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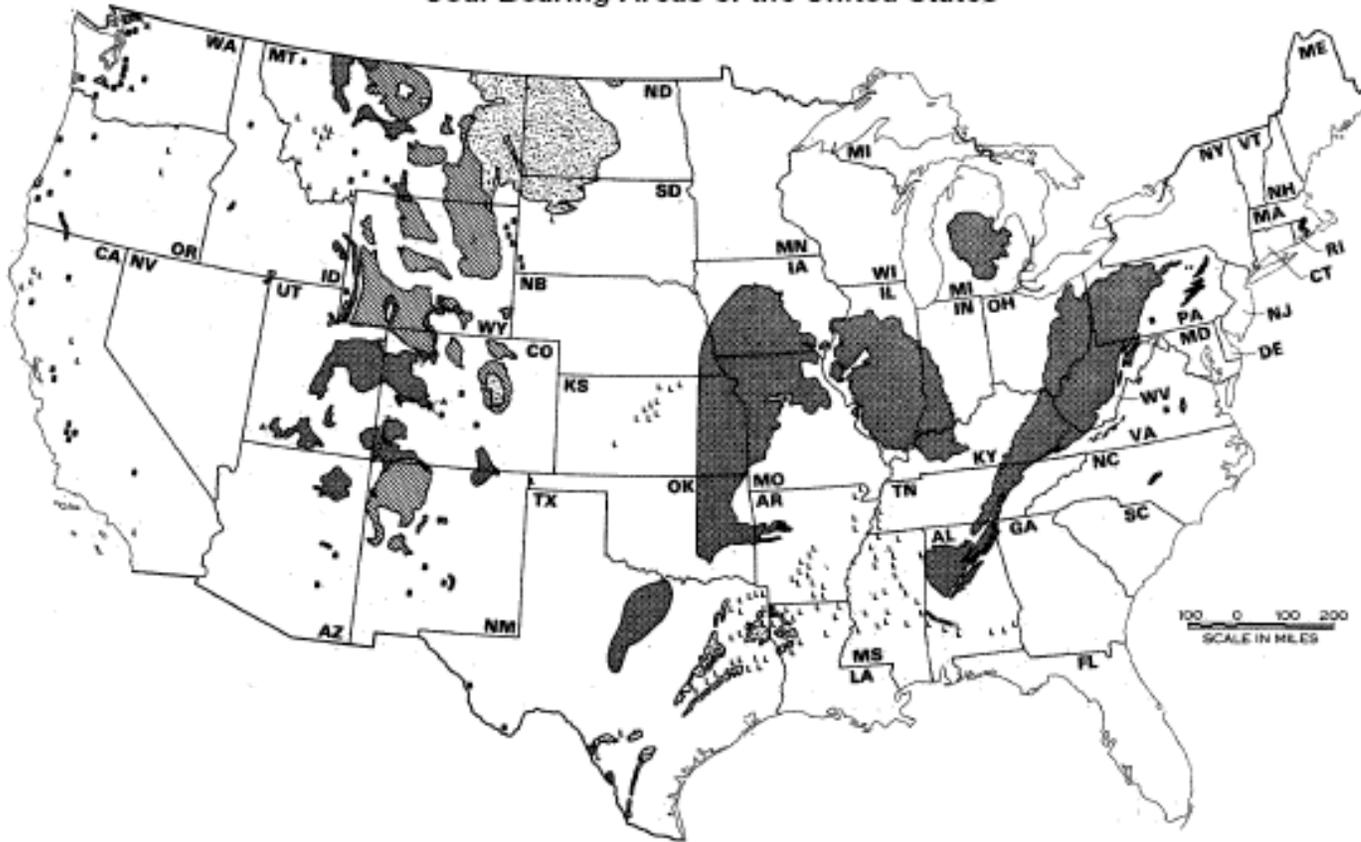


Cerulean Warbler Breeding Ground Perturbations from Surface Mining

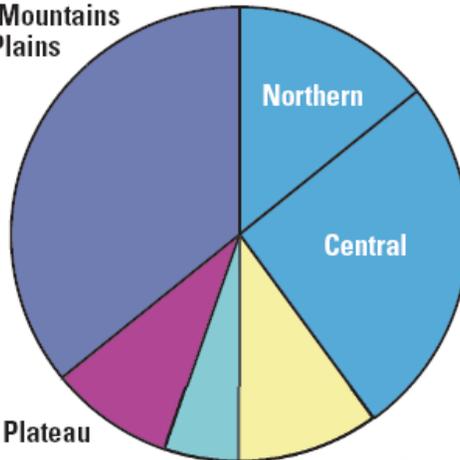


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Coal-Bearing Areas of the United States



Northern Rocky Mountains
and Great Plains



Appalachian
Basin

Appalachians:

