The background of the slide is a photograph of a clear blue sky with some light, wispy clouds. In the foreground, there are several green tree branches with leaves, some of which are slightly out of focus. The branches are scattered across the frame, with a larger cluster on the right side and smaller ones on the left and bottom edges.

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

David A. Buehler, University of Tennessee

Petra Bohall Wood, USGS WV Coop. Fish & Wildlife Research Unit

Paul B. Hamel, Center for Bottomland Hardwoods, USFS Southern Research Station

# Today.....

- Update on cerulean relationships with forest management.
- Talk a little about the forest management experiment we are conducting in the core of the range.

# Forest Management and Ceruleans

- Landscape scale relationships
  - How does forest management affect patch size, edge, and other components important to cerulean....
    - Occurrence
    - Productivity
    - Survival
- Stand scale relationships
  - How does forest management affect stand structure and composition important to cerulean.....
    - Occurrence
    - Productivity
    - Survival

# Studies on Ceruleans and Forest Management

- Anecdotal observations
- Point counts
- Reproductive success
- Return rates
- Experimental treatments
  - Before and after with controls

West Virginia: Wood et al.

# two-age harvests

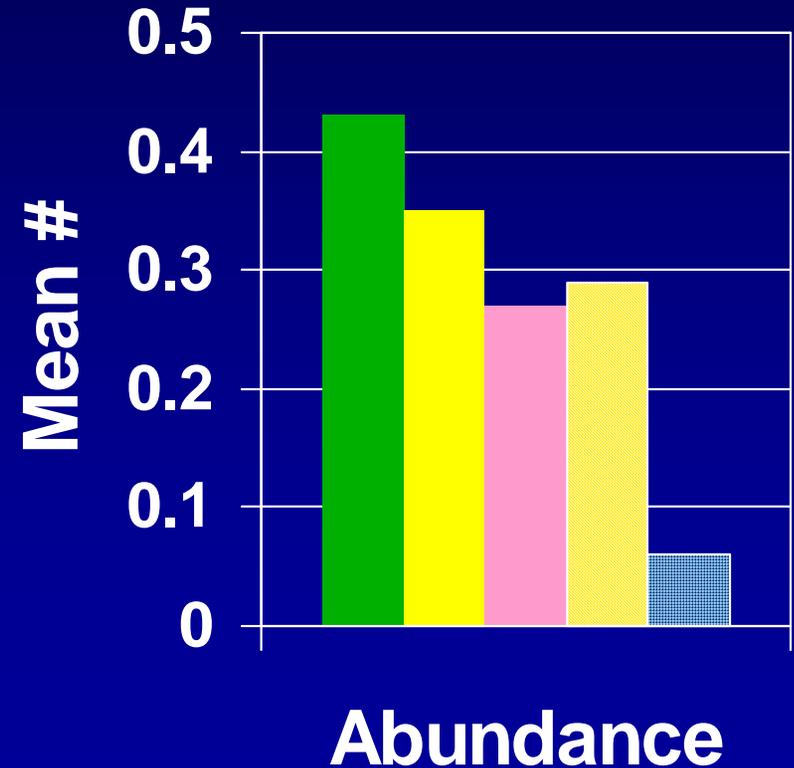
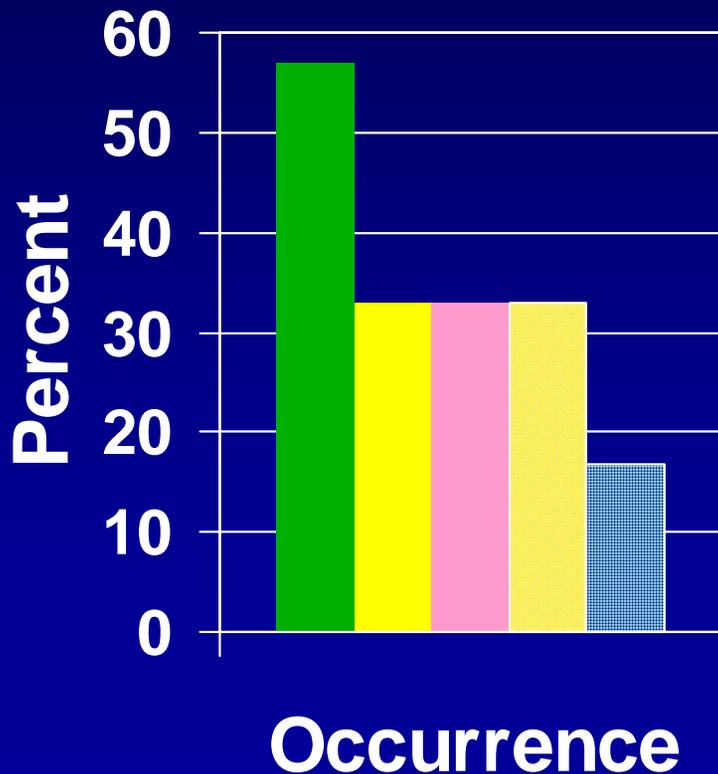
Photo by Gary Miller

