Cerulean Warbler Breeding Ground Perturbations from Surface Mining

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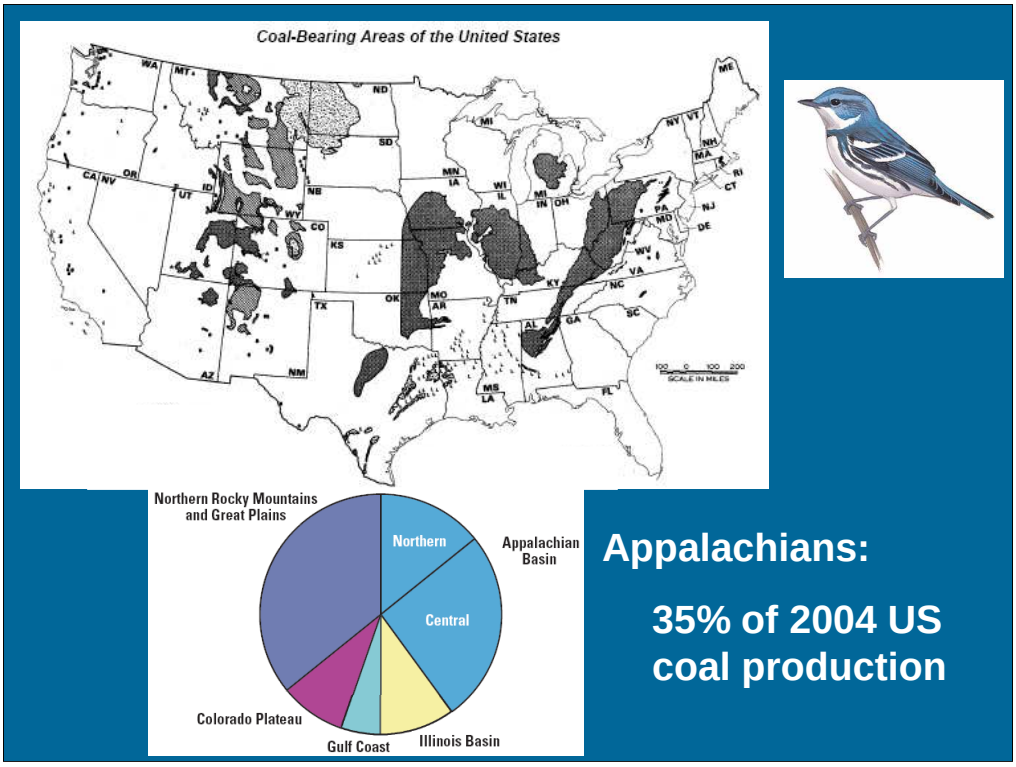
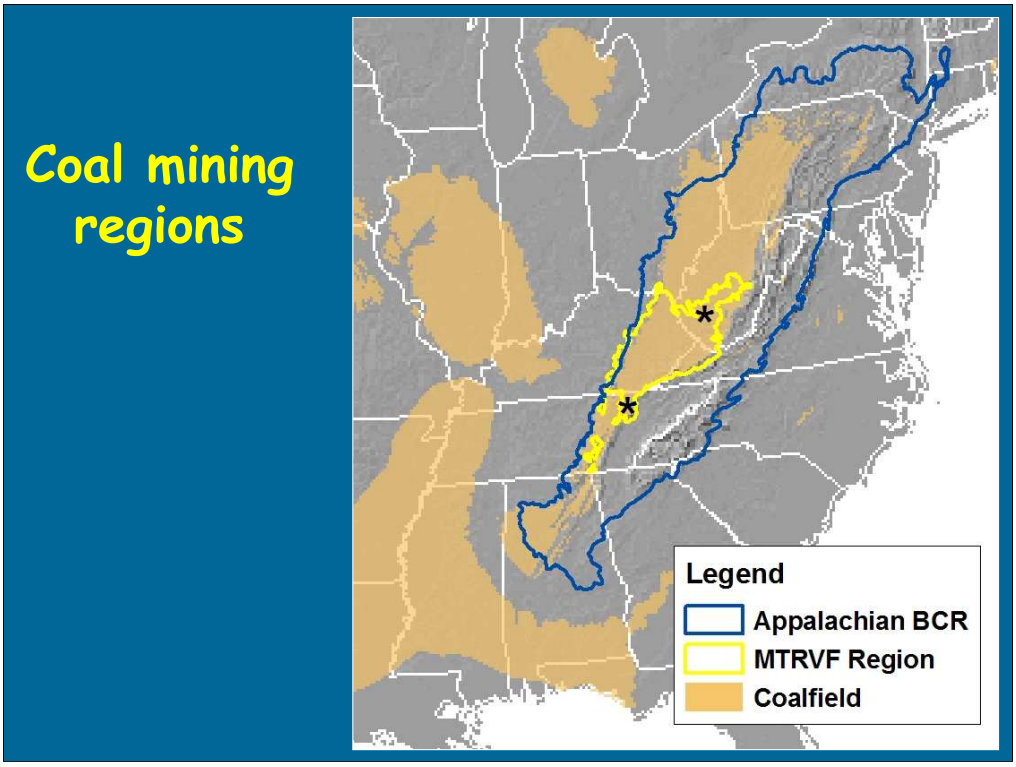
Summarizing results from our field studies in SW-WV, habitat modeling in the mountaintop removal mining region, and Dave Buehler et als results modeling habitat and potential popul change in central TN.



