Recycling Urban Tree Waste With Gourmet Mushrooms

By Jim Clark

Happy treeguy. Oyster mushrooms on an elm.

If you have the right tools, growing gourmet mushrooms on urban wood waste is *easy* – and if you're a tree guy, chances are you have the right tools.

This article is a continuation of the techniques discussed in *Recycling Urban Tree Waste with Gourmet Mushrooms: Part One* (*TCI* May 2003), where I demonstrated how to use hand saws and drills to cultivate mushrooms without using gas powered tools – easy, small-scale and inexpensive. The focus of this article is growing gourmet fungus on urban tree waste *using* gas powered and other industrial arborist tools.

I have no intention of encouraging you to become commercial mushroom growers. I just enjoy sharing my pictures, techniques, and Web site for informational and enjoyment purposes. I'll show you some advanced methods, but be aware that there are a variety of ways to introduce fungus to wood. I believe many of the techniques shown here are original, and many have never been published before. As a trained commercial mycologist and a scientist who happened to become a residential arborist, I have developed these methods over a five-year period. Using fungus, arborist tools and urban tree waste, I've experimented and taken dozens of pictures to share with you.

Let's start with a review of some basic terminology.

Growing mushrooms on spawn blocks

Spawn is a single specie of pure, edible fungus which, in the clean lab, has been put on sterilized sawdust and allowed to grow completely through it. This fungus-permeated sawdust is commonly referred to as a "block," because it no longer resembles sawdust. When you get a bag of spawn, the sawdust is held tenaciously together in the bag and will be totally white with the fungus covering every part of every sawdust particle. Your mission is to open this bag and move the fungus onto new, fresh wood in order to promote continued growth off the spawn into the wood. Getting the spawn into the wood is the objective. I encourage you to start with white oyster mushrooms (*Pleurotus ostreatus*). They are very easy to grow, will grow on any hardwood, and are a fine edible mushroom. As shown in the photo above, you can harvest a crop off your spawn block. Enjoy them in the frying pan and then use the block to inoculate a log.

A spawn block, ripped in half. Outer tissue will be scraped off and the inner block crumbled so it can be spread on the fresh-cut wood surface.

Using spawn blocks to inoculate a log

Inoculate means to introduce the fungus from where it was (the spawn block) to where you want it to be (in the log or stump). A five-pound block of spawn costs around $25, and you can mix the spawn with fresh sawdust fourfold so you can create 20 to 25 pounds of spawn to work with (see the band mill section at right). For a spawn supplier, see the end of this article. I hope these pictures will inspire you to grow mushrooms, too.

Handling the spawn

When you receive your spawn block(s), understand that it is living material. If you mishandle it, you could damage it, and it will go bad. Keep away from heat sources and direct sunlight, and transport it as gently as you would an infant child. Only when you introduce it to the fresh-cut wood surface will you rip the block in half, scrape off the outer rind and crumble the insides into what once again resembles sawdust.

Spawn blocks fruiting gourmet oyster mushrooms.

part two....

Using a chain saw to open up logs

Here is a series of images showing a few ways to use a chain saw to open up the inside of a fresh piece of hardwood. Once the fresh cuts have been made, spread the spawn into contact with the freshly cut surfaces. It is vitally important that the spawn does not dry out. Once the log is inoculated, it must rest in full shade.

A mini Alaskan mill used to slab a log to expose fresh-cut surfaces.

A shiitake (*Lentinula edodes)* spawn block crumbled on the fresh-cut face of a fresh elm log.

Freehand ripping of a V-shaped slab. The log is then opened up.

Spawn is spread evenly, and the log put back together and left in full shade.

Mycelium from sawdust spawn running across the surface of sawn wood.

Plunge-cutting slots into a maple to introduce blue oyster *(Pleurotus columbinus)* spawn. Spawn packed in, cheese wax melted to seal in moisture.

This curved cut happens when one side of your chain is dull. Layers are packed w/ enoki spawn (*Flammulina velutipes),* the sections are reassembled, placed in shade.