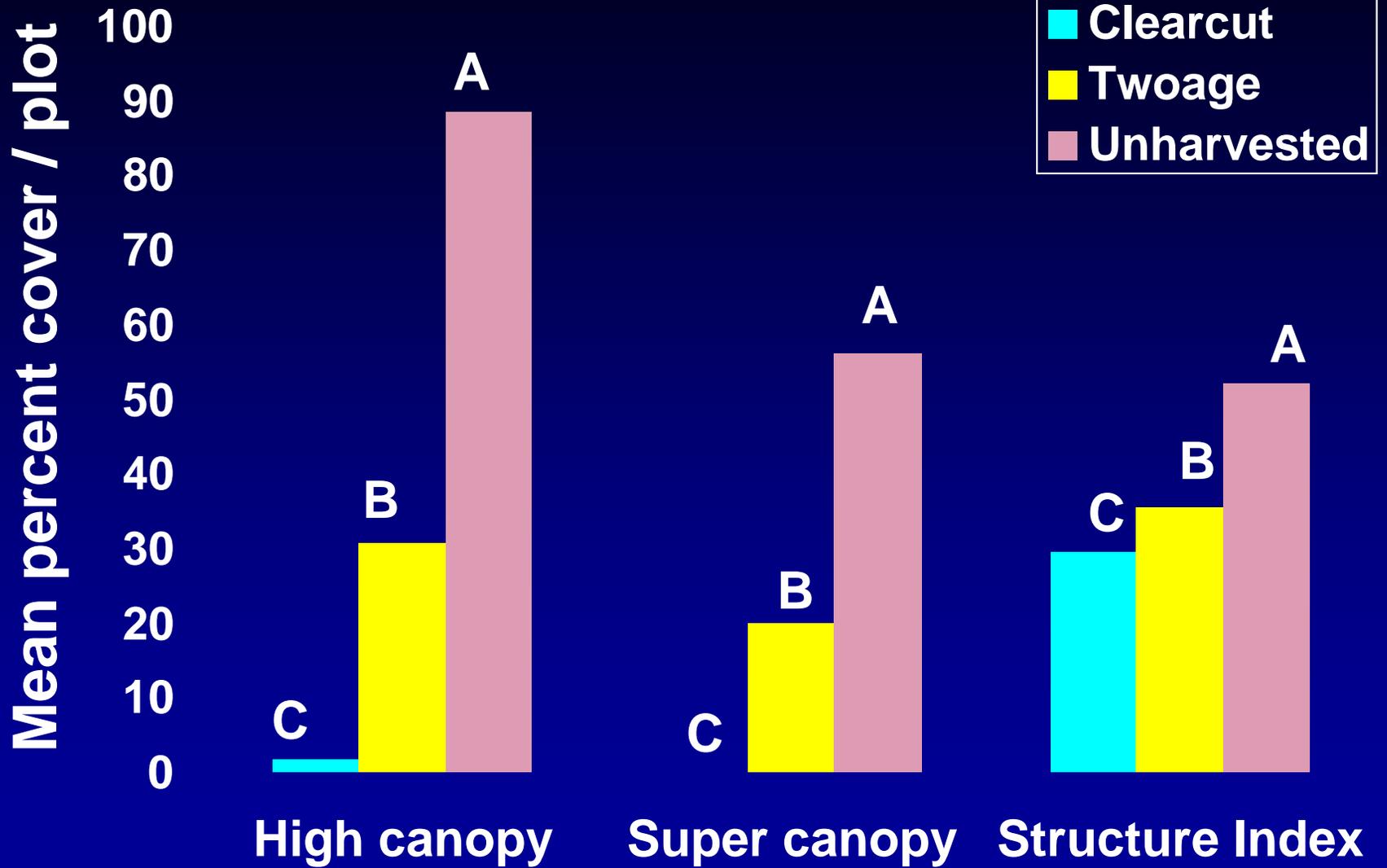


Photo by Tim Dellinger



# Cerulean occurrence and abundance





# 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.

# 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  $\sim 10 \text{ ft}^2/\text{ac}$  ( $2.5 \text{ m}^2/\text{ha}$ ) 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.

# Silvicultural Prescriptions

- Do we manage the species by applying standard silvicultural prescriptions and measuring response by Cerulean Warblers  
or
- Do we manage the species by designing a specific Cerulean Warbler prescription?

