

PREDICTING DIEBACK IN U.S. FORESTS: CONCEPTS AND APPLICATION OF A FOREST HEALTH DECISION SYSTEM

Allan N.D. Auclair

USDA APHIS, PPQ
4700 River Rd., Riverdale, MD 20737

ABSTRACT

There are important reasons to predict accurately the onset and progression of forest dieback episodes in the U.S. and elsewhere. These include extensive ongoing dieback and expectations of increased mortality as climate becomes warmer, drier, and more variable. Earlier work showed that dieback episodes in U.S. northern hardwoods are incited by root mortality caused by soil frost; effects of root injury are then exacerbated by drought in the following growing season. A test model is described that uses routinely updated NDVI, snow depth, minimum air temperature, and percent soil moisture to estimate risk of dieback in Maine. A computer animation is made using 10-day updates of these parameters available on the USDA FAS web site (<http://www.pecad.fas.usda.gov/>

cropexplorer) to predict the location and severity of potential episodes in the state. I demonstrate that the changing frequency of winter soil frost and summer drought long term (1920 to 2007) accurately predicts actual dieback levels as reconstructed from field records. Further verification is made using meteorological records from 1991 to 1995 at Portland, ME, to predict a dieback episode there in 1993; both snow cover / minimum air temperature / PDSI and SHAW simulation of soil frost and soil moisture correctly depict the event. I discuss applications of these findings to predict dieback being tracked annually by the U.S. Forest Health Monitoring Program. The goal is to help forest managers identify patterns of risk early to enable timely decisions on intervention and treatment.