This simple log bench has been spawned with King oyster (*Pleurotus eryngii).*

Using the wood splitter to produce firewood gardens

This is a very simple technique if you have a hydraulic splitter, axe, or even a wedge and sledge. The key here is to not split the wood apart completely. Simply crack it open in five or six places so one end is apart and the other end remains intact. You will pack the spawn into these cracks. If you're using a wedge and sledge, pack the spawn in while the wedge is still in the wood. Pulling the wedge out will then close the split wood and compress the spawn. Then simply stack the logs in the shade like you would rounds of firewood to season. Give them at least a month of incubation and check them after rains, especially in the spring and fall. This technique is one of the easiest I have ever experimented with and no matter how sloppy you are, it always seems to work.

1. Crack each log in five or six places.
2. Pack the cracks full of spawn.
3. Stack your spawned lengths where they will always be in the shade.
4. Young Andrew holding a Lion's Mane fruit body, the delicious *Hericium erinaceus* from cottonwood rounds spawned with this "firewood" technique.

Using a band mill to spawn large grade-B logs

Not every trunk is worthy of milling into lumber, but with a bag or two of spawn, you can mill yourself a mushroom garden that could fruit gourmet edibles for years (or provide you with exotically spalted lumber next season). It is *very important* to start with a healthy, live, fresh log. The bark must be intact with no evidence of another fungus growing on the wood. Infestation by ants, or cavities in the trunk are also not favorable. Your choice of logs must be relatively clean and of a *hardwood* species, not from a conifer. It can be a flaring buttress section, crotch section or a curved log, but it must be fresh.

Spawning logs almost certainly requires being able to move them. A log arch is very effective and highly recommended.

How to Spawn Large Logs

Getting the log and the mill together is the hard part. Spawning the log is a breeze.

1. Make your first cut thick and beefy. Remove it from the mill and place it in its shady place *cut-side up*, hopefully where it will rest permanently. You really don't want to have to move the log again, unless you have a log arch. In this case, you can move an entire log conveniently.

2. *Cut side up*, crumble and mix your spawn block with some fresh, just-off-the-mill sawdust in a ratio of four parts sawdust to one part spawn as in the second and third photos. This expands your spawn and gives the mycelium some fresh, instant food after the trauma of having its body broken up into several thousand tiny pieces. By expanding the spawn, you can inoculate four times as much wood or inoculate four times as densely for greater mushroom production.

3. After the first thick slab, cut the rest at 8/4 (2 inches or 50 cm). Take the second cut, a 2-inch thick slab, and flip it over (just as you did the first). Then, lay it on top of the first slab you spawned. You now have a slab sandwich with spawn in between and a clean, fresh-cut side facing up. Spawn this second face (just as you did the first). Spread the spawn / sawdust mix evenly across the surface, side to side and end to end. Get ready for your next 2-inch slab and repeat the procedure.

4. By now you are in a groove. Spawn each and every level of the log in the same way. Enjoy the experience with confidence; there's really no wrong way to do it.

5. Make the last and final slab bigger and thicker, like the first one. Flip that one over onto the freshly spawned face of the topmost slab. That completes your 500 Kg gourmet mushroom garden.

6. Stake the log to prevent kids from moving layers, destroying the garden, or hurting themselves.

Sealing the ends of the logs is a good idea. I like to use cheese wax, but it can be hard to find, so I also buy candles from the thrift shop. Rub these *vigorously* into the end-grain of the logs and then use a propane torch to melt the wax. This works very well, is

cheap, easy, and keeps the ends of your hard-earned garden from drying out, which would kill the spawn along the ends. Give this garden a month or two after a rain. The timing of when mushrooms fruit depends on a number of factors, such as:

- overall size of the log;
- vigorousness of the spawn;
- species and density of the wood;
- strain of mushroom;
- average temperatures;
- amount of rainfall.

Having your log resting in the shade is absolutely essential. If your region suffers through a drought, fill up six one-gallon milk jugs with water and screw the caps on tightly. Set them on top of the log and make a small puncture hole on both sides of each jug at the bottom to make a low-tech, low-cost, slow-drip irrigation system.

Sometimes what you don't see is what it's all about. The photo below is of *mycelium*. The wispy, filament-like growth you see here in this close-up is growing from only *two single pieces* of sawdust spawn. In our logs, we put down thousands of pieces of these fungal growth particles. Inside a band mill cut log, you disperse spawn throughout; top to bottom, side to side, end to end, completely. That's what makes the band mill such an effective method.

