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**Water Gardens-Creating for Green landscape Infrastructure**

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**Abstract**

*Green Infrastructure is the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect villages, towns and cities. Individually, these elements are Green Infrastructure assets, and the roles that these assets play are Green Infrastructure functions. When appropriately planned, designed and managed, the assets and functions have the potential to deliver a wide range of benefits – from providing sustainable transport links to mitigating and adapting the effects of climate change. When properly planned and managed, water gardens are restful, relaxing, and beautiful additions to any landscape. However, if you get started on the wrong foot, your water garden will be difficult or even stressful to manage. This publication promotes a low intensity approach to water gardening and attempts to dispel some common misconceptions that can lead to problems in managing a water garden.*

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**Water for Agriculture:**

Agriculture has historically used around 70% of the water supply but use has been decreasing since the mid-1980. In recent years, the agricultural sector relies on 50% of its total demand for irrigation on recycled and saline water sources. Interestingly, decreased potable water demand for agriculture has been accompanied by a steady increase in the overall value of agricultural output. During its first sixty years, while the country's population grew seven-fold, agricultural production expanded sixteen-fold. Water usage, however, did not increase. The drought of the early 1990's suggests how more market forces may decrease agricultural demand for water without affecting production. Due to extended drought in the years 1990-91, the real price of water supplied to agriculture was increased by 47% and the supply quotas were reduced by more than 50% to deal with the shortage. However, although farmers were adversely affected in the short-run, they were able to adapt through substantial investment in highly efficient computerized and drip irrigation technologies that reduced their demand in the long run.

**How do they manage water?**

Swales are shallow, long, low depressions in the ground that are designed to collect and move stormwater runoff. As well as transporting water, one of their main functions is to allow water to infiltrate into the ground. They are not meant to be permanently full with water, but rather to encourage accumulation of rainfall during rainstorms and hold it for a few hours or days, allowing the water time to infiltrate down into the soil.

## **Know your soils and their water holding capacity:**

The ability of a soil to store water is called water-holding capacity. Soil water-holding capacity is primarily controlled by soil texture (the amount of sand, silt and clay) and organic matter. Fine textured soils (more silt and clay) have a greater number of small spaces between soil particles than coarser, sandier soils. These pore spaces are what allow fine textured soils to hold more water than coarse textured soils. Organic matter holds and stores water, much like fine soil, and also insulates soil against heating and cooling.

Knowing a little bit about the soil where you intend to grow plants will improve your ability to effectively manage the water you have; clay soils have different water-holding capacities and watering needs than sandy soils, which are different from loamy soils. Contact your local county Extension agent or Natural Resources Conservation Service (NRCS) office to get information on obtaining a soil test and/or getting a report on your soil.

**Clay soil:** clay soils absorb water very slowly, so apply water only as fast as it is absorbed by the soil. TIP: Till or spade your soil to help loosen the soil and add organic material such as compost or peat moss. Keep the soil surface rough and covered with some type of mulch. This will make it easier for water to enter the soil.

**Sandy soil:** water can drain through sandy soils so quickly plants won't be able to absorb it. TIP: Add organic material to supplement sandy soil. Keep the soil covered with some type of mulch to minimize drying caused by evaporation. This will help water remain longer in sandy soil.

**Loam soil:** this soil is a combination of sand, silt, and clay. Loam absorbs water readily and stores it for easy plant use.

## **Water Gardens Are Not Pet Fish Aquaria:**

Most of us have some experience in managing an aquarium. This can lead to problems if we assume that a water garden must be managed in the same way.

Feeding of water garden fish is not required when fish are stocked lightly. A stocking rate of one fish per 5 square feet of surface area should allow fish to do well foraging for natural food. In new water gardens, where natural food is not yet plentiful, stock fish that are less than 6 inches long. If you do choose to feed your fish, be careful not to overfeed. Excess fish waste and uneaten feed quickly degrade water quality.

This problem is more likely when fish are overstocked, have grown large over time, or too much "recreational" feeding occurs. Dense green, turbid pond water; elevated ammonia levels; and even fish death due to poor water quality can result from overfeeding. Water exchanges and reduced feeding are generally recommended if dense green water or fish distress are observed as a result of overfeeding.



**FISH POOL**



**WATER GARDEN**

**Benefits of a Green Garden:**

- ✓ Reduce water usage
- ✓ Reduce the need for pesticides and fertilizers
- ✓ Lower the overall impact on the surrounding environment
- ✓ Provide wildlife habitat
- ✓ Preserve the look and feel of Central Texas

### **Water conservation tips for lawns and flower beds:**

- ✓ Choose the irrigation system that is most efficient for your needs; micro-spray systems, sprinklers, soaker hoses, drip systems and timers all have advantages and disadvantages. Make a list to decide what's best for your situation.
- ✓ • If you plan to use a timer system – make sure it's in good working condition and turn it off when it's raining or windy.
- ✓ • Drip or soaker hoses cause minimal surface wetting while allowing water to penetrate to the root zone. Soaker hoses minimize evaporative loss and can reduce your water use by 60 percent or more. Plus, you can water longer without causing run-off.
- ✓ • Drip or soaker hoses and micro-spray systems are good for areas which dry out quickly (i.e. foundation and border plantings, along sidewalks, driveways and streets).

