Filling the Gaps: Whitebark pine (*Pinus albicaulis* Engelm.) inventory of the North Cascades ecoregion- Falls Creek Drainage and Eightmile Ridge Methow Valley Ranger District

Whitebark pine seedling in Falls Creek drainage post-fire.

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**Eightmile Ridge:** (see Figure 1 in Appendix A for reference)

In July of 2018, whitebark pine surveys were conducted along Eightmile Ridge and old stock driveway from the end of the Falls Creek Road to the base of Birch Mountain and the headwaters of the West Fork of Falls Creek. Recently burnt and old ghost snags of whitebark pine (*Pinus abicauilis*) began to show up as scattered individuals at about 6,600 ft. It wasn’t until about 6700 ft. that the species became more regular in its representation. Even at this point, very little whitebark was encountered. At this elevation, subalpine larch (*Larix lyallii*) becomes the dominant overstory species and subalpine fir (*Abies lasiocarpa*) becomes codominant.

Whitebark pine was mainly restricted to the edges of the west facing bluff above the Eightmile drainage. The stock driveway may have contributed to the survival of some trees along this edge (see picture 9 below). Whitebark pine made up about 10% of the stand along the bluff edge. The whitebark pine that survived the 2014 Falls Creek fire from the east and the 2017 Diamond Creek Fire from the west were tall, spindly and thin crowned. Some were bearing cones. No regeneration of whitebark pine was found. A few, (<5) whitebark ghost snags were found and examined. Only one showed evidence of blister rust. Cause of death was undetermined for the others. The blister rust in the live whitebark, show evidence of mainly branch cankers. No active cankers were found and it is estimated about 20% of the live whitebark had blister rust.

The dominant overstory species, in the burned area east of the bluff, were subalpine larch and subalpine fir. No whitebark pine was found once you left the bluff edge and no regeneration of whitebark was seen. Nearly 80% of the conifers were killed in the fire and there is little or no sign of conifer regeneration in the area of the 2014 fire. Trees that survived the fire were mainly subalpine fir with a few whitebark pine scattered along the western ridge. The only conifer post-fire regeneration found was subalpine fir, and regeneration was very sparse. Just below the Birch Mt. summit there was a small basin where a pocket of subalpine larch survived the fire. To the east near the West Fork Falls Creek headwaters, the fire again consumed nearly all the conifers. Only very small pockets of unburned were encountered.

Many of the live whitebark, that survived the fire, had red needles at the tip of the branches. This was not blister rust as there was new growth coming out of the middle of the red needles. This could be the result of fire damage from the Diamond Creek fire below or from frost damage resulting from early season growth in 2017.

In the low to moderate severity fire area, the species colonizing the understory are predominately: *Vaccinium scoparium*, *Luzula hitchcockii*, *Carex rossii*, *Epilobium angustifolium*, and *Spraguea umbellate*. 
Picture 3: Few trees, mainly subalpine fir, survived above the West Fork Falls Creek headwaters.

Picture 4: Whitebark pine “ghost” snag in unburned area.
The Eightmile Ridge does not appear to be a suitable place for restoration planting. No Clark’s nutcrackers were heard or seen during our visit. The area where whitebark pine was found was limited in size and restricted to inaccessible rock bluffs. The remaining live trees were not thrifty, suggesting it is a marginal place for long term persistence of whitebark pine. There are robust stands of whitebark pine about 0.8 km (ca 0.5 miles) in the Barney Mt. Fire and about 3.2 km (ca. 2 miles) from the Obstruction Peak population (see Figures 2&3 in Appendix A). These healthy stands of whitebark pine could provide a seed source for Eightmile Ridge providing there are resident Clark’s nutcrackers in the area.
Picture 7: Whitebark pine with cones and red tips.

Picture 8: Typical spindly whitebark pine along bluff edge.

Picture 9: Stock driveway along Eightmile Ridge appeared to prevent total conifer mortality along the western edge in this high severity burn area.
In the high severity fire areas, between 5100 ft. and 6,600 ft., the dominant conifers were subalpine fir and lodgepole (Pinus contorta). In the low to moderate fire severity areas there was abundant lodgepole regeneration, resprouting of shrubs, perennial plants and colonizing of other species. Soils were well protected by post fire growth. Once into the higher severity burn area, there was no conifer regeneration seen and very little diversity in the understory growth.

