# Implementating a Burn Prioritization Model for South Mountains Burn Units with GIS

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June 30 2011

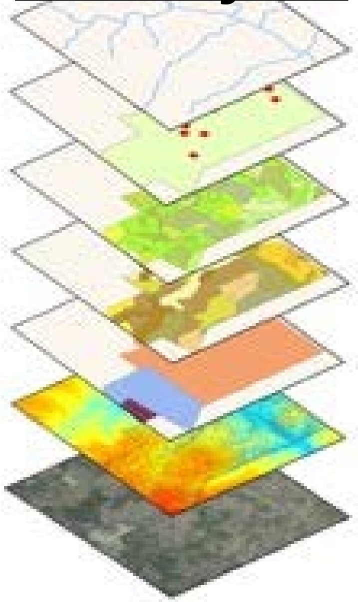
Supported by….

# Implementing “Eco-Math”

## Eco-Math model

3PA/100 + OA/100 + 10GlobalRFAS + 5StateRFAS + (15,10,5) SNHA + 1/4WO

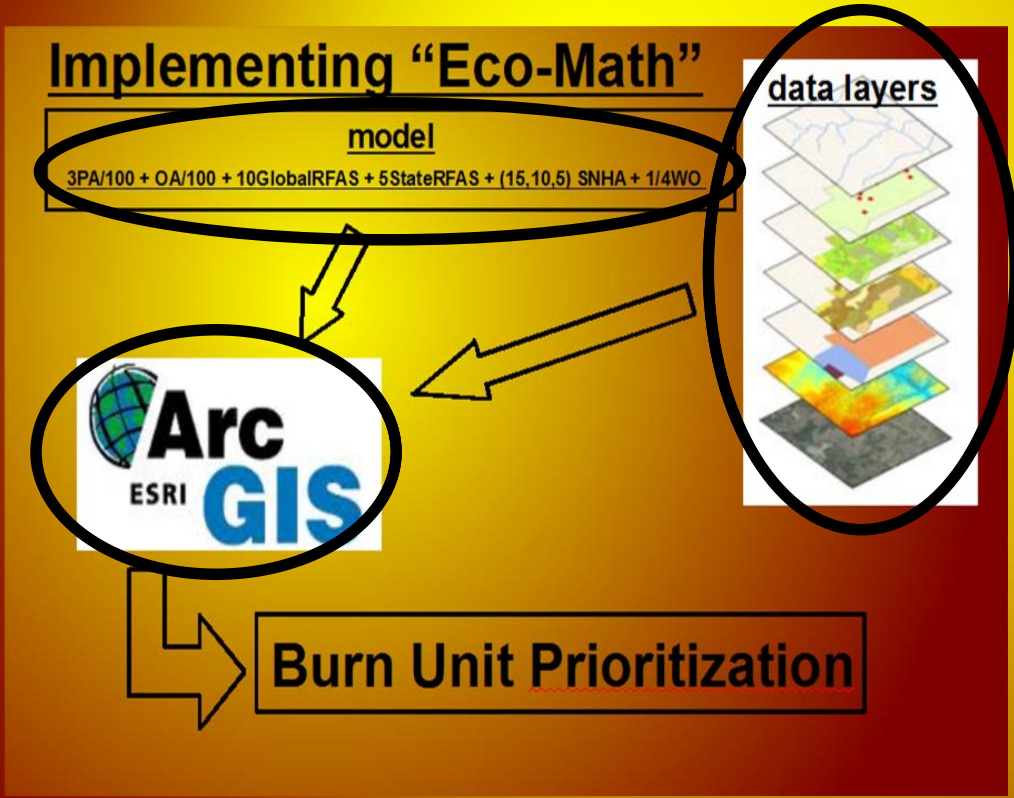
data layers



ArcGIS
ESRI

Burn Unit Prioritization

# Outline

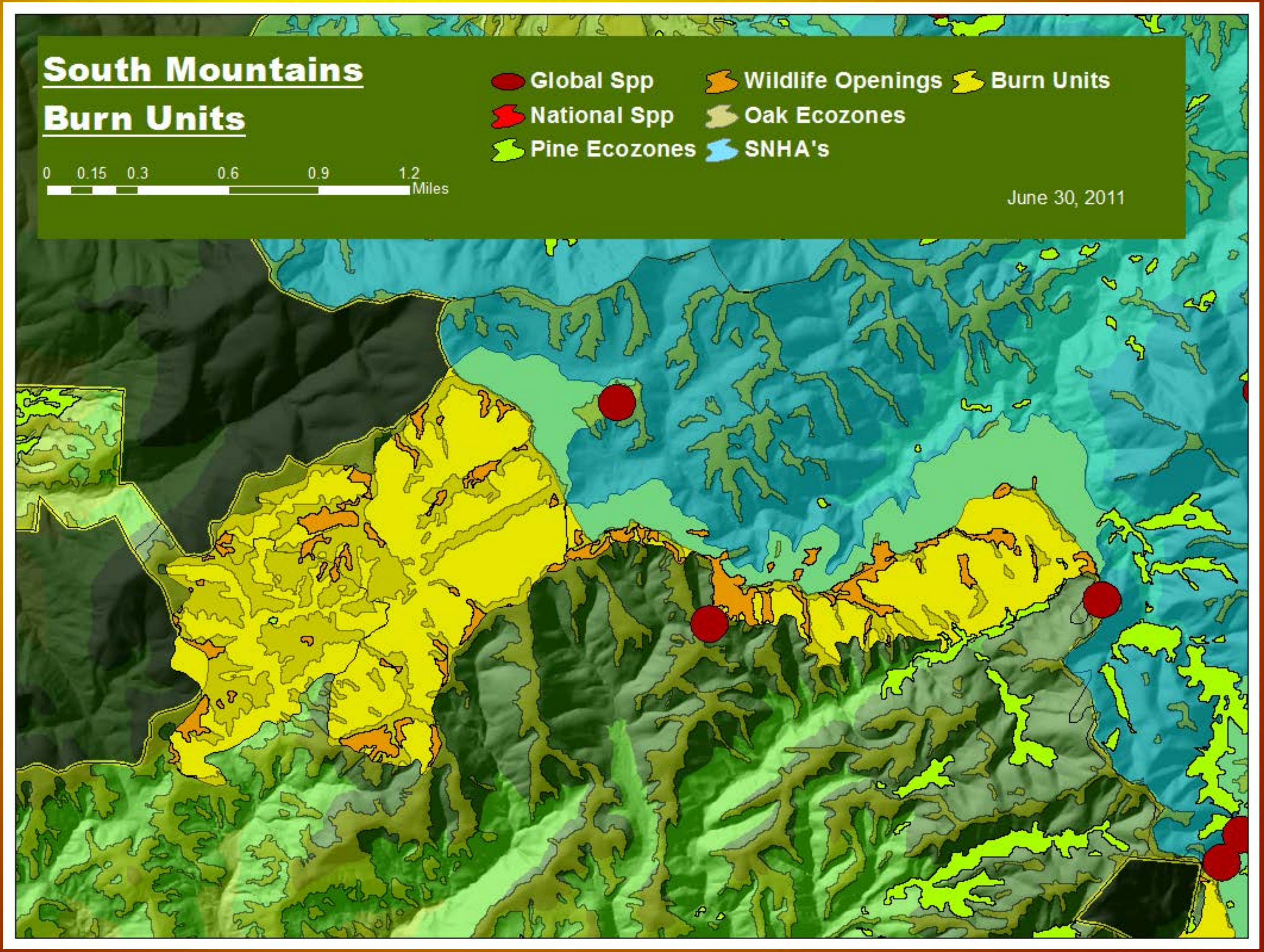



**Considerations for the data:**
**Which data sets?**
**Which format?**
**How reliable ?**

**Considerations for the Eco-Math model:**
**Which ecological variables are included?**
**Which aspects of the model are consistent?**
**Where do we want flexibility?**

**Considerations for the GIS:**
**What are the capabilities of the GIS?**
**How user-friendly is the GIS analysis?**
**Can we develop custom GIS tools?**

# Data Layers Used With Eco-Math



# Data Layers

**Depending on which Eco-Math model was used....**

- SNHA (Significant Natural Heritage Areas).