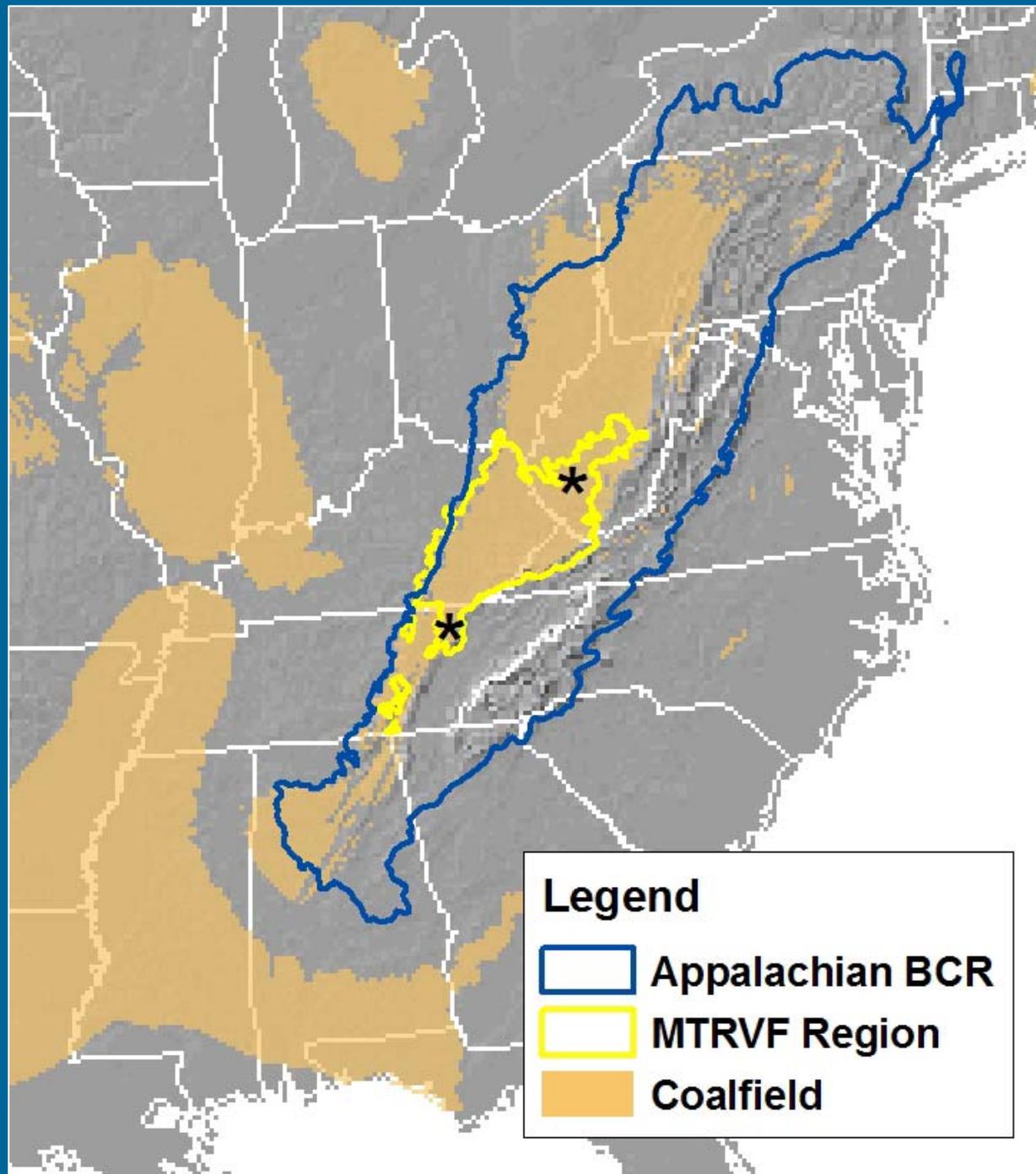
35% of 2004 US coal production

Colorado Plateau

Gulf Coast

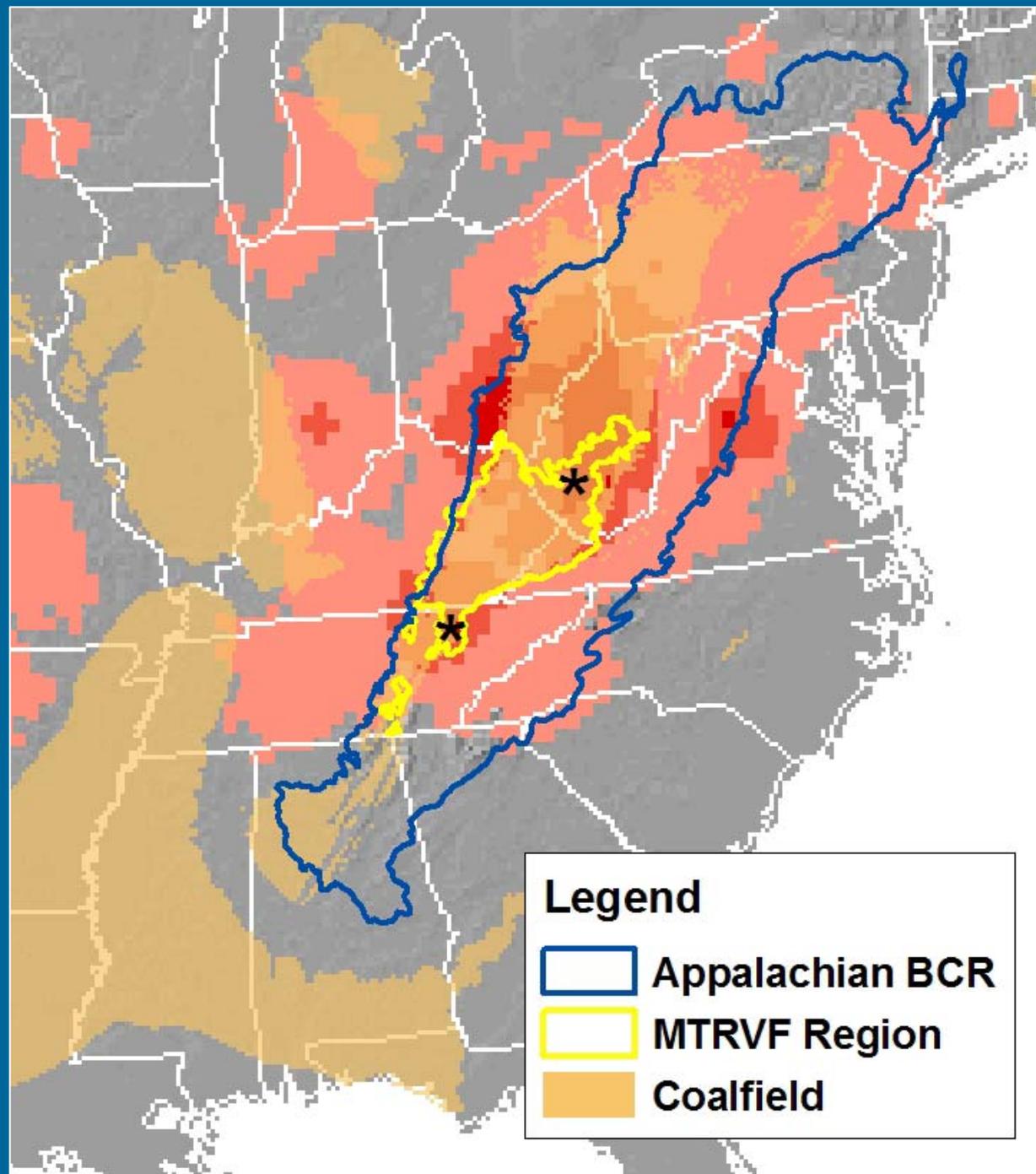
Illinois Basin

Coal mining regions



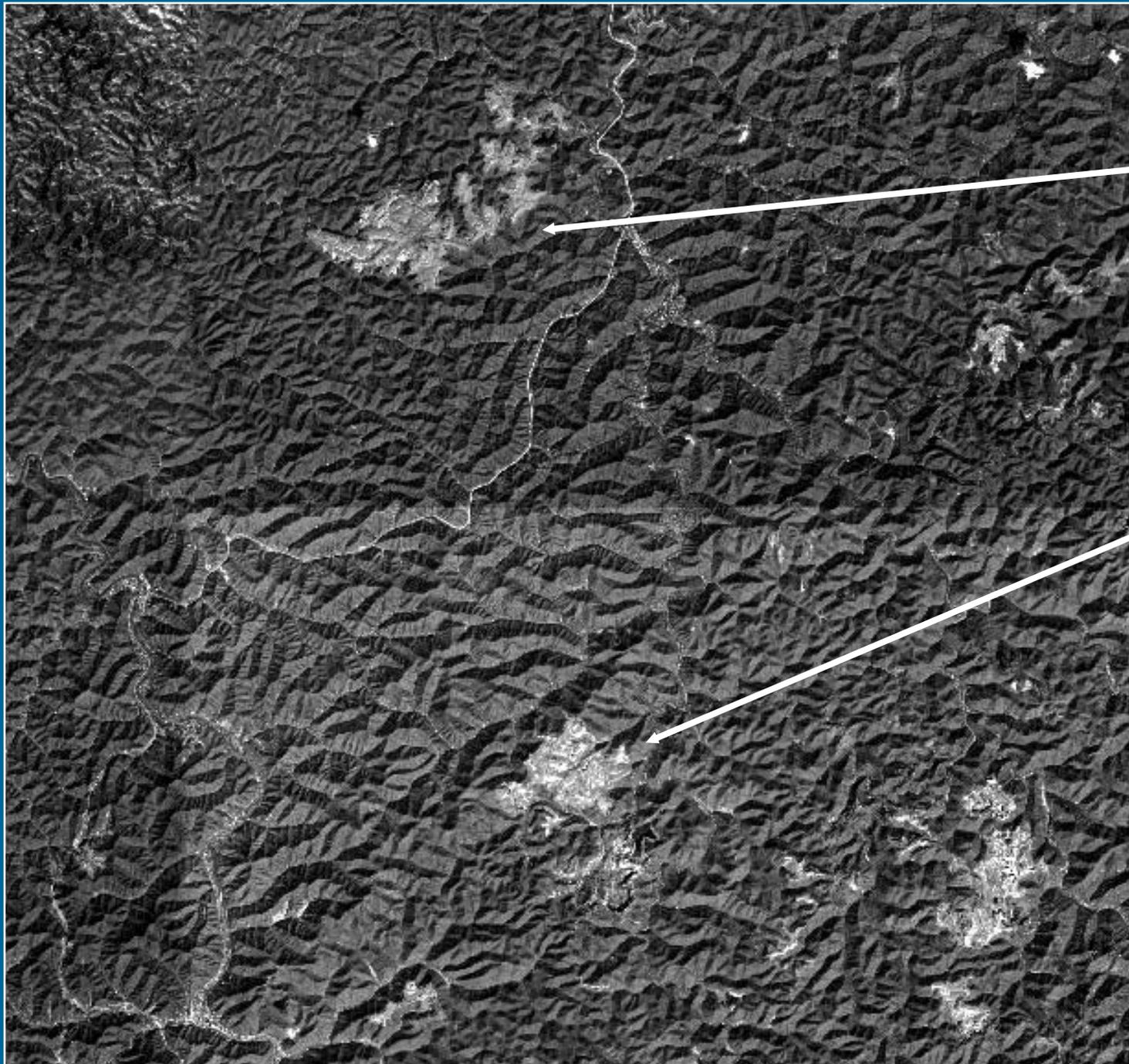
Coal mining
regions

with
Cerulean
