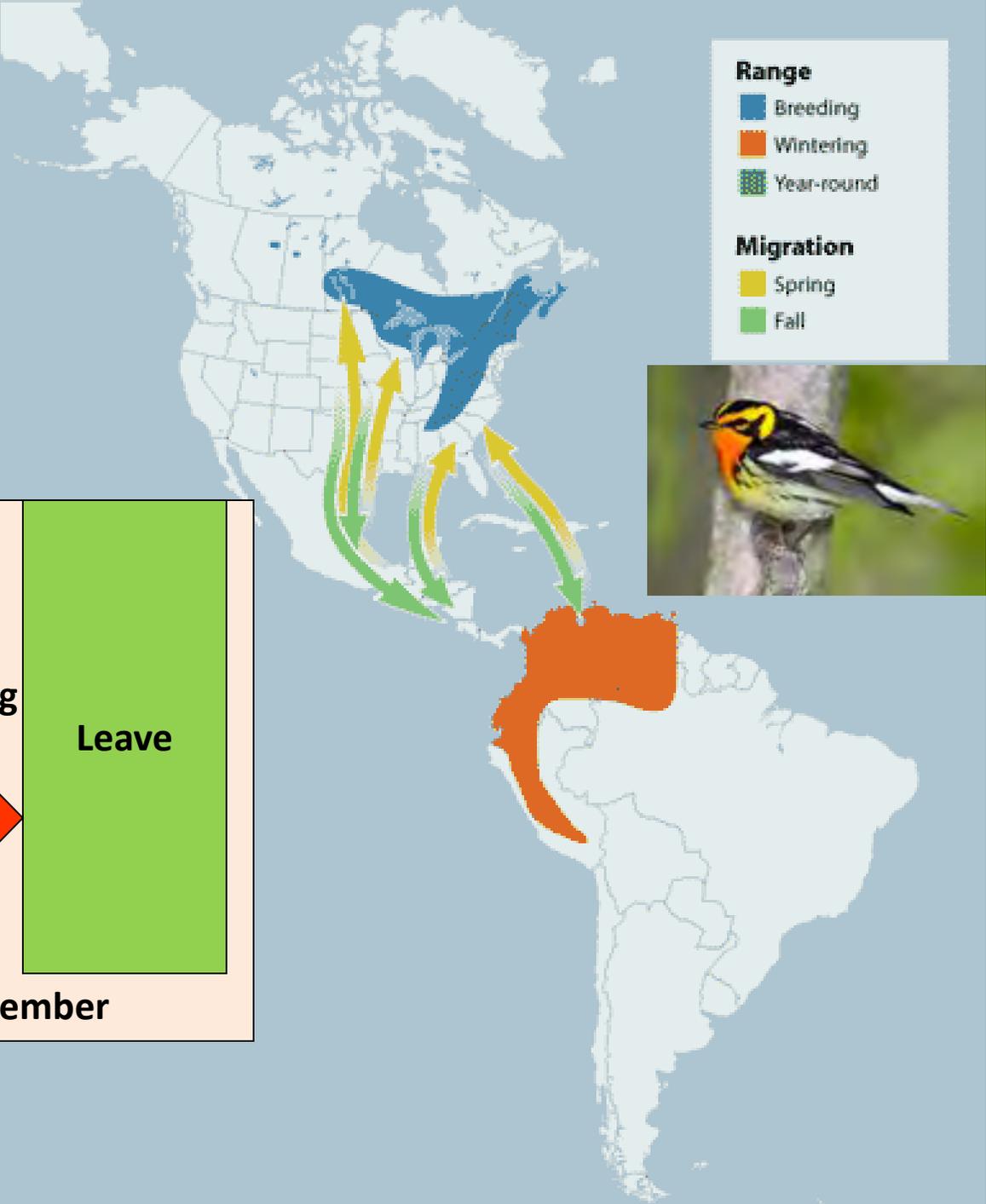
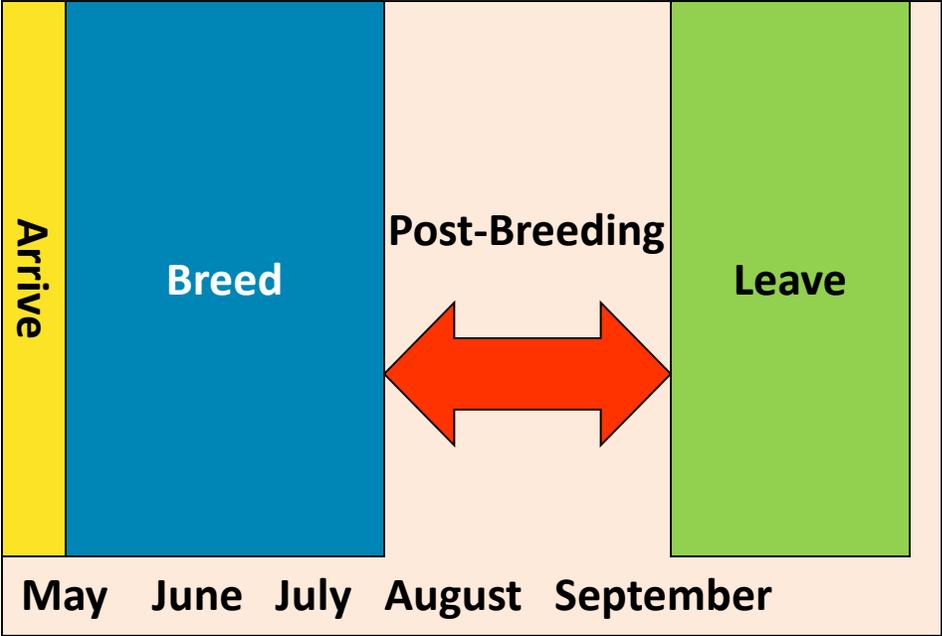


# Research has identified problems in:

- 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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  - Adults and young accumulate fat as fuel just prior to and in migration



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)

