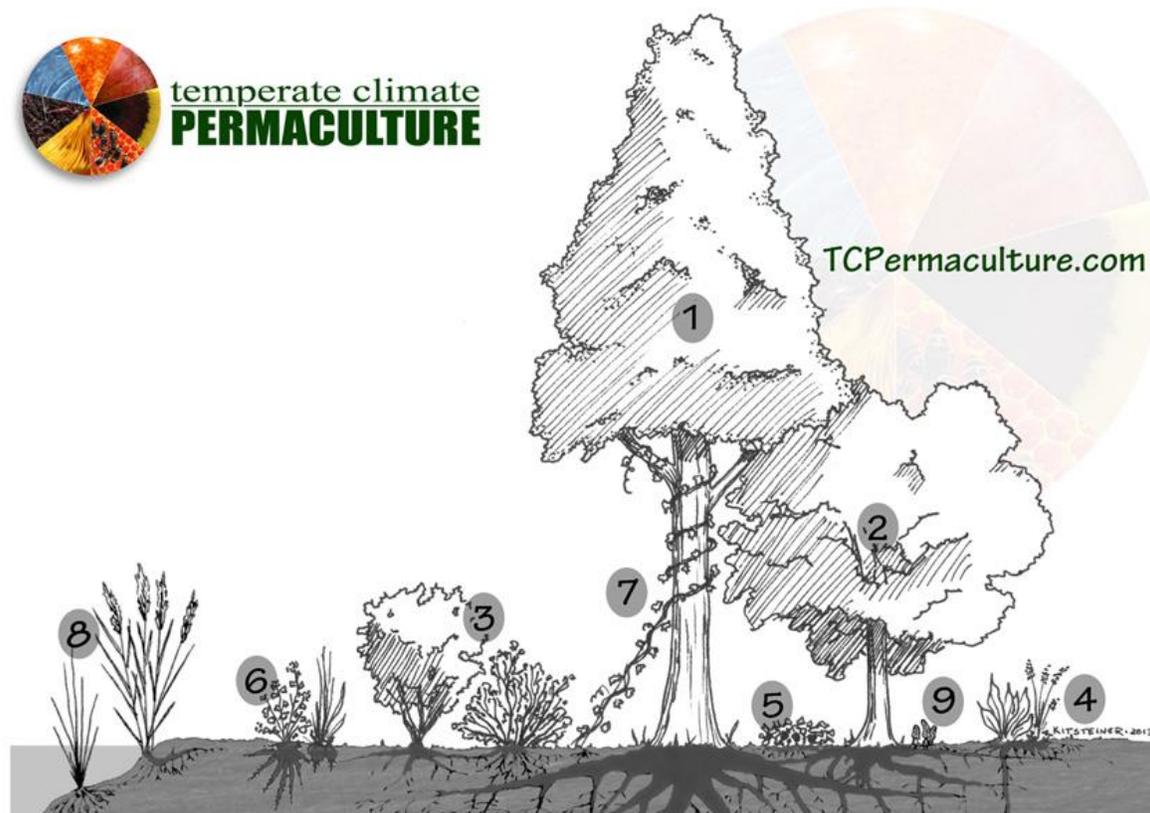




temperate climate  
**PERMACULTURE**



## Nine Layers of the Edible Forest Garden

- |                                 |                           |
|---------------------------------|---------------------------|
| 1. Canopy/Tall Tree Layer       | 6. Underground Layer      |
| 2. Sub-Canopy/Large Shrub Layer | 7. Vertical/Climber Layer |
| 3. Shrub Layer                  | 8. Aquatic/Wetland Layer  |
| 4. Herbaceous Layer             | 9. Mycelial/Fungal Layer  |
| 5. Groundcover/Creeper Layer    |                           |

### Nine Layers of the Edible Forest Garden (Food Forest)

Food Forests have been around for thousands of years in tropical and sub-tropical climates. In fact, there is a Food Forest currently still producing food in Morocco that was established 2,000 years ago! The concept of food forestry was almost lost to the annals of history when Robert Hart decided to adapt this design to his temperate climate in the UK in the 1960's. The idea of a Forest Garden was brought to the public's awareness when Robert wrote a book documenting his grand experiment. Bill Mollison, the co-founder of Permaculture, visited Robert's site in 1990, and he quickly adopted this design element into his teachings and work. Initially, when Robert Hart described the layers of the Forest Garden, I believe he did so based on what he had and what he studied. Since then, Robert Hart's categorization of the layers of the Forest Garden has stood unquestioned.

Until now.

