

Forested Vegetation - Ponderosa Pine

Ponderosa pine (*Pinus ponderosa*) has a limited range in the Bighorn Mountains where it occurs in the lowest elevations of the conifer forest and covers approximately 124,000 acres in the Ecological Section and 31,000 acres on the Bighorn National Forest. Ponderosa pine stands are common on coarse textured soils along the eastern flank of the Bighorns between 1,520 and 1,830 meters, with occasional stands at 2,340 meters. The ponderosa pine forest ends abruptly in grasslands on the lower eastern slopes (Despain 1973). There is a narrow belt of open-grown climax ponderosa pine stands in the southwestern portion of the Bighorns. Along the west slopes, ponderosa pine stands are generally seral to Douglas-fir (Hoffman and Alexander 1976).

COMPOSITION

Hoffman and Alexander (1976) described five ponderosa pine habitat types, which are summarized below.

Habitat Type	Description	Important Associated Species
P. ponderosa/ <i>Agropyron spicatum</i> Ponderosa pine/ bluebunch wheatgrass	Driest and warmest of the ponderosa series, below the eastern NF boundary on south aspects. Tree reproduction is been sporadic, resulting in open patches of even-aged trees.	<i>Agropyron spicatum</i> , <i>Aristida longiseta</i> , <i>Carex filifolia</i> , <i>Koeleria cristata</i> , <i>Stipa comata</i> , <i>Artemisia frigida</i> , <i>Prunus virginiana</i> , <i>Viola nuttallii</i> 4 <i>Antennaria parvifl'ora</i> , <i>Balsamorhiza sagittata</i> and <i>Astragalus 'succulentus</i> .
<i>P. ponderosa/</i> <i>Festuca idahoensis</i> Ponderosa pine/ Idaho fescue	Tree reproduction is more consistent over time than in the drier bluebunch wheatgrass habitat type, but it also follows episodic cycles. Increased fire protection has encouraged both graminoids and forbs that compete more effectively than tree seedlings for limited soil moisture.	<i>Festuca idahoensis</i> , <i>Carex filifolia</i> , <i>Agropyron spicatum</i> , <i>Bromus tectorum</i> , <i>Hesperochloa kingi</i> 4 <i>Koeleria cristata</i> , <i>Rhus trilobata</i> , <i>Prunus virginiana</i> , <i>Artemisia frigida</i> , <i>Rosa acicularis</i> , <i>Symphoricarpos albus</i> , <i>Balsamorhiza sagittata</i> , <i>Cerastium arvense</i> , <i>Cystopteris fragilis</i> , <i>Achillea millefolium</i> , <i>Anemone patens</i> , <i>Antennaria rosea</i> , and <i>Astragalus succulentus</i> .

<p><i>P. ponderosa/</i> <i>Spiraea betulifolia</i></p> <p><i>Ponderosa pine/spirea</i></p>	<p>The understory vegetation is a mixture of grasses, perennial forbs, and low shrubs. The mesophytic habitat results in a more closed overstory structure and tree reproduction is more abundant than in the previous habitat types.</p>	<p><i>Spiraea betulifolia,</i> <i>Symphoricarpos albus,</i> <i>Festuca idahoensis,</i> <i>Hesperochloa kingii,</i> <i>Poa palustris,</i> <i>Clematis tenuiloba,</i> <i>Galiurn boreale,</i> <i>Balsamorhiza sagittata,</i> <i>Lomatium dissecturn,</i> <i>Lupinus argenteus,</i> and <i>Smilacina racemosa.</i></p>
<p><i>P. ponderosa/</i> <i>Physocarpus monogynus</i></p> <p><i>Ponderosa pine/</i> mountain ninebark</p>	<p>Confined to the east slope of the Bighorn mountains on northerly aspects that receive little or no direct solar radiation. It is the most productive of the climax ponderosa pine sites. Understory vegetation is dominated by mountain ninebark and is relatively rich in species.</p>	<p><i>Physocarpus monogynus,</i> <i>Acer glabrum,</i> <i>Amelanchier anifolia,</i> <i>Clematis tenuiloba,</i> <i>Berberis repens,</i> <i>Rosa acieularis,</i> <i>Spiraea betulifolia,</i> <i>Symphoricarpos albus,</i> <i>Festuca idahoensis,</i> <i>Hesperochloa kingii,</i> <i>Poa interior,</i> <i>P. palustris,</i> <i>Antennaria rosed,</i> <i>Balsamorhiza sagittata,</i> <i>Cerastium arvense,</i> <i>Cystopteris fragilis,</i> <i>Galium boreale,</i> <i>Lupinus argenteus,</i> <i>Carex xerantica,</i> <i>Stipa columbiana,</i> <i>Aster conspicuus,</i> <i>Epilobium angustifolium,</i> and <i>Fragaria</i></p>
<p><i>P. ponderosa/</i> <i>Juniperous communis</i></p> <p><i>Ponderosa pine/</i> common juniper</p>	<p>Limited to the southeastern portion of the Bighorn mountains. Sparse understory.</p>	<p><i>Juniperous communis,</i> <i>Hesperochloa kingii,</i> <i>Poa interior,</i> <i>Agoseris glauca,</i> <i>Astragalus miser,</i> <i>Lonatium ambibuum,</i> and <i>Clematis tenuiloba.</i></p>

