USING MODELS TO ASSESS FIRE REGIME CONDITIONS AND DEVELOP RESTORATION STRATEGIES IN GRASSLAND SYSTEMS AT LANDSCAPE AND GLOBAL SCALES

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ABSTRACT

Altered fire regimes are a serious threat to biodiversity in almost every major habitat type on earth. Threats to the restoration and maintenance of intact fire regimes (e.g., federal and state fire policies, land use, social values, global plant dispersal, governmental cultures, climate change, etc.) can act at various geographic levels. However, strategies to address these threats differ greatly depending on whether the work is at a landscape or global level. For the purposes of global biodiversity conservation, practitioners and scientists must understand the relationships between local and global ecological processes and conservation strategies, and assess if strategies being applied in one part of a major habitat type can be applied effectively to another. One step toward greater understanding is to compare the similarities and differences in native fire processes and threats within major habitat types. Since 2004, The Nature Conservancy has been working with the USDA Forest Service and U.S. Department of the Interior to quantify reference conditions for every biophysical setting in the United States as part of the LANDFIRE project (www.landfire.gov). The Nature Conservancy is also embarking on an assessment of major habitat types worldwide as part of development of a strategic, global, 10-y goal for biodiversity conservation. Assessment of reference fire regime conditions is a part of this process. We compare similarities and differences between reference condition models developed for 1) grasslands of the midwestern United States as a part of the LANDFIRE project, and 2) all temperate grasslands, savannas, and shrublands at the global scale as a part of The Nature Conservancy's strategic conservation planning. Quantitative state-and-transition models for grasslands of the Midwest were parameterized for the LANDFIRE project using the best available data and local expert knowledge of mean fire frequency, intensity, and ecosystem-level fire effects. Model outputs include the long-term mean percentages of structural–seral stages expected by biophysical setting (i.e., potential natural vegetation type) given a native fire regime. A global-level state-and-transition model for temperate grasslands, savannas, and shrublands was built starting with the LANDFIRE models, given current knowledge about coarse-resolution transitions within this major habitat type. We compare model simulation results for reference conditions at local and global scales for grasslands, savannas, and shrublands, and present results for alternative future conditions at each scale given varying assumptions about native fire regime function and human interactions. Simulation models of ecosystem function at multiple scales are invaluable to the testing of assumptions about ecosystem function, the efficacy of conservation strategies, and their applicability across geographic scales.

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