I am not actually arguing about the existing layers. My issue is that there are certain layers that have been ignored or overlooked. My goal is to resolve this discrepancy today. As you can see in my illustration above, I believe that there are 9 layers in a Forest Garden. The first 7 are identical to Robert Hart's initial design. The missing layers are the **Aquatic or Wetland Layer** and the **Mycelial or Fungus Layer**.

Here are my **Nine Layers of the Edible Forest Garden**:

1. **Canopy/Tall Tree Layer**
2. **Sub-Canopy/Large Shrub Layer**
3. **Shrub Layer**
4. **Herbaceous Layer**
5. **Groundcover/Creeper Layer**
6. **Underground Layer**
7. **Vertical/Climber Layer**
8. **Aquatic/Wetland Layer**
9. **Mycelial/Fungal Layer**

### **1. Canopy or Tall Tree Layer**

Typically over 30 feet (~9 meters) high. This layer is for larger Forest Gardens. Timber trees, large nut trees, and nitrogen-fixing trees are the typical trees in this category. There are a number of larger fruiting trees that can be used here as well depending on the species, varieties, and rootstocks used.

### **2. Sub-Canopy/Large Shrub Layer**

Typically 10-30 feet (3-9 meters) high. In most Forest Gardens, or at least those with limited space, these plants often make up the acting Canopy layer. The majority of fruit trees fall into this layer.

### **3. Shrub Layer**

Typically up to 10 feet (3 meters) high. The majority of fruiting bushes fall into this layer. Includes many nut, flowering, medicinal, and other beneficial plants as well.

### **4. Herbaceous Layer**

Plants in this layer die back to the ground every winter... if winters are cold enough, that is. They do not produce woody stems as the Shrub layer does. Many culinary and medicinal herbs are in this layer. A large variety of other beneficial plants fall into this layer.

### **5. Groundcover/Creeper Layer**

There is some overlap with the Herbaceous layer and the Groundcover layer; however plants in this layer are often shade tolerant, grow much closer to the ground, grow densely to fill bare patches of soil, and often can tolerate some foot traffic.

## **6. Underground Layer**

These are root crops. There are an amazing variety of edible roots that most people have never heard of. Many of these plants can be utilized in the Herbaceous Layer, the Vining/Climbing Layer, and the Groundcover/Creeper Layer.

## **7. Vertical/Climber Layer**

These vining and climbing plants span multiple layers depending on how they are trained or what they climb all on their own. They are a great way to add more productivity to a small space, but be warned. Trying to pick grapes that have climbed up a 60 foot Walnut Tree can be interesting to say the least.

## **8. Aquatic/Wetland Layer**

This is my first new layer to the Forest Garden. Some will say that a forest doesn't grow in the water, so this layer is inappropriate for the Forest Garden. I disagree. Many forests have streams flowing through or ponds in the center. There are a whole host of plants that thrive in wetlands or at the water's edge. There are many plants that grow only in water. To ignore this large list of plants is to leave out many useful species that provide food, fiber, medicinals, animal feed, wildlife food and habitat, compost, biomass, and maybe most important, water filtration through bioremediation (or phytoremediation). We are intentionally designing Forest Gardens which incorporate water features, and it is time we add the Aquatic/Wetland Layer to the lexicon.

## **9. Mycelial/Fungal Layer**

This is my second new layer to the Forest Garden. Fungal networks live in healthy soils. They will live on, and even within, the roots of plants in the Forest Garden. This underground fungal network transports nutrients and moisture from one area of the forest to another depending on the needs of the plants. It is an amazing system which we are only just beginning to comprehend. As more and more research is being conducted on how mycelium help build and maintain forests, it is shocking that this layer has not yet been added to the list. In addition to the vital work this layer contributes to developing and maintaining the forest, it will even provide mushrooms from time to time that we can utilize for food and medicine. If we are more proactive, we can cultivate this layer intentionally and dramatically increase our harvest.

Source: <http://tcpermaculture.com/site/2013/05/27/nine-layers-of-the-edible-forest-garden/>

## In Defense of my Ninth Layer (of the Forest Garden): the Mycelial/Fungus Layer

*(photo is the Shaggy Mane Mushroom (Coprinus comatus), one possible addition to our Forest Garden design)*

I wrote an article yesterday outlining my proposal to add two layers to the Forest Garden. You can read that article here: [Nine Layers of the Edible Forest Garden](#). Within just 24 hours, I have received a number of emails and comments in support. While almost everyone has agreed with my addition of the Eighth Layer: Aquatic/Wetland Layer, I have a number of people questioning the details of the Ninth Layer: Mycelial/Fungus Layer. Most are asking why add Fungus but not bacteria, or worms, protozoa, etc. for that matter? Why not just call it the Underground Life Layer or Soil Layer or something else that is more inclusive?