BBS



Mountaintop removal mining





**~2000
ha**

**~1800
ha**

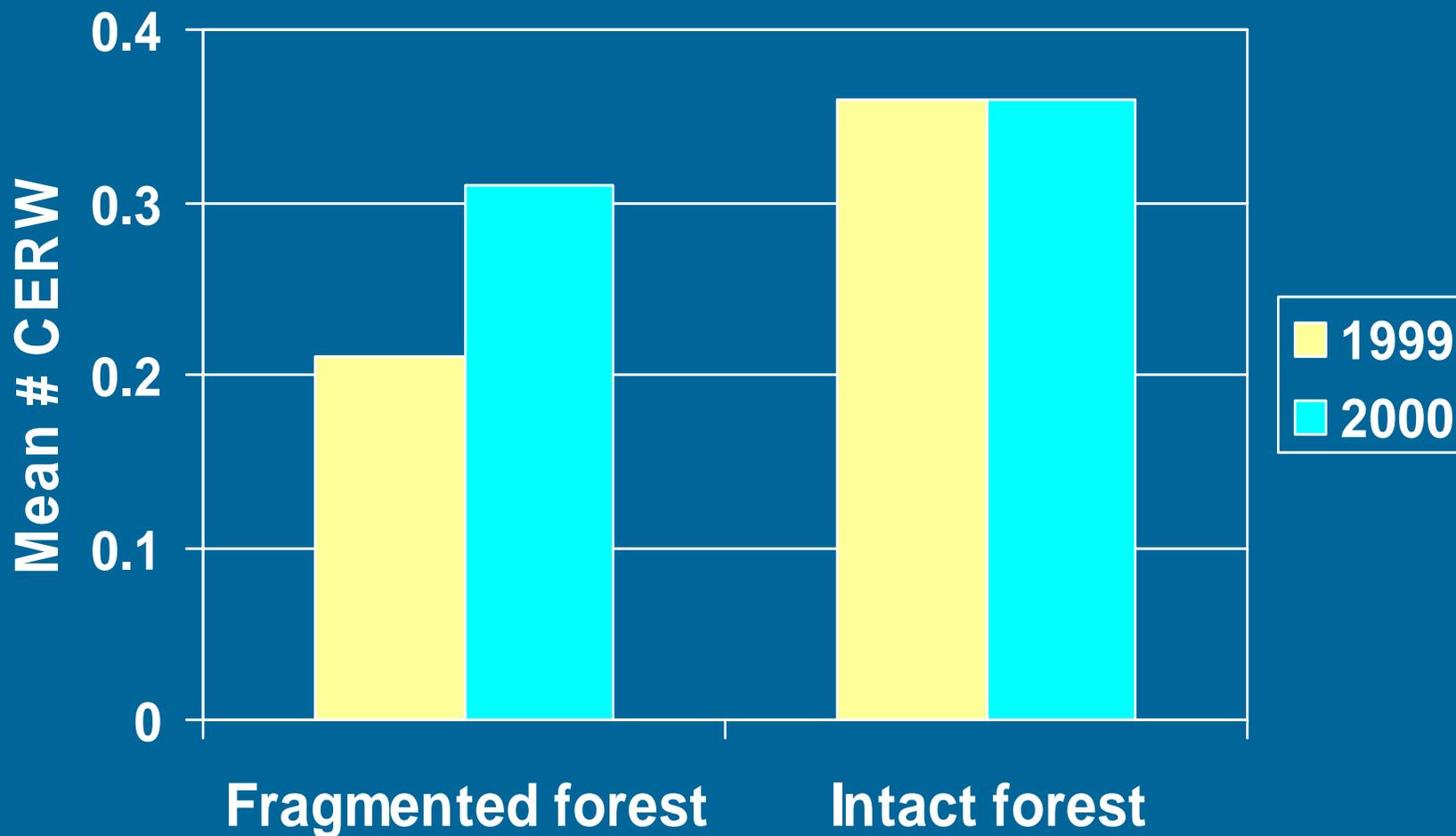
Point Counts

(Weakland & Wood 2005)



occurrence: 28%

40%



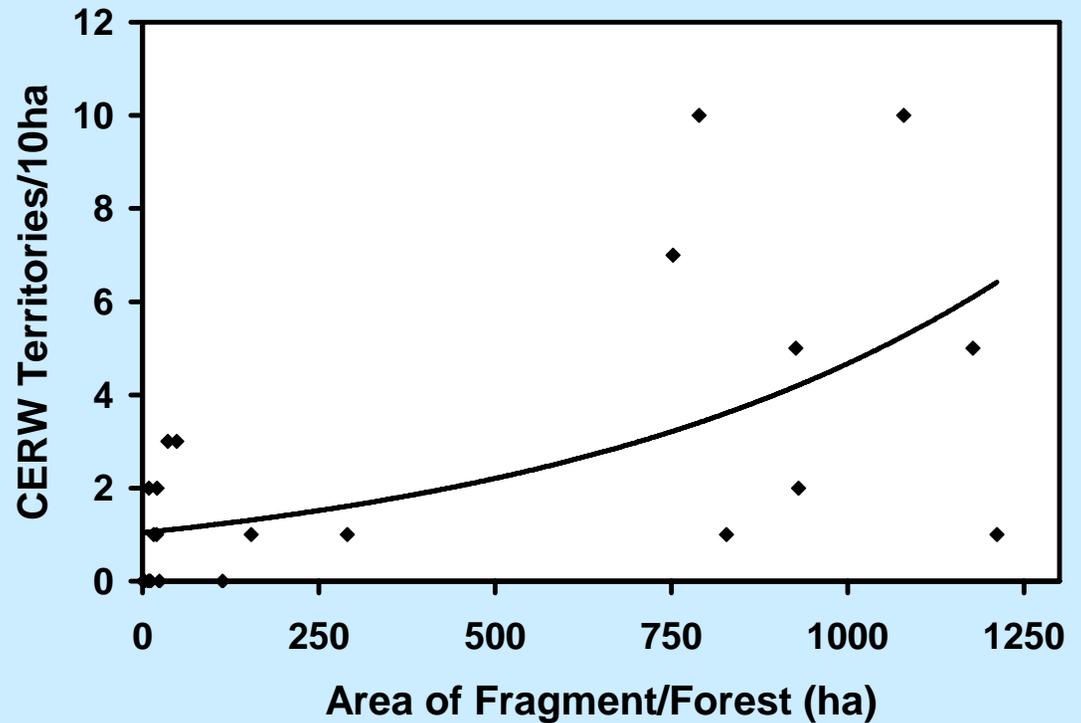
Territory density

(Weakland and Wood 2005)