    - Pine or Oak dominated.
    - With elements of National, State, or Regional significance.
- Ecozone acreage, either Pine (PA), or Oak (OA).
- Burn Unit acreage (UA).
- Globally rare fire adapted species (GlobalRFAS).
- Nationally rare fire adapted species (NationlRFAS).
- State rare fire-adapted species (StateRFAS).
- Wildlife openings (WO).
- Early Successional areas (ESA).
- Presence of *Hudsonia montana* (HM).

# Data Considerations

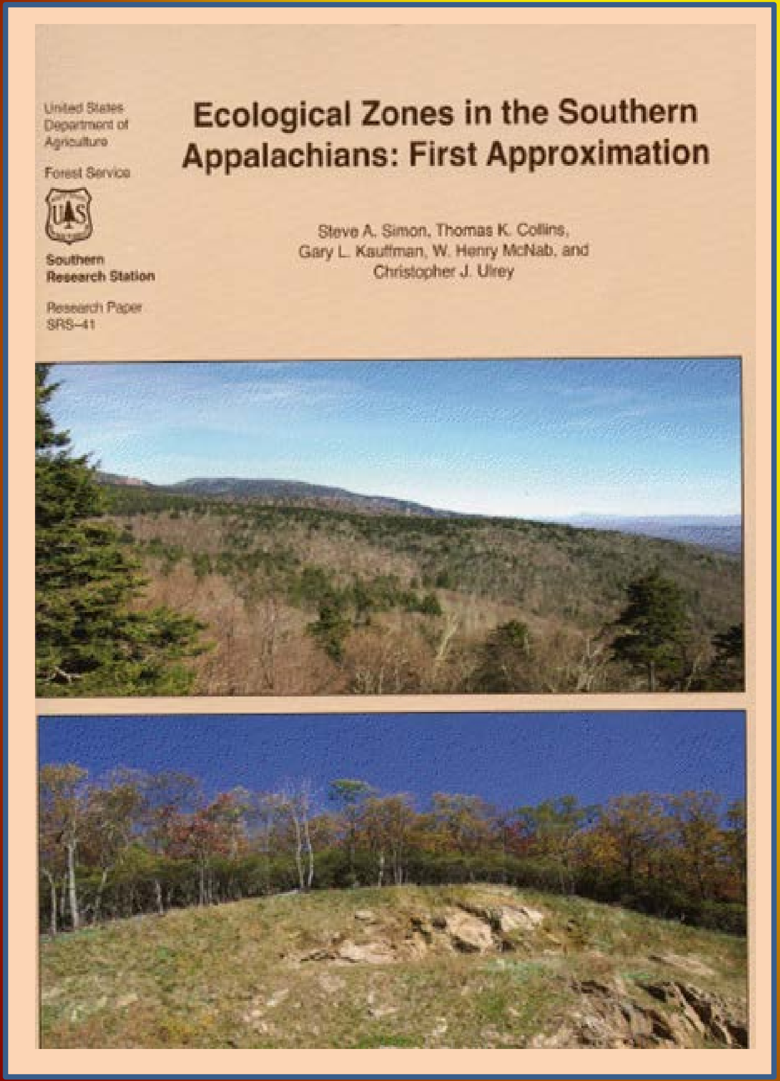
**Origin:** **NC DENR, USDA, TNC.**

**Format:** **shapefiles (could have used other formats having locational information: raster file, spread sheet, .csv ("txt")).**

**Understanding the data sets:**

- **Interpretation.**
- **Accuracy assessment.**
- **GIS works best when combined with field expertise!**

# Ecozone Data Layers




**Developed by:** **Steve Simon, et al.**

**Origin:** **field data and geospatial modeling.**

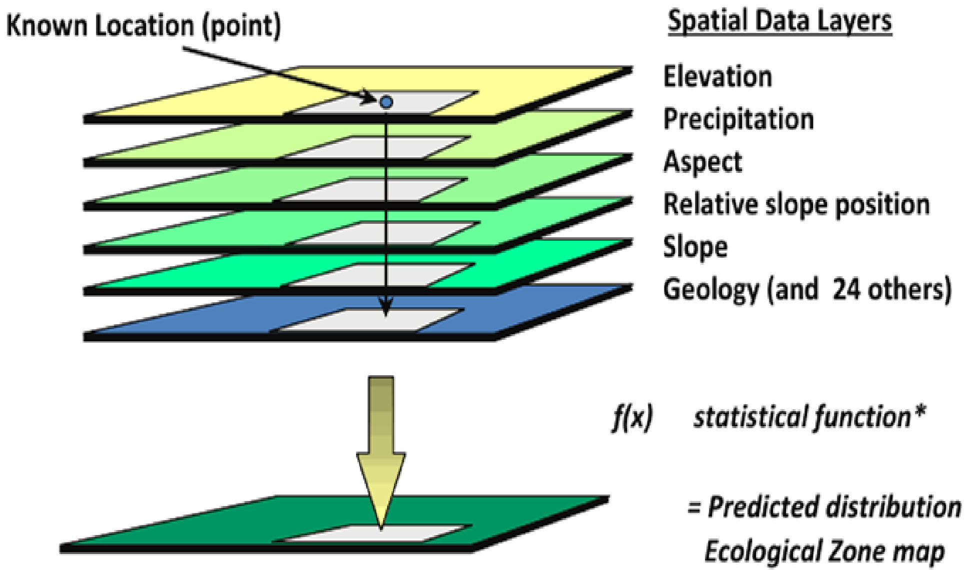
**Accuracy for South Mountains:** **64% overall, 89% for fire adapted communities.**