Why is surface mining an issue for cerw? Slide shows major coal beds for the US.

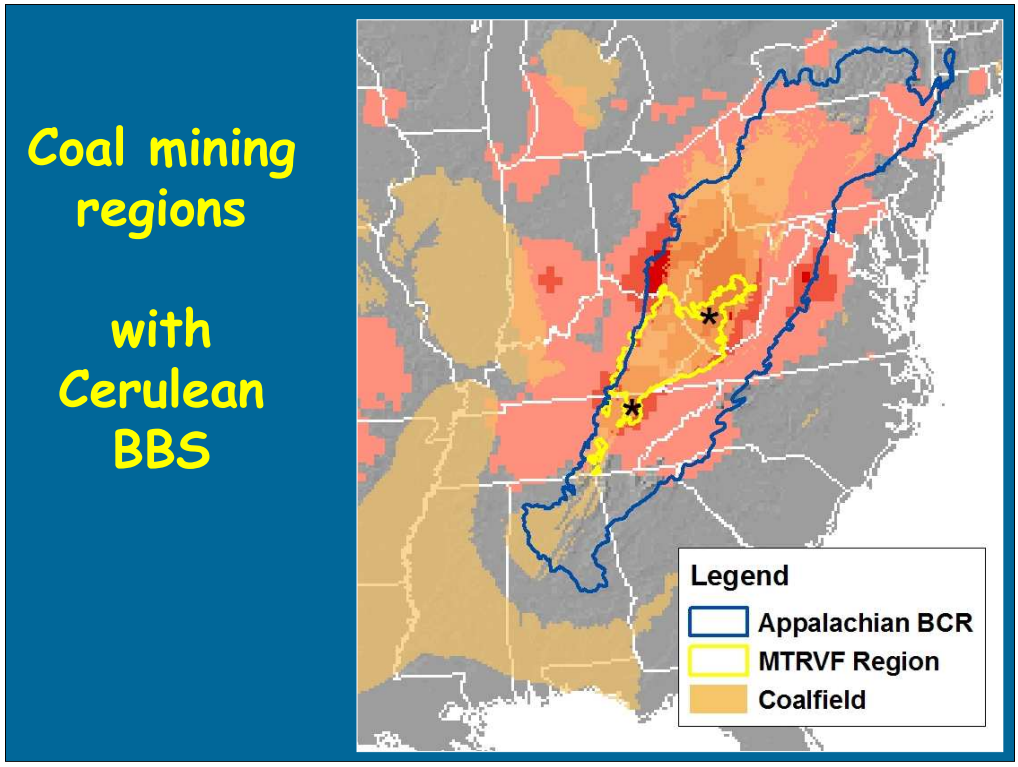
The Appal Basin accounts for ~35% of the coal produced by the US in 2004; majority in central Apps. About 1/3 from surface mines.



Zoom in on appal region; note that ~ 1/3 has mineable coal

- our study sites located in MTR region in SW WV and NE TN

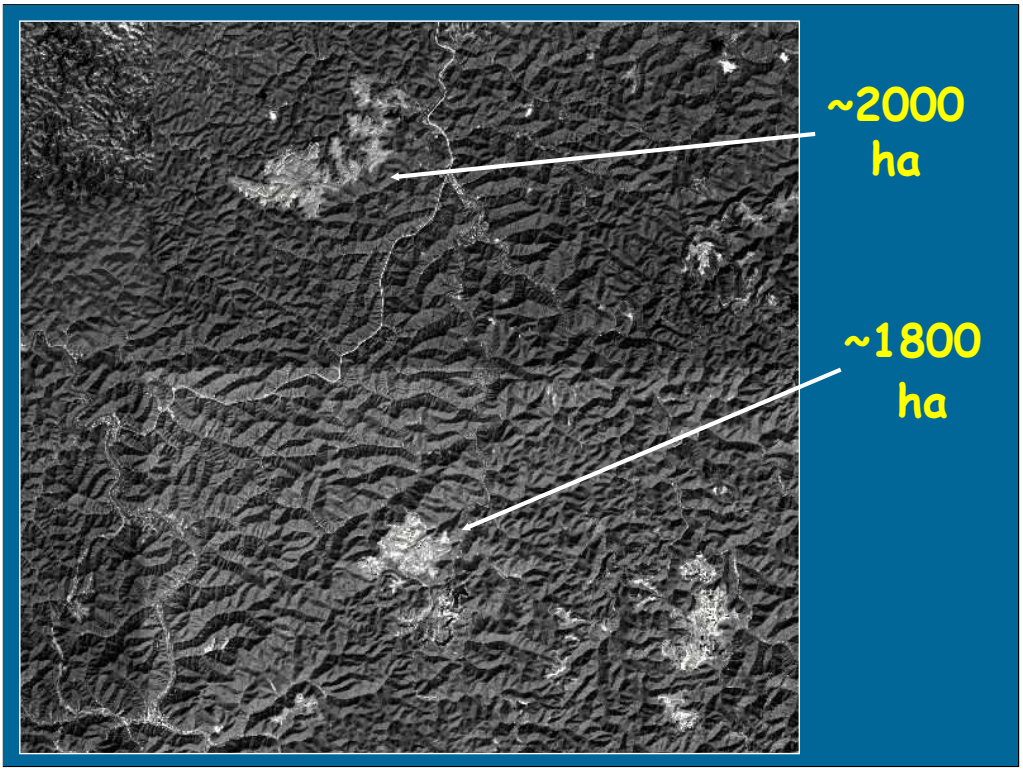
- although mountaintop removal mining region is primary area of concern, it's important to consider other types of surface mining in the region because . . .



