

The Role of Disease Resistance in the Recovery of Whitebark Pine

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Over the last fifty years, research and development of genetic resistance to *Cronartium ribicola* in North American white pines (subgenus *Strobus*) has gone from what seemed a long-shot in the late fifties and early sixties, to the most widely-accepted option today for protecting host pines from infection and damage by the exotic rust pathogen. Yet, as budgets and personnel shrink in size and number, it is becoming increasingly difficult to muster the long-term will and resources to carry out the R & D tasks required. It is no longer enough to assume that finding and developing resistance to white pine blister rust is a financially- and politically-supportable enterprise, without explicitly documenting the scope of the task and addressing the likelihood of success. Efforts to develop disease-resistance in white pines of commercial value (*Pinus strobus*, *P. monticola*, and *P. lambertiana*), despite allocation of substantial human, financial, and temporal resources, have met with remarkable but incomplete success overall, leading some managers to believe that it is now time to declare victory in the war against white pine blister rust and leave the field of battle. Following a counter-trend, many forest researchers, managers, and advocates, with considerable preliminary success, have turned their attention to whitebark pine (*Pinus albicaulis*), a high-elevation keystone species that is simultaneously threatened by *C. ribicola*, bark beetles, decades of fire suppression, global climate change, and benign neglect. Again, developing resistance to the pathogen is heralded as the best option for whitebark recovery, yet, as a non-commercial species that is appreciated for ecosystem values that are somewhat opaque to politicians and the general public, can we expect research and management efforts to accomplish with whitebark pine what has eluded us so far with the three commercial white pine species? In this talk, I suggest that we consider carefully what we hope to achieve with our resistance efforts, and that we let our past efforts be a guide to how we plan and carry out this monumental task. Just saying, "It has to be done," is not enough. I shall discuss a few of the considerations that must be addressed, some in greater detail than others. Among these are several key questions: Is *C. ribicola* a primary or secondary cause of the observed decline of whitebark pine in Western North America? If it is a primary cause, will deploying resistant whitebark seedlings reverse that decline? Do we have the know-how and technology to deploy whitebark successfully? What are the mechanisms of resistance to blister rust in whitebark pine? Are they sufficiently observable, repeatable, robust, and durable? How are these mechanisms inherited? Is that mode of inheritance sufficient to practically deploy seedlots that comprise an appropriate mix of the desired resistance traits? How long will it take to answer these five questions? How long will it take to develop product (i.e., resistant seedlings), and how will we market it? Do we have the will and stamina to carry out these and other needed research and development efforts over the long-term and with the finances

required? Perhaps most important, do we have the will and foresight to seriously address these and other issues before we leap into the enterprise?