HOW DO WE SAVE OUR PONDEROSA FROM THE IPS BEETLE?

I've had a number of people call me with questions about treatments for Ponderosa that they have heard about to prevent the Ips beetle from infesting their trees, or how to save their Ponderosa once the beetles have entered them.

In answer to the last question, there is NOTHING that you can do to save your Ponderosa once the beetles have entered them. This is not just my opinion – this is what the scientists, the foresters, and the knowledgeable arborists state.

I have talked with pest control people who state that they have a spray for Ponderosa that will kill the beetle and also will save an Ips-infested Ponderosa. I have also called a company who advertised, on the radio, that they have a sure-fire treatment to protect Ponderosa from the Ips beetle.

After talking with these people, I am still not convinced that their allegations are true. So, I would warn Timberridge residents that, if the experts (scientists, foresters, etc.) say that there is no known treatment for the Ips beetle, I would put more credibility in their statements than the statements of those who stand to profit from applying their "cures" to your Ponderosa.

Allow me to describe the "workings" of a tree so that you may analyze for yourself the feasibility of some of the proffered cures. A tree trunk is composed of many concentric cylinders, or layers. When you look at the cut end of a log, you see the evidence of these cylinders as concentric circles, sometimes referred to as "tree rings". Out near the bark is a cylinder, or layer, called the cambium layer, which is really the "heart" of a Ponderosa. This layer is composed of cells that, on the inside of the layer, create another layer of growth cells every year during the spring and summer (the so-called "tree rings"). These newly-created cells, called the xylem layer, are the elongated cells that bring moisture gathered by the roots up to the needles. The needles then, through the "magic" of photosynthesis, convert water with trace minerals from the roots and carbon dioxide from the air into the sugars that constitute the "food" for the rest of the tree.

At the same time the cambium layer is creating the xylem cells on the inside of the tree, it is also adding a layer of phloem cells on the outside of the cambium layer. These phloem cells, also called the inner bark, are the cells used to transport the "food", manufactured by the needles, to the rest of the tree in order to sustain it.

So, we have the xylem cells (the "sapwood") bringing water UP on the inside of the cambium layer, and the phloem cells taking needle-manufactured food DOWN to the rest of the tree on the outside of the cambium layer. And, since the cambium layer manufactures both the xylem and the phloem cells, you can see that it is a very vital part of the tree!

Now for the Ips beetle. The beetle bores through the outer bark (the rough-textured bark that you see on the trunk) to get to the nutrient-rich phloem and cambium layers. There, the beetles mate and lay eggs that hatch into larva. The larva begin chomping away on the cambium and phloem layers, making little tunnels in those layers that can disrupt the flow of food down to the roots and the rest of the tree.

Although these tunnels are damaging to the tree, it takes quite an infestation of Ips beetles to seriously inhibit the flow of food to the roots. The most damage, however, that the Ips does to your Ponderosa is due to the microscopic spores of a "wilt" fungus that the beetle brings on its back into the tree. This fungus, often called the "Blue Stain" fungus, rapidly permeates the xylem cells (the ones that bring water from the roots to the needles) and clogs those cells, thereby inhibiting, and even shutting off, the flow of water to the needles. Needless to say, it doesn't take long for the needles to show signs of water deprivation – they die and turn straw-colored. Were it not for the wilt fungus, after an Ips infestation, the Ponderosa could survive for a while, a few weeks or months, even after its supply of food is attenuated by the proliferation of the Ips larva tunnels in the phloem layer. But, when the xylem cells are clogged because of the wilt fungus, a couple of weeks will see the demise of the water-starved tree. When all of a Ponderosa's needles suddenly turn straw-colored, it is a very probable sign that the wilt fungus has done its dirty work.

So, in summary, a massive infestation of the Ips beetle in a Ponderosa can, by means of the proliferation of larva tunnels in the cambium and phloem layers, cause the demise of the tree, but over a period of weeks or months. However, the quick, almost overnight browning of the entire canopy of needles is most probably the result of the clogging of the xylem cells by the wilt fungus, allowing little or no water to the needles.

With these facts in mind, let us evaluate the potential efficacy of some of the treatments proposed to treat our poor, stressed Ponderosa. Various insecticides have been suggested for spraying the tree. For an insecticide to be really effective on the Ips beetle, it must be ingested by the beetle. A report that I recently read indicated that the Ips beetle feeds on the nutrients in the cambium and phloem layers. The sprayed-on insecticide is applied to the outer bark and does not soak into the phloem or cambium area. Of course, the beetle bores THROUGH the outer bark to get inside the tree, but it does not FEED on the outer bark. So, the beetle would ingest the insecticide only by chance as it bores through the outer bark to get to the phloem and cambium area.

Let us assume that the beetle DID ingest some of the poison as it bored in to the tree, then died in the tree before it had a chance to mate and lay eggs. The fact that the beetle is IN the tree means that the spores of the wilt fungus are also IN the tree. With the spores in the tree, the wilt fungus will spread in the xylem cells to clog them and prevent water from the roots reaching the needles. Consequently, despite the fact that the insecticide killed the beetle in the tree, the damage has been done and the tree may die – not because of a massive beetle infestation but because the dying beetle entered the tree with spores of the lethal wilt fungus.