. . . much of the core range of the CERW, in dark red, falls within the Appal coalfield. So surface mining in general, but mt-top removal mining in particular, has been identified as a limiting factor for cerw populations.

Mountaintop removal mining

Of all the types of surface mining, mt-top removal mining has received the most attention. The coal lies in thin seams near the tops of mountains. It's removal is like taking apart a layer cake; the uppermost rock layers are removed and pushed to the side, then the coal seam is removed.



Concern because occurring In a landscape that is primarily forest and these mines tend to be very large

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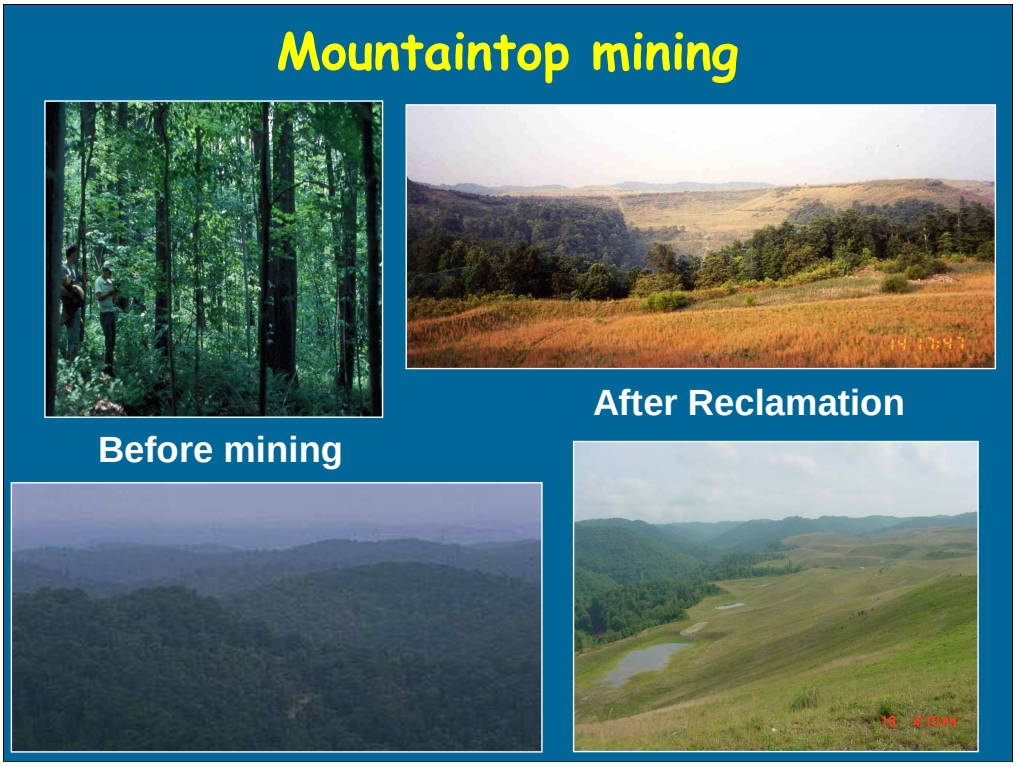
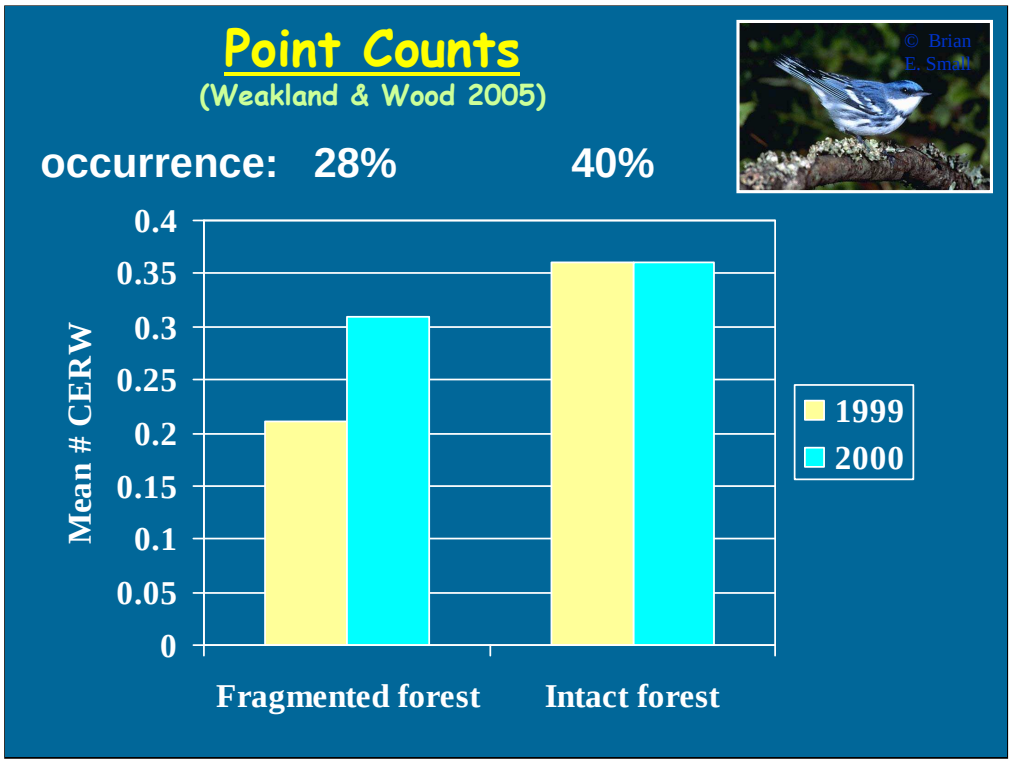


