

Conservation of whitebark pine may hinge on preservation of ponderosa

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The caching of whitebark pine seeds by the Clark's nutcracker in late summer and early fall may not be enough to regenerate populations of the imperiled conifer in most of its range, scientists have found.

Their research—which is featured in the February issue of *Science Findings*, a monthly publication of the U.S. Forest Service's Pacific Northwest Research Station—suggests, for the first time, that the success of whitebark pine restoration may be linked to the conservation of another tree species: ponderosa pine.

"Whitebark pine is a keystone species in the high-mountain ecosystems of the northern Rockies, Cascades, Olympics, and eastern Sierra Nevada because it plays a major role in creating suitable conditions for the growth of other plants and in supplying seeds, which are consumed by a number of animals," said Martin Raphael, a research wildlife biologist with the station and one of the study's collaborators. "But the species is in trouble and is experiencing declines of 45 percent across some of its range."

Regeneration of the high-elevation tree—which is threatened today by outbreaks of the mountain pine beetle and blister rust—would seem intimately tied to the foraging behavior of the Clark's nutcracker, a crow-sized bird that propagates the tree by removing its large seeds from its cones and caching them in the ground. Unlike most other pines, the cones of whitebark trees do not open on their own to release their seeds, but must be forced open by Clark's nutcrackers. The birds' spatial

memory allows them to retrieve seeds from many of their caches throughout the year; those that remain are left to germinate.

"The nutcrackers flock around whitebark pine stands in autumn as the cones ripen and use their sharp, strong bills to hammer into the tightly closed cones and dig out the seeds," said Teresa Lorenz, a doctoral student who led the study, along with Raphael and Forest Service geneticist Carol Aubry, as part of her master's degree studies at Utah State University. "You can see the cone chips flying."

In the study, aimed at determining how effective the birds are in regenerating whitebark pine, the researchers fitted 54 Clark's nutcrackers in the Olympic and Cascade Mountains with radio collars and tracked them for three seasons. They found that:

- The nutcrackers foraged widely for whitebark pine seeds, but transported nearly all of them back to their home ranges for caching, which suggests that natural generation of the tree would be greatest within the birds' home ranges
- The nutcrackers transported seeds over much longer distances than previously observed, sometimes up to 20 miles, which suggests that the birds facilitate a great amount of genetic mixing of the tree
- The nutcrackers tended to cache their seeds in sheltered locations at the driest, lowest elevation sites within their range—areas unsuitable for successful whitebark pine germination

"One of the most important things this study helped us to understand is how unlikely it is that whitebark pine seeds will end up in good germination spots," Raphael said. "Birds placed only about 15 percent of the seeds they gathered in places where germination is actually possible."

In addition to revealing that Clark's nutcracker caching alone, while critical, would not be sufficient to recover populations of whitebark pine, the study also is the first to document the role of the birds in disseminating the seeds of ponderosa pine. The nutcrackers not only routinely gathered ponderosa pine seeds within their home ranges, but were more effective in dispersing them to suitable germination sites than they were at dispersing whitebark pine seeds.

"Because we found ponderosa pine seeds to be an important food for nutcrackers in Washington and Oregon, the success of whitebark pine restoration may be irrevocably linked to the conservation of low-elevation ponderosa pine," Lorenz said. "What we've found can help managers focus restoration efforts and may help them refine seed boundaries and identify the likeliest regeneration sites."

More information: To read the February issue of Science Findings online, visit www.treearch.fs.fed.us/pubs/37291

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