

# Forest Structure and Bird Assemblages in Old-Growth and Managed Hemlock–Hardwood Forests of the Western Laurentian Great Lakes Region, USA

By Michael Mossman<sup>1</sup>, Robert Howe<sup>2</sup>, and Nick Anich<sup>1</sup>

<sup>1</sup> *Bureau of Science Services, Wisconsin Department of Natural Resources*

<sup>2</sup> *Cofrin Center for Biodiversity, University of Wisconsin-Green Bay*





Isidor Jeklin

# Definitions

Within Curtis's (1959) northern mesic forest and Kotar et al.'s (2002) ATD and ATM types. Sugar maple, hemlock, yellow birch, with basswood, white ash, red maple, ironwood.

## Type

*Hardwood:* <22% hemlock basal area; Sylvania

*Hemlock:* 25-66% hemlock basal area; Sylvania and SNA/RNA

## Treatment

*Oldgrowth:* no cutting except occasional white pine; >1/3 of canopy >60cm dbh & >150 yr old

*Uneven-Age Managed:* origin even-age or oldgrowth; single- or group selection; cut within 2-40 yr; multi-aged

*Even-Age Managed:* regenerated after clearcut, age 58-85 yr; 4 stands thinned 3-10 yr prior









# Other Areas Surveyed

40+ managed stands

Oldgrowth at Porcupine Mts, Huron Mts, Sylvania

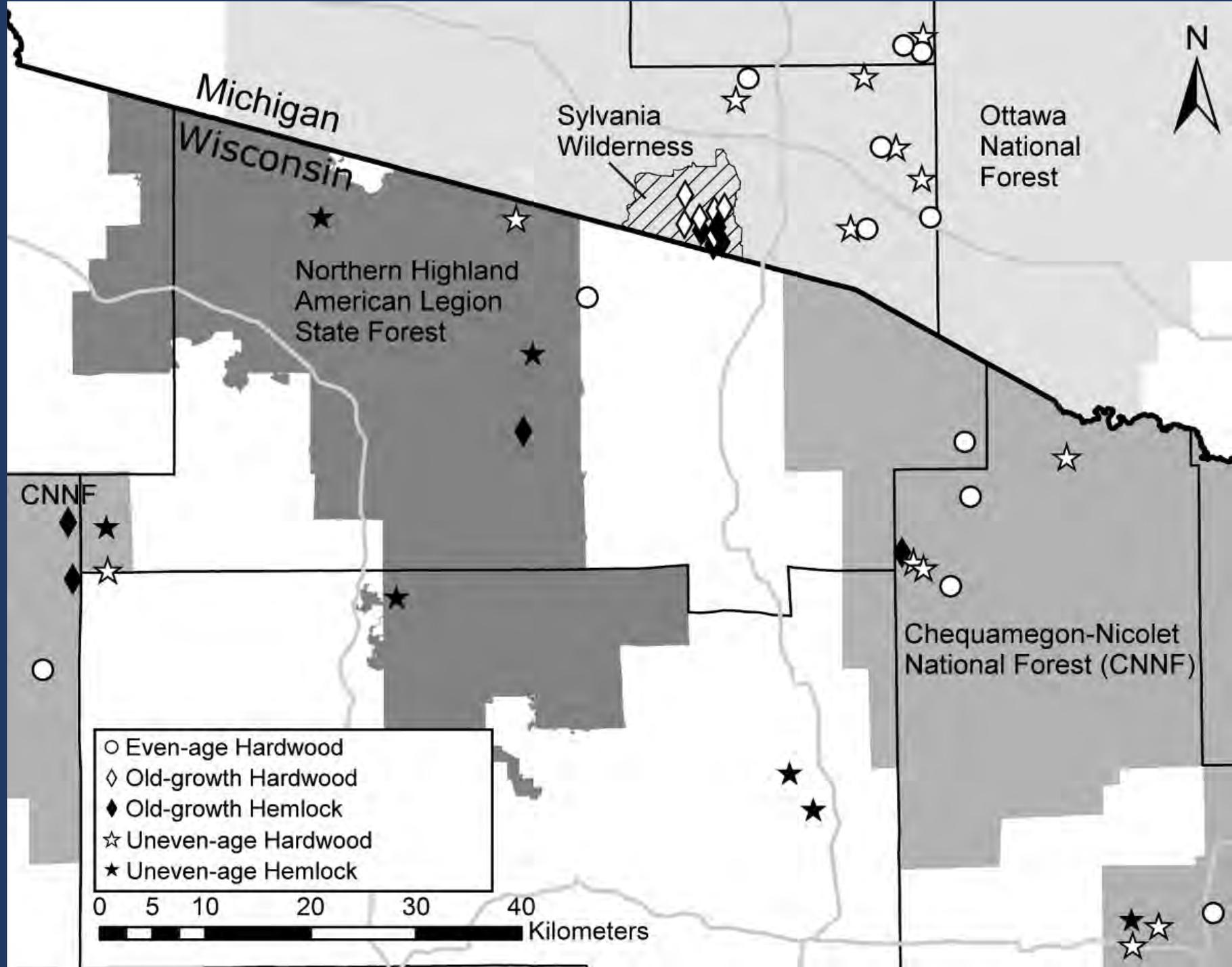
Additional SNAs and RNAs

Menominee Reservation

Outer Island managed and oldgrowth







# Study Design

Total 46 sites

## Northern Hardwoods



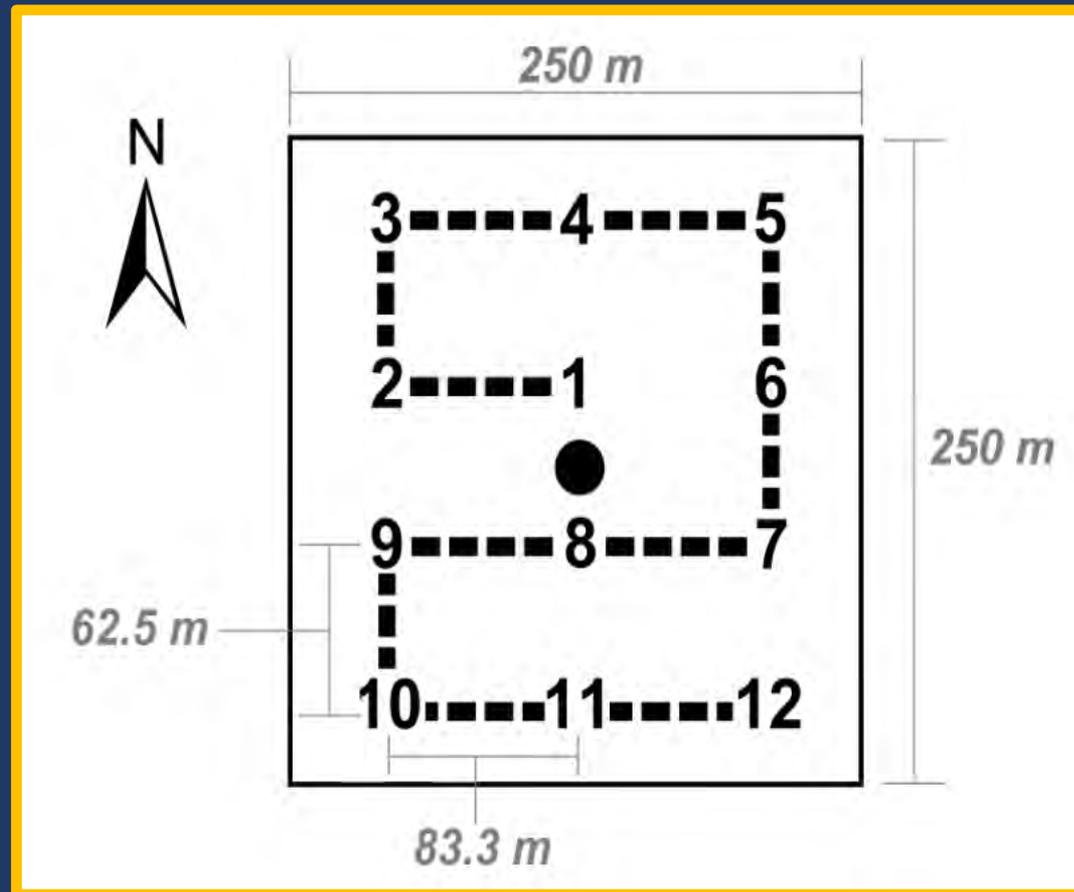
## Hemlock



# Bird Sampling

- 250x250m plots (6.25ha, 15 acre)
- 3 annual visits, 2 years
- Point-counts and 3-hr spot-map by team of 2
- Daily estimate of # individuals and pairs

Placement of 12 vegetation sampling plots and 833m-long line-intercept transect in 6.25ha study plot.



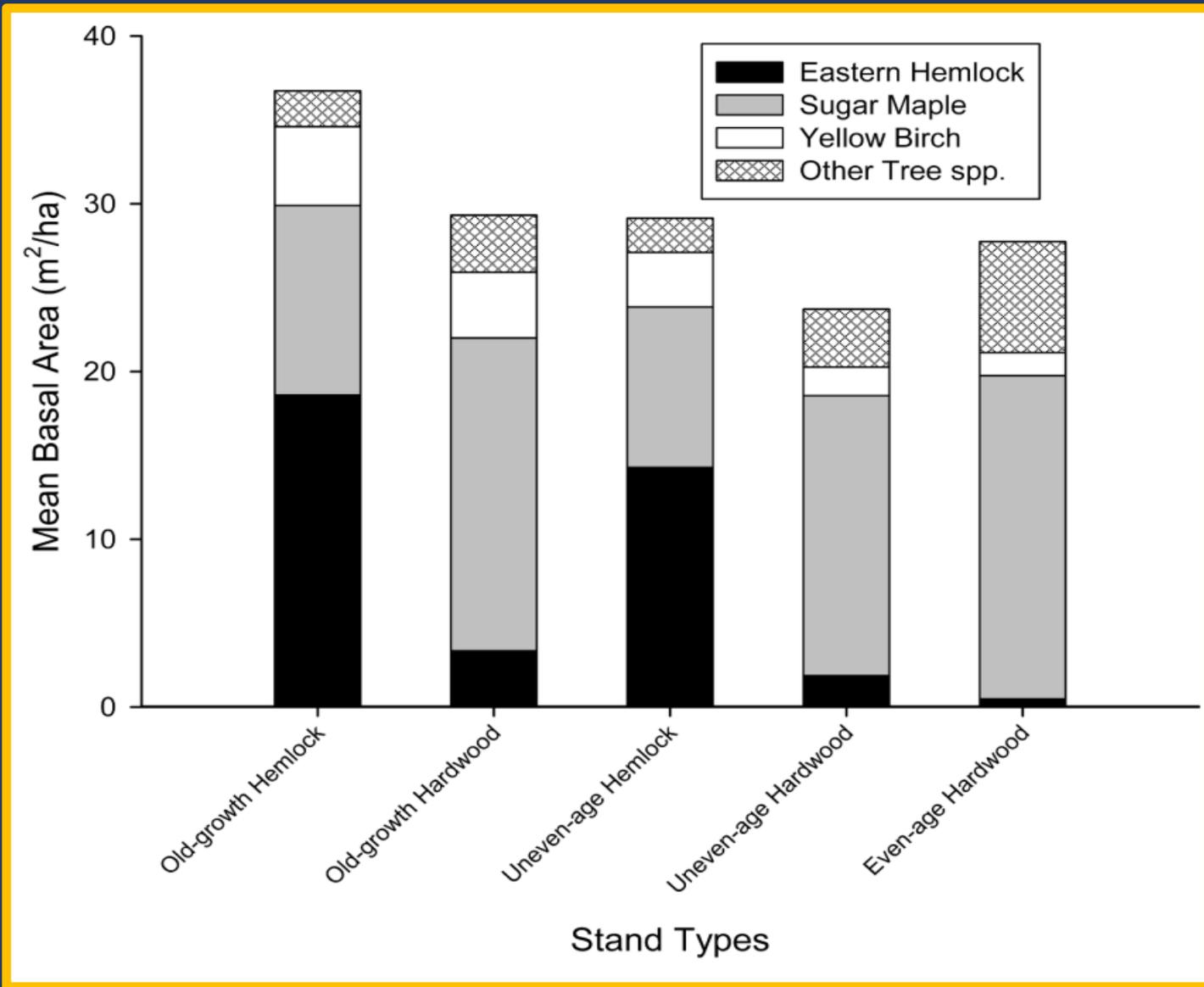
# Habitat Sampling

- 12 sampling points and 11 transect segments
- Timber cruise with 10x gauge, by 10cm size class; max canopy ht
- Woody understory stems by species and 4 ht classes in 20m<sup>2</sup>
- Snags, loose bark plates >10x10cm; tip-ups
- Canopy gaps >2.5m wide
- DWD dia, species decay class, type, origin