**May need ongoing accuracy assessment.**

**Published December, 2005**

# Ecozone Data

## Process: Ecological Zone modeling




* e.g. Maximum Entropy, Logistic regression, Discriminant analysis

From "Assessment and Mapping of Vegetation Communities in the Shenandoah National Park", John Young, USGS

**Process used to model/ map Ecological Zones:**

Data acquisition: identifying plant community types / ecological zones / in the field,

Creating digital terrain GIS database (elevation, aspect, slope, slope position, geology, annual precipitation, etc.) and extracting environmental data for each field plot,

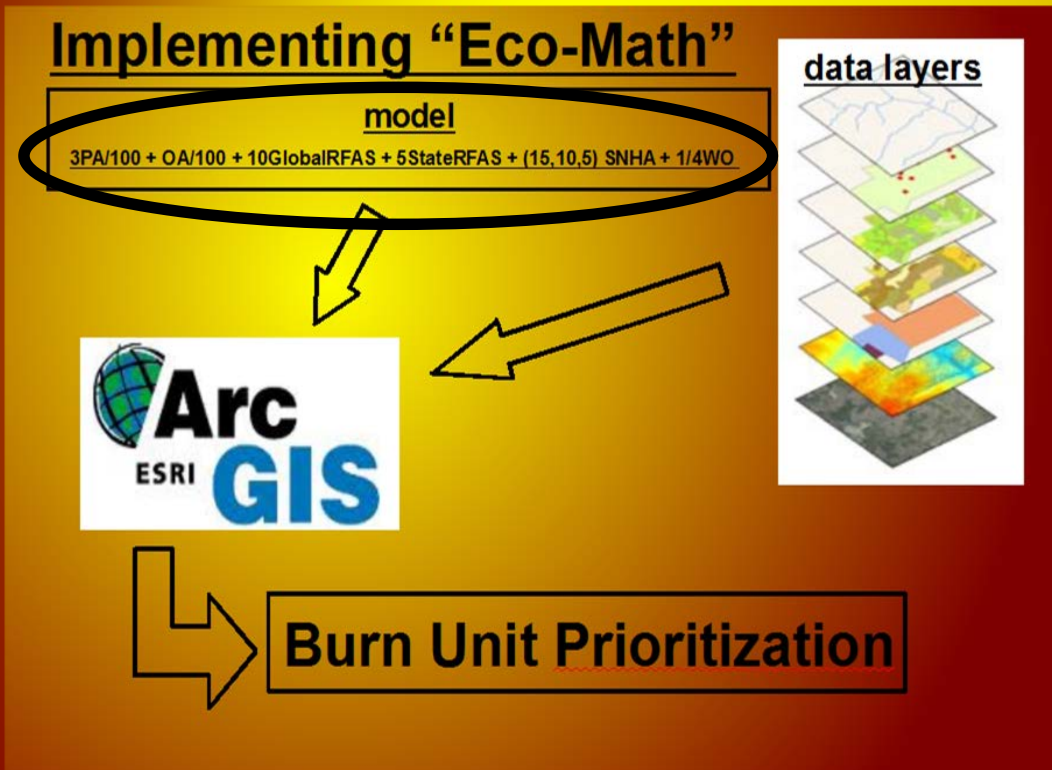
Statistical analysis and spatial modeling,

Post-processing of digital models, and

Accuracy evaluation / assessment.

From Steve Simon

# Outline

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# Burn Prioritization Models

**Several versions have been developed:**

**(3(PA) + 2(ESA) + OA) / UA) (9) + (UA/150) + GRS(6) + SRS(3) + (9*Pine or 6*Oak)SNHA**

**10((3(PA + ESA) + OA)/ UA) + 5GlobalRFAS+ 3StateRFAS + (# of FA – SNHA) + (UA/150)**

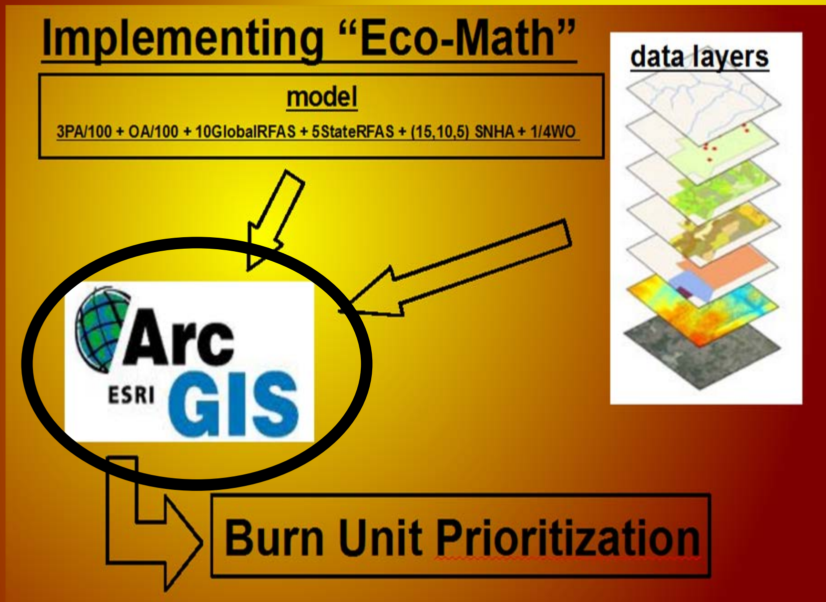
**8((3PA + 2ESA + OA)/UA) + (UA/150) + 4GR + 1 SR + ( 3PS, 1OS) SNHA**

