Burn Prioritization Model use on the South Mountains Landscape

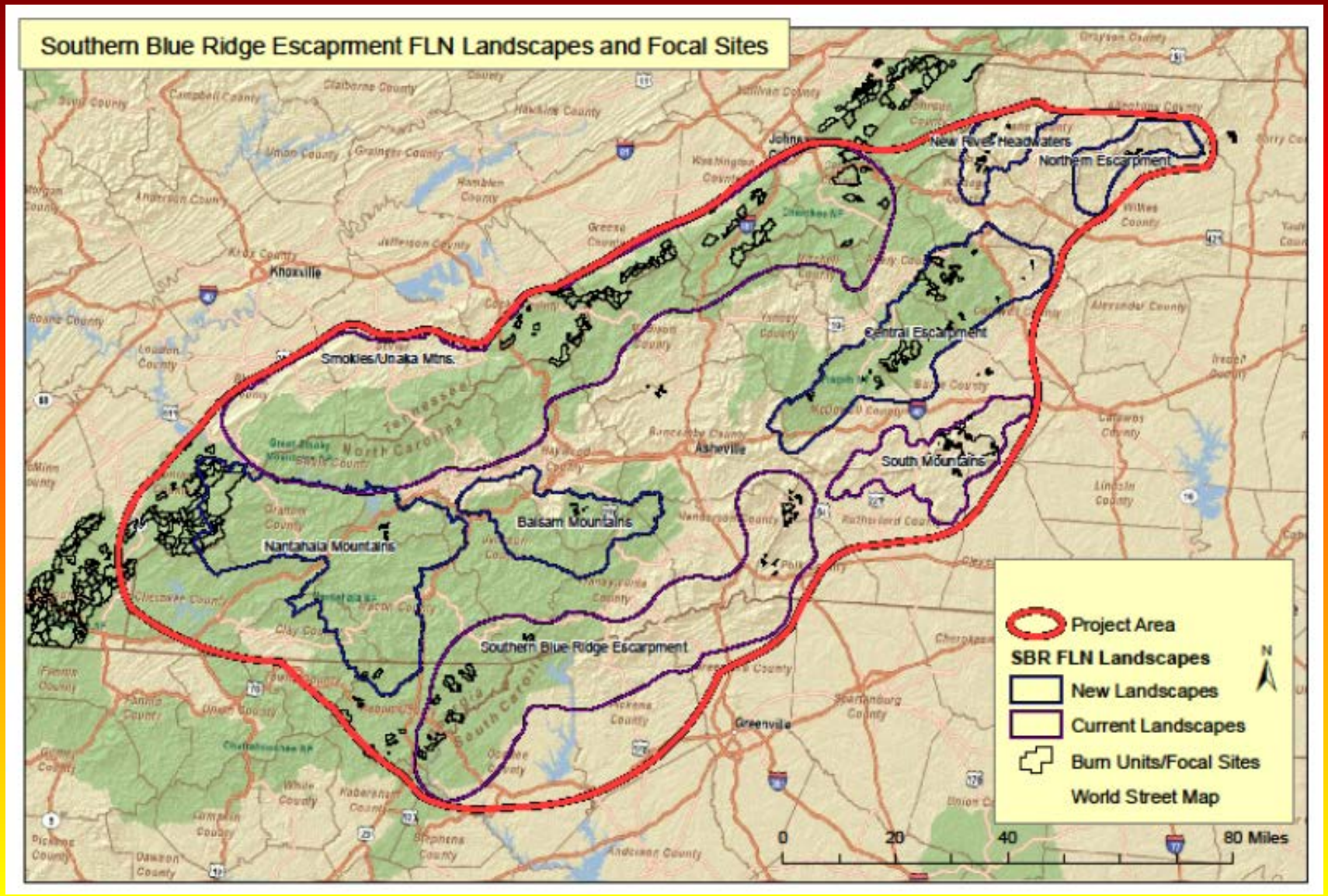
NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