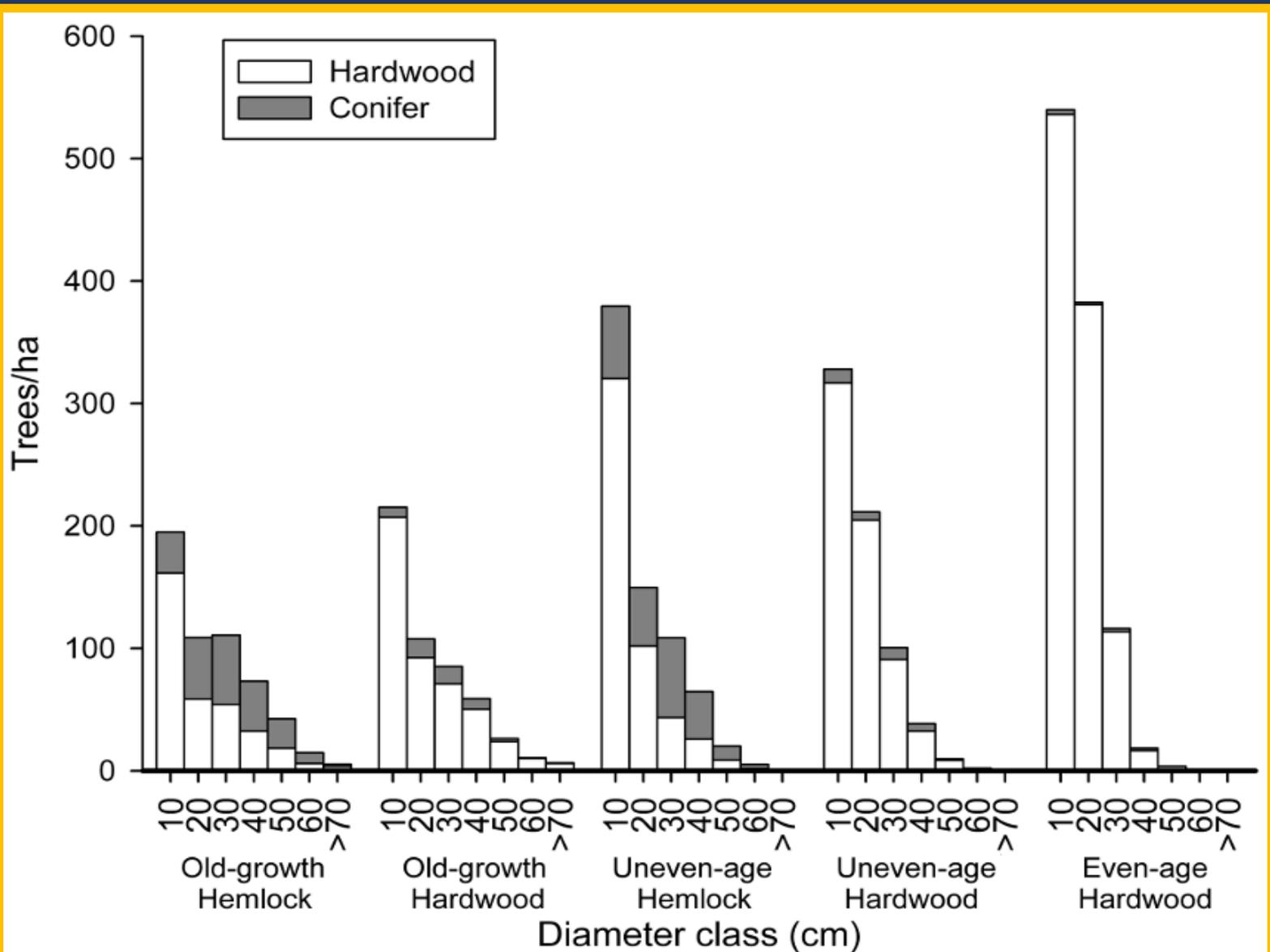
# Landscape Variables

- Distance to nearest road
- Distance to nearest water body
- % forest cover within 500m

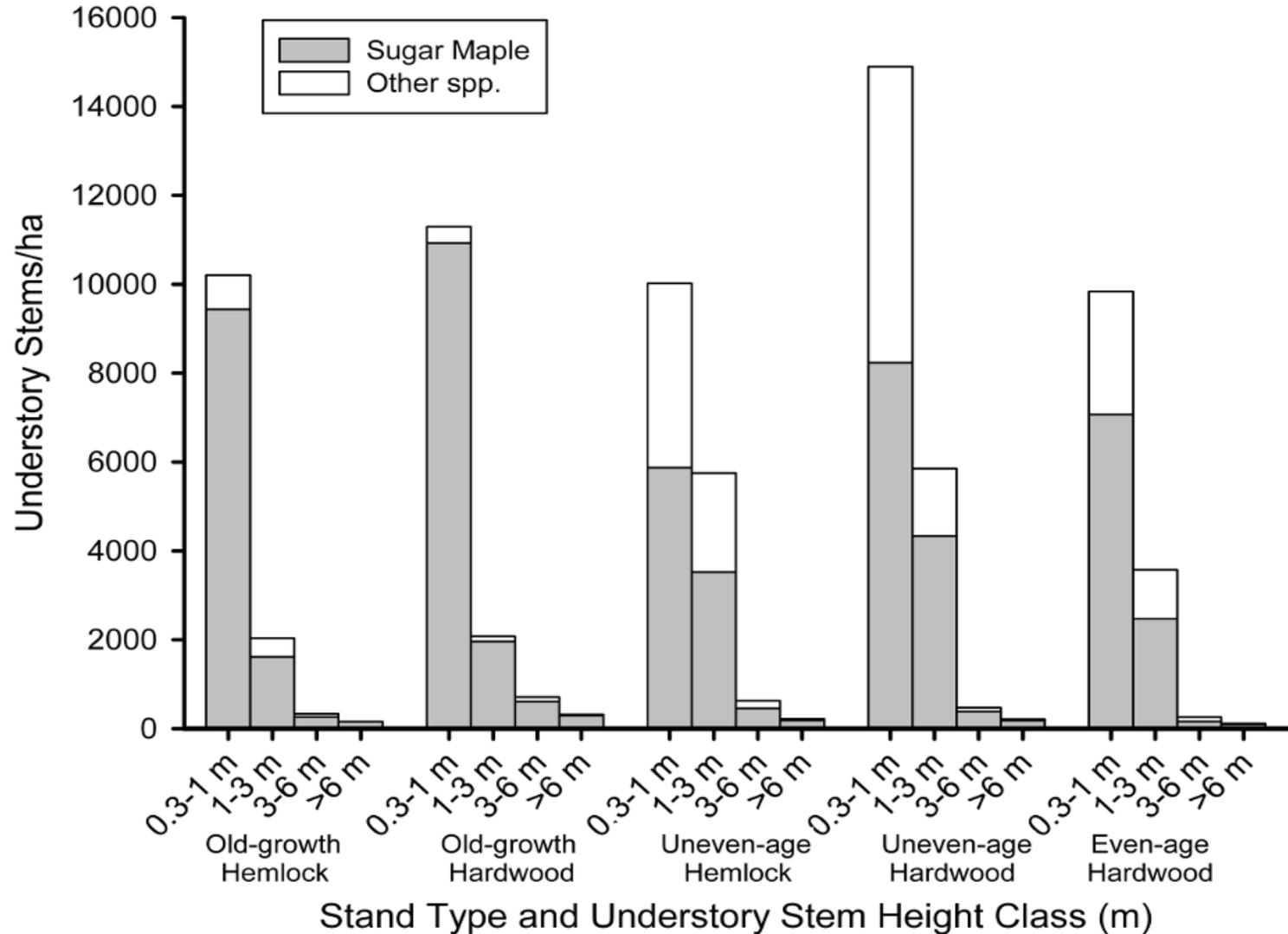
# Basal area of live trees.



