



Enhanced Conservation Action Planning

Maps, Models & Metrics

Cherokee National Forest Landscape Restoration Initiative



Maps

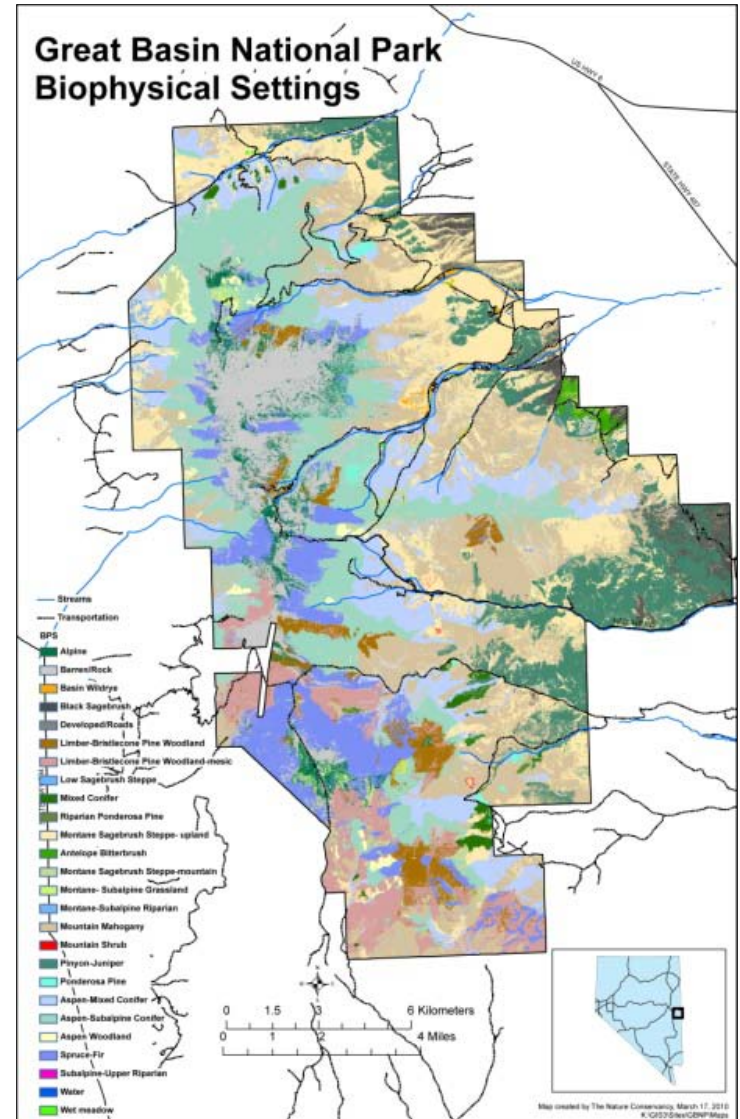
Models

Metric

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Biophysical Settings - aka Ecological Systems

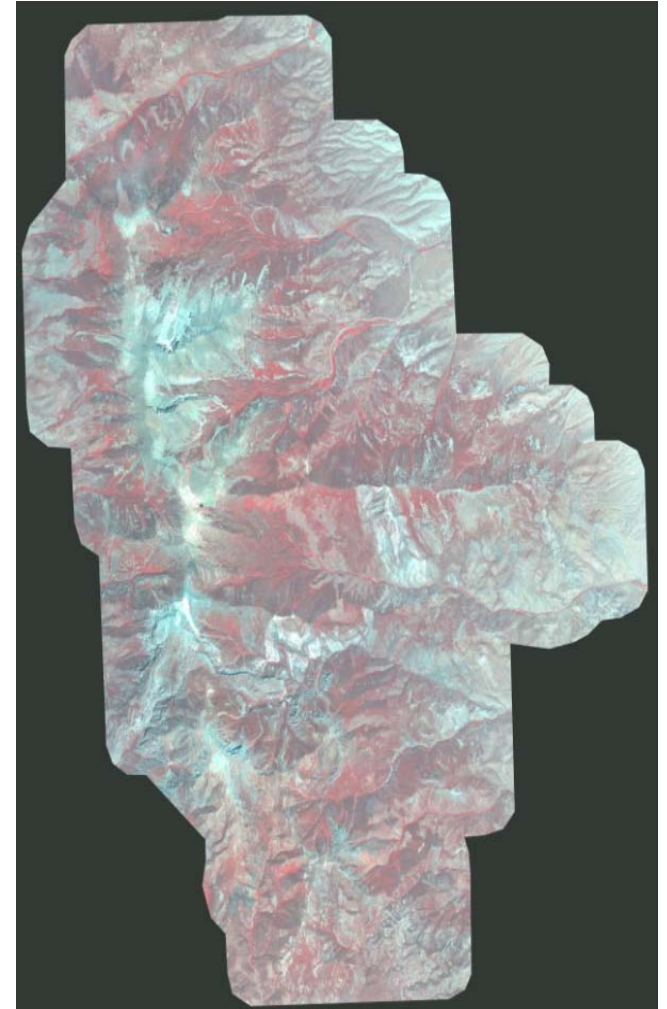
Dominant vegetation type expected in the physical environment (geology & climate) under a natural disturbance regime.



