

PROGRESS REPORT 2009
North Central Region
Sustainable Agriculture Research and Education (SARE) Program

Project Title: Field study of a technique for combining low-cost, herbicide-free control of woody invasives, in particular *Ailanthus altissima*, with production of edible mushrooms.

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1. Describe in detail your work activities and how you used your grant funds this year.

March 2009: I successfully generated my own mushroom plug spawn in the lab from the 3 native OH strains supplied by Mushroom Harvest. I also renewed my Denison affiliated scholar status; this status allows me to use Denison's information technology resources and other research facilities, including lab bench space in the Dept. of Chemistry.

On March 18, I gave a mushroom cultivation demonstration for Licking Co. Herb Society. About 30 people attended. While the presentation was a general introduction to mushroom log cultivation, I brought and displayed my poster from the OEFFA conference in February (available at http://www.blueowlgarden.com/SARE_poster2.pdf) and briefly summarized my research.



I inoculated trees in Plots E and F (trees T101-T125, T126-150) with a mix of the remaining commercial spawn from Mushroom Harvest and the spawn I generated myself.

On March 28 we did a workshop (with brunch featuring Blue Owl Garden herbs) here at Blue Owl Hollow for 5 members of Slow Food Columbus; the event was our donation to the annual OEFFA fundraising auction in fall 2008. Again, the workshop topic was general mushroom log cultivation, but I made my poster available and we talked about many of the issues involved, e.g., invasive plants, local markets for small farm products, etc. One of the participants is the manager of The Greener Grocer in Columbus, OH, which specializes in selling locally produced foods. Later in the summer, I was able to supply fresh herbs to The Greener Grocer for their Market Bag CSA project.

In conducting the workshop, I was assisted by a friend, Rebecca Mazur, who has an interest in mushroom cultivation. Rebecca has also helped with all aspects of the *Ailanthus* control and inoculation in the test plots. In March, the last 2 plots in the test area, Plots G and H (trees T151-T175, T176-T200), were measured, labeled, and treated for *Ailanthus* control.

April 2009: Trees in the last 2 plots (Plots G, trees T151-T175, and H, trees T176-T200) were inoculated with my own spawn. Also, I inoculated a couple dozen cut logs with the same 3 strains of mushrooms used in the test plots. These will be kept in the yard close to the house and monitored as

controls. Not only will these logs confirm spawn viability, but they will serve as indicators for fruiting cycles/seasons.

May - September 2009: Throughout the summer, I monitored moisture content levels in all the test plots. Moisture content (MC) is one of the critical environmental considerations for mushroom cultivation -- most cultivated species require MC >25% in order to fully colonize the woody substrate. And unlike cut log cultivation, it is impossible to intervene with soaking or other forms of irrigation if the MC drops too low. On these visits, I made other observations, took photos, and recorded notes about sprouts, evidence of mycelium, appearance of other competing fungi, etc. Also during the summer market season, I promoted the upcoming farm tour and talked about my SARE project to interested visitors at our weekly Granville farmer's market booth.



May 2009: We confirmed a date for Blue Owl Hollow farm tour featuring my SARE-funded project to be held Sunday, October 25, 2009 and submitted a short description for inclusion in the OEFFA 2009 Farm Tour publication, which is widely distributed across the region (no longer linked, but still available for viewing at: <http://www.oeffa.org/pdfs/farmtour2009.pdf>). The Blue Owl farm tour was co-sponsored by OEFFA, Licking Co. Soil and Water Conservation District, and the Ohio Dept. of Natural Resources Division of Forestry. In preparation, I identified a dozen or so trees to be used during the farm tour for hands-on demonstrations.

September 2009: I posted electronic copies of OEFFA poster and other SARE-related materials to Blue Owl Garden website: <http://www.blueowlgarden.com/BOprojects.shtml>. Also met with collaborators to put out publicity for up-coming farm tour.

In mid-Sept, I delivered 20 lbs. of wild-harvested sulphur shelf mushrooms to The Greener Grocer. While these were not produced on trees in the test plots, it is indicative of a viable local market for native culinary mushrooms. In addition to our regular shiitake mushroom sales at the Granville Farmer's Market, we also easily sold the first of our log-cultivated oyster mushrooms (another native culinary species). Again, this proves that there is an appreciative local market in which to sell any crop produced by this research. What is not clear yet is whether the cost-benefit ratio will be sufficiently lucrative to make this a major focus for future production.