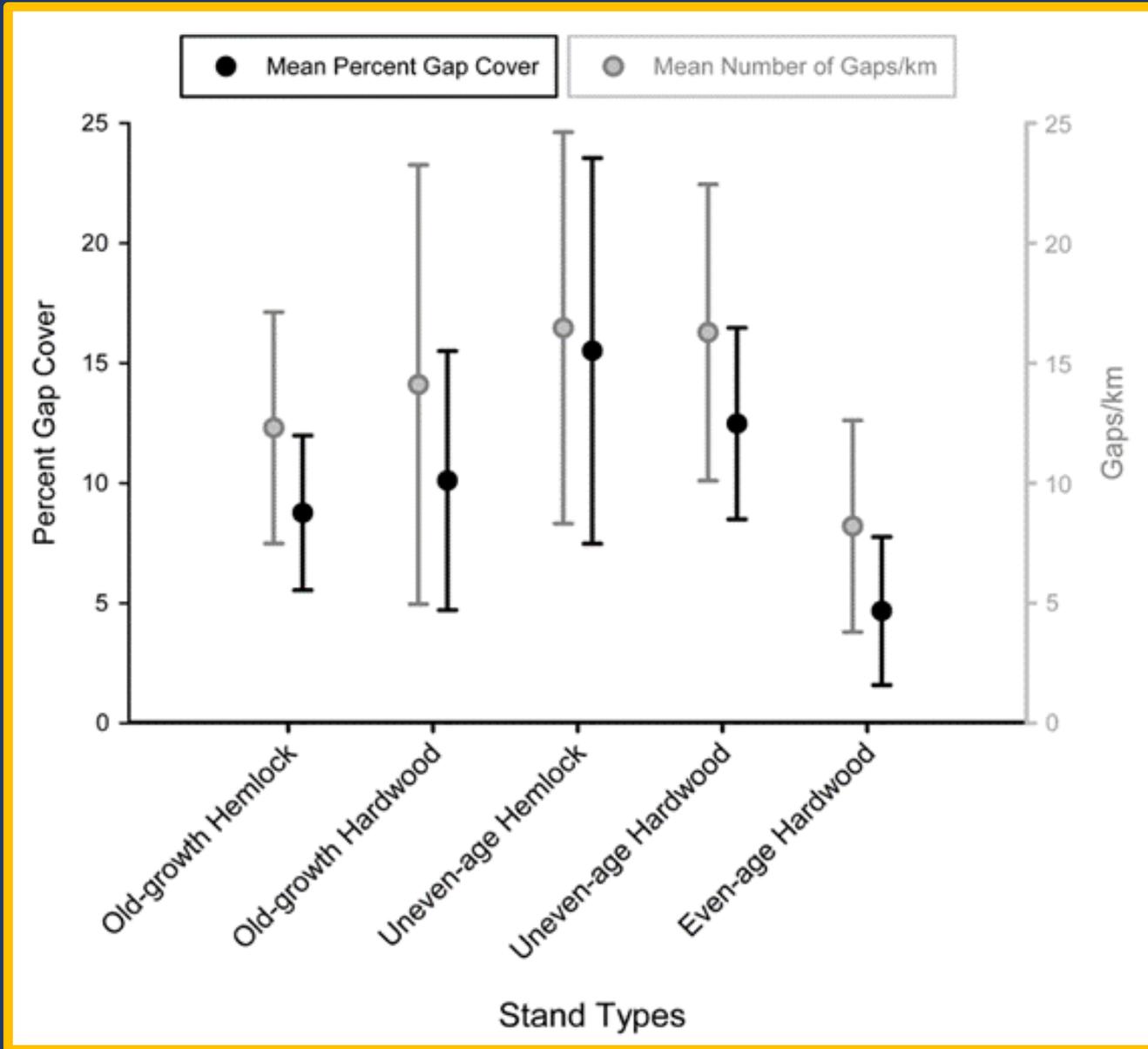
# Tree size class distribution.



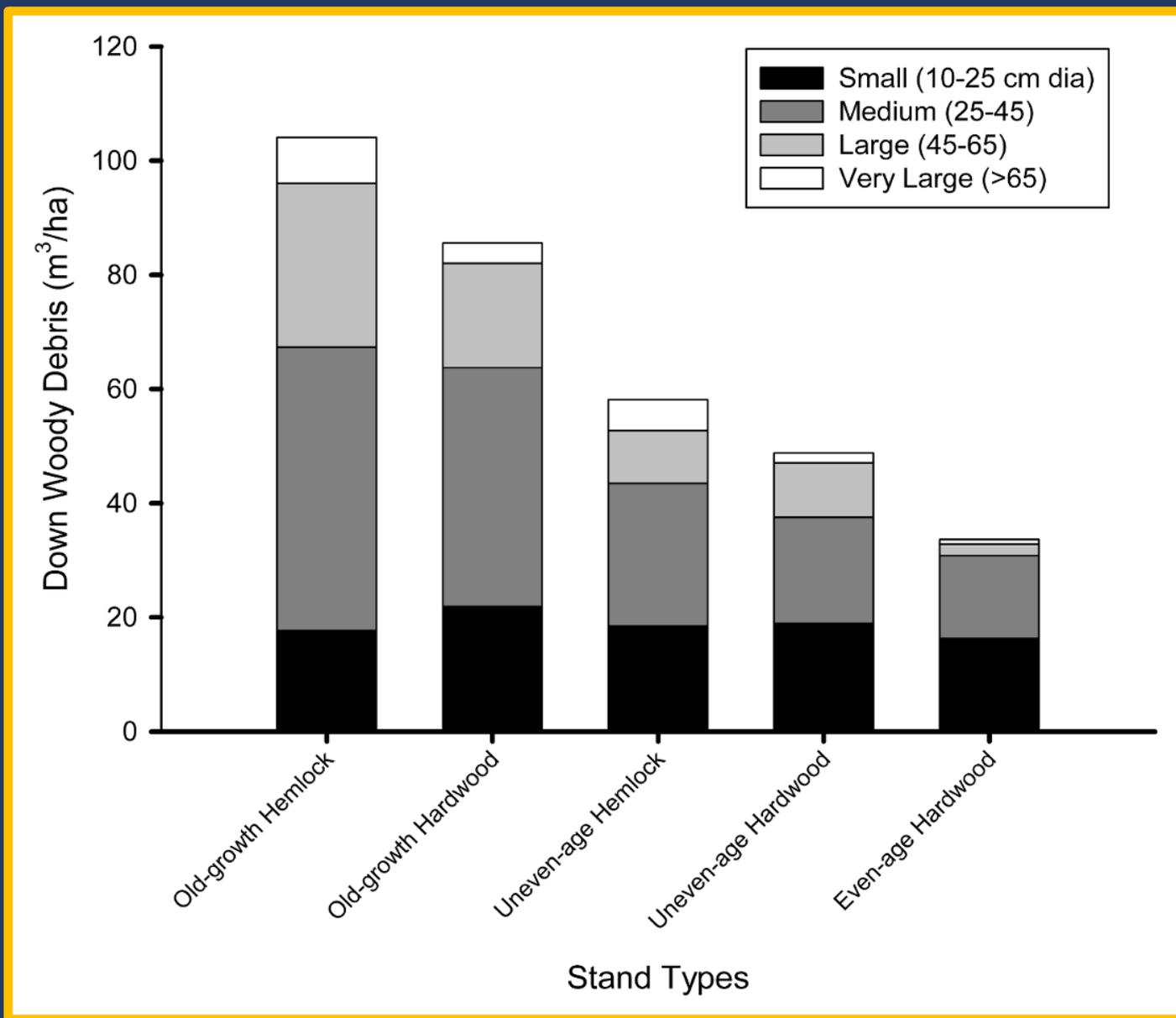
# Height class distribution of woody understory stems (<10cm dbh)



