

TREADING LIGHTLY ON THE SHORE: THE ROLE OF RESIDENTS AND DEVELOPERS IN KEEPING LAKES HEALTHY



Proper preservation of a lakeshore buffer during construction
along Lake Greenwood

Photo courtesy John Tynan, Upstate Forever

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TREADING LIGHTLY ON THE SHORE: The Role of Residents and Developers in Keeping Lakes Healthy

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For additional information on lake friendly landscaping and development along Lake Greenwood as well as links to relevant organizations and web resources, please visit www.saludareedy.org/outreach/forums.html.

INTRODUCTION:

The Importance of Lakefront Property Management

The Upstate of South Carolina is blessed with an abundance of water resources. The lakes, rivers, creeks and ponds of our region have provided economic development, recreation, and wonderful places to live. Our rich water resources provide opportunities for residents and tourists to relax, interact, and play. Numerous individuals have discovered the natural amenities of the Upstate and have decided to reside along our rivers and lakes, reinforcing the desire for cleaner water and easily accessible recreation opportunities. To this end, the [South Carolina Outdoor Recreation Plan](#) has found that water related activities such as swimming and boating are among the most preferred and requested forms of outdoor recreation.

The privilege of lakeshore living is accompanied by the responsibility to help maintain and improve the water quality for all users. One person's, or one development's, shoreline actions can impact the water quality of an entire lake or river system that provides sustenance and leisure for a broader community. Our lakes and rivers are invaluable resources that require proper management in order to retain aesthetic beauty, ecological integrity, and economic opportunity. One poorly managed construction site can degrade water quality, hinder future lakeshore development, and spoil the beauty that attracted many of us to this region. When this degradation occurs on a larger scale, the damage can be greater and more widespread, but encouraging development that meets communities' social and economic needs while sustaining natural resources will yield a higher quality of life. Developers, communities, and individual homeowners can contribute to sustaining a lake's ecosystem at home, at work, and while enjoying themselves on the lake. Resources for building and maintaining a sustainable community at the water's edge are outlined below and will be discussed in greater detail through the remainder of this document.

Property owners and developers hold the keys to promoting good lake stewardship and working towards environmentally sustainable waterside development. When many homeowners purchase a home, they are usually sold a property that, while beautiful, does not implement best practices for low-impact lakeshore development. For example, if a family purchases a new home with brand new landscaping, it's difficult for them to justify the cost of going back and re-landscaping the site with a lake-friendly design. However, lake-friendly site design, whether it is home construction or landscaping, doesn't have to be a *burden* for the developer or property owner. Properly implemented lakefront management plans that encourage low-impact development contribute to *high property values, lower insurance premiums, improved water quality, and increased economic opportunity*. If we allow our waterfront developments to proceed without strong management plans, lake residents and other lake users could miss out on the economic, environmental, and recreational benefits associated with proper shoreline management.

Beyond new construction, individual homeowners play an important role in proper lakefront management. By regularly maintaining septic systems and landscaping with native species, lakeshore residents can greatly improve the integrity of nearby bodies of water. Actions like these allow residents living along Upstate lakes and rivers to help improve the water resources on which we all rely. For example, homeowners maintaining or restoring the natural vegetation in shoreline buffers – the land immediately adjacent to the water – can reduce shoreline erosion as well as the amount of pollutants that flow into lakes and streams.

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This report will review the importance of shoreline management in protecting our region's lakes and other water resources. The topics discussed here will present an overview of how lakeshore developments can minimize their impact on the lake ecosystem without sacrificing profitability. The content of this report includes information from a breadth of sources, including *Life at the Water's Edge* – a comprehensive lakeshore-living guide for homeowners who are interested in restoring shoreline buffers to reduce their impact on the lake environment. This issue summary is designed to complement *Life at the Water's Edge* with respect to what developers need to know to create lake-friendly properties and the economic benefits of doing so.

The second house on the left shows the impacts of poor construction site management on Lake Greenwood. The lake-edge lawns of the other three houses make a significant contribution to water quality problems as well.



