
A Homeowners
Guide to
Lakefront
Restoration
and
Aquascaping



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A Homeowners Guide to Lakefront Restoration and Aquascaping

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INTRODUCTION

Lakefront homeowners can have major impacts on the water quality, habitat value and productivity of lakes and ponds. Through their actions they sometimes unwittingly promote the decline of the resource they enjoy the most. The cumulative effects of such things as clearing shoreline vegetation, installing septic tanks too close to the lake, fertilizer and pesticide run-off from lawns, and inflow of stormwater have caused most urban and populated lakes to show signs of degradation or even total eutrophication.

Our years of work as environmental consultants have introduced us to many examples of the problems described above and to many concerned people who want to remedy the situation as much as possible. We have found that most lakefront owners are willing to give up their white sandy beaches and work hard at protecting their lakes, once they really understand how to do so. At Biosphere Consulting we have volunteered a lot of time working with various groups and educating individuals about aquatic ecosystems. We maintain a nursery and farm where we propagate and conduct research on native plant species and restoration.

One of our main projects is to introduce the concept of landscaping to improve or create habitat for native species. We have coined the word **BIOSCAPE** to describe this process and we are now researching and writing about methods and species to be used, both wetland and upland. We would invite anyone to visit our nursery and farm and to give us their ideas.

The purpose of this guide is to assist interested homeowners in understanding the basic ecology which determines the quality of their lakes and to help them restore and maintain lakefront property to help ensure healthy conditions. We would also encourage every homeowner to join or form associations which involve everyone who has lakefront property. These associations can provide information exchanges which help educate lakefront homeowners about lake problems. Organized associations can also be more effective in working with local governments and regulatory agencies in solving the larger problems, like stormwater and development regulations.

The individual lakefront homeowner can do a great deal to improve lake conditions. It is hoped this guide will assist in this effort.

BASIC COMPONENTS OF AQUATIC ECOSYSTEMS

Understanding the interactions between the basic components of a lake ecosystem will help the homeowner to comprehend and appreciate the balance required for a healthy lake. The oversimplified version presented here will provide a basic overview of some of the most important factors that function in that dynamic ecosystem along the lakeshore.

Nutrient levels in the lake provide the basic fertilizer required for the important plant life in the water. These nutrients consist primarily of **PHOSPHORUS**, **NITROGEN**, and **POTASSIUM**. Phosphorus is probably the most significant in terms of lake productivity because it is generally not as abundant naturally. These nutrients are transported into the water in a number of ways: from natural rainfall, from upland runoff, and from animal wastes and decay of vegetation in the water. Nutrient overloading occurs when man-made sources are allowed to discharge into a water body. Sewage effluent disposal, stormwater discharges from streets and paved areas, run-off from lawns or farms carrying fertilizers, pet wastes, pesticides, and decomposing leaves and debris, all contribute to the nutrient loading of an aquatic ecosystem.

Plants in the lake absorb and use these nutrients in the same way a vegetable crop uses fertilizer in the garden. **PLANT COMPONENTS** in a lake are of many forms and species. **ALGAE** exists in abundance and may be found as microscopic individuals suspended in the water columns, as long **FILAMENTOUS** strands which often form floating mats when over-abundant, and as forms which grow attached to some substrate. Algae suspended in the water column form the **PHYTOPLANKTON** in the lake and are very important as **OXYGEN PRODUCERS** in the water as well as serving as **FOOD SOURCES** for many organisms. Algae respond quickly to changes in nutrient levels. When present at low densities, the water will appear clear. At high nutrient levels, the algae will overpopulate, often turning the water to a green color. The rapid life cycle of algae causes deeper and deeper **SEDIMENTS** on the bottom of the lake as the cells die and settle to the bottom where they decay. Algae are important to other life in the lake because of their roles in **OXYGEN BALANCE**: they are oxygen producers and oxygen users at the same time. Under normal sunlight conditions photosynthesis (which produces oxygen) occurs much more rapidly than respiration (which uses oxygen) so there is a net gain of oxygen. When the algae overpopulate, forming an **ALGAE BLOOM**, the large numbers of cells use too much oxygen when the sun is not shining. Decaying algae in the sediments also use up valuable oxygen. Under extreme circumstances oxygen levels may be depleted to a point where fish and other aquatic organisms which cannot tolerate low dissolved oxygen levels are killed.

Higher plants present in the water are also important as food and cover for wildlife, as oxygen producers and as nutrient absorbers. These occur in several forms: as **SUBMERGED ROOTED PLANTS**, as **EMERGENT** plants that are rooted at the base but protrude above the surface of the water, and as **FLOATING** plants on the surface. The majority of these plants occur around the shallower edges of the water where the light penetrates to the lake bottom and the water is shallow enough for emergent species. This band of plant life around the edge of the typical lake is called

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the **LITTORAL ZONE** and it is extremely important to the health of the lake.

Even in a balanced lake there is a tendency, over the years, for a buildup of sediment layers over the sandbottom. This natural aging process will eventually convert the open water lake to a swamp or marsh and eventually to dry land with organic soils. Nutrient overloading greatly accelerates this aging process. Noxious plants such as cattail and primrose willow, which grow fast and build up large amount³ of **BIOSMASS** also tend to accelerate this process.