NORTH CAROLINA STATE PARKS

The Nature Conservancy

FLN

Overview of the SM Landscape

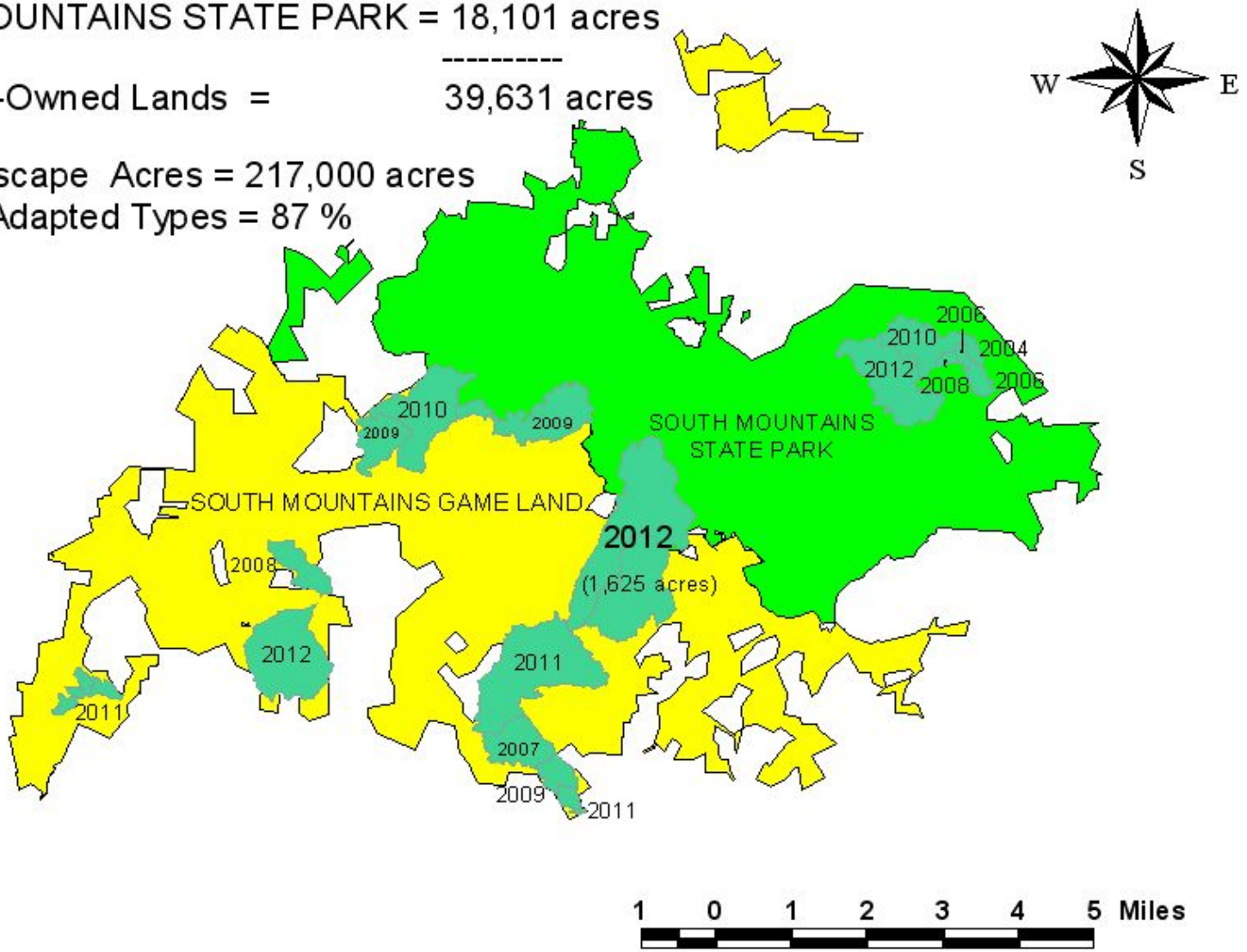


South Mountains Landscape - Current Focal Areas
State Owned Lands - NCWRC and NCDPR

SOUTH MOUNTAINS GAME LAND = 21,530 acres
SOUTH MOUNTAINS STATE PARK = 18,101 acres

Total State-Owned Lands = 39,631 acres

Total Landscape Acres = 217,000 acres
Total Fire Adapted Types = 87 %



Agency Overview

- Began burning in 1998 - 1st State Park to prescribed burn in Western North Carolina.
- Burn an average of 100 acres per year.
- Has approximately 700 acres in burning rotation.
- Have 11 trained and certified prescribed burning personnel.

- Began burning in the mountains in 1987
- Began Burning on South Mountains Game Land in 2003 and have approximately 3,500 acres in a burning rotation.
- Burn an average of 2,000+ acres per year in the mountains - about 1/2 of this is on South Mountains Game Land.
- Conduct prescribed burns on 12 Game Lands across 13 counties in Western North Carolina.
- Have 25 trained and certified prescribed burning personnel in Western North Carolina.

Origination of the Concept

- The concept of burn prioritization modeling within the South Mountains Landscape began in response to the idea of testing the CE model approach on other landscapes.

- After a preliminary test run of the CE model against the already established burn program on the SM landscape, it was determined that the CE model didn't fully capture all the aspects and priorities of the burning programs within the landscape.

- Although the CE model contained many ecological factors that were also important across the SM landscape, the members of the SM landscape felt like the CE model could be adjusted to more effectively reflect and capture those differences in agency goals and priorities.

Development of the Model

- Development of the SML model began with a lot of email conversations followed by a meeting of the SML members.
- Similarly to the CE model, prioritization would focus on ecological factors within a burn area and would attribute each burn unit within the landscape a ranking based on a score derived from an “eco-math” equation.
- The goal was to create a method of prioritizing both existing and potential burn areas with in the landscape.
- The model was designed to be easily calculated using available GIS data which could be simply entered into the model.

Differences in Landscape

Central Escarpment

- Goal primarily is to rank potential units to be burned- NEPA
- Predominantly conducts landscape sized burn units- affects numbers of acres and occurrences more greatly
- Management objectives are geared more towards creating woodland conditions- especially on USFS property
- Tend to have greater resources available to conduct burns
- A small number of large burns are conducted each burning season

South Mountains

- Goal to prioritize the many existing burn units with in the landscape as well as help determine new areas to burn
- Conducts burns of various size small to moderate in size
- Management objectives include creating Early Successional, Savannah, and Woodland Conditions
- Have fewer resources available to conduct burns
- Several burns conducted varying in size throughout the burning season

A Comparison of Both Models

Central Escarpment Model

(3PA)/100 + OA/100 +50HM +10GR +5SR +(15,10,5)SNHA + WO

PA=Pine Acres
OA=Oak Acres
HM=Hudsonia montana
GR=Globally Rare Fire Dependent Species
SR=State Rare Fire Dependent Species
SNHA= State Natural Heritage Areas with fire adapted vegetation; 15 for "A", 10 for "B", 5 for "C".
WO= Wildlife Openings

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) +4GR +1SR +(3ps, 1os)SNHA

PA=Pine Acres
OA=Oak Acres
ESA= Early Successional Acres including wildlife openings
UA= Unit Acres
GR=Globally Rare Fire Dependent Species
SR=State Rare Fire Dependent Species
SNHA= State Natural Heritage Areas
(PS= Pine System, OS= Oak System)

Differences in Models

Central Escarpment

- Compares similarly sized "landscape" areas typically 1000 acres or larger- is acres driven
- Considers only wildlife openings- Early Successional Areas are less documented
- Doesn't consider unit size or acres of the burn unit
- Specifically weights towards units with occurrence of Hudsonia montania
- Presence of rare fire adapted species and SNHA's applies the most weight to the final score
- SNHA's receive points based on ranking of condition or quality.

South Mountains

- Compares a wide variety of actual burn units ranging in size from 25 acres to 1000 acres
- Considers all acres of Early Successional habitat including wildlife openings
- Is weighted slightly towards larger units and takes into account the ratio of ecological factors compared to unit size.
- Doesn't weight toward specific plant species
- Percentage of pine, oak, and early successional systems applies the most weight to the final score
- Points for SNHA's are given to ranking based solely on type