# Canopy gap frequency, % cover and 95% CI.



# Down woody debris volumes according to diameter class.



# Common Bird Species (Hardwoods)

	<u>Oldgrowth</u>	<u>Uneven-aged</u>	<u>Even-aged</u>
1	Red-eyed Vireo	Red-eyed Vireo	Red-eyed Vireo
2	Ovenbird	Black-thr. Green Warbler	Black-thr. Green Warbler
3	Black-thr. Green Warbler	Ovenbird	Ovenbird
4	Least Flycatcher	Least Flycatcher	Least Flycatcher
5	Winter Wren	Black-thr. Blue Warbler	Black-thr. Blue Warbler
6	Eastern Wood Pewee	Black-capped Chickadee	Brown Creeper
7	Blackburnian Warbler	Veery	Hermit Thrush
8	Hermit Thrush	Rose-breasted Grosbeak	Yellow-bellied Sapsucker
9	Brown Creeper	Brown Creeper	Rose-breasted Grosbeak
10	Black-capped Chickadee	Eastern Wood Pewee	Chestnut-sided Warbler

# Common Bird Species (Hemlocks)

	<u>Sylvania</u>	<u>RNA</u>	<u>Managed</u>
1	Black-thr. Green Warbler	Black-thr. Green Warbler	Black-thr. Green Warbler
2	Red-eyed Vireo	Blackburnian Warbler	Red-eyed Vireo
3	Ovenbird	Ovenbird	Ovenbird
4	Blackburnian Warbler	Red-eyed Vireo	Least Flycatcher
5	Brown Creeper	Winter Wren	Blackburnian Warbler
6	Winter Wren	Black-capped Chickadee	Black-capped Chickadee
7	Black-capped Chickadee	Hermit Thrush	Hermit Thrush
8	Northern Parula	Northern Parula	Winter Wren
9	Hermit Thrush	Golden-crowned Kinglet	Veery
10	Myrtle Warbler	Myrtle Warbler	Brown Creeper

# Modal Species: Oldgrowth Hemlock

According to PPI

- **5 canopy-nesting foliage gleaners:** Blue-headed Vireo, Golden-crowned Kinglet, Northern Parula, Blackburnian Warbler, Yellow-rumped Warbler
- **3 cavity nesters:** Red-breasted Nuthatch, Brown Creeper, Winter Wren
- **1 ground nester and forager:** Hermit Thrush

# Modal Species: Oldgrowth Hardwood

According to PPI

- **5 cavity nesters:** Downy Woodpecker, Hairy Woodpecker, Pileated Woodpecker. Great Crested Flycatcher, White-breasted Nuthatch
- **1 raptor:** Broad-winged Hawk

# Modal Species: Managed Hemlock

According to PPI

- **5 canopy/understory nesters and foliage gleaners:** Red-eyed Vireo, Black-capped Chickadee, Nashville Warbler, Mourning Warbler, Black-throated Green Warbler, Scarlet Tanager
- **3 ground feeders:** Northern Flicker Ovenbird, White-throated Sparrow
- **1 omnivore:** Blue Jay

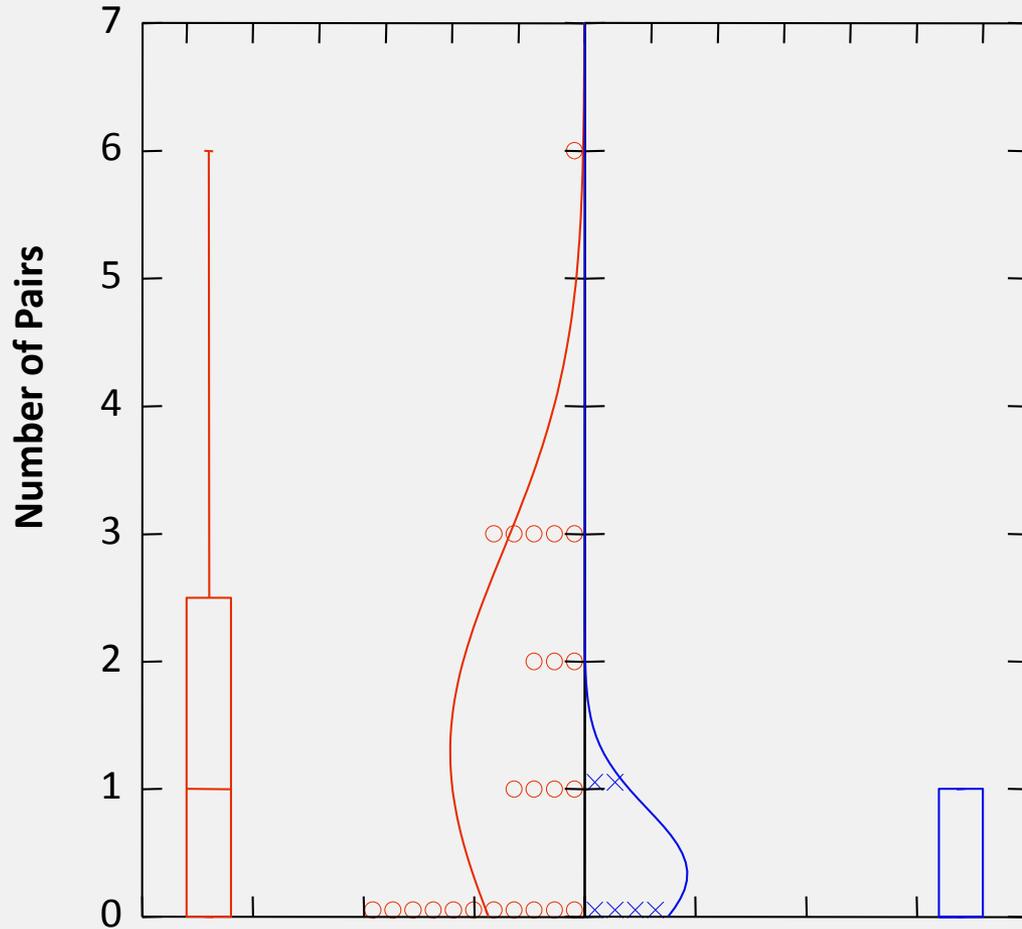
# Modal Species: Uneven-Age Managed Hardwood

