

JFSP Project Highlights

Research Supporting Sound Decisions

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The JFSP, a partnership of six federal wildland fire and research organizations, provides scientific information and support for fuel and fire management programs.

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A Fire Management Model for Stand to Landscape Scales: A Case Study in Northern Wisconsin

Background

Managers need readily available information on fire ecology and fire effects to craft fire management plans. Dr. Jiquan Chen of the University of Toledo and fellow researchers have helped meet this need by creating a model that predicts the effects of alternative management actions, such as timber harvesting, on fuel loading, fire behavior, and landscape vegetation structure and composition. This model enables users to investigate the effects of management actions on forest vegetation and fire spread at multiple spatial scales through time.

The Model

Dr. Chen's model was created by integrating several existing models, including the forest management simulator "HARVEST", and the fire area simulator "FARSITE". Model input includes readily available information such as slope, aspect, precipitation, and temperature. Model outputs include both tabular data and animated visual displays of changes in forest vegetation and fire spread.

Application on the Chequamegon National Forest

Dr. Chen and colleagues tested the model on forested sites of the Chequamegon NF in northern Wisconsin. Fuel loads were predicted for red pine, jack pine barrens, and northern hardwoods vegetation types as a function of varying harvest patterns, fire frequencies, and forest condition. These predictions were used to modify the fuels layer in FARSITE.

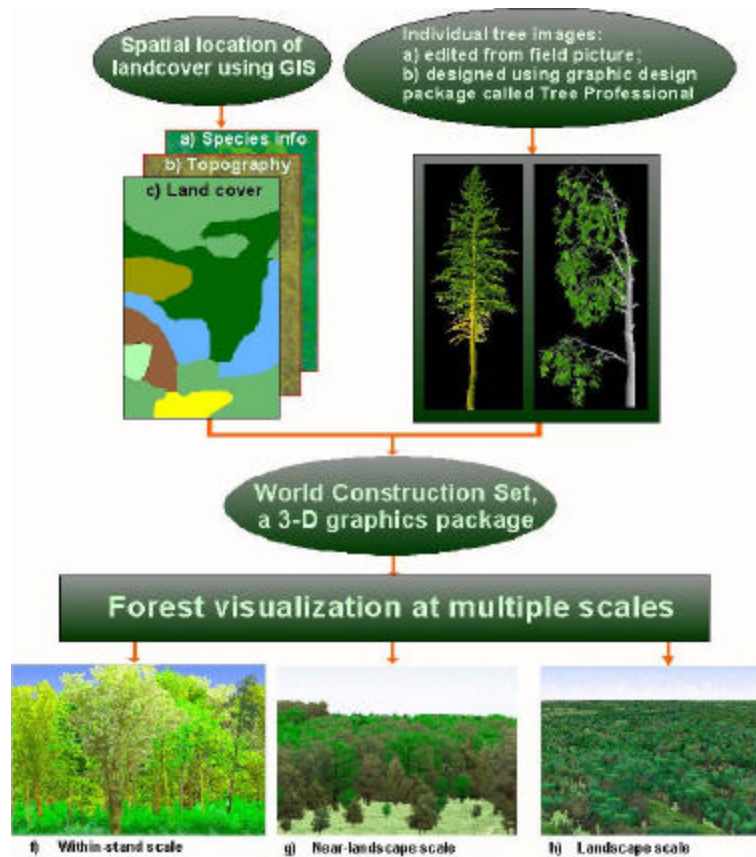


Figure 1. Forest visualization at multiple scales.

The forest visualization portrayed in figure 1 was merged with the FARSITE simulation to develop an image of fire moving through a landscape as shown in figure 2. Figure 3 shows FARSITE predicted fire sizes 15 days after ignition on a landscape subjected to various harvesting patterns and precipitation amounts.

