Pine Conundrum
PART 1: NEEDLE AND SHOOT MALADIES

photo 1

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ABOUT THE AUTHOR

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Pines (*Pinus* sp.) consist of a diversity of conifers that may be characterized by the number of needles per fascicle, bark, cones and growth habit, among other criteria. Pines, along with a number of other groups of conifers, represent very valuable components of the forests and of the nursery and landscape industries. Pines are often incorporated into landscape designs. Some of the more common pines in Michigan landscapes (and nurseries) include Eastern White Pine, Austrian Pine, Scotts Pine, Red Pine, and Mugo Pine. Other less common species such as Bristlecone and Swiss Stone Pine and various related subspecies or cultivars of the aforementioned are becoming more common in the nursery trade and hence utilized more commonly as landscape plants. As with spruce trees (*Picea* sp.), some species of pines are undergoing some rather startling decline issues in Michigan landscapes (Photo 1). It is not uncommon to encounter several causal factors affecting each tree. Following is a brief discussion of some of the more common problems affecting pines in Michigan; these issues will be discussed in a two-part series.

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1 Many pines in Michigan are declining due to a whole host of "conundrum issues". Differentiating the various maladies can be challenging, but with some experience and education can be relatively straight forward.

2 *Diplodia* causes tip blight in pines that may eventually result in branch and even tree death. Note typical shoot death due to *Diplodia*.

3 *Diplodia* tends to attack older rather than young vigorously growing trees because the fungus tends to colonize the cones and bark of cone bearing-aged trees. Note dark fruiting bodies of *Diplodia* on this cone.

4 Rain and/or irrigation tend to cause a release of *Diplodia* spores (Inset) from fungal fruiting bodies, which then shower the tree with spores. Newly emerging shoots are very susceptible compared to older hardened-off shoots.

5 Believe it or not, even though *Diplodia* is probably the most destructive malady on pines, resistance exists in the natural population of pine species; no one has taken advantage of this opportunity. In Ann Arbor, the pine on the right is decimated by *Diplodia* while the pine on the left is unaffected.

Contributors to Pine Conundrums:

Diplodia Tip Blight: *Diplodia* (fungus: formerly called *Sphaeropsis*…and before that, *Diplodia*!!!) tip blight is probably regarded as one of the most common and destructive maladies on pines (Photo 1). The exotic introduced pines such as Austrian, Scotts and Mugo are very susceptible, but some native pines such as Jack and Red are also affected. Native Eastern White Pine is rarely affected. *Diplodia* initially causes a shoot tip dieback (Photo 2) that may eventually spread to many other shoots, often killing branches. In very advanced situations trees may be killed, even though other factors generally contribute to tree death at this advanced stage. Tip blight may occasionally be found on younger nursery-sized trees, but tends to be much more prevalent on older trees that have reached cone-bearing age because the fungus colonizes the cones and older bark (Photo 3). Pines are most susceptible in the spring as new shoots are emerging. Rain showers (or overhead irrigation, Photo 4) may cause release of spores (Photo 4 Inset) that literally rain down on succulent, susceptible shoots as they are emerging in the spring. Infection and girdling (death) of the shoots may take several days to several weeks, depending on temperature. Fungicide treatments may protect trees or help them recover. Many professional plant health care providers exhibit frustration with the management of *Diplodia*. Timing of the fungicide is critical and the first of several treatments needs to be applied at or slightly before bud break. If this first window of management opportunity is missed, no amount of fungicide application after will stop an infection that may have already commenced. Some arborists also report some success with trunk injections of high rates of propiconazole. There is some natural resistance to *Diplodia* in the natural population of pines, but no horticulturists or plant breeders have taken advantage of it (Photo 5).

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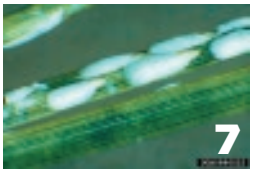
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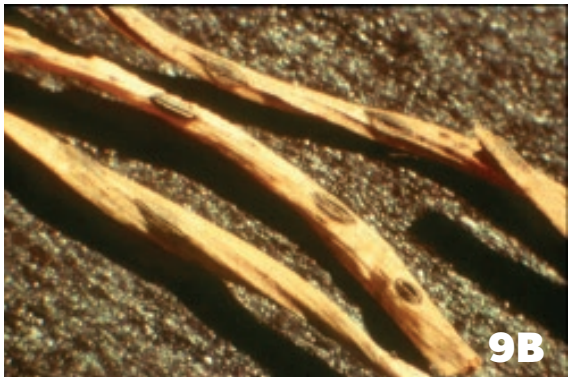
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6 Dead tips in pines may be caused by *Diplodia* or a variety of shoot borers (or other instigators). In this case, the tip was broken off to verify tunneling by a shoot boring insect. Tips killed by *Diplodia* will appear solid and dark in color. Obviously, management of a fungal disease requires vastly different inputs than that of an insect.

