

October 8, 2009

Re: Harney Peak and Custer State Park Limber Pine, 2009; RCSC-01-10

To: Forest Supervisor Black Hills

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On September 2, 2009 I examined limber pine (*Pinus flexilis* James) trees near Harney Peak in the Black Hills National Forest of South Dakota and did a quick check of limber pine in the Cathedral Spires of Custer State Park, South Dakota. The objectives were to do a quick assessment of the limber pine condition, to check seed-cone numbers and maturity, and to record tree and sapling locations.

Harney Peak trees, saplings, and seedlings

On Harney Peak, two trees, five saplings, and three seedlings were examined. The two trees and four of the five saplings were reported by Dr. Eric C. Grimm, Curator and Chair of Botany, Illinois State Museum (E-mail communication). However, only one global position location (GPS) was recorded. Approximately 30 acres were examined from northwest to west of the Harney Peak Tower. Only one sapling not reported by Dr. Grimm was found.

The 2 trees were killed by (MPB) (*Dendroctonus ponderosae*). Judging by the appearance of their crowns, the trees (**Fig. 1** and **Table 1**) were attacked by mountain pine beetle MPB in 2008 and died in 2009. There also was an *Ips* sp. in one tree that may have contributed to mortality. Some suspicious-looking branch swellings were observed, but white pine



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blister rust (WPBR) (*Cronartium ribicola*) could not be confirmed. MPB is killing and has killed many ponderosa pine in the area.

The five saplings (**Fig. 2** and **Table 2**) and three seedlings all appeared healthy. No evidence of WPBR was observed, and the trees are likely too small to be targeted by MPB. Although no WPBR was confirmed on the few limber pines in the area, there is no evidence that these trees are resistant to WPBR.

There is poor natural limber pine regeneration in the area. The limited amount of limber pine regeneration in the Harney Peak area is likely due to lack of soil in the area (*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 tree species from time to time. Therefore, fire suppression activities 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.

The maps (**Fig. 3**) show the locations of individual trees and saplings on Harney Peak and the general area in the Cathedral Spires. One of the trees (**Fig. 1, left**) fell over years ago, and branches grew up from the horizontal trunk. This tree is very close to four of the saplings and two of the seedlings. The other mature limber pine (**Fig. 1, center**) is west of Harney Peak had a small seedling growing near the tree. The sapling not previously reported by Dr. Grimm is the farthest east in Figure 3, and is several meters east of the other saplings. Although GPS locations were not recorded for individual seedlings, all seedlings are within 40 m of the other limber pine.

Harney Peak cones

Three of the five saplings had 2-year-old cones (**Table 2**). Since all but three cones likely would have opened in less than three weeks, and given the death of the two mature trees, I decided to collect all ripe 2-year cones from the saplings on Harney Peak.

A bulk collection of 33 cones was made from three limber pine saplings (**Table 2**). 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, nursery manager, said the cones and the collection information (USDA–Forest Service Form R2-2470-25) I sent were received and the cones look good. Seeds will be extracted and stored there. The Black Hills National Forest was recorded as the cone's owner.

The three saplings from which cones were collected span about 15 ft and are about the same age (**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).

Two of the five saplings had numerous 1-year-old cones (**Table 2**). Cone collection next year would be possible.

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 seedling 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. Should any beetle-caused mortality be detected in the area among any pines, 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 Management, Rocky Mountain Region Disease & Insect Training Manual¹.

- WPBR: There is no WPBR on the saplings or seedlings currently, but WPBR-infected limber pine and *Ribes* spp. are 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 future branch cankers would be the best option for WPBR if the limber pine become infected. Given the terrain, *Ribes* spp. eradication might 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).

WPBR resistant growing stock would be the best long term option regarding WPBR disease management. It would be prudent to determine if 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: With no WPBR in the immediate vicinity and with no trees susceptible to MPB, my recommendation is to increase the number of limber pine in the area by planting. The saplings and dead trees are/were growing in rock. Seedlings would need to be planted in rock cracks. However, if the area a few yards to the north is cleared, seedlings could be planted in soil. A controlled burn would help prepare the area a few yards north of the limber pine, and might promote natural regeneration. Richard Gilbert would need to know soon if you want him to sow seed this spring at the Bessey Nursery. I would suggest planting at least 40 seedlings as 2-0's or 3-0's.

¹ < <http://www.fs.fed.us/r2/fhm/bugcrud/manual/mpb.pdf> > and < http://www.fs.fed.us/r2/fhm/bugcrud/manual/limber_pine_engraver.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 >

- 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 the Bessey Nursery there have been seed lots as old as 49 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. Numerous 1-year-old cones were observed on 2 of the saplings in September 2009.

Cathedral Spires

I examined 80+ limber pine in the Cathedral Spires area of Custer State Park. A limber pine cone count was conducted, but no cones were collected. One hundred and fifty one cones were observed on 16 trees or an average of 9.4 cones per tree. Nine cones on 2 trees already started to open, and most of the cones will open within 3 weeks. Coe Foss and John Ball were informed. I think this information was already known, and John Ball and others collected cones from the limber pine in this area the following week.

About 5 limber pine were killed by MPB between 2006 and 2008 judging by the crowns, but most are doing well. WPBR is in the area. Branch mortality and some top mortality caused by WPBR is common on a few of the trees, but no WPBR caused tree mortality was observed.



Fig 1. Recently killed limber pine trees on Harney Peak (left and middle), and evidence of both mountain pine beetle and Ips (right) in the tree shown at left.