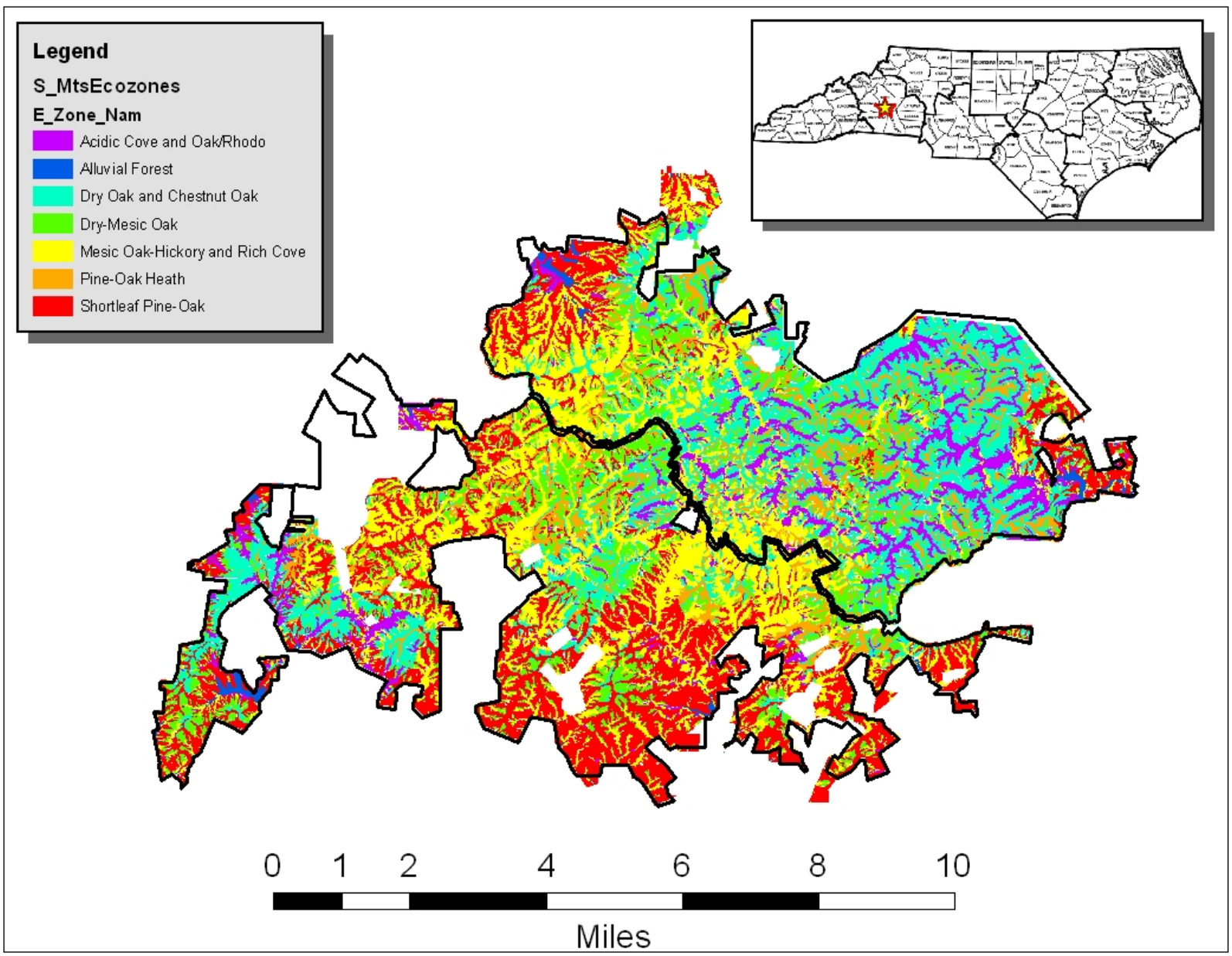
Components of the Model

South Mountains Model

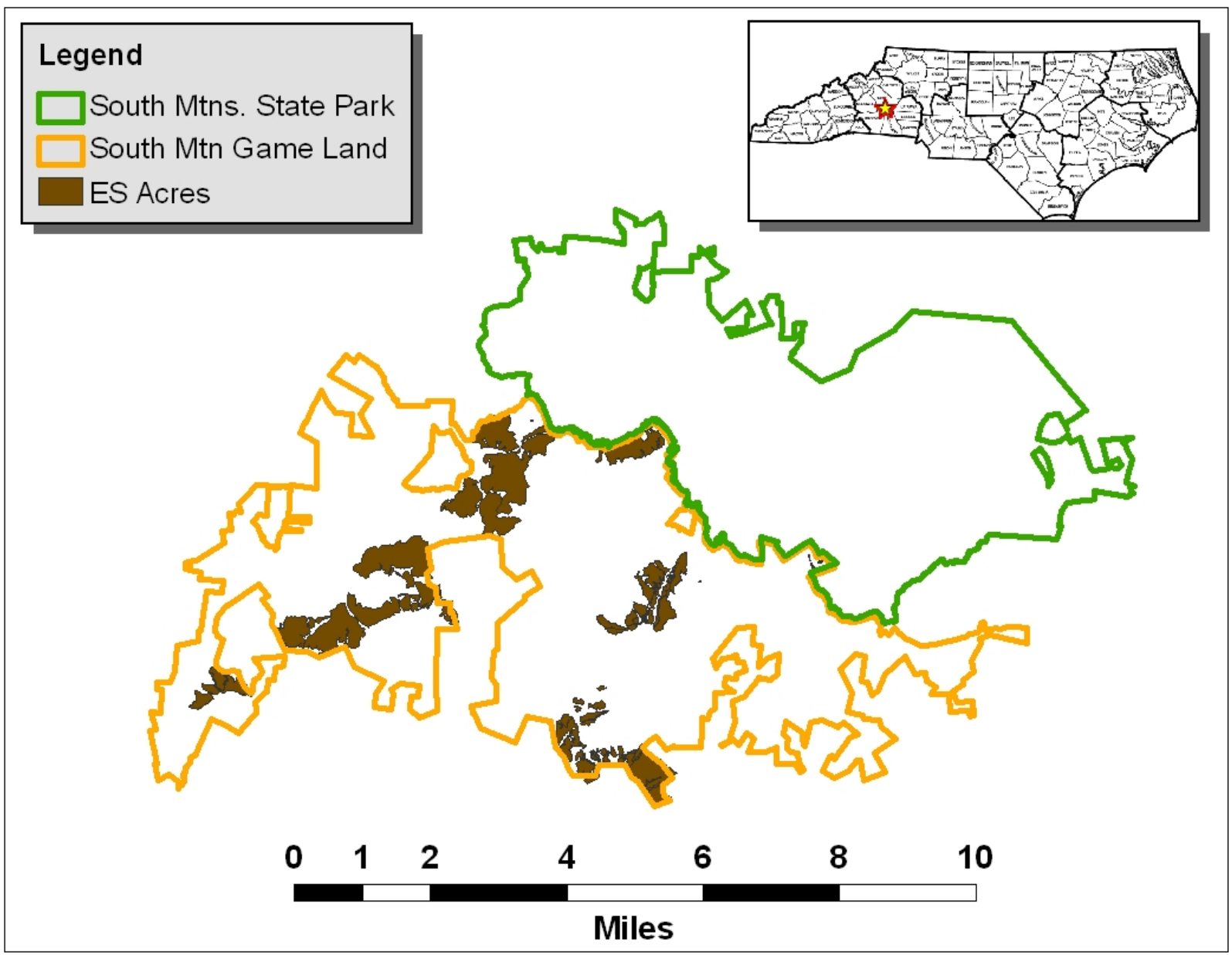
9((3PA + 2ESA + OA)/UA) + (UA/150) +6GR +3SR +(9PS, 6OS)SNHA

PA=Pine Acres
OA=Oak Acres
ESA= Early Successional Acres including wildlife openings
UA= Unit Acres
GR=Globally Rare Fire Dependent Species
SR=State Rare Fire Dependent Species
SNHA= State Natural Heritage Areas
(PS= Pine System, OS= Oak System)