So before mining have a deciduous forest landscape with forested ridges;

After mining have a grassland landscape with forest patches along streams surrounded by grassy ridges



In our initial studies in southern WV, collected 2 yrs of pt count data in intact and fragmented forest

Only 28% of pts In forest fragments, embedded in reclaimed grasslands

Territory density

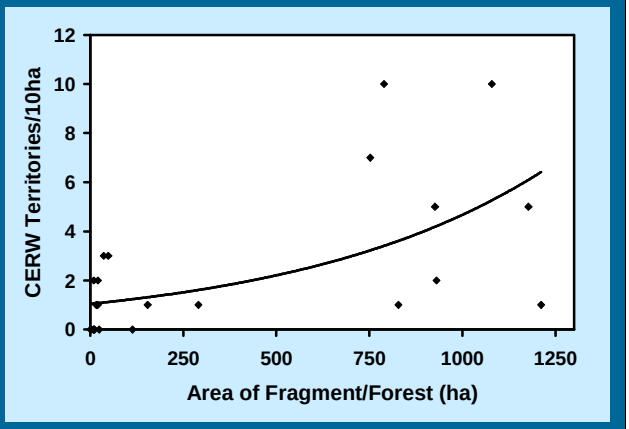
(Weakland and Wood 2005)

fragmented forest

➔ **0.7 / 10 ha**

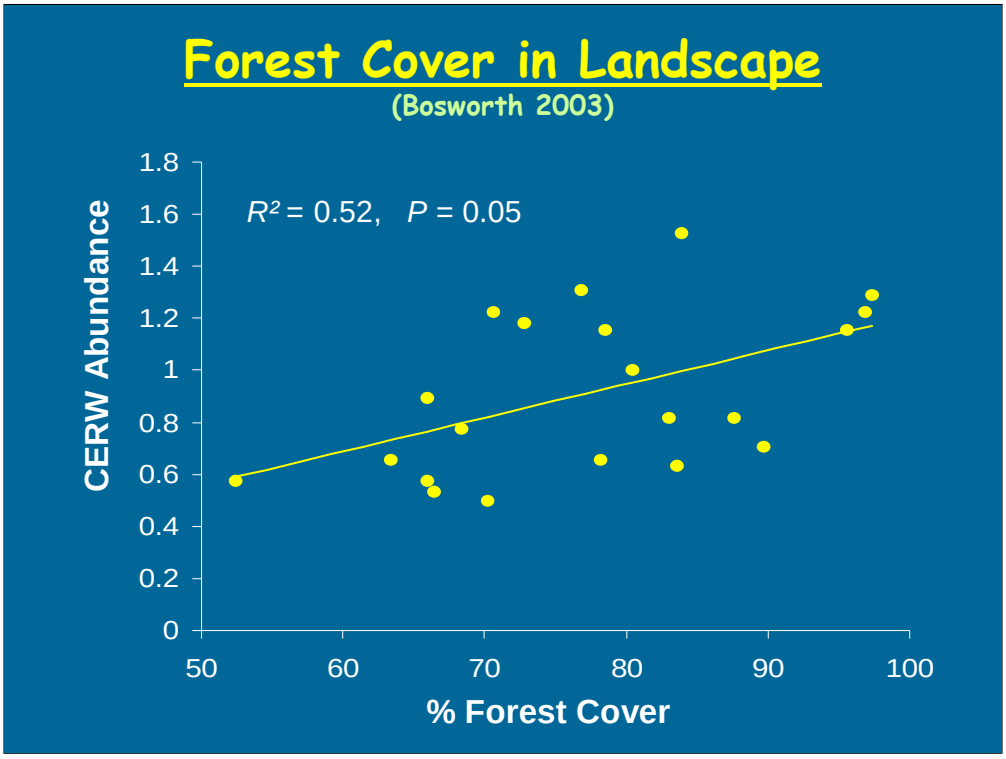
intact forest

➔ **4.6 / 10 ha**



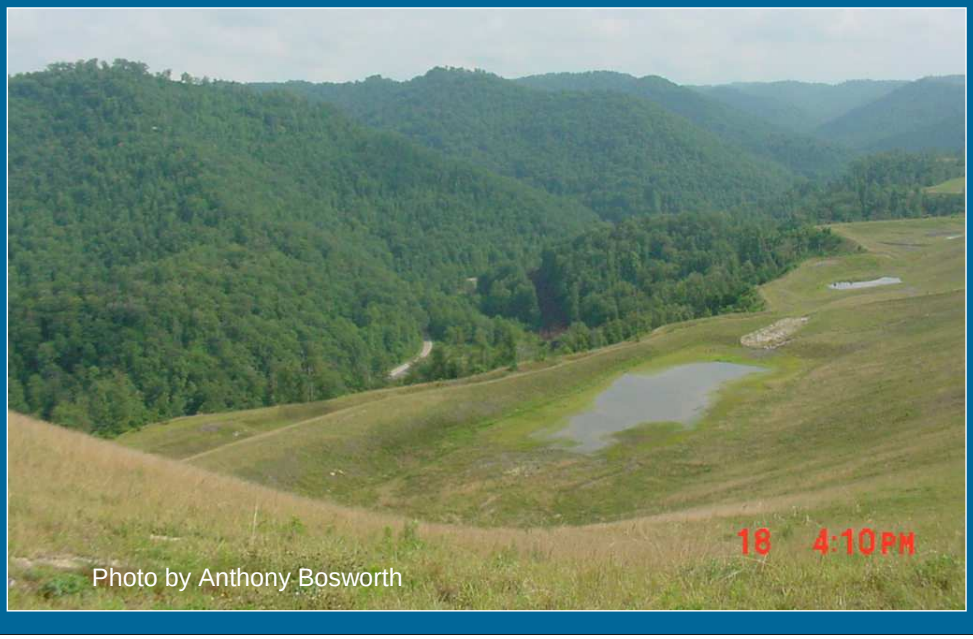
- terr density 6x lower in fragmented forest

- One reason appeared to be an area effect; territory density increased as size of the forest fragment increased.