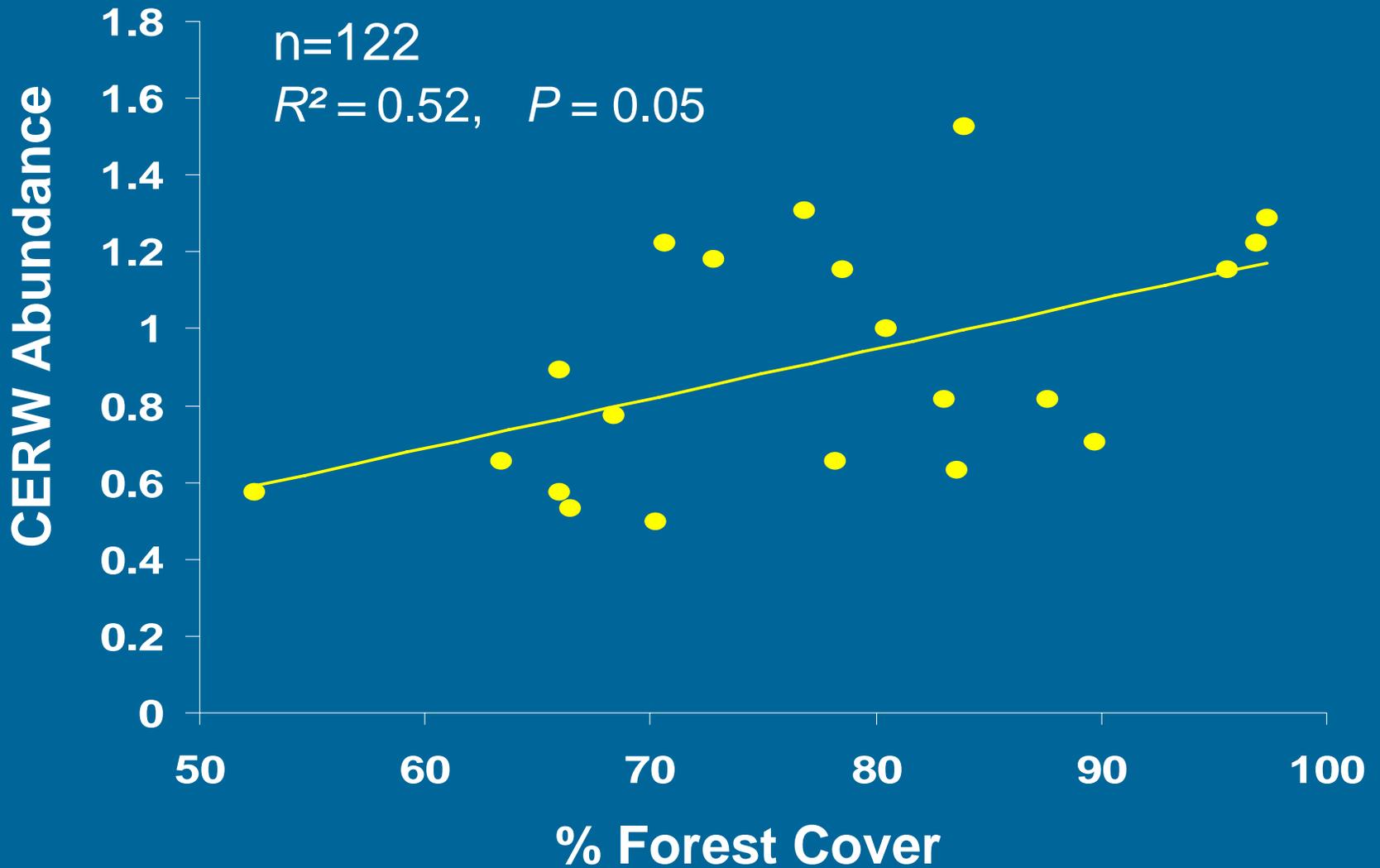
fragmented forest
→ 0.7 / 10 ha

intact forest
→ 4.6 / 10 ha



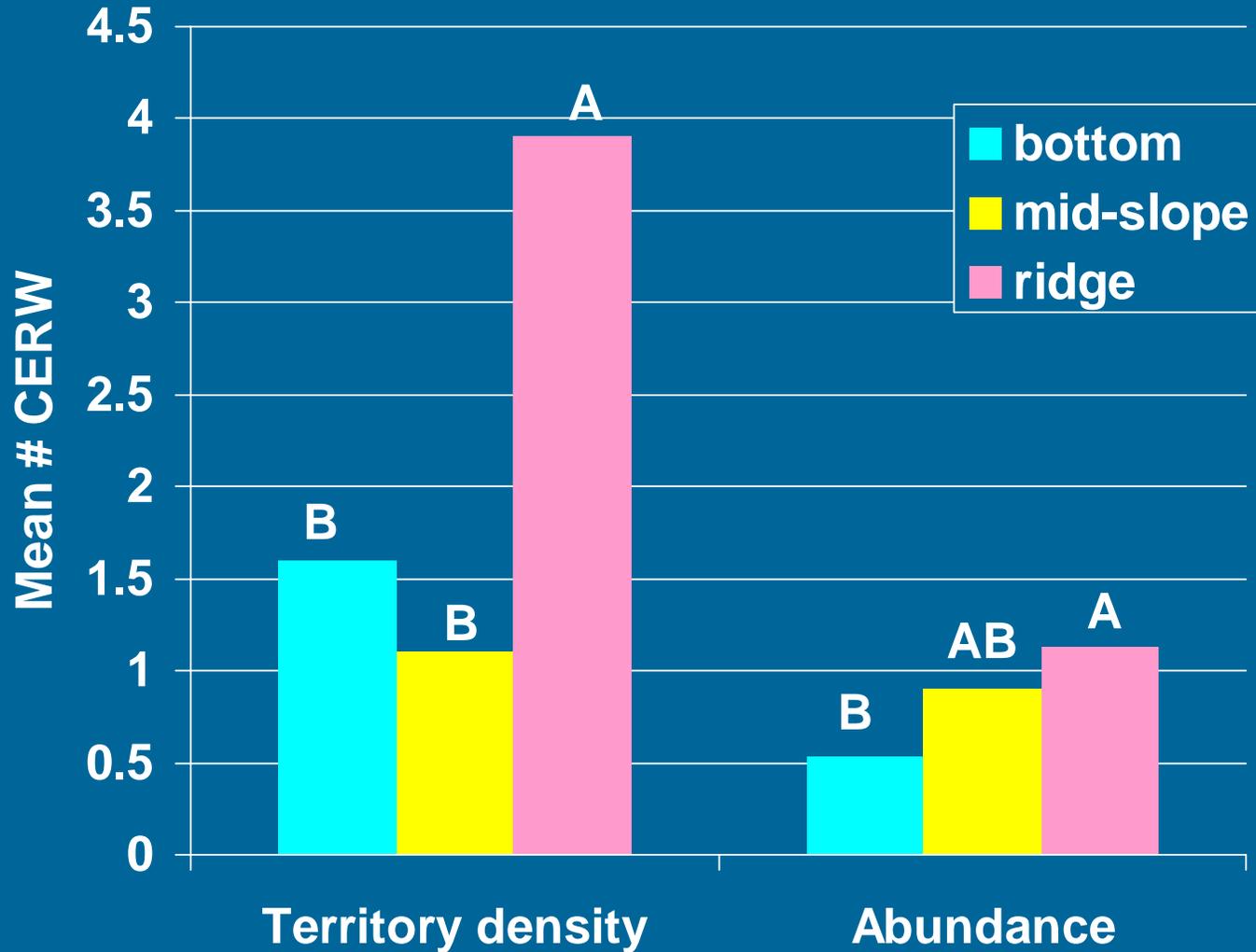
Forest Cover in Landscape

(Bosworth 2003)



Slope position

(Weakland, Wood, Bosworth)



ridge ~ canopy heterogeneity

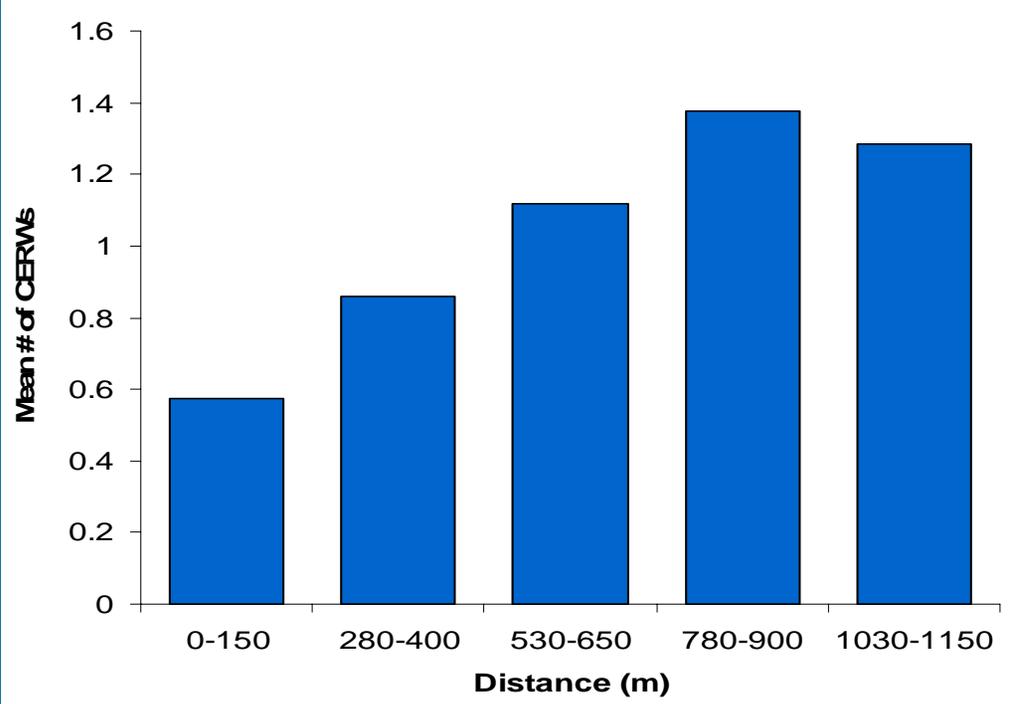


Edge Effects



18 4:10 PM

Photo by Anthony Bosworth



CERW distance from mine edge

(Weakland & Wood 2005, Wood, Bosworth, Dettmers 2006)