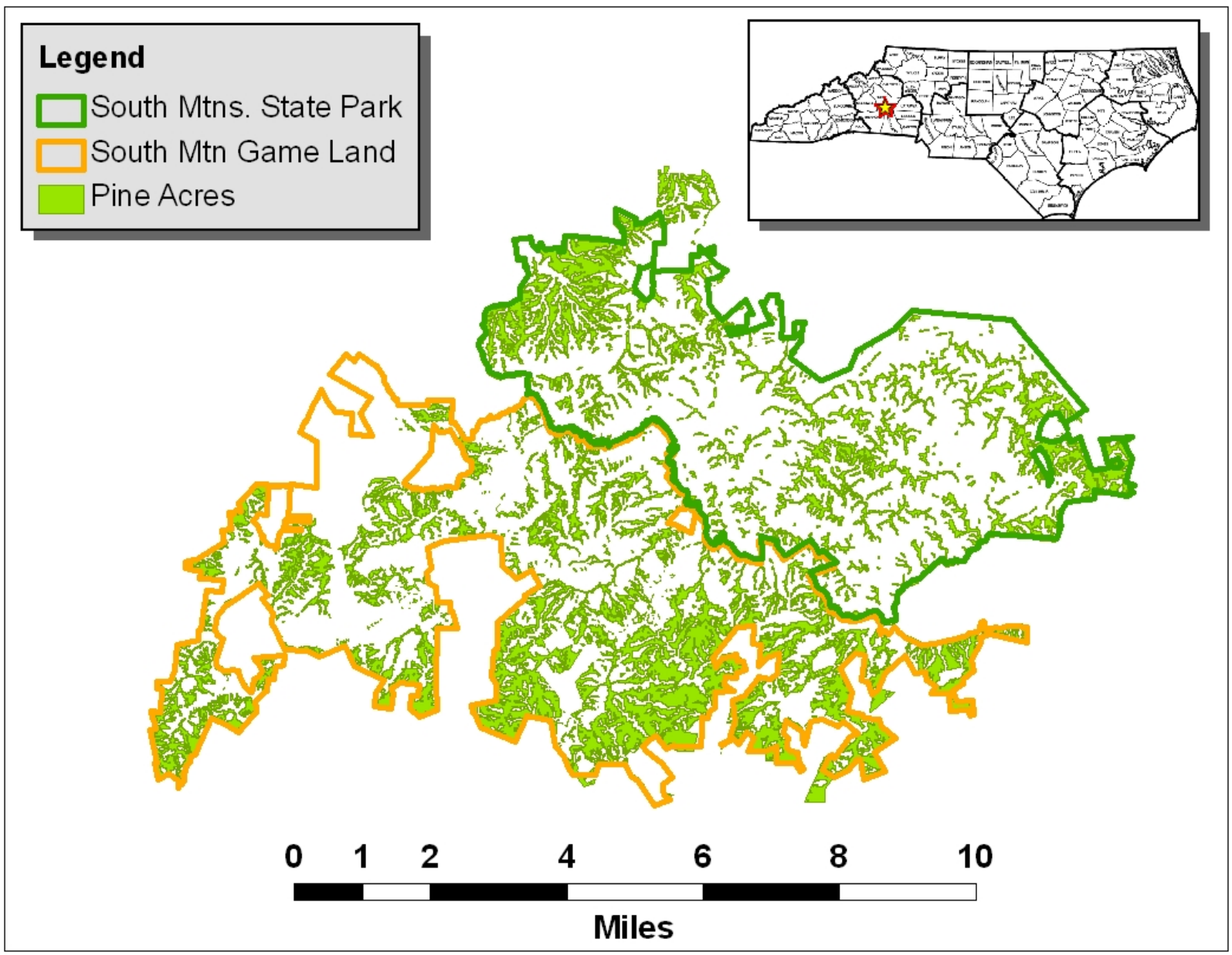
Eco-Zones


Legend
S_MtsEcozones
E_Zone_Nam
Acidic Cove and Oak/Rhodo
Alluvial Forest
Dry Oak and Chestnut Oak
Dry-Mesic Oak
Mesic Oak-Hickory and Rich Cove
Pine-Oak Heath
Shortleaf Pine-Oak
0 1 2 4 6 8 10
Miles

