

Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area

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Ecological condition and context determine the likelihood of success of management interventions to mitigate impacts of white pine blister rust (WPBR) (Schoettle et al. 2019a). In populations heavily impacted by WPBR, the remaining seed trees may be too few to support natural regeneration even with management intervention. Likewise, rust pressure can be so high that it will overcome the expression of WPBR-resistance, reducing the efficacy of planting with resistant stock. Management has a low probability of successfully rebuilding a population under these conditions (Keane and Schoettle 2011); focusing less on these areas in favor of managing areas with less rust pressure may be a better investment. In threatened or less impacted populations, regeneration management, whether it be planting genetically resistant seedling stock, maintaining and augmenting the size of the pine populations, or generating a diverse mosaic of stand ages across a landscape, can provide and position young seedlings to begin to mature to help offset mortality of the reproductive overstory trees as the disease intensifies over time (Schoettle and Sniezko 2007).

These concepts of highlighting opportunities across stand conditions and encouraging management in areas where management has a high probability of success have been applied in the development of the Proactive Limber Pine

Conservation Strategy in the Greater Rocky Mountain National Park Area (Schoettle et al. 2015, 2019b).

Rocky Mountain National Park (RMNP) is at the infection front for *C. ribicola* in Northern Colorado and the park has a responsibility to prevent ecosystem impairment. The Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area is an outcome of a partnership between RMNP and the USDA Forest Service. The Strategy focuses on timing specific research, monitoring and interventions efforts to inform management to sustain healthy limber pine populations and ecosystems during invasion and naturalization of WPBR, thereby helping to put limber pine on a trajectory that does not lead to ecosystem impairment in the future (Schoettle et al. 2015, 2019b, Cleaver et al. 2017). At the time of this collaboration, a high frequency of complete resistance to WPBR in limber pine populations in RMNP and surrounding areas was discovered revealing a unique feature of this area's ecology (Schoettle et al. 2014).

That we have this information and gained additional site-based genetic and disturbance ecology information from a network of plots installed before the limber pine populations have been invaded by WPBR is also unique. This situation justified developing a proactive

conservation strategy specific to the greater RMNP area.

The management goals that the Strategy outlines includes (1) Promote ex situ and in situ conservation - continue and expand efforts to collect and archive limber pine genetic diversity through seed collections and protect limber pine trees from mountain pine beetle, WPBR, and fire to minimize mortality when and where land designations and management objectives permit; (2) Increase population size and sustain genetic diversity - increase the number of limber pine trees on the landscape through planting or seeding, or both, immediately to offset future mortality and to sustain viable self-sustaining populations; (3) Locate treatments to maintain durability of complete WPBR resistance - minimize selective pressure on the rust by planting trees with a range of susceptibilities, only in low-WPBR-risk areas, to reduce the probability of the proliferation of rust genotypes virulent to the complete resistance in limber pine; (4) Discover, develop, and deploy local quantitative WPBR-resistant sources - research quantitative (polygenic) WPBR resistance types in limber pine in the greater RMNP area; and (5) Monitor pines and rust - monitor for limber pine health, early detection of WPBR, and WPBR virulence.

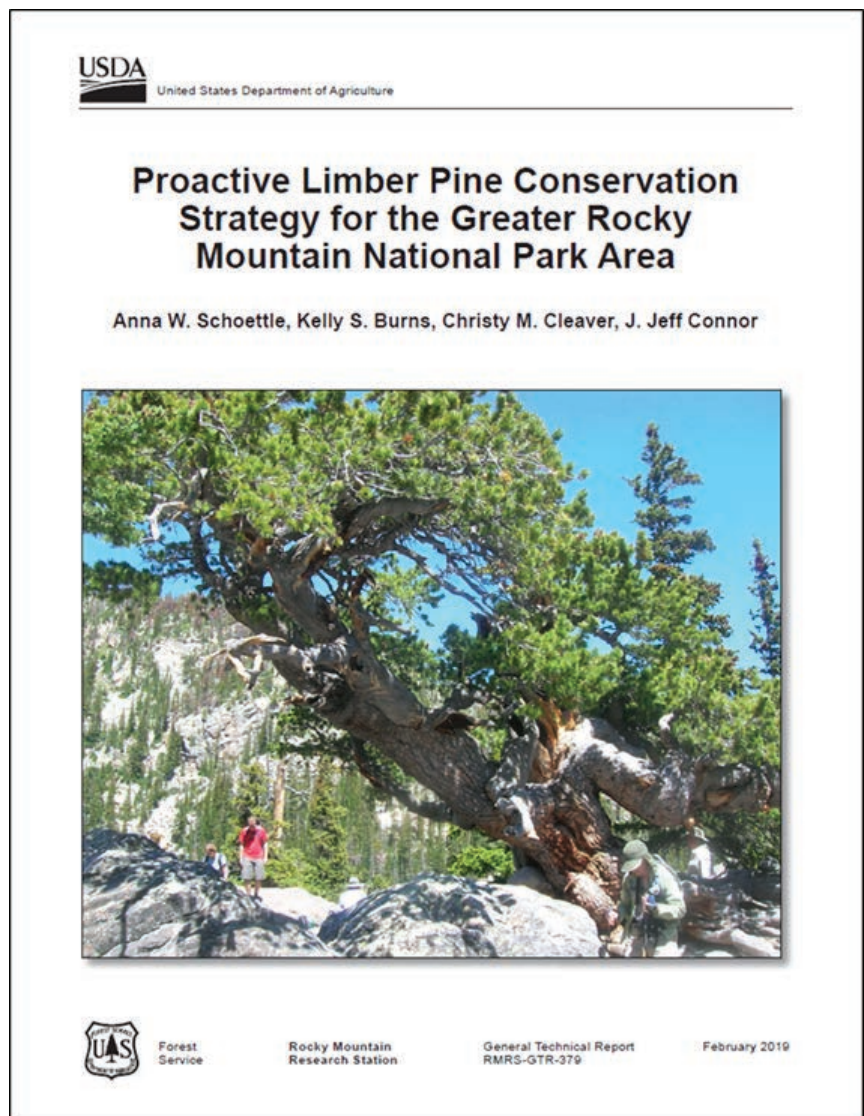
The Strategy includes specific recommendations for the monitoring