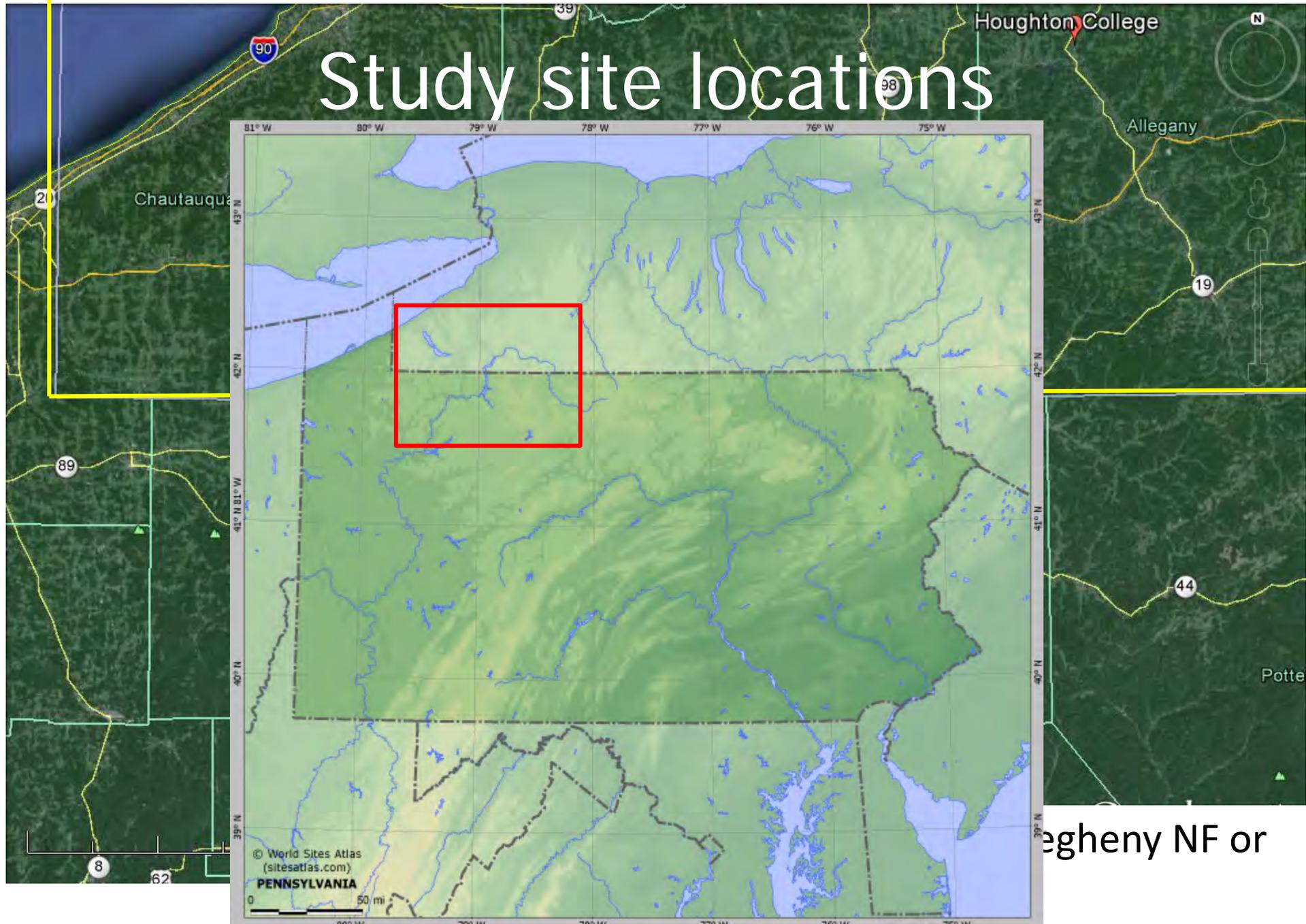
# Study Goals

- 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

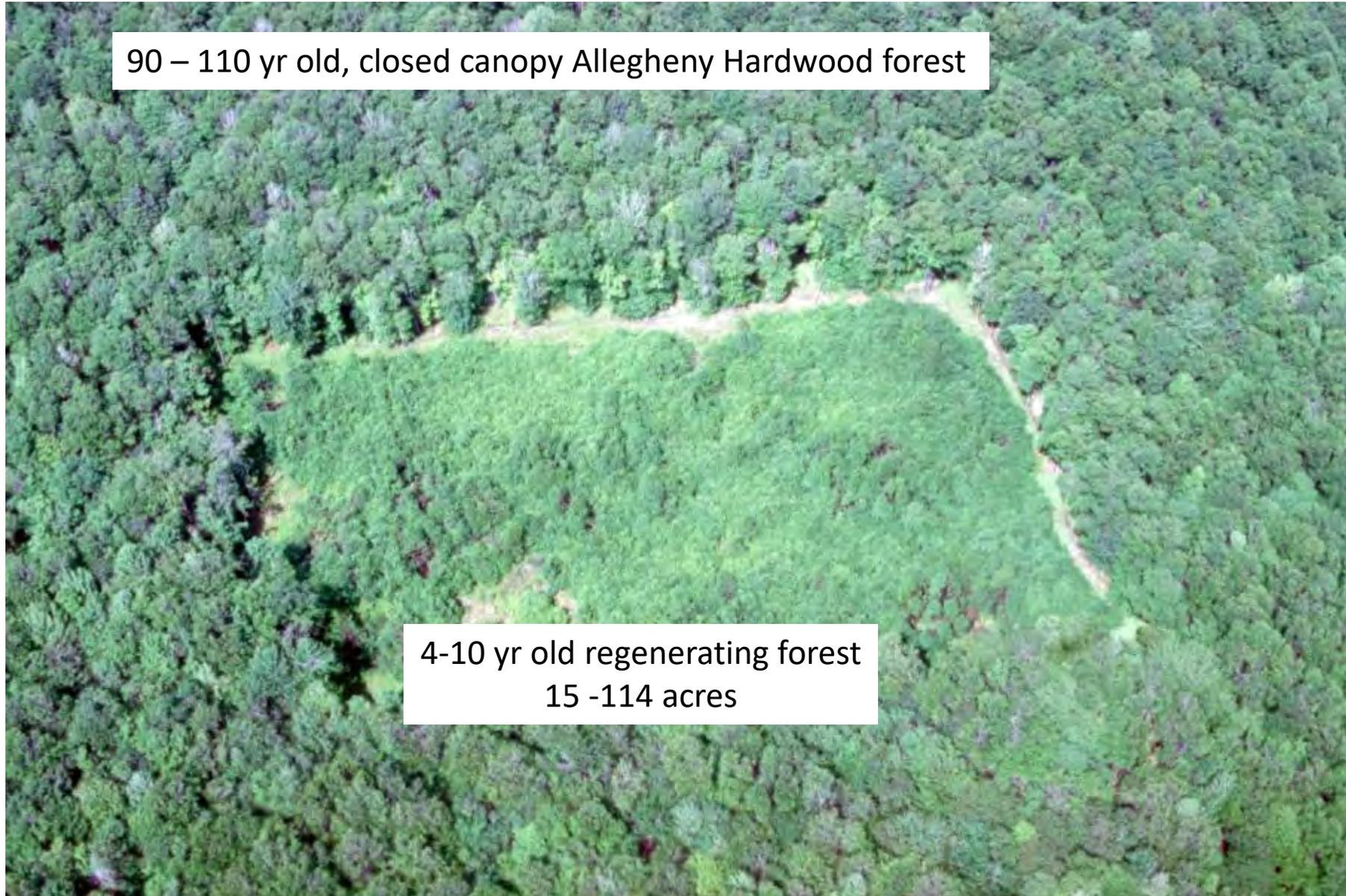
- Constant-effort mist-netting
  - 4 nets each in regenerating clearcut, forest interior with substantial understory - simultaneous netting corrects for day-to-day variation in captures
  - Nets run daily 6 hrs starting 20 min. before dawn
  - Each site run for 1 week at a time, weather permitting, rotated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