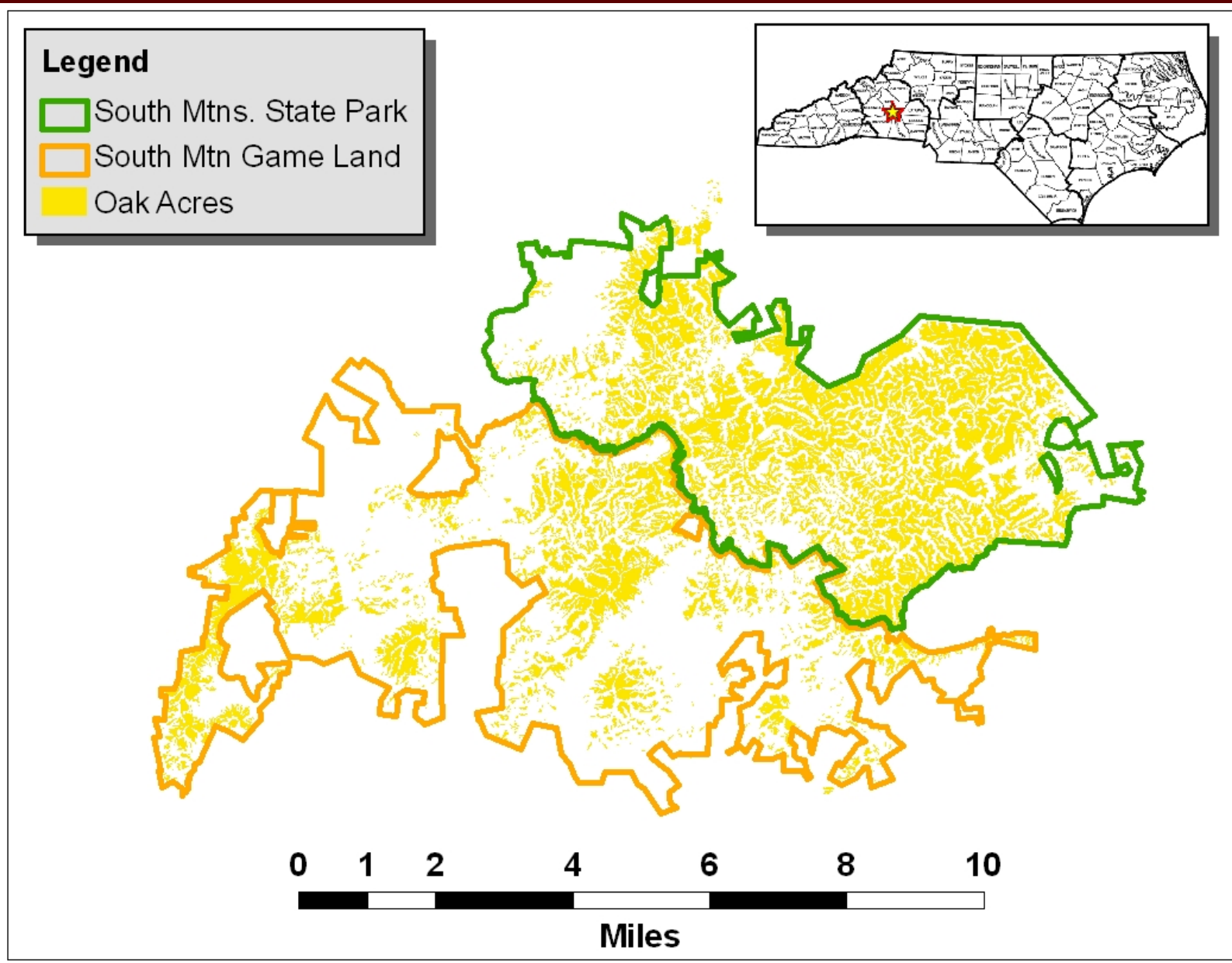
ES Acres


Legend
South Mtns. State Park
South Mtn Game Land
ES Acres
0 1 2 4 6 8 10
Miles

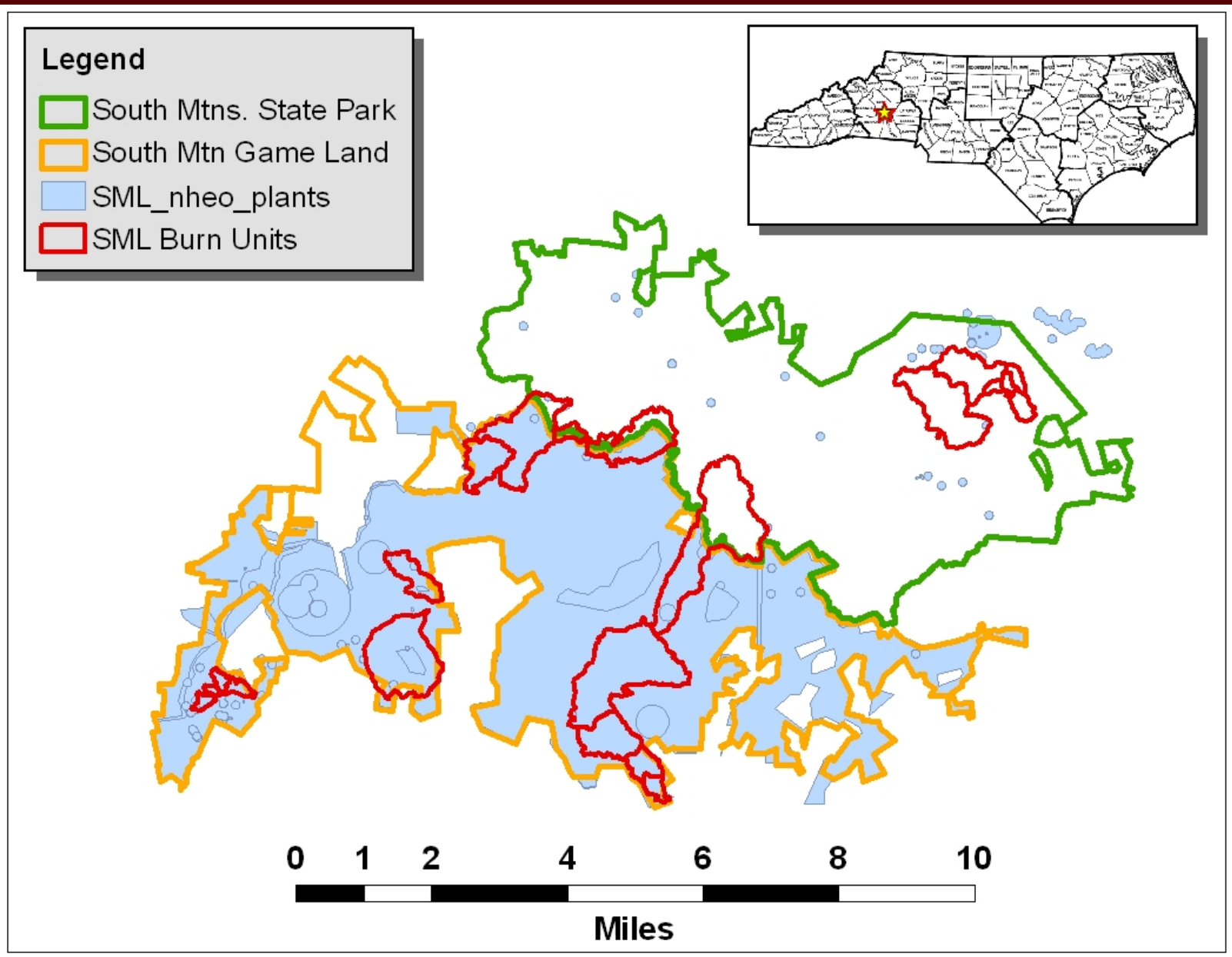
Pine Acres


Legend
South Mtns. State Park
South Mtn Game Land
Pine Acres
0 1 2 4 6 8 10
Miles