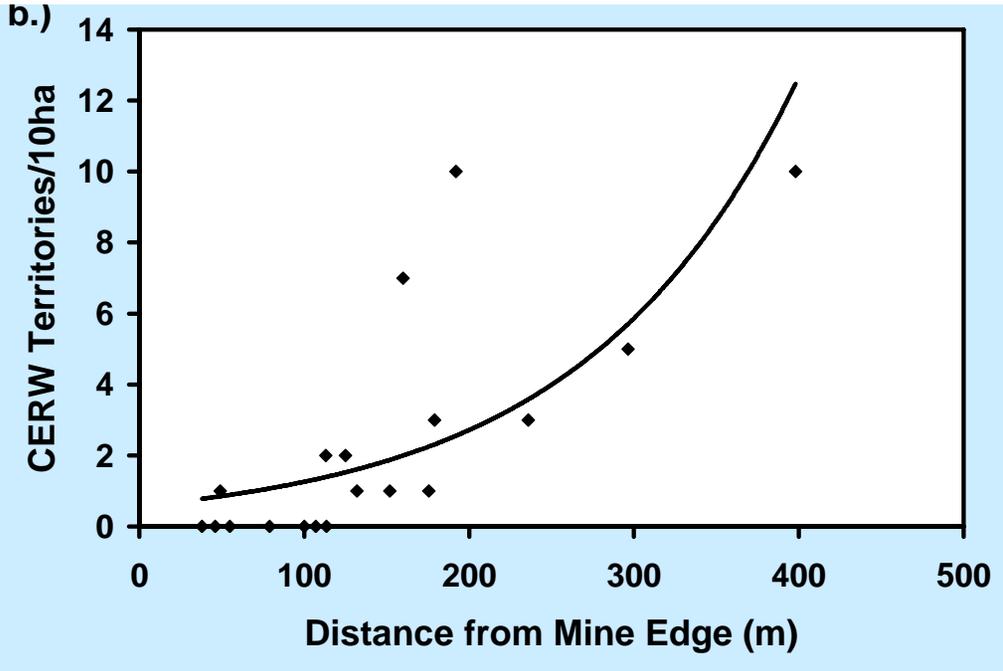


relative abundance

(122 point count plots)

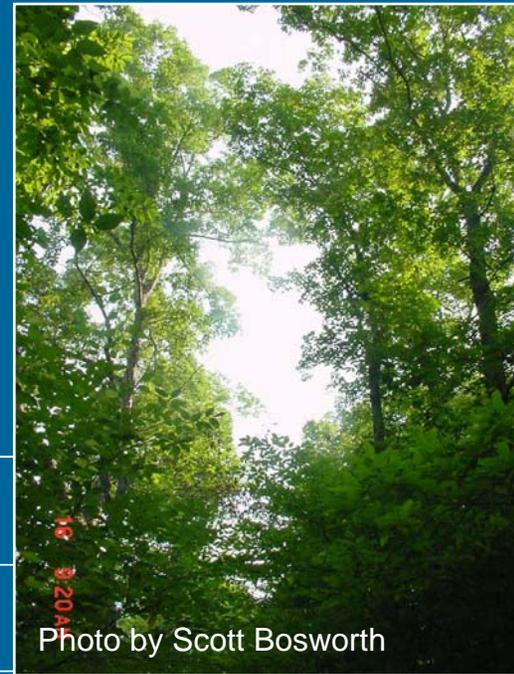
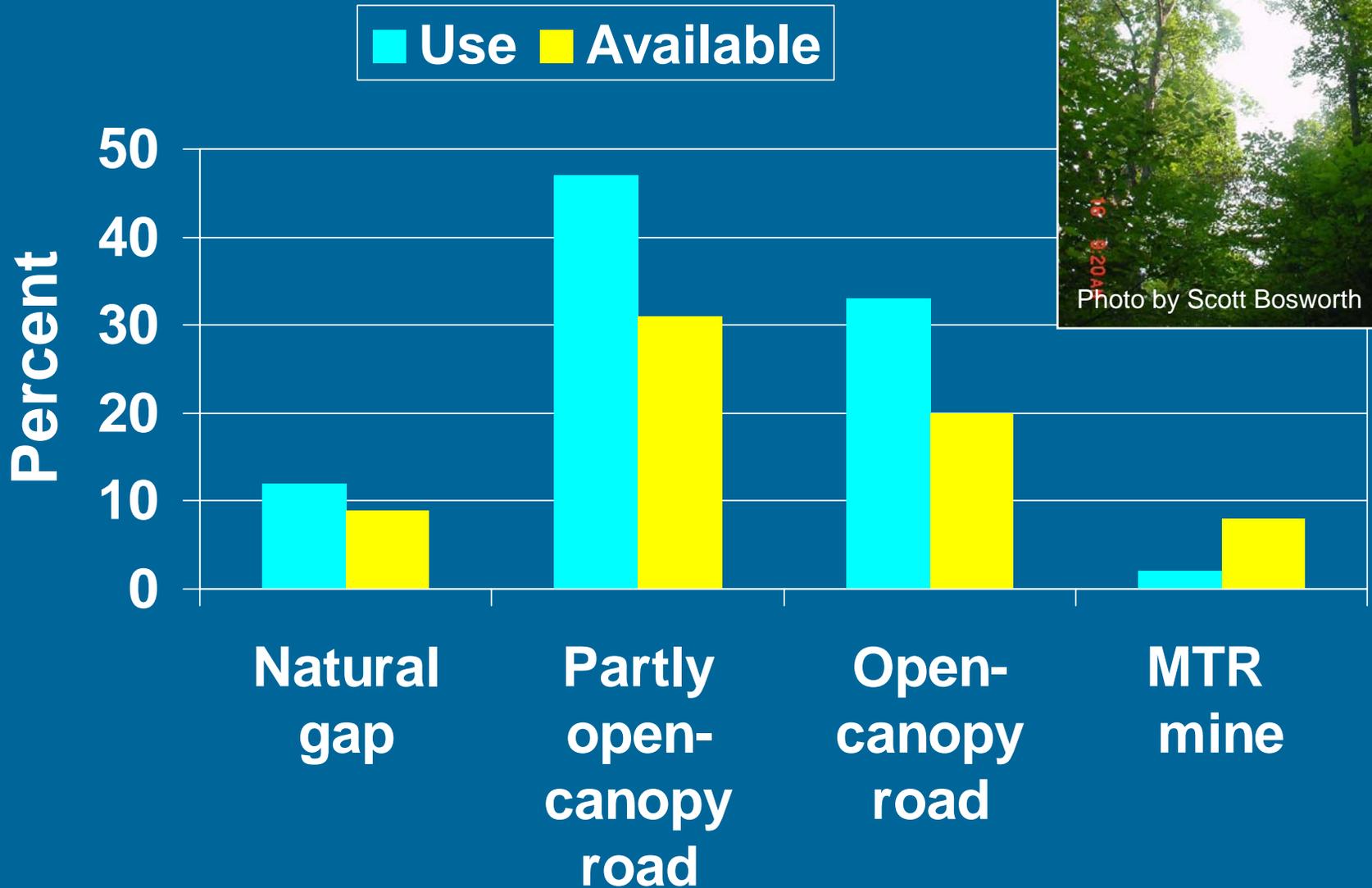


territory density
(27 spot-mapping plots)