# Study site locations



Allegheny NF or

# Study site layout

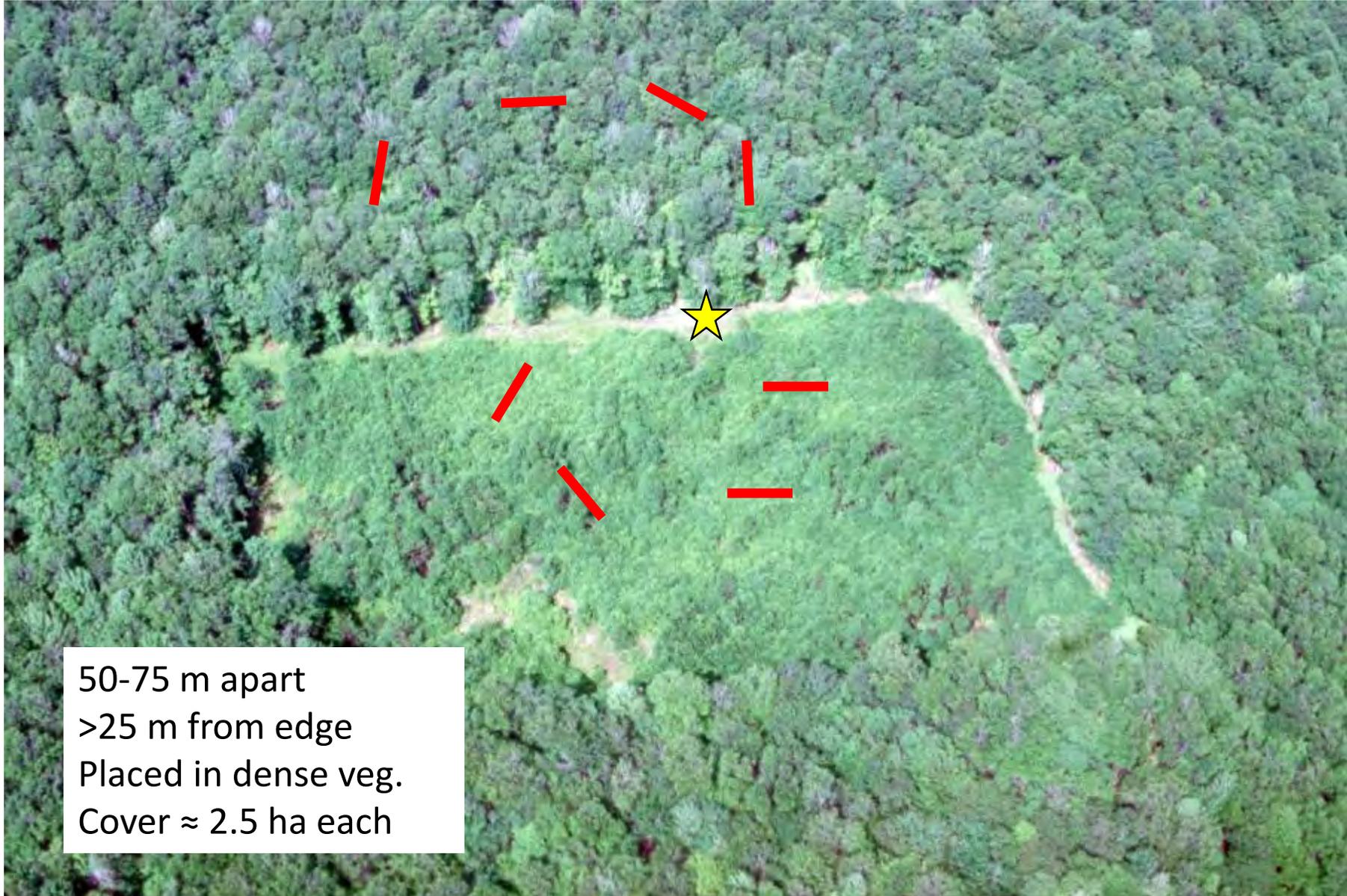


90 – 110 yr old, closed canopy Allegheny Hardwood forest

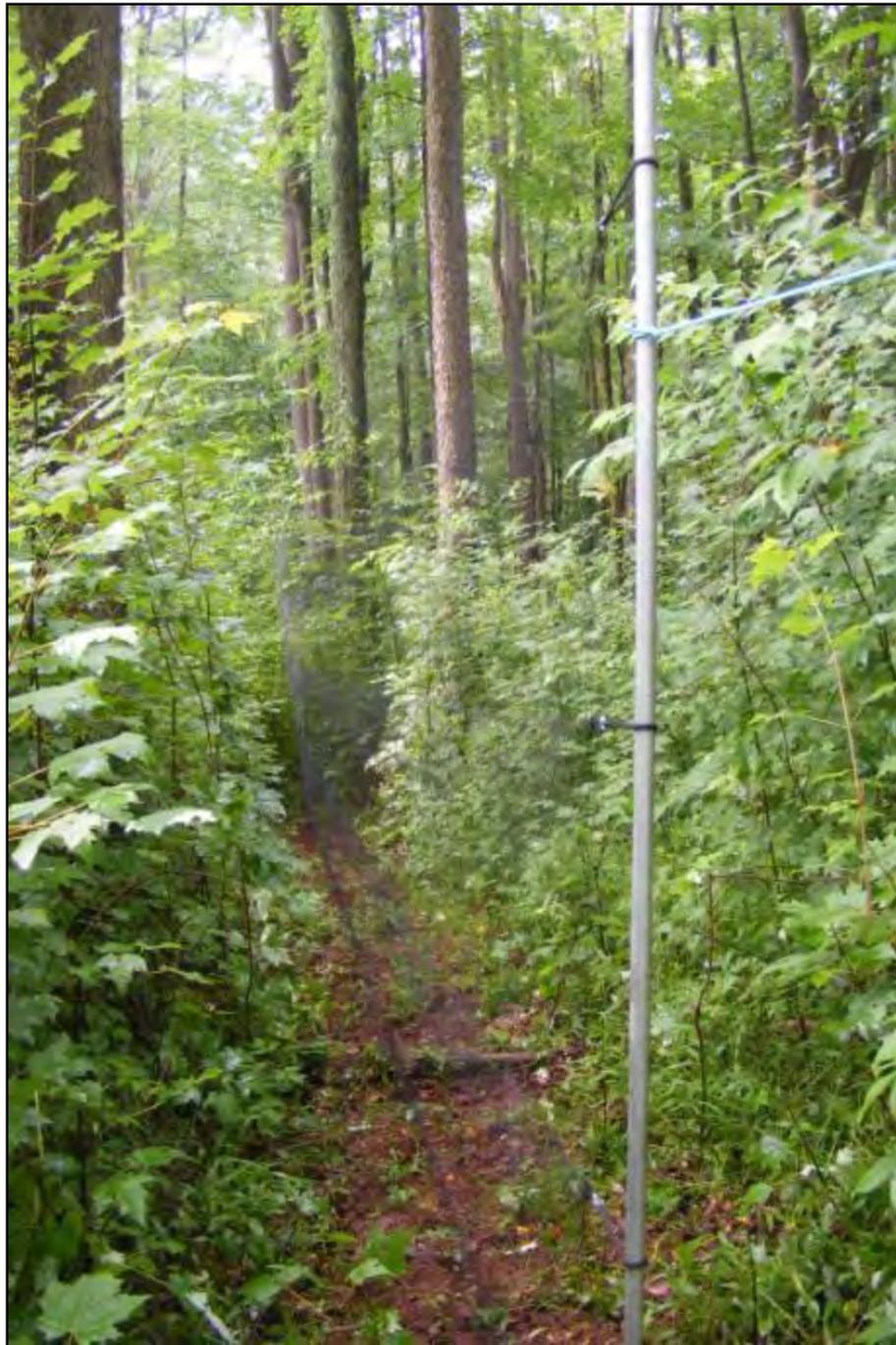
4-10 yr old regenerating forest  
15 -114 acres



