

Introduction to Rust Diseases

Specialized foliage and/or canker diseases often with alternate hosts

Rust diseases are grouped based on the taxonomic classification of the pathogens. They are fungi in the phylum Basidiomycota, class Pucciniomycetes, and order Pucciniales. Rusts are all obligate parasites that depend on the living cells of their hosts. Initially, they produce structures (haustoria) that grow into their hosts' living cells, from which they derive nutrients.

The diseases caused by this group are varied. Most of the rust fungi initially infect and cause diseases of foliage. However, some spread into branches and stems, colonizing the phloem and cambium. Rusts cause cankers (diseases of the bark), galls, brooms, foliage diseases, and/or cone diseases.

The majority of the rust diseases in this Region are native pathogens, with the exception of white pine blister rust. Table 9 provides examples of some of the most damaging and/or common rusts in the region (figs. 1-7). However, many other rusts occur within the Rocky Mountain Region.

Signs and Symptoms—The common name, “rusts,” comes from the rust-like appearance of the various spore structures that are often rust-colored, yellow, and/or orange. These brightly colored signs help to distinguish rusts from other diseases. If signs are not present, symptoms may look like other foliage or canker diseases, with discolored foliage or branch flagging (faded and dying branches). Stem rusts often can be identified by the host and shape of the cankers or galls. The cankers usually have distinctive roughness on their margin that are the remains of earlier fruiting structures.

Disease Cycle—Rust disease cycles are complicated. Many require two different host species (table 1) that usually need to be less than a mile apart. The alternate hosts to the tree hosts can be other trees, shrubs, or herbaceous plants. The hosts are often specific species or groups within the same genus. Rust fungi may have as many as five different spore types or stages (table 1). White pine blister rust is an example of a five-stage (macrocytic) rust with two hosts (fig. 1). There are rust diseases, such as western gall rust (*Peridermium harknessii*), that require only one host to complete their life cycle.

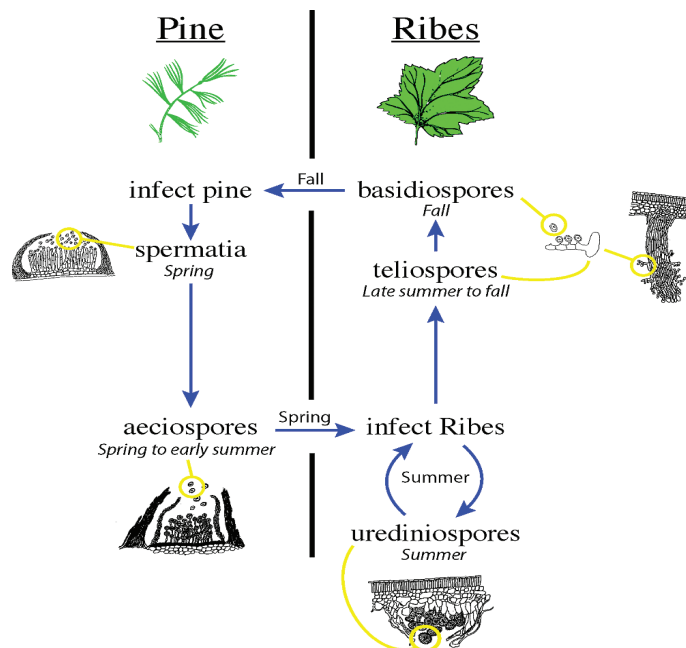


Figure 1. White pine blister rust disease cycle as an example of a five-cycle rust. Image: Jim Worrall, USDA Forest Service.

Table 1. Comparison of the more damaging and common rusts in the Rocky Mountain Region.

Rust	Scientific name	Common tree hosts	Common alternate hosts	Number of spore types	Main damages on tree host
White pine blister rust (Fig. 2)	<i>Cronartium ribicola</i>	Five-needle pines	Currants and gooseberries	5	Stem and branch cankers
Comandra blister rust cankers (Fig. 3)	<i>C. comandrae</i>	Lodgepole and ponderosa pine	Bastard toadflax	5	Stem and branch
Stalactiform rust	<i>C. coleosporioides</i>	Lodgepole pine	Indian paintbrush	5	Stem and branch cankers
Western gall rust cankers (Fig. 4)	<i>Peridermium harknessii</i>	Ponderosa, lodgepole, Scots, and pine		None	1 Branch galls and stem
Spruce broom rust (Fig. 5)	<i>Chrysomyxa arctostaphyli</i>	blue spruce	Engelmann and Colorado	Bearberry	4 Branch brooms
Fir broom rust (Fig. 6)	<i>Melampsorella caryophyllacearum</i>	White and subalpine fir	Chickweed	5	Branch brooms
Melampsora leaf disease rust	<i>Melampsora medusae</i> , other <i>Melampsora</i> spp.	Aspen, cottonwood, and willow	Douglas-fir and ponderosa and lodgepole pine		5 Foliage
Gymnosporangium brooms (Fig. 7)	<i>Gymnosporangium</i> spp.	Junipers	Species in family Rosaceae	4	Branch galls, stem swelling, and

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Spores are disseminated by wind and often infect hosts through needle stomata. However, some rusts can infect hosts through wounds. Prolonged periods of cool, wet weather or high humidity are necessary for infection and germination. Therefore, “wave years,” or years with significant increases in new infections, occur during years of high rain and increased humidity.

Many rust pathogens have spore types called urediniospores. These spores permit the rusts to spread and only re-infect an alternate host group. This allows for increased spore levels (increased inoculum) during the summer.

Impact—Impacts include reduced growth, stem deformities, loss of wood quality, dead tops and branches, and tree mortality. Stem cankers, especially when associated with decay fungi, can increase the chance of stem breakage. White pine blister rust and comandra blister rust are among the most damaging diseases in the Rocky Mountain Region.



Figure 2. White pine blister rust. Photo: James T. Blodgett, USDA Forest Service.



Figure 3. Comandra blister rust. Photo: James T. Blodgett, USDA Forest Service.



Figure 4. Western gall rust. Photo: James T. Blodgett, USDA Forest Service.



Figure 5. Close-up view of spruce broom rust fruiting on needles. Photo: James T. Blodgett, USDA Forest Service.



Figure 6. Gymnosporangium rust. Photo: James T. Blodgett, USDA Forest Service.



Figure 7. Fir broom rust. Photo: James T. Blodgett, USDA Forest Service.

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