

# Relationships between Cerulean Warblers and Forest Management on the Breeding Grounds

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## Today.....

- Review what we know about relationships with forest management
- Talk a little about forest management experiments we are conducting in the core of the range

## Levels of Evidence

- Anecdotal accounts
- Correlative studies
- Natural experiments
- Experimental studies with controls and treatments
- Effects on habitat suitability and habitat quality in terms of..
  - Occurrence
  - Productivity
  - Survival

# Forest Management and Ceruleans

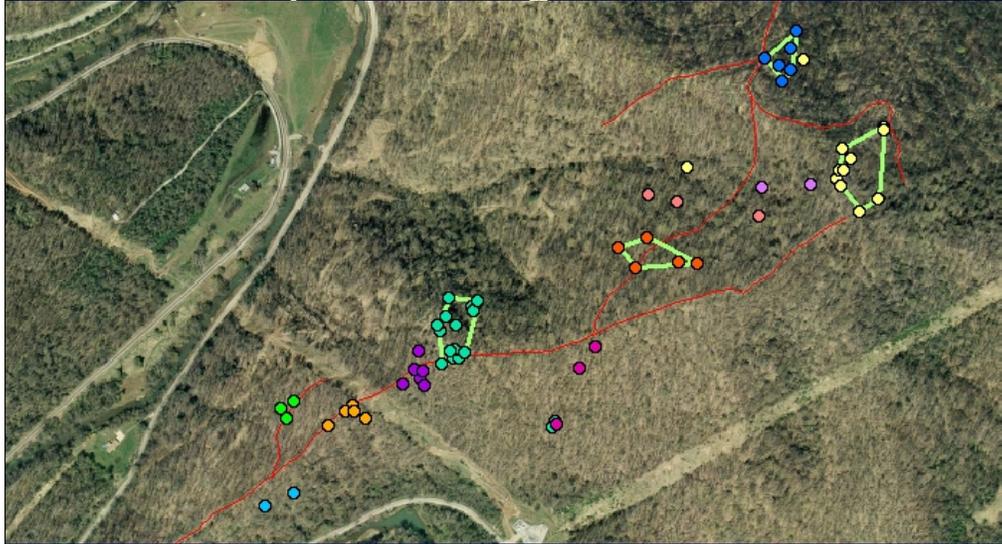
- Landscape-scale relationships
  - How does forest management affect patch size, edge, and other components important to ceruleans
- Stand-scale relationships
  - How does forest management affect stand structure and composition important to ceruleans

# Landscape-scale Relationships

- Largely forested landscapes
  - eg. Cumberland Mountains, TN- 85% forested
- and/or
- Large forest patch size
  - 700 ha- MD (Robbins et al 1992)
  - 1600 ha- Miss. Alluvial Valley (Hamel)
- Regional variation in sensitivity

## Edge vs. Gaps

- included canopy gaps / trails within territories
- did not appear to avoid open-canopy edges
- did not use powerline edges



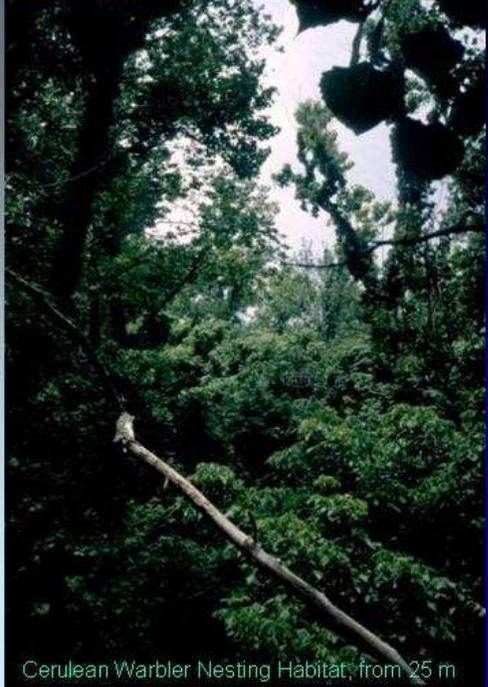
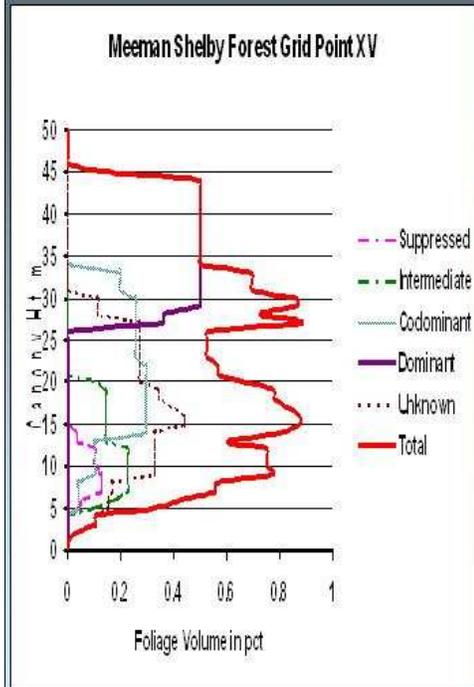
## Edge Effects?