According to PPI

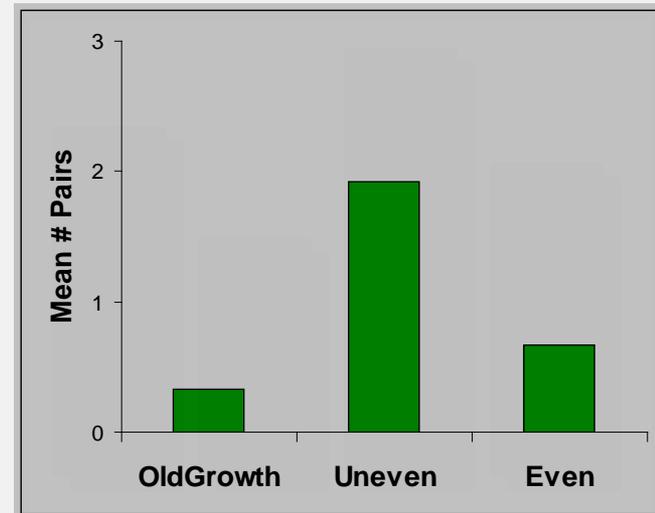
- **8 understory/low canopy nesters:** Ruby-throated Hummingbird, Least Flycatcher, Swainson's Thrush, American Robin, Cedar Waxwing, Chestnut-sided Warbler, Black-throated Blue Warbler, Rose-breasted Grosbeak
- **2 ground nesters:** Veery, Black-and-White Warbler
- **1 cavity nester:** Yellow-bellied Sapsucker