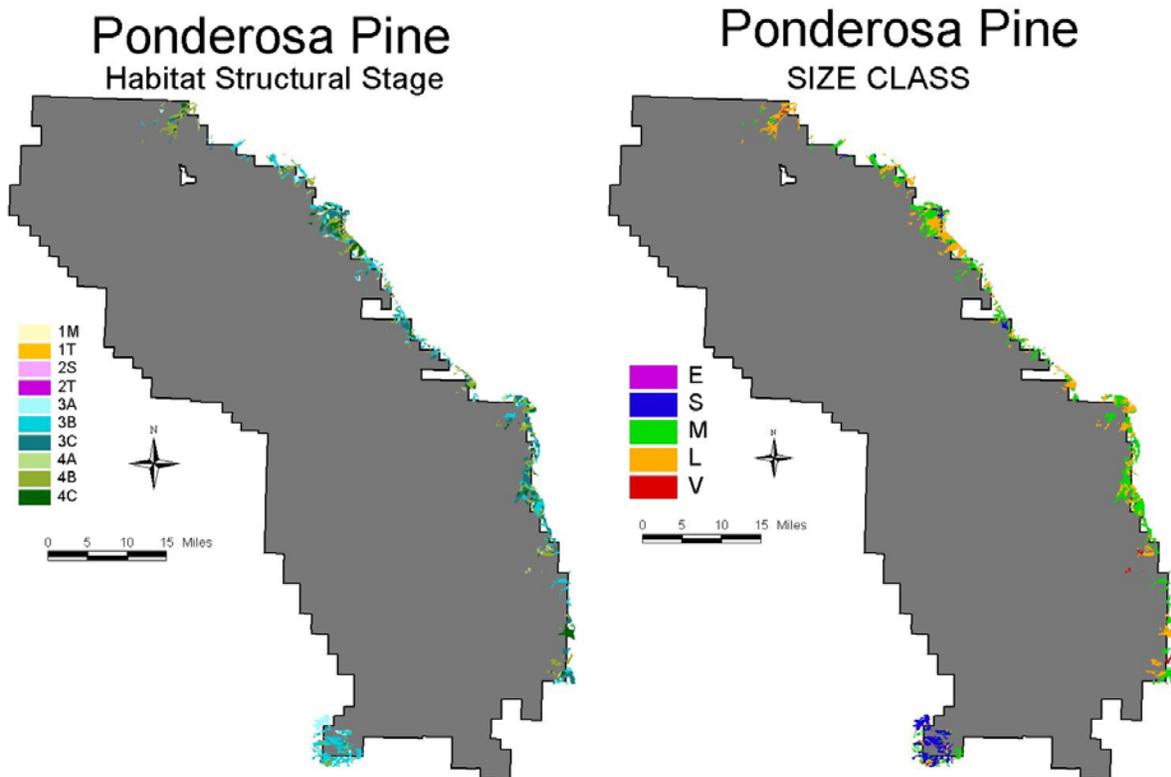
Meyer and Knight (in draft) state that current successional trajectories probably do not differ much from the historic trajectories. They note the increases in tree density increases the risk of large conflagrations that could set more area in early successional stages than would have existed prior to fire suppression.