- Reduced density (Wood et al.) and possibly reduced productivity in areas adjacent to hard edges.
- Effective distance unknown
  - Needs to be documented for different forest management types

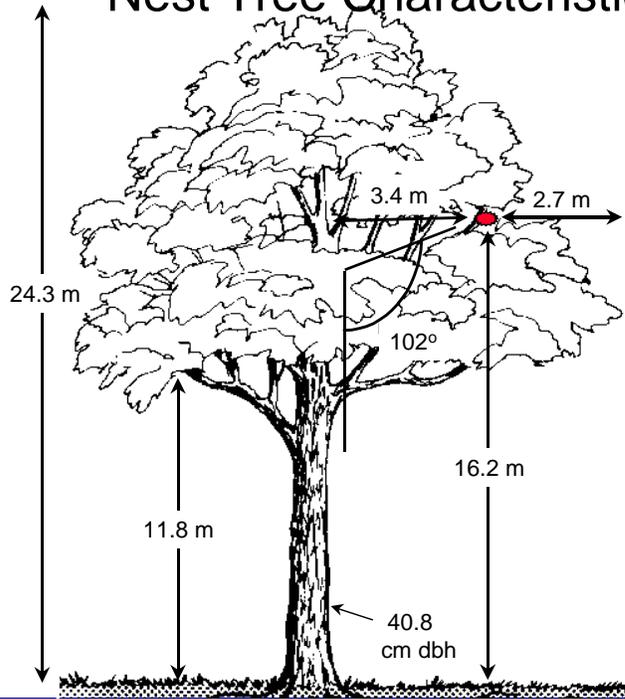
## Pennsylvania- Rodewald

- Ceruleans more likely to occur in forested landscapes disturbed by silviculture than landscapes disturbed by agriculture.
- Ceruleans used even-aged regeneration areas <5 yrs old with 100 trees/ha residual.
- Ceruleans most common in unharvested stands with natural tree-fall gaps.

# Habitat Use



# Nest Tree Characteristics



West Virginia: Wood et al.

## two-age harvests

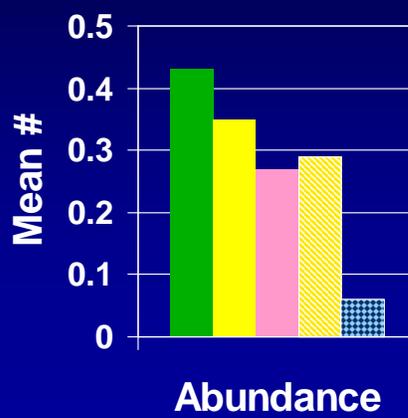
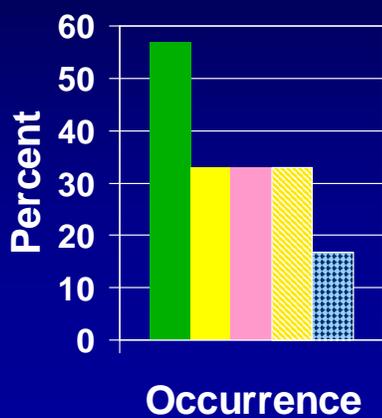
Photo by Gary Miller



Photo by Tim Dellinger



## Cerulean occurrence and abundance



## Pennsylvania: Stoleson et al.

- Shelterwood cuts with prescribed burning had greater cerulean occurrence than uncut controls.

C. Kellner. 2002. Influence of group selection on populations of cerulean warblers in the Ozark National Forest of Arkansas. Unpubl. report.