Animal life in the lake is also diverse in form and numbers of species. The **INVERTEBRATES** range from free floating, microscopic **ZOOPLANKTON** species, to the more familiar **FLATWORMS**, **ROUNDWORMS**, **MOLLUSCS**, such as snails and mussels, **CRUSTACEANS**, and **INSECTS**. Many insects spend their **LARVAL STAGES** as aquatic forms, later emerging as adults which live on land. **VERTEBRATES** include the **FISH**, **REPTILES**, **BIRDS**, and **MAMMALS** that depend on the aquatic ecosystem for food and cover. The interactions between these plants and animal develop a **FOOD CHAIN** which determines which species survive and proliferate in the lake. Most of these animals concentrate in and around the littoral zone where they find food, cover, and places to attach.

The **LITTORAL ZONE** is of major importance to the entire lake. The dense plant growth at the water's edge tends to buffer the lake from upland run-off and the uptake of nutrients becomes critical to nutrient balance in the water column. The plants provide oxygen for the animal life, cover for many forms that live in and around the lake and food that is the basis for all the food chains in the ecosystem. Removing this zone to make white sandy beaches has major effects on the entire ecosystem.

This guide is designed to show the lakefront homeowner how to repair or replace this important littoral zone in his lake.

LITTORAL ZONE PLANTING AND AQUASCAPING

Creating or restoring a littoral zone must first be planned and permitted. The site must be selected and prepared and the desired species to be planted must be determined. Required permits will be described in another section of this guide. Help can be obtained from a number of sources if problems or questions arise. Local offices of the following agencies may be able to provide assistance: FDEP (formerly Florida Department of Environmental Regulation and Florida Department of Natural Resources), Water Management Districts, environmental departments of local governments, and the Bureau of Aquatic Plant Management (formerly a DNR office). Biosphere Consulting, Inc. and other local firms may provide advice. Plant samples may be brought to the Biosphere nursery for help with identification.

Removal of noxious species in the area to be aquascaped is important. These should preferably be dug out and removed by hand to ensure complete removal. Should this be too great a job, herbicide sprays may be used but only after a determination that a spray has been approved for use on aquatics. This herbicide application should only be done by a certified spray operator. Noxious species, most of them exotic (not native), must be entirely removed because their rapid growth causes them to completely dominate an area, thereby preventing the establishment of more desirable species being planted. While the list of noxious, prohibited species is fairly long, the following are the most commonly encountered by the lakefront homeowners:

Cattail	(<u>Typha spp.</u>)
Primrose Willow	(<u>Ludwigia peruviana</u>)
Alligatorweed	(<u>Alternanthera philoxeroides</u>)
Torpedo Grass	(<u>Panicum repens</u>)
Hydrilla	(<u>Hydrilla verticillata</u>)
Water Hyacinth	(<u>Eichhornia crassipes</u>)
Water Lettuce	(<u>Pistia stratiotes</u>)
Taro	(<u>Colocasia esculenta</u>)

A3 with any landscaping or construction activity, take the time to properly plan and design your lakefront restoration project before you obtain the plant material. The process of developing a detailed planting plan will determine the exact size of the area to be planted, the species of plants best suited for your particular lakefront, and the number of each plant species needed for desired coverage. Following the simple planting plan development steps outlined below will help insure the success of your lakefront restoration project.

For ease in communicating the concepts used in planning your lakefront restoration project, we will use an example describing the planning process for a typical 100 foot lakefront. Figures depicting a cross section and planting plan for our lakefront have been included for reference.

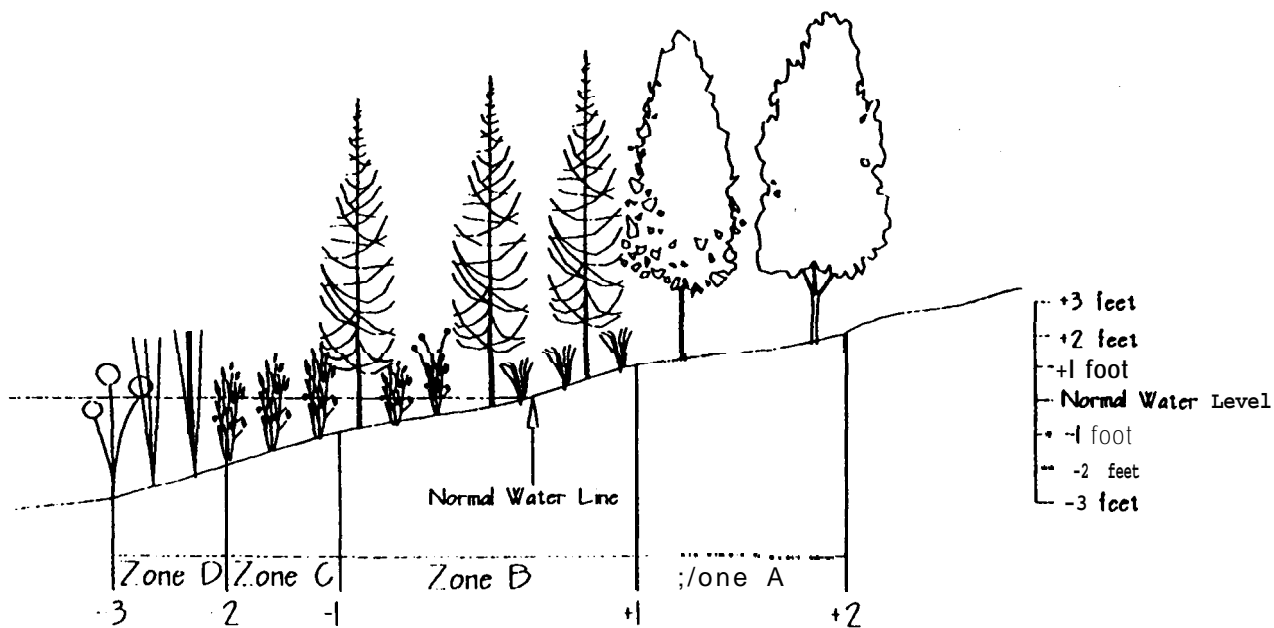
Begin the planning process by determining the size of the area to be restored, the locations of each planting zone, and the size of each planting zone. Planting zones are based on water depth below, and ground elevation above, the normal water

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line (NWL). The most difficult part of this process is determining the normal water line. Help may be obtained from the county environmental offices or the water management district by contacting their representatives. However, the simplest method is to observe and mark changes in the seasonal elevation of the water line, and chose the mid-point between high and low water. Most homeowners who have lived on their lakefront for a period of time usually have a general idea of the normal water line. The cross section of our lakefront restoration project example below depicts typical elevations used for delineating each planting zone.