Photo courtesy of Ben Keys

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SUSTAINING LAKEFRONT ECOSYSTEMS: An Overview of Water Quality and Economic Benefits for Homeowners and Developers

Lake-friendly landscaping, whether created post-construction or left alone from the start, can protect marketable components of a property – like water quality – and generate new selling points for a development. Homeowners can realize economic and quality of life benefits by reducing their impacts on lake water quality. By incorporating a few alternative principles into new development, developers can maintain and improve the water quality of the lakes around which they build. Adhering to these principles will provide ecological benefits in addition to increased economic benefits. For example, when planned from the beginning, lake-friendly landscaping can be cheaper to install and maintain – especially if it was already there before construction began! Most undeveloped waterfront lots already have adequate lakeshore buffers, but when construction begins and the land is cleared or graded natural buffers are replaced with expensive retaining walls or riprap. Properly maintained or constructed lakeshore buffers can stabilize the shore from erosion much better than a lawn planted with short, non-native grasses. Furthermore, naturally landscaped lawns require much less mowing, fertilizers, and pesticides, reducing the overall expense and toil of yard maintenance. Best of all, reducing the amount of clear-cutting and grading that takes place on a lot will also reduce the amount of sediment that runs into the water – eliminating the brown coloration that often results from development – and keep the water clean for future buyers.¹

Protect Natural Shorelines for Water Quality and Property Value Benefits.

Naturalized lakefronts are shorelines with minimal disturbance and abundant vegetation in the form of tree cover and under-story shrubbery and grasses. One important aspect of a naturalized lakeshore is a riparian buffer or a vegetated filter strip along the water's edge. Lakeshore properties can reduce the amount of pollutants and sediment that enter the body of the lake using vegetative shoreline buffers. Individual homeowners can create a lakeshore buffer and contribute to runoff reduction by planting native vegetation near the waterfront and not having a heavily-fertilized, grassy lawn trimmed all the way to the shoreline. Here's how vegetated shoreline buffers work:



This Lake Greenwood property combines a naturalized lakefront with dock access, providing recreational use of the lake for the homeowner while preserving water quality and maintaining wildlife habitat along the shoreline.

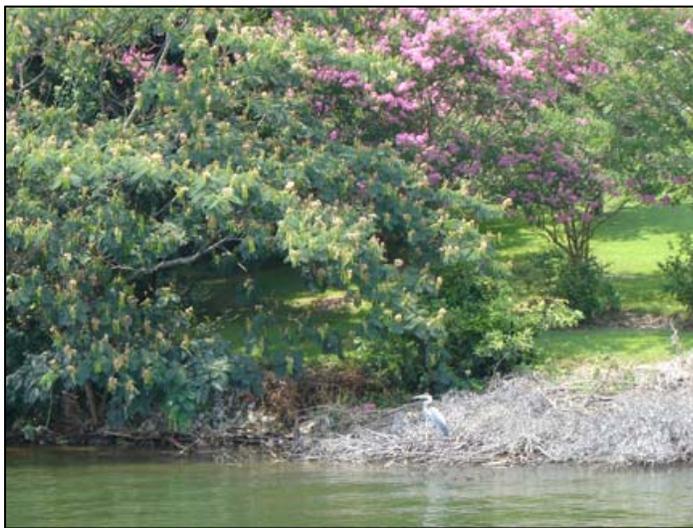
- Plant roots in a naturalized lakefront slow the flow of runoff from the ground and help stabilize the shore against wave action, reducing the need for expensive stabilization measures.
- Plant roots also help filter pollutants and sediment from the runoff that comes from construction sites, roofs, roads, driveways, and other impervious surfaces.

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- Tree cover reduces the force and amount of rain that reaches the soil, which also helps reduce the runoff volume and slow the erosion of topsoil.
- Lakeshore vegetation shades the water, providing the cool temperatures that are optimal for aquatic wildlife and discouraging the growth of unwanted algae.

Buffer areas can also be incorporated into runoff reduction plans in developments because of their ability to capture sediment before it reaches the lake. Lakeshore buffers help preserve one of a lakefront development's most important amenities: sparkling water. In this way, the ecological benefits of vegetative buffers also generate financial benefits for property owners and developers. The University of Maine conducted a 35-year study of 34 lakes and found that an additional 3 feet in the depth of water clarity can raise shoreline property values \$11-200 per foot of waterfront property, stating: "Lake-front property owners are potentially the recipients of the greatest economic gains from improved lake-water quality because the benefits of water quality can be capitalized in the price of lake-front properties."² This [University of Maine study](#) also concluded that a difference of nearly \$500 per foot of shoreline between lakes with good water-clarity and lakes with poor visibility. Conversely, lower water clarity can result in a 10-20% decrease in property.