Use of edge types

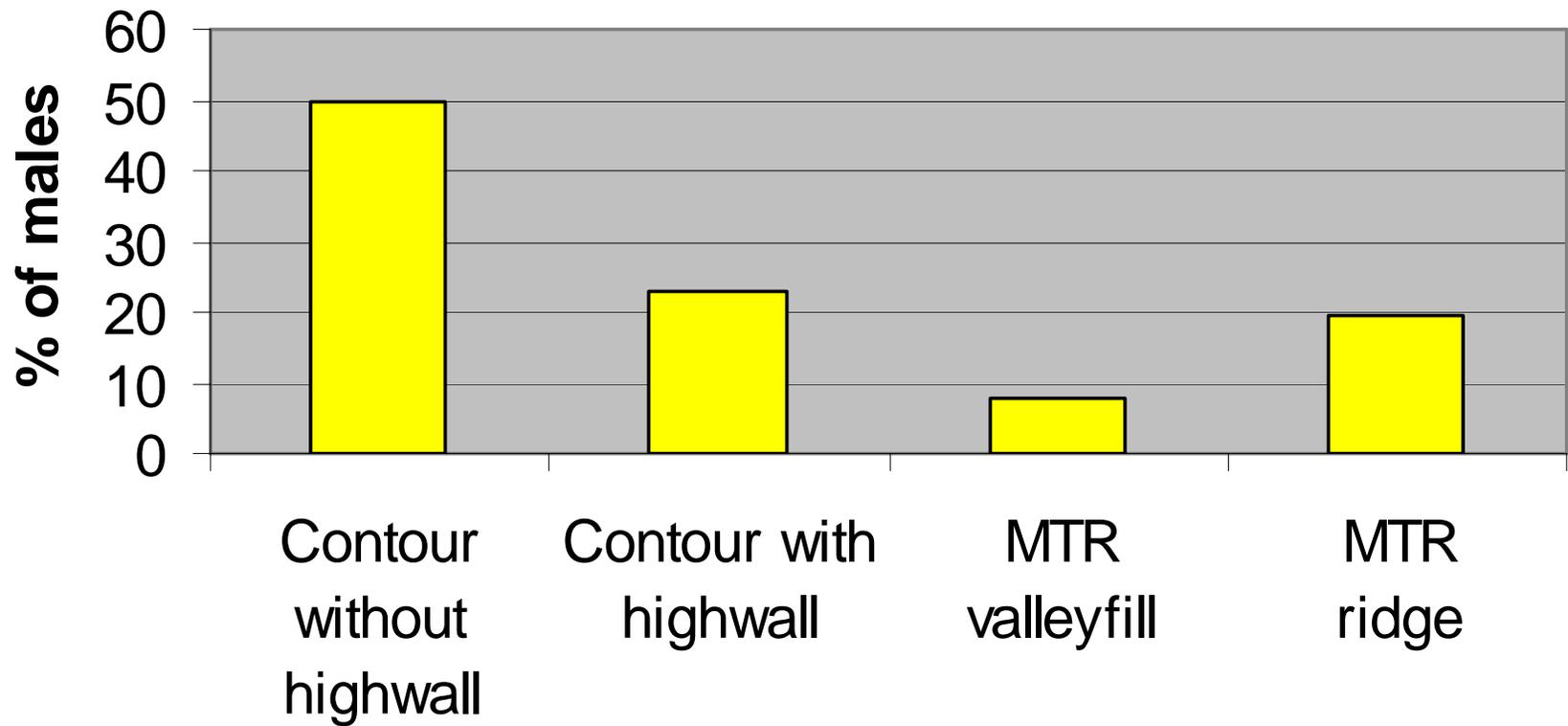
(Weakland and Wood 2005)



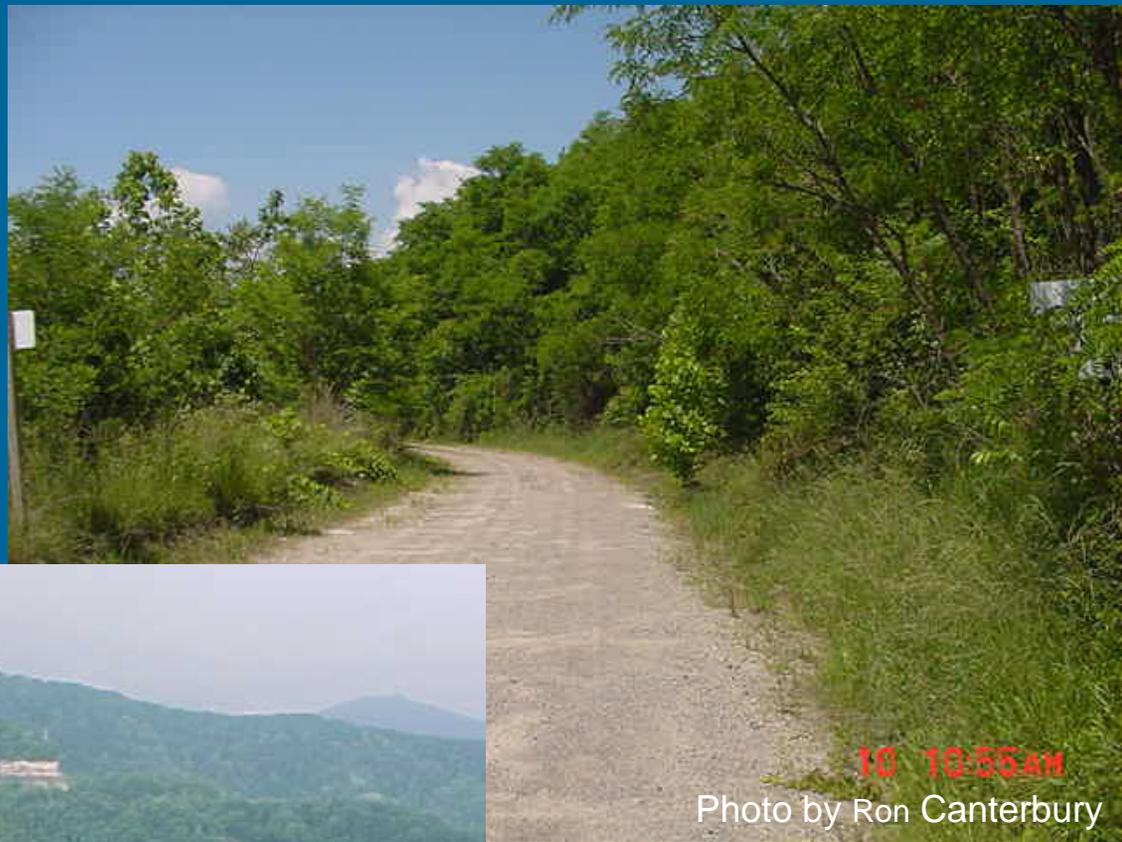
Use of mine edges

(Canterbury)

