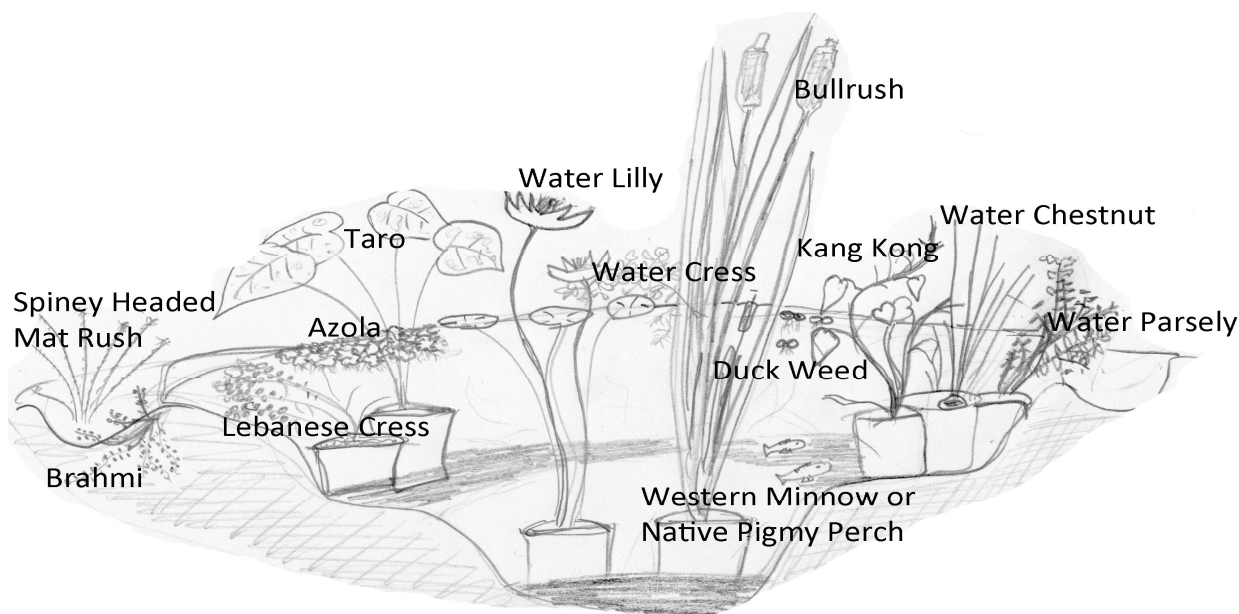


## Edible Garden Ponds – Food, Pest Management and essential Backyard Biology

A pond or water garden is essential in any permaculture garden. It relaxes us, feed us, and provides a habitat and drink for many insects and creatures. A water garden is a diverse aquatic ecosystem, one of the most productive and efficient systems around, far more productive than any land based systems. This is because the aquatic plants have a constant supply of water that has nutrients dissolved in it.



Waste from fish and other animals in the system provide additional nutrient to the plants, making for a very efficient and productive system. And on that note: fish are required to control mozi breeding, and to avoid then snacking on frogspawn and tadpoles small natives like Western Minnow and Pigmy Pearch are recommended

Don't confuse the virtues of a Permie Pond with the trendy new plastic tank over populated aquaculture systems, that are reliant on continuous pumps, and a perfect/fleeting balance between plant, fish and water systems. These do not offer acceptable stability or ecological design to be considered a permaculture solution.

The trick to creating a stable aquatic ecosystem is the various types of plants in it, each of which plays a specific role to support and sustain aquatic life. Most people go wrong by not adding enough plants and end up fighting algae. To stack in the plants look at the four categories of water plants that can be included in a pond to achieve perfect balance.