Current Vegetation

Actual current vegetation classes (S-class) for each ecological system

- early to late succession
- open vs. closed canopy
 - natural vs. uncharacteristic (U-class)



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Maps

Models

Metric

"All Models Are Wrong But Some Are Useful"

George E.P. Box



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LANDFIRE developed reference condition models for every ecological system in the United States



LANDFIRE Biophysical Setting Model

Biophysical Setting 5713180 **Southern and Central Appalachian Cove Forest**

This BPS is kept with:
 This BPS is split into multiple models:

General Information

Contributors (also see the Comments field) **Date** 5/15/2007

Modeler 1 Milo Pynn *milo_pynn@naturserve.org* **Reviewer**

Modeler 2 **Reviewer**

Modeler 3 **Reviewer**

Vegetation Type		Map Zone	Model Zone	
Forest and Woodland		57	<input type="checkbox"/> Alaska	<input type="checkbox"/> W. Cent. Rockies
Dominant Species*		General Model Sources	<input type="checkbox"/> California	<input type="checkbox"/> Pacific Northwest
PAGE AEPL	<input checked="" type="checkbox"/> Literature		<input type="checkbox"/> Great Basin	<input type="checkbox"/> South Central
LITU QURU	<input type="checkbox"/> Local Data		<input type="checkbox"/> Great Lakes	<input type="checkbox"/> Southeast
ACEAS QUAL	<input checked="" type="checkbox"/> Expert Estimate		<input type="checkbox"/> Northeast	<input checked="" type="checkbox"/> E. Appalachians
TIAMH CADR12			<input type="checkbox"/> Northern Plains	<input type="checkbox"/> Southwest

Geographic Range

This BPS model represents the "cove forests" or mixed-mesophytic forests (including "Acid Covets" with Shortleaf) of sheltered topographic positions in the Southern Blue Ridge and central Appalachian Mountains, ranging from northwestern GA through the southern Appalachians of the Carolinas and VA. It is found in an area that generally corresponds (in the south) with the Appalachian Oak region of Kitchler (1964). To the northern end of its range, it includes parts of the Northern Hardwoods and Oak-Pine regions, and to the west it includes the higher elevation and more rugged parts of the Mixed Mesophytic region (e.g. Pine and Black Mountains in KY). This range is generally consistent with M221 of Keys et al. (1995).