The dominant species in the understory was Ross’ sedge (Carex rossii), with a little bit of fireweed (Chamerion angustifolium). In this high severity burn area, between 2 in. and 3 in. of the soil has eroded off the slope, as indicated by the lichen line on larger residual rocks. This loss of soil and burn severity likely is responsible for the poor vegetative recovery seen. The long-lived soil seed bank of C. rossii likely contributed to the near monoculture of this species on these severely burned sites (Wilson et all 2008). Herbaceous understory cover increases along with species diversity above 6700 ft., but still remains relatively low, often less than 25% cover in burned areas.

Five plants of potato chip sedge (Carex proposita), an R6 Sensitive species, were found along the ridge, likely a subpopulation of the population previously documented on the summit of Birch Mountain. A nearly monoculture of Ross’ sedge was associated with C. proposita, except for a few scattered plants of sticky current (Ribes viscosissimum) and fireweed.
The Falls Creek trail is a popular trail primarily used by hikers and horsemen. The trail follows Falls Creek north up the west fork, reaches the summit of Birch Mountain at the headwaters of the west fork, then loops southward along the Eightmile Ridge and reconnects with the main trail near the trailhead. Some work to re-establish the trail since the 2014 fire has occurred. It is not likely this recreational use would ever be in conflict with whitebark pine. The only potential conflict would be in the reconstruction and maintenance of the trail, if whitepark pine are encountered and accidently cut.
Falls Creek Drainage: Barney Mountain Fire 2012- The ridge between the headwaters of the West and East forks of Falls Creek, and whitebark pine on ridgeline between Obstruction Peak and Mt. Barney (see Figures 1&2 in Appendix A):

Surveys were concentrated in July of 2018 approximately 4 miles up the Falls Creek trail, in the Barney Mountain Fire area (note: the Barney Mountain fire was misnamed and is not on Mt. Barney proper, but instead on a small ridge NW of Barney Mountain). Not far past the main stream crossing, we headed up the toe of the ridge toward the Barney Fire. The ridge had burned during the 2014 Falls Creek Fire leaving burnt snags and crumbling granite on a 60% to 70% slope making travel difficult. Increasing winds made it unsafe to proceed in a forest of burnt snags, therefore, we did not make it to the top of the ridge. A date was set to return and complete the survey. However, smoke laden air, from nearby fires, created hazardous air quality for several weeks throughout the valley. Falls Creek drainage was closed soon after the visit due to the approaching McCloud Fire. We were unable to return to complete the survey in 2018.

On the ridgeline to the Barney Mountain fire location, we made it to the edge of the whitebark pine stand beginning at 6,800 ft. where the high to moderate severity burn graded into the low to unburned portion of the stand we examined. We examined approximately 3 acres of the stand, most of which was unburned.

Our approach to the edge of the stand took us through mostly high severity fire areas. There was no conifer regeneration seen in any of the high severity burned area and rarely a live conifer was encountered. In 2014, Bowden and crew found whitebark pine were sporadically encountered in the lower elevations and were more commonly found around fens or wetlands, which are interspersed along the length of upper Falls Creek drainage. Whitebark became more prominent at about 6,200-6,300 ft. The Falls Creek Fire appears to have killed all the whitebark pine below the 6,800 ft level, where we encountered it. The unburned stand we examined was the lowest live band on trees in the drainage (see Figure 2 and Appendix A).

The portion of the whitebark pine stand examined experienced low severity fire or was unburned due to surrounding rock and sparse fuels in the understory. A few whitebark pine were killed along the fringes of the moderate severity burn area where crown fire killed most conifers, despite the low fuel loading on the forest floor. Subalpine fir was the codominant conifer in the stand with a few old Douglas-fir (Pseudotsuga menziesii). Whitebark pine made up about 50% to 75% of the stand. Understory regeneration of whitebark pine was common in the unburned area, exceeding the number of understory regeneration seen of subalpine fir and Douglas-fir combined. Despite the high severity burn, the understory herbaceous development was much more diverse and had a higher percent herbaceous ground cover (30 to 50%) compared to Eightmile Ridge (20 to 30%). The most abundant species were: grouse whortleberry (Vaccinium scoparium), biscuitroot (Lomatium brandegei), Ross’ sedge (Carex rossii), Indian paintbrush (Castilleja), and lupine (Lupinus). Since the ridge is located between the West and East Forks Falls Creek, cold air drainage and the associated higher humidity likely influenced the recovery of the area.
There was no evidence of blister rust seen in any of the young whitebark pine. However, about 15% of the mature stand did have blister rust. Several blister rust killed, ghost snags were scattered in among the live trees. No active cankers were seen in any of the live trees and the inactive cankers found were predominantly branch cankers. There were several mature trees that appeared to be blister rust free and were producing cones. Cone production was good, with cone numbers ranging from 10 to 50 per tree.

