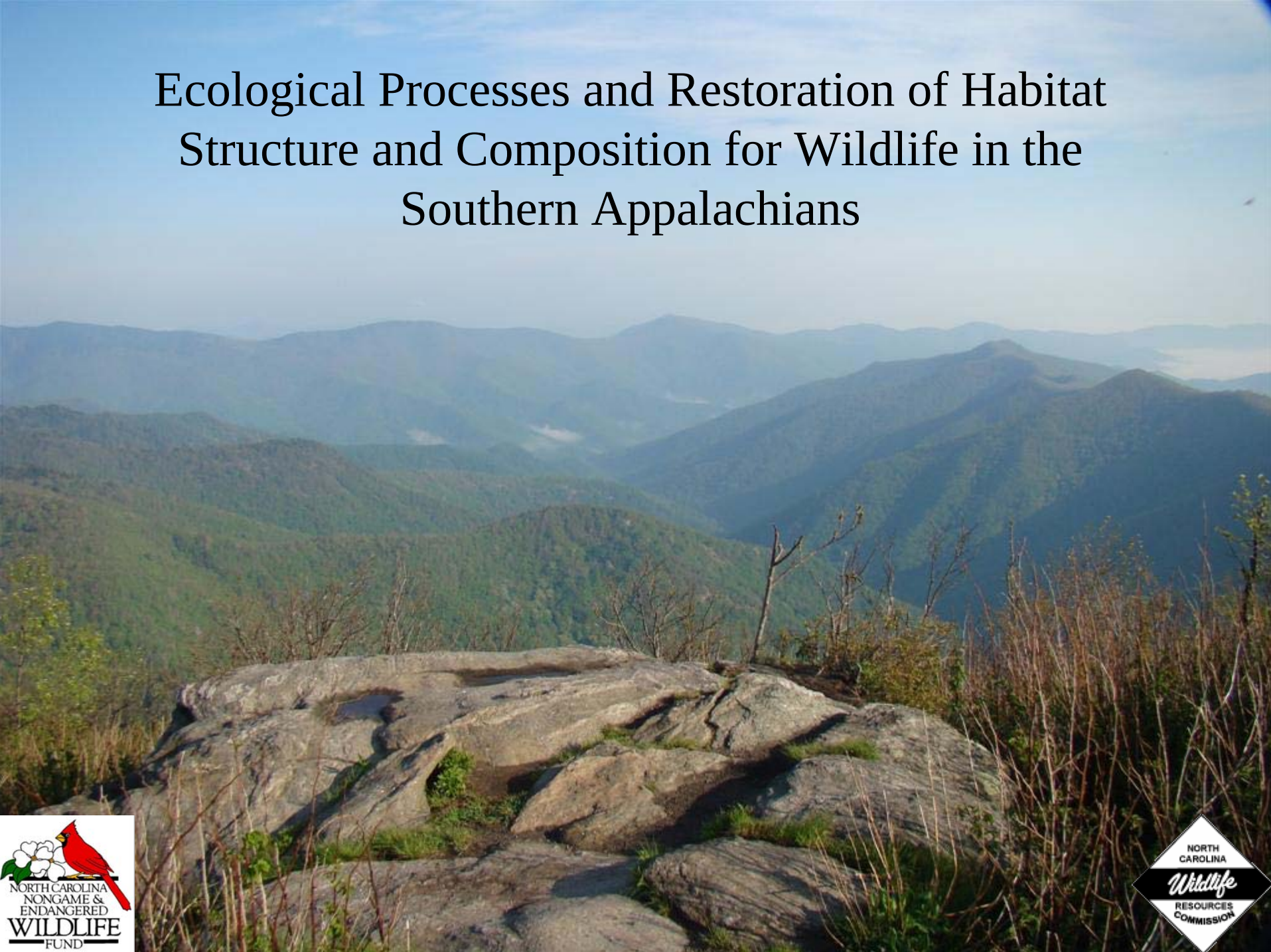
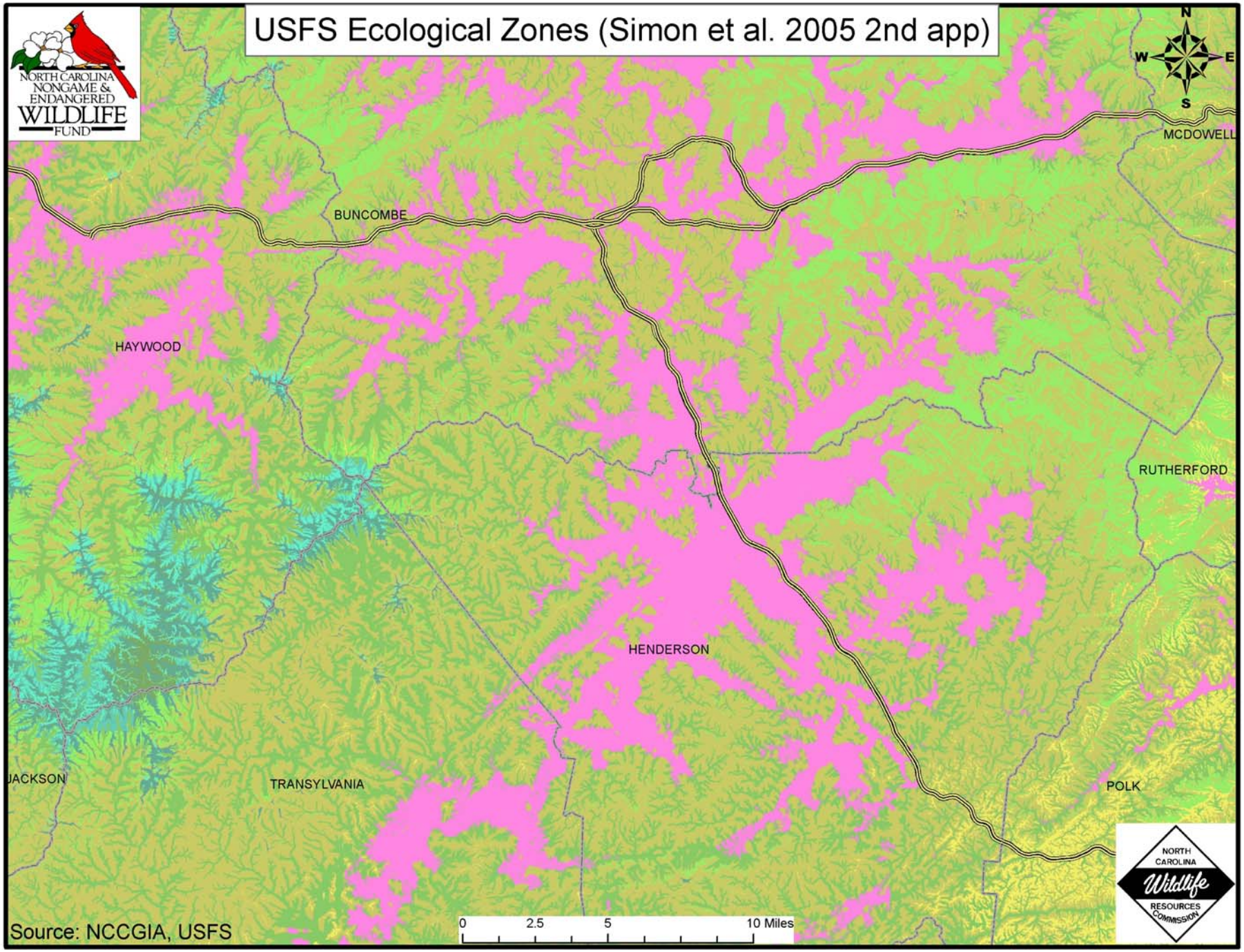
Ecological Processes and Restoration of Habitat Structure and Composition for Wildlife in the Southern Appalachians