7 Pine Needle Scale is very common on pines and can usually be readily identified. Photo from Tim Tigner at Bugwood.com

8 Pine Sawflies (here Redheaded) may appear to be very destructive as they strip needles from shoots in relatively short order. Photo from John Ghent from Bugwood.com

9A & 9B Scotts (Scotch) Pine is affected by a variety of needlecast diseases that typically cause older needles to be "cast" from trees. The needlecast can be identified by the morphology of their fungal fructifications: *Cyclaneusma* (9A) and *Lophodermium* (9B).

10 *Dothistroma* needle blight can be very common on pines, but is most common on Austrian. The disease can be mistaken for salt toxicity or needle desiccation.

Shoot Borers: A variety of shoot borers may attack pines. Several of the more common ones include European Pine Shoot Tip Moth, Eastern Pine Shoot Borer and the White Pine Weevil….and potentially the Pine Shoot Beetle. Shoot borers usually affect the extremities of the branches and may in some cases be confused with *Diplodia* tip blight (Photo 2). Differentiating the two is fairly straight forward; break off the affected tips and look for tunneling (Photo 6). A hollowed-out tip will confirm a shoot borer while a solid, black stem will most likely be indicative of *Diplodia*.

Other Pests: A variety of pests such as scale insects (Photo 7), sawflies (Photo 8), needle miners and so forth are occasionally found on pines. Their identification is fairly straightforward. Sawflies in particular may be perceived as highly destructive as they strip needles from trees in a rather short time period, while pine needle scale tends to build up populations much more slowly. Natural resin secretions on Bristlecone Pine and other "exotic" species have sometimes been confused with insects such as scale.

Needle Diseases – Needlecasts, Needle Rusts and Needle Blights: The various pines are susceptible to particular needle diseases. For example, Scotts Pine (depending on the seed source) is affected most commonly in Michigan by *Cyclaneusma* and *Lophodermium* needlecasts; these diseases are generally characterized by specific appearing fructifications on the needles (Photos 9A & 9B). *Dothistroma* needle blight often attacks Austrian Pine and may be confused with winter desiccation or damage from deicing salt (Photo 10).

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Cultural Disorders: It must be kept in mind that any cultural or environmental issue that affects the health of pines will likely be exhibited first in shoot and foliar growth. A variety of cultural factors may lead to shoot/needle issues such as the cessation of growth or stunting of shoot and needle growth. Over-watering (leading to root rot), over-fertilization, excess mulch, soil compaction, soil disturbance, "fill dirt", herbicide toxicity (Photo 11), and a host of other issues may contribute to pine decline. It is not uncommon for some urban factors to predispose pines to attack by the various pests and diseases.

Environmental Disorders: Salt toxicity, wind damage, ice damage (Photo 12), and lightning strikes are just a few of the environmental disorders we may encounter on pines. Those pines, such as native Eastern White Pine with delicate needles, are more likely to exhibit symptoms from environmental causes than, for example, the introduced Austrian Pine, which is considered far more salt tolerant. With such species as White

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11 Pines can be particularly sensitive to herbicides applied in the landscape or nursery. Many of the herbicides are translocated to the growing points where cell division is inhibited or death may result. This is Imprelis damage.

12 Limbs don't have to necessarily break to cause "ice damage" to conifers.

13 Pines, especially the delicate five-needle pines, may be very susceptible to deicing salt spray or winter desiccation. New, unaffected growth in the spring is quite common.