Biophysical Site Description

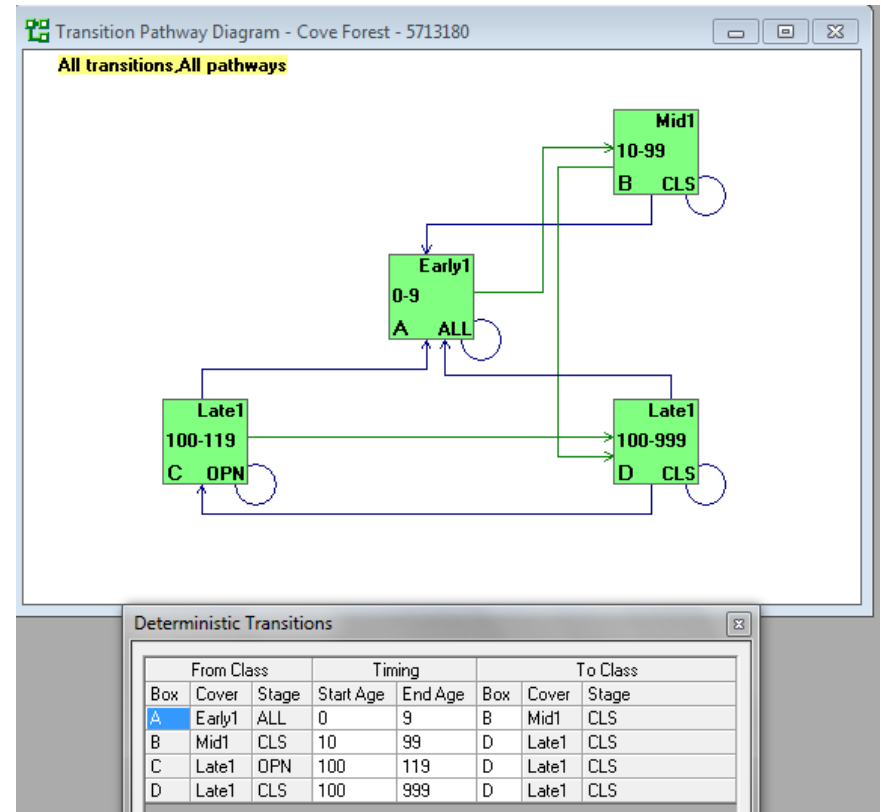
Mixed mesophytic forests occur on moist, topographically protected areas (e.g. coves, v-shaped valleys, north and east facing low slopes) within highly dissected hills and mountains. On slopes it forms a mosaic with pyrogenic oak-hickory forests, whereby cove or mixed mesophytic forests are restricted to the most protected coves and oak-hickory occurs on the interfluvies. The dissected topography creates strong gradients in microclimate and soil moisture and fertility at the local (watershed) scale (Hutchins et al. 1976, Iverson et al. 1997, Morris and Bourner 1998). In the absence of frequent or catastrophic disturbance, these environmental gradients determine forest composition (Hutchins et al. 1976, Muller 1982, Iverson et al. 1997, Dyer 2001). These forests occupy the transition zone from the oak-hickory forest to the northern hardwood forest. They are among the most diverse in the United States containing more than 30 canopy tree species. This model focuses on the cove or mixed-mesophytic type in the Southern and Central Appalachian regions.

*Dominant Species are from the NRCGS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.
*Fire Regime Groups are: I: 0-25 year frequency, surface severity; II: 0-25 year frequency, replacement severity; E1: 25-100 year frequency, mixed severity; N: 25-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity

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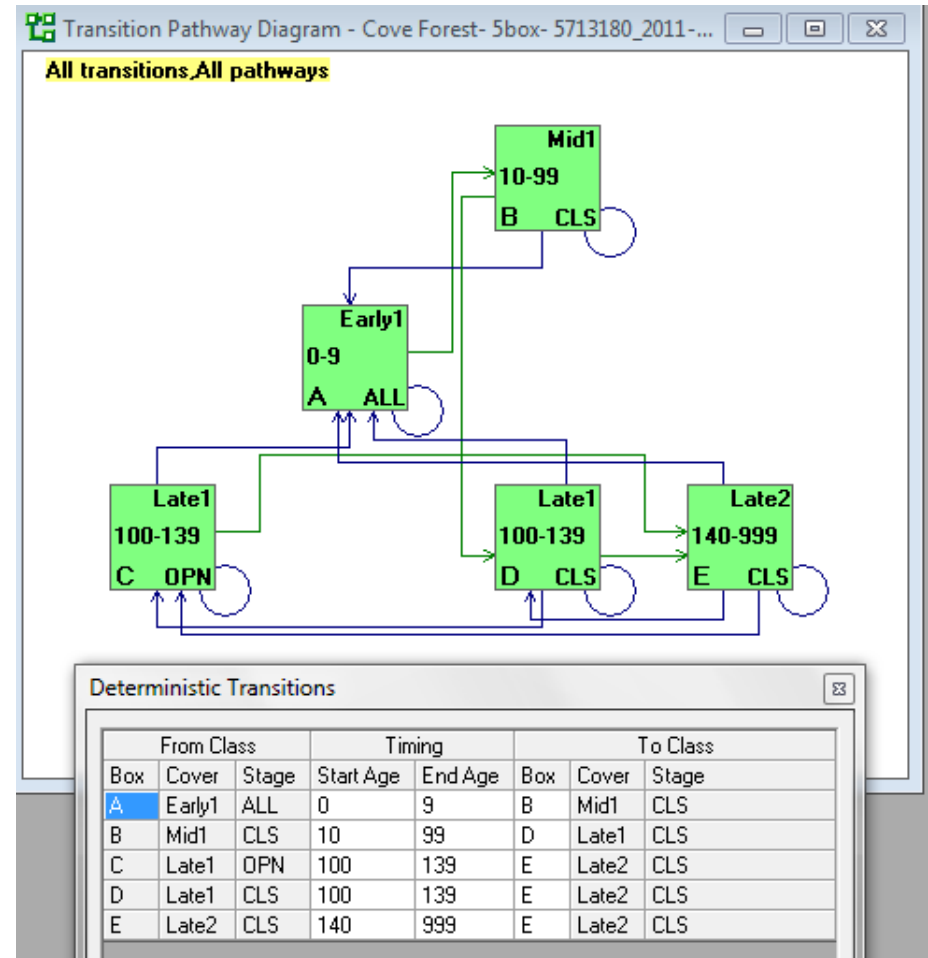
LANDFIRE also developed computer models for each system in VDDT software