# 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

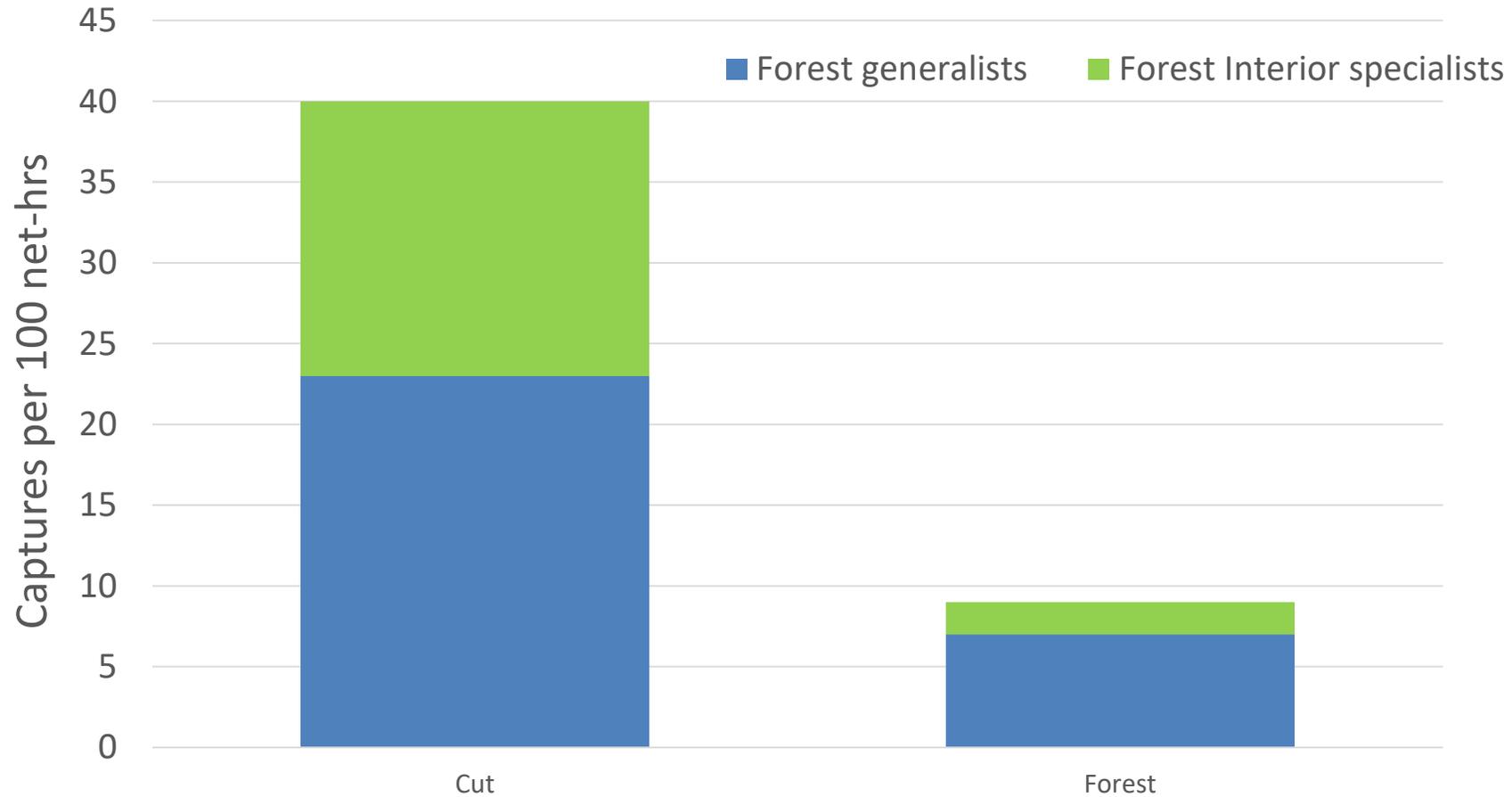
- Molt scored on scale of 0-5 for body, wing, tail (newer = higher)
- Fat score 0-3
- Presence of ectoparasites noted
- Calculated Body Condition Index:
  - Weight-size residuals, like human BMI