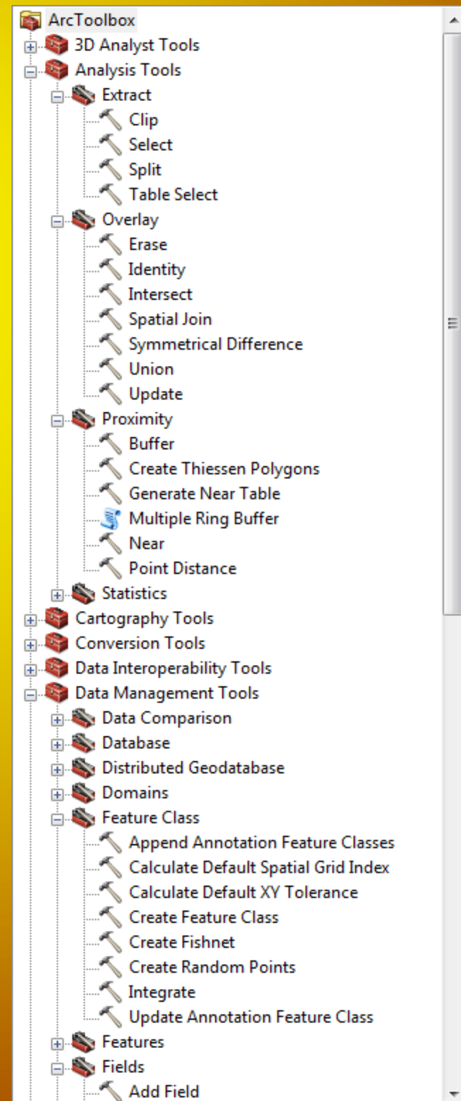
**3PA/100 + OA/100 + 10GlobalRFAS + 5 StateRFAS + (15,10,5) SNHA + 1/4WO**

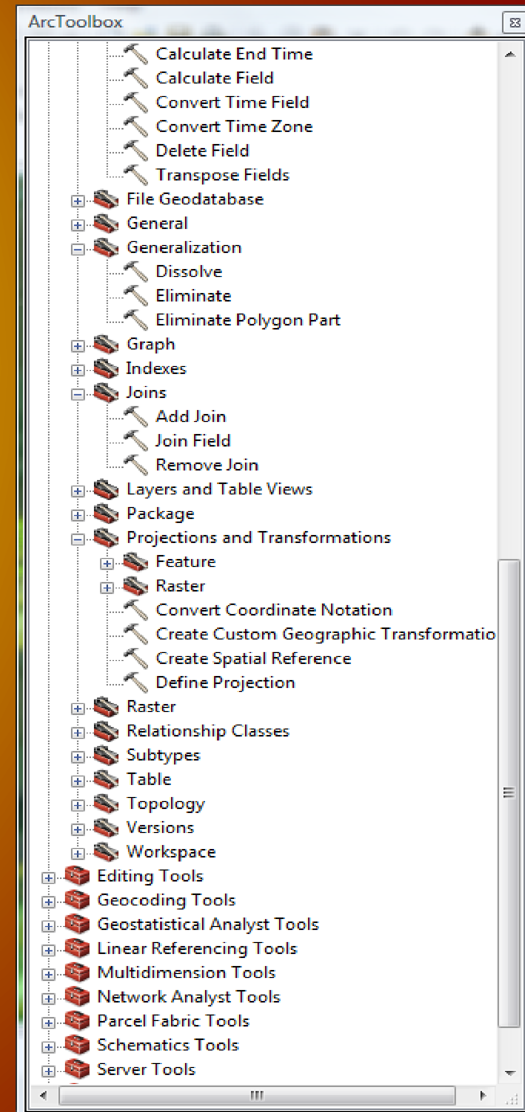
**Consideration of all versions helps develop a better GIS analysis, by keeping in mind that...**

- **The Eco-Math models use mostly the same data sets.**
- **They share a similar format.**
- **Future versions might share these similarities.**

