Designing an Integrated Perennial Food Forest
At Pacific University’s B Street Permaculture Project
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What is a Food Forest?

Forest Gardening is an aspect of Permaculture Design – a growing field of ecological study that seeks to build a "permanent-culture". It is a way of observing patterns in nature to apply what already works to designing homes, landscapes, food systems, & lifestyles. Any design using principles of Permaculture will be more efficient, effective, and ecologically balanced.

Food Forests are intentionally designed, multi-layered productive ecosystems that give high outputs with low inputs. These systems are both enriching and self-sustaining, capitalizing on the many layers which exist in natural systems, so they thrive from root layers to treetops. They utilize what Permaculturists call "guilds" – plants which work together filling niches of space, all mutually benefitting from a diversity of species and functions (See Fig. 1 & Fig. 4).

Sustainability

“Sustainability” – put simply – means that something can be “sustained” over time, without having to put in excess energy to get a result. Permaculture works to minimize or close loops to energy losses wherever possible and we’ve noticed that sustainable systems have these essential things in common:

• Whole > Σ parts. Things work best when they work together.
• Does not damage other systems.
• Energy out > Energy in (excluding daily allotment of solar).
• They have many layers. Forest gardens are sustainable systems which cycle nutrients in a continuous way. Once established, they continue to survive independently; they take care of themselves. But beyond just being sustainable as an ecological system, it’s also sustainable financially and in its longevity.

Financial sustainability has us consider that plants are expensive and can add up quickly. This project has a purchase value of approximately $6,200 – but our methods have kept costs in only the hundreds (See Propagation). In years to come, forage shrubs on site will also cut the cost of animal feed. In addition, labor may be captured into the classroom, and research participation ensures that students have opportunities for valuable hands-on learning and the university can perpetuate student engagement (Fig. 10).

The information we have gathered will be used by future Pacific students to manage the project and see it to its next stages.

Design

Our project was designed as a ‘forest of food’. This diagram shows the seven layers of a Forest Garden, so that all niches above and below ground are being utilized to their highest potential.

Under The Walnut Tree

We started with one Walnut and one Apple. Walnuts are a tricky, Allelopathic tree, meaning it emits a toxin into the soil (called Juglone in this case), which creates an inhospitable environment for many plants to grow in. Much of our research was done around what plants grow well with Walnut trees and almost all of our species selections are either Juglone tolerant, or are able to create buffers for more sensitive plants to thrive that otherwise could not (Mulberry does this very well). This particular guild’s qualities, not surprisingly, also include good weed suppression.

Propagation

Propagation is the process of taking cuttings of wood, stems, or buds from existing plants and rooting them or attaching them to other wood to make additional plants. There are many different methods of propagation and which one is used depends on the type of plant and the season when propagating. Propagation cuts costs and allows you to choose for specific, desirable traits.

To have a greater chance of success, rooting hormone is used on the cutting that have been taken. Chemical rooting hormone comes in liquid and powder form. The most common is called indole-3-butyric acid, or IBA. IBA is an Auxin, which stimulates growth, allowing for cuttings to root more quickly and successfully.

There are a few known alternatives to chemical rooting hormones, most well-known are organic honey and willow water. These both have been known to have the same basic properties in assisting plant rooting during propagation.

Perennial Productivity

A single tree may have ten to thirty acres of leaf surface.

Trees and other woody perennial plants are integral pieces in ecological gardening because they are:

• Extremely productive with a variety of outputs (shade, habitat, food, wood, mulch…)
• Carbon and water sequesetering
• Soil enriching/nutrient accumulating
• Resilient
• Aesthetically pleasing
• Perennial (do not need to be re-planted every year)
• And you can grow a lot of other plants underneath them, as well.

Table 1: Crop Data & Planting Type

<table>
<thead>
<tr>
<th>Crop</th>
<th>Root Type</th>
<th>Planting Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
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<td>Annual</td>
</tr>
<tr>
<td>Nut Tree</td>
<td>3</td>
<td>Perennial</td>
</tr>
<tr>
<td>Fruit Tree</td>
<td>15</td>
<td>2018</td>
</tr>
</tbody>
</table>

This design is a completed product of our research this summer. It represents a to-scale guideline for the parcel of land, featuring a material, but also food, and nutrient accumulator; Clover is animal forage, but also weed suppressor and nitrogen fixer).