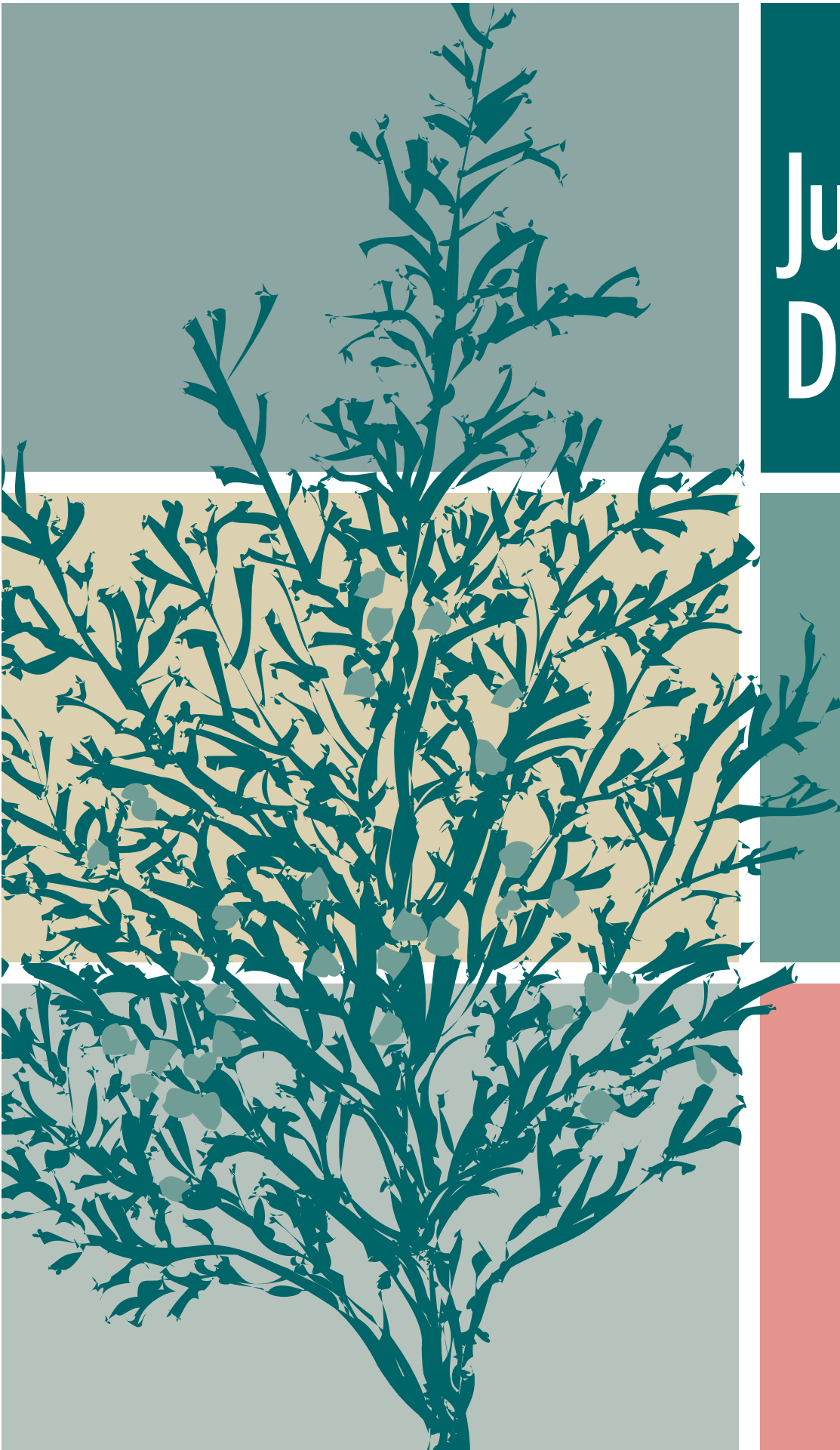


Juniper Diseases



J

Junipers, including eastern redcedar, Rocky Mountain juniper, Savin juniper, and others, are used extensively in windbreak and ornamental plantings because they tolerate a wide range of sites, extreme and rapid temperature fluctuations, and arid sites where other plant materials would fail. Junipers are generally considered to be low maintenance because they are relatively free of major insect and disease problems. Nevertheless, several fungal diseases may adversely affect the appearance and health of these trees in certain locations. This publication is intended to help the identification and control of the most common juniper diseases.

