Fuels Planning: Science Synthesis and Integration

Environmental Consequences Fact Sheet: 13

Root Disease Analyzer—*Armillaria* Response Tool (*ART*)

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What is *ART*?

The Root Disease Analyzer—*Armillaria* Response Tool (*ART*)—is a Web-based tool that estimates *Armillaria* root disease risk in dry forests of the Western United States. It uses habitat types to identify sites with high- or low-risk potential for developing *Armillaria* root disease, which can reduce productivity and increase wildfire risk. *ART* indicates how some fire planning (fuels management) activities may exacerbate *Armillaria* disease within high-risk stands, and helps determine an appropriate fuels management plan for reducing future damage by *Armillaria* root disease.

Resinosis (left) is a common symptom on trees infected with *Armillaria* root disease. Tightly attached mycelial fans (right) are a definitive sign of *Armillaria* root disease, and can be found beneath the bark on roots and lower boles of infected trees. Photos credit: R.C. Rippy (left) and J.W. Hanna (right).

Armillaria Root Disease and Fuels Planning

Root rot caused by *Armillaria* fungi warrants special consideration before fuels management activities are selected in Western forests. *Armillaria* species are widely distributed, and their effects on disease and mortality can increase greatly after human-caused disturbances. Not all *Armillaria* species decrease forest productivity. Some nonpathogenic species of *Armillaria* are beneficial forest decomposers. But in many environments, pathogenic *Armillaria* fungi cause reduced tree growth, increased mortality, and predisposition to bark beetle attack. In addition, *Armillaria* root disease can increase wildfire risk by contributing to fuels buildup and fuel ladders in affected stands.

Habitat Types, Subseries, and *Armillaria* Risk

Associations of plant species, known as habitat types, are strong indicators of site conditions, which are determined by the interaction of topography, soil, temperature, and precipitation patterns. Data from random *Armillaria* plots throughout the Western United States have indicated that distribution of *Armillaria* species is strongly correlated with habitat type, which combines overstory series and forest floor vegetation. Habitat types reflect combined temperature-moisture regimes. Subseries, which are groups of habitat types, can be used as indicators of *Armillaria* regimes (*Armillaria* distribution and activity), as well

as fire severity and fire return intervals in coniferous forests of the Western United States.

Intended Users

- Fuels treatment planners
- Silviculturists
- Resource managers
- National Environmental Policy Act (NEPA) planners

Intended Uses

ART can help reveal stands with site conditions that indicate risk for developing *Armillaria* root disease, if susceptible host trees are present. It is intended to help users make predictions and evaluate impacts of alternative fuels treatments. Knowledge about the role of fire and responses of various species in Western forests is a good starting point for management considerations. Each fuels-treatment option must be considered in relation to the habitat type, mix of host species, and other interacting factors.

Required Inputs

- Stand location (Forest Service Region or National Forest)
- Habitat type
- Fuels treatment

For effective use of ART, it is essential that stand habitat types have been correctly identified. A GIS-based extension to ART uses landscape analysis to identify misclassified stands and stands with differences in slope and aspect classes that may indicate substands with different habitat types.

What the Model Does

Outputs include:
- Low or high risk for the presence of *Armillaria* root disease
- Potential behaviors after fuels treatments

ART presents potential effects of fuels treatments for high- and low-risk categories. Treatments included in the tool are:

1. No treatment
2. Thinning
3. Prescribed burning
4. Thinning and prescribed burning
5. Wildfire

To assess the effects of fuels treatments on *Armillaria* root disease, it must be determined whether *Armillaria* species are likely to exist on the site. As expected, fuels treatments will have no effect on *Armillaria* root disease for subseries where *Armillaria* root disease does not occur. Where *Armillaria* can occur, the decision process is more complex and must consider tree species present, fire regimes, and fuels treatment methods.

For More Information

The ART model and documentation are available online at:http://forest.moscowfsl.wsu.edu/fuels/art/
ART is currently in the early developmental stage.

The habitat type for this stand is grand fir/ninebark-ninebark phase (*Abies grandis/Physocarpus malvaceus—Physocarpus malvaceus*) (ABGR/PHMA-PHMA). The *Armillaria* Response Tool would classify this stand as high risk for the presence of *Armillaria* root disease. *Armillaria* root disease causes mortality that can increase fuels buildup and risk of wildfire. Photo credit: R. C. Rippy.

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.