Since the Ips beetles attack the trunk of the Ponderosa up high in the crown of the tree, spraying is a bit difficult, and overspray in a residential area could be a problem with your and your neighbor's homes. It would be non-productive to spray the lower part of the trunk near the ground because the Ips beetles seldom invade that area. The foresters do use a particular insecticide, Sevin SL (Carbaryl), for special, high-value Ponderosa in and near forest campgrounds. This is a special formulation of Sevin and is NOT the same as the Sevin sold in the nurseries. It is designed to stick to the tree and resist being washed off by rain, but the spraying must be repeated at least yearly, BEFORE the Ips beetles have come out of their dormancy. The quoted costs for spraying each tree runs between $80 and $120, depending on the size and location of the tree. Some pest control people use a high-pressure sprayer to get the insecticide

high up in the tree. However, the likelihood of overspray on your and your neighbor's houses, pets and automobiles is very high, and the insecticide is toxic to fish and bees, although its effect on birds and small animals is supposedly minimal. The best application method is for the workman to either climb the Ponderosa with ropes (NOT spikes!) or be lifted up in the branches with a "cherry picker", then use a portable backpack sprayer to apply the insecticide, thereby minimizing overspray.

Some have proposed using systemic insecticides, i.e., those insecticides that are absorbed by the tree either by means of small, pressurized vials inserted into the base of the tree, or broadcast around the tree to be taken up by absorption through the root system. These systemic insecticides are transported up into the tree by means of the xylem cells along with the water from the roots. So, if the beetles are in the xylem cells, then they will ingest the insecticide. However, the beetles spend their time in the phloem and cambium cells, not necessarily the xylem cells, so the effectiveness of even a systemic insecticide is questionable. The cost of inserting these pressurized vials of systemic insecticide is between $4 and $5 per vial and they are placed about 4" or 5" apart around the base of the trunk. The cost, then, for a 12" diameter Ponderosa would be around $40 to $50 and would be effective only until the vials are empty. Then the vials would have to be removed and replaced for an additional $40 to $50.

Since the big danger to the tree is the wilt fungus, which IS in the xylem cells, then perhaps a systemic fungicide MIGHT be effective, but no one has proposed that treatment, and to my knowledge, no investigation has been done to pursue that approach.

As the scientists, foresters, arborists (and I) have been stating all along, the best defense against the Ips beetle is a healthy Ponderosa! A healthy Ponderosa generates plenty of sap that is distributed by the phloem cells to the rest of the tree. When an Ips beetle bores through the outer bark to the inner bark (phloem cells), he is often pushed out of the tree by the pressure of the sap in the phloem cells or he drowns in the sap! That is the way Nature intended for the healthy Ponderosa to survive! On the other hand, a highly stressed Ponderosa has precious little sap with which to drown the beetle, so the beetle has no trouble getting in the tree to start a family and spread the wilt fungus. That's the way Nature planned to eliminate sickly trees! A Ponderosa can become stressed by lack of water (due to our four year drought), too many Ponderosa in a small area, roots chopped off by contractors, or by roads, driveways and sidewalks covering up roots and depriving them of moisture and oxygen. When a Ponderosa becomes stressed, it exudes chemicals (pheromones) that attract the Ips beetles. Once the male beetle is drawn to and arrives at the stressed Ponderosa, the beetle then gives off his own pheromones to attract female beetles.

Thus, the conclusions of the experts still are, (1) there is no way Ponderosa can be saved once the Ips beetles have entered them and, (2) the most effective and least expensive weapon against the Ips beetle is to keep the Ponderosa healthy so they do not become stressed. There are just two simple things that you need to do to keep your Ponderosa healthy, (1) don't disturb their roots and (2) make sure they get enough water.

It is unwise to fertilize a drought-stressed Ponderosa. A stressed Ponderosa needs all its energy to fight off the Ips beetle and fertilizer would encourage new growth on the tree, which would then detract from its ability to fight off the beetle. Our Ponderosa need

only some supplemental nitrogen, so standard fertilizers should NOT be used. The only fertilizers suitable for Ponderosa in this area are either ammonium sulfate or ammonium nitrate, and then only if applied VERY sparingly in late summer or early fall and with PLENTY of watering by soaker hoses at the time of application and throughout the spring and summer.

Gene Wilkison, Chairman
Timberridge Tree Committee

Sources of information:

a) "Engraver Beetles in Southwestern Pines" – Dr. Jill L. Wilson, US Forest Service
b) "Pests of Forest Trees" – Univ. of Calif., Div of Agriculture
c) "The Great American Forest" – Rutherford B. Platt
d) "The Ips Engraver Beetle" – Dr. Curtis Swift – Colorado State Forest Service
e) "Western Pine Beetle" – Clarence DeMars and Bruce Roettgering – US Forest Service
f) "Anatomy and Physiology of Trees" – Arborist Home Study Course, National Arborist Association
g) "Bark Beetles – Biology, Prevention and Control" – Dr. Jill L. Wilson, US Forest Service and Bob Celaya, AZ State Land Dept.
h) "Ponderosa Pine Bark Beetles in the Prescott Area" – Jeff Schalau. Agent Agriculture and Natural Resources, University of Arizona
i) "Briefing Paper: Sequence of Events Causing Pine Mortality in the Southwestern Region and Possible Actions that can be Taken to Protect High-Value Trees" – Dr. Tom DeGomez, University of Arizona and Dr. John Anhold, USDA Forest Service