- Population densities fluctuated widely but generally were declining in stands with group selection for one rotation and also in controls.
- Return rates were greater in stands with groups although sample sizes were very small.
- Felt that thinning between groups had negative effects on ceruleans.

## Ontario: Jones et al.

- Canoe Lake, ON
  - Study site had annual single-tree selection harvest during last 10 years.
  - No change in density from 1994-2000
  - Breeding success was high when monitored.
  - No pre-treatment density estimates.

## Wayne National Forest, OH: Flegel

- 1992
  - Group selection harvest
    - 2 ac groups, up to 25% of stand area harvested
  - Single-tree selection harvest
- No ceruleans found in group selection stand
- More ceruleans found in single-tree selection stand than in adjacent uncut areas.

## Wisconsin: Hoffman

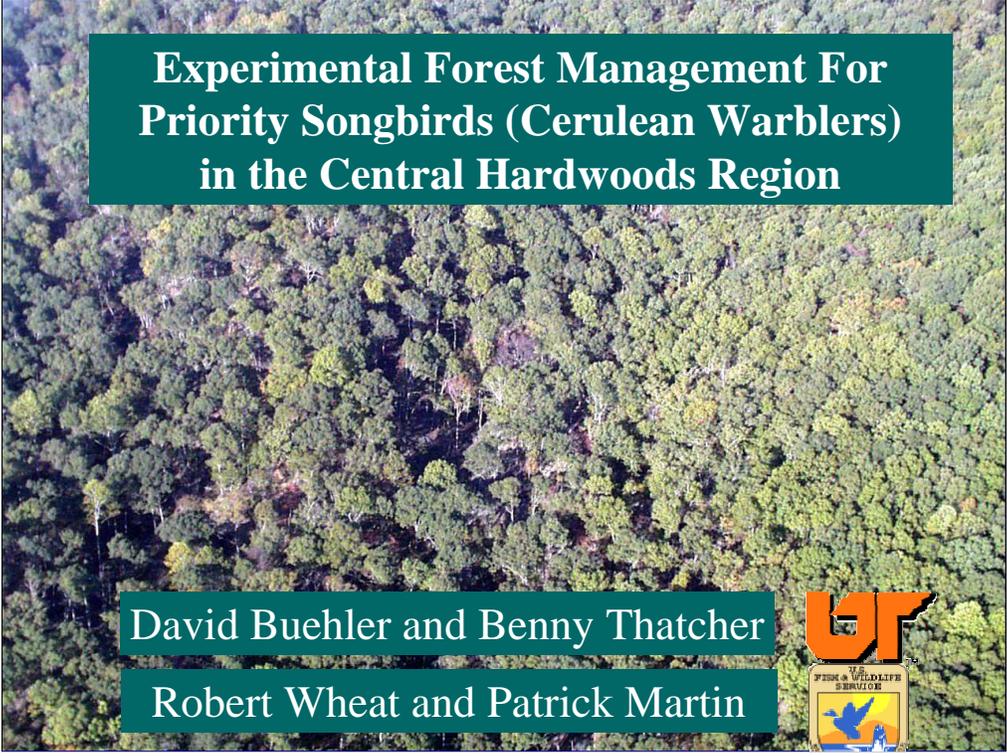
- Kettle Moraine State Forest
  - Thinning treatment on mature hardwood forest reduced canopy cover to 70%.
  - No change in pre-harvest cerulean densities.

## Tennessee Cumberland Mtns: Buehler et. al

- Ceruleans continued to use forest stands that had been commercially “clearcut” with ~10 ft<sup>2</sup>/ac (2.5 m<sup>2</sup>/ha) residual basal area.
- Densities were lower in the harvested area than in adjacent uncut stands.

Jones et al. 2001. Assessing the effects of natural disturbance on a neotropical migrant songbird. *Ecology* 82:2628-2635.

- Ice storm significantly opened canopy of study site.
- Territory size in the year of disturbance was similar to previous years but nest success was much lower.
- Territory size and nest success increased in the second year post-disturbance although nest success did not reach pre-disturbance levels.
- Cerulean showed some flexibility in territory size and habitat selection in response to changing habitat conditions.