Phomopsis and Kabatina tip blights

Two fungal diseases called Phomopsis tip blight and Kabatina tip blight are common problems in windbreak and ornamental plantings of junipers. These diseases result in foliar blighting and a tip dieback. Damage to young nursery stock, transplants and certain juniper varieties and species can be extensive but most established junipers in the landscape are seldom killed. Nevertheless, these tip blights may reduce the overall quality of the planting. Although Phomopsis and Kabatina blights cause almost identical symptoms, aspects of their development and control do differ. Therefore, it is important to distinguish between the two diseases.

Phomopsis tip blight, caused by the fungus *Phomopsis juniperovora*, damages new growth and succulent branch tips of junipers from mid-April through September. Older, mature foliage is resistant to infection and therefore most blighting occurs on the terminal 4 to 6 inches of the branches. Affected foliage first turns dull red or brown and finally ash-gray. Small gray lesions often girdle branch tips and cause blighting of foliage beyond the diseased tissue. Small, black, spore-containing fungal fruit bodies develop in the lesions. Use a hand lens to more easily view these diagnostic fungal structures.

Spores of the *Phomopsis* fungus are produced throughout the summer and infection can

Figure 1. (right) Symptoms of Kabatina tip blight develop in late winter or early spring. Note the discoloration of the branch tips. Symptoms of Phomopsis tip blight are similar, but they normally develop later in the growing season.

Figure 2. (far right) Branch tip killed by Kabatina tip blight. A small ash-gray lesion is formed at the base of the dead shoot. This type of symptom is also present for Phomopsis tip blight.



occur whenever young foliage is available and moisture or humidity are high. Most infections usually occur in April through early June and again in late August through September. Very few infections occur in midsummer or during the winter months. Repeated blighting in early summer can result in abnormal bunching (witches' broom) and discoloration of the foliage, stunting of young trees or shrubs, or in severe cases plant death.

Symptoms of **Kabatina tip blight**, caused by the fungus *Kabatina juniperi*, appear in February and March and well before those of Phomopsis tip blight. The terminal 2 to 6 inches of diseased branches throughout the juniper first turn dull green, then red or yellow. Small ash gray to silver lesions dotted with small black fruit bodies of the fungus are visible at the base of the discolored tissue. The brown, desiccated foliage eventually drops from the tree in late May or June. Foliar blighting occurs only in early spring; it does not continue through the summer. Blighting is also restricted to the branch tips and does not cause extensive branch dieback or tree death.

The primary infection period for the Kabatina fungus is thought to be in autumn even though visible symptoms are not apparent until late winter or early spring. Infection often is associated with small wounds on branch tips caused by insect feeding or mechanical damage.

Several practices can help reduce the severity of Phomopsis and Kabatina tip blights. When purchasing new plants, select those that show disease resistance (see table). Space new plantings to allow for good air circulation. Avoid wounding plants, especially in spring and fall. Maintain adequate fertility but do not over fertilize. Water plants in early morning so the foliage will dry as the day progresses. Avoid night watering. Prune out diseased branch tips during dry summer weather and destroy them. However, avoid excessive pruning or shearing. This encourages new succulent growth which is susceptible to Phomopsis blight.

Chemical control of these tip blight diseases normally is not necessary in established landscape or windbreak plantings. Occasionally, fungicide applications may be needed on

susceptible junipers to control Phomopsis blight. Application of azoxystrobin, propiconazole, mancozeb, certain copper-based fungicides, or products containing thiophanate-methyl at 7- to 21-day intervals during rapid plant growth in the spring will give adequate control of Phomopsis but not Kabatina tip blight. Kabatina blight infections occur in the fall and there currently are no fungicides labeled for control of this disease.

Cercospora needle blight

Cercospora needle blight, caused by the fungus *Cercospora sequoiae* var. *juniperi*, is potentially destructive in established juniper plantings. Repeated infections over several



Figure 3. (above) Needle browning and defoliation on the lower third of the crown on Rocky Mountain juniper caused by Cercospora needle blight.