The Real Common Problem

- Humans and associated effects
  - Urban
  - Suburban and residential
  - Agricultural practices
  - Invasive species
  - Resource extraction
  - Climate change
  - Effects interactions


USFS Ecological Zones (Simon et al. 2005 2nd app)
NORTH CAROLINA NONGAME & ENDANGERED WILDLIFE FUND
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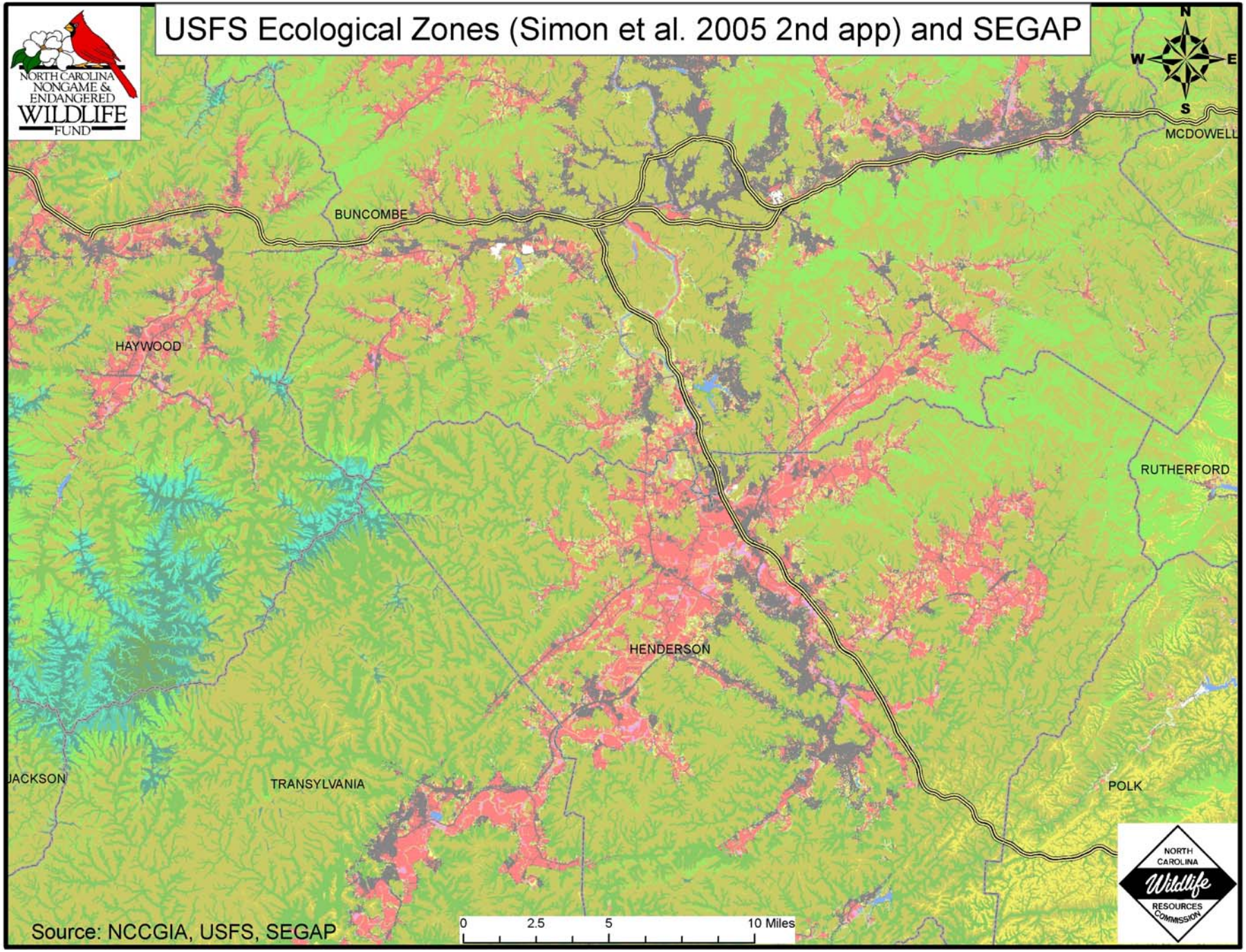
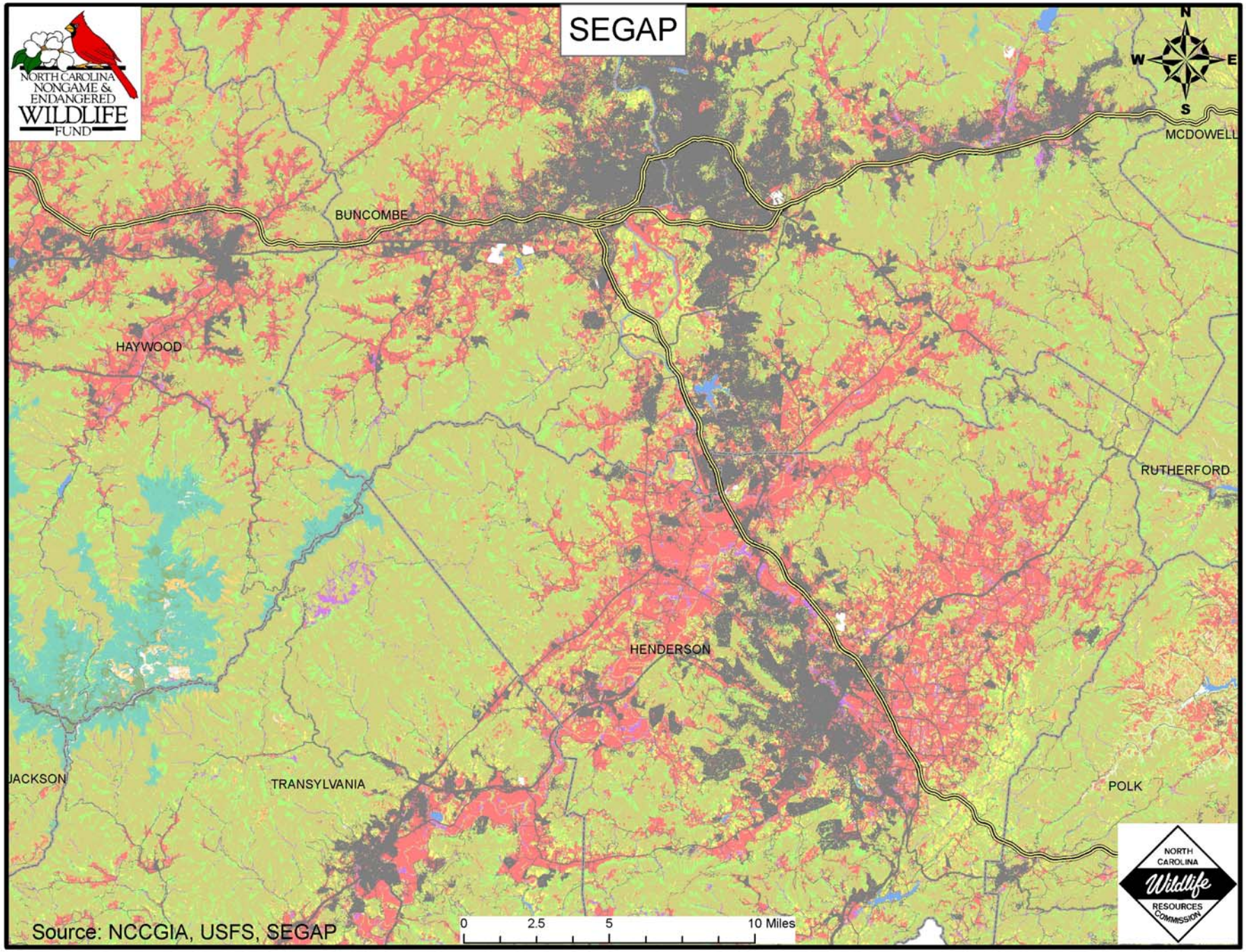
MCDOWELL
BUNCOMBE
HAYWOOD
RUTHERFORD
HENDERSON
JACKSON
TRANSYLVANIA
POLK
0
2.5
5
10 Miles
Source: NCCGIA, USFS
NORTH CAROLINA Wildlife RESOURCES COMMISSION