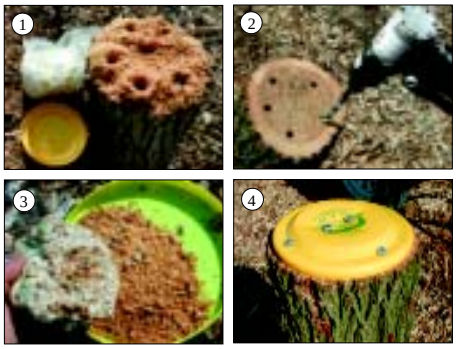
There's a lot of really good mushroom cultivation information out there, but what you're seeing here is different. It's written *by* a tree care professional *for* tree care professionals.

Mushrooms such as these delicious Blue Oysters (*Pleurotus columbinus)* can be induced to grow out the ends of your logs using the *Frisbee technique*.

Using a band mill is the fastest and most effective way to spawn large logs.

Spawning logs using the Frisbee technique

Allow me to describe this fine method through the captions on the photos.



1. Get yourself a fresh hunk of live, *non-diseased* hardwood limb that is of the same diameter as a Frisbee you're willing to sacrifice. Bore holes into the end-grain. Scrape the new sawdust onto the Frisbee.

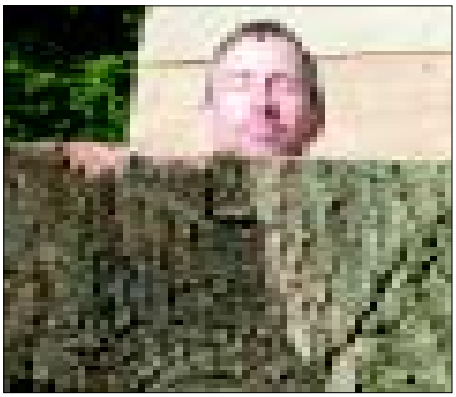
2. To bore holes into the end-grain of a log, I use a hydraulic impact wrench running off a hydraulic circuit from my chipper.

3. After boring the holes, crumble up the spawn and mix it with the sawdust. Once mixed, pack the holes full of spawn. I use the non-drilling end of the drill bit to pack the holes tightly. Pack until all the holes are filled. Hopefully there is still plenty of spawn left on the Frisbee. In fine, omelet-flipping fashion, slap the spawn-filled Frisbee directly onto the end of the log. Screw or nail it in place, and set the log to rest in the shade. Ignore it for at least a month.

4.This is why I call it the *Frisbee technique*. The Frisbee seals in moisture and mushrooms will fruit out the edges of the log.

Spawning rounds using the plastic sheeting technique

As always, your wood must be from a live tree and free of visible disease, bug infestation or cavities. The plastic sheeting technique is almost the same as the Frisbee technique, except you use plastic sheeting instead of a Frisbee and big rounds instead of Frisbee-diameter ones. These are among my best and longest-producing gardens. While this technique is made efficient by the power of a hydraulic impact wrench and a 29-inch auger bit, it still requires some physical work.



Using the *plastic sheeting technique*, a big round can be a stump inoculation, only without the root system.

1. Dig a shallow hole, bigger around than the round, only a few inches deep.

2. Place plastic sheeting across the freshly dug hole.
3. Sprinkle a layer of spawn on the sheeting.
4. Flop the big round directly onto the layer of spawn. You have just spawned the underside of this round.
5. I used the hydraulic impact wrench to plow 30 holes into the end-grain of this massive oak trunk in just a few minutes. Packing the holes with spawn can take well over an hour.
6. Once the holes are packed, cover the entire top surface of the round with spawn, and cover that with the plastic sheet. Secure the plastic to the wood with a staple gun. Let rest in the shade. You're finished.

The hydraulic impact wrench can also bore holes through the sides of logs effortlessly. These holes can be packed full of spawn, waxed over to seal in moisture, and left to rest in the shade.