Locate and stake the limits of each zone based on the depths below and elevations above NWL as depicted in the cross section. Determine the square footage of each zone by measuring their respective length and width. Draw a site plan similar to the one illustrated on the following page. Be sure to include the length and width of each planting zone on the site plan.

Next determine the plant species most appropriate for the planting zones you have delineated. Different wetland plant species are adapted to survive within different ranges of water depth, soil moisture, and duration of inundation. Therefore, each species should be planted within the planting zone most consistent with its requirements. A list of commercially available wetland plant species, listed according to their preferred planting zone (based on water depths depicted in the cross section above) is presented in this guide. Use this list to decide which species are best for your particular restoration project. Note the plant species used on our example restoration project.



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To determine the number of plants needed for each zone, first decide on the desired planting density. Trees and shrubs are generally planted at strategic locations or clumps to achieve a desired aesthetic effect. Herbaceous plants are generally planted on either 2 ft., 3 ft. or 5 ft. centers, depending on the desired effect. To determine the total number of plants needed when planting on 2 ft. centers, divide the area of the planting zone by 4. When planting on 3 ft. centers, divide the area of the planting zone by 9 to determine the total number of plants needed. When planting on 5 ft. centers, divide the area of the planting zone by 25 to determine the total number of plants needed. The total number of plants needed for each zone will be subdivided by the number of each species desired. For example, on our site plan you will note 112 herbaceous plants are to be installed in Zone C. Of those 112 plants, 38 will be pickerelweed, 37 will be spikerush, and 37 will be bulrush. The number of each species used per zone can be altered to achieve any effect desired.

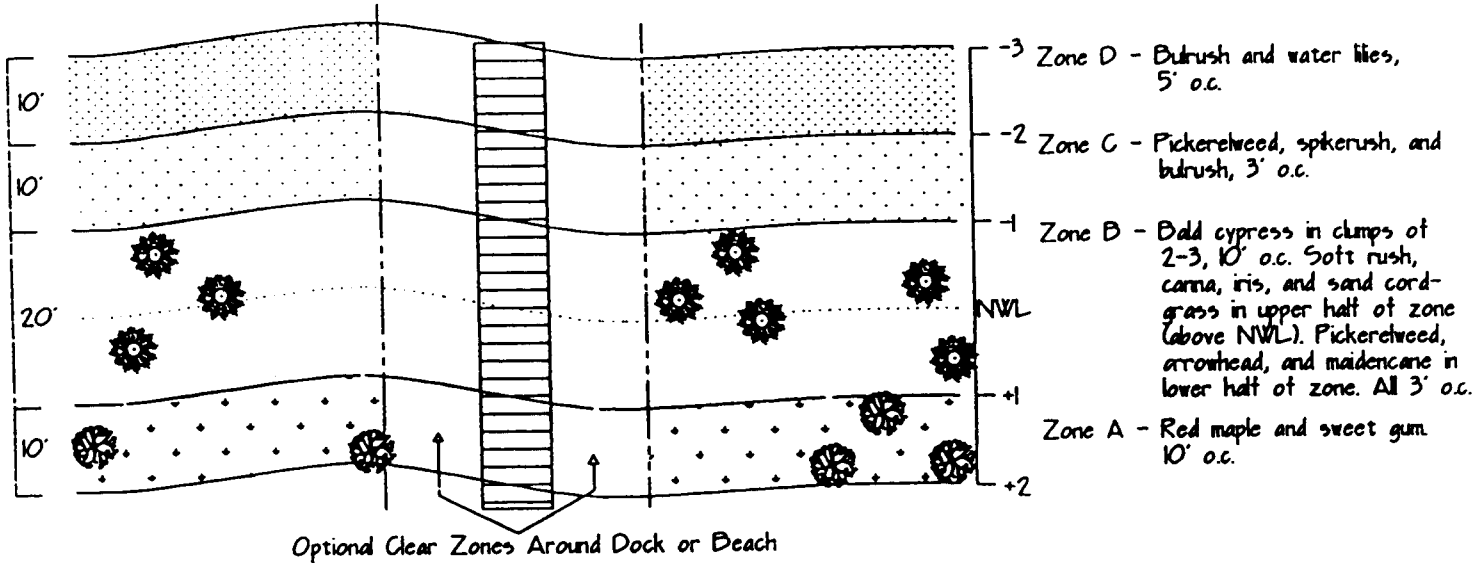
Obtaining plants for aquascaping can sometimes be a problem due to a lack of commercial availability and to state regulations which prohibit transplanting from wild populations except from the homeowners property. Obviously, if some species are abundant on the homeowners lakefront property, it would be ideal to transplant some of them to the new aquascape site (being careful not to decimate the existing population). A few nurseries now make wetland species available but great care should be taken to make sure all species purchased for use are native and indigenous to the area where they are to be used. A major advantage to using container grown nursery stock is that they are already established and adapt and grow more quickly once installed in the aquascape. One major problem with transplanting from the wild is the possibility of introducing noxious species along with the transplants. This problem is less likely if properly grown nursery stock is used. Included in this guide are species available from Biosphere nursery.

