

Report RCSC-20-01

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Limber Pine Planting in the Black Hills National Forest (2019 Update)

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As part of the *Limber Pine Restoration Project*, a new limber pine (*Pinus flexilis*) population was established in 2017 in the Norbeck Wildlife Preserve, Black Hills National Forest¹. The Norbeck Wildlife Preserve planting site was selected due to its close proximity to the original limber pine population². In South Dakota, limber pine (a Black Hills National Forest species of local concern) is in isolated areas scattered over a small geographic area of about 2 square miles in the Black Elk Wilderness of the Black Hills National Forest and adjacent Custer State Park. Recently many of these pines were killed by mountain pine beetle (*Dendroctonus ponderosae*, MPB) and white pine blister rust (*Cronartium ribicola*), an exotic, invasive disease of 5-needle pines. Container grown two-year-old limber pine seedlings, using seed collected from the Black Elk Wilderness, were planted in 2017 and in 2018 at 7 areas just off Trail #2 in the preserve (**Figure 1**).

Areas 1 to 6 (**Figure 2-left**) are ponderosa pine (*Pinus ponderosa*) areas that experienced extensive mortality from MPB. These areas have relatively deep soil and a northerly aspect. Vexar tubes (*i.e.*, animal protectors) were staked around all seedlings to protect them from herbivory. Area 7 is a thin-soiled, rocky, ridge top where Vexar tubes could not be installed. This area is typical of the sites where limber pine naturally occurs on the forest. The area supports few trees and many of the small ponderosa pines in this area have died or have yellow needles (**Figure 2-right**). Ponderosa pine mortality in this area was not caused by MPB.

On June 10, 2019, Cheryl Mayer (Black Hills National Forest Botany Technician) and Jim Blodgett (Plant Pathologist) evaluated seedling survival and assessed mortality/damage agents. Seedlings selected for monitoring (128 seedlings) are a representative sample of the 276 limber pine planted in the preserve.

All 56 seedlings planted in 2017 were examined and 95% survived (**Table 1**). Mortality was caused by root disease (2 seedlings) and rodent chewing at the base of a seedling (1 seedling) (**Figure 3**). The root disease was a "damping-off" disease likely caused by a *Fusarium* species. Symptoms included dead roots with a water soaked appearance and an "earthy" smell. One seedling was heavily browsed in 2018, but it was still alive in 2019 with new growth.

For seedlings planted in 2018 (based on 72 monitored seedlings), 86% survived (**Table 1**). However, seedlings planted at the ponderosa pine areas had no mortality and seedlings planted on the rocky ridge top (area 7) had 58% mortality. Mortality was caused by root diseases (6 seedlings) and rodent chewing at the base of a seedling (1 seedling), and 3 seedlings were missing. The missing seedlings were presumably

¹ Blodgett, J. T. 2018. Limber Pine Planting in the Black Hills National Forest. USDA For. Serv., Rocky Mountain Region, For. Health Mgt., Rpt. RCSC-18-10.

² Blodgett, J. T. 2018. Black Elk Limber Pine: 2015 to 2018. USDA For. Serv., Rocky Mountain Region, For. Health Mgt., Rpt. RCSC-18-11.



consumed by animals (mountain goat, deer, etc.). The root diseases were likely caused by *Fusarium* species (5 seedlings; with dead roots and water soaked appearance, and an "earthy" smell) and a *Leptographium* species (1 seedling; with dead black-stained roots) (Figure 3).

Summary/Conclusion:

- Seedling survival was better than expected; even on the rocky ridge top at area 7. This might be due to the higher than average precipitation in 2018/2019, compared to average precipitation for the area.
- Most of the seedlings are growing well.
- Vexar tubes appear to be protecting seedlings, and the lack of the tubes might explain the missing seedlings at area 7.
- Results suggest limber pine grows better on "good" sites (*i.e.*, ponderosa pine sites) with deep soil and no competition, verses harsh sites. Limber pine are often found in rocky and/or thin-soil sites. This is likely the result of reduced tree competition.
- We will be planting additional limber pine in this area in the spring of 2021.

