United States Department of the Interior

NATIONAL PARK SERVICE
Sierra Nevada Network
Yosemite, Sequoia, and Kings Canyon National Parks

To: United States Fish and Wildlife Service, Wyoming Ecological Services Field Office

From: National Park Service, Sierra Nevada Network Parks–Yosemite, Sequoia, and Kings Canyon

Re: Information request on status and distribution of whitebark pine

8 September 2010

This letter is a response to the Fish and Wildlife Service request for quantitative data on the status of whitebark pine (*Pinus albicaulis*) for Sierra Nevada Network Parks–Yosemite, Sequoia, and Kings Canyon. Whitebark pine is a dominant component of upper subalpine forests in Yosemite and Kings Canyon National Parks, and also occurs in the upper subalpine of Sequoia National Park but in lower relative abundance. In all three parks, whitebark pine exists in mixed species stands scattered throughout the subalpine environment. Based on data compiled by the NPS Inventory and Monitoring Vegetation Mapping Program, we estimate that whitebark pine occurs in 26,878 ha in Sequoia-Kings Canyon National Parks combined and 13,467 ha in Yosemite National Park.

The two main factors causing whitebark pine decline–white pine blister rust (*Cronartium ribicola*) and mountain pine beetle (*Dendroctonus ponderosae*)–are in lower abundance and therefore currently present less of a threat in Sierra Nevada Network Parks relative to other parts of the pine's range (e.g., the Rocky Mountains). In short, whitebark pine is currently faring better in the Sierra Nevada than in any other comparably large region in the conterminous United States. However, it is unknown how much of the estimated area of whitebark pine habitat in Sierra Nevada Network Parks (given above) is affected by blister rust or mountain pine beetle. This uncertainty is likely due to a true low occurrence, and hence low detectability, and a lack of systematic surveys to detect their presence. Below we present information from the few known studies that attempted to quantify the degree of either, or both of these stressors.

Table 1. Occurrence of white pine blister rust and mountain pine beetle in plots containing whitebark pine in Sierra Nevada Network Parks. Percentages represent percentages of trees in the plots; mean values are given for studies with more than one plot. NA, data were not available; WPBR, white pine blister rust; MPB, mountain pine beetle.

Date	Park	Plot size (m)	No. plots	% WPBR	% MPB	Source
1995-1999	Sequoia	30 x 50	3	0	NA	NPS SEKI[1]
2004-2006	Sequoia	30 x 50	1	0	0	USFS FHP[2]
1995-1999	Kings Canyon	30 x 50	29	0	NA	NPS SEKI[1]
2004-2006	Kings Canyon	30 x 50	1	0	0	USFS FHP[2]
2004-2006	Yosemite	30 x 50	5	0.8	0.4	USFS FHP[2]
1996-2010	Yosemite	50 x 250	1	0.2	≤ 2.2	USGS[3]
2010	Yosemite	50 x 50	4	0.3	0	NPS I&M[4]

[1]Duriscoe and Duriscoe 2002.
[2]Maloney et al. 2008.
[3]Das and Stephenson unpublished data .
[4]McKinney et al. *in review*.

Mortality rate (per cent of trees dying per unit time) has been assessed in only one of the studies in Table 1. The USGS long-term demography plot yields an estimated mortality rate of ~0.5% per year over a 15 year period. Many snapshot studies report the number of standing dead trees relative to all standing tress (dead + live) as per cent mortality. There are several confounding aspects to such reporting including uncertainty in the cause of death, time of death, and differences among areas in how long trees remain upright after death. Despite this, and in lieu of having long-term data, some insight can be gained in making coarse-scale comparisons among regions in the proportion of all standing trees that are dead (% mortality). In Sierra Nevada Network Parks, there was 0% mortality in seven 30 x 50 m plots (1 in Sequoia, 1 in Kings Canyon, and 5 in Yosemite), and a mean 5% mortality in four 50 x 50 m plots in Yosemite.

Despite the low mortality and blister rust infection values presented here, blister rust has been present in the Sierra Nevada since at least 1968. Moreover, the lower elevation five-needle pines–sugar pine (*P. lambertiana*) and western white pine (*P. monticola*)–are more severely impacted than whitebark and its other high-elevation five-needle counterpart–foxtail pine (*P. balfouriana*). It is currently unknown why blister rust has not spread and intensified in the high-elevation pines, but recent discoveries of rust infection on whitebark pine in Yosemite NP might indicate that this relationship is changing (Table 1). Furthermore, mountain pine beetle outbreaks are occurring in whitebark pine forests on the Modoc National Forest in northeastern CA. Therefore, the recent spread of these two stressors in proximity to Sierra Nevada Network Parks may portend future whitebark pine declines in the region.

No restoration or recovery strategies have been developed for whitebark pine in Sierra Nevada Network Parks. A protocol to monitor high-elevation white pines in the Pacific West Region (including Yosemite and Sequoia-Kings Canyon) is in review with planned implementation for 2011. This project will specifically assess whitebark pine health and demographic parameters. If conditions eventually warrant restoration in the Sierra Nevada region, the parks would have at their disposal a range-wide restoration strategy now under development (Keane et al. 2011). However, the broad extent of wilderness in our parks and accompanying implications would present challenges to management in deciding whether to adopt the available techniques (e.g., planting rust-resistant seedlings).

If there are any questions about this document please contact:

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