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

David Buehler and Benny Thatcher

Robert Wheat and Patrick Martin

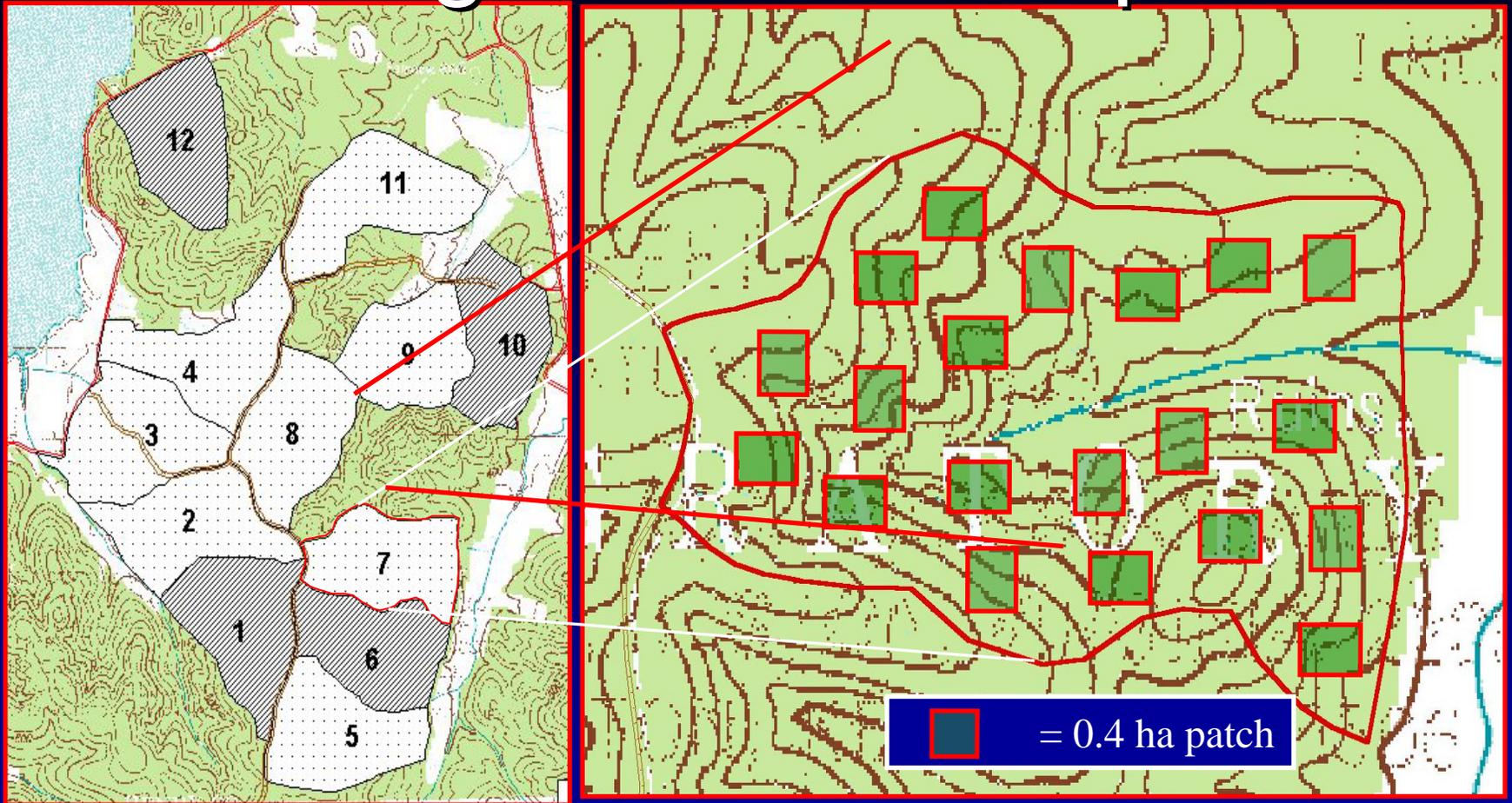


# Experimental Silvicultural Prescription for