# Analysis with GIS



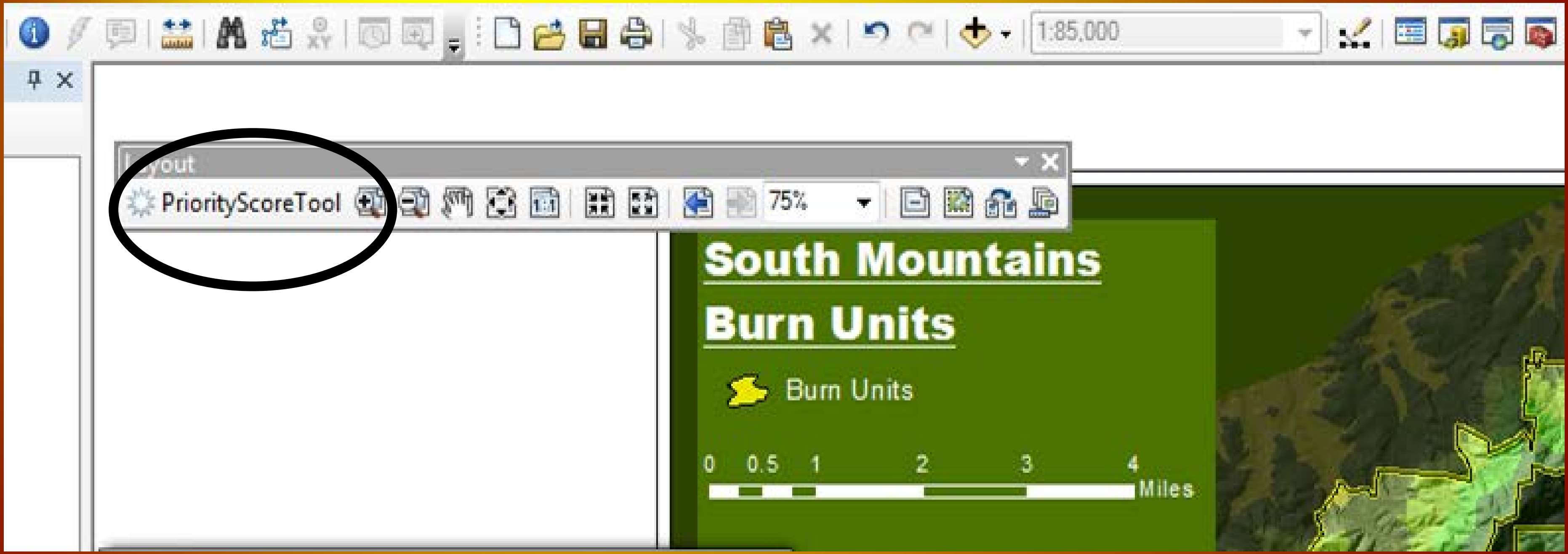



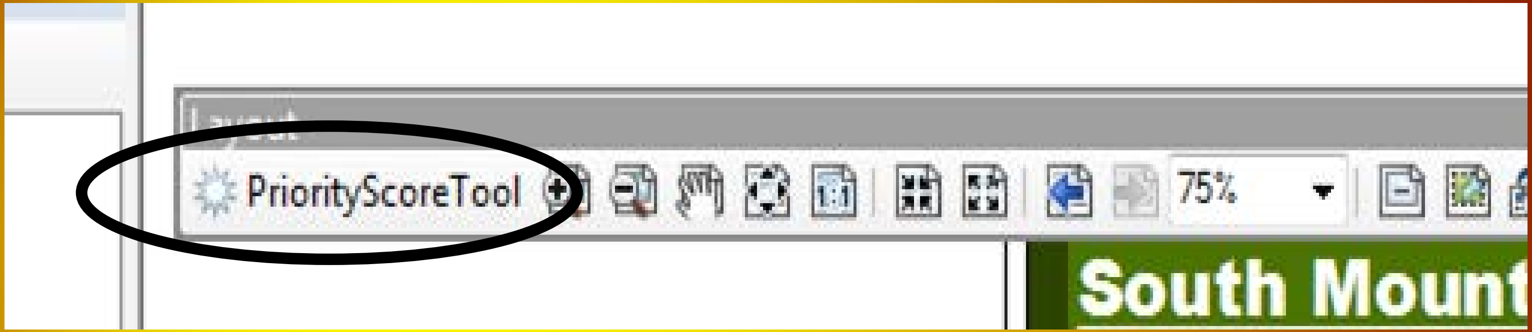

**Many ArcMap tools are available. But working step-by-step to implement the Eco-Math model can be time consuming and overwhelming!**

# Implementing the Model with GIS

**A “PriorityScoreTool” was developed, and added to ArcMap tool bar for ready use.**



# Developing the Custom Tool




**Made for use with ESRI ArcMap 10**

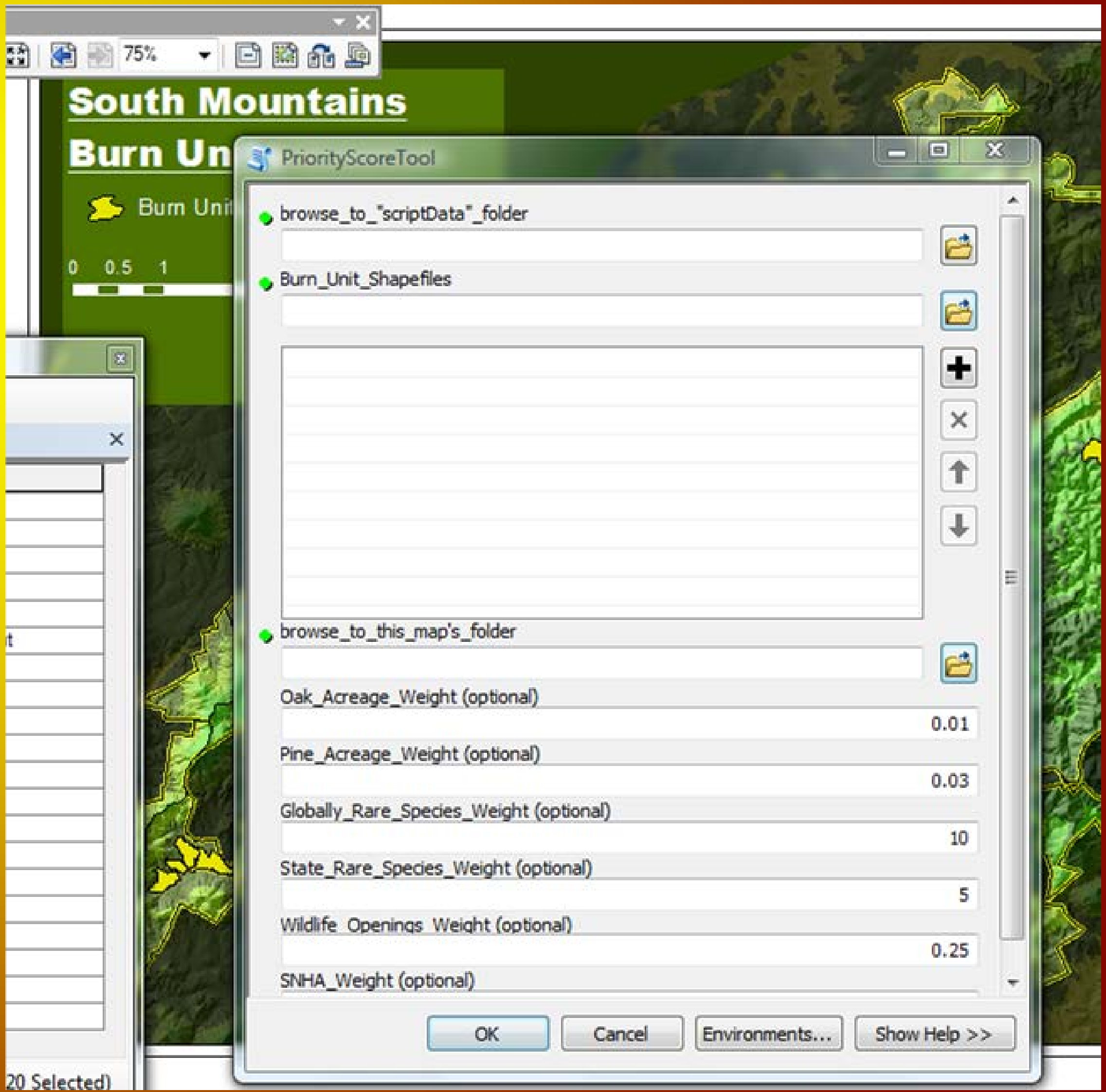
**Developed using knowledge from one college course of Python programming.(Check out NCSU's GIS Dept. for online courses.)**

# Custom Tool Interface

**The user specifies data sets .**

**Parameter weights are user-specified, or kept as default values. This allows for running multiple scoring scenarios.**

**This tool is based on an earlier version of the model. A subsequent tool could be developed to allow for additional user-input, to potentially accommodate different eco-math models.**