October 2009: The month of October was dedicated to the farm tour: mowed trails, weeded, hauled logs for milling demonstrations, cut mushroom logs, printed flyers, and otherwise tidied up. The farm tour was held on Sunday, Oct. 25 from noon to 5 PM. Weather was beautiful and approximately 55 people attended. ODNR had a poster display on invasive plant species, collaborator Dr. Dick Doyle was available to identify and discuss wild mushrooms, fellow farmer Andrew Semler demonstrated the use of our Peterson portable sawmill, Rebecca Mazur demonstrated cut log mushroom cultivation techniques, and we provided several additional displays on the SARE project and the production of other non-timber forest products. At least 25 people hiked up to the test plots for hands-on demonstrations where about a dozen people actually tried their hand at the treatment and inoculation techniques. Along the trail on the hike up, I was able to point out Ailanthus which had been treated in previous years as part of our forest management plan and/or EQIP contracts. One of these trees, an Ailanthus ~6" in diameter treated in early 2007, sported a huge flush of naturally occurring



oyster mushrooms -- a most amazing case of serendipitous timing by Mother Nature to highlight the potential benefits of my SARE project.

Although not in fruit at the farm tour, several of the cut logs inoculated with the oyster mushroom strains OH brown and OH white used in the study produced small fruitings, confirming that the spawn is viable.



Also in October, I began working with Granville High School student Jessica Volzke. She has an interest in the laboratory culture of mushrooms. We meet once per week in the Dept. of Chemistry at Denison University. In late spring of 2010, she will present the preliminary results of her individual research project at school.

December 2009 - February 2010: Did another round of visits to all the test plots for photos and stump sprout counts.

February 2010: On February 13, I presented a workshop at 2010 OEFFA conference, describing my Ailanthus control technique and associated mushroom inoculation. Approximately 50 people attended. I updated the Blue Owl website with more on-line resources pertaining to the project, in particular the hand-out from the OEFFA conference, which describes in detail both the techniques for Ailanthus treatment (Step #1) and mushroom inoculation of the trees (Step #2):
http://www.blueowlgarden.com/Ailanthus_mushroom_handout.pdf

Also in February, I requested a one year extension for my SARE project research.

Project expenses in 2009:

Labor: \$735

Operating costs and supplies: \$457

Outreach: \$115

Equipment & spawn: \$35

2. List the results of your project and what you have learned so far.

As noted above, I requested a one year extension of this project. I believe the results in one year will be significantly more informative than what I have right now. My project work has been completed, and while I can show that the mycelium is present in at least some of the test trees, none of the trees have yet fruited, i.e, produced a mushroom crop. This is to be expected, since the incubation period by any fungus is directly proportional to the total mass of the woody substrate. A whole tree, even if it is only a small 4" diameter one, will take longer to produce than a similar diameter 4' long cut log. While there is no guarantee that the test trees will fruit within the next year, circumstantial evidence from naturally fruiting trees in the same area suggest that it is likely. Waiting another year for these trees to actually produce a fruiting will make a much better "story" for my research and provide a much more useful guide for other farmers and landowners who read about it.

The preliminary results to date are much as I expected. Treated Ailanthus in all plots put out some small leaves, but by end of summer had re-directed most of their remaining energy to sending up stump sprouts. In my late 2009 photodocumentation round of monitoring visits to the plots, I also made notes of the number of stump sprouts on each tree with at least some potential for continued growth -- many of the original sprouts were clearly no longer viable even by the end of the first summer. Sprout number

ranged from 0 to 16 with the average being about 6. In past practice, I revisit the trees and stomp down the sprouts 1 year after treatment. Given the controlled environment of this test area, I will take the opportunity of another year to see how many of these first-year sprouts actually make it through the second year. In order to maintain some consistency with the original plan, I will stomp sprouts in half of the test plots this year as planned (Plots A, C, E, G), and leave the remaining test plots (Plots B, D, F, H) until next year to see how much sprout attrition occurs naturally. While it takes virtually no time to stomp down 6 sprouts on a dying *Ailanthus* (10 seconds or less), a high-rate of natural attrition in the second year will save a farmer/landowner many steps and minimize the risks of re-growth posed by failure to followup on the initial treatment. The latter is a major problem for conventional herbicide-based treatments of *Ailanthus*, which still require 1-2 followup visits to ensure tree mortality.