Ceruleans

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

# Management Prescription



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



Harvest unit

Control unit



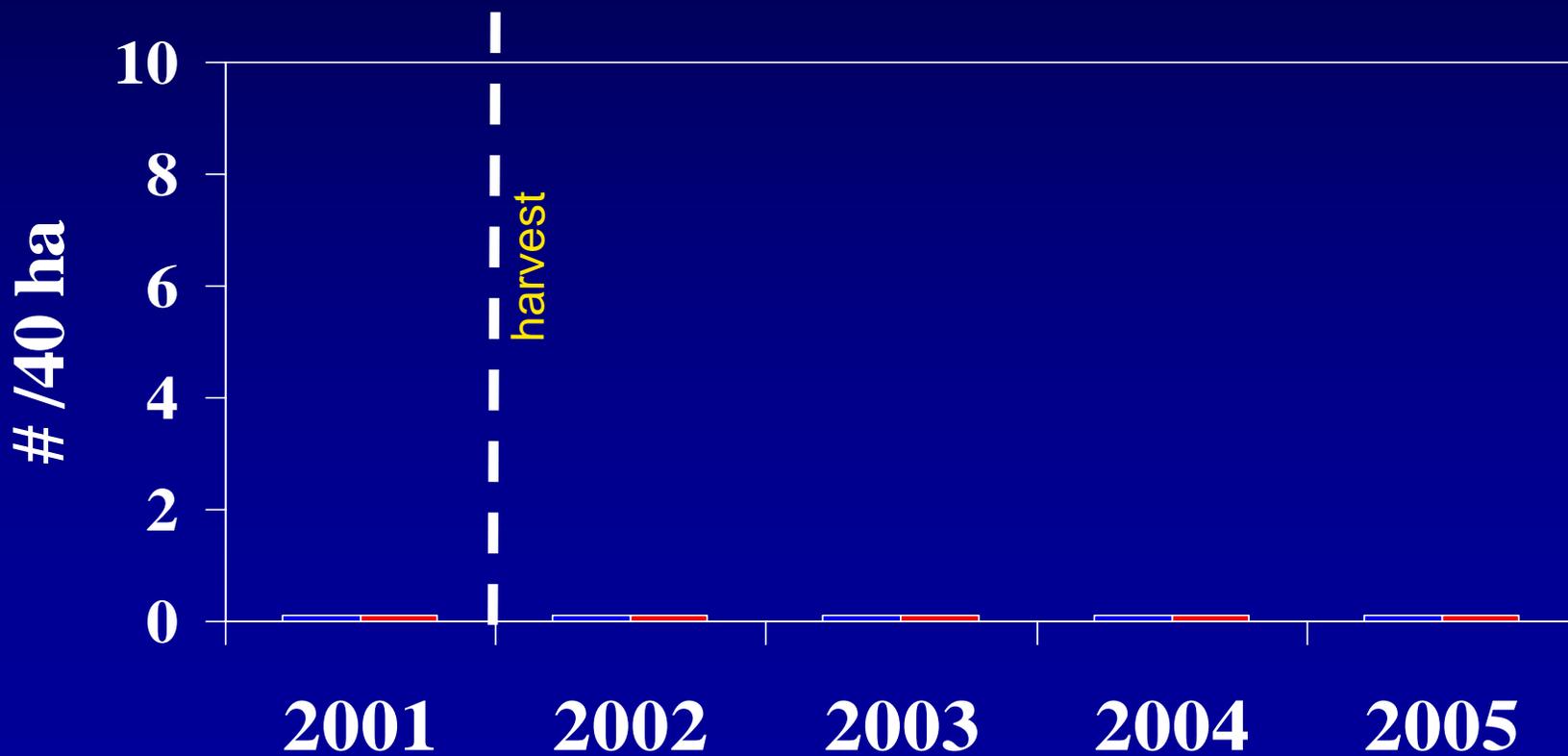