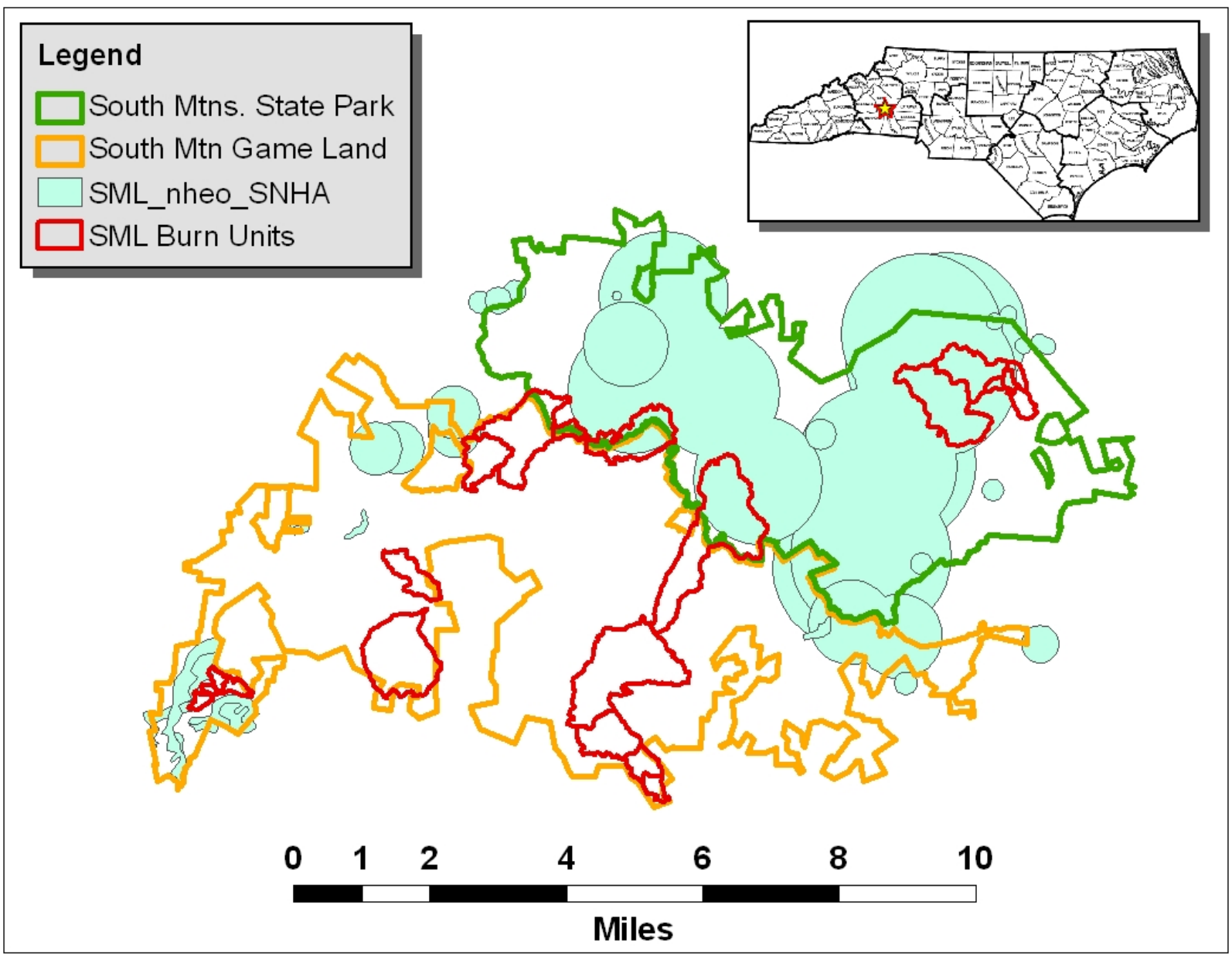
Oak Acres


Legend
South Mtns. State Park
South Mtn Game Land
Oak Acres
0 1 2 4 6 8 10
Miles

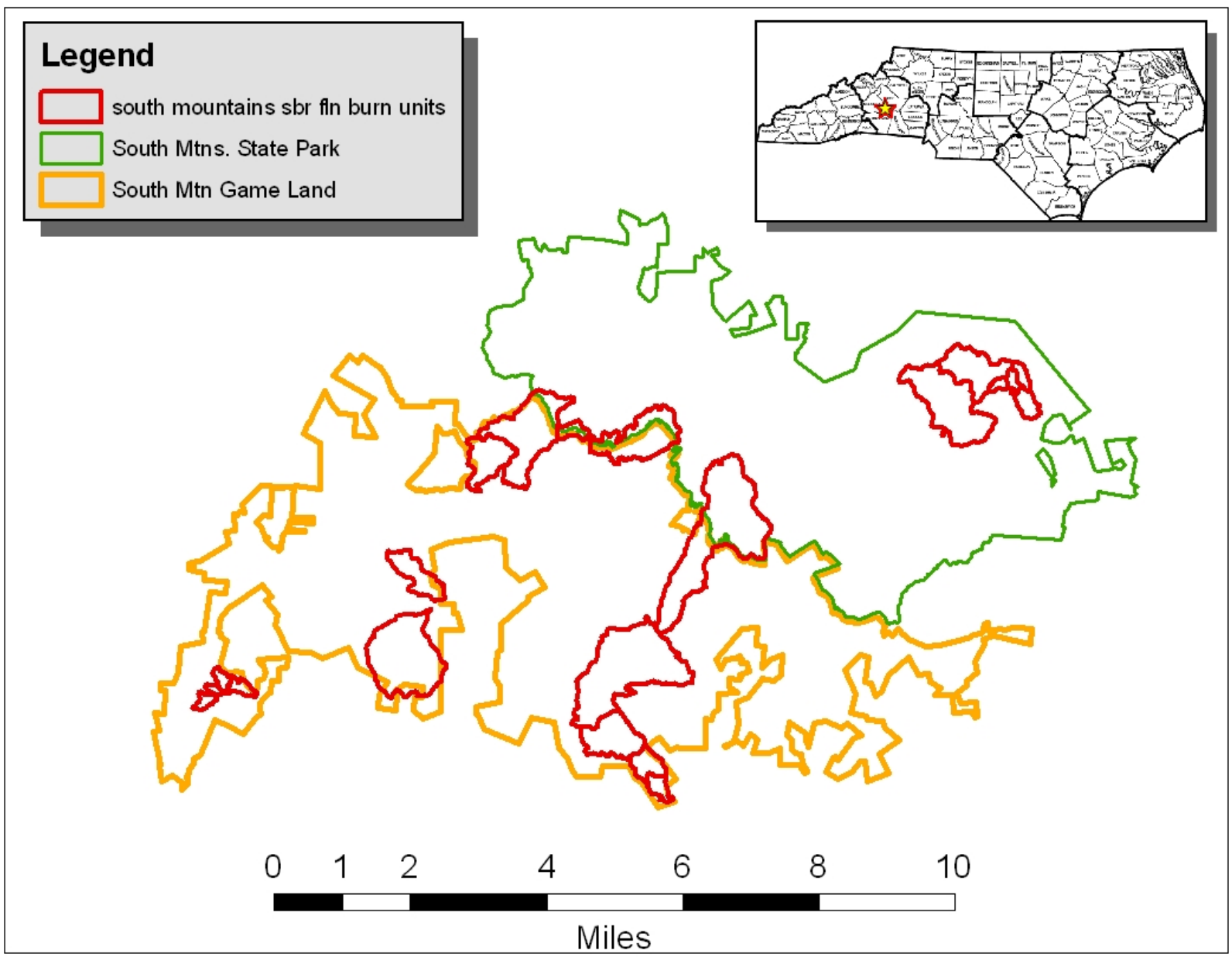
NHEO Data- Plants



NHEO Data- SNHA's



Burn Units

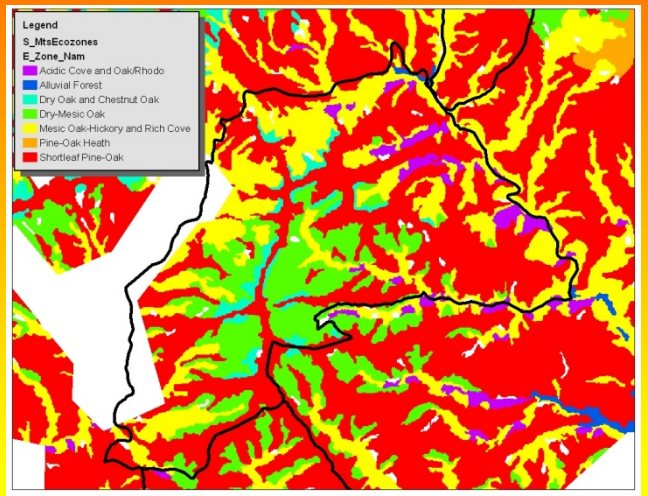

Legend
south mountains sbr fln burn units
South Mtns. State Park
South Mtn Game Land
0 1 2 4 6 8 10
Miles