Not only can lakeshore buffers control sedimentation and runoff that can lead to decreased visibility, the buffers themselves can increase property values. A study of Californian residents indicates that shoreline buffers can also increase waterfront property value by 3-13%.³ While working around a natural landscape instead of clearing a lot and re-landscaping can require more attention during development, other [studies show that it can increase the final lot price by 10-30%](#).⁴ In addition to being cheaper to install and maintain, a natural buffer can also be much more attractive and appealing to homebuyers than riprap or retaining walls.



The shoreline landscaping along the shoreline of this Lake Greenwood lot provides habitat for birds, fish, and other wildlife. With an increase of shoreline vegetation, Lake Greenwood could be the home to a number of beautiful waterfowl and other animals.

Abundant wildlife can be another potential feature of lakefront developments, attracting buyers and visitors interested in activities like bird watching and wildlife viewing. Healthy and diverse lakefront vegetation provides good habitat for fish and other wildlife. The wildlife management program on Lake Russell (along the South Carolina – Georgia border) is a good example of how a natural lakefront can attract a wide range of wildlife. The Army Corps of Engineers management plan for Lake Russell centers on

approximately 20,500 acres of public lands surrounding the lake. In the spring and fall, land around the lake is planted with vegetation that provides food and

cover for deer, duck, turkey, dove, quail, and a variety of songbirds. Thousands of ducks use the lake, adjacent ponds, and wetlands as staging areas for feeding and resting as they migrate south for the winter. Also, appropriate management techniques are used to protect and spread rare plant

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and animal communities. Biologists and park rangers conduct surveys to evaluate populations and nesting success of both eagle and osprey. The presence of abundant wildlife can translate into economic development and recreational opportunities for a lake community.

A [National Park Service](#) publication cites the U.S. Fish and Wildlife Service as having calculated that outdoor enthusiasts spend over \$18.1 billion annually on wildlife viewing and photography.⁵ Other studies indicate that birdwatchers benefit the local economy as they spend more than \$13 on food/beverages, gas, and lodging per day.⁶ One study from California determined that, “of the 9.2 million people participating in wildlife-related recreation,...71% pursued wildlife viewing.”⁷ Since residents and visitors increasingly desire to see wildlife, landscapes that create wildlife habitat in addition to providing other water quality benefits can augment a community’s list of selling points.

Maximize Lakeshore Setbacks. Where the house is built on a piece of property has an impact on water quality as well. Of course, site location and site planning vary according to the natural landscape and topography of a particular lot. However, according to the North American Lake Management Society publication *Managing Lakes and Reservoirs*, lakeshore setbacks should generally be as large as possible.⁸ The impervious surfaces that developments introduce to the natural environment impede storm water filtration into the ground and increase runoff as the amount of the development increases.⁹ Impervious surfaces can come in the form of roofs, driveways, sidewalks, etc. and the closer they are to the lake or stream, the less time and space there is for the ground (or buffer, if one exists) to soak up the runoff and prevent it from entering the water. A naturalized landscape that includes adequate ground cover during construction, a lakeshore buffer, wetlands, and proper landscaping up to the water’s edge can contribute to the reduction of sedimentation that reduces water clarity as well as runoff that causes unsightly algal growth, thereby contributing to the economic benefits of sparkling-clear water.

Use Lake Friendly Landscaping Techniques. The landscaping leading up to the lakeshore buffer is a key aspect of good lakeshore management and provides a good example of how to maintain a naturalized lakeshore. In contrast to the ability of naturalized lakeshores to improve water quality, disturbed areas tend to degrade water quality. A landscape that consists mostly of impervious surfaces and treeless lawns allows about 55% of precipitation to become runoff, compared to 10% runoff in undisturbed forested areas. The increased volume of runoff that comes from disturbed lakeshores carries pollutants and excessive nutrients into the water and is a factor in uncontrolled algae growth. Large amounts of impervious surface – like pavement and storm drains – increase the speed of runoff as well. With a lack of proper vegetation to slow this runoff and remove sediment, rates of topsoil and shoreline erosion increase and contribute to sedimentation of the nearby lake.