# Cerulean Warbler



Control



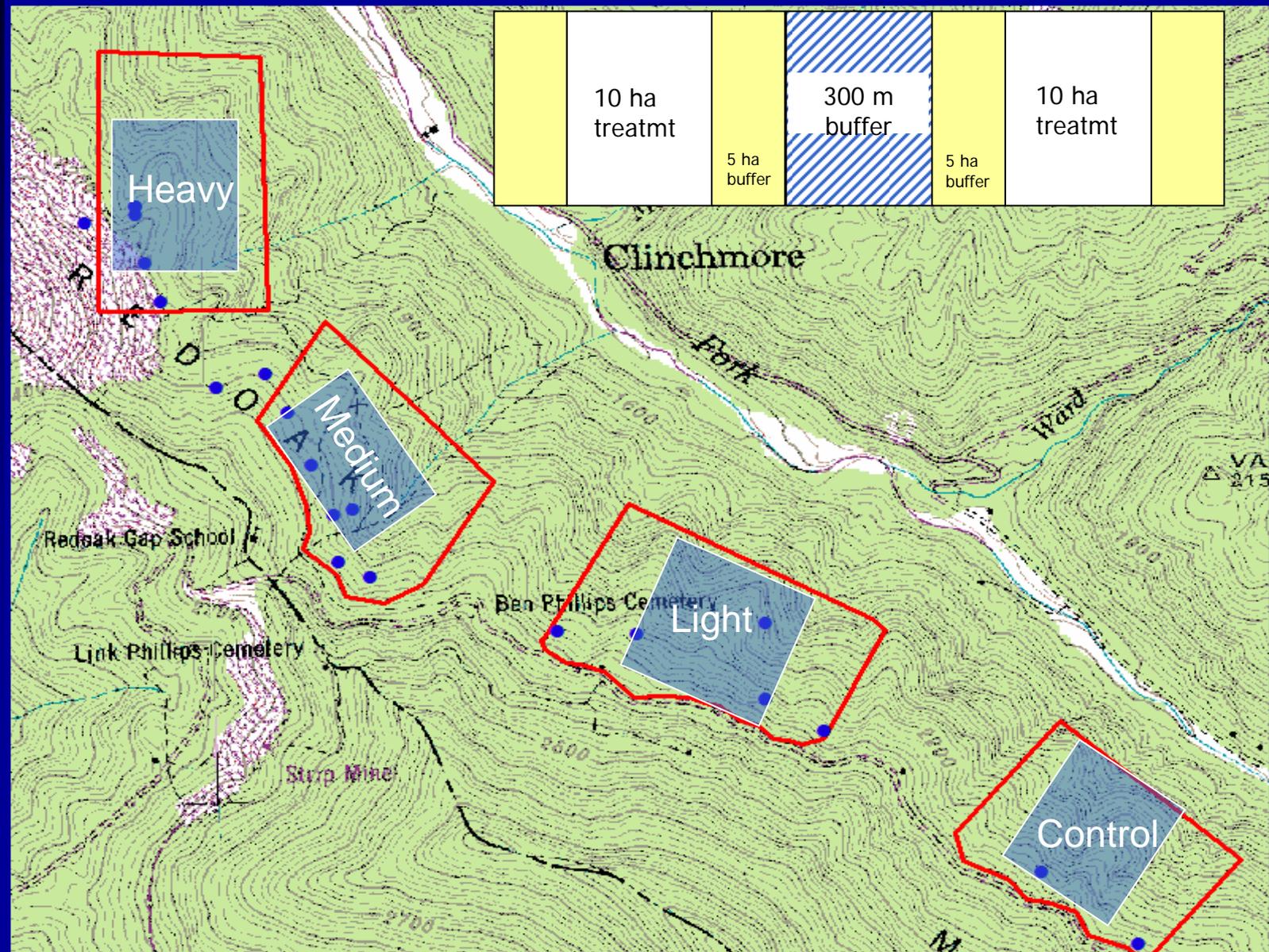
Harvest



# 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



# Timing of 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