# Results: Summary stats

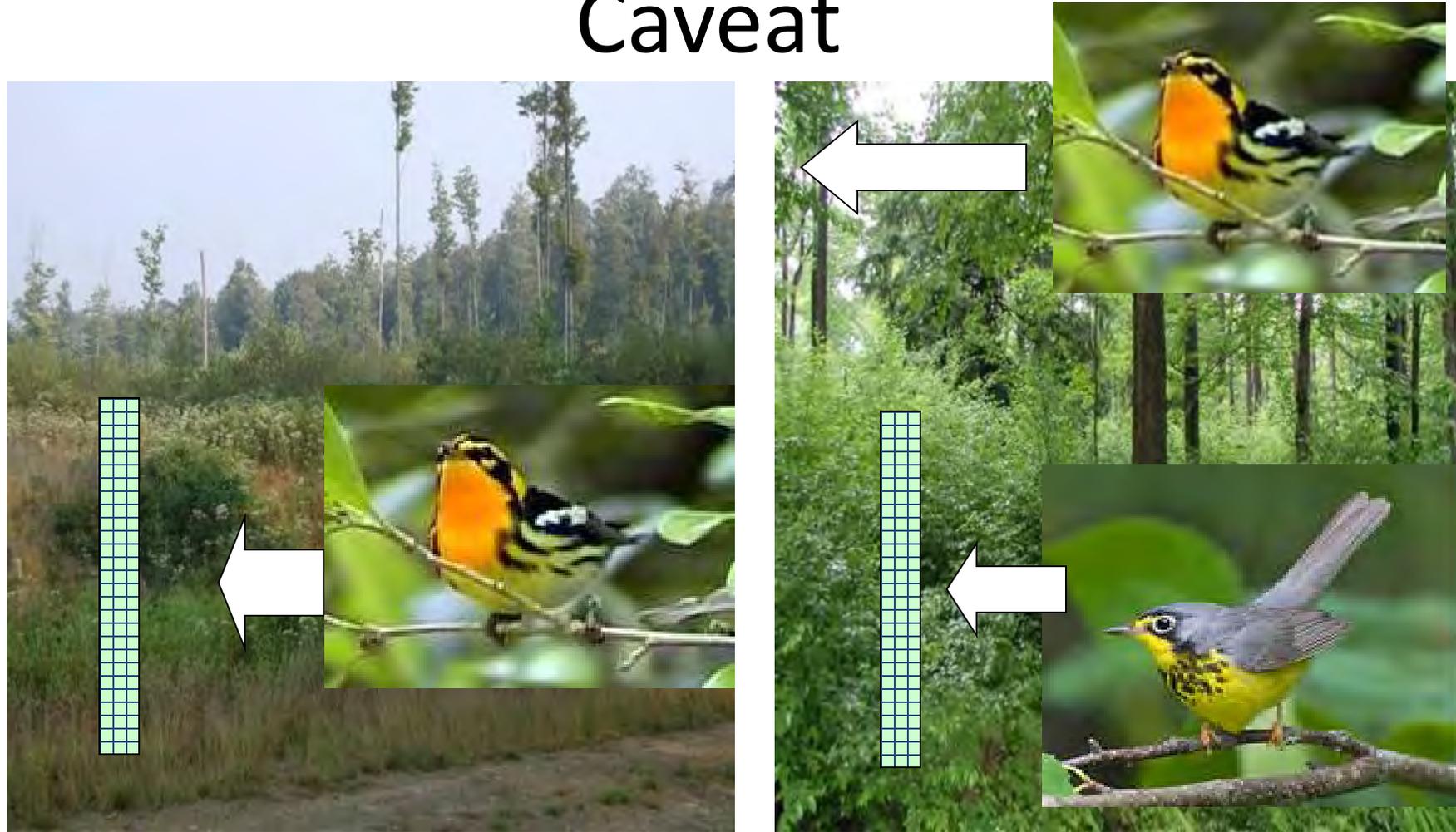
- 10,616 net-hrs total: 5514 in cuts, 5102 in forest
- **3846 birds** captured & banded, of 84 species
  - Ave. capture rate of 36.2 birds/100 net-hrs
- Of those, 237 in breeding condition, 2030 post-breeding, & 1578 apparent migrants
- Of post-breeding birds, 605 were forest generalists, 514 were forest-interior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