When purchasing the material be sure the roots and the foliage appear healthy and the plants are free of insect pests. Trees and shrubs are generally grown in 1 gallon, 3 gallon, 7 gallon, 15 gallon, and lorio size containers. One gallon trees are generally 2-3 feet tall, 3 gallon are 4-6 feet tall, 7 gallon are 6-8 feet tall, 15 gallon are 8-10 feet tall, and lorios are over 10 feet tall. Choose the size class desired for your project. Herbaceous species generally come in 1 gallon containers, although bare root material may be obtained for some species when extremely large quantities are required. For emergent plant species being installed in the water, be sure the plants are tall enough to extend above the water line.

The following information is intended as general notes to aid you in completing a successful lakefront restoration project. Never let the plant material dry out. Plan your project so that planting is completed as quickly as possible, especially when using bare root material. Store herbaceous plant material with the roots submerged. Store trees and shrubs with 50% of the pot submerged. Clump attractive blooming species such as iris, canna, and crinuxn lilies when planting to accentuate them. Pickerelweed and duck potato should be used to fill large areas. These species spread rapidly, are attractive, stabilize the soil, and provide excellent wildlife habitat. For areas with erosion problems above or at NWL use densely clumping species such as soft rush, sand cordgrass, or maidencane. Inoculate all planting zones with small quantities of as many species as possible to increase the diversity of the planting. USE ONLY NATIVE PLANT MATERIAL IN YOUR RESTORATION PROJECT.

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Typical Planting Plan for a 100 ft. Lakefront



Plant List: Specifications and Quantities

Zone A	5 Trees		Zone C	112 Herbs	
Red Maple	3 Gallon	3	Pickerelweed	1 Gallon	38
Sweet Gum	3 Gallon	2	Spikerush	1 Gallon	37
			Bulrush	1 Gallon	37
Zone B	8 Trees, 224 Herbs		Zone D	40 Herbs	
Bald Cypress	3 Gallon	8	Bulrush	1 Gallon	30
Soft Rush	1 Gallon	35	White Water Lily	1 Gallon	10
Canna	1 Gallon	28			
Iris	1 Gallon	28			
Sand Cordgrass	1 Gallon	21			
Pickerelweed	1 Gallon	38			
Arrowhead	1 Gallon	37			
Maidencane	1 Gallon	37			

Note: For illustrative purposes the plan depicts an optional clear zone around a dock or beach. However, plant quantities listed above were based on planting the entire 100 ft. long lakefront. If a clear zone is maintained along the lakefront, the number of plants necessary to fill that area must be subtracted from the quantities listed above.

BIOSCAPE SPECIES: WETLANDS

The following native wetland species are recommended for use in lakefront restoration, and in planted littoral zones of created ponds, lakes, and retention areas. All are perennial and are available commercially. They are grouped by growth form (herbaceous, shrubs and trees) and by optimum water levels. Most are excellent habitat plants, providing food and/or cover for aquatic species (vertebrates and invertebrates) and for waterfowl and wading birds.

Herbaceous:

- A. Wet areas, above normal water line, may be inundated for short periods (UPPER ZONE B):
1. Lemon bacopa or water hyssop (*Bacopa caroliniana*)
Forms an attractive, dense mat in wet areas, often growing into the water. Plants are olive to bright green and flowers are a bright blue. Somewhat fleshy and does not hold up well where foot traffic is abundant. Another species (*Bacopa monnieri*) may also be used, but forms a less dense mat with much smaller leaves and small lavender flowers.
 2. Soft rush (*Juncus effusus*)
Forms dense clumps of tall, round, spike-like leaves. Very hardy, adapts to a variety of hydrologic conditions but seems to do best when wet but not inundated. Excellent for controlling erosion when spaced closely.
 3. Canna (*Canna flaccida*)
A vigorous, broad-leaved plant which grows 2-3 feet tall and forms dense clumps. The leaves may freeze back in winter but grow back quickly in spring. The showy yellow flowers make it attractive in aquascapes.
 4. Iris (*Iris hexagona* var. *savannarum*)
Grows in clumps with pale green leaves stiffly erect, up to 3 feet tall. Large typical iris flowers with purple and yellow make it an attractive aquascape plant. Blooms about the same time as canna, makes a nice contrast.
 5. Swamp lily (*Crinum americanum*)
Typical lily growth with strap-like leaves up to 2 feet long. Large, fragrant white flowers.
 6. Lizards tail (*Saururus cernuus*)
Dark green foliage with plants growing in clumps up to about 2 feet high. The flowers are long and slender

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and white in color. Attracts bees and other insects so it should not be placed close to high traffic areas.