# South Mountains Burn Units table before scoring.

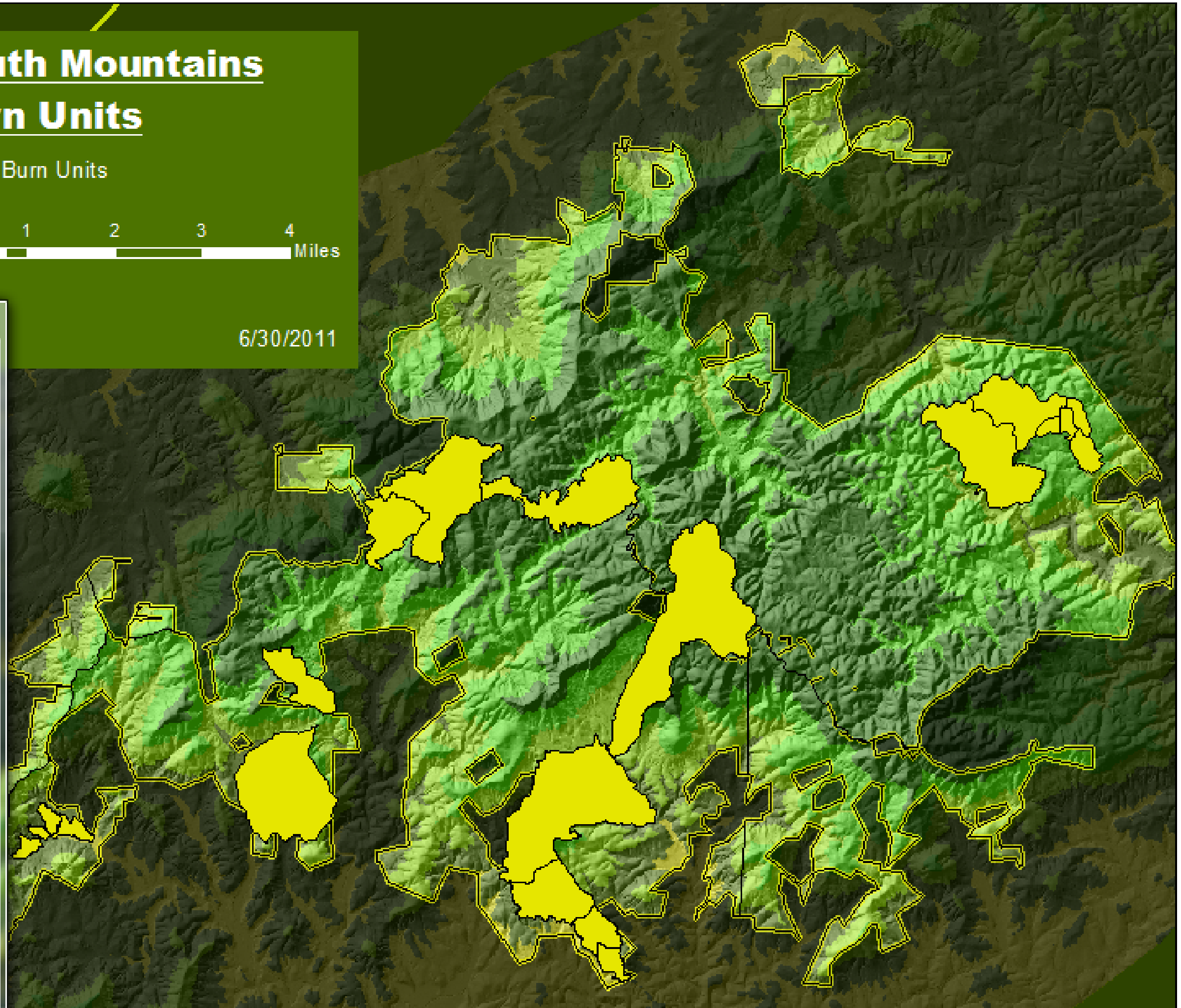
Table

Burn Units

| FID | Shape * | BURN_UNIT_ |
|---|---|---|
| 0 | Polygon | Woods Gap |
| 1 | Polygon | South Huckleberry Mountain |
| 2 | Polygon | Icy Knob/Chestnut Knob |
| 3 | Polygon | Roper Creek |
| 4 | Polygon | Lone Mountain Unit C/D |
| 5 | Polygon | South Golden Valley Clear-cut |
| 6 | Polygon | Devils Fork Mountain |
| 7 | Polygon | High Peak |
| 8 | Polygon | Huckleberry Mountain |
| 9 | Polygon | Oakey Knob |
| 10 | Polygon | Golden Valley Clear-cut |
| 11 | Polygon | Lone Mountain Unit F/G |
| 12 | Polygon | Lone Mountain Unit E |
| 13 | Polygon | Lone Mountain Unit A/B |
| 14 | Polygon | SM State Park Burn Unit 17 |
| 15 | Polygon | SM State Park Burn Unit 13 |
| 16 | Polygon | SM State Park Burn Unit 14 |
| 17 | Polygon | SM State Park Burn Unit 15 |
| 18 | Polygon | SM State Park Burn Unit 16 |
| 19 | Polygon | SM State Park Burn Unit 18 |