STRUCTURE

Ponderosa pine typically forms clumpy stands with 350-700 trees per hectare with young stands on better sites having up to 1,400 trees per hectare. Basal areas range from 8.8 to 24.8 square meters per hectare (Despain 1973).

Dense stands of ponderosa pine existed historically on sites where fire did not occur for 40-50 years. These stands were interspersed on the landscape with savannas and grassy areas (Romme et al. 2000, Meyer and Knight in draft). The individual stand structure characteristics today may not exceed the historic range of variability, however, the landscape structure probably does (Meyer and Knight in draft). They state the natural disturbances rarely create the dense, even-aged stands that are common today.

Fire suppression and harvesting has reduced the natural variability in stand structure and age structure as increased tree density reduces the number of large trees and harvest skews age and size distribution toward younger, smaller trees in even-aged stands (Meyer and Knight in draft).



Old-growth ponderosa stands are described as having clumps of large uneven-aged trees with little understory or down woody material and few snags in the climax ponderosa pine type with a natural fire regime. Where fire has been controlled, the stands will have a more understory vegetation and more dead and down wood material. Old-growth stands have old trees with irregular, open, and large branched crowns and few low branches. The bark on the old trees is thick with light colored plates. Burls and

other deformities are often present as indicators of the fire history. Stands are at least 200 years old and have at least 10 trees per acre over 16 inches dbh (Mehl 1992).

NATURAL DISTURBANCE AND FUNCTION

The historic fire regime in ponderosa pine forests is considered to be low-intensity surface fires that mostly kill small trees with the thick-barked trees surviving. Open, park-like stands are described in historical accounts in other parts of the Rocky Mountains (Cooper 1960, Veblen and Lorenz 1991). Historical photographs show open, park-like ponderosa pine forests on the east slopes of the Bighorn Mountains. Some timber harvest occurred in the late 1800s (Jack 1900) that may have contributed to the open conditions (Meyer and Knight in draft). Pre-settlement era fire scars indicate a mean fire interval of 26 to 33 years in the Laramie Range (Brown et al. in press) and 14 to 27 years in the Devil's Tower National Monument (Fisher et al. 1987). Fire suppression and grazing have reduced the size of fire in the low-elevation portions of the Bighorn National Forest below its historic range of variability (Meyer and Knight in draft).

The Bighorn National Forest xxx database identifies xxx acres of ponderosa pine that burned since 1900.

Mountain pine beetle is the primary insect affecting ponderosa pine trees in the Bighorns. The mountain pine beetle population fluctuates over time with serious epidemics occurring in the 1950s and 1970s that killed over 6,000 trees (Meyer and Knight in draft). Mountain pine beetle outbreaks can cover large areas, reduce the average tree diameter in stands, and create small or large openings, and allow Douglas-fir to become more dominant (Schmid and Mata 1996). Epidemic return intervals within at the stand level occur every 50 to 100 years (Johnson 1995, Schmid and Mata 1996).

Diseases and windthrow do not seem to have much influence on ponderosa pine in the Bighorns (Meyer and Knight in draft).

RECENT HUMAN DISTURBANCE

There is very little documented timber harvest in ponderosa pine stands on Bighorn National Forest. Jack (1900) identified timber harvest occurred in the ponderosa pine forests in late 1800s, and evidence of past harvest can be seen on site today, though how much took place is not known. The effects of fire suppression are likely the most important result of recent human influence.

FINDINGS

The ponderosa pine forest is a relatively small portion of the ecological section (124,000 acres) and the Bighorn National Forest (31,000 acres).

Fire suppression and harvesting has reduced the expected variability in stand structure resulting in higher forest density and fewer large trees. Today's ponderosa pine stands are younger and denser with smaller trees in more even-aged stands than those that comprised the historic landscape.