Treated trees are exhibiting signs of brittleness, though. In mid December 2009, central Ohio experienced unusually strong, gusty, but straight winds that lasted ~36 hours. After this event, we discovered that almost half of the treated trees in Plot C had broken off (9 out of 20 treated, 9 out of 25 total). Other plots sustained much less damage. At first glance, this may seem disaster, but it turned out to be quite serendipitous. The broken trees allowed us a look into the tree interior itself. I was able to determine whether the mushroom mycelium was present and also glean an indication of how far the incubation process had gone. Some trees were clearly contaminated with other types of fungi, but several showed fine textbook examples of mycelium spread from the inserted plug spawn into the woody substrate. It was very reassuring to see the spread of mycelium because under normal circumstances, even in controlled log culture, there are few outward indications of incubation until fruiting actually occurs.



3. Describe your work plan for next year.

The primary work for the project has been completed. Monitoring and photodocumentation of the test plots will continue. Now it is mostly a matter of waiting and watching. We know there is mycelium growing in at least some of the test plot trees. We know that oyster mushrooms (which comprise 2 out of the 3 strains used in the study), naturally colonize *Ailanthus* and fruit abundantly in the wild. What we don't know is how long it may take for the inoculated trees to produce a crop. Nor if *Ailanthus altissima* is a sufficiently fertile host capable of producing more than one fruiting. We don't know if *Laetiporus sulphureus* (sulphur shelf) is an equally appropriate species for *Ailanthus*. We do not know if the initial *Ailanthus* treatment is sufficient to kill the trees in a high percentage of cases, or if a revisit to stomp down the stump sprouts is an absolute requirement. Another full year will hopefully give us answers to more of these questions.

4. How did you share information from your project with others? (Include the number of people who attended field days or demonstrations.) What plans do you have for sharing information next year?

See the descriptions of events above, i.e.,:

March 18, 2009 - Licking Co. Herb Society mushroom log cultivation demo (attendance: 30)

March 28, 2009 - Mushroom log cultivation workshop for members of Slow Food Columbus (attendance: 5)

October 25, 2009 - Blue Owl farm tour co-sponsored by OEFFA, Licking Col. Soil and Water Conservation District and ODNr Division of Forestry (attendance: 55)

February 13, 2010 - OEFFA Annual Conference presentation (attendance: 50)

In addition, there has been one-on-one sharing. A particularly intensive interaction is my October 2009-to-present role as mentor to a Granville HS student (see below for more detail on future plans). In addition, a number of people have assisted in the execution of the various activities and events described above; in the process, they have become quite familiar with the research and techniques. These close collaborators number about a dozen. My outreach has also resulted in individual plot tours or long phone conversations with other landowners interested in organic Ailanthus control, numbering perhaps a half dozen.

I do not yet have any scheduled outreach plans for the upcoming year. Jessica Volzke has requested a continuation of her mushroom cultivation research for the summer and into the next school year, if practical. We would like to spend this time identifying and collecting potentially interesting native strains of culinary, fiber, medicinal, or dye mushrooms in the wild and propagating them out for future tests on Ailanthus or other woody sub-strates. We will thus develop a library of useful locally-optimized strains which can be shared with others interested in this work.

Another probable event for late 2010, perhaps October or November, is a mushroom foray on the Blue Owl property, in conjunction with the Ohio Mushroom Society. The SARE test plots would be a focus of this event. Licking Co. Soil and Water Conservation has also suggested another event when we have evidence of fruiting on the treated trees; again, perhaps in fall 2010. I anticipate that other opportunities will present themselves as time goes on.

A third possibility, not yet confirmed, is to continue this research as part of the USDA NRCS Conservation Stewardship Program, once the 2010 sign-ups are announced.

Send completed report by mail or e-mail:

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