Figure 4. (below) Fuzzy fruiting structures of the Cercospora fungus form on dead needles. These structures are visible with a hand lens.



years may result in defoliation and tree death. The disease is most severe in areas with high summer humidities and frequent rains.

Symptoms of *Cercospora* needle blight first appear in late-summer and fall on inner branch needles (those located nearest the main tree trunk) and toward the lower portion of the tree. Needles turn dull brown or red and eventually drop. Small fuzzy or hairy spore-bearing fungal structures, easily visible with a hand lens, form on the dead needles. Defoliation in succeeding years continues from the inner portion of the branch toward the tip, and from the bottom of the tree toward the top. Severely infected trees are open, spindly and may appear as if they had

been scorched by a fire.

Cercospora needle blight may occur on several juniper species. Rocky Mountain juniper is particularly susceptible and should not be planted in locations where the disease has previously been a problem. Most selections of eastern redcedar and Chinese junipers have good resistance to this disease (see table). Proper tree spacing, which promotes good air movement and rapid drying of foliage, will also inhibit disease development.

Chemical control may be necessary on susceptible junipers during wet summers. Although symptoms of *Cercospora* needle blight appear in the fall, fungal infection of needles actually occurs in the summer. Therefore, make two applications of mancozeb or Bordeaux in early June and again in early July. A third application in mid- to late-July may be necessary during wet summers. Fungicide applications at other times are ineffective. Take care to cover the foliage thoroughly, especially the lower two-thirds of the tree crown. Yearly fungicide applications may not be required once the disease is controlled; however, carefully monitor trees for recurrence yearly.

Cedar Apple Rust and Related Rust Diseases

Cedar apple rust and related rusts are the most striking and colorful diseases of juniper. The fungi (*Gymnosporangium* spp.) responsible for the diseases spend part of their life cycle on rosaceous hosts such as hawthorn, flowering crabapple and apple, and another portion on junipers. These rust fungi can cause considerable damage to the rosaceous plants as a result of premature defoliation and fruit distortion; however, the effects on junipers are normally minimal.

Both cedar-apple and cedar-hawthorn rusts produce reddish-brown galls on the twigs of juniper. These woody galls usually are 1/2 to 2 inches in diameter, although sizes and shapes may vary slightly. Cedar-quince rust produces perennial, cigar-shaped galls on small twigs. Galls of all the rust fungi begin to swell and produce orange gelatinous tendrils in April and remain active through May.

Although the presence of rust galls on twigs may be unsightly, they rarely cause significant



Figure 5. (above) Cedar-apple rust gall in spring. The gelatinous orange tendrils release millions of fungal spores.

Figure 6. (right) Browning and scorching of foliage on one side of a juniper caused by desiccating winter winds.



damage to the juniper. Select resistant junipers (see table) for locations where rust may be a problem (e.g., where rust susceptible flowering crabs or hawthorns are nearby). In landscapes where only a few susceptible junipers are present, remove rust galls by hand in late winter. The galls are killed once detached from the tree. Alternatively, apply fungicides (azoxystrobin, myclobutanil, ferbam, triadimefon and others) at 7- to 21- day intervals from early July through August to prevent infection and gall formation on junipers. Fungicides are ineffective in controlling the gelatinous galls in the spring.

Winter Injury

Juniper foliage can be killed by extremely cold temperatures or, more commonly, by winter desiccation. Because junipers retain foliage throughout the winter, they continue to transpire some water. If the soil is dry or frozen, the tree cannot replace water lost from the needles. This causes a scorching or general browning of the branch tips in late winter or early spring.

Desiccation injury is more common on the southwest or northwest portion of the tree crown and on trees exposed to dry winter winds, such as those planted at the corner of windbreaks, on southern exposures of buildings, or in raised planting boxes.

Prostrate and horizontal junipers also tend to suffer more injury than upright forms. Winter injury that results in death of branch tips may be confused with *Kabatina* tip blight. Generally, a distinct gray lesion appears at the base of *Kabatina*-blighted tips and the demarcation between healthy and diseased tissue is sharp. Winter injury results in a more diffuse or gradual browning of tissue.

