

October 26, 2011

Re: Harney Peak Limber Pine, 2011; RCSC-01-12

To: Forest Supervisor Black Hills

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On August 31, 2011 Cheryl Mayer (Black Hills National Forest Botany Technician), Keith Burden, and I examined limber pine (*Pinus flexilis* James) on and near Harney Peak in the Black Hills National Forest of South Dakota. The objectives were to do a quick assessment of the limber pine condition; check seed-cone numbers and maturity; and record tree, sapling, and seedling locations. Cheryl Mayer visited two additional limber pine on October 14, 2011.

Limber pine were assessed as trees if they were ≥ 4 inches diameter (DBH), as saplings if they were < 4 inches DBH, and as seedlings if they were < 4.5 ft tall; and were categorized as live, recent dead tree (less than 5 years dead), or old dead tree (more than 5 years dead). For all limber pine global position locations (GPS) were recorded. For trees and saplings data recorded included: DBH, number of white pine blister rust (WPBR) (*Cronartium ribicola*) cankers, presence of major wounding, and if cones were collected. Photographs were taken of most trees and saplings. For trees additional data recorded included: presence of mountain pine beetle (MPB) (*Dendroctonus ponderosae*) and *Ips* spp., and approximate number of years dead.

Results:

Three live trees, 5 recent dead trees, 3 old dead trees, and 7 saplings were examined and locations recorded (**Tables 1** and **2**). Nine live seedling locations were recorded (**Table 3**).



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All of the recent dead trees had MPB. Judging by the appearance of their crowns, those trees (**Fig. 1** and **Table 1**) were attacked by MPB between 2007 and 2009. *Ips* sp. may have contributed to the mortality of one tree. The saplings are likely too small to be targeted by MPB. MPB is killing and has killed many ponderosa pine in the area.

WPBR symptoms were observed in the area along with a few potentially infected branches with unclear symptoms (**Tables 1** and **2**). It is estimated that WPBR has been in the area for at least 8 years. A canker that killed the top of a tree is potentially older (**Table 1, live tree 1**). WPBR infected *Ribes* sp. plants were identified in the area.

Although there are probably more, the nine live seedlings found in the area represent a small amount of limber pine regeneration. The limited amount of limber pine regeneration in the Harney Peak area is likely due to lack of soil (*i.e.*, trees are growing in rock cracks), along with competing vegetation surrounding the area where the limber pine occur. However, limber pine normally does not regenerate well in the absence of fire. Natural fires burn off competing vegetation. Therefore, fire suppression activities can limit limber pine regeneration. Birds, including Clark's nutcracker (*Nucifraga columbiana*), and to a lesser degree gray jays (*Perisoreus canadensis*), and squirrels promote regeneration by planting (caching) seeds. They never eat all the seeds they cache, and therefore end up planting new trees. Gray jays and squirrels are common in the area. Clark's nutcracker is less common, but does occur in the area and was observed during this survey.

The map (**Fig. 3**) shows the approximate locations of individual limber pine surveyed on or near Harney Peak. One of the live and one of the recent dead trees (**Fig. 1, left**) fell over years ago, and branches grew up from the horizontal trunks.

Three of the seven saplings had 2-year-old cones (**Table 2**) that were collected in 2011. These cones likely would have opened in less than three weeks. A bulk collection of 78 cones was made from three limber pine saplings. The cones were sent to the seed bank at Bessey Nursery, operated by the USDA-Forest Service, Rocky Mountain Region in Halsey, Nebraska. Richard Gilbert, Bessey Nursery Manager, said the collection information (USDA-Forest Service Form R2-2470-25) looked good but that cones may have a low "good" seed count. Seeds will be extracted and stored there. The Black Hills National Forest was recorded as the cones' owner.

The three saplings from which cones were collected span about 15 ft and are about the same age (**Fig. 2, Table 2**). The elevation midpoint for the collection is 6,981 feet, and the geographic location midpoint for the collection is latitude 43.867455 and longitude -103.533786 (WGS 1984).

Recommendations:

- Ips and MPB: The limber pine engraver, *Ips woodi*, is likely to occur in the area. It will attack stressed saplings larger than 2 inches DBH and the tops and branches of larger trees in poor health. It is highly unlikely MPB will attack saplings that are less than 3 inches DBH. By the time the saplings are large enough to be attractive to MPB in 20 to 40 years, the current MPB epidemic in the area will have ended. The few existing seedlings and any that are planted would not be large enough to be susceptible to MPB for about 50 to 75 years.

Actions that reduce tree stress lower the probability of attack from tree-killing bark beetles. Regular monitoring of the limber pine is recommended. Appropriate preventive treatments should be considered for the limber pine such as protective carbaryl spray. Additional management options for MPB are included in our recent Forest Health Protection (2010) field guide¹.