Furthermore, disturbed lakefronts, like in the picture to the right, often neglect to provide shade for the water, which may further contribute to uncontrolled algal growth. Algae are a source of food and energy for fish and other lake organisms



*This sketch from *Life at the Water's Edge* depicts the typical lakefront landscaping: no vegetated shoreline buffer; short non-native grass planted to the water's edge; bright green lawn indicates heavy fertilization. Image by Randy Burroughs.*

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and a vital part of all lakes. However, too much algae or nuisance species of algae can inhibit the growth of other water plants by clouding the water, can contribute – as they decay – to oxygen depletion and fish kills, and can cause taste and odor problems in water and fish. Some species of algae also release toxins. Excess algae can degrade the aesthetics of a lake because of unsightly scum or algal blooms. The regular occurrence of visible algal blooms often indicates that nutrient levels, especially phosphorus, are too high. High nutrient levels are a consequence of many different factors, but they can be influenced by large quantities of storm water runoff and heavy lakeshore fertilization.¹⁰ Traditional grassy yards (above) require high inputs of fertilizers and pesticides to maintain the vivid green color that is often associated with a “healthy” lawn. Since fertilizers and pesticides, which contribute to algal blooms and can be harmful to aquatic wildlife, are often carried right to the lake or stream as storm water runs off of impervious surfaces into the water, it is easy to see how impervious surfaces combined with traditional, highly-fertilized lawns can compound a lakeshore development’s impact on water quality.¹¹



This sketch from [Life at the Water's Edge](#) illustrates a less harmful landscape: wide vegetated shoreline buffer; native grasses planted in front of the buffer strip; tree cover; and carefully designed lake access. Image by Randy Burroughs

Keeping as much of the natural landscaping (trees, shrubs, lakeshore buffers, etc.) as possible intact can help reduce a development’s impact on water quality. This practice includes limiting clear-cutting and lot grading to the minimum amount necessary to construct the home and to provide adequate access to the home and to the water. Rather than clear-cutting the entire lot, building the home, and then landscaping the rest of the lot with a grassy yard right down to the water’s edge as in the photo above, consider an alternative. Limit clearing and grading to the minimum amount necessary to build the house. Selectively remove trees to provide picturesque viewsheds that allow residents to have a view of the lake and create paths, meandering through sections of native grasses and shrubs, to provide easy access to the water without sacrificing water quality. As in the photo to the left, where a lot has already

been cleared, native grasses, shrubs, and trees can be replanted to replicate the natural landscape and impede runoff. According to the [Center for Watershed Protection](#), in addition to providing an attractive landscape, naturalized lakefronts can be less expensive to maintain: “landowners can save between \$270-640 per acre in annual mowing and maintenance costs when they keep open lands as a natural buffer instead of replacing it with turf.”¹²

Preserve or Create Wetlands. Healthy wetlands are critical to good water quality. Property owners should understand that wet or marshy areas are important for a healthy lake and can have flood control benefits. Work with nature to have a healthy wetland amenity on your property. Developers in some areas are beginning to see wetlands as less of an obstacle and more of a selling point for buyers.

According to the [EPA wetlands fact sheet](#), the benefits of near-lake wetlands include: storm water filtration, bank stabilization, flood control, wildlife habitat, and even beautiful landscaping.

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An acre of wetlands can store over a million gallons of floodwater, and wetland plants can help stabilize a bank or shore from the waves that cause erosion.¹³ Wetland plants work like a lakeshore buffer and filter contaminated runoff before it enters a river or lake. Wetlands can also help to reduce the fertilizers, pesticides, and pollutants from leaking septic systems that enter Lake Greenwood. In fact, wetlands can be so good at filtering runoff that municipalities are beginning to use wetlands to treat storm water and wastewater. One elementary school, [Bruns Avenue Elementary](#) in Charlotte, NC, restored a wetland to treat storm water runoff from the school's property and nearby neighborhoods. In addition to treating storm water, the Bruns Avenue Elementary wetland is a beautiful addition to the school's landscape.¹⁴



The wetland at Bruns Avenue Elementary in Charlotte treats stormwater runoff from the school and surrounding neighborhoods and provides an attractive landscape amenity.

Wetlands can provide these same functions for Lake Greenwood and can also provide the same economic benefits as lakeshore buffers: reducing the need for retaining walls and riprap and also providing habitat for wildlife that residents and visitors can enjoy. A document published by the EPA entitled [Economic Benefits of Runoff Controls](#) discusses additional economic benefits that are associated with constructed wetlands:

In many cases, developers are able to realize additional profits (and quicker sales) from units that are adjacent to a wet pond.... If the urban runoff management control is also developed to allow passive recreation (e.g., a walking path around a lake or pond), the recreational area and the wet pond/constructed wetland can become the feature attraction when advertising the property. Adding walking trails, fitness equipment, gazebos, bird houses, and other facilities to enhance a detention area can be costly, but eventually additional profits are realized.¹⁵

Incorporate Low Impact Development Practices. Wetlands are an example of construction techniques known as Low-Impact Development (LID) that can also help ensure that a development does not negatively affect the natural environment or a lake's ability to attract new homebuyers. One of the basic principles of low-impact development is to let the landscape's hydrology guide the development – that is, develop around the existing landscape. Using low-tech strategies like rain gardens, bioretention ponds, and wetlands can help manage storm water runoff that is created when we introduce impervious surfaces to the landscape. Another important LID approach is to minimize the amount of impervious surface where possible: sharing driveways and parking lots; narrowing street widths; making paths with gravel, wood chips, or other pervious surfaces; etc.