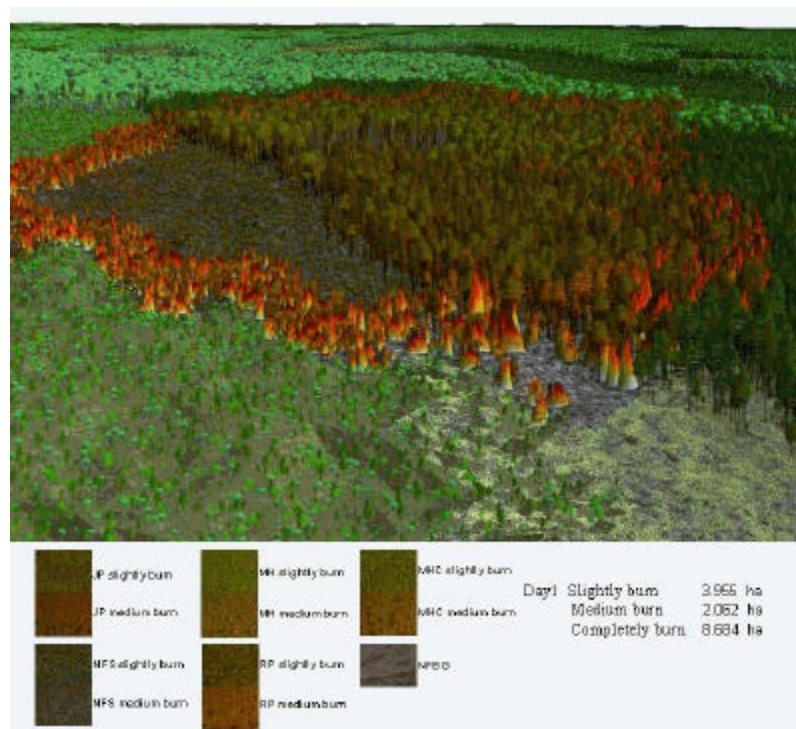


Figure 2. Fire spread simulation, Chequamegon NF.

Chequamegon National Forest

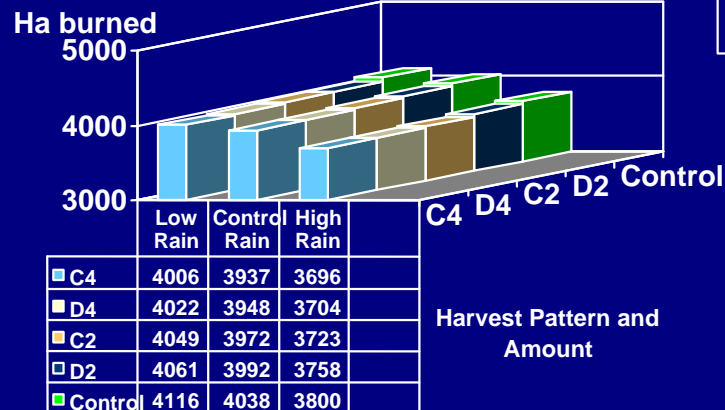


Figure 3. Predicted burned area 15 days after ignition with varying harvest patterns and precipitation amounts. C4 – clustered or clumped harvest pattern with 4% of the forest area cutover, D4 – dispersed harvest with 4% cutover, C2 – clustered harvest with 2% cutover, D2 – dispersed harvest with 2% cutover, Control – no harvest. “Control Rain” represents actual measured precipitation; “High Rain” precipitation is twice that of the control; “Low Rain” precipitation is one-half that of the control.

A fully animated simulation is available at <http://research.eeescience.utoledo.edu/lees/research/jfsp> under “animations” and is titled “FARSITE model simulation in CNF over a month with 5-day intervals (Legend) (5/12/04)”. Additional animations are at <http://research.eeescience.utoledo.edu/lees/pubs/lup/>.

This modeling system helps fire planners and land managers evaluate fuels treatment alternatives to achieve land management objectives.

Future Development

The model will also be tested on the Sierra, Coconino, Willamette, Huron, Mark Twain, and Francis Marion National Forests. Further information is available at: <http://research.eeescience.utoledo.edu/lees/research/jfsp>

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