# Capture rates post-breeding



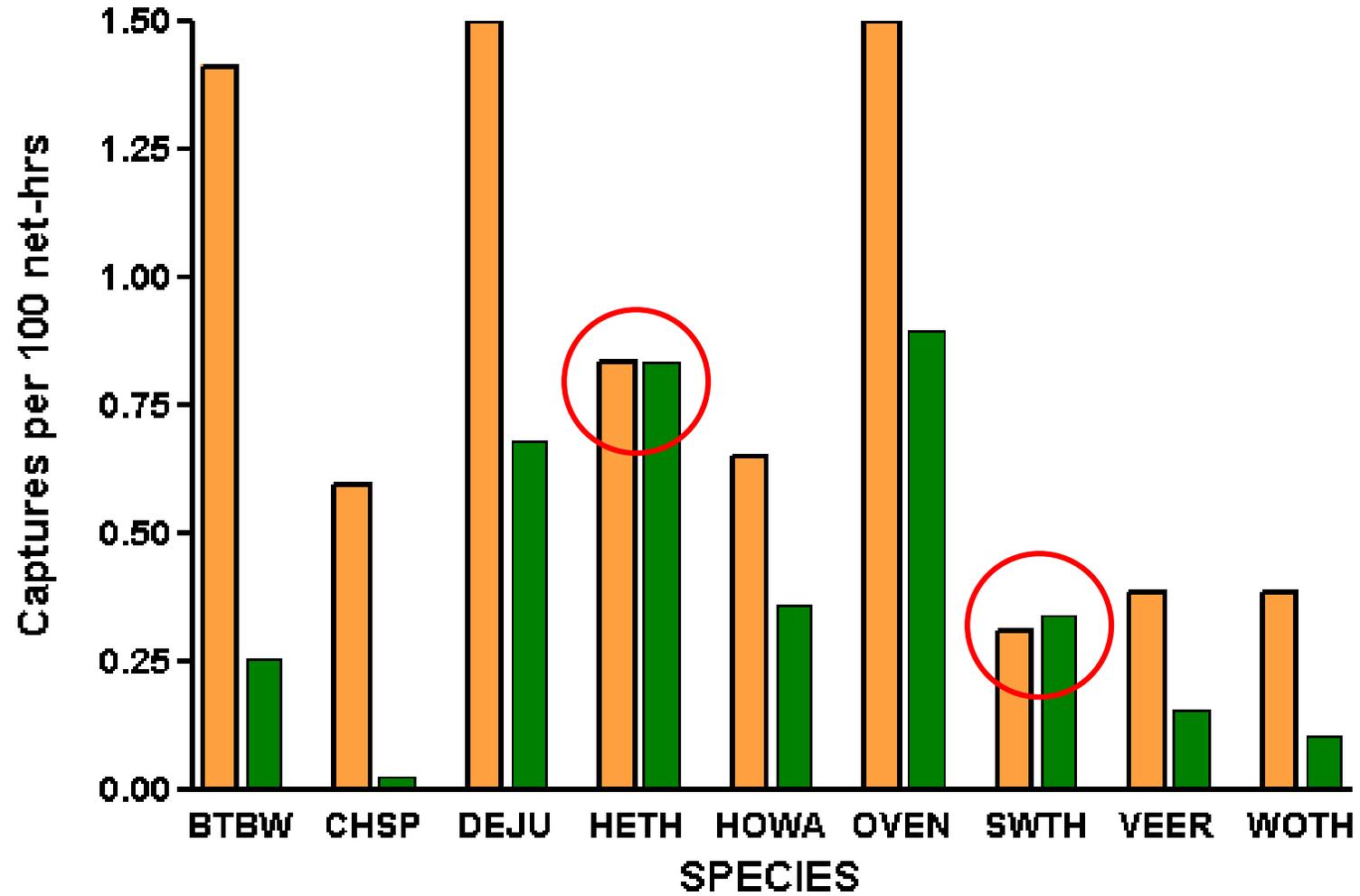
*Forest birds were significantly more abundant in clearcuts than in forest interiors in the post-breeding season*