- WPBR: Limber pine trees and saplings and *Ribes* sp. plants were identified with WPBR in the Harney Peak area. WPBR-infected limber pine and *Ribes* spp. are also known to occur in the Cathedral Spires area of nearby Custer State Park. Since the Harney Peak site is open, which promotes branch drying that lowers the potential for infection, pruning any current and future branch cankers is a good option to reduce WPBR caused mortality. Given the terrain, *Ribes* spp. eradication would be difficult, but that is another option that has been shown to work in the Lake States. Detailed management options for WPBR are included in a recent management guide (Burns, et al. 2008²).

¹ Rocky Mountain Region, Forest Health Protection. 2010. Field guide to diseases and insects of the Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-241. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. < https://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5262952.pdf >

² Burns, K.S., Schoettle, A.W., Jacobi W.R., and Mahalovich, M.F. 2008. Options for the Management of White Pine Blister Rust in the Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-206. Fort Collins, CO: USDA Forest Service, RMRS. < http://www.fs.fed.us/rm/pubs/rmrs_gtr206.pdf >

WPBR resistant growing stock would be the best long term option regarding WPBR disease management. It would be prudent to determine if any of the saplings show resistance to WPBR using locally collected seed. Given the small population, testing for WPBR resistance will determine if resistance is evident in this isolated population. Anna Schoettle (USDA Forest Service, Rocky Mountain Research Station) expressed an interest in including this population in her white pine blister rust resistance screening studies and would appreciate receiving some limber pine seeds from this area.

- **Planting:** The small population in the area could be increased by planting. The saplings and trees are/were growing in rock. Seedlings could be planted in rock cracks, but survival rates would likely be low. Given the limited limber pine seed from this area, a better option would be to plant small seedlings in the nearby soil just off the rocks that is relatively free of competing vegetation. In some areas, site preparation that removes competing ground vegetation might be needed to improve success. A controlled burn would help prepare the area. With the high ponderosa pine MPB mortality in this area these sites are already clear of trees. Richard Gilbert, Bessey Nursery Manager, would need to be contacted regarding the collected seed and producing limber pine nursery stock. Jim Thinnes, Regional Silviculturist, has offered to help if additional information is needed regarding planting.

- **Seed conservation:** It would be good to try to collect seed every year. Limber pine seed does not remain viable for as long as other pine species in storage, but it can be stored for about 5 – 15 years effectively. However, at Bessey Nursery there have been seed lots as old as 51 years (collected in 1960) that still show good viability. If seeds are collected each year there would not be a problem when a year with poor or no cone production occurs, since a viable seed store would be maintained.

Live trees:



Recent dead trees:



Old dead trees:



No photograph
for old dead
tree #2.

Fig 1. Limber pine trees on or near Harney Peak.

Table 1. Tree health with damage agents, diameter (DBH), and location of limber pine trees on or near Harney Peak, based on order presented (left to right) in **Fig. 1**.

Tree	Tree health	Years dead	MPB present	Number of WPBR cankers	DBH (inches)	Longitude (WGS 1984)	Latitude (WGS 1984)
1	live	-	no	3	6	-103.521833	43.874794
2 ^a	live	-	no	0	10	-103.534799	43.866820
3	live	-	no	0	13	-103.525350	43.865516
1 ^b	recent dead	4 ^c	yes	0	11	-103.533756	43.867360
2	recent dead	4 ^c	yes	0	10	-103.534743	43.866298
3	recent dead	3	yes	10+	12	-103.521759	43.875569
4	recent dead	3	yes	7	8	-103.521578	43.875676
5	recent dead	2	yes	4+	13	-103.534453	43.866549
1	old dead	15+	-	-	14	-103.521386	43.874717
2	old dead	20+	-	-	13	-103.533146	43.866210
3 ^d	old dead	10+	-	-	-	-103.533955	43.867688

^a Tree has extensive porcupine damage including top kill caused by porcupine.

^b *lps* sp. present.

^c The photograph in **Fig. 1** was taken in 2009.

^d Major wound to 50% of the stem.



Fig 2. Limber pine saplings on or near Harney Peak.

Table 2. Diameter (DBH), years cones were collected, number of observed cankers, and location of live limber pine saplings on or near Harney Peak, based on order presented (left to right) in **Fig. 2**.

Sapling	DBH (inches)	Cones collected	WPBR cankers found	Longitude^a (WGS 1984)	Latitude^a (WGS 1984)
1	1	-	2 ^a	-103.533220	43.867360
2	2	2009/11	3	-103.533814	43.867438
3	2	2009/11	0	-103.533786	43.867455
4	3	2011	0	-103.533757	43.867428
5	1	2009	0	-103.533722	43.867427
6	3	-	2	-103.521638	43.875599
7	0.5	-	0	-103.521581	43.875674

^a The cankers noted for sapling #1 were about 2-year old, therefore symptoms were not clear.

