



Western Forest Diseases and Climate Relations: Root Diseases and Climate Change

Mee-Sook Kim¹, Bryce A. Richardson² and Ned B. Klopfenstein³

Climate change could alter patterns of disturbances from pathogens through (1) direct effects on the development, survival, reproduction, dispersal, and distribution of pathogens; (2) physiological changes in tree defenses; (3) indirect effects from changes in the abundance of mutualists and competitors.

In general, any climate change could increase the incidence and spread of root disease if host trees become maladapted and undergo stress due to climate change. In addition, climate change could alter fitness of various mycorrhizal fungi and other beneficial microbes that currently suppress root disease.

Some reports suggested that hot and dry conditions (e.g., prolonged drought) are expected to increase incidence and spread of root diseases in forests. However, it is difficult to specifically predict how this climate change will affect diverse root diseases under various projected climate scenarios. Currently, the distribution of pathogens that cause root disease in the western USA is not well documented. Current disease surveys often overlook non-symptomatic trees that are infected by pathogens.

In: McWilliams, M.G. comp. 2008. Proceedings of the 55th Western International Forest Disease Work Conference; 2007 October 15-19; Sedona, AZ. Salem OR: Oregon Department of Forestry.

¹USDA, Forest Service, Rocky Mountain Research Station, Moscow, ID. mkim@fs.fed.us.

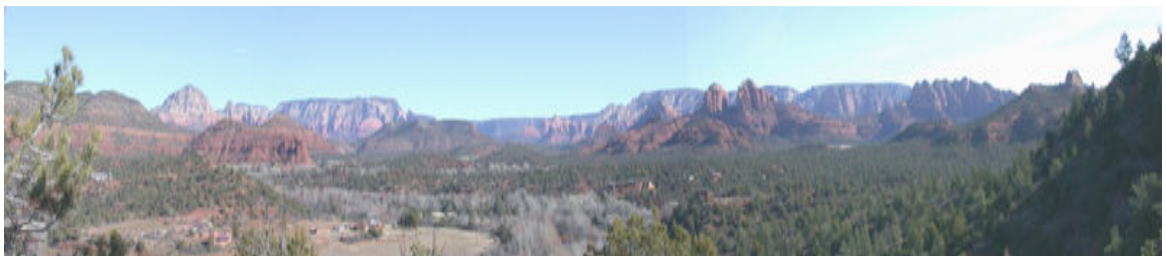
²USDA, Forest Service, Rocky Mountain Research Station, Moscow, ID. brichardson02@fs.fed.us.

³USDA, Forest Service, Rocky Mountain Research Station, Moscow, ID. nklopfenstein@fs.fed.us.

Furthermore, precise diagnostic tests are seldom performed to accurately identify pathogens, and precise GPS-recorded data about pathogen distribution is frequently lacking. Without reliable and accurate information of pathogen distribution under present climate conditions, it is difficult to assess the relationships among root-disease pathogens and climate variables. Determining the precise distribution of currently existing pathogens and disease is the first step toward understanding impacts of climate change on root pathogens.

An example of predicting *Armillaria ostoyae* based on climate variables will be discussed at the workshop. A short description of this pilot project follows: To develop a climatic envelope for *A. ostoyae*, latitude, longitude and elevation were compiled from 102 confirmed locations where this species was found. These location data were used to develop climate-variable estimates from a spline-climate model at 1 km² resolution followed by Random Forests multiple-regression tree analyses.

Currently available climate models that predict suitable climate space for forest tree/shrub/forb species based on various climate change scenarios will also provide a basis to determine climate effects on host vigor and pathogen distribution in the western USA. These approaches will be discussed at the workshop.



Panoramic view of the immediate Sedona area, covering an angle of view of approximately 90 degrees. The line of bare (deciduous) trees at center left marks the course of Oak Creek. From Wikipedia.org. October 2008.