In Littleton, Massachusetts, a community retrofit residential and commercial developments on Long Lake using LID approaches that minimized storm water runoff and used natural processes to filter runoff before it entered the lake. Throughout the Long Lake watershed, including on the lakeshore, parking lots now feature bioretention ponds – wetland-like areas – to store and filter storm water runoff from impervious surfaces. In addition, many waterfront residents minimize runoff from their own property by capturing the water in rain barrels and rain gardens. Lastly, the community constructed a wetland on one edge of the lake (shown above), which residents

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and city officials in Littleton expect to make a significant reduction in the amount of sediment and nutrients entering the lake.¹⁶

LID techniques provide numerous water quality and economic benefits in that the design is multifunctional. Wetlands and bioretention ponds can easily be incorporated into parks or public greenspaces, providing storm water filtration services, wildlife habitat, and also creating beautiful places for residents and visitors to enjoy. These features of a development can appeal to buyers who want to live near parks and who enjoy being near wildlife. In fact, “The real estate market consistently demonstrates that many people are willing to pay a larger amount for a property located close to parks and open space areas than for a home that does not offer this amenity,” writes [John L. Crompton](#), a professor at Texas A&M University.¹⁷

Additionally, the [National Association of Realtors](#)¹⁸ conducted a study in 2001 in which 50% of respondents indicated that they would be willing to pay 10% more for a house that is located near a park or other protected space. More information on low-impact development can be found in an in-depth manual [Low-Impact Development Design Strategies: An Integrated Design Approach](#).¹⁹



Incorporating Low-Impact Development practices into a development could include restoring a shoreline with a vegetated buffer and wetland plants, like along Long Lake in Littleton, Massachusetts (as seen above). LID Infrastructure created by the Long Lake community now filters 90% of the storm water that flows into the lake, benefiting water quality and providing beautiful areas in the community.

Photo courtesy: http://www.minnehahacreek.org/documents/Long_Lake_MA_Retrofit_.pdf.

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REDUCING COSTS AND PROTECTING WATER QUALITY: A Developer's Guide to Maintaining and Creating a Natural Lakeshore

Development along lakeshores in the Upstate is growing rapidly, with developers, contractors, retailers, and recreational service providers benefiting from increasing property values and the influx of new residents to the Lakelands region. As indicated in the [Maine study](#) cited earlier, the prosperity along our lakeshores is tied to the water quality of the lakes. Few residents wish to purchase a waterfront lot that is filled with sediment or where the water is not suitable for swimming. Unfortunately, developments along lakeshores that conform to the status quo contribute to the degradation of Lake Greenwood and other lakes in our region. But, by consciously creating lake friendly neighborhoods and subdivisions, developers can ensure that their work sustains the economic potential and water quality of the lakes in the Upstate.

Zoning and Shoreline Management Plans

Developers and residents of lakeside communities often must adhere to zoning ordinances or existing shoreline management plans. These regulatory mechanisms are typically used to guide economic development and protect lake water quality. However, as is the case with many South Carolina counties, the necessary ordinances for these tools are not always enacted by county or municipal governments. Nevertheless, the principles of these tools can be used to self-direct lake friendly development and set the standard and expectations for other developments around a particular lake.

Many local governments elsewhere in the nation have established shoreline zoning ordinances with the intent of preserving shoreline vegetation and minimizing impervious surface (such as concrete, asphalt, bricks, or pavers) on shoreline lots. In [Vilas County, Wisconsin, zoning ordinances](#) classify all lakes greater than 50 acres according to their environmental sensitivity and current levels of development. With regard to impervious surfaces, the ordinances prohibit the development of driveways closer than 100 feet from the boundary between the public lakebed and private land, and driveways cannot exceed 20 ft. in width. Additionally, footpaths leading to the water body cannot exceed 6 ft. in width. One of the most notable aspects of Vilas County's shoreline zoning is the requirement of a shoreline alteration permit for the use of any impervious surfaces.²⁰

To protect existing, native vegetation, the [Vilas County shoreline zoning](#) requires that an unmowed buffer representing at least 25% of the minimum water access lot width be left along each side lot boundary. The development of structures such as boathouses or docks should be done with as little disturbance to the shoreline vegetation as possible. The removal of trees or shrubs to create a footpath must be done in accordance with Forestry BMPs. The zoning also restricts clear cutting within 300 ft. of the lake and the removal of trees, shrubs, or undergrowth within 75 ft. of the lake.