# Veery



- Managed hardwoods
- × Old growth hardwoods

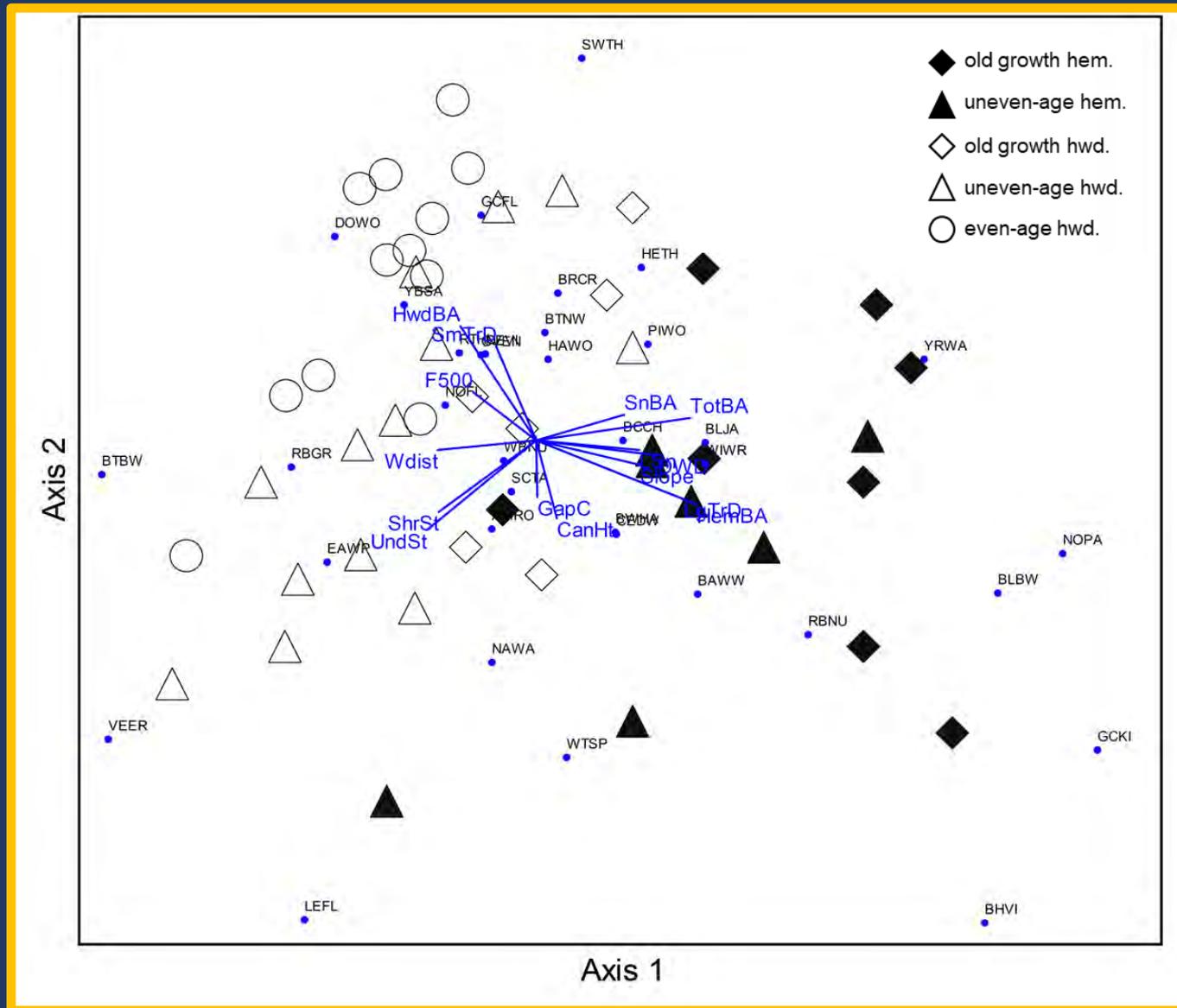


# Modal Species: Even-Age Managed Hardwood

According to PPI

- NADA

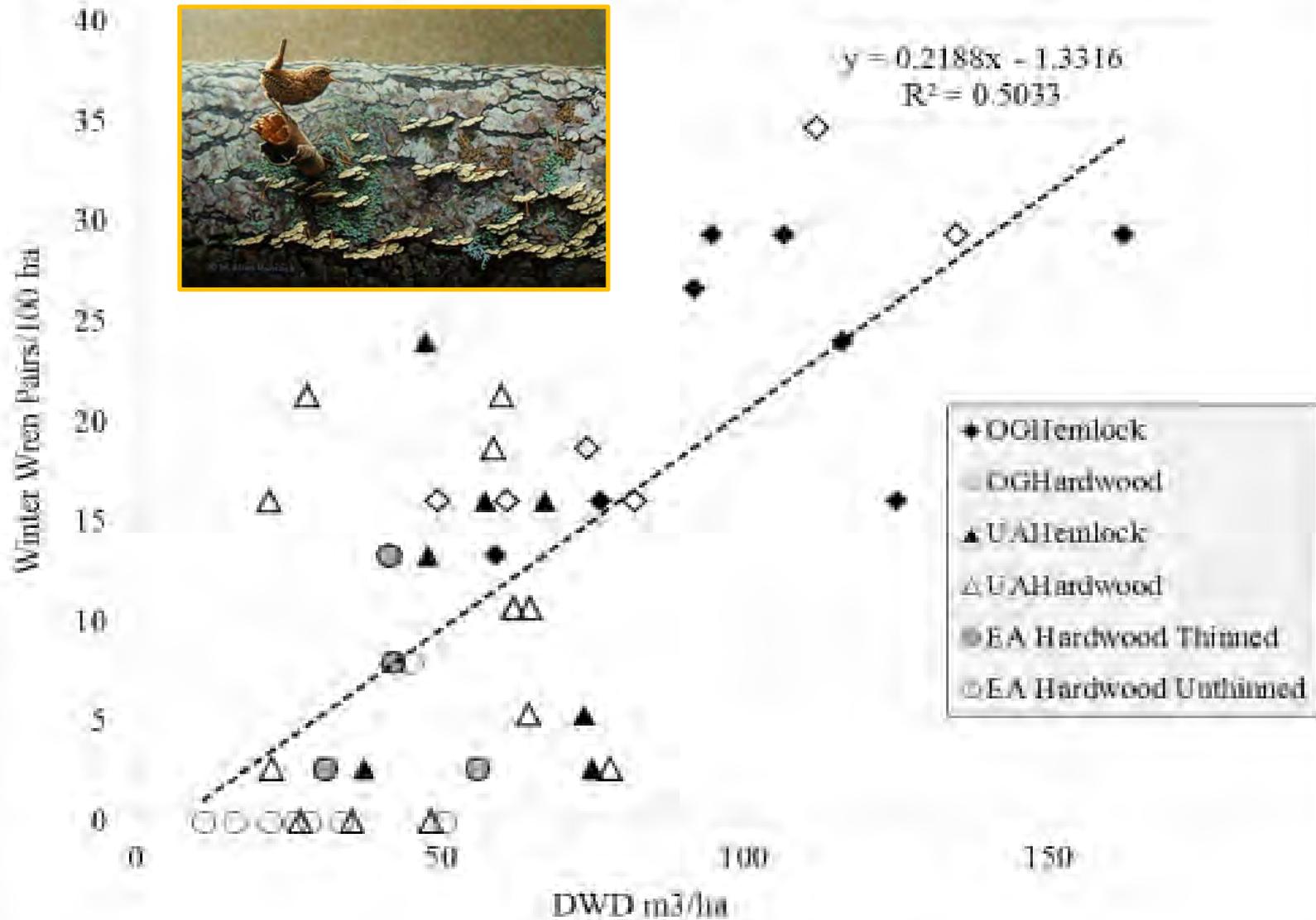
# Canonical correspondence analysis ordination of 46 forest study plots based on 16 environmental variables (CSWA, MOWA excluded).



