

# Can Microscale Meteorological Conditions Predict the Impact of White Pine Blister Rust in Colorado and Wyoming?

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**Abstract**—White pine blister rust occurs when there are compatible interactions between susceptible hosts (white pines and *Ribes* spp.), inoculum (*Cronartium ribicola* spores), and local weather conditions during infection. The five spore stages of the white pine blister rust (WPBR) fungus have specific temperature and moisture conditions necessary for production, germination, and dissemination of spores. Local meteorological conditions may be important factors in infection success, infection periodicity and disease intensification over time.

Predictions of white pine blister rust occurrence and severity depend on various tree, secondary host, site and environmental factors. Recent predictions have also used spatial climate data of 30-year monthly averages (which are available for a matrix of points over large geographic areas) and concluded that meteorological conditions are dynamic forces determining successful infestation. Hourly temperature and relative humidity data at the local, microsite level (in white pine stands) allow specific temporal resolution not offered by spatial climate datasets. The objectives of this study were to determine: 1) if short-term, microsite weather data could be used to adjust longer-term, regional data to accurately represent conditions within white pine stands; 2) suitable infection periods for WPBR at sites with host and disease information; and 3) if modified regional data is useful in explaining variability in WPBR occurrence, severity, periodicity or impact on host health.

Nine to 21 years of data from 27 long-term, regional stations were adjusted to microsite white pine stand meteorological conditions by 48 short-term, local station data from corresponding white pine stands in Colorado and Wyoming. Paired site equations (from 1 to 4 microsite data sources per site) were averaged by site and used to adjust regional station data. Adjusted hourly data were used to determine suitable infection periods (relative humidity >90% and air temperature within 0–23.8 °C for periods of at least 6 or 12 hours) for study sites with information on WPBR occurrence and site factors.

Canker size and canker growth rate estimation data recently collected in limber pine stands throughout Colorado and Wyoming were extrapolated to explain periodicity of WPBR infection and temporal estimations of infestation length and disease intensification. We are attempting to combine various aspects of disease occurrence, severity and intensification with host responses (die-back or mortality due to WPBR) to categorize sites as high- or low-impact over time and use this information in site-specific hazard predictions. Preliminary models indicate that predictions of WPBR hazard still rely on the knowledge of important site factors such as *Ribes* presence and density; however, local relative humidity, temperature fluctuations and suitable infection periods are also important variables that can help forecast how rust will intensify once it establishes on a site.

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.