Shoreline Management Plans are another tool often used to protect water quality. The US Army Corps of Engineers often uses these plans to control shoreline disturbance along the lakes it manages. For example, the U.S. Army Corps of Engineers established a Shoreline Management Plan for Lake Hartwell, SC, to manage private use of the shoreline. The [Lake Hartwell Shoreline Management Plan](#) (LHSMP) classifies the shoreline into four categories: Limited Development Areas (50%), Public Recreation Areas (24%), Protected Shoreline Areas (24%), and Prohibited Access Areas (1%).

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In addition, the [Lake Hartwell Shoreline Management Plan](#) requires Shoreline Use Permit/Licenses for vegetation modifying activities, improved walkways, erosion control, and other specified activities. The LHSMP establishes requirements that limit underbrushing – the “selective cutting and continuing control of woodland understory vegetation” – up to a maximum of 50 ft. in Protected Shoreline Areas and 100 ft. in Limited Development Areas. Underbrushing is limited to vegetation less than 4 in. in diameter at ground level. Vegetation exceeding 4 in. in diameter at ground level, as well as native ornamental trees or shrubs, may not be cut without permission from the Shoreline Management Plan Project Manager. In accordance with the Plan, walkways cannot exceed 6 ft. in width and no contiguous segments of impervious materials are allowed to exceed 12 square feet.²¹

Other Lake-Friendly Development Strategies

Maintain a naturalized shoreline. As described previously, a natural shoreline is a complex ecosystem that sustains fish and wildlife and protects the entire lake. Acting as a buffer zone, a naturalized shoreline intercepts nutrients and reduces runoff, erosion, and sedimentation. Additionally, native trees, plants, and wildflowers can be used to create a wooded lawn that provides privacy and requires less water and chemical inputs than open lawns and non-native plants.

However, naturalized shorelines provide more than just environmental benefits: maintaining or creating a naturalized buffer zone (filter strip) is cheaper and requires less maintenance than intensively managed landscaping. Besides saving homeowners money in annual landscape maintenance costs, maintaining or installing a buffer zone during development can prevent the loss of many natural functions critical to the health of the lake. Maintaining a naturalized lakefront from the beginning of the development can reduce upfront landscaping costs and increase property value. In fact, buffers can also reduce a developer’s costs because they



Seawalls and riprap (seen on the left) are more expensive to install than a maintaining or creating a naturalized shoreline (seen on the right). Riprap and seawalls do not provide the wildlife habitat or water filtration capacity that a vegetative buffer provides along a lakeshore.

are cheaper to install and maintain than other methods like retaining walls or riprap (a technique that uses large stones to stabilize the bank). While prices vary depending on location and shoreline condition, research conducted by the [Indiana Department of Natural Resources](#) discovered that installing a vegetative buffer costs around \$5-20 per foot of shoreline, whereas riprap can cost \$20-40 per foot and retaining walls can cost in excess of \$50-200 per foot.²²

Since native vegetation provides excellent nutrient filtration and bank stabilization, maintenance of existing lakeshore buffers from the design phase through the end of construction is critical. According to *Life at the Water's Edge*, it is preferable to leave an existing lakeshore buffer in place: “Felling trees and digging holes for new plantings can create bankside soil disturbance and sedimentation even beyond the sort that a buffer is intended to counteract; undisturbed forest...is practically unrivalled in its ability to protect watersheds.”²³ But, developers can also incorporate buffer zones into the landscape as they design and construct large developments and individual properties. The best buffer zone is mature woodland with ground level, mid-story, and upper-story growth; however, full-height native grasses along the shore are more effective as filters than short mowed lawns. Wooded landscapes come with economic benefits too – [a study by Bank of America Mortgage](#) found that 84% of realtors surveyed believe that naturally wooded lots are about 20% more sellable than non-wooded lots.²⁴

Design the House to Blend into the Existing Landscape.