Bowden and his crew in 2014 found slightly different conditions along the ridge line, and in the Barney Mountain fire area. The majority of dead whitebark pine encountered had been killed by fire or weakened by fire stress. Mountain pine beetles had established in the stand causing additional mortality in the weakened trees between 2012 and 2014. Bowden also found 70% of the stand was infected by blister rust. Loss of the mature cone producing trees from mountain pine beetle is far more critical to whitebark pine survival than is the presence of blister rust because mountain pine beetle does not differentiate between those trees that are blister rust resistant or infected. Blister rust also kills a tree slowly while mountain pine beetle mortality is often immediate and extensive in a stand. This is a major concern for the persistence of the stand. They also found this ridgeline to be extremely rocky, and harbors some of the largest specimens of whitebark pine on the District. Blister rust was common. Many dead giant whitebark were found along this ridgeline and many others appeared weakened. Recruitment of young trees does seem to be occurring, but there is a distinct lack of middle-aged trees (Bowden 2014).

From the middle ridgeline of the Barney Mountain fire, surveyors were able to look east with binoculars at the east slope of the east fork of Falls Creek proceeding up towards Barney Mountain and Obstruction Peak. Large stands of whitebark were noted along the entire hillside, from approximately mid-slope to the top of the ridgeline. A particularly large and seemingly pure stand was noted just southwest of the peak of Barney Mountain. Bowden and crew surveyed further to the northwest of the Barney Fire.
toward the headwaters of the West Fork Falls Creek and encountered robust and nearly pure populations of whitebark pine growing along the eastern slopes of the ridge, above 6500 ft (see maps in Appendix A).

The Barney Fire burn severity was mapped as unburned and low to moderate severity when Bowden and crew surveyed the site. Bowden (2014) reported the Barney Fire area did reburn a month after the survey when an additional 8,000 acres burned in Falls Creek. Reburn fire severity was mapped as low, but has not been confirmed on the ground.

The 2018 surveyed encountered the first cone crop seen in our area in nearly six years and nearly all whitebark of cone bearing age supported a cone crop. It appears 2018 was a mast cone production year region wide in whitebark, based on what the authors and others have seen. Two or three Clark’s nutcrackers were heard in the stand, hopefully, indicating resident Clark’s nutcrackers in the area. The abundance and wide range of size classes of whitebark regeneration indicates Clark’s nutcrackers favor this area for caching. There was no mountain pine beetle activity detected in this small portion of the stand we surveyed. Due to low whitebark pine cone production over the last six years, it will be important to revisit the area in three to five years when 2018’s cached seed has had a chance to germinate.

August 2019 Visit of Falls Creek:
The intent of the 2019 visit was to gain Connie Mehmel’s (retired Oka-Wen N.F. Entomologist), professional view about verbenone treatments for the whitebark pine stand towards the West Fork of Falls Creek at to the SW of Mt. Barney. As mentioned above, these stands were noted by Bowden to be one the most robust and pure stands observed on the Methow Valley Ranger District, and evidence of mountain pine beetle had not been detected. Binocular surveys in 2019 were conducted to evaluate health of the stands. Treatments for these stands would be important as they are surrounded by areas with trees that have shown evidence of infestation. Evidence of mountain pine beetle was present. Needles on infested trees have begun fading and changing color. Fading can occur several months to one year after the trees have been attacked. Therefore, it is highly likely that there was no apparent beetle infestation during the 2018 surveys. In 2019, there was no fading observed on the SW side of Barney Mountain proper.

Clark’s Nutcracker:
Whitebark pine is dependent on the Clark’s nutcracker for seed dispersal. Lorenz et al (2011) found these birds have a strong fidelity for relatively small core areas or home ranges (mean home range is 13.3 km² with a range between 1.4 to 52.1 km²). They spend all their time within this home range except during autumn and winter foraging. Seed caching is highest within these home ranges (97%) and only 15% of the seed is actually cached below ground in suitable habitats where whitebark pine can germinate. There is preference (93%) to cache below ground within 9 m of tree cover. Lorenz also found 43% of seed harvested was outside a bird’s home range and the birds foraged for seed between 12 and 32 km away from their summer home range (Lorenz et al. 2011; Lorenz 2011).