7. **Redroot (*Lachnanthes caroliniana*)**
The leaves are linear and grow upright to average about 1 foot tall. The flowers are cream colored and grow on tall spikes.
8. **Sand cordgrass (*Spartina bakeri*)**
This plant grows in dense clumps with needle-like leaves growing up to 3 to 4 feet in height. In the wild, the plant often appears brownish to green most of the year but in a landscape situation where fertilizer and irrigation are used, the plant grows much more profusely, with wider and taller leaves (up to 6 feet tall) and makes a dense cover. This is an excellent erosion-control species when planted in clumps that are close together.
9. **Maidencane (*Panicum hemitomon*)**
This grass grows either at the edge of the water on moist soils or in depths up to 3 feet as an emergent. It is considered an excellent fish habitat plant when growing in water 1 to 3 feet deep. It will out-compete most other aquatic species when started well and forms "pure" stands of the grass.
10. **Wildflowers**
Mucky or wet shorelines can provide excellent growing area for a number of wildflowers. Most of these areas must be mowed once or twice a year and may appear weedy during part of the year. Some wildflowers are available as transplants or as seeds. These include:
 - Paint Brush (*Carphephorus corymbosus*)
 - Vanilla Flower (*Carphephorus odoratissimus*)
 - Tickseed (*Coreopsis* spp.)
 - Beach Sunflower (*Helianthus debilis*)
 - Blazing Star (*Liatris* spp.)
 - Phoebanthus (*Phoebanthus grandiflorus*)
 - Meadow Beauty (*Rhexia* spp.)
 - Black-eyed Susan (*Rudbeckia hirta*)
 - Goldenrods (*Solidago* spp.)
 - Rain Lily (*Zephranthes* spp.)
 - Cardinal flower (*Lobelia cardinalis*)
11. **Ferns**
Some areas that have moist soil will support a variety of native ferns that form very attractive clumps or groundcovers. Most do better where some shading exists. The following species are recommended:

Florida Shield Fern (*Dryopteris ludoviciana*)
Shield Fern (*Thelypteris* spp.)
Swamp Fern (*Blechnum serrulatum*)
Chain Fern (*Woodwardia* spp.)
Cinnamon Fern (*Osmunda cinnamomea*)
Royal Fern (*Osmunda regalis*)

B. Edge of water (normal water level) to a depth of 2 feet
(emergent species, LOWER ZONE B and ZONE C):

1. Pickerelweed (*Pontedaria lancifolia* or *cordata*)
This is one of the most attractive, hardy and valuable emergent species. Leaves are formed in dense clumps around heavy rhizomes that are rooted in the substrate. The plant can withstand inundation or drying for periods of time but seem to thrive best when growing as emergents in shallow water. They are excellent habitat plants and produce purple flowers throughout the summer. Leaves vary from broadly heart shaped to narrow and lanceolate.
2. Duck potato (Arrowhead) (*Sagittaria* spp.)
A number of species within this genus are found in central Florida. The most commonly used and the most hardy in the typical aquascape is *Sagittaria lancifolia* which grows normally as an emergent in shallow water. The clumps of leaves are not as dense as pickerel weed and the leaf petioles (stems) are normally long, up to 3 to 3 1/2 feet high. Flowers are white. Another species *Sagittaria latifolia*, has large arrowhead-shaped leaves and white flowers. This species seems to thrive best at the edge of the water or in wet, mucky areas.
3. Spikerushes (*Eleocharis* spp.)
Many species of this genus occur in Central Florida. The most common species used in aquascaping in Central Florida is *Eleocharis cellulosa* which grows about 2 feet above the water with straight, round spike-like leaves. *Eleocharis interstincta* which looks very similar, is grown more frequently in south Florida.
4. Sawgrass (*Cladium jamaicense*)
This tall grass grows best near the edge of the water down to a depth of about 1 foot. The leaves are tall, 5 to 6 feet in height and have finely serrated, sawtoothed edges. The plant color is a dusty green, it looks good in clumps, and it is an excellent habitat plant. It should not be used near traffic areas because of the sharp leaf edges.

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5. Arrowroot, Fireflag (Thalia geniculata)
This is a large perennial herb with a thick fleshy rhizome rooted in the substrate and a clump of large, broad leaves, 6 to 8 feet tall, similar to banana plants. The clusters of small pink flowers are attractive and form fruit which are relished by waterfowl. The plant makes a bold, tropical statement in an aquascape. The leaves may be burned in a frost or freeze but the plant recovers vigorously in spring.

C. Deeper water, 2 to 5 feet deep (ZONE D):

1. Bulrush (Scirpus validus, Scirpus californicus)
The two species above are both tall (giant) bulrushes, both occurring throughout the Central Florida area with validus found more frequently. Both grow tall, bare, green, round stems emerging from the water up to 4 to 6 feet tall. This is an excellent fish habitat plant and will grow to depths up to 5 feet.
2. Fragrant Water Lily (Nymphaea odorata) This plant grows rooted in the substrate with round floating leaves and large, fragrant white flowers. It makes an excellent habitat plant and an attractive aquascape feature. The clumps of floating leaves may spread over a large area over a long period of time. If space is limited, it is probably best to plant it in a tub or box which can be submerged. The plant can grow in depths up to 5 to 6 feet, but 2 to 3 feet seems optimum. Another species, Nymphaea mexicana, is available from time to time. It has smaller leaves and yellow flowers.

Shrubs:

Most shrubs should be planted at understories above normal water levels. Some can withstand long periods of inundation but most prefer moist soil without standing water. Shrubs are classified here by height. (UPPER ZONE B AND ZONE A):

- A. Shrubs which are low growing, normally less than 8 feet in height at maturity.
 1. Buttonbush (Cephalanthus occidentalis)
This hardy shrub normally grows to a height of 6 to 8 feet but sometimes higher. The flowers are globe-shaped, white, fragrant and quite striking. The shrub has a loose growth pattern.
 2. Virginia Willow (Itea virginica)
This deciduous shrub normally grows to a height of about

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6 to 8 feet at maturity. The shrub normally grows loosely branched with arching branchlets. The white flowers are borne in long racemes and can be quite showy.