Using the Low Impact Development principles described earlier, developers and homeowners have a great opportunity to create lakeside communities that focus on the integration of the infrastructure with the environment and minimize the community’s impacts to the lake’s water quality. LID principles are designed to imbed the development into the existing landscape, rather than creating an entirely new landscape altogether. Integrating buildings into the landscape can also be done by minimizing the structure footprint, building height, and roof area. Minimizing the building height and roof area allows the structure to remain below the tree canopy, offering privacy, shade, and a naturalized shoreline for perspective homebuyers. By reducing the size of the building footprint and roof area, developers can reduce the amount of impervious surface they create, reducing the need for expensive storm water infrastructure.



By blending their residence into the landscape, this Lake Greenwood homeowner has created shade and privacy for their home and a wonderful vegetated buffer that will help filter stormwater runoff before it enters the lake.

The natural landscape is perfectly able to handle natural volumes of storm water and runoff. However, increased runoff caused by buildings, roads, driveways, and patios often results in increased concentrations of storm water that carry pollution and sediments to water bodies. A green roof is a tool that some developers use to absorb and slow runoff created from rooftops – green roofs contain thin layers of material that support small plants installed over the roof, allowing the roof to actually soak up storm water. Driveway and boat ramp hard surfaces can also be limited by using various types of gravel or pavers or by sharing between homes or businesses. Homeowners and developers can also consider installing gutter drains that flow into rain gardens, grassed areas, or mulched areas instead of into storm drains or concrete pads. There are also a number of other innovative solutions for dispersed storm water management,

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including constructed wetlands, bioswales, and bioretention areas. More information on these options can be found online at www.saludareedy.org or in the LID resources cited earlier.

Control Erosion. In addition to reducing water clarity and filling in shallow areas of lakes, eroded topsoil and sediment can contain nutrients that promote excessive algae and bacteria growth in lakes. Ideally, erosion problems during construction are either prevented altogether or stabilized and corrected as they occur, using mulch, sod, hydro-seeding, and other methods to minimize soil exposure and loss. Properly installed and maintained silt fences and/or hay bales will help developers control erosion during the time of construction. By maintaining adequate buffers, contractors and developers can use the natural function of vegetation to prevent sediment from running off into nearby lakes and streams.

In a less optimal scenario, both riprap (loosely placed coarse stones) and retaining walls can reduce erosion, but these methods are expensive – [up to \\$200 per linear foot of shoreline](#)²⁵ – and visually fragment the shoreline by creating a barrier between upland areas and the shoreline environment. These tools should never be used to replace a stable, naturally vegetated shoreline, but if necessary, riprap can be used to reduce erosion due to wave action and storm water runoff. Planting native vegetation among the rocks can stabilize the structure, improve the visual appearance, and serve to filter some pollutants from storm water. In addition to retaining walls and riprap, there are a wide variety of natural shoreline stabilization techniques ranging from using aquatic plants as wave breaks to biodegradable fabric and grasses used to stabilize topsoil along the shoreline.

The [USDA-NRCS](#) also provides a comparison of the costs of riprap and natural bank stabilization methods like planting native vegetation along the shoreline. For 100 linear feet of bank stabilization of a 4 ft. high bank, excavating and planting native plants can cost anywhere from about \$550-800. On the other hand, excavating and installing the same amount of riprap can cost a staggering \$4,000. Even installing riprap to only half of the height of the 4-foot bank and planting native plants above the riprap can still cost over \$2,500.²⁶

Select and Preserve Native Plants for Landscaping. While native trees and shrubs are elements of proper naturalized lake buffers, they can also be effective tools for framing open space and accenting the appearance of developments. Large trees at appropriate locations anchor landscaped areas, functioning as a backdrop to the understory plants and bushes in an area. By connecting greenspace with low growing areas such as buffer strips, developers can make properties look larger and encourage wildlife diversity within the development infrastructure. And remember: contributing to the creation of a more naturalized landscape composed of native plants improves water quality while increasing property values.

The Upstate Chapter of the [South Carolina Native Plant Society](#) is an invaluable resource for native plant information. Some plants that the society recommends instead of typical ornamental, exotic species include: *Carolina Cherry Laurel*, *Carolina Jessamine*, *Cross Vine*, *Redbud*, *Red Maple*, *Fringe Tree*, *Wild Phlox*, *Trumpet Creeper*, *Winterberry*, *Native Blueberry*, *Button Brush*, and *Clethra*.