**Experimental Forest Management For  
Priority Songbirds (Cerulean Warblers)  
in the Central Hardwoods Region**

**David Buehler and Benny Thatcher**

**Robert Wheat and Patrick Martin**



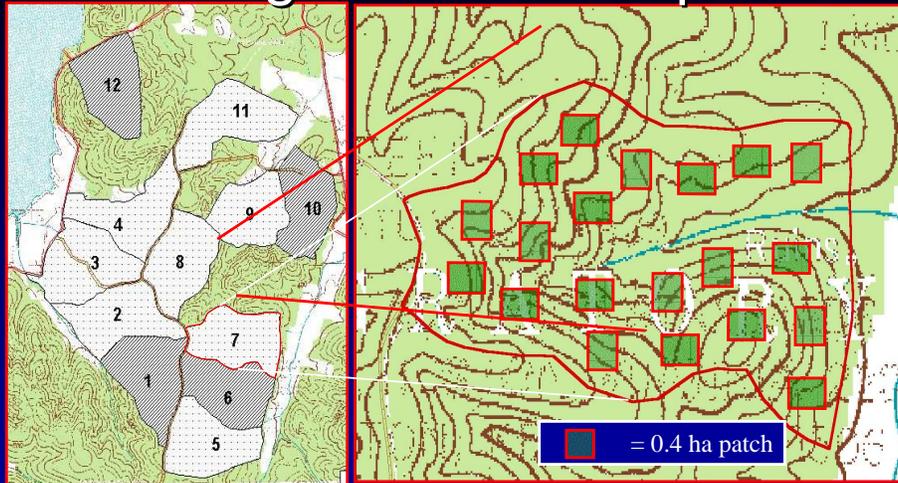
# Experimental Silvicultural Prescription for Ceruleans

Goal: Increase forest structural diversity to improve breeding habitat quality for regional priority songbirds (Cerulean Warbler among others).

- Timber harvest to create canopy gaps
- Increase light, moisture, nutrients
- Accelerate crown and diameter growth
- Promote development of understory & mid-story vegetation

- TNWR developed an experimental silvicultural prescription
- Selection cutting proposed as an approach to rectify habitat deficiencies.
- 
- The experimental prescription called for tree harvest to reduce average canopy closure to 60% across the stand.
- Implemented in a series of 0.4 ha blocks [SEEN DIAGRAMATICALLY ON THE SLIDE] that would be distributed evenly throughout the stand. [~25% of stand- check!!]
- Canopy closure within these blocks would be reduced to 40%, thus mimicking a series of tree-fall gaps within the blocks.
- Canopy closure would be reduced to 70% elsewhere across stand.
- Because this unique harvest was designed not for market production, but rather for forest songbirds
- They would retain hard and soft mast producing species and cavity trees.
- And retain the larger trees, while selectively removing co-dominants.
- Removal of co-dominants would allow remaining canopy trees to get larger, and would increase sunlight penetration, thus stimulating vegetative growth
- The hypothesis was that the tree removal would increase sunlight penetration and stimulate vegetative growth and therefore lead to increased vertical structure and improved species composition, particularly at the understory and midstory levels
- This would increase nesting and foraging substrate and therefore improve habitat quality

# Management Prescription



- Canopy closure: 40% in patches, 70% in matrix
- Retain: large trees, cavity trees, mast species

- The experimental prescription called for tree harvest to reduce average canopy closure to 60% across the stand.
- Implemented in a series of 0.4 ha (1 ac ) patches [SEEN DIAGRAMATICALLY ON THE SLIDE] that would be distributed evenly throughout the stand. [~25% of stand- check!!]
- Canopy closure within patches reduced to 40%, thus mimicking a series of tree-fall gaps within the blocks.
- Canopy closure in surrounding forested matrix to 70%.
- Because this unique harvest was designed for avian conservation, not market production,
- They would retain hard and soft mast producing species and cavity trees.
- And retain the larger trees, while selectively removing co-dominants.
- Removal of co-dominants would allow remaining canopy trees to get larger, and would increase sunlight penetration, thus stimulating vegetative growth
- The hypothesis was that the tree removal would increase sunlight penetration and stimulate vegetative growth and therefore lead to increased vertical structure and improved species composition, particularly at the understory and midstory levels
- This would increase nesting and foraging substrate and therefore improve habitat quality
- This would be evidenced by increases in population density and nest survival rates

