



United States
Department
of Agriculture

Forest Service

Rocky Mountain
Research Station

Research Note
RMRS-RN-23-10-WWW

March 2005

Fuels Planning: Science Synthesis and Integration

Environmental Consequences Fact Sheet: 10

The Understory Response Model



Rocky Mountain
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Pacific Northwest
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*Synthesizing
Scientific Information
for Fire and Fuels
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Fuels planning: Science synthesis and integration, an interagency research/management partnership to support the Ten-Year Fire Plan, led by Russell T. Graham, RMRS, and Sarah M. McCaffrey, NCRS.

What is the Understory Response Model?

The Understory Response Model was developed by Steve Sutherland (USDA Forest Service) and Melanie Miller (USDI Bureau of Land Management) at the Fire Sciences Laboratory in Missoula, Montana. It is a species-specific computer model that qualitatively predicts change in total species biomass for grasses, forbs, and shrubs after thinning, prescribed fire, or wildfire. The model examines the effect of fuels management on plant survivorship (the survival, growth, and colonial growth of plants present at the site before treatment) and reproduction (establishment and growth of plants from stored seeds and onsite and offsite colonization).



Intended Users

The Understory Response Model was created as a planning tool to assist project or National Environmental Policy Act (NEPA) planners in evaluating the effect of alternative fuels treatments on understory plants.

Intended Uses

The Model predicts the effect of alternative fuels treatments or wildfire on understory plant survivorship and reproduction at 1, 5, and 10 years posttreatment. It is left to the user to set management goals and objectives, compare alternative fuels treatments, and determine if the predicted changes in understory vegetation are acceptable.

What the Model Does

The Model provides qualitative data on the effects of alternative fuel treatments on understory grasses, forbs, and shrubs for 1, 5, and 10 years postfuels treatment. The output provides a listing of input values, followed by qualitative effects for the survivorship and reproduction pathway for each treatment.



What the Model Does Not Do

The Understory Response Model does not predict quantitative changes in biomass, competitive interactions, or new species invasions. It should be used for comparing the effect of alternative fuels treatments or wildfire on target species and not for cross-species comparison.

Required Inputs

Treatments to Compare

- Thinning and broadcast burning
- Thinning and pile burning
- Prescribed fire
- Wildfire

Initial Stand Conditions

- Size of treatment area
- Starting canopy cover
- Duff depth

Plant Life History Traits

- Life span
- Life form
- Shade tolerance
- Root location
- Bud location
- Vegetative reproduction
- Weediness
- Sprouting ability
- Preferred light levels
- Seed dispersal
- Seed bank
- Fire stimulated seeds
- Presence onsite or offsite

Thinning Effects

- Canopy cover after thinning
- Mineral soil exposed by thinning
- Timing of thinning and prescribed fire

Fire Effects

- Canopy cover after fire
- Fuel and duff moisture

Outputs

Survivorship Pathway

- Thinning mortality
- Fire mortality
- Nutrients
- Clonal growth
- Weed
- Canopy effect
- Shrub damage
- Survivorship sum, which is a qualitative measure of change in plant biomass from pretreatment conditions

Reproduction Pathway

- Stored seeds
- Onsite colonization
- Offsite colonization
- Weeds
- Mineral soil
- Canopy effect
- Reproduction sum, which is a qualitative measure of the potential for a plant to colonize or recolonize an area after fuels reduction.



How to Obtain the Model

The Understory Response Model and other related tools can be found at: <http://forest.moscowfsl.wsu.edu/fuels/>

Environmental Consequences Fact Sheets

Look for fact sheet topics from the Environmental Consequences Team including information about the effects of fire behavior and alternative treatment strategies, Wildlife Response Model, weed responses, riparian systems, soil erosion, restoration objectives, treated spaces, the Fire Effects Information System (FEIS), and the First Order Fire Effects Model (FOFEM).

Fuels Planning: Synthesis and Integration

This fact sheet is one in a series being produced as part of a larger project supported by the USDA Forest Service to synthesize new knowledge and information relevant to fire and fuels management. Fact sheets address topics related to stand structure, environmental impacts, economics, and human responses to these factors. Information in the fact sheets is targeted for the dry forests of the Inland West, but is often applicable across broad regions of the country. For more information, please visit our Web site at: www.fs.fed.us/fire/tech_transfer/synthesis/synthesis_index

The Fuels Planning fact sheets are based on preliminary findings. Information from fact sheets will be synthesized in an upcoming publication.