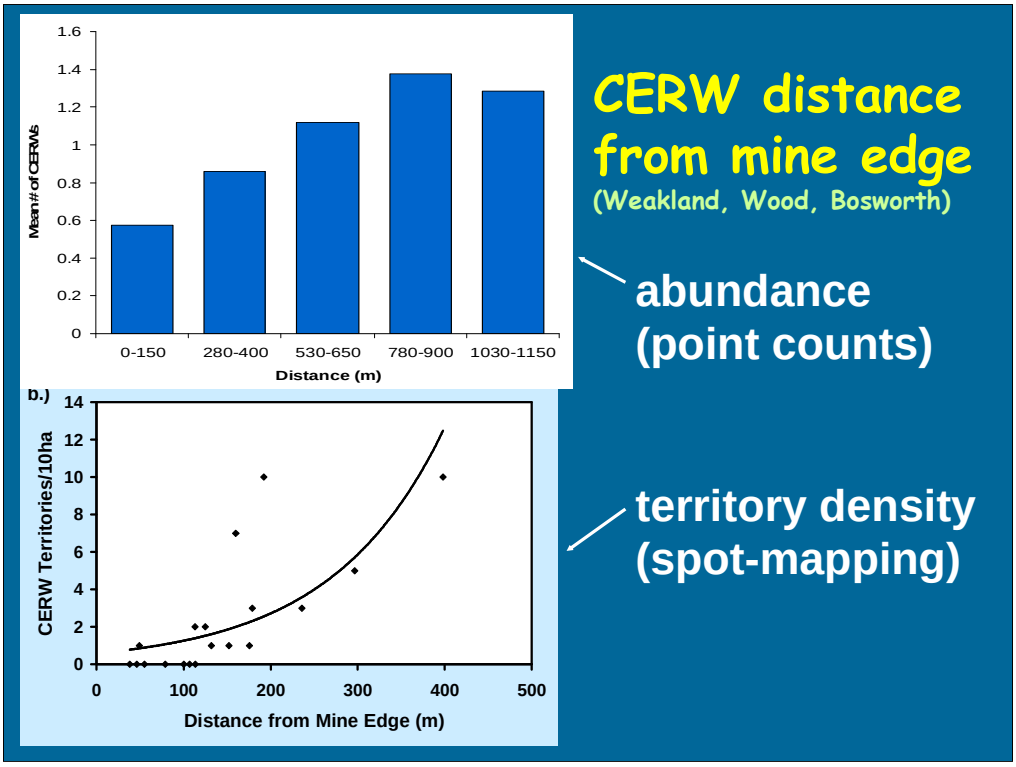


With a concurrent study on cerw abundance, we detected greater #s of cerw as forest cover in the landscape increased, so another aspect of area effects

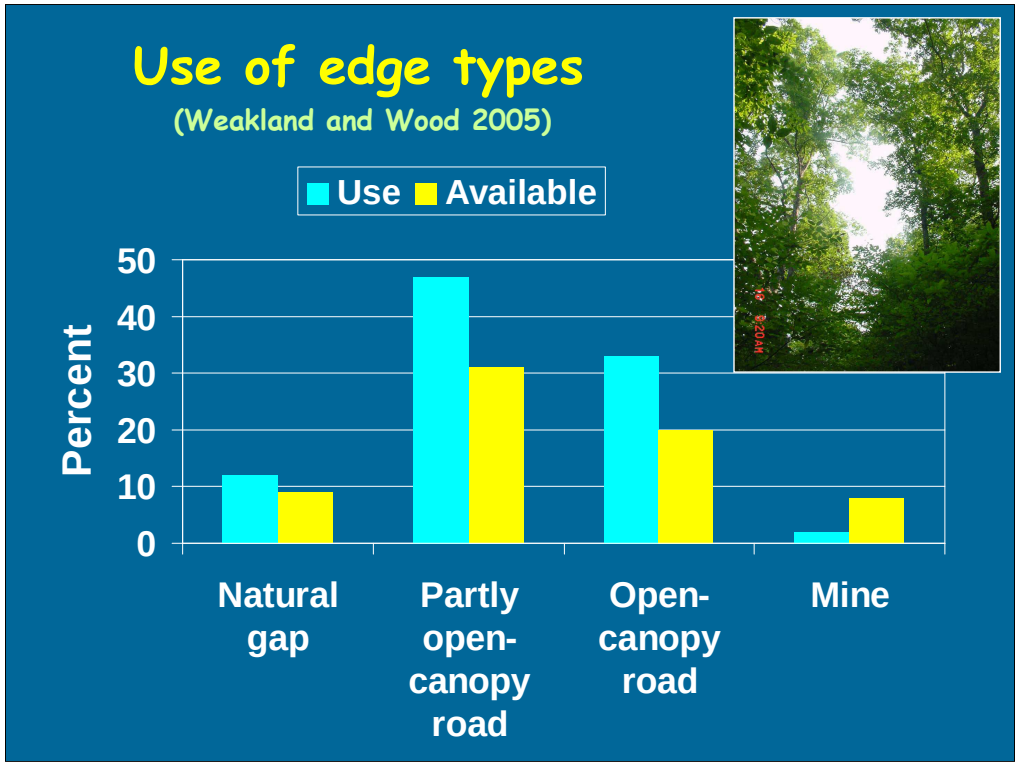
Edge Effects



We also examined response to edges for both abundance and terr density. Specifically interested in response to abrupt change at the mine edge.