USFS Ecological Zones (Simon et al. 2005 2nd app) and SEGAP



Source: NCCGIA, USFS, SEGAP


SEGAP
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Source: NCCGIA, USFS, SEGAP
NORTH CAROLINA Wildlife RESOURCES COMMISSION

Landcover	Percent
Lakes and Reservoirs	9.3%
Floodplain Forests	4.4%
Early Successional (includes grass and heath balds)	8.7%
Urban	32.3%
Agricultural Crops	44.9%
Barren Areas	0.4%
	100.0%

- This is a common misclassification with landcover datasets

- Early succession habitat (ESH) is hard to map, classify, and is often misclassified; National Vegetation Classification System or Ecological Systems Classification is great, but still difficult to map…

Ecological Systems of the US

- "…system may include both early successional associations and later mature woodland stages that form dynamic mosaics…" Comer et al. 2003
- Accepting that early seral stages of forests are part of natural processes, how much floodplain forest, considering we had any left, should be in this landscape position "naturally"?
- Fire probably wasn't likely, soil is rich, flooding occurs periodically but doesn't kill trees…

Don’t forget about the ecosystem engineers of the Animal Kingdom


Others…

Ecological Systems

- Current ecological paradigm: Not Clementsian (1916) but not Gleasonian (1926) either…multiple outcomes but not every variation under the sun
- Ecological Classification; "…all seral components are explicitly included in the system concept." (Comer et al. 2003)

Ecological Processes

- Natural communities are based upon soil (e.g. nutrients, pH, and depth), landscape position (e.g. moisture and light exposure), elevation (e.g. climate), and species and disturbance interactions
- Natural disturbances and their effects are determined by and affect these same factors
- Natural disturbance probabilities and return intervals can be somewhat determined by modeling…

Wildlife Habitat

- Southern Appalachian wildlife diversity is high because of habitat diversity
- This not only includes plant community diversity, geologic diversity, and the structural and compositional diversity of mature seral stages, but also the structural and compositional diversity of early seral stages

NC Wildlife Action Plan (terrestrial spp.) in the Southern Appalachians

- 116 Species of Greatest Conservation Need
- ~32 spp. associated with ESH (3 State SC; GWWA, Rock Vole, timber rattlesnake)
- 19 spp. associated with Spruce-Fir (5 State SC, 1 T, and 1 E); 2 of the 19 (~10%) are associated with ESH (*CSWA and Rock Vole*)
- 31 spp. associated with Northern-Hardwood (5 state SC, 1 T, and 1 E); 15 shared with S-F (35); 1 plus 2 additional spp. associated with ESH (*GWWA*, CSWA, *Appalachian Cottontail*)
- 34 spp. associated with Cove Forest (2 additional SC); 13 shared with N-H (56); 0 spp. associated with ESH

NC Wildlife Action Plan (terrestrial spp.) in the Southern Appalachians

- 49 spp. associated with Oak Forests (2 additional SC); 37 shared with previous habitats (68); 1 plus 4 additional spp. associated with ESH (*Eastern box turtle*, *timber rattlesnake*, *least weasel*, *whip-poor will*, GWWA)
- 21 spp. associated with Floodplain Forest; 16 shared with previous habitats (73); 2 plus 2 additional spp. associated with ESH (*EAKI*, *AMWO*, timber rattlesnake, and Eastern box turtle) more if you include bogs and small wetlands
- 10 spp. associated with Dry Coniferous Woodlands; all but 1 (BHNU) shared with previous habitats; 1 plus 2 additional spp. (~30%) associated with ESH (timber rattlesnake, *coal skink*, *PRWA*)

Age Distribution of National Forests in North Carolina

- 2.5% Old growth
- ~2% *Quality* early successional
- 80% 80-100 yr old forest
- Solution: Increase QES and OG
- BUT, Where and How?

ESH: Succession vs. Maintained

- Dynamic mosaics were created by natural disturbances and most disturbances have been controlled by humans for their own purposes for hundreds or thousands of years and more so now…out of whack
- Returning to this is a challenge, even in large contiguous protected areas such as GSMNP

Succession

ESH: Succession vs. Maintained

- Generally, there are even greater restraints that will require active management mimicking natural disturbances and/or compensating for human interruption of natural processes and disturbances (e.g. invasive spp.)
- Moving forward in adaptive management framework requires collaboration

Maintained: Warm Season Grasses

Old Growth: Current and Future?

- Legacy features and dynamics can be perpetuated by preserving old growth
- Natural disturbances more likely in some ecological systems than others
- Disturbance suppression and use barriers may have made some systems over-represented in old growth (e.g. Chestnut Oak Forest)


Ben Kimball

Old Growth: Current and Future?

- High site index and ease of harvest have made others under-represented (Cove Forest)
- These need to be considered while moving forward with restoration of ecological systems

The Real Common Solution

- Humans
  - Understanding we are part of the ecosystems
  - Using the best available science and continuing to learn through adaptive management
  - Balancing multiple human values and goals underneath the umbrella of ecological restoration
  - Wearing my or your’n shoes; partnerships


Questions?
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