# Caveat



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

# Understory species



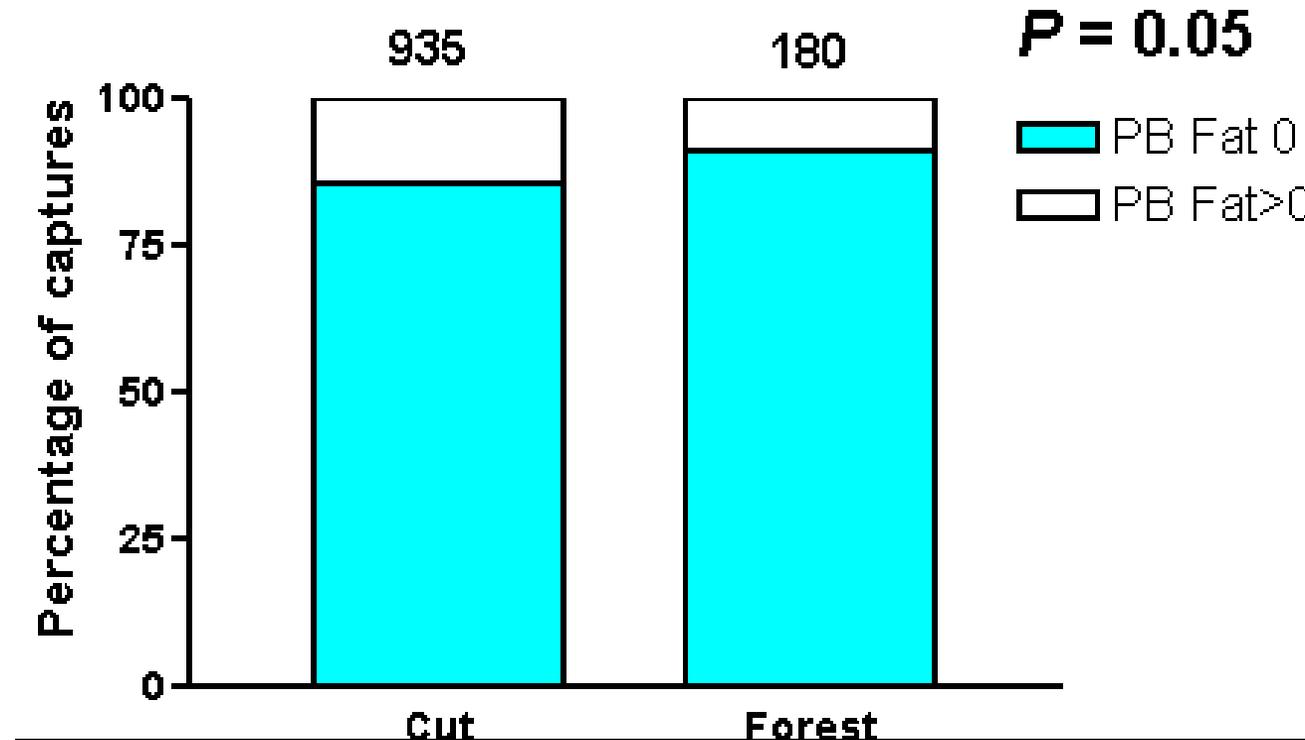
# But might we be missing

- 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!



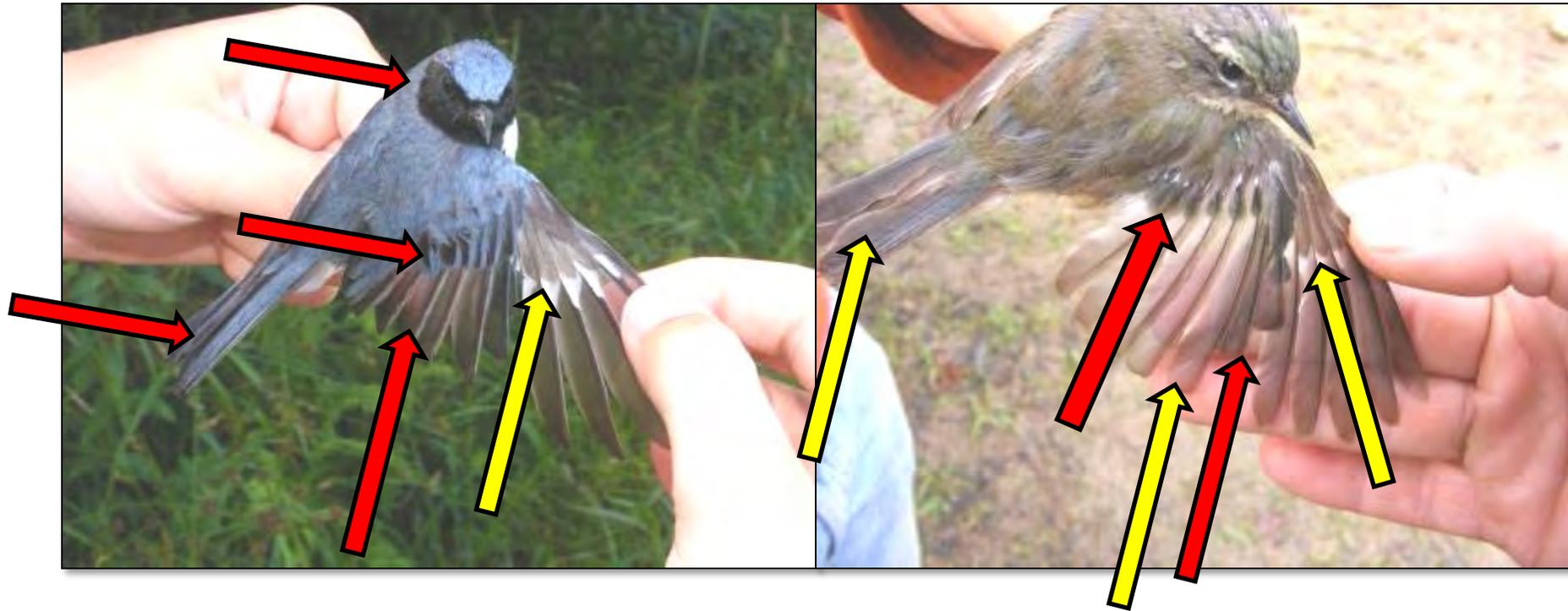
**Did habitat use affect measures of condition?**