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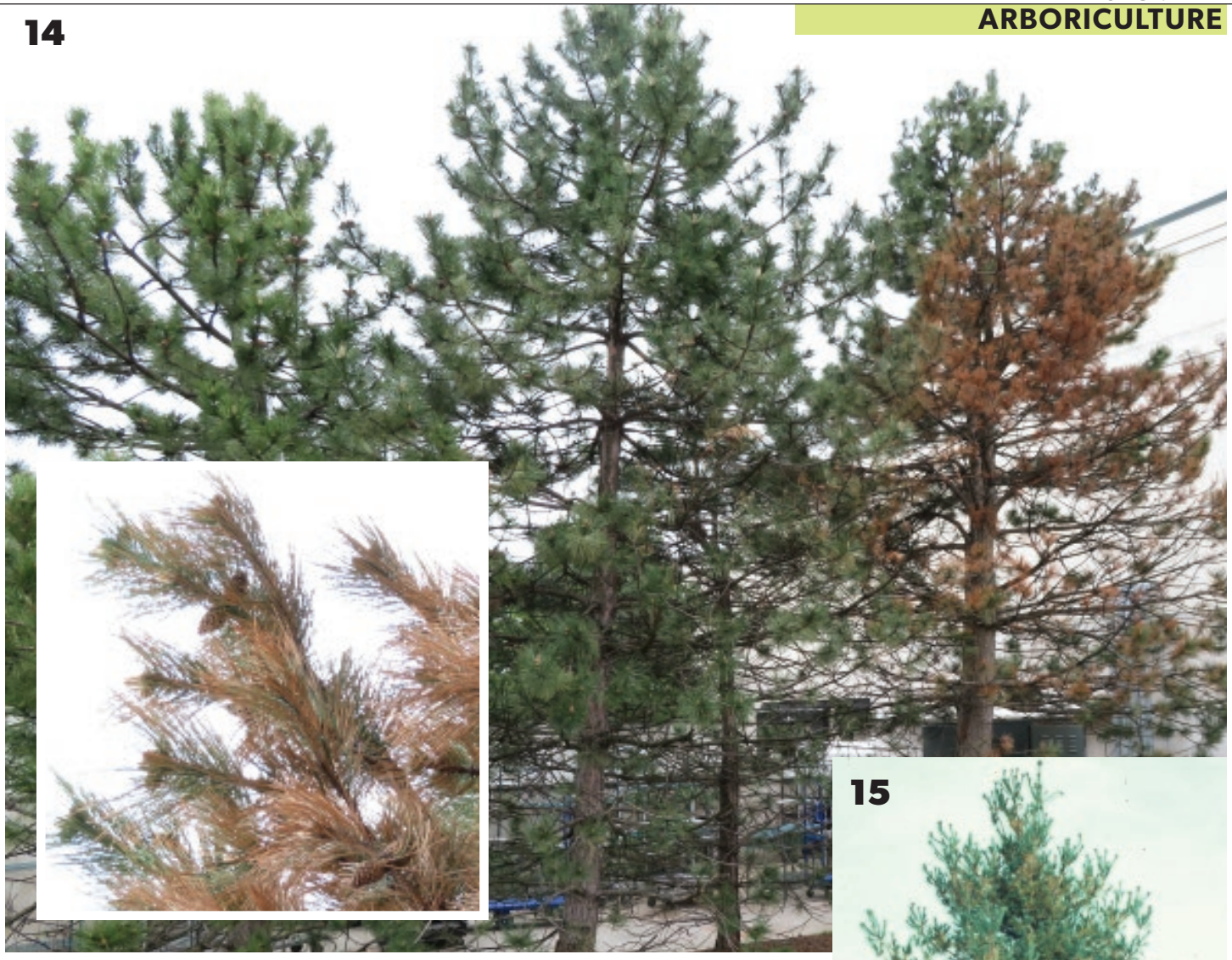

Pine or Flexible Pine, it would be wise to avoid installing them in areas subject to salt spray and/or windy conditions…even in locations where there is a wind tunnel effect. Such needle discoloration may be confused with fungal needle blights. Usually trees affected by salt spray or wind desiccation will produce new, unaffected shoots the following spring (Photo 13). Pines are especially sensitive to pollution (Photo 14 and Inset), but with the stricter EPA laws over the last several decades, pollution damage is not nearly as common as it once was. Many Michiganders become alarmed when many conifers exhibit yellowing, browning, cascading needles in the fall every year; this is completely natural fall needle drop, a deciduous phase of all conifers (Photo 15).

Management of Pine Conundrums:

Occasionally, one or two issues may be the primary factors causing debilitating health of pines in a particular landscape. However, several factors may contribute to Pine Decline. Obviously, accurate diagnosis of the problem(s) is the essential first step to managing the declining health of particular pine trees. It is important to consider all factors involved. For example, abundant irrigation will likely not only cause root problems, but may also promote diseases such as *Diplodia* tip blight and needlecast diseases. When attempting to treat for pests and diseases with pesticides, it is vitally important to identify the causal agent before any pesticides are applied. Furthermore, to obtain the most efficacious treatment, it is important to mitigate as much as possible any of the cultural and environmental issues. Once the problem or contributing issues are identified, inputs to correct the decline are fairly straightforward.

Stay tuned for Pine Conundrum Part 2: Branch, Trunk and Root Maladies. Please feel free to contact the author if assistance is needed in addressing pine conundrums in your area.

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14 Pollution toxicity on pines is not as common as it once was, primarily due to EPA laws and regulations. These pines, however, are affected by pollution near a loading dock where trucks idle for long periods of time (see Inset for needle damage from exhaust).

15 Many Michiganders become alarmed when they witness the older, inner needles of their pines turning yellow, then brown, followed by extreme shedding in the fall. This is simply an all-natural deciduous phase that all conifers undergo despite being "evergreen".