- 140 banded males



Contour mines

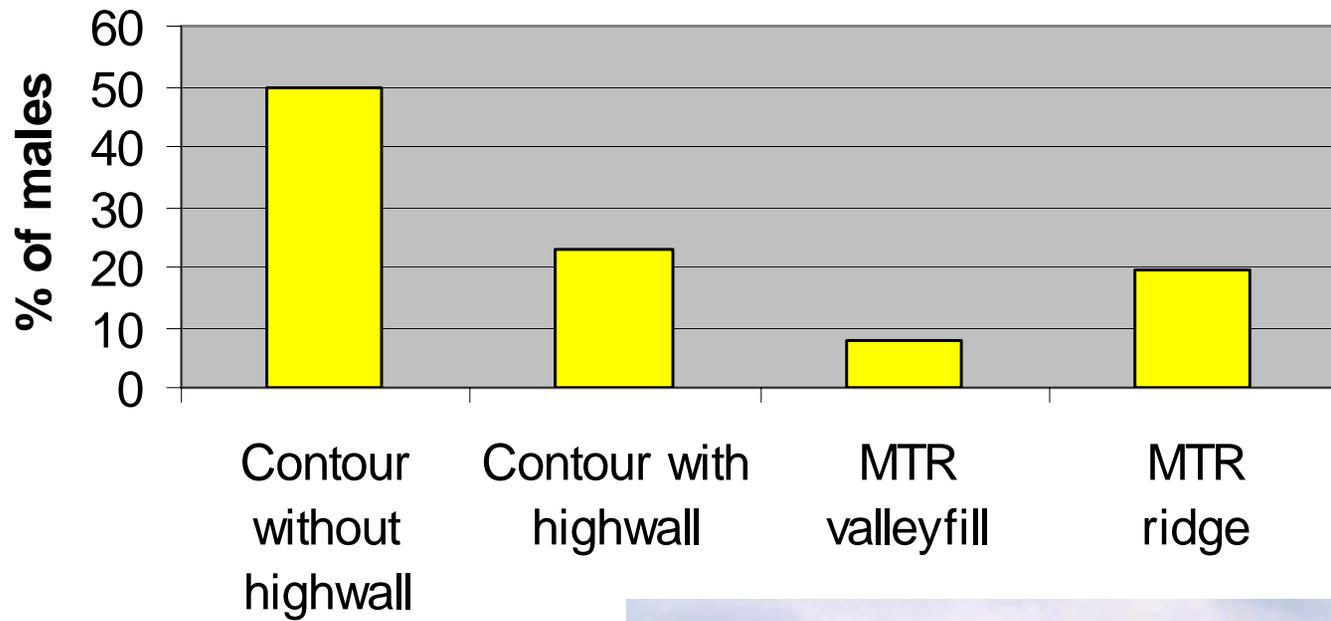


10 10:55AM

Photo by Ron Canterbury



Photo by Ron Canterbury



**mountaintop
removal**

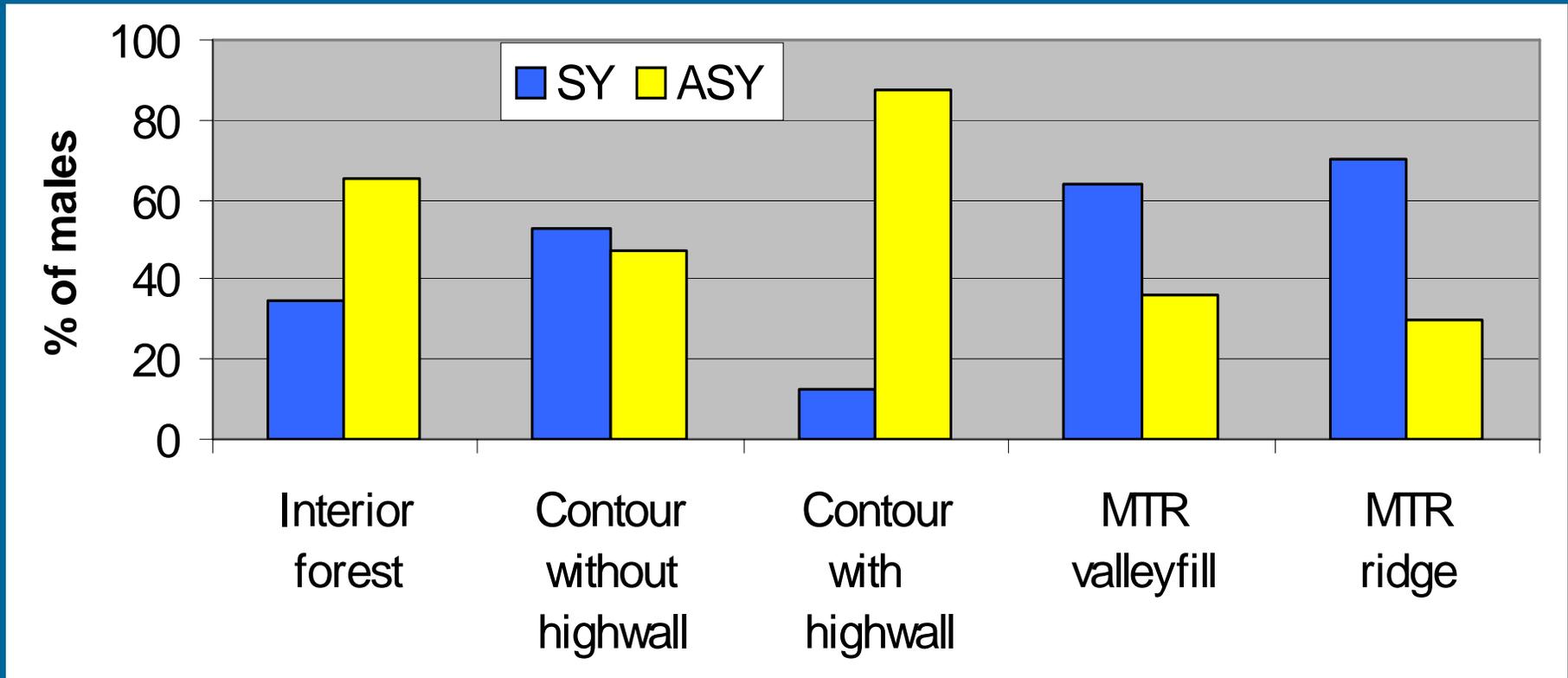


Photo by Frank Ammer

Use of mine edges

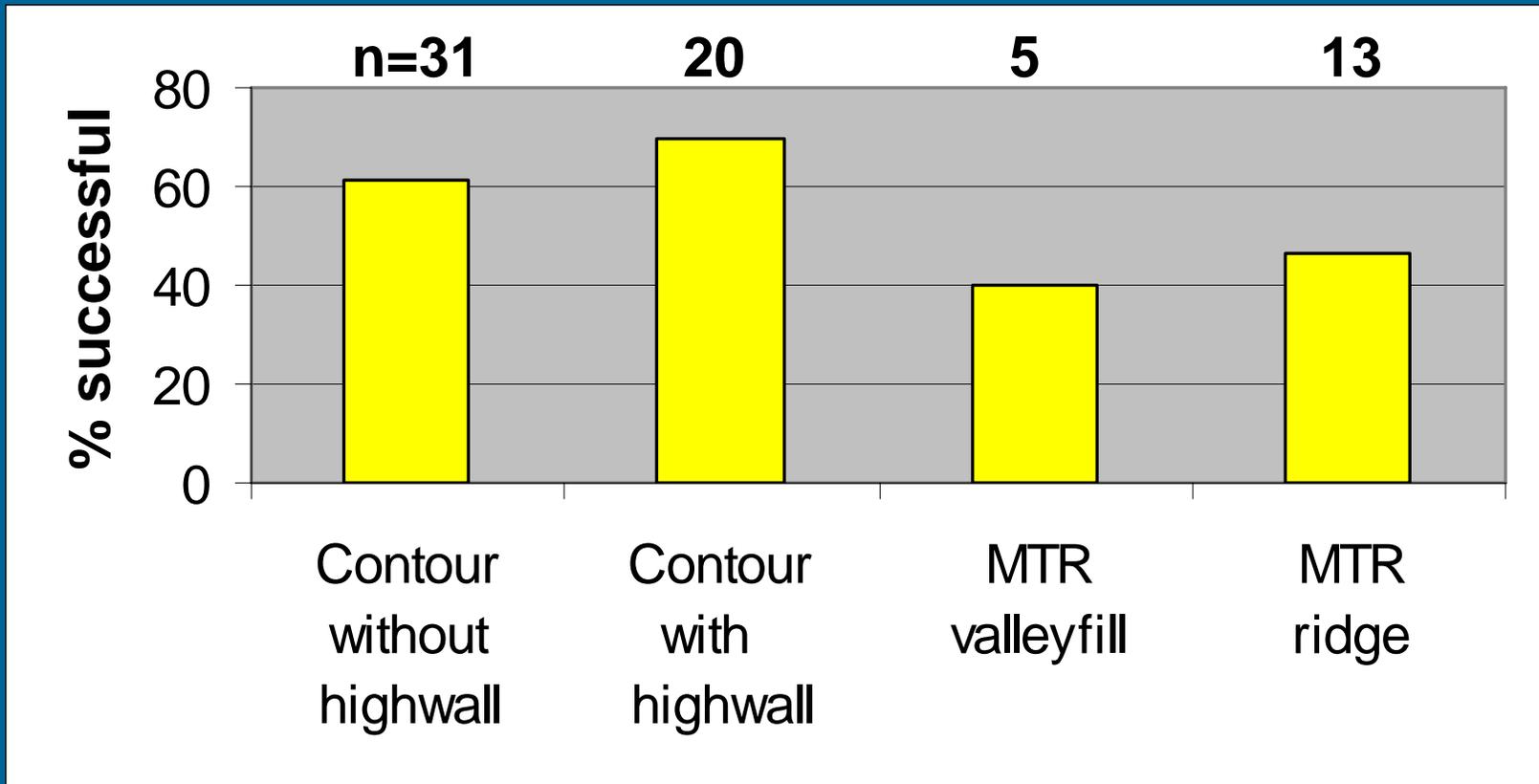
(Canterbury)

habitat use varied with male age ($P < 0.05$)