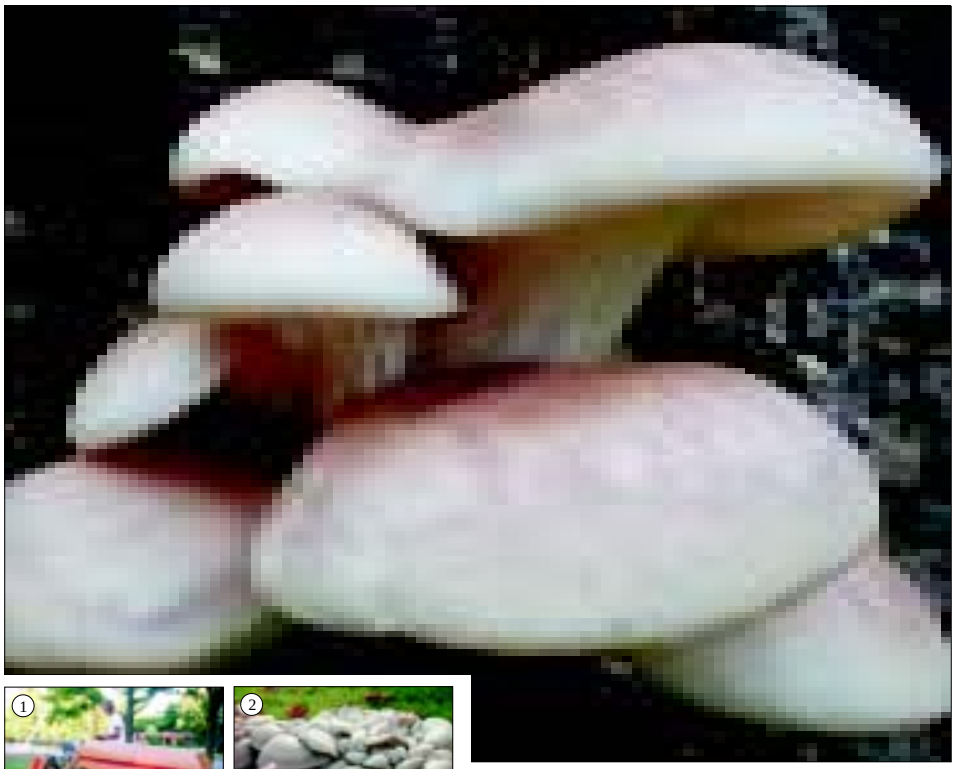
Using the stump grinder to inoculate a stump

Talk about *easy*! Easy, that is, if you have a stump grinder. The only real downside to this method is that you can't move this one into the shade. Often the tree that was above it was its only source of shade. The advantages to stump culture using a stump grinder, besides being the easiest of all the techniques shown here, is that the mycelium will colonize the root system underground, where it is perpetually cool and moist, just the way mushrooms like it. Since there's an immense food and water source all nicely packaged together down there, mushrooms can grow to immense sizes, seemingly right out of the ground. Here's how it's done:

1. Grind the stump.

2. During the grind, throw fist-sized chunks of spawn right into the area of action until the spawn block is gone, and the stump is a pile of mulch. Pack the mound firmly. You're done. These sites fruit mushrooms sooner than most, possibly within a month, depending on the environmental factors discussed earlier.

Being a scientist who owns a tree care company has allowed me to share with you methods of growing gourmet mushrooms on tree parts quite unlike normal commercial or research growing methods. All the work was done in the name of recycling and reutilization of urban tree waste. This is my personal effort toward keeping the planet green, and of course, I thoroughly enjoy cooking with mushrooms and eating them. Good luck and *Bon Appétit*!



1. **Stump grinding in action.**
2. **Monster edibles from the roots beneath.**
3. **Most of the time your outdoor gardens will produce mushrooms after a rain, but mushrooms from underground root systems seem to flush whenever they feel like it.**
4. **A fruiting stump of shiitakes, *Lentinula edodes*, can be as much art as it is nature.**

Morels can be grown in outdoor patches. The process that has worked for me uses a specially equipped 6-inch personal industrial chipper. See my Web site at treeguy.info for more.

To buy spawn and mushroom cultivation supplies, visit: www.mushroompeople.com or call 1-800-692-6329 to request their catalog.

Visit www.treeguy.info for more techniques, such as reating a miniature log cabin spawned with shiitake, growing white morels indoors, growing black morels outdoors, and how one single tree guy recycles over 100 tons of tree waste a year. TCI