Canker Diseases

Canker diseases result in the formation of distinct, sunken lesions on the bark of woody plants. Cankers restrict water and nutrient movement and may ultimately lead to branch dieback and tree death. At least two canker diseases, called *Botryosphaeria* canker and *Seiridium* canker, occur on junipers.

Botryosphaeria canker, caused by the fungus *Botryosphaeria stevensii*, has been reported from the Great Plains region, but is probably more widely distributed in the



Figure 7. (left) Branch dieback on Rocky Mountain juniper caused by *Botryosphaeria* canker.

Figure 8. (below) *Botryosphaeria* canker on a juniper branch. The outer bark has been removed to expose the chocolate brown discoloration of the inner bark and wood.



United States. Affected junipers develop elongated, flattened, often resinous cankers. These cankers may occur anywhere on woody stems, but are commonly located near branch crotches in the interior portion of the tree crown. Cankers are often difficult to see, and it is often necessary to cut the dead branch off and carefully scrape away the outer bark to expose the chocolate brown, dead tissue in the canker. Surrounding healthy tissue will be pearl white. Small, black fruit bodies of the fungus also develop in the canker, but these may be partially hidden by thin pieces of dead bark.

Occasionally, girdling stem cankers cause rapid death of the top third to one-half of the tree crown. More commonly, the disease

causes death of branches throughout the crown and a gradual tree decline. This disease should not be confused with Kabatina or Phomopsis tip blights, which affect only foliage and succulent branch tips.

Rocky Mountain juniper is very susceptible to Botryosphaeria canker and should not be planted in locations where the disease is present. Savin junipers also are susceptible to the canker. Eastern redcedar and Chinese juniper are more resistant (see table). Fungicides currently are not labeled for control of Botryosphaeria canker. Remove cankers on diseased trees in winter or late spring. Do not prune or shear cankered junipers in May or

June. Spores of the Botryosphaeria fungus are released during this period, and pruning wounds could increase the chances of infection. Pruning and sanitation may not completely suppress canker development.

Seiridium canker, caused by the fungus *Seiridium unicorne*, occurs on oriental arborvitae, bald-cypress, Arizona, Italian and Leyland cypresses, and occasionally junipers. Symptoms of the disease are similar to Botryosphaeria canker. Elongated, flattened cankers form on small branches and main stems. Bleeding or resin formation in cankers is common. Multiple coalescing branch and stem cankers may cause branch dieback, or in some cases, tree death.

Seiridium canker tends to be associated with trees suffering from winter damage, drought, or other environmental stresses. Suppress canker development by irrigation and protection from winter desiccation. Prune cankered branches from the tree and destroy them.

Root Diseases

Roots of junipers occasionally are damaged by soilborne fungi such as *Pythium*, *Phytophthora*, and *Rhizoctonia*, parasitic nematodes, and/or excessive watering and poor soil drainage. Symptoms of root injury include stunting, yellowing, branch dieback, low vigor, and sometimes rapid plant death. Damage is more common on prostrate and horizontal forms of juniper. Laboratory analysis is normally necessary to diagnose fungal pathogens associated with rotted roots.

To avoid root rots, plant junipers in well-drained soils and away from locations where water has a tendency to puddle or stand for extended periods. Do not use nonporous, plastic mulches as a weed barrier in juniper plants. Plastic mulch inhibits water and air movement and is detrimental to root growth. Instead, select organic mulches and breathable fabrics for weed control in planting beds. Selections of *Juniperus horizontalis* and *J. sabina* appear to be particularly susceptible to root rots, and should not be planted in heavy, poorly drained soils. Fungicide and/or nematocide soil drenches are sometimes used to control root rots in the nursery, but are not frequently used in landscape plantings.