Table 1. Diameter (DBH), number of 2-year old cones, presence of 1-year old cones, and location of recently killed limber pine trees on Harney Peak, described by position in **Fig. 1**.

Tree	DBH (inches)	Number of cones (2-year old)	Presence of cones (1-year old)	Longitude ^a	Latitude ^a
Left	11	0	Yes, but dead	-103.533758	43.867395
Middle	10	0	Yes, but dead	-103.534743	43.866334

^a Latitude/Longitude, WGS 1984.



Fig 2. Limber pine saplings on Harney Peak.

Table 2. Diameter (DBH), number of 2-year old cones, presence of 1-year old cones, and location of limber pine saplings on Harney Peak, based on order presented (left to right) in **Fig. 2.**

Tree	DBH (inches)	Number of cones (2-year old)	Presence of cones (1-year old)	Longitude ^a	Latitude ^a
1	1	0	No	-103.533220	43.867360
2	2	15	Yes	-103.533814	43.867438
3	2	19	No	-103.533786	43.867455
4	3	0	Yes	-103.533757	43.867428
5	1	2	No	-103.533722	43.867427

^a Latitude/Longitude, WGS 1984.

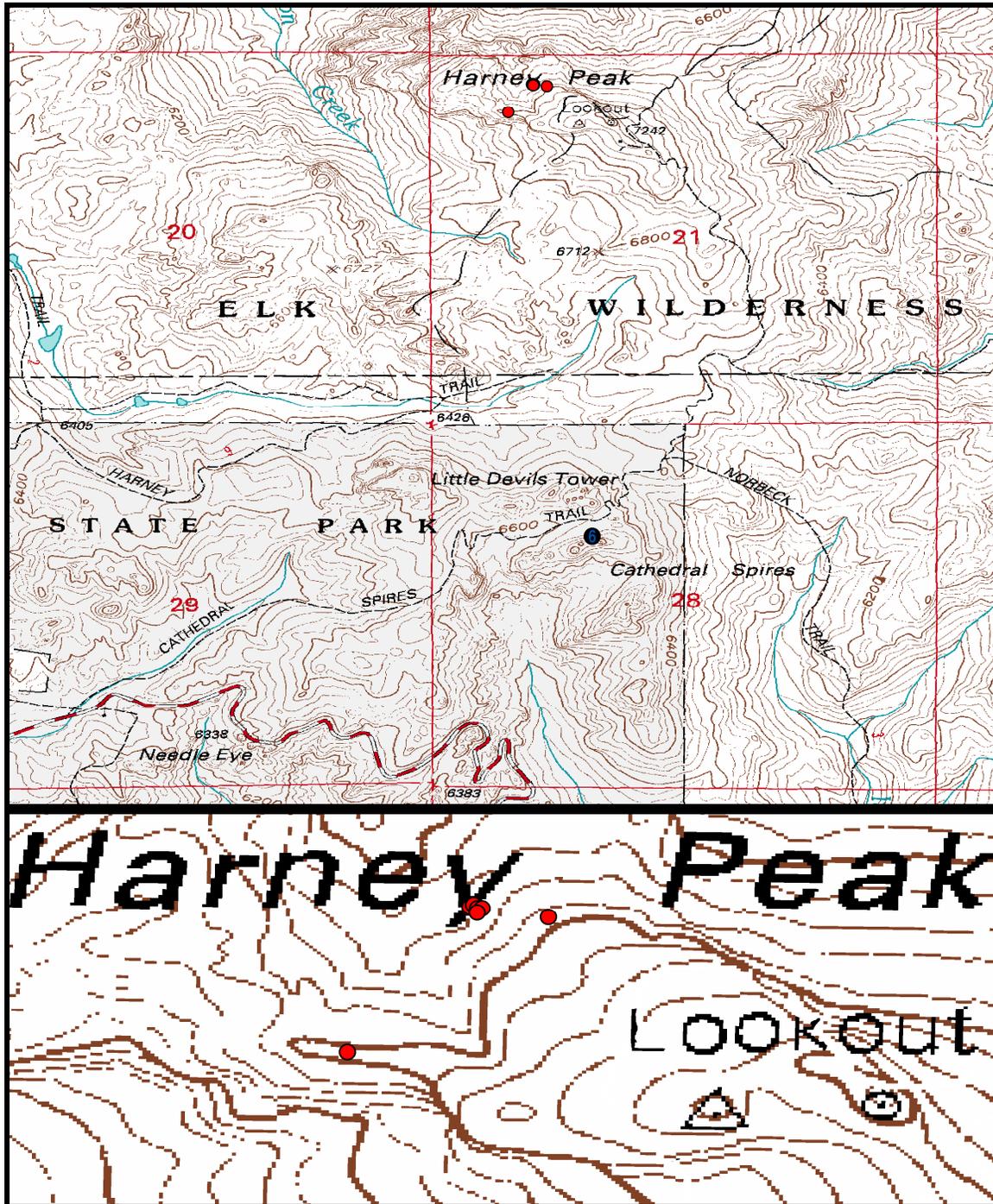


Fig. 3. Harney Peak and Custer State Park limber pine observation and cone collection areas (upper). Close up of the Harney Peak area (lower). Black circle with blue 6 represent a study plot surveyed in 2006 in the Custer State Park limber pine area (upper). Red circles represent trees and saplings on Harney Peak (upper and lower).