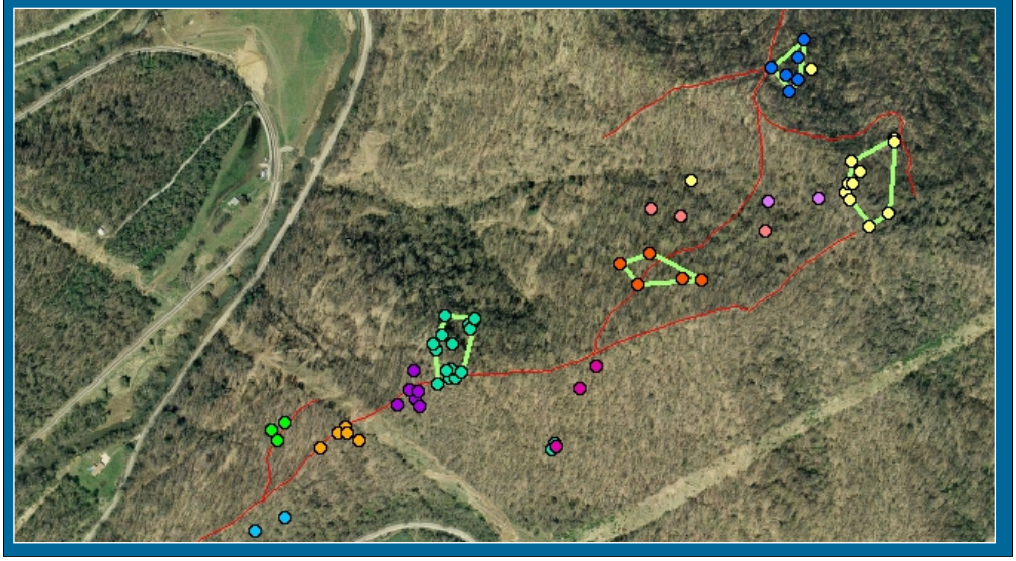


And had signif increasing relationships with both . . .



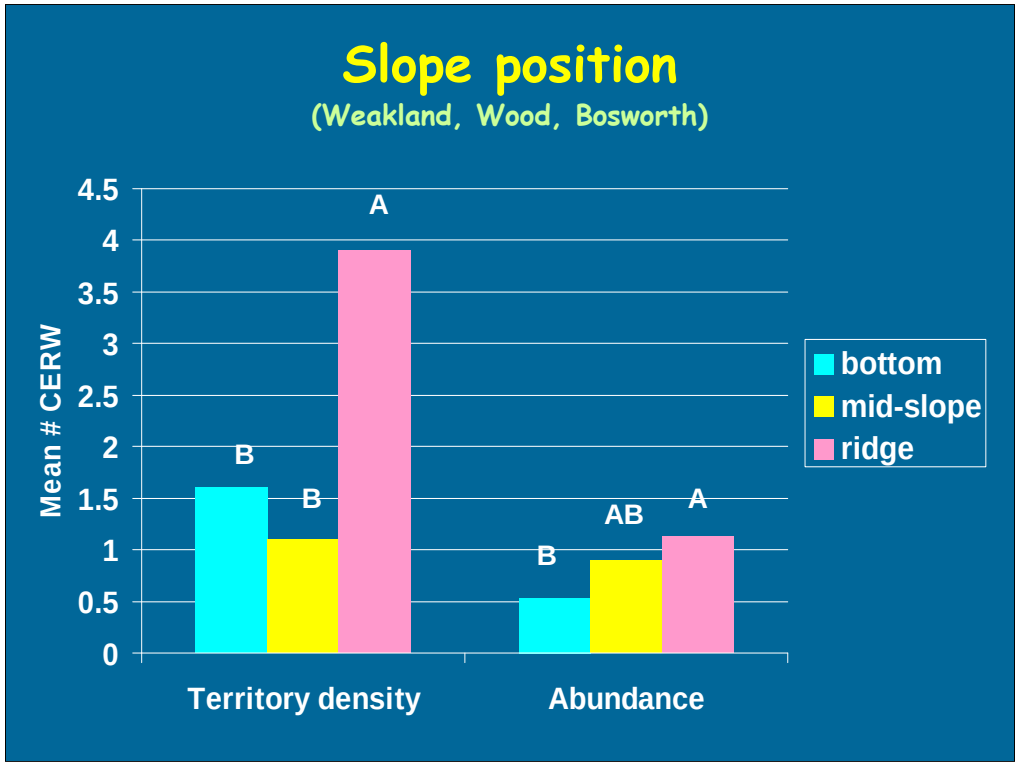
Ceruleans did not respond negatively to all types of edges. Smaller scale edges such as canopy gaps . . .

- included canopy gaps / trails within territories
- used trails as territorial boundaries
- did not use powerline edges (Perkins 2006)



This is further illustrated by a study that mapped gaps and edges relative to territories.

Red line is trail



Another landscape factor important to cerw that is affected by mt-top removal mining is position on the slope. More on ridges than on bottoms

Ridge = canopy heterogeneity

(gone after mining)

Ridges appear to be a surrogate for canopy heterogeneity

Summary of impacts

- outright loss of forest
  - ➢ particularly ridges
- degradation of remaining forest
  - ➢ edge
  - ➢ area
    - patch size
    - landscape

- fragmentation effect on demographics

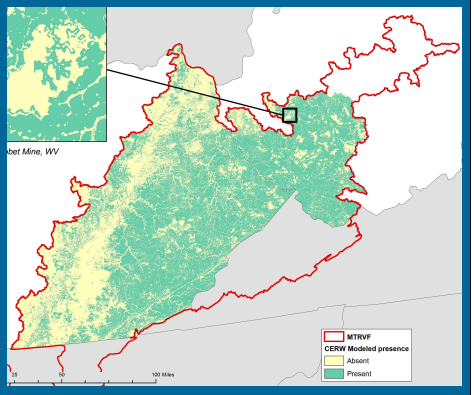
.