# Vegetative Response



Pre-treatment

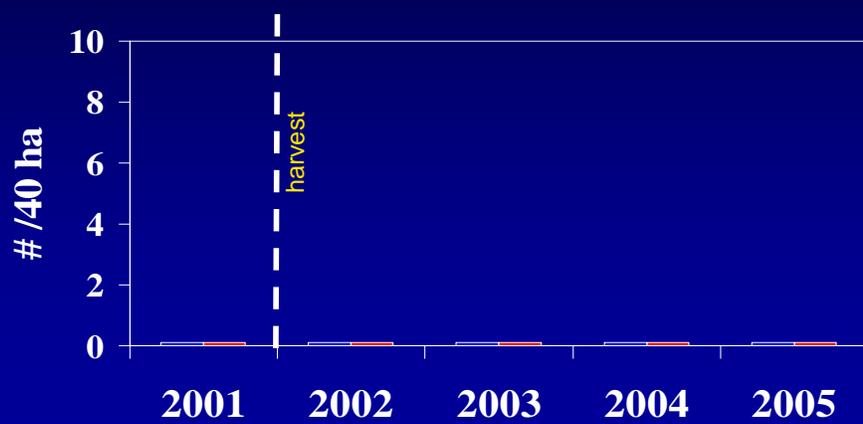


Year 1 Post-treatment



# Cerulean Warbler

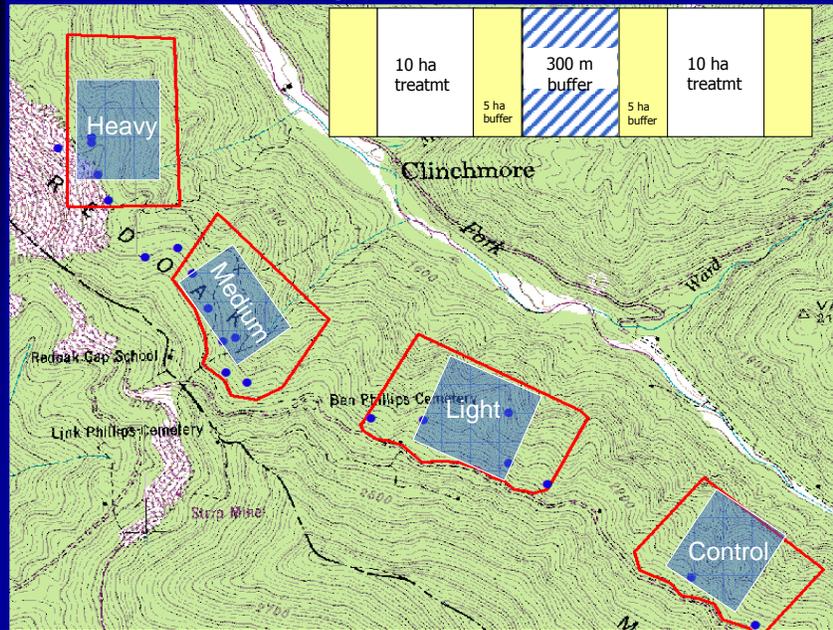
Control Harvest



# CWTG Forestry Experiment

- Funded by NFWF, forest industry, NFs, state wildlife agencies, TNC, and others.
  - 7 sites (KY, OH, TN-2, WV-3)
- 4 Treatments
  - Heavy: harvest to 20 ft<sup>2</sup>/ac BA, remove all other woody stems > 5 cm
  - Moderate: harvest to 55 ft<sup>2</sup>/ac BA, remove all other woody stems > 5 cm
  - Light: harvest to 75-80 ft<sup>2</sup>/ac BA
  - Control: unharvested
- Pretreatment 2005-2006
- Treatments summer-fall 2006
- Monitoring through 2009 at least.

# Experimental Design Sundquist Forest, TN



## Heavy Treatment Sundquist Forest, TN



# Results

- Stay tuned.....

# Summary

## Forest Management and Ceruleans

- Landscape-level
  - Issues that need to be addressed (edge effects and patch size)
  - Research: document effective distances
- Stand-level
  - Response varies with intensity of treatment
    - Light-intensity treatments may be beneficial at least in terms of density effects
  - Research:
    - duration of effects
    - effects on productivity and survival

# One more thing!

## Cerulean Habitat Recovery

- Human development => probably never
- Mining => unknown
  - Key is the success of reforestation reclamation option
- Forest Management
  - Dependent on management regime
    - Clearcutting => 40+ years?
    - Alternative methods => may maintain habitat suitability throughout rotation although habitat quality may go down and then recover over time with harvest