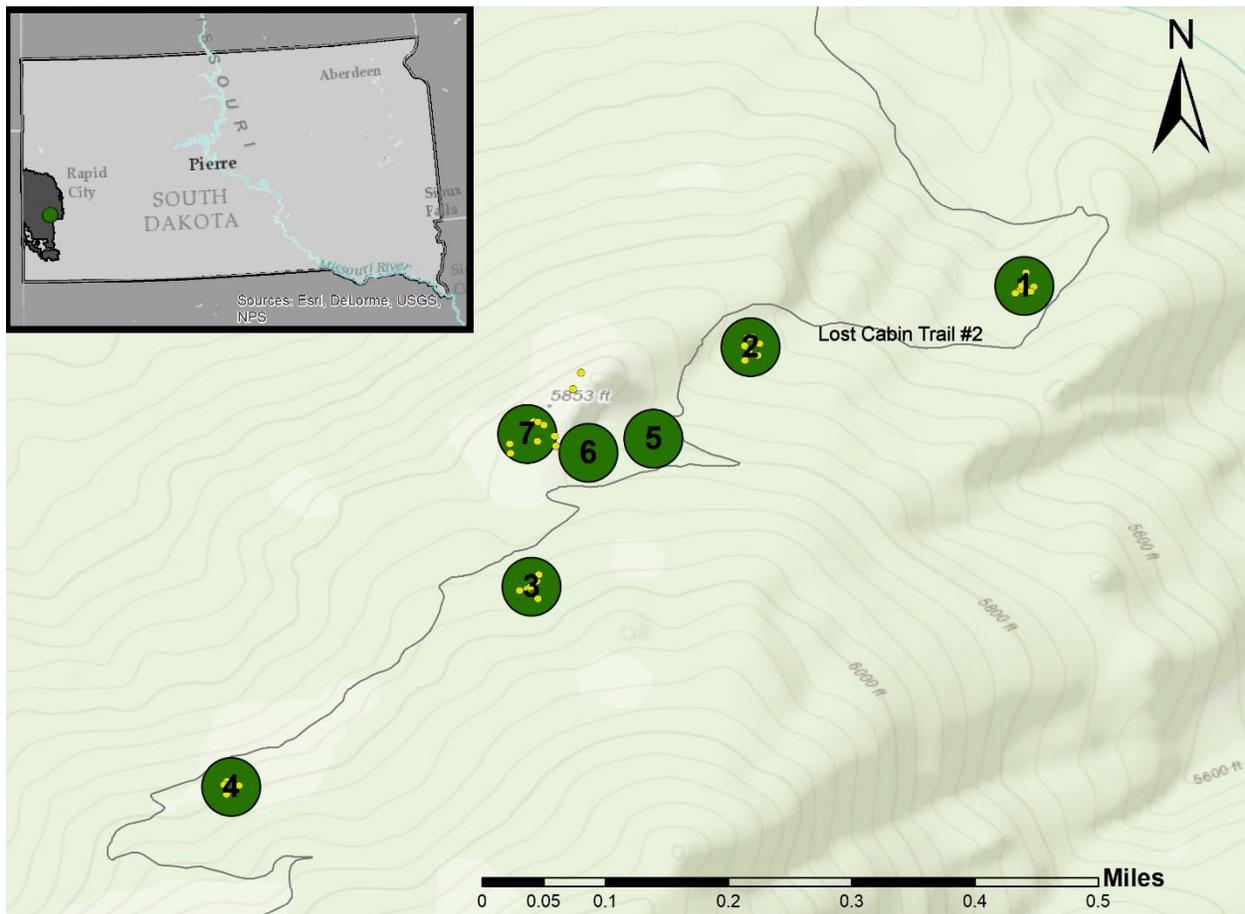


Figure 1. Limber pine planting site in the Norbeck Wildlife Preserve, Black Hills National Forest. Seedlings were planted at areas 1 to 4 in 2017; and at all areas in 2018 (green circles). Seedlings are being monitored at locations 1 to 4 and 7 (yellow dots represent groups of monitored trees).



Figure 2. Example of planted limber pines at a ponderosa pine site with high mountain pine beetle mortality (**left**) and example of planted limber pine at the rocky site (area 7) with few ponderosa pine (**right**), in the Black Hills National Forest. Note the dead limber pine seedling (middle of image, in black circle); dead and yellow ponderosa pines in the background (right photograph).

Table 1. Percentage of live limber pine in 2019 by year and site planted at the Norbeck Wildlife Preserve planting site in the Black Hills National Forest.

| Year / site planted | Number ^a | % alive |
|---------------------|---------------------|---------|
| 2017 / all sites | 56 | 95 |
| 2018 / all sites | 72 | 86 |
| 2018 / sites 1 to 4 | 48 | 100 |
| 2018 / site 7 | 24 | 58 |

^a Number of seedlings selected for long-term monitoring.



Figure 3. Example of limber pine seedling with a root disease likely caused by a *Fusarium* species (dead roots with a water soaked appearance and "earthy" smell, **left**); a root disease likely caused by a *Leptographium* species (dead black-stained roots, **middle**); and rodent chewing at the base of a seedling (**right**).