3. Storax (Styrax americana)
This shrub may grow in dense form and normally to a height of 6 to 8 feet. It seems to prefer growing in shallow, standing water or very moist soil. It produces large numbers of white flowers and is very showy.
4. Fetterbush (Agarista populifolia = Leucothoe populifolia and Agarista racemosa)
The fetterbushes normally grow as shiny-leaved shrubs with racemes of waxy, urn-shaped white or lightly pink flowers. With landscape trimming it can become a dense, almost hedge-like plant. A. populifolia is evergreen and A. racemosa is deciduous.
5. Climbing aster (Aster carolinianus)
This climbing and sprawling perennial aster makes a showy plant when blooming with numerous pink to lavender flowers. It will form a large tangle or will sprawl over other vegetation. It should be used only where space allows a large mass.
6. Swamp Rose (Rosa palustris)
This attractive pink flowering rose grows in wet areas or shallow water and has a characteristic sprawling rose growth. It has thorns and is deciduous.
7. Shiny Lyonia (Staggerbush) = (Lyonia lucida)
This evergreen shrub shows a dense, shiny, dark green growth, normally 6 to 8 feet but sometimes taller. Flowers are white to pink, similar to fetterbush.
8. Swamp Honeysuckle (wild azalea) = (Rhododendron viscosum var. serrulatum)
This wild azalea is a deciduous shrub which forms showy white flowers in the spring. This is an excellent shrub for the edges of wetland plantings.

B. Shrubs which may become small trees, forming understories averaging 8 to 12 feet height at maturity.

1. Swamp Dogwood (Cornus feomina)
This attractive shrub may grow as a small understory tree and adapts to a number of habitats. It likes wet

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soils but not standing water. It produces clumps of small white flowers that are fragrant and attract insects. The berry-like fruit is blue and is a good wildlife food source.

2. **Wax Myrtle (*Myrica cerifera*)**

This evergreen grows as a shrub or small tree and often forms dense understories within swamps or around the edges. The leaves have a distinctive brownish-yellow tinge and are aromatic. The light grey trunks grow in attractive forms when clear wood is showing.

3. **Titi (*Cyrilla racemosa*)**

This shrub commonly forms thickets in swamps, wet flatwoods or along stream banks. It forms white flowers in clusters of racemes and is showy in full bloom. Fruits form food for wildlife.

4. **Anise (*Illicium spp.*)**

Two species of this large shrub may be used and both form dark green, fairly dense shrubs or small trees. The more rare *Illicium floridanum* is endemic to the state and has red star-shaped flowers and this species should be specified if available. The yellow flowered *Illicium parviflorum* may also be used although some question exists about whether it is actually native to Florida.

5. **Black-Haw (*Viburnum obovatum*)**

This popular wetland shrub adapts well to a variety of soils and hydrologic regimes. It has a dark green foliage and large clusters of white to cream flowers.

Trees :

Trees recommended for wetland planting vary in moisture requirements, ranging from those that should be planted near normal water level or in the edges of the water to those that prefer moist soil, such as seepage slopes, and will not tolerate inundation. Trees are classified by height (canopy trees and understory trees).

A. Canopy Trees

1. **Cypress (*Taxodium distichum* and *Taxodium ascendens*)**

These two species of cypress are generally used without distinction between the two. In natural situations, the pond cypress (*Taxodium ascendens*) is generally

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found in flatwood ponds while the bald cypress (*Taxodium distichum*) is found in river swamps and floodplains. They seem to thrive equally well in aquascape conditions. They are slowgrowing. They are deciduous, forming bright russet brown to yellow colors in fall and a bright green in spring. They should be planted near normal water level but can withstand long periods of inundation. (ZONE B)

2. Swamp Tupelo, Blackgum (*Nyssa sylvatica* var. *biflora*)
This deciduous tree can withstand considerable flooding but seems to thrive best when planted at normal water level. It forms bright red colors in fall before shedding its leaves and produces a fruit that is a good wildlife food source. (ZONE B)
3. Red Maple (*Acer rubrum*)
This deciduous tree also seems to prefer wet soils but not inundation. The tree is relatively fast growing, forms a dense canopy and produces vivid colors in the fall with bright red seeds forming in early spring. (ZONE A AND UPPER B)
4. Sweetbay magnolia (*Magnolia virginiana*)
This attractive tree has large leaves with silvery undersides. It prefers wet soils and will withstand inundation for short periods. It has large white flowers and pods bearing bright red seeds. The seeds are eaten by several wildlife species. (UPPER ZONE B AND ZONE A)
5. Water hickory (*Carya aquatica*)
An attractive deciduous tree with fern-like leaves. It prefers rich moist soil and does not tolerate much flooding. The nuts are relished by squirrels and other wildlife. (ZONE A)
6. Sugarberry (*Celtis laevigata*)
This tall tree has small, light green leaves and prefers moist but not flooded soils. It produces a sweet berry that is an important wildlife food source. (ZONE A)
7. Loblolly Bay (*Gordonia lasianthus*)
This is one of the most attractive native trees used for landscaping. It has dark green foliage with large leaves and produces large, showy white flowers in summer. It prefers moist but not flooded soils. (ZONE A)
8. Sweetgum (*Liquidambar styraciflua*)
This large tree has dark green star-shaped leaves and

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forms a dense canopy. It prefers moist rich soils. It produces bright fall colors, from yellows and oranges to deep red. (ZONE A)

9. Pond Pine (*Pinus serotina*)

This is the pine that tolerates wettest conditions. It prefers moist soils but not flooding. It is evergreen with short needles and small cones.

(UPPER ZONE B AND ZONE A)

B. Understory Trees

1. Dahoon Holly (*Ilex cassine*)

This small, dense tree produces dark green foliage, small white flowers and brilliant red berries which ripen in the fall. It adapts to a variety of soil conditions and is an important wildlife food source.