The best home range habitat for the Clark’s nutcracker are the mature unburned whitebark pine stands along the ridgeline between the West and East Fork Falls Creeks, where the Barney Mountain Fire is
located, and the ridgeline between Obstruction Peak and Barney Mountain. If resident Clark’s nutcrackers are in the area, seed caching is likely within their home territory (13.3 km radius), which includes this area, Eightmile Ridge and beyond. The importance of this island of intact whitebark pine, surrounded by thousands of acres of recently burned terrain, cannot be underestimated for its importance in the future survival of the species. Maintaining suitable Clark’s nutcracker home range habitat is key.

![Picture 16 & 17 (top and bottom) Whitebark pine fading occurring along ridge in/near the west fork of Falls Creek.](image)
Picture 20: Ridge line between Obstruction Peak and Barney Mountain with mature stands of whitebark pine. Whitebark “ghost” snag in the foreground.

Picture 21: Whitebark pine stand below Barney Fire. Rocks and low fuel loads prevented fire from burning this portion of the stand.
**Conclusion and Future Needs:**
These stands are critical if any natural regeneration of the species is to occur. The fact that mountain pine beetle are becoming established in the whitebark, means loss of these mature trees may be eminent. Verbenone use to deter mountain pine beetle from mature, blister rust free, trees should be considered and action taken quickly. It is important not to delay in initiating active restoration, seed collection and genetic testing. The stands are outside the wilderness boundary; a rarity to find such stands outside wilderness. The authors and now retired Forest Entomologist, feel all measures should be explored to restore and maintain the health of these populations, even if air support is necessary to achieve the work. Approximately 300 acres of whitebark pine could be treated in the Falls Creek drainage (see Figure 3 in **Appendix A**). Given the marginal habitat for whitebark pine along Eightmile Ridge, no restoration efforts are recommended. An Environmental Assessment (EA) is needed for the aerial application of verbenone. Currently, there is not a Regional programmatic document available that would allow for aerial application. The Methow is interested in pursuing a Forest-wide project that would include verbenone treatments in targeted areas over multiple districts on the OkanoganWenatchee NF. It is important to note that a limiting factor for restoration work will be the capacity at district levels.

At the time of the Barney Fire, many whitebark pines had been cut down in order to clear helispots, hand-line, and drop points. This established helispot in the area may be usable to deliver crews and seedlings for restoration planting. The close proximity of the area to the North Cascades Smoke Jumper Base provides for an economical resource to assist with this work.

The 2018 McCloud Fire burned 23,000 acres of mostly high elevation habitat and spread into the Eightmile drainage burning into the 2017 Diamond Creek fire that burned the upper headwaters of
Eightmile Creek. The combining of these two fires significantly increased the expansive extent of this recently fire charred landscape. Due to the combined severity and extent of the 2003 Farewell Fire, 2014 Falls Creek Fire, the 2017 Diamond Creek Fire, and the 2018 McCloud, there is likely very little mature, unburned habitat remaining for Clark’s nutcrackers to maintain home ranges. Falls Creek headwaters and Obstruction Peak to Barney Mountain are now one of the few intact, mature whitebark pine strongholds. Those mature trees, free of blister rust, are valuable targets for genetic blister rust resistance testing and critical for the long-term sustainability of the species.

Whitebark pine is dependent on the Clark’s nutcracker for seed dispersal and regeneration, but the Clark’s nutcracker is more opportunistic in selection of its home range territory. As whitebark pine declines, nutcrackers are more likely to establish home ranges at lower elevations in ponderosa pine \((Pinus ponderosa)\) and Douglas-fir stands. This will result in more whitebark pine seed being transported into inappropriate low to mid elevation home ranges (Lorenz 2011). Another reason it is critical to actively manage intact whitebark stands for suitable habitat for nutcracker home ranges. Because of the remote nature of this area and the access difficulty, there is no reason to believe recreation activities or trespass cattle would pose a problem with restoration efforts.
Appendix A: Maps

Figure 1: Fire history map in the Falls Creek drainage vicinity.
Figure 2: Fire history map in the Falls Creek drainage vicinity. Pink highlighted polygons represent approximate areas of unburned whitebark pine.

Figure 3: Potential treatment of whitebark pine by aerially applied verebone.
REFERENCES:


