Blue Spruce Blues

My Spruce is afflicted
by the Blues,
– the Blue Spruce Blues,
It has Rhizosphaera, that I knew,
Now I'm told it has Phomopsis
and Pitch Mass too,
Oh Dear, what do I do?
As I sit here a singin'…
The Blue Spruce Blues

-Bob Marley Roberts

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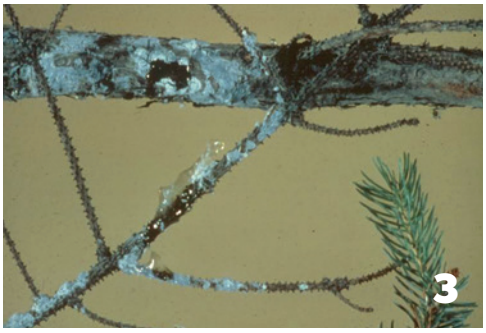
Introduction

Colorado Blue Spruce (*Picea pungens*) is one of the most recognizable and widely planted conifers in Michigan landscapes. Perhaps, nothing is more visually stimulating than a gaggle of healthy blue spruce trees (Photo 1). Unfortunately, blue spruces have been encountering some seriously health-threatening maladies in recent years (Photo 2). These maladies, largely disease and pest issues, may kill branches or eventually the entire tree, leading to a condition I have termed, "Spruce Decline". Spruce Decline is possibly a nebulous catchall phrase or excuse for, "We don't know what the heck is going on!", and in some cases, we don't know what the heck is going on! However, over the last decade or so, we've been able to discern many of the leading causes of Spruce



1 A gaggle of healthy Blue Spruce is a beautiful thing to behold…the reason why this species has been utilized in Michigan landscapes to such a great, if excessive, extent.

2 Many blue spruces are in decline around Michigan. Various factors contribute to this decline, but diseases, pests, cultural and the local environmental issues are undoubtedly involved.

3 The presence of sap often indicates a canker, in this case *Cytospora*. *Phomopsis* cankers are less conspicuous; only droplets of sap may be present.

4 *Phomopsis* canker was first discovered by the author in Michigan nurseries during the late 1980s and early 1990s. Note the lower branch dieback. Nursery-sized trees may be killed by *Phomopsis*, especially after transplanting (shock) to landscapes.

5 Cankers can be found by scraping the bark of branches with a knife. These brown areas indicate early stages of *Phomopsis* canker, which will eventually destroy the entire cambium of this branch. For comparison, note healthy green cambial tissues, which are currently uninfected. With needlecasts and other foliar diseases, the cambium will usually remain green and succulent.

6 Many needlecast diseases such as *Rhizosphaera* cause the loss of previous year's needles.

7&8 Various foliar (needle) diseases can be identified based upon fungal fructifications (reproductive structures) that develop on the needles. Photo 7 shows the typical fructifications of *Rhizosphaera* protruding from stomata while Photo 8 shows pustules of Weir's needle rust. Compared to some needle rust diseases, which require alternate host plants, Weir's rust does not.

Decline. Spruce Decline has become so prevalent that some individuals have suggested that blue spruce trees will literally become extinct within a decade or two. I believe that sentiment is an overreaction – there are millions of blue spruces in Michigan landscapes and urban forests that are doing just fine (Photo 1).

Causes of Blue Spruce Decline

There are a variety of factors that may contribute to Spruce Decline not only in Michigan landscapes, but in nurseries as well. Before delving into those specific causes, it might be useful to discuss why the causes are doing the "causing". I think there are two factors. First, we have probably overplanted blue spruce, just as we do with most popular plants; overplanting often leads to buildup of diseases and pests with so much "food and survival" potential for these causal factors. Second, we have taken a tree that is "native" to the slopes (well drained, perhaps even droughty, nutrient poor) of the Rocky Mountains to clayish, poorly drained soils of Michigan. In addition to "provenance", we apply daily irrigation, abundant if excessive fertilizers, and herbicides. So, trying to manage the following maladies may be challenging particularly given the fact that we humans often violate the tenant, "right tree, right place". I also want to mention that other species of spruce (Norway, white, black, Serbian, etc.) may contract some of these problems as well…even though they are generally not nearly as seriously affected as blue spruce. Cultivars of spruce trees that have some genetics of blue spruce typically are susceptible to many of the same issues.

Canker Diseases (Especially *Phomopsis*): There are a variety of diseases on spruce that cause branch cankers. Caused by fungi, the most common are *Phomopsis, Cytospora* (*Valsa*) and *Diplodia*. Exudates of sap, which may be confused with bird droppings, often indicate where the cankers have formed (Photo 3). These cankers may girdle the branch; needles on cankered branches usually turn yellow, then brownish-purple, and subsequently drop from the tree. Needle loss may be mistaken for needlecast diseases. These canker diseases are usually manifested as dead branches or dead portions of branches. In my estimation, *Phomopsis* is by far the most serious fungus of the canker diseases and, overall, probably the most serious contributor to Spruce Decline in Michigan. *Phomopsis* canker was first discovered by the author in the late 1980s and early 1990s in nursery trees (Photos 4 & 5). The fungus initially caused

lower branch dieback, but could eventually kill trees especially after transplant shock to landscapes. Subsequently, the fungus began appearing on large trees in the landscape. While *Cytospora* and other diseases tend to inhabit the lower branches of trees, *Phomopsis* may be found throughout the tree.

Needlecast (Foliar) Diseases: This broad category of foliar diseases achieves it name due to the "casting" or dropping of needles from the spruce tree. *Rhizosphaera* is probably the most common, but others such as *Lirula, Stigmina* (*Mycosphaerella*) and various needle rust diseases may also be involved (Photo 6). Even some pests (i.e. needleminers) may cause needle loss. Needle diseases can often be identified based upon their characteristic reproductive structures on needles (Photos 7 & 8). Needlecast diseases can usually be easily distinguished from canker diseases even though both conditions result in needle loss. Needlecasts typically affect previous year's needles, at least initially, and resulting needle loss usually leaves current year's needles in place (Photo 6). With needlecast diseases, the cambial tissues (water, nutrient conducting) will appear viable (see green tissue in Photo 5), while canker diseases will result in the death (brown cambium – Photo 5) of the cambial tissues.

Pest Problems: One of the most common trunk problems on spruce in Michigan is Pitch Mass Borer (PMB). PMB can usually be identified as pitch exudates on the trunk (Photo 9 inset). Often the insect (clear wing moth) kills the tops of spruce trees (Photo 9). Pitch exudates may also be caused by fungal cankers (i.e. Fusarium Pitch Canker), and don't forget guy wires that are often left in conifers. Many conifers, including spruce trees, are often attacked by bark beetles (IPS, etc.); their attack is usually a sign of severe stress or decline. Bark beetle activity can be easily discerned by the presence of many tiny holes or resin secretions from holes on the trunk. Other pests such as Cooley Spruce Gall (adelgid, Photo 10), spruce bud worm, spruce needleminers and spruce spider mites, etc., are not uncommon.

Cultural/Environmental Problems: Excess soil moisture, either from precipitation or irrigation, fertilizer or deicing salts, planting problems and so forth and so on may all contribute to spruce decline. Herbicides may induce subtle or severe effects on spruce trees. Herbicides such as Imazapyr, found in several Roundup and other companies' formulations, may cause severe decline in

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9 The tops of spruce trees are often killed by the Pitch Mass Borer, which may also cause copious sap cascades down the trunks of infested trees (inset).

10 Cooley Spruce Gall is quite common on Colorado Blue Spruce. Uniquely, this insect also "attacks" Douglas fir as an alternate host. Expect more Cooley Spruce Gall where blue spruce and Douglas fir reside in the same landscape.

11 Herbicides applied to landscape may be very phytotoxic to spruce trees. In this case, Imprelis herbicide was involved. Imazapyr, an herbicide commonly found in many herbicide formulations, may cause similar dieback.

12 Frequent "overhead" irrigation may not only cause stress on blue spruce trees, which are adapted to well drained soils, but may also contribute to development of various diseases.

spruce trees (Remember Imprelis? Photo 11). In general, cultural problems often predispose spruce trees to attack by diseases and pests.

Managing "Blue Spruce Blues"

Obviously, when considering the management of spruce problems, it is very important to identify the major problem(s) on specific spruce trees. Certain spruce trees in some locales may have serious *Rhizosphaera* needlecast diseases while other trees may have *Phomopsis* canker. It is not unusual, however, to find several contributing factors leading to branch dieback and/or tree decline or death.

Cultural: Management of spruce decline by cultural means is very complex, with many different avenues of approach. For example, it would be wise given the severity of spruce decline in Michigan at this time to not "overplant" landscapes with blue spruce. Adequate spacing to allow air movement may reduce the incidence of fungal diseases because fungal diseases (needlecasts, cankers) require moisture to perform their

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dastardly activities. Similarly, frequent irrigation spraying or misting of trees will often result in more serious outbreaks of diseases caused by fungi (Photo 12).

Plant Selection: As we should have learned with Chestnut Blight, Dutch Elm Disease and Emerald Ash Borer, planting monocultures of trees or overplanting with one species or cultivar is conducive to the buildup of diseases and pests. Planting a diversity of (conifer) species will help to minimize serious disease and pest issues. Norway spruce, for example, is less susceptible to Phomopsis canker, needlecast diseases and Pitch Mass Borer, among other issues, than blue spruce. Concolor fir (= white fir) provides a viable alternative to blue spruce because it exhibits a bluish color and has fewer disease and pest problems than blue spruce.

Pesticide: In some circumstances, where other inputs are having marginal results, many of the problems found in association with blue spruce can be addressed with applications of pesticides – as a final resort. Pesticides can be applied as cover sprays (including "trunk washes"), soil applications, or trunk injections. Trunk injections are probably the most environmentally friendly, but uptake of the pesticide through the resinous vascular system may be difficult.

Borers may be controlled by insecticides such as imidacloprid, dinotefuran, and bifenthrin. Some borers (example Pitch Mass, a clear wing) are not controlled by imidacloprid while others (beetles) are. Elixirs of fungicides may control multiple diseases. These mixes may include a systemic and a contact for broad spectrum disease control. In the case of *Phomopsis* canker, the methyl benzimidazole carbamate class of fungicides (T-Methyl, Cleary 3336, etc.) provides the best control according to my research trials. Mixing thiophanate methyl with chlorthalonil, mancozeb, or copper fungicides, etc., can provide very broad spectrum control for cankers and needlecast diseases.

It is important to know the targeted pest or disease before application of pesticides so that the proper timing of application can result in the most optimal management. As always, be sure to read and follow label directions. The author has articles devoted to specific disease and pest problems discussed herein. Please feel free to contact him at robertsd@msu.edu, 248.320.7124, website:treedoctor.msu.edu.

The author and MSU do not endorse any particular products. If using pesticides, be sure to read and follow label directions.

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