

# Growing Mushrooms on Logs Bolts

Plug Spawn

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As far as growing Shiitake mushrooms outdoors, cultivation on logs, or ‘bolts’ is most common. The process is fairly simple. This guide will help you plan for an effective cultivation experience and give you some insight before you have the logs out and ready to grow mushrooms. Keep in mind that this process is slightly different for each grower and will benefit from personal adjustments as you become a more accomplished grower. Here is how we do it and some advice we learned along the way.

## Supplies:

- logs, 3-4 feet long, 4-6 inch diameter
- ‘dowel’ or ‘plug’ spawn
- high speed drill
- 5/16” drill bits with stop at 1”
- food grade cheese wax, or bees wax
- foam paint brushes or daubers
- electric fry pan , or propane burner
- old sauce pan for melting wax
- hammer
- aluminum tags or for labeling material the logs
- sturdy work surface
- log holder (jig)
- safety gear: work gloves, goggles

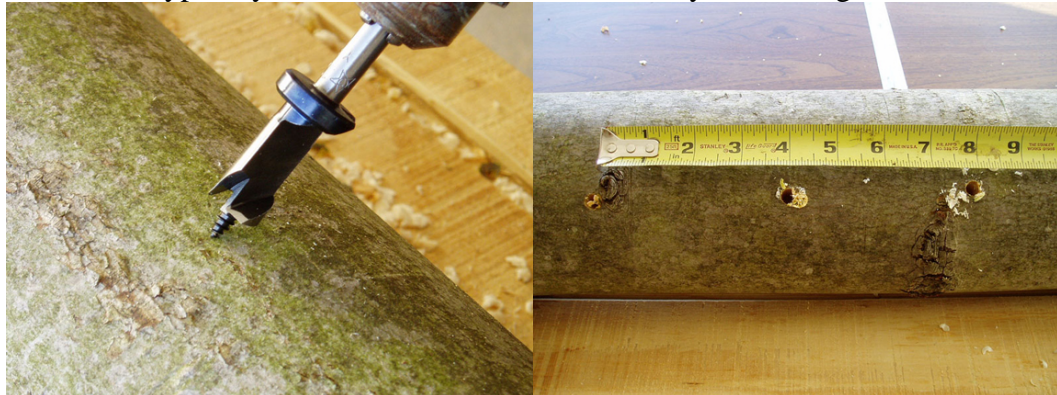
## Cutting of Logs

It is important to have fresh logs for inoculation because they have a high moisture content, little or no competing wild fungi, which are two important factors for successful mushroom cultivation. If you are cutting your own trees, it is best done late winter or early spring; at least a couple of weeks before bud-swell. This is also the time when the bark is tightest around the trunk and will prevent early bark loss later on. An intact bark is a very important component of the log in order for it to retain moisture and block pathogens from entering the log. Logs are typically 4-6 inches in diameter. Larger logs can be used but they are obviously more difficult to manage. This diameter range was

chosen because it optimizes the amount of sapwood per volume of log. The sapwood is the primary part of the log that the fungi will colonize. Length is not as pertinent as diameter for health of the fungi, but a 3 to 4 foot long is manageable for transport and individuals to carry. The species of tree used for mushrooms is going to be dependent on what species of mushroom you are trying to cultivate. Mushrooms can be picky about what tree that they would like to eat! Tree species will also be dependant upon what you have available in your woodlot and what sort of forest management plan you have. In general hardwoods like oak and sugar maple perform best. Research is underway to determine what other species make acceptable substitutions.

### **Inoculation Method:**

- 1) Logs are set in a simple jig (guide). This is just a simple 2 X 4 attached to a piece of 2' x 4' x 1/2" plywood with the 2x4 marked at 4 inch intervals to guide the spacing of drill holes. The guide is helpful in keeping the log steady and to insure that the holes are more or less evenly spaced.
- 2) Drill holes, 5/16" diameter, 1' deep, every 4 inches along the log. Rotate log and repeat. To create a diamond pattern, shift the 2" down along the guide for every other row. Typically 1 row of holes is drilled for every inch of log diameter.



- 3) Place a plug (dowel) spawn in each drilled hole and hammer it into the log. Each plug should lie just below flush with the log surface.



- 4) Heat wax in sauce pan on an electric fry pan. If you don't have access to an electrical outlet, a gas stove (i.e. Coleman stove) works fine, but the combination

of molten wax and an open flame is not as safe as an electrical heat source.

Besides the pot of wax within the electric fry pan is sturdier and easier to control.

- 5) Apply thin layer of liquid hot wax with the foam brush over the holes. Logs should be dry before applying wax or else the wax will not form a tight seal over the plug and will peel away easily.



- 6) Apply thin layer of liquid hot wax with foam brush or large paint brush over both ends of the log.
- 7) Label the logs with a date, tree species, mushroom species and any other information you find pertinent. This is recommended for home growers because it is useful over time to learn from what you do well, and also what mistakes you have made. This will allow your personal cultivation method to become more effective over time.

### **The Laying Yard:**

Before you begin, think about where you are going to keep all the logs once they are inoculated with mushroom spawn. This will become the ‘laying yard’ which is the place where the logs are incubated and where routine “maintenance” is performed. Almost nothing is more important than laying (incubating) the logs under year round shade in order to keep the logs from drying out due to sun and wind. A laying yard beneath the canopy of a coniferous forest is best. A deciduous canopy will suffice but it will be necessary to protect the logs with (80%) shade cloth or pine boughs during the winter. Other important aspects of the laying yard include slope, microclimate, and accessibility. The slope and microclimate of the laying yard will affect how you lay the logs. For example, if it is a sight with lots of exposure to wind, one may choose to lay logs closer together to maintain log moisture. It is very important that the laying yard is accessible so



that you may irrigate the logs if desired and check for fruiting regularly during the growing season.



### **Maintenance of logs:**

The Fungi will take a little less than a year or more to colonize, before fruiting (mushroom formation) begins. You can check for colonization by looking at the ends of the logs; there should be visible mycelium in the form of fuzzy white patches on the ends. If you want a more conclusive look, you may sacrifice one log and cut a cookie out of the middle, soak it in water for several hours and in a few days the white mycelium should be visible.

Once the log is colonized you may induce fruiting of mushrooms by ‘shocking’ the logs. This involves soaking the logs in water for a 24-48 hour period. Over time you should check that the logs are retaining moisture. If logs drop below about a 25% moisture level you may want to consider irrigating them. Irrigation may be done with a hose, soaking in a tank or nearby stream. It is important that they are thoroughly soaked so that they may become wet into the log and not just on the surface of the bark. If the bark is made wet and only stays wet this may encourage the growth of ‘weedy’ fungi such as *Diatrype*, *Hypoxylon*, and *Turkeytail*. If you do see large amount of ‘weedy’ fungi colonizing the logs you should separate them from the other logs. Other potential pests include insects and rodents.