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These models have been reviewed and modified for the Cherokee National Forest to reflect local conditions



Cherokee Model Revision and Refinement

- Created new model for Montane Red-Chestnut Oak
- Revised Dry Oak model
- Revised and refined disturbance regimes for oak systems
- Added old growth age classes for oak & cove forests
- Other minor adjustments so models match up with map data



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Maps

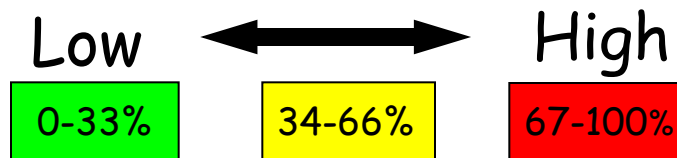
Models

Metric



Metric: Ecological Departure

- Measures each ecological system's condition *across a landscape*
- Integrated measure based upon vegetation *composition, structure* and *disturbance regimes*
- *Departure* of current vegetation from its natural range of variability (NRV) -- i.e., dissimilarity between expected and current vegetation classes



Natural Range of Variability (NRV)

- The distribution of vegetation succession classes (S-class) for each ecological system in a naturally functioning landscape.
- Assumes landscape condition and disturbances pre-European settlement
- Percentages for each system's vegetation classes determined by VDDT model runs over 1000 years using age classes, transitions and disturbances.



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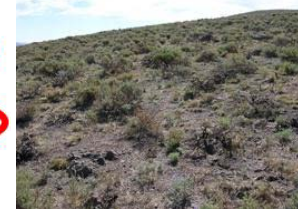
Ecological Departure = which vegetation classes are "out of whack"

Montane Sagebrush

Vegetation Classes	Actual % in Class	NRV % in Class
<u>Class A</u> – Early Development, Open Herbaceous vegetation is dominant; shrub cover is 0 to 10%.	5%	20%
<u>Class B</u> – Mid Development, Open Mountain big sagebrush cover up to 30%; herbaceous cover typically >50%.	10%	50%
<u>Class C</u> – Mid Development, Closed Shrubs are dominant with canopy cover of 31-50%. Herbaceous cover is typically <50%. Conifer sapling cover is <10%.	10%	15%
<u>Class D</u> – Late Development, Open Conifers are the upper lifeform; conifer cover is 10- 30%.	10%	10%
<u>Class E</u> – Late Development, Closed Conifers are dominant; conifer cover is 31- 80%.	45%	5%
<u>Class U</u> – Uncharacteristic	20%	-