network and management actions to achieve these goals. The Proactive Limber Pine Conservation Strategy was adopted by the park in 2015 and was expanded to the larger area of northern Colorado and southern Wyoming in 2019 (Schoettle et al. 2019b). It has served as a model for ongoing proactive conservation efforts for Rocky Mountain bristlecone pine, Great Basin bristlecone pine, and southwestern white pine and healthy portions of foxtail pine and whitebark pine distributions. The approach to prioritize management actions by their probability of success (Schoettle et al. 2019a) has also been adapted and applied to prioritize treatments for a restoration strategy for whitebark pine in a pilot area within the Crown of the Continent Ecosystem (Jenkins et al. 2020).

Timely management approaches that incorporate both ecological context and an evolutionary perspective increase the likelihood of successfully sustaining high-mountain pine ecosystems into the future. In healthy but threatened ecosystems, acting now will increase forest resilience to position the ecosystems to develop fewer impacts, and need less restoration, in the future.

The Proactive Strategy encourages managers to not wait until an ecosystem is impaired to begin managing for increased resilience. This Strategy also offers insights for managing impacted ecosystems by suggesting that one look for management opportunities beyond the heavily impacted areas that often attract most attention but have a poor prognosis. Starting management before or early in the invasion of *Cronartium ribicola* and spreading treatments over a diversity of current stand conditions will increase the likelihood that some populations avoid impairment or extirpation and can sustain the high elevation five-needle pine species.

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References

Cleaver CM, Burns KS, Schoettle AW. 2017. *Limber Pine and White Pine Blister Rust Monitoring and Assessment Guide for Rocky Mountain National Park. Final Report prepared by Rocky Mountain*

Research Station for Rocky Mountain National Park. Inter-Agency Agreement 15-IA-11221633-157. 28p. <https://www.fs.usda.gov/treearch/pubs/56244>

Jenkins MB, and 14 others. 2020 press. *Project Summary - Crown of the Continent Ecosystem Whitebark Pine Restoration Strategy 2019 Pilot.* Will be available at <https://www.crownmanagers.org/five-needle-pine-working-group>

Keane RE, Schoettle AW. 2011. *Strategies, Tools, and Challenges for Sustaining and Restoring High Elevation Five-Needle White Pine Forests in Western North*

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Sorcerer Lodge certified as first 'Whitebark Pine Friendly Ski Area' in Canada

The Whitebark Pine Ecosystem Foundation is pleased to announce that Golden-based Sorcerer Lodge is being recognized as the first Whitebark Pine Friendly Ski Area in Canada. Whitebark pine is an endangered high elevation tree species, commonly growing within ski areas; thus, ski areas have a unique management responsibility for the survival of the tree.

This program recognizes ski areas that have contributed to the recovery of whitebark pine through diligent management actions. The intent of this program is to: 1) Recognize ski areas that are leaders in whitebark pine recovery; 2) Increase awareness among

ski areas; 3) Provide guidance to ski areas in conservation efforts; 4) Provide opportunities for ski areas and their patrons to be directly involved in whitebark pine recovery; and 5) Preserve whitebark pine to be enjoyed by future generation of recreationists.

Sorcerer Lodge has been supporting whitebark pine recovery for over a decade by providing a base for recovery specialists, educating guests, developing local mapping and recovery projects, and contributing financially to the recovery of the species.

Media and public are invited to a recognition ceremony and reception to

be held on November 21st from 7-9 PM at the Mount Begbie Brewery Tasting Room, 2155 Oak Drive, Revelstoke BC.

For more information see: whitebarkfound.org/our-work/ski-area-certification/

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America. In: *The Future of High-Elevation, Five-Needle White Pines in Western North America: Proceedings of the High Five Symposium*. 28-30 June 2010, Missoula, MT. Edited by RE Keane, DF Tomback, MP Murray, CM Smith. USDA For. Serv. Proc. RMRS-P-63. pp 276-294 <https://www.fs.usda.gov/treearch/pub/s/38240>

Schoettle AW, Burns KS, Cleaver CM, Connor JJ. 2019b. *Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area. General Technical Report RMRS-GTR-379*. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research

Station. 81 p. https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr379.pdf

Schoettle AW, Cleaver CM, Burns KS, Connor JJ. 2015. *Limber Pine Conservation Strategy for Rocky Mountain National Park*. On file as an active management guide at Rocky Mountain National Park.

Schoettle AW, Jacobi WR, Waring KM, Burns KS. 2019a. *Regeneration for Resilience Framework to Support Regeneration Decisions for Species with Populations at Risk of Extirpation by White Pine Blister Rust*. *New Forests* 50: 89–114. <https://doi.org/10.1007/s11056-018-9679-8>

Schoettle AW, Snieszko RA. 2007. *Proactive Intervention to Sustain High Elevation Pine Ecosystems Threatened by White Pine Blister Rust*. *Journal of Forest Research* 12:327-336. <https://www.fs.usda.gov/treearch/pubs/29500>

Schoettle AW, Snieszko RA, Kegley A, Burns KS. 2014. *White Pine Blister Rust Resistance in Limber Pine: Evidence for a Major Gene*. *Phytopathology* 104: 163–173. <https://www.fs.usda.gov/treearch/pubs/44228>