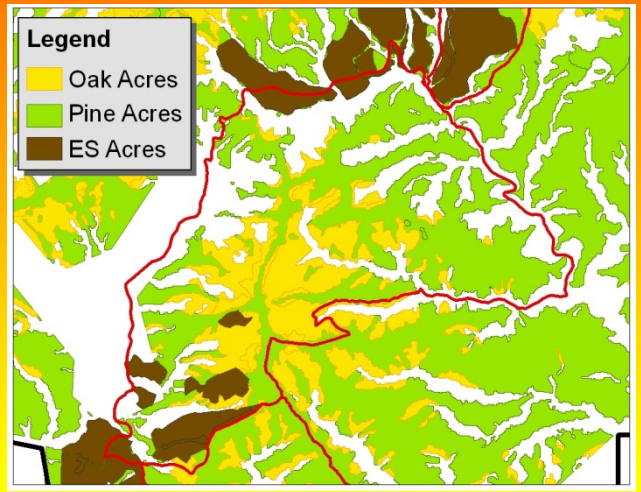
Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

- Pine acres modeled using Steve Simon's "eco-zone" model with acres of early successional habitat deducted
- Includes Pine/ Oak Heath and Shortleaf Pine/ Oak ecozones
- Has a multiplication factor of 3 because pine systems are often the furthest departed from their DFC, and they have a much shorter return interval or frequency of fire than oak systems.



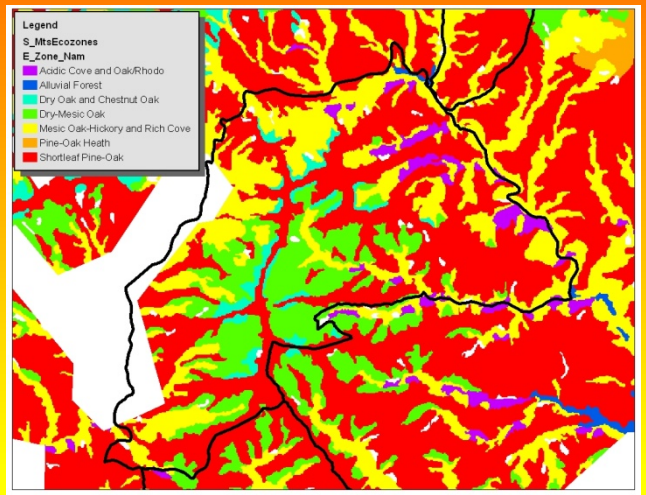


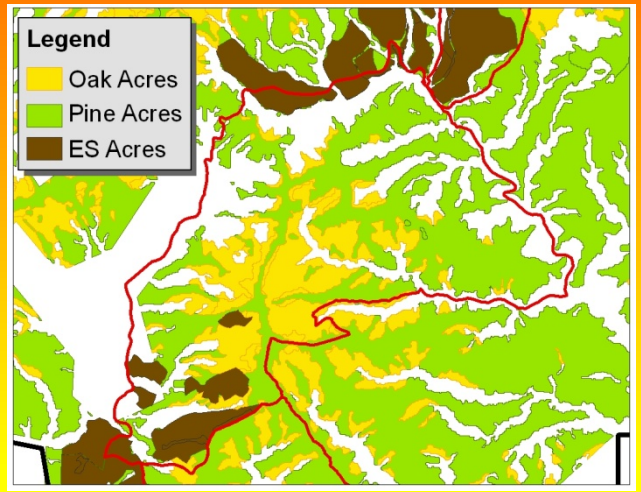
Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

- **Early successional acres of areas specifically managed for ES habitat and include wildlife opening acres, and are deducted from the eco-zone model types.**
- **ES areas are areas which are maintained in the 0-10 year age class and have a maximum woody vegetation dbh of 4 inches.**
- **Has a multiplication factor of 2 as it requires a higher frequency of fire to promote and maintain and considered a limiting habitat type**



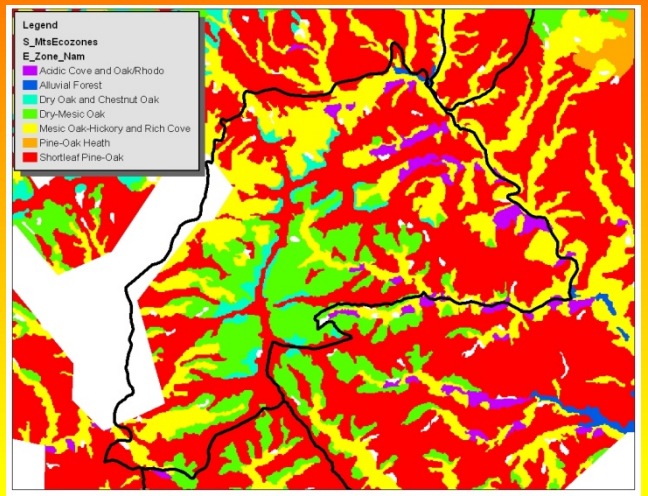


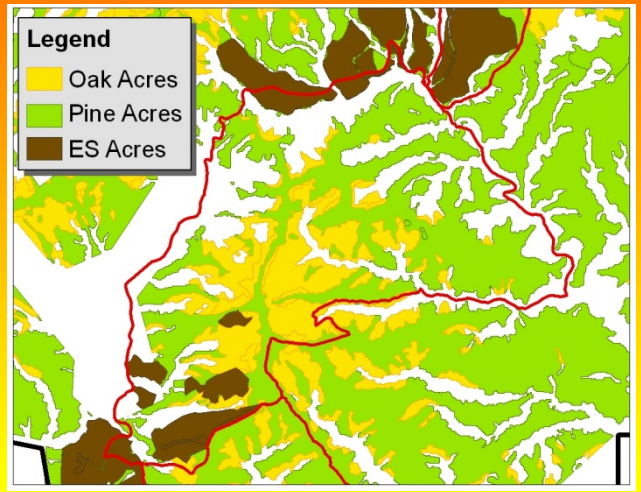
Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 10s)SNHA

- Oak acres modeled using Steve's eco-zone model with ES acres deducted
- Includes Dry-Mesic Oak and Dry Oak- Chestnut Oak ecozones
- Has a multiplication factor of 1





Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

- Totals of weighted pine, oak, and ES acres divided by the total acres of the burn unit
- Creates a ratio between totals of the ecological factors in burn unit
- Makes all units equal regardless of size
- Gives the ratio between totals of the ecological factors and the burn unit a multiplying factor of 8

Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + **(UA/150)** + 4GR + 1SR + (3ps, 1os)SNHA

