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

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Supported by....









Implementing "Eco-Math"

data layers

Eco-Math model

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



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 (NationIRFAS).
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.

<u>Origin:</u> 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

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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

🔨 Clip

🔨 Identity

🔨 Intersect

Union

🔨 Buffer

Spatial Join Symmetrical Difference

Create Thiessen Polygons

💐 Multiple Ring Buffer

Create Feature Class

Create Random Points

Create Fishnet

🔨 Integrate

F

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🗄 🗞 Features

🗞 Fields 🔨 Add Field



overwhelming!



Implementing the Model with GIS

A "PriorityScoreTool" was developed, and added to ArcMap tool bar for ready use.

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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 userspecified, 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.

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	Wildlife Openings Weight (optional)	0.25
and the second	SNHA Weight (optional)	-

South Mountains Burn Units table before scoring.

Table

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Running the Tool

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



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Running...

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

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L	6	Polygon	Devils Fork Mountain			
	7	Polygon	High Peak		Initiating analysis for	27
L	8	Polygon	Huckleberry Mountain		buSouthMtns20.shp.	
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	10	Polygon	Golden Valley Clear-cut			
	11	Polygon	Lone Mountain Unit F/G	10		
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Results

The results are automatically printed to a table.

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Г	BURN_UNIT_	oakacg	pineacg	WLopns	nmbrgibi	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	1
	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	1
	Lone Mountain Unit C/D	0.049107	0.016369	20	10	0.5	15	91.14	1
	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	1=
	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	1
	Golden Valley Clear-cut	0	0	0	0	0	0	0	Ŧ
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(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.