An Experiment in Controlling GSOB

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After losing our big oak tree to Golden Spotted Oak Borer (GSOB) in August 2015, we met the entomology professor who wrote the Emerald Ash Borer (EAB) treatment plan for the state of Colorado. EAB was found in Michigan in 2002, has killed millions of trees throughout the Midwest and arrived in Boulder last year. This entomologist was very familiar with GSOB since it is the same genus as EAB. Genus is the taxonomic rank used in the biological classification of organisms; genus comes above species and below family. Both EAB and GSOB titles begin with genus *Agrilus.* He explained the successful, systemic treatment of EAB with Tree-age pesticide (emamectin benzoate or EB) by the Arborjet injection system. He was aware of the same treatment being used for GSOB in oaks. The purple color used on the GSOB traps posted around our valley is the color initially chosen to attract EAB.

Use of a systemic often means applying chemicals directly to the soil at the base of a tree or plant. This is a terrible option for Green Valley, or any area relying on wells, because it poisons the ground water which we all drink. When a systemic is injected into a tree's base, the vascular system of the tree pulls the pesticide up into the tree without contaminating the soil. However, the vascular system of our oak trees is dormant throughout the summer months. The injection system on oaks works best in the spring because their vascular system is fully functioning after the winter rains.

In July, Darry Duhm, the certified arborist from Cragoe Pest Services, measured a few of our trees and gave us estimates on various trees. He was very helpful and informed about oaks. The measurement of the tree's circumference is taken approximately 4 ½ feet above the ground. The circumference is divided by 3 to find the diameter. The price of treatment is $12 to $14 per inch of diameter. A 20" diameter oak was $280 and a 42" diameter ran $530. The prices include the entire treatment. Though it adds up quickly and will need to be repeated in 2-5 year intervals, the possible loss of our highly-valued trees plus the huge cost of removal were compelling reasons to try this.

To decide how and when to treat, our first step was to make a numbered map of the 20+ oak trees on our property and inspect each of them. We decided to treat 5 trees. Trees #1 and #2 have bark bleed which forestry inspected but could not confirm GSOB. Tree #3 has bark bleed and a couple of GSOB emergent holes; not an ideal candidate but we decided to add it to our experiment. Trees #4 and #5 have no symptoms but they are in an area of infection and we would hate to lose them.

In further conversations with Darry, we learned we could jumpstart our oaks' vascular systems with a deep watering 2-3 days before treatment and then water again after treatment to keep the soil moist. We knew we would need to bring water in from outside since Green Valley is on severe water restrictions. This was accomplished using a 300 gallon water container on a trailer. Bruce designed a gravity-feed water system which delivered water to circular rows of drip lines spaced 3' away from the tree trunks and out to the drip line of the tree. (The drip line is defined as the point on the ground where water will drip off the widest-reaching branch. This is important when watering any tree.) The question of exactly how much water to use had multiple answers. The Arborjet regional manager explained that if you dig 2-3" beneath the soil of your oak tree, you will find an intricate network of very fine roots. She said 10 gallons per tree would activate that network which pulls in the water and nutrients for the tree(also a good reason to stop raking up the tree's own nutritious leaf and moisture retaining system).

Another arborist treating oaks with Tree-Age in the Escondido area recommended the moisture be 12" deep into the soil. Cragoe recommended 60 gallons per thousand square feet. Somewhat confused, we planned a watering schedule and treatment for the end of August. Allowing for several water trips in addition to having the water slow- drip at night, we did 300 gallons on the 3 trees in the front yard which have overlapping drip lines, 300 gallons on the back tree and 150 gallons on a smaller side tree. The moisture level reached 12" deep in most places. Tarps laid over the watered areas also held moisture in.

The Tree-Age pesticide is introduced into the tree via clear 3/16" tubing and a ring of injectors 6 to 12" apart which are drilled into the tree at the base. Observing Darry working a tree, we saw the fluid being drawn into each injection site. Two of the trees were a foot away from the house foundation and a large portion of their drip area could not be watered. The un-watered trunk sides were much slower to draw the fluid. The process took about 45 minutes per tree.

We monitored the moisture level under the treated trees and watered again 2 weeks later: 150 gallons on the front 3 trees and 50 gallons on each of the other trees; using tarps once again to help retain moisture. Waiting until spring to treat would have been much easier but considering that our big tree went from healthy-looking to dead in two weeks, we decided not to wait. Watering oaks after 5 years of drought will also help them fight pests and disease. When the adult beetles fly again next May, we'll be watching for their D-shaped emergence holes and hoping that the treatment will have reduced the larvae which overwinter under the bark.

The studies on Tree-Age are limited and not conclusive. Injecting emamectin benzoate(EB) at a high rate is found to be the most effective and Arborjet trains certified arborists in this method. It will last in the tree for a minimum of 2 years and is already on the forestry's approved chemical list. This is not considered an annual treatment. There is another injected systemic, imidacloprid or IC, also used for both EAB and GSOB but EB had better results long term.

For further information, search your browser for Tree-Age as well as Arborjet. A complete review of the 2010-2013 study using both EB and IC on San Diego County oaks was published in the journal, *Pesticide Management Science* in January, 2015. Both the short summary and a PDF of the full study can be found at the Wiley Online Library: http://onlinelibrary.wiley.com/doi/10.1002/ps.3959/abstract

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