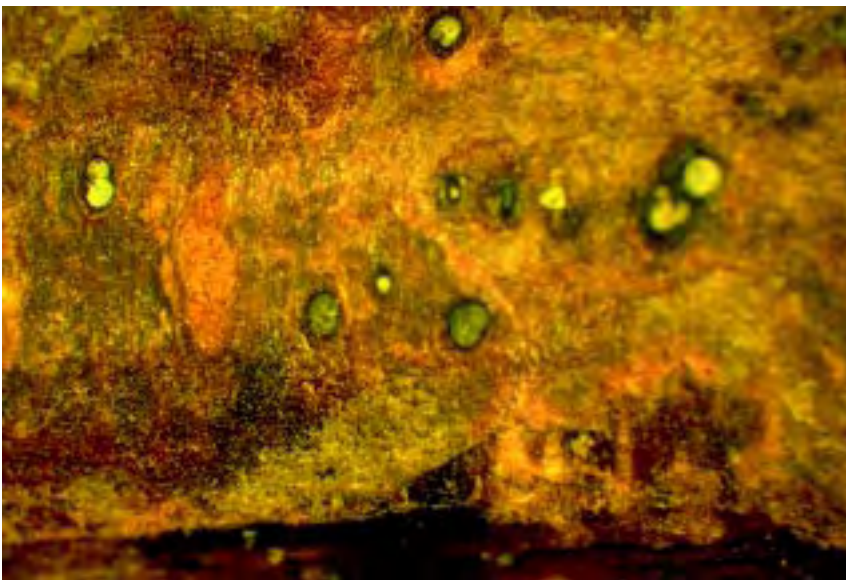


Figure 9. (above) Small fruiting structures of the Botryosphaeria fungus are visible in cankers by carefully shaving the outer bark and viewing with a hand lens. Note the characteristic white interior of the fungal fruiting structure.

Figure 10. (right) Branch dieback on oriental arborvitae caused by Seiridium canker. This disease also occurs on Arizona, Italian and Leyland cypresses and junipers. Laboratory confirmation may be necessary to distinguish this disease from Botryosphaeria canker.



Table 1.

| Disease Characteristics | Kabatina Tip Blight | Phomopsis Tip Blight | Cercospora Needle Blight | Cedar Rusts | Botryosphaeria Canker | Seiridium Canker |
|--------------------------|--|--|--|---|---|---|
| Symptoms | February-May; tip dieback; gray lesion at base of shoot | May-September; tip dieback; gray lesion at base of shoot | August-May; inner needles die and drop. Fuzzy black fruiting structures on needles | Active orange, gelatinous galls in April and May | Symptoms all year; branch cankers and dieback; tree mortality | Symptoms all year; branch cankers and dieback; tree mortality |
| Infection Period | September-November | May-September | June-July | July-September | May-June | Unknown |
| Cultural Controls | Prune out dead tips; provide good air movement by proper plant spacing | Prune out dead tips; provide good air movement by proper plant spacing | Avoid planting Rocky Mountain juniper; promote good air circulation | Remove galls; eradicate rosaceous hosts; resistant cultivars | Remove diseased branches; avoid planting Rocky Mountain juniper | Remove diseased branches; more common on arborvitae |
| Chemical Controls | None | Azoxystrobin propiconazole, thiophanate-methyl Bordeaux, fixed coppers at 7- to 21-day intervals as needed | Mancozeb, Bordeaux mixture applied early June and July | Azoxystrobin myclobutanil Ferbam, triadimefon at 7- to 21-day intervals July-August | None | None |

Disease Resistance of Juniper Cultivars

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Table 2. Relative resistance of various *Juniperus* selections to cedar–apple rust, cedar–hawthorn rust, *Phomopsis* tip blight, *Kabatina* tip blight, *Cercospora* needle blight, and *Botryosphaeria* canker (*B. stevensii*). Ratings of 0 = no disease, L = light, M = moderate, S = severe disease, and – = not determined were gathered during seasons favorable for disease development. Those selections with moderate to severe levels of rust, *Phomopsis* tip blight, or *Kabatina* tip blight may be aesthetically unacceptable during a portion of the year and could require additional cultural or chemical controls. Juniper selections with moderate to severe levels of *Cercospora* blight or those susceptible to *Botryosphaeria* canker should be avoided.

| <i>Juniperus chinensis</i> | Apple rust | Hawthorn rust | <i>Phomopsis</i> tip blight | <i>Kabatina</i> tip blight | <i>Cercospora</i> blight | Bot canker |
|----------------------------|------------|---------------|-----------------------------|----------------------------|--------------------------|------------|
| Ames | 0 | 0 | L-M | 0 | 0 | 0 |
| Aureo–globosa | 0 | 0 | L | – | – | – |
| Blue Point | 0 | – | – | M | 0 | 0 |
| Columnaris | 0 | 0 | S | – | – | – |
| Femina | 0 | 0 | L | – | – | – |
| Fortunei | 0 | 0 | – | – | – | – |
| Globosa | M | L | L | – | – | – |
| Hetzii | – | – | L | L | – | – |
| Hetzii Columnaris | 0 | 0 | M | 0 | 0 | 0 |
| Japonica | 0 | 0 | S | – | – | – |
| Keteleeri | 0 | 0 | 0 | L | 0 | 0 |
| Leeana | 0 | 0 | – | – | – | – |
| Maney | 0 | – | M | 0 | 0 | 0 |
| Mas | 0 | – | L | – | – | – |
| Mint Julep | – | – | L | L | – | – |
| Mountbatten | 0 | – | L | 0 | 0 | 0 |
| Oblonga | 0 | 0 | – | – | – | – |
| Parsonsii | 0 | 0 | – | – | – | – |
| Pendula | 0 | 0 | S | – | – | – |
| Perfecta | 0 | – | – | 0 | 0 | – |
| Pfitzeriana | L | 0 | M | L | – | 0* |
| Pfitzeriana Aurea | 0 | 0 | M | L | – | – |
| Pfitzeriana Compacta | 0 | 0 | L | – | – | – |
| Plumosa | 0 | – | M | – | – | – |
| Plumosa Aurea | 0 | 0 | – | – | – | – |
| Pyramidalis | 0 | 0 | L | – | – | – |
| Robusta Green | 0 | – | 0 | 0 | 0 | 0 |
| Saybrook Gold | – | – | 0 | 0 | – | – |
| Spartan | L | – | 0 | M | 0 | 0 |

| <i>Juniperus chinensis</i> , cont. | Apple rust | Hawthorn rust | Phomopsis tip blight | Kabatina tip blight | Cercospora blight | Bot canker |
|------------------------------------|------------|---------------|----------------------|---------------------|-------------------|------------|
| var. <i>sargentii</i> | L? | L? | L-M | — | — | — |
| Variegata | 0 | 0 | M | — | — | — |
| Watereri | 0 | 0 | M | — | — | — |
| Wintergreen | 0 | — | M | 0 | 0 | 0 |
| <i>Juniperus communis</i> | | | | | | |
| Aurea | 0 | — | — | — | — | — |
| Depressa | 0 | 0 | 0 | — | — | — |
| Hibernica | 0 | 0 | 0 | L | — | — |
| Oblonga—pendula | 0 | — | 0 | — | — | — |
| <i>Juniperus conferta</i> | | | | | | |
| Blue Pacific | 0 | 0 | L | M | — | — |
| <i>Juniperus davurica</i> | | | | | | |
| Expansa | — | — | L | L | — | — |
| <i>Juniperus horizontalis</i> | | | | | | |
| Admirabilis | 0 | 0 | M | — | — | — |
| Adpressa | 0 | 0 | S | — | — | — |
| Alpina | M | 0 | S | — | — | — |
| Argentea | 0 | 0 | S | — | — | — |
| Bar Harbor | — | — | S | L-M? | — | — |
| Blue Chip | — | — | L-S? | M | — | — |
| Douglasii | L? | 0 | L | — | — | — |
| Emerald Isle | — | — | L | L-M | — | — |
| Emerson | — | — | S | L-M? | — | — |
| Eximius | 0 | 0 | S | — | — | — |
| Filicina | 0 | 0 | M | — | — | — |
| Glenmore | 0 | — | L-M | — | — | — |
| Glomerata | 0 | — | — | — | — | — |
| Grey Carpet | 0 | — | M | — | — | — |
| Livida | 0 | 0 | S | — | — | — |
| Petraea | 0 | 0 | S | — | — | — |
| Plumosa (Andorra) | L? | 0 | S | L-M? | — | — |
| Prince of Wales | — | — | L? | M | — | — |
| Procumbens | 0 | 0 | L | — | — | — |
| Variegata | 0 | 0 | S | — | — | — |
| Wiltonii (Blue Rug) | 0 | 0 | M | L-M? | — | — |