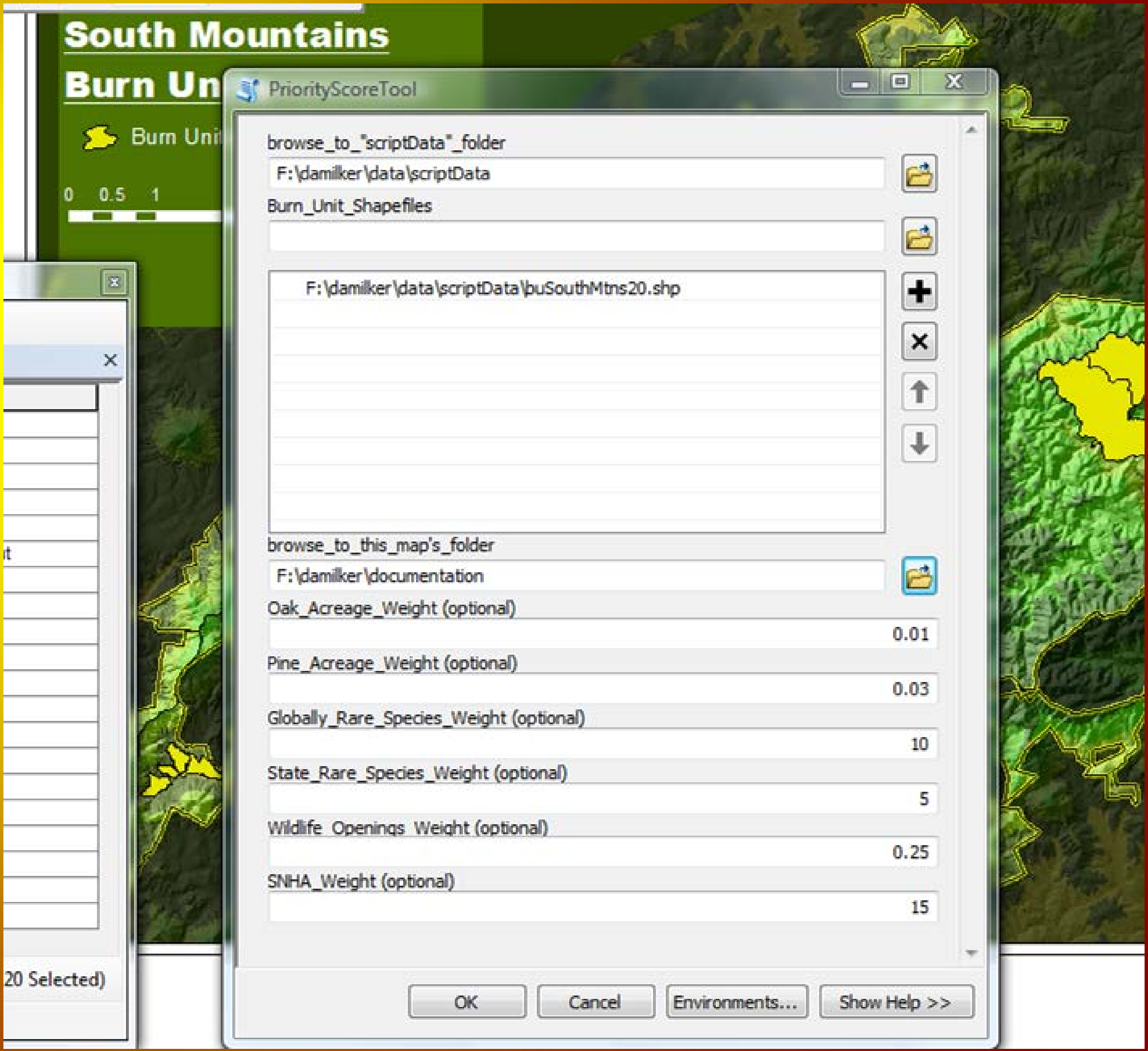
1 (0 out of 20 Selected)

Burn Units



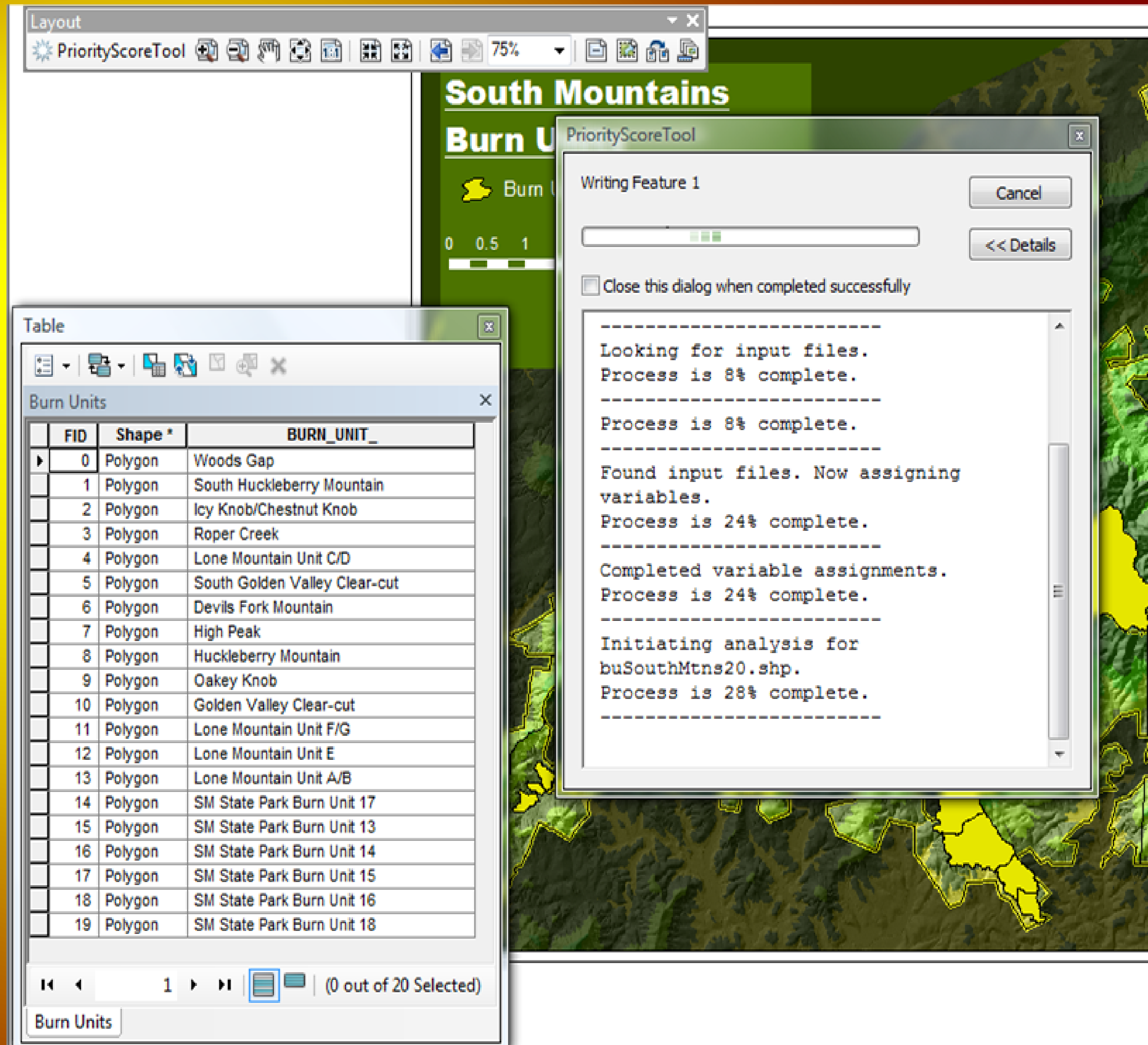
# Running the Tool

**With user-interface completed, tool is now ready to run…**



# Running...

It took about 14 minutes to calculate scores for 20 burn units.