Table 3. Location of live limber pine seedlings on or near Harney Peak.

Seedling	Longitude^a (WGS 1984)	Latitude^a (WGS 1984)
1	-103.533193	43.866614
2	-103.533520	43.867194
3	-103.534866	43.866844
4	-103.534712	43.866586
5	-103.533994	43.867582
6	-103.533726	43.867476
7	-103.533740	43.867467
8	-103.533738	43.867468
9	-103.525232	43.865244

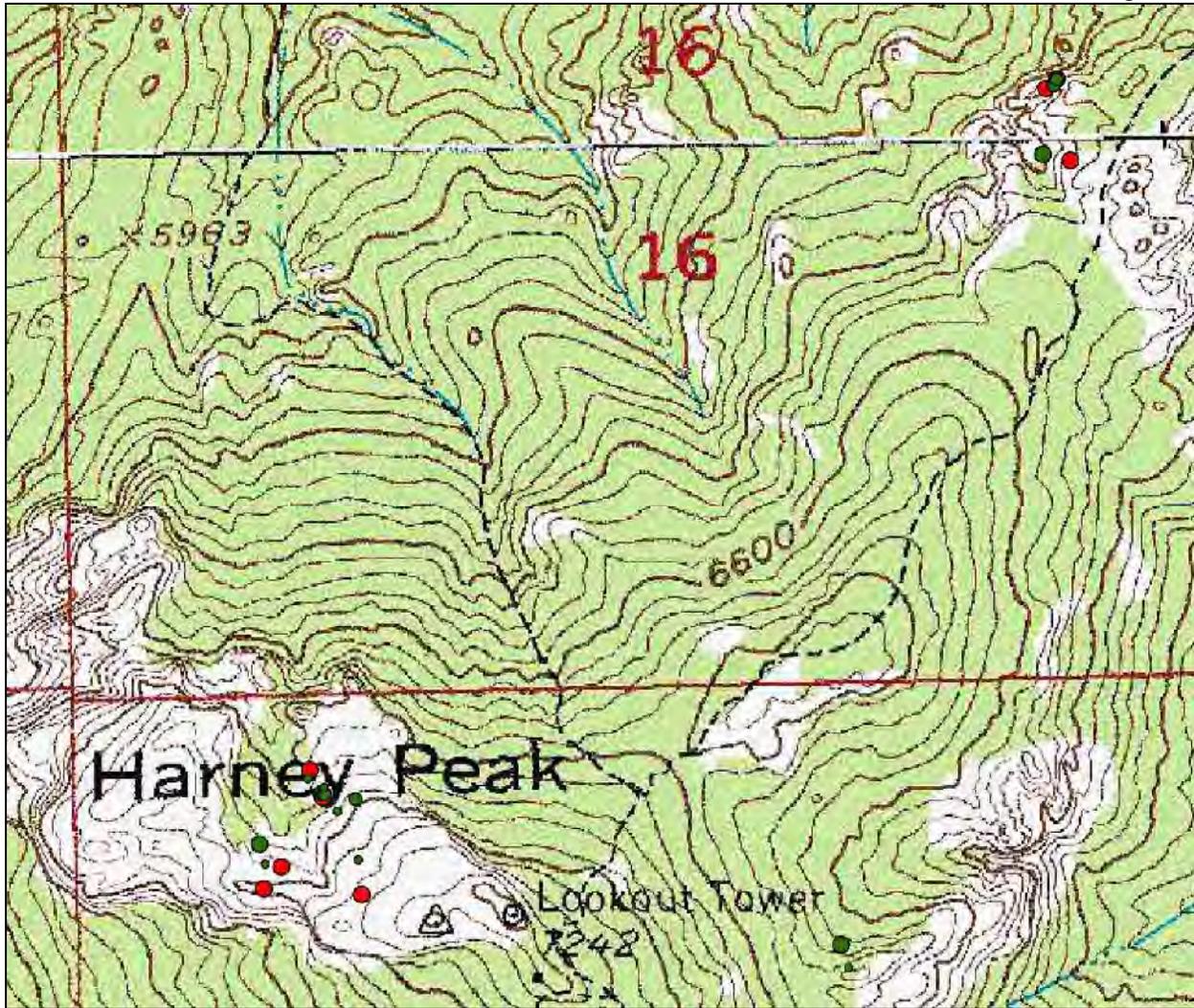


Fig. 3. Approximate location of limber pine. Green circles represent locations of live limber pine with the larger green circles representing trees, mid-size representing saplings, and small circles representing seedlings. Red circles represent locations dead limber pine.