Well, here is my response.

Let me start by restating what I wrote yesterday:

*This is my second new layer to the Forest Garden. Fungal networks live in healthy soils. They will live on, and even within, the roots of plants in the Forest Garden. This underground fungal network transports nutrients and moisture from one area of the forest to another depending on the needs of the plants. It is an amazing system which we are only just beginning to comprehend. As more and more research is being conducted on how mycelium help build and maintain forests, it is shocking that this layer has not yet been added to the list. In addition to the vital work this layer contributes to developing and maintaining the forest, it will even provide mushrooms from time to time that we can utilize for food and medicine. If we are more proactive, we can cultivate this layer intentionally and dramatically increase our harvest.*

Now let me elaborate a bit.

Permaculture is about design. The seven existing layers of the Forest Garden are designed by us. Nature takes what we have designed and runs with it. We just get to benefit from nature's work. We can also design the Mycelial/Fungus Layer. We can choose to inoculate with specific fungus. We will provide specific habitats. Of course, nature will also do its own thing, but we can use design to influence (and experiment) with how we would like the Mycelial/Fungus Layer to be incorporated into our system. The other soil elements (worms, protozoa, bacteria) will be a natural component of our Forest Garden, but they will not be an element designed by us.

If we look at things from a broader scale, we need to consider that pastures and fields are bacteria predominant. This is strongly influenced by the ruminant animals that live in this environment and deposit large amounts of bacteria-laden manure on a daily basis. As a field lays fallow and are not grazed by ruminants, the fungal population rises. The mycelium will then “select” which bacteria stay and which ones are not allowed to stay; the fungi can actually produce antibiotics to achieve this. Perennial plants and shrubs will start to take over the fields which will then allow pioneer trees and then young forest trees and finally mature forest trees. All the time this is occurring the fungal to bacteria ratio is climbing, eventually reaching at least a 10:1 ratio and likely closer to a 20:1 ratio (i.e. there are 20 times more fungi than bacteria).

While we may occasionally use some bacterial inoculum on our legumes and other nitrogen-fixing plants at the onset of development, and this will speed the land recovery process, it is the fungi that are our primary goal. Using fungal inoculum on our shrubs and trees in the Forest Garden will give them a significant advantage, and this has been proven time and time again in well-designed research studies. You can read any of the work from Paul Stamets (my favorite is *Mycelium Running*) to get an overwhelming amount of references for the benefits of fungi in the forest. While bacteria and other elements play a role in healthy soils, the influence of any of these elements is nothing compared to that of fungi.

In addition, while the other elements (worms, protzoa, etc.) are very important for soil health, we can harvest almost nothing from them. Fungi will produce mushrooms which can be used in many ways. We can eat them; mushrooms are one of my favorite foods. We can use them for medicine; this has been practiced for thousands of years, and modern medicine is just finally starting to acknowledge their benefit outside of antibiotics. As a physician, I am well aware of this. We can also use them for dyes, fire starters, crafts, and even water and soil rehabilitation (mycofiltration and mycoremediation respectively). While illegal in many countries, the Psilocybin mushrooms are used for their psychoactive properties to induce a “spiritual experience”. It is very difficult to explain this (and I have not tried it), but those who have report an insight to the natural world which they cannot quite explain but they often describe as the most significant moments in their lives. It is easy to shrug this off as a form of intoxication, and maybe that is all there is to it, but researchers are now using these mushrooms to successfully treat Obsessive-Compulsive Disorder and Migraines. Finally, with any of these mushrooms, and I mean the legal ones now, we can also sell them for a supplementary income. The other elements of the “soil layer” don’t offer anything close to this.

Finally, and closely related to the previous point, we will do almost nothing to manage any portion of the soil elements other than the fungi. We will be “managing” the fungi if we want a reliable harvest. We will inoculate our tree roots. We will provide wood chips or straw or manure or logs which provide food for them, which will in turn provide mushrooms for us. This is exactly how we treat every other layer in the Food Forest system. We provide for their needs and then harvest the surplus. Again, the other elements in the soil do not need our management and they provide no harvest for us.

There you have it. These are my reasons and defense for my addition of the Ninth Layer of the Edible Forest Garden: Mycelial/Fungus Layer.

Source: <http://tcpermaculture.com/site/2013/05/28/in-defense-of-my-ninth-layer-of-the-forest-garden/>