# Fat in post-breeding birds



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

# Molt progression



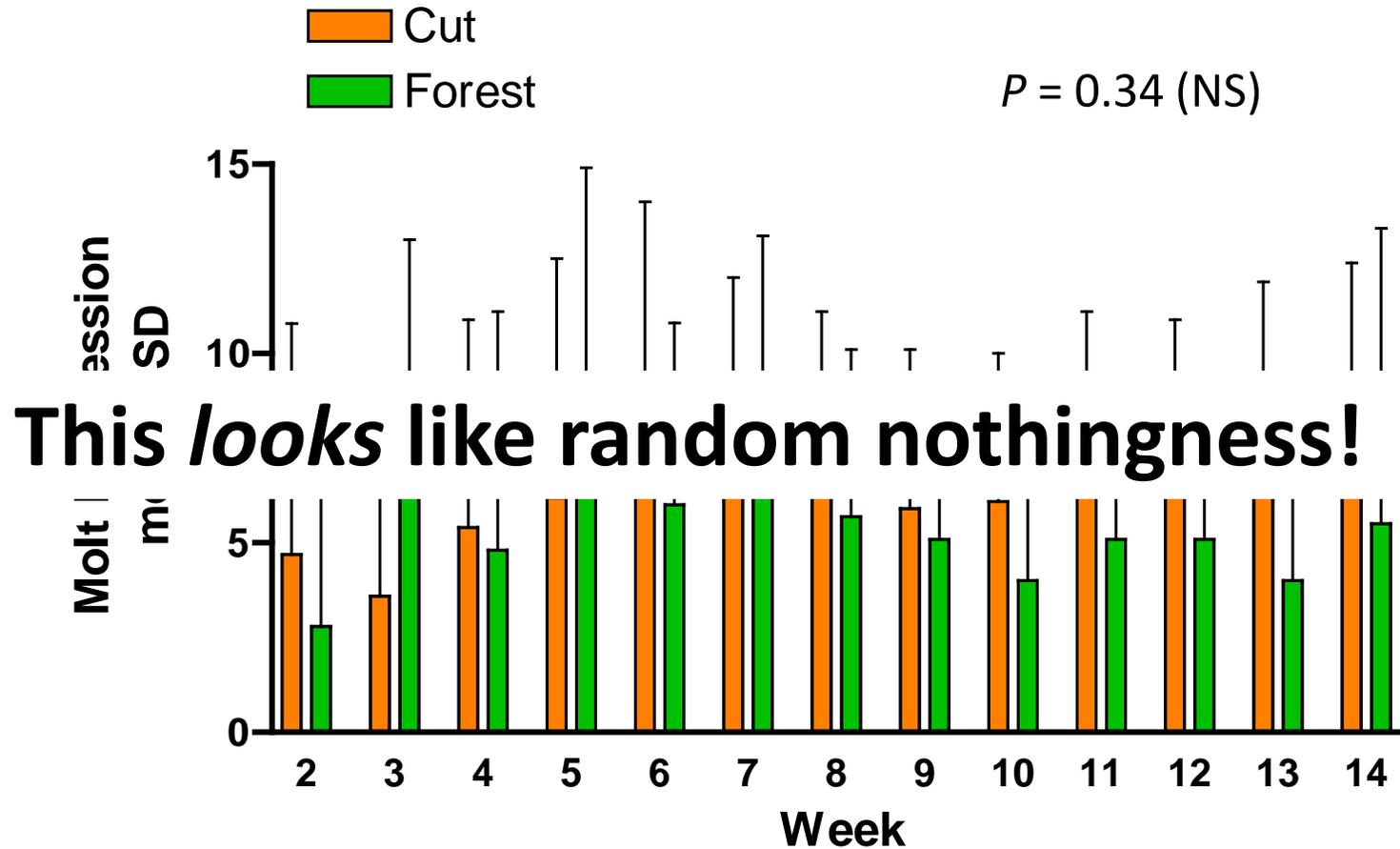
Black-throated Blue Warblers

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



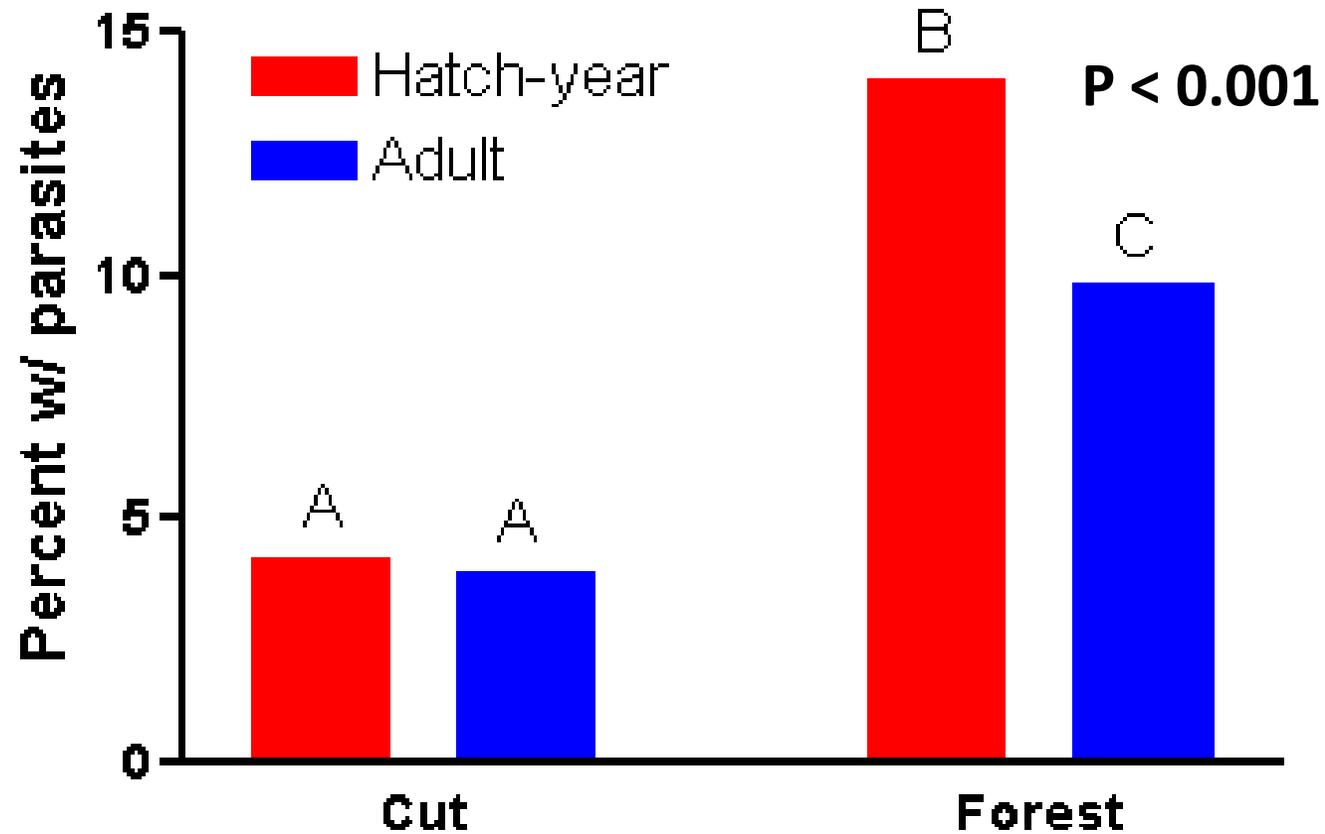
# But statistically...

Variable	Model	K	Log-likelihood	AIC	$\Delta$ 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