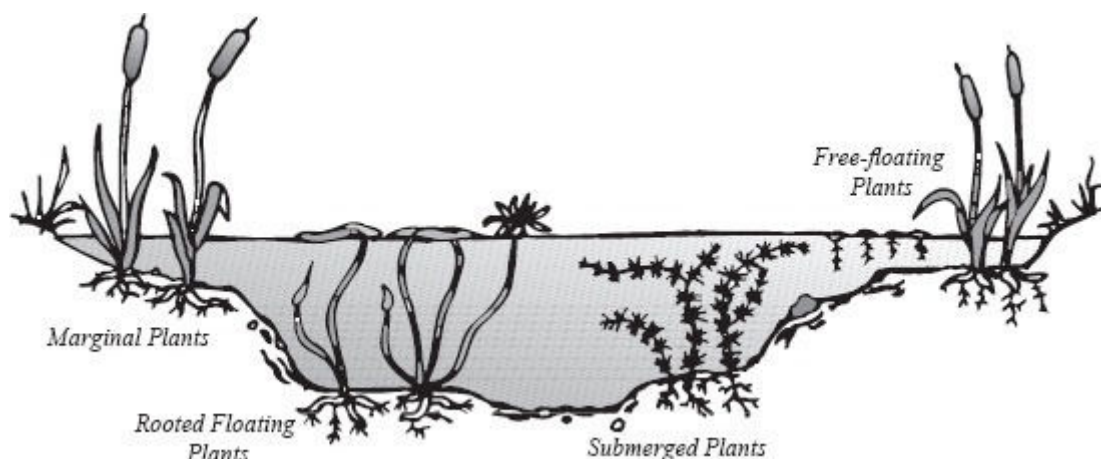
1. Rooted floating plants, such as water lilies, Nadoo, Lotus)
2. Marginal plants (Bullrush, Spiney Headed Rush, Pickerel Rush, Vietnamese Mint, Water Chestnut)
3. Submerged (oxygenating) plants (Millfoil)
4. Floating plants (Duckweed, Azola, watercress)

Rooted Floating Plants, are sun-loving plants and can survive with 10-20cm or more of water above the plant's crown. They produce floating leaves that shade the water, which reduces the growth of algae. They also provide shade and a hiding place for fish.

Marginal Plants grow in the shallow margins around the edge of a pond, and they can survive with up to 10cm of water over the plant crown. These plants do best in still to slow moving water. These plants

can serve several functions. Adding height and shape to the water garden, as well helping to blend in the edges of a pond into the surrounding ground. They also provide more practical functions, such as shelter from the wind, and shade. They also serve as a barrier around the water's edge, providing protection to fish and frogs from predators.

Submerged plants also called Oxygenators, grow with their roots anchored in soil, but the leaves stay underwater. Oxygenators are essential for keeping the pond healthy and the water clear. Milfoil is the most common option in WA. These plants absorb carbon dioxide and release oxygen into the water, and by oxygenating the water they help it support more aquatic life such as fish and beneficial aquatic insects.



Floating Plants do not need soil, or anchorage and they grow by extracting nutrients from the water. They control algae in two ways, by shading the surface of the water restricting the light that algae needs to grow, and by remove excess nutrients from the water. Duckweed is a protein rich food source for fish, goldfish consume it greedily! Azola is a tiny fern which supports nitrogen-fixing bacteria just like legumes do, so it captures its own nitrogen from the air. This makes it a great nitrogen source.

Together these categories of plants create a balanced ecosystem, similar to the **stacking** of the seven defined vertical layers of a forest garden; an aquatic ecosystem has these four layers.

For 1m<sup>2</sup> of pond surface area you should aim for:

- **one Rooted Floating Plant,**
- **three Oxygenating Plants and**
- **two Marginal Plants.**

For coverage of the water's surface to both avoid algal growth but allow oxygenation of the water

- **Half of the water's surface should be covered with free floating and rooted floating plants.**
- **Or, conversely, no more than half of the water's surface should ever be covered with floating plants, however if with plants like azola that are cropped continuously for mulch this can be over looked.**

**An excellent local source of plants and information is Swan Valley Fish and Lilly.**

[http://www.fishandlily.com.au/water\\_plants/](http://www.fishandlily.com.au/water_plants/)

**This worksheet has been adapted for WA from <http://deepgreenpermaculture.com/diy-instructions/building-a-small-water-garden/>**