(UPPER ZONE B AND ZONE A)

2. Redbay (*Persea palustris*)

This tree is dark green and produces a pleasant aromatic smell. The fruit are black and are eaten by birds and wildlife. (ZONE A)

3. Pop Ash (*Fraxinus caroliniana*)

A small tree with open growth and compound leaves which are bright green in spring. It can withstand some inundation. (UPPER ZONE B AND ZONE A)

4. Willow (*Salix spp.*)

This small tree is very fast growing and produces a light green foliage with linear leaves. It can withstand inundation and provides perching and nesting habitat for wading birds. (ZONE B OR C)

5. Florida elm (*Ulmus americanus*)

This is a small, attractively shaped tree which is deciduous. It prefers moist soils but will not tolerate flooding. (ZONE A)

MAINTENANCE

Routine maintenance of an aquascaped area should be conducted during the first year to prevent dominance of noxious species and to allow establishment of the desirable **species**. If done frequently, hand removal of species such as cattail and primrose willow are easier. Be **sure** all roots are removed to prevent reoccurrence and take **care not** to leave any specimens long enough to form seeds. Spot spraying with herbicides maybe done by an experienced spray operator without damage to beneficial plants but hand removal is preferable. Once the desirable species become established and adequate coverage is achieved, maintenance becomes minimal. The native **species** recommended should be hardy and able to withstand normal fluctuations in water levels. They should not require fertilizers or pesticide sprays and none should be introduced into the aquascape.



Noxious herbaceous plants like this water hyacinth make good **compost** for the garden.

PERMITTING

Permits are required for any shoreline alteration and it is the responsibility of the property owner to obtain them, even if he hires a firm to do the work. The basic permit is from the Florida Department of Environmental Protection and was formerly administered by the Department of Natural Resources, Bureau of Plant Management. Some local governments also require permits for any work within a lake. Orange County requires a Shoreline Protection permit while Osceola County does not have a local permit. Some exemptions apply as described below. Any proposed project cannot include excavation, dredging, filling or use of heavy equipment which will cause deep ruts without a dredge and fill permit (also called an Environmental Resource Permit) from Florida Department of Environmental Protection and/or the local Water Management District.

The basic state permit required from FDER, Bureau of Aquatic Plant Management, is acquired through that office (address listed below) and the application form is simple with no filing fees. One exemption applies: an individual may clear a strip from the shoreline to open water up to 25 feet wide, for access to navigable water, without obtaining a permit. The permit required for clearing more than the 25 feet will require replanting of desirable species.

The Orange County Shoreline Protection ordinance requires a permit issued by the Orange County Environmental Protection Department (address below) and requires an application form and a filing fee of \$ 118.00. This ordinance allows for an exemption to the individual homeowner to clear a strip of vegetation that is 30 feet wide or 20 % of shoreline frontage, whichever is greater. This ordinance also contains a "grandfather clause" for maintenance of shoreline that were cleared before passing of the ordinance. Questions regarding these requirements should be directed to that department.

Projects that propose excavation, filling, dock building or use of heavy equipment should be cleared with both the Florida Department of Environmental Protection and the appropriate Water Management District.

In summary, any project involving removal or planting of vegetation requires a permit from the Bureau of Aquatic Plant Management. In Orange County, an additional permit is required from the Environmental Protection Department. Dredging, filling, excavation or dock building may require further permitting from FDEP and/or Water Management District.

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The following addresses should be used:

Florida Department of Environmental Protection
(formerly a DNR agency)
Bureau of Aquatic Plant Management
5882 South Semoran Blvd (Airport Business Center)
Orlando, Florida 32822-4717
(407) 275-4004

Orange County Environmental Protection Department
800 Mercy Drive Suite 4 & 5
Orlando, Florida 32808
(407) 836-1400

Florida ~~Department~~ of ~~Environmental~~ Protection
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803
(407) 894-7555

St. John8 River Water **Management** District
618 E. South Street
Orlando, Florida 32801
(407) **897-4300**

South *Florida* Water Management District
1756 Orlando Central Parkway
Orlando, Florida 32809
(407) 858-6100

ADDITIONAL HOMEOWNER ACTIONS FOR LAKE RESTORATION

In addition to restoring his own lakefront by aquascaping planting, the average homeowner can do a number of additional things that will make a difference. Joining (or forming) a homeowners association that includes all owners on a particular lake will give added impetus to restoring a lake. Recommended activities for such a group include:

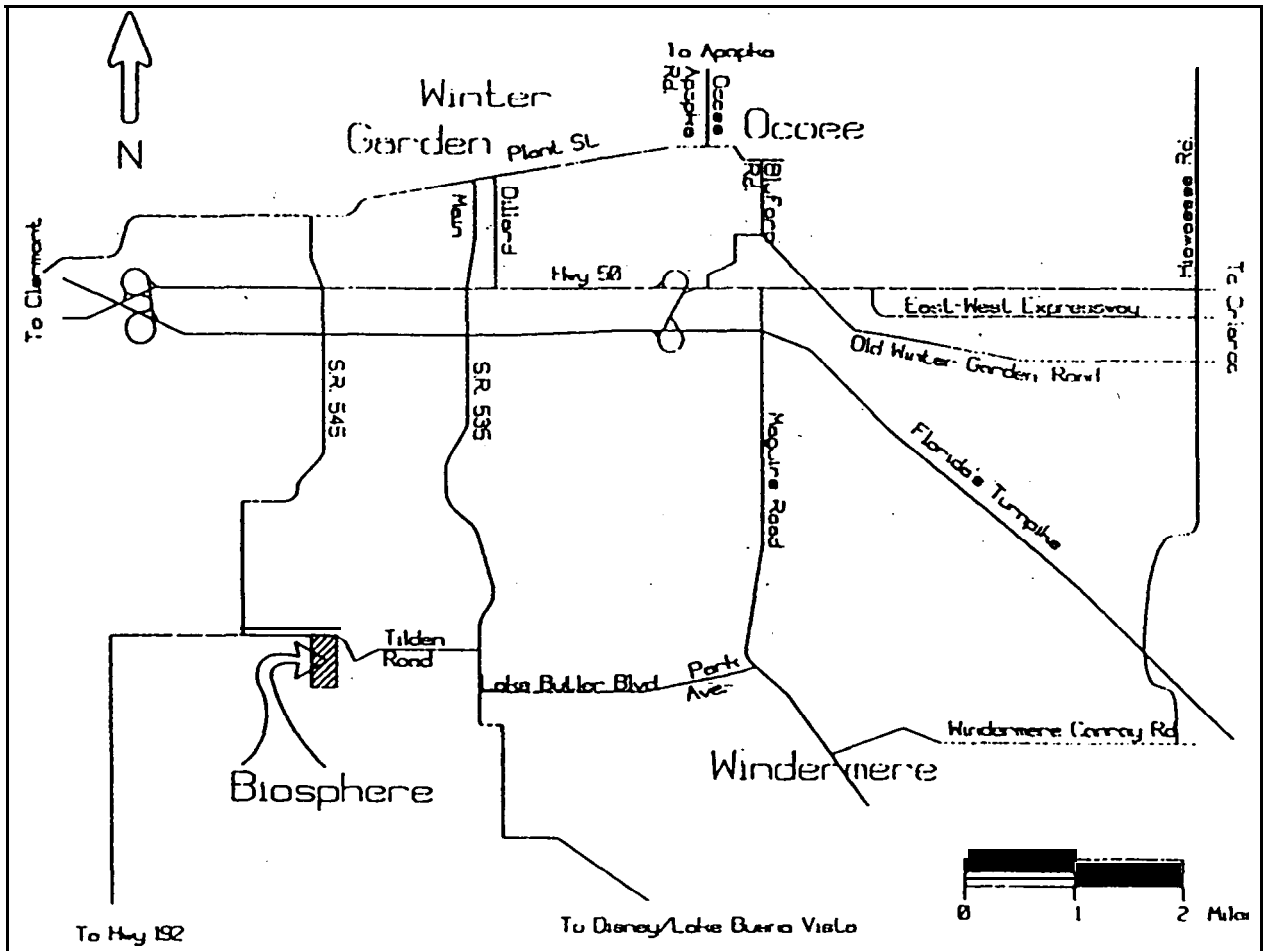
1. Conduct meetings where all homeowners can be educated about lakefront restoration activities and understand the need for cumulative efforts.
2. Conduct work parties where owners can help each other in restoring their lakefronts and can work on common spaces.
3. Identify sources of runoff into a specific lake. Get aerial photographs **from the** County tax assessors office **and map** such things as stormwater culverts, erosion areas, canals or ditches discharging to the lake, etc.
4. Using the above information, work with staff from the county and the appropriate water management district to address the problems in the most realistic way. Sometimes a single retrofitting of a storm drain or control structure can help. Even where this is not possible, such things as routine street cleaning can be effective. New taxes for stormwater control should be directed immediately to solving the problems of urban lakes.
5. Where new **development** is proposed on a lake, make sure adequate stormwater retention/detention is proposed.
6. Work with individual homeowners regarding their own lawns and landscapes. Educate them about the need to decrease fertilizer and spray programs near the lakefront. On lawns that are maintained frequently, a simple **swale** with a berm which detains the water before it sheet flows into the lake will give enough pre-treatment to remove a lot of nutrients before they enter the lake. Septic tank drainfields near the lake may need to be moved away. Leaves and landscape debris should not be allowed to wash into the lake.
7. Educate everyone about the dangers of introducing noxious species such as hydrilla to a clean lake. If a public boat ramp exists on the lake, make sure adequate **signage** exists directing boaters to clean trailers and boats to avoid the possibility.

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8. Join coalition groups such as the Clean Lakes Coalition of Central Florida and the Orange County Homeowners Association to give each group a greater voice where regulatory or enforcement issues arise and to get a better chance for continued education and updates on problems.

BIOSPHERE NURSERY - RETAIL SALES

Biosphere's nursery was organized as a wholesale growing operation, specializing in native wetland plants. Because of the demand, we are now offering limited retail sales to homeowners with the nursery open to the public **ONLY ON SATURDAYS FROM 9:00 a.m. UNTIL 3:00 p.m. OR BY SPECIAL APPOINTMENT.**



DIRECTIONS: Go west on Colonial Drive (Hwy. 50) to Winter Garden. Turn south on Hwy. 535 (7-11 and Walgreens on the corner). Go a little over 3 miles. There is a subdivision 'Banana Bay' on the left side. Look for Tilden Road it is on the right side. Turn right and go about 1 1/2 miles and the nursery is on the left. There is a chain link fence and our sign out front. Follow the dirt road to the office in the back. **PLEASE NOTE OUR HOURS.**

Telephone number (407) 656-8277

This publication, A Homeowners Guide to Lakefront Restoration and Aquascaping was prepared by Jim Thomas, Keith Fisher and Wendy Daniels of BIOSPHERE CONSULTING, INC., 14908 Tilden Road, Winter Garden, Florida 34787.

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