Nest success at mine edges (Canterbury)

% of nests fledging young (n=78)



59% - edges; 56% - interior

Summary of impacts

- loss of mature forest
 - particularly ridges
- degradation of remaining forest

- edge

- area

patch size

landscape



- fragmentation effect on demographics

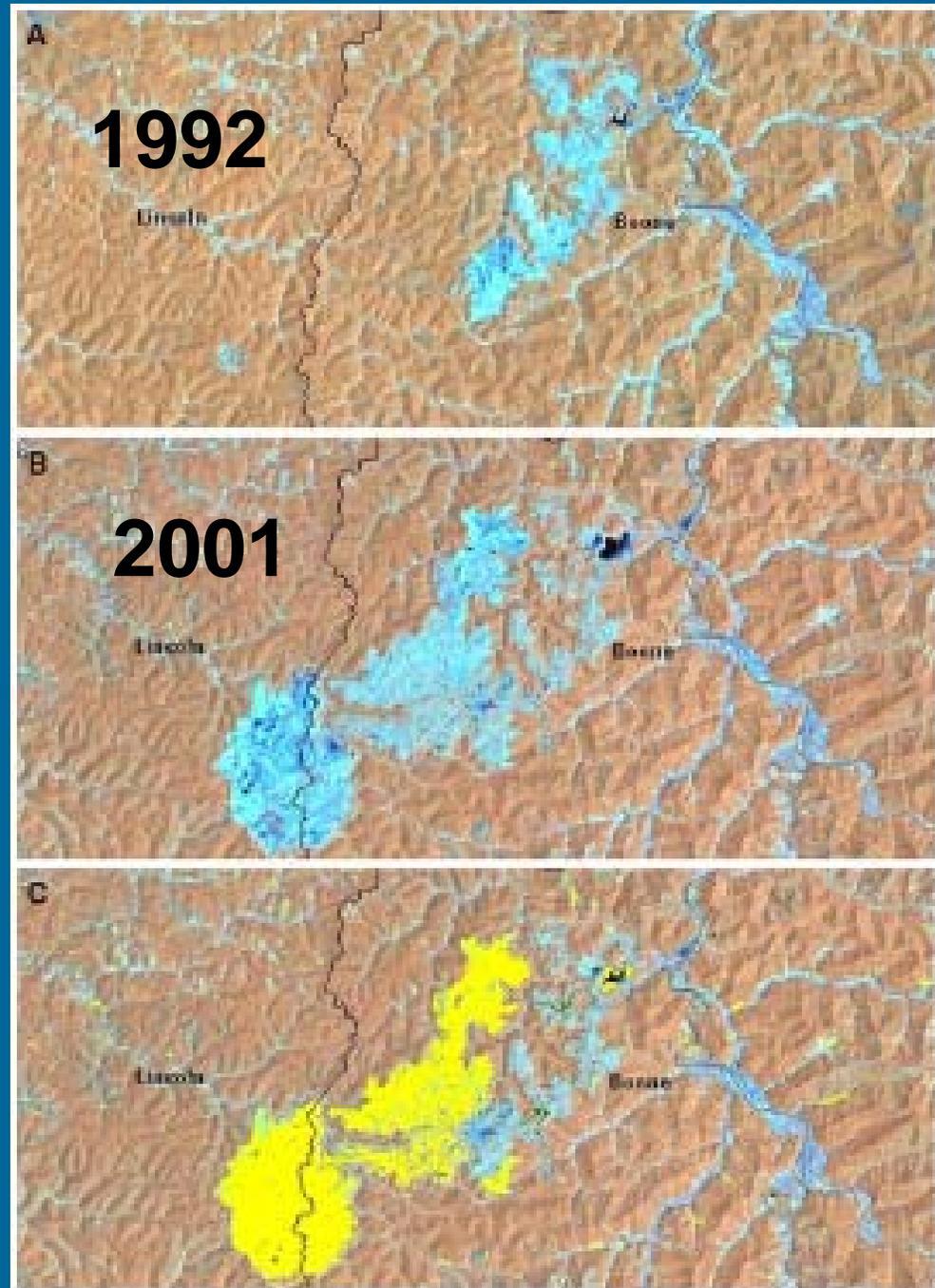
Mountaintop removal region forest loss

(Wickham et al. 2007)

~ 4.2% forest loss

+

~ 7.4 - 20.5%
interior forest loss



Habitat modeling in mountaintop removal mining region

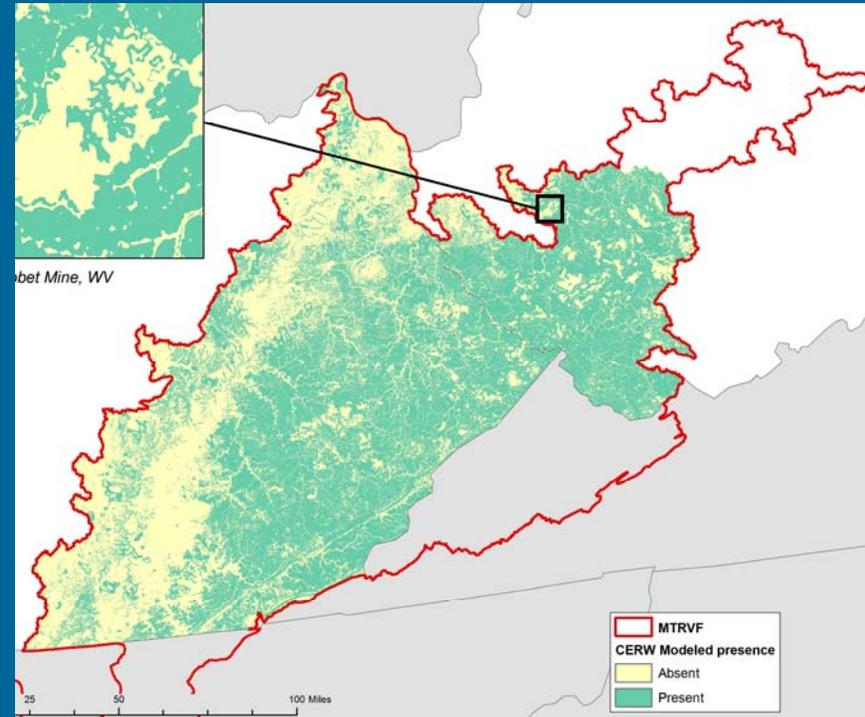
(Wood, Strager, and Strager 2006)

Predicted presence:

- 56% of study area

Potential future mining:

- ~ 0.8 % of area with cerw presence



Habitat modeling in Tennessee

(Buehler, Welton, and Beachy 2006)

estimated impact from coal surface reserves

- **surface mining may remove 2,954 ha of potential cerulean habitat**
- **could displace 3,161 breeding pairs**
 - ~ **25% of Royal Blue population**
 - ~ **7% of Cumberland Mtns population**
- **fate and reproductive success of displaced pairs is unknown**

Possible Mitigation Measures

- mitigation needed at local, regional, and international scales
 - within and outside of the coalfields
 - purchase land / conservation easements
(mineral rights)
- cluster mining permits
- encourage timber as post-mining land use; focus on restoration of forested habitats
 - young forests

The end