Too Little

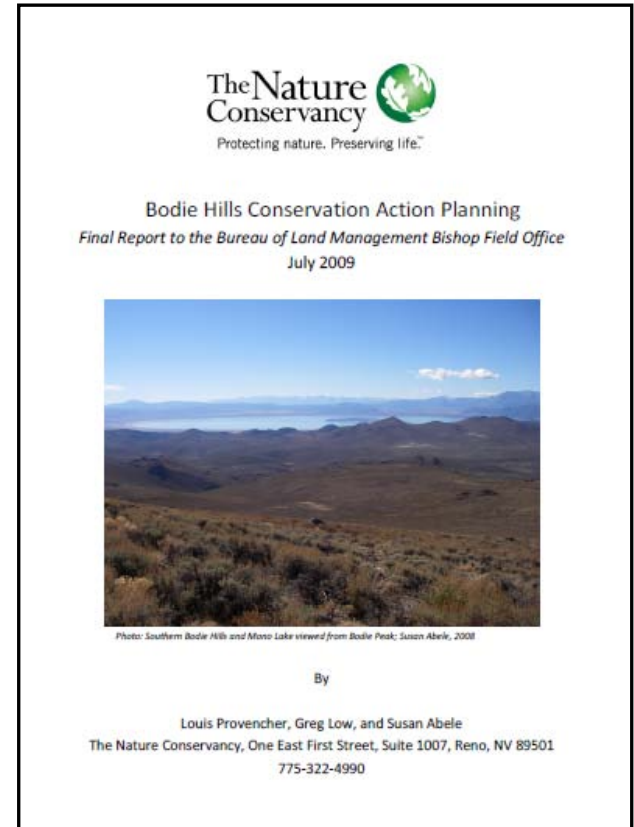
Too Much



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All Leading to Restoration Strategies

Allows land managers and stakeholders to develop and test alternative strategies to restore ecological systems



<i>Aspen-Mixed Conifer Woodland</i>	Average acres/yr Years 1-5	Average acres/yr Years 15-20	Cost/acre (\$)
Mechanical thinning of late succession classes	43	20	\$ 150
Prescribed fire applied to late succession classes	95	50	\$ 150
Average Annual Cost	\$ 20,700	\$ 10,500	

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To find cost-effective, landscape-scale solutions

Ward Mountain Ecological Forecasts						
June 23, 2010						
Ecological System	Ecological Departure			Acres	20 Year Cost Preferred Mgmt	Preferred Mgmt ROI (area-weighted)
	Current Condition	Minimum Mgmt - 20 yrs	Preferred Mgmt			
Black Sagebrush	79	69	36	46,660	\$ 5,150,000	5.6
Montane Sagebrush Steppe - Upland	62	41	29	25,610	\$ 1,016,900	3.8
Montane Sagebrush Steppe - Mountain	47	31	31	2,570	-	n/a
Aspen Mixed-Conifer	53	50	25	2,240	\$ 106,300	5.9
Wyoming Big Sagebrush	77	74	61	8,330	\$ 1,021,000	3.9
Basin Wildrye	86	86	43	1,650	\$ 405,600	3.9
Winterfat	78	87	47	610	\$ 225,000	2.5
Aspen Woodland	45	39	24	590	\$ 20,000	4.6
Montane-Subalpine Riparian	59	55	32	170	\$ 90,200	0.6
Mountain Shrub	47	35	27	33	-	n/a
					\$ 402,000	ave. per year

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E-CAP Workshops & Outcomes

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Workshop I - Today

- Review ecological systems map and data
- Review vegetation succession classes and data
- Review current conditions (departure from NRV)
- Discuss restoration objectives

Workshop II - April 12

- Confirm restoration objectives
- Review projected future conditions
- Select focal ecological systems for management
- Develop and test alternative management strategies for 1 to 2 ecological systems
- Develop list of potential management strategies and costs



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Workshop III - May 31

- Review preliminary simulations and outcomes of alternative management strategies
- Recommend adjustments to management strategies, budgets or models

Workshop IV - June 23

- Review final simulations and outcomes, including return on investment
- Recommend preferred management strategies or options
- Determine next steps for project completion



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Some Thoughts Before
We Begin...

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Maps

Our map data are imperfect, but we've made big improvements in accuracy and have a reasonable approximation of the landscape.

Models

Models are inherently imperfect, but our LANDFIRE-based models have been improved and are very useful. They are transparent, based on good science input, have been & can be revised, & allow us to test things.

Metric

NRV does not necessarily have to be your only metric of your desired future condition.

"The perfect is the enemy of the good."

Voltaire



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Some E-CAP Limitations... but things you may want to otherwise address in your restoration recommendations

- Efforts to restore chestnut species
- Single-species pest and pathogens (e.g., gypsy moth, hemlock woolly adelgid)
- Invasive plant species that don't have landscape-scale impacts (e.g., kudzu)



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Questions?