# Results

**The results are automatically printed to a table.**

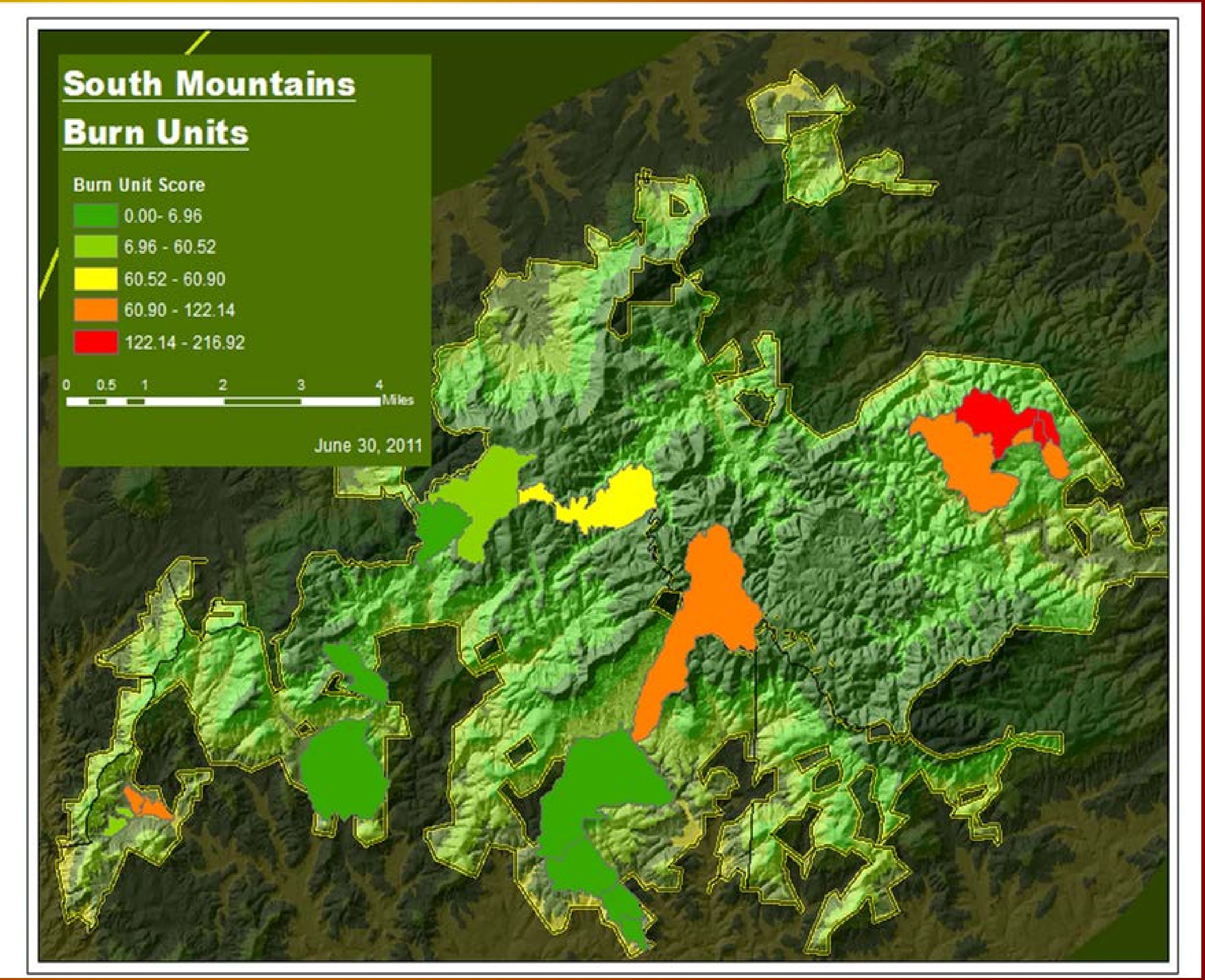
| BURN_UNIT_ | oakacg | pineacg | WLopns | nmbrglbl | nmbrntl | buWsnha | score |
|---|---|---|---|---|---|---|---|
| SM State Park Burn Unit 17 | 1.46983 | 0.489942 | 60 | 30 | 1.5 | 15 | 216.92 |
| SM State Park Burn Unit 14 | 0.127454 | 0.042485 | 50 | 25 | 1.25 | 15 | 182.84 |
| SM State Park Burn Unit 15 | 0.190913 | 0.063638 | 40 | 20 | 1 | 15 | 152.5 |
| SM State Park Burn Unit 16 | 0.24089 | 0.080297 | 30 | 15 | 0.75 | 15 | 122.14 |
| SM State Park Burn Unit 18 | 3.14667 | 1.04889 | 20 | 10 | 0.5 | 15 | 99.4 |
| Woods Gap | 2.26582 | 0.755272 | 20 | 10 | 0.5 | 15 | 97.04 |
| SM State Park Burn Unit 13 | 0.092961 | 0.030987 | 20 | 10 | 0.5 | 15 | 91.24 |
| Lone Mountain Unit C/D | 0.049107 | 0.016369 | 20 | 10 | 0.5 | 15 | 91.14 |
| Lone Mountain Unit F/G | 0.00143 | 0.000477 | 20 | 10 | 0.5 | 15 | 91 |
| High Peak | 0.148348 | 0.04945 | 10 | 5 | 0.25 | 15 | 60.9 |
| Lone Mountain Unit E | 0.008265 | 0.002755 | 10 | 5 | 0.25 | 15 | 60.52 |
| Icy Knob/Chestnut Knob | 0 | 0 | 10 | 5 | 0.25 | 15 | 60.5 |
| Lone Mountain Unit A/B | 0 | 0 | 10 | 5 | 0.25 | 15 | 60.5 |
| Oakey Knob | 2.6136 | 0.8712 | 0 | 0 | 0 | 0 | 6.96 |
| Huckleberry Mountain | 0.971463 | 0.323821 | 0 | 0 | 0 | 0 | 2.6 |
| South Huckleberry Mountain | 0.062211 | 0.020737 | 0 | 0 | 0 | 0 | 0.16 |
| Roper Creek | 0.00854 | 0.002847 | 0 | 0 | 0 | 0 | 0.02 |
| South Golden Valley Clear-cut | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Devils Fork Mountain | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Valley Clear-cut | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

0 (0 out of 20 Selected)

**(The values in this table reflect variables after applying appropriate weights.)**

# Results

**A new map is automatically created. Scores are represented graphically.**



# Conclusions

Assess data required for each model.

Consider previous models, consider how current model might change to suit future needs.

Custom GIS tools offer great efficiency and flexibility in implementing burn prioritization models.