Documented for mt-top removal mining and likely applicable to other types of large-scale surface mining

Although we didn't document demographic effects in our studies, it's very likely that the resulting fragmentation affects demographics, potentially reducing nesting success or survival

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**

- To identify potential impacts of future mining, we modeled suitable habitat for cerw in the mt-top region using pt ct data and various landscape variables.

- Our model predicted cerw would be present in 56% of SA

- Using mine permit data, thru 2012, we estimated that future mining would impact about 0.8% of the suitable habitat. We suspect this is a low estimate.

Habitat modeling in Tennessee

(Buehler, Welton, and Beachy 2006)

- habitat model for the Cumberland Mountains of eastern Tennessee

- estimated cerulean population size 44,804 prs

  - Royal Blue Wildlife Management Area
    - 12,785 ha
    - 59% is potential cerulean habitat
    - averaged 10.7 prs/10 ha of cerulean habitat
    - estimated population = 13,680 prs
    - 30% of Cumberland total

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 is needed at local, regional, and international scales**
- **purchase land / conservation easements (mineral rights)**
- **cluster mining permits**
- **encourage timber as post-mining land use; focus on restoration of forested habitats**

Because of the extent of mining impacts it's important consider mitigation at all scales

Acknowledgments

Field

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- numerous field techs

- biologists, et al

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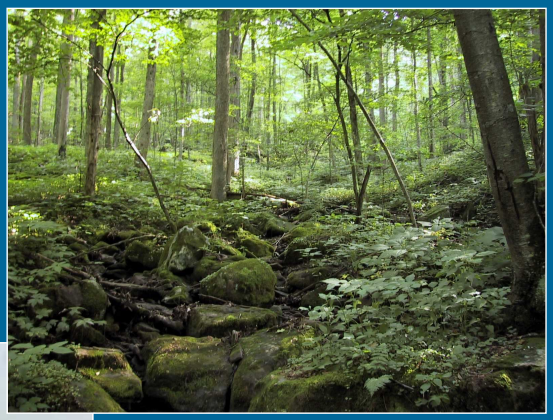
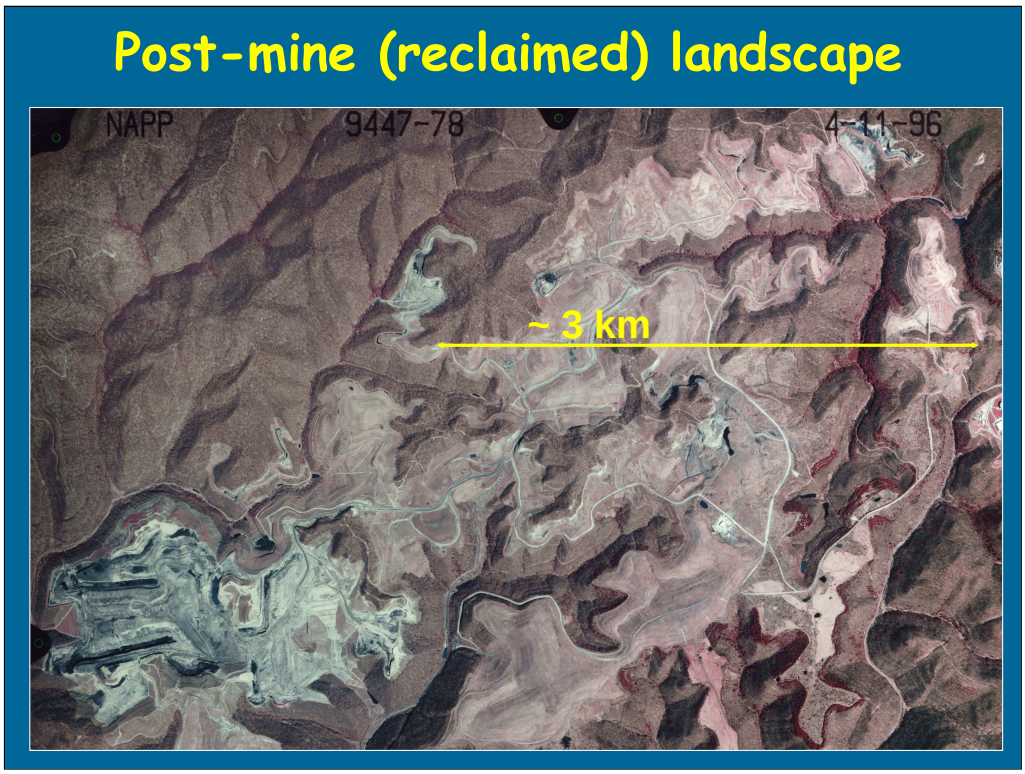
Thanks!

Gracias!



Questions?

Preguntas?



Aerial view of mine (>3km)