

Estimating Historic Fire Conditions: Looking Back to See Ahead

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Do you want to know how much fire occurred before European settlement in the United States? Ecologists acknowledge that fire is a natural occurrence on many landscapes and in many vegetative systems, but knowing how much and what type of fire is needed for proper ecological function can be a mystery. Looking back at historic fire conditions can provide some help to conservation planners and practitioners, but how do you determine historic fire levels in the face of large scale land conversion, invasive species, fire suppression policies, logging, etc.? The LANDFIRE project provides a simple way to peer into the past and estimate historic fire conditions.

Let's ask the question for portfolio areas in the state of North Carolina. What is the long term average number of acres burned each year at replacement, mixed and low severity levels before European settlers arrived and significantly impacted the landscape? The LANDFIRE National (LFNA) product suite includes a spatial data layer called "Biophysical Setting," or BpS. This layer represents the Ecological System that most likely occupied the landscape before significant alteration by European settlers. We overlay the North Carolina portfolio site boundaries and LFNA BpS to determine the number of acres in each pre-European settlement Ecological System within current portfolio area boundaries. These values are then exported to a spreadsheet (via ArcMap). The LANDFIRE project also used local experts to estimate reference period (defined as pre-European settlement for LFNA) fire return intervals for replacement, mixed and low severity fires for each BpS in a mapping zone. Add those values to the spreadsheet for each BpS, divide the number of acres in each row (BpS) by each of the three fire return intervals, and round the answer to a reasonable number of digits. The result is an estimate of the long-term average annual acres burned for each BpS in North Carolina portfolio areas (Table 1).

Table 1. Historic Fire Estimates for BpS with more than 10,000 estimated total annual burn acres within Portfolio Areas in North Carolina.

BPS_NAME	Historic Replacement Severity Average Annual Burn Acres	Historic Mixed Severity Average Annual Burn Acres	Historic Low Severity Average Annual Burn Acres	Historic Average Total Annual Burn Acres
Atlantic Coastal Plain Upland Longleaf Pine Woodland	7000	3000	240000	250000
Southern Piedmont Dry Oak(-Pine) Forest	3000	5000	209000	217000

Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland	0	2000	203000	205000
Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods	9000	3000	166000	178000
Atlantic Coastal Plain Peatland Pocosin and Canebrake	57000	57000	0	114000
Southern Appalachian Oak Forest	2000	7000	74000	83000
Southern Appalachian Low-Elevation Pine Forest	9000	2000	44000	55000
Gulf and Atlantic Coastal Plain Tidal Marsh Systems	45000	1000	0	46000
Southern Appalachian Montane Pine Forest and Woodland	2000	2000	41000	45000
Central and Southern Appalachian Montane Oak Forest	0	0	25000	25000
Gulf and Atlantic Coastal Plain Floodplain Systems	10000	0	11000	21000
Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	500	1000	13000	14500
Atlantic Coastal Plain Mesic Hardwood Forest	1000	1000	11000	13000

Fire was evidently an important ecological process in North Carolina prior to European settlement, easily totaling more than one million acres per year on the average, much of it with low severity. Replacement fires were rare, except in Pocosin systems. While Longleaf systems make up the bulk of the annual burn acres as might be expected, hardwood and mixed hardwood systems make up about 30% of the annual burn acreage, and peatland systems more than 10%. Bringing fire back looks to be an important restoration strategy, but we advise that you use these estimates (and all others) with typical caution. No one knows precisely what the pre-European settlement landscape looked like or how it functioned, but this type of analysis provides a unique perspective that can be beneficial to conservation practitioners and organizational leaders.

In addition, take care not to confuse past conditions with desired future conditions. Even in portfolio sites, portions of the landscape may not be intended to be restored to pre-settlement conditions, or burned at pre-settlement levels (e.g., plantation lands or other

modified habitats). Looking at historic fire levels is intended to provide conceptual “scale and scope” information, not current fire need estimates. Ecological fire needs for a modified current landscape could be estimated using locally revised LANDFIRE fire return intervals combined with existing vegetation maps (local maps, LANDFIRE EVT, GAP, Southern Fire Risk Assessment) after cross-walking similar forest types.

All the data needed to conduct this type of analysis in your chapter are available for downloading immediately. Contact Jim Smith (jim_smith@tnc.org; 904.327.0055) or any LANDFIRE Team member (Kori Blankenship: kblankenship@tnc.org; Randy Swaty: rswaty@tnc.org) for more information or assistance.