### **Design and Site Considerations:**

The **Wildlife Habitat** is a **Wildlife** immersion exhibit - an open and interactive environment for guests and animals to mingle in a spacious and natural setting. Visitors wander along elevated boardwalks, observing up close a huge range of flora and fauna as birds fly and roam freely.

The advice of an experienced landscaper can be invaluable in assuring that you will be pleased with the appearance and functionality of your pond. Here are some recommendations to consider:

- ✓ Consider sites close to a patio or other seating area where the pond can be better enjoyed. The distant corner of the backyard may be a poor location.
- ✓ Access to an electrical outlet should be considered.
- ✓ Avoid sites under trees where leaf accumulation will be a problem.
- ✓ Do not build a water garden that receives runoff water from surrounding areas. This puts the pond at risk of chemicals in the runoff. Avoid locations close to bedrooms or else frogs may keep you awake.
- ✓ "Plant shelves" are a desirable feature for most water gardens.



**WILDLIFE HABITAT**

### **Water supply management:**

Sustainable alternatives can provide a year-round supply of low-cost water for urban and peri-urban horticulture and, at the same time, minimize competition for domestic and industrial water. The key is to adapt horticultural production to the use of more marginal quality water in order to minimize health risks for producers and consumers.

Untreated wastewater is already widely used for growing fresh vegetables in many low-income developing cities. For producers, the use of wastewater makes good economic sense: it is readily available and produce has relatively high value. When appropriately treated for agricultural re-use, wastewater from domestic sources is safe and can supply most of the nutrients needed to grow fruit trees, vegetables and ornamental plants.

### **Development and Creating for Green roof:**

Green roofs are roofs that have had a layer of vegetation added to them. Garden sheds, porches, summerhouses, balconies, garages and small extensions offer great potential for planting green roofs. Greening up these surfaces not only improves the view, but it also turns such buildings and structures into attractive focal points and features in their own right. The most common types of green roof are composed of Sedum species, but there are many other options available depending on the objectives. Green roofs also offer new opportunities for growing alpine plants, commonly used in rock gardens.



**GREEN ROOF**

### **Benefits of a green roof:**

1. Reduces storm water runoff.
2. Reduces heating in buildings by adding thermal mass and resistance to the roof membrane, resulting in energy savings
3. Filters pollutants and CO<sub>2</sub> out of the air; improving air quality.
4. Creates natural habitat and promotes biodiversity, including increasing the population of pollinators in cities.

5. Accessible green roofs provide green space above the dim. of city streets and increase marketability of properties.
6. Roof top terraces for residents and workers.
7. Can reduce imposed storm water fees

### **A Natural solution:**

In nature, storm water flows down the hillsides into streams, riverbanks, and low-lying wetlands that form a watershed. In a healthy watershed, the roots of grasses, perennial plants, shrubs and trees capture rainwater, aerate soil and help water percolate into the ground, reducing erosion and flooding. Unfortunately, healthy watersheds and their associated plant communities have been damaged and/or destroyed by urbanization.

Rain gardens function like miniature natural watersheds. They slow water flow by using elements similar to those in nature: plants, rocks, shallow swales and depressions that hold water temporarily rather than let it quickly escape. Rain gardens minimize flooding and loss of soil and improve water quality in lakes and rivers by reducing silt. Use of rain gardens also can save tax dollars by reducing the need for communities to build larger storm-water retention facilities. Rain gardens provide beauty, natural diversity and wildlife habitat in areas that otherwise would be a monoculture of lawns, pavement, concrete culverts and storm drains. This landscaping style is increasingly used by homeowners, commercial and residential developments, and by cities for park beautification.

### **Low Impact Development (LID) Challenges:**

1. **Lack of Information:** Many municipal planners, consultants and the general public are unfamiliar with the benefits of LID practices and how to utilize them in different environments.
2. **Inflexible Regulations/Ordinances:** Existing rules often lack the flexibility to implement LID solutions
3. **Maintenance:** Some LID tools require maintenance by homeowner and local public works departments to function properly
4. **Presence of Contaminants:** Use of filtration practices can threaten groundwater quality if high levels of soil contaminants are present.

### **Conclusion**

The idea of not feeding water garden fish may be difficult for some people to accept. It is neither cruel nor impractical. Given proper stocking rates, an unfed water garden managed as described above, mimics a natural aquatic ecosystem and offers all the delights of other water gardens with fewer problems. Most water gardeners seek relaxation – the low intensity, no-feed approach offers just that. Something to be proud of; properly planned and maintained, they can be eye-catching parts of your landscape. Healthy, attractive landscaping helps visually tie your property together, can add value to your property, and actually improves your living environment. On hot, sunny days, your lawn and garden reduce sun glare, thereby reducing evaporation, keeping surrounding areas cooler and attracting birds and other wildlife. On windy and rainy days, your lawn and garden protect your property from erosion and soil loss.

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