Rather than planting native plants after the development phase, maintaining the natural lakefront during the process can reap considerable cost savings. Cost savings of maintaining the native vegetation will include: clearing the land, ordering and planting nursery plants, and installing expensive irrigation systems needed for new plantings. Even if new plantings are necessary, native plants require far less water and fertilizer than exotic species. Using native species for

any landscaping that must occur will therefore reduce maintenance costs of these areas because of the decreased quantity of inputs. At the end of the development process, a more naturalized lakefront and smaller building footprint will create a legacy that future generations will appreciate and duplicate.



These photographs of a residence on Lake Keowee demonstrate that natural landscaping with native vegetation can be attractive. This landscape is designed to reduce runoff and erosion, with a mulch path that reduces the amount of impervious surface and a rain garden that collects storm water runoff from the roof and driveway.

Photos Courtesy: Colin Hagan

Encourage a Lake Friendly Homeowners Association. Few individuals have a larger interest in maintaining the health of the lake ecosystems than the residents of lakeshore communities. These individuals, whether they are retirees, weekend vacationers, or year round working residents, likely chose to live along the lake because of the amenities that a lakeside community offers. Therefore, preserving the beauty and intended uses of the lake through water quality maintenance is in the best interest of these residents. Lake friendly homeowners associations are a likely start for working towards water quality protection.

Lack of knowledge is one of the biggest inhibitors to action on water quality issues. In fact, 10% of individuals in a [recent survey in Upstate SC](#) thought that a watershed was a physical shed in the backyard where water was stored – rather, it is all the land area that drains to a given point, whether it is a drinking water reservoir, a stream reach, or the ocean²⁷. Educating new residents about water quality issues relating to the lake would augment the efforts that a developer has made in creating a lake friendly development. For instance, without proper knowledge or neighborhood development standards a homeowner could easily undo all of the lake friendly practices that a developer implements. The best way to ensure the longevity and quality of our Upstate water resources is to continue a developer’s lake friendly efforts after they have done their part.

For additional information on lake friendly landscaping and development along Lake Greenwood as well as links to relevant organizations and web resources, please visit www.saludareedy.org/outreach/forums.html.

Conclusion

Many people value natural riverfronts and lakeshores for their beauty and the stormwater services they provide. In most cases, buyers are willing to pay premium prices for lake-friendly developments. Lakefront management recognizes this value and attempts to achieve it by setting minimum standards. Property owners and developers have the privilege and the responsibility to preserve and develop their land in a manner that does not impair the environmental quality of the lake ecosystem and negatively impact their neighbors. In doing so, it is clear that the entire community will reap substantial social and economic benefits.

Every lake is unique. Specific strategies to address a lake's water quality problems should focus on activities in the watershed and/or in-lake restoration techniques, depending on the nature and extent of the problem. *Life at the Water's Edge*, published by Clemson University, is an excellent resource for both developers and homeowners who want to make their properties more in tune with the environment.

Lake management approaches fall into two categories: the "quick-fix" and long-term management. The quick-fix offers a short-term solution such as the application of herbicides to kill unwanted algae or macrophytes (large aquatic plants). It treats the biological symptoms of a lake problem, but does not address the underlying causes. Plant and fish productivity are dependent on the chemical and physical processes going on in and around the lake, and these must be considered in any plan to change the biology of a lake.

Long-term management considers all of the environmental, cultural, and biological factors affecting the lake and sets a priority on finding lasting solutions. If immediate in-lake restoration techniques are necessary, they should be followed by appropriate long-term management actions to control sediment, nutrient, and toxic inputs.²⁸

Lake management is a complicated job is necessarily a joint effort of community groups, individuals, landowners, and government agencies. If we want to continue to enjoy the beauty, tranquility, and recreation that our lakes and other water bodies provide, we need to make a long-term commitment and investment in lake management

¹ Roth, 49.

² Michael et al., 14.

³ Schueler, 173

⁴ Barklay et al., 2004 (eacheconomics site)

⁵ US Department of the Interior, National Park Service, 2-19.

⁶ Ibid. 2-7.

⁷ Ibid. 2-19.

⁸ Holdren et al., 346.

⁹ Prince George's County, Department of Environmental Resources, 3-7.

¹⁰ Davis et al.

¹¹ Roth, 65.

¹² Schueler, 173.

¹³ Environmental Protection Agency, 2001.

¹⁴ Loughner.

¹⁵ Environmental Protection Agency, 1995.

¹⁶ Monnelly

¹⁷ Crompton, 1999.

¹⁸ National Association of Realtors

¹⁹ Prince George's County, Department of Environmental Resources, 1999

²⁰ Vilas County Shoreland Zoning Ordinance

²¹ US Army Corps of Engineers, 1998.

- ²² Indiana Department of Natural