- **Factor adds a slight weighting towards larger units, particularly units over 150 acres.**
- **Larger units provide more ecological opportunities to restore habitat and ecosystems and often have greater logistical benefits (more bang for the buck)**
- **150 represents a threshold, which is the most acres which can be burned with the fewest amount of resources**
- **In a situation where two units have the exact same ratio of ecological factors within the unit, the larger unit would receive the higher score.**

Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + **4GR** + 1SR + (3ps, 1os)SNHA

- **Total number of different globally rare fire dependent/ fire tolerant species with in the burn unit, multiplied by a factor of 4**
- **Presence is based on the Natural Heritage Elemental Occurrence data layer**
- **For consideration a species must have a G1, G2, or G3 ranking**
- **Only one occurrence of each species is considered within the formula**

White Irisette

Components of the Model

South Mountains Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

- **Total number of different state rare fire dependent/ fire tolerant species with in the burn unit, multiplied by a factor of 1.**
- **Presence is based on the Natural Heritage Elemental Occurrence data layer**
- **For consideration a species must have a S1 or S2 ranking**
- **Only one occurrence of each species is considered within the formula**

Tall Boneset

Bear Oak

Components of the Model

South Mountains Model

$$8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA$$

- Total number of significant natural heritage areas with in the burn unit from the Natural Heritage Elemental Occurrence data layer
- Considered based on whether it is an oak or pine system, ranking has no effect
- Does not consider rank due to inconsistency of surveys across the landscape and due to the fact that current condition rankings could be a response of past fire history or could potentially change with implemented burning.
- Includes Pine/ Oak Heath, Chestnut Oak, Dry-Mesic Oak/ Hickory, and Montane Oak/ Hickory forest type designations.
- Pine systems have a multiplication factor of 3 and oak systems a multiplication factor of 1
- Only one occurrence of each system type is considered within the formula

Comparison of How Fire Adapted Systems Affect Score

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

Unit	Unit Acres	Pine Acres	ES Acres	Oak Acres	Description	Score
A	100	30	20	40	Small Unit/ High %	14.27
B	1000	300	200	400	Large Unit/ High %	20.27
C	100	10	5	15	Small Unit/ Low %	5.00
D	1000	100	50	150	Large Unit/ Low %	11.06
E	600	300	100	100	High Pine Acres	20.00
F	600	100	300	100	High ES Acres	17.33
G	600	100	100	300	High Oak Acres	14.67

NCWRC and Joint Burn Units Results

Unit	Unit Acres	Pine Acres	ES acres	Oak Acres	GRS	SRS	Pine SNHA	Oak SNHA	Score
Icy Knob/Chestnut Knob	527	58	275	58	2	4	0	2	29.38
Woods Gap	1003	134	118	214	2	4	0	1	26.49
Huckleberry Mountain	878	336	77	175	1	3	0	0	25.03
Oakey Knob	646.6	181	0	228	2	3	0	0	24.85
Roper Creek	223.3	55	101	16	1	3	0	1	23.21
South Huckleberry Mountain	269.1	179	23	26	0	3	0	0	22.89
High Peak	438.4	50	148	135	1	3	0	1	21.62
Devils Fork Mountain	176	13	124	9	2	3	0	0	21.52
Lone Mountain	126.4	0	125	0	0	4	0	0	20.68
Golden Valley Clear-cut	107.8	0	108	0	0	3	0	0	19.72
South Golden Valley Clear-cut	55.7	0	56	0	0	3	0	0	19.46

SMSP Burn Units Results

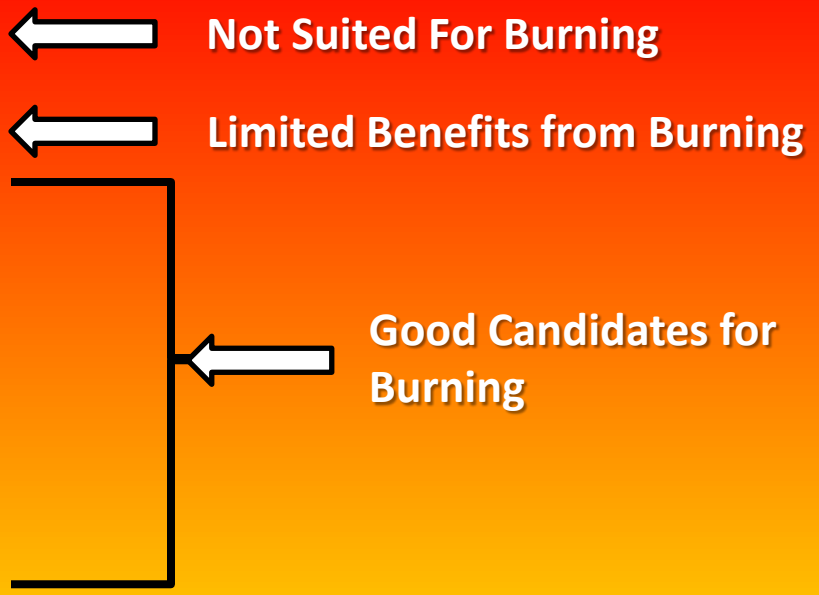
Unit	Unit Acres	Pine Acres	ES** acres	Oak Acres	GRS	SRS	Pine SNHA	Oak SNHA	Score
SM State Park Burn Unit 17	278.9	56	0	174	1	0	0	2	17.67
SM State Park Burn Unit 18	523	57	0	354	1	0	0	2	17.49
SM State Park Burn Unit 16	69.8	32	0	29	0	0	0	1	15.77
SM State Park Burn Unit 13	26	8	0	15	0	0	0	2	14.17
SM State Park Burn Unit 14	40.4	12	0	24	0	0	0	2	14.16
SM State Park Burn Unit 15	30.2	6	0	18	0	0	0	2	11.74

** Early Successional Habitat has not been modeled across SMSP lands.

Burn Prioritization Classification

For Use as a Guideline for New and Potential Unit Development

Classification	Score
Poor	0-5
Low	6-10
Fair	11-15
Good	16-20
High	21-25
Excellent	26 or greater



Benefits of a Prioritization Model

- Streamlines planning and coordination
- Can be used to identify key focal areas
- Gives a general comparison of units- and potential expectations for new units
- Evaluates a burn units productivity by which it could be adjusted to improve efficiency. (implementation year, consolidation, liquidation)

Implementation of the Model

8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1SR + (3ps, 1os)SNHA

- This model could be used and modified by any agency, NGO, or group to prioritize burn units in any area where oak, pine, and early successional habitat are priority systems for burning.
- By simply changing the multiplying and dividing factors (highlighted in yellow) for each of the ecological components, the model could be easily adjusted or adapted to incorporate specific management priorities.

Thanks To:

The South Mountains Landscape Team:

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Ryan Jacobs-NCWRC

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Josh Kelly- Wildlaw
Steve Simon- USFS Retired
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Questions?