| <i>Juniperus sabina</i> | Apple rust | Hawthorn rust | Phomopsis tip blight | Kabatina tip blight | Cercospora blight | Bot canker |
|-----------------------------|------------|---------------|----------------------|---------------------|-------------------|------------|
| Arcadia | 0 | 0 | L | — | — | — |
| Broadmoor | 0 | 0 | L | M-S | — | S* |
| Fastigiata | 0 | 0 | L | — | — | — |
| var. <i>tamariscifolia</i> | 0 | 0 | S | L | — | — |
| Variegata | 0 | — | — | — | — | — |
| <i>Juniperus scopulorum</i> | | | | | | |
| Blue Haven | M | — | L-S | S | M | S |
| Cologreen | M | — | — | L | M | S |
| Dewdrop | L | — | — | M | M | — |
| Gray Gleam | M | — | — | M | 0? | 0 |
| Horizontalis | M | S | S | — | — | — |
| McFarland | M | — | — | L | S | M |
| Medora | 0 | — | — | M | L | 0 |
| Moffettii | M | 0 | L | M | M | 0 |
| Moonglow | 0 | — | — | M | S | S |
| Pathfinder | L | — | — | M | L | 0 |
| Pendula | S | 0 | S | — | — | — |
| Platinum | L | — | S | L | L | 0 |
| Silver Globe | L | — | — | L | L | 0 |
| Sparkling Skyrocket | M | — | — | S | S | S |
| Sutherland | S | — | — | L | L | ? |
| Viridifolia | L? | — | — | — | — | — |
| Welchii | L | — | S | M | L | S |
| Wichita Blue | L | — | M-S | M-S | M | S |
| <i>Juniperus squamata</i> | | | | | | |
| Albo–variegata | 0 | 0 | M | — | — | — |
| Blue Star | — | — | M | M | — | — |
| Fargesii | — | — | 0 | — | — | — |
| Meyeri | — | — | L | — | — | — |
| Wilsonii | 0 | — | — | — | — | — |
| <i>Juniperus virginiana</i> | | | | | | |
| Admiral | M | — | — | M | 0 | 0 |
| Albospica | M? | M? | S | — | — | — |
| Aurea | 0 | — | — | — | — | — |
| Blue Mountain | 0 | — | — | 0 | 0 | 0 |

| <i>Juniperus virginiana</i> , cont. | Apple rust | Hawthorn rust | Phomopsis tip blight | Kabatina tip blight | Cercospora blight | Bot canker |
|-------------------------------------|------------|---------------|----------------------|---------------------|-------------------|------------|
| Burkii | S | — | — | L | 0 | 0 |
| Canaertii | S | S | M-S | L | 0 | 0 |
| Chamberlaynii | S | L | M | — | — | — |
| Cinerascens | S | S | L | — | — | — |
| Elegantissima | S | S | M | — | — | — |
| Emerald Sentinel | M | — | — | L | 0 | 0 |
| Glauca | S | S | M | — | — | — |
| Globosa | L? | 0 | L | — | — | — |
| Henryii | S | — | — | L | 0 | 0 |
| Hillii Dundee | S | — | M-S | L | 0 | 0 |
| Hillspire (Cupressifolia) | 0 | 0 | M-S | L | 0 | 0 |
| Kosteri | 0 | 0 | — | — | — | — |
| Manhattan Blue | S | — | — | L | 0 | 0 |
| Nova | S | S | — | — | — | — |
| Oxford | M | — | — | M | 0 | 0 |
| Pendula | S | M | M | — | — | — |
| Pseudocupressus | 0 | 0 | — | — | — | — |
| Pyramidalis | L? | 0 | — | — | — | — |
| Pyramidiformis | S | S | M | — | — | — |
| Reptans | S | 0 | L | — | — | — |
| Schottii | S | 0 | — | — | — | — |
| Sky Rocket | L | — | L | M-S | S | S |
| Tripartita | 0 | 0 | 0 | — | — | — |
| Variegata | M | L | — | — | — | — |
| Venusta | 0 | — | — | — | — | — |

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- 2) Himelick and Neely. 1960. Plant Dis. Rep 44:109-112 (rusts)
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* Ratings based on general field observations and not from replicated plots.



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