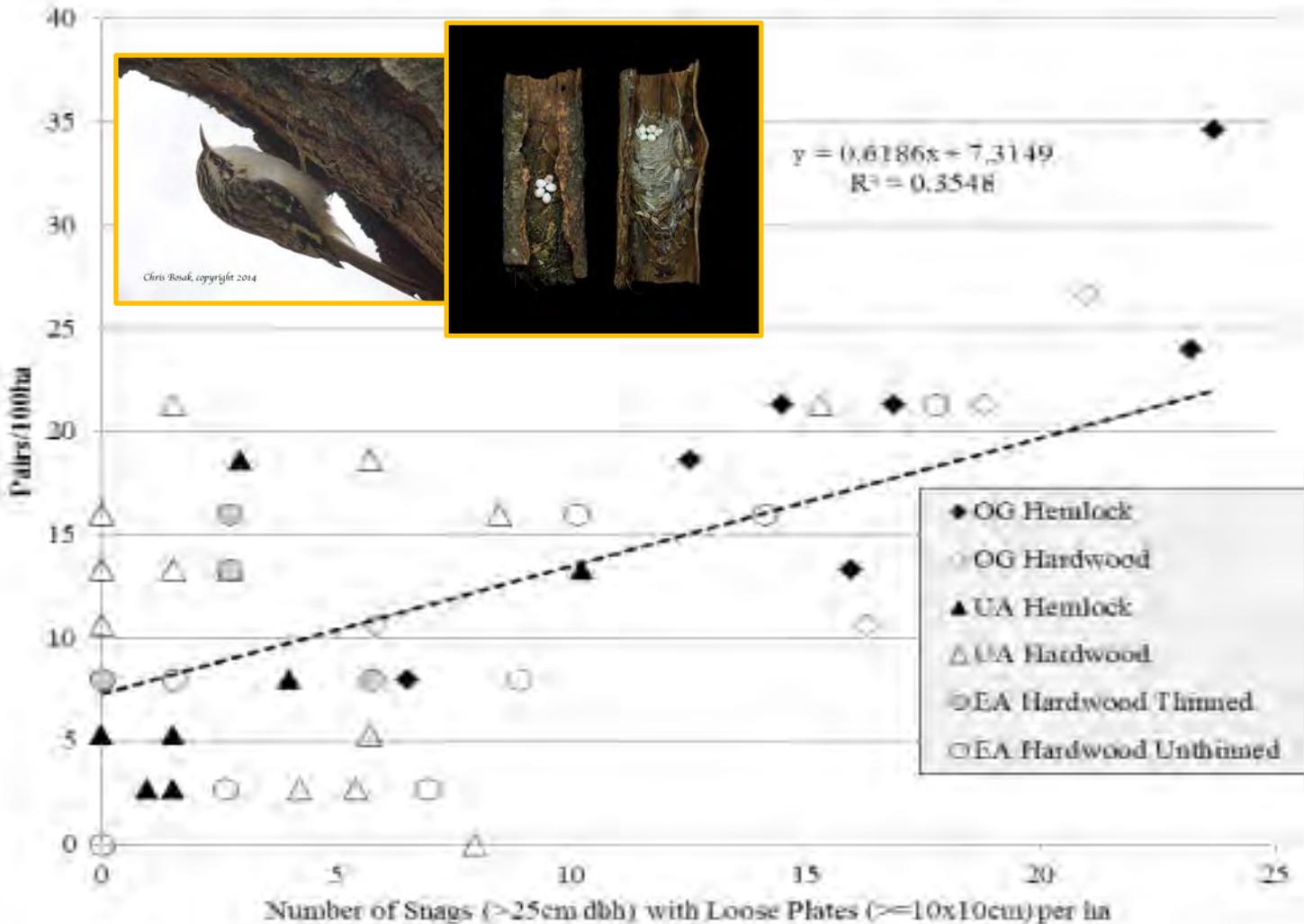




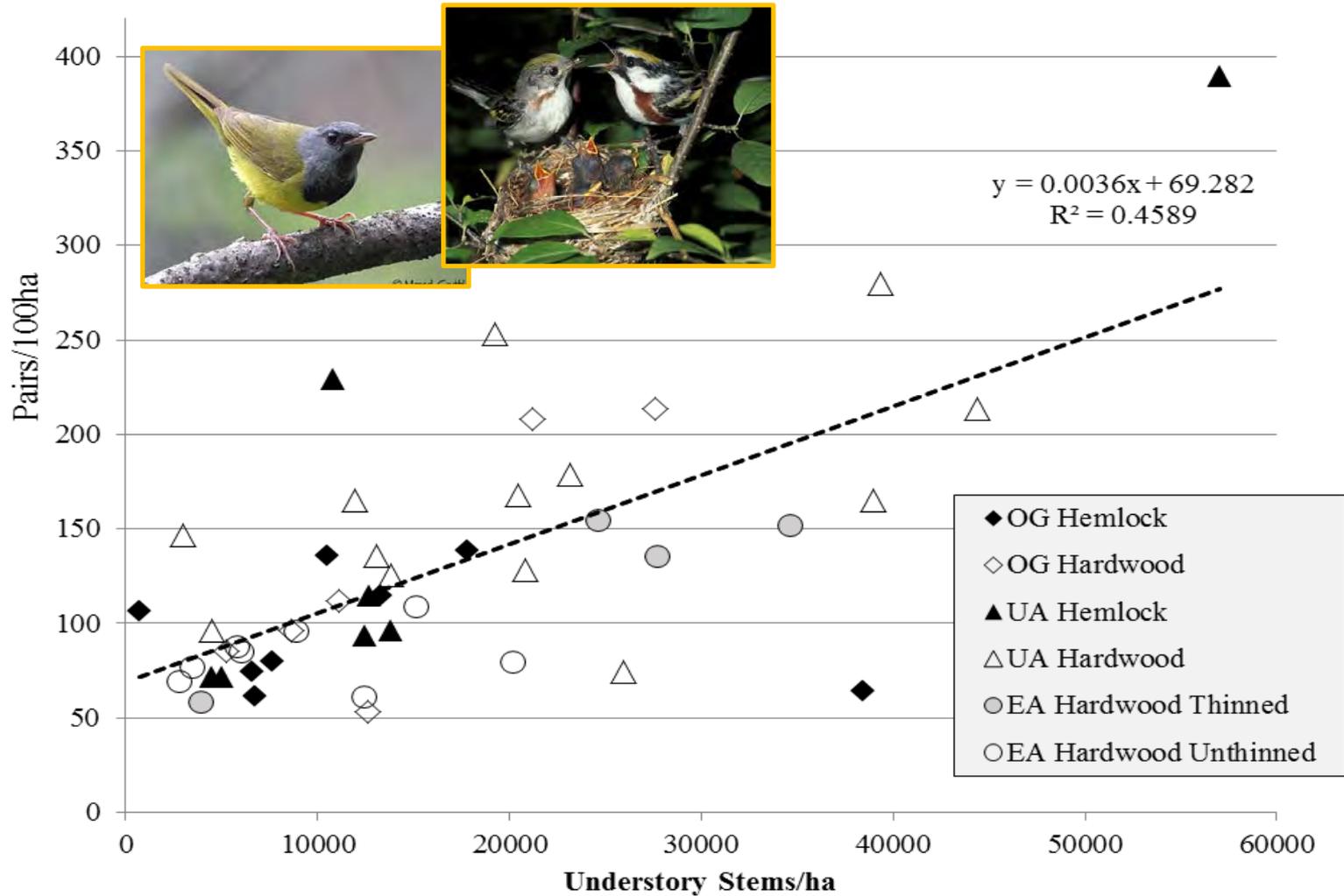
## Winter Wren Response to DWD Volume & Treatment-Type



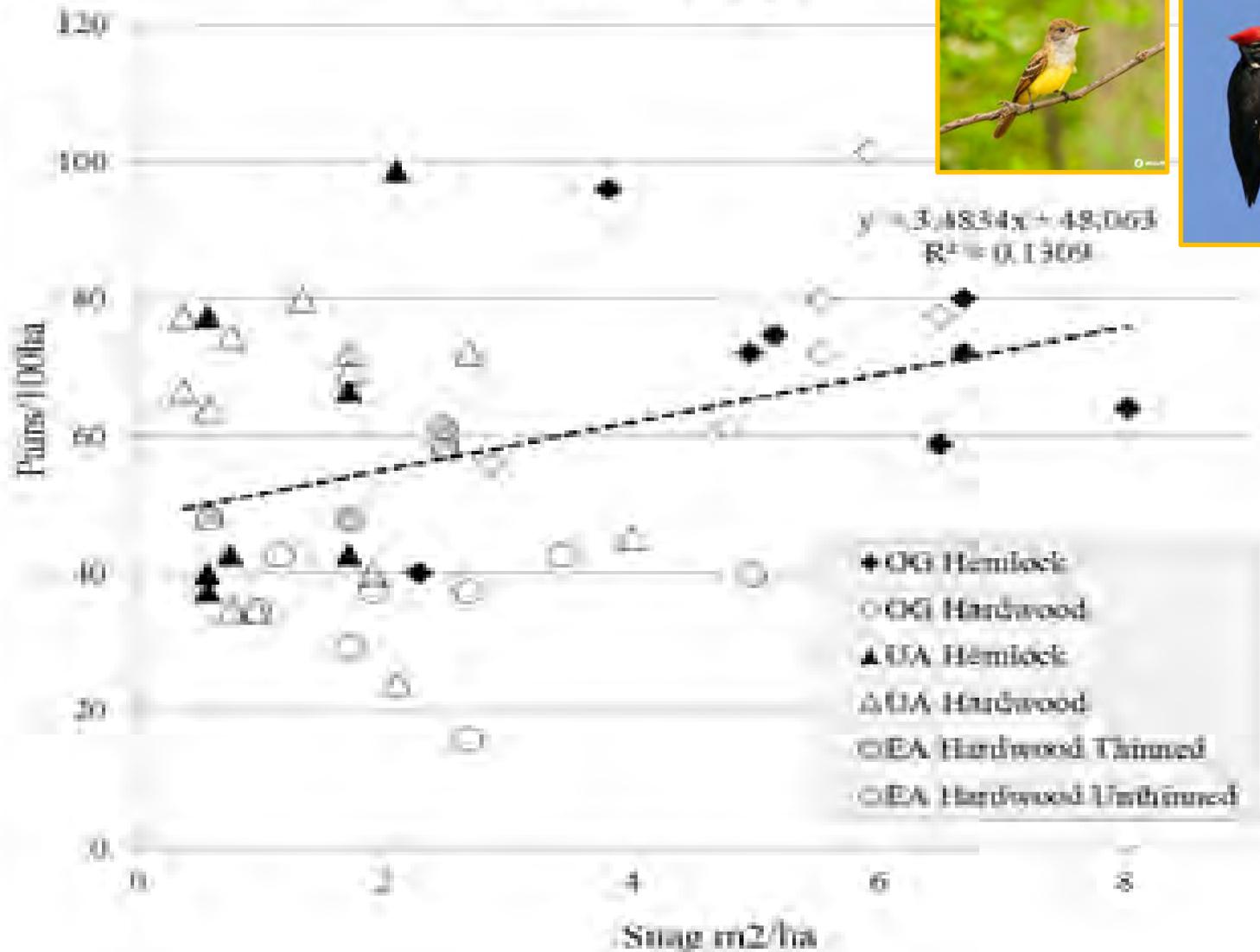
# Brown Creeper Response to Density of Snags Bearing Loose Bark Plates



## Response of Understory Nesters to Understory Stem Density and Treatment-Type



# Response of Cavity Nesters to Snag Basal Area and Treatment-Type





Isidor Jeklin





