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A Multi-Model Framework for Simulating Ecological, Economic and Human Health Tradeoffs Associated with an Array of Rangeland Burning Practices

Background

The Central Great Plains Flint Hills ecoregion in Kansas is an economically and ecologically important area encompassing the largest (12,000 square miles) remaining tallgrass prairie ecosystem in North America. Historically, frequent wildfires were essential to the development and maintenance of the native prairie ecosystem, and prescribed fires are today routinely used to control invasive woody species and improve forage production for the multi-billion dollar beef-cattle industry.

Unfortunately, grassland burning also releases harmful pollutants such as ozone and particulates into the atmosphere, often leading to air quality problems for several communities across a multi-state area. Consequently, Region 7 is faced with multiple stakeholder groups seeking to determine when, how and why to burn. Balancing the ecological, economic and human health effects of rangeland burning is proving to be a major sociological and regulatory challenge.


Prescribed fires in Flint Hills grasslands

Thus, the Flint Hills region presents trade-offs between agricultural practices, cultural values, and health and safety considerations - rural communities and ranchers that value their heritage which relies on the economic and ecological benefits of the tallgrass prairie and downwind urban communities that under certain conditions are exposed to harmful air pollution generated from grassland burning practices.


Beef cattle – a multi-billion dollar industry


Smoke over Kansas City, MO, April 2003

Approach

To assist rangeland managers, local and state officials, and other stakeholders in finding solutions to the trade-off challenges, EPA Region 7 and the Office of Research and Development are collaborating with the State of Kansas and Kansas State University to establish a user-friendly air quality modeling and visualization tool set. The air quality modeling component is similar to the current web-based burn management tool at the State of Kansas' www.ksfire.org website, but is being adapted to utilize grassland biomass and fuel load predictions, generated by an eco-hydrologic model (VELMA; Abdelnour et al. 2011,2013), for alternative burning scenarios.

The intent of this linkage is to help stakeholders explore ecological and air quality tradeoffs for both actual and hypothetical changes in the location, timing and frequency of rangeland fires.

Additional visualization modules are currently being added to the tool set, including a human health and economic impacts tool (BenMAP; www.epa.gov/air/benmap) and a wildlife population model (HexSim; www.hexsim.net) for assessing greater prairie chicken responses to burning practices.

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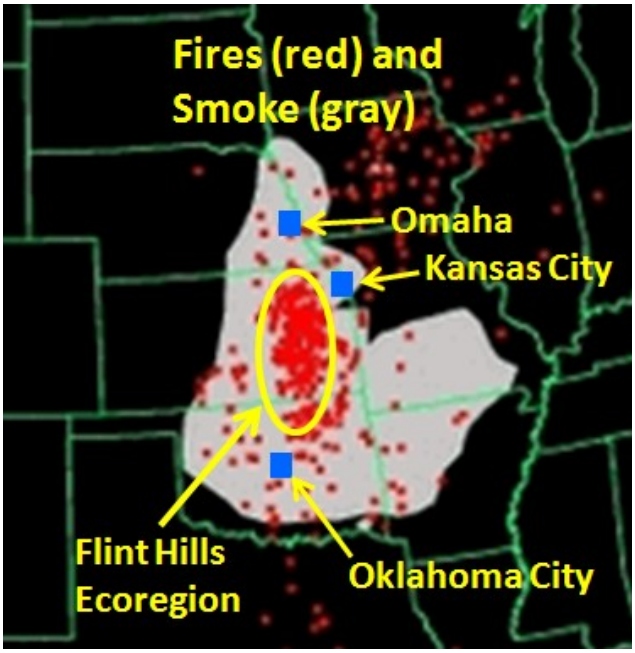
Greater prairie chickens

Results and Impact

Tangible products of this research will include computer-generated visualizations of predicted changes in rangeland productivity and air quality that stakeholders and decision-makers can use to identify potential "best case" scenarios for land management that strike a balance between the environmental, human health and economic objectives of rural and urban communities.

This research will also support environmental assessments of interest to a variety of EPA programs, such as the Sustainable and Healthy Communities Research Program, Safe and Sustainable Water Research Program, Office of Air, and Office of Water.



April 14, 2014 – Regional spread of smoke from rangeland fires. Image from NOAA analysis of satellite data (http://alg.umbc.edu/usaq/images/hms0418.jpg)

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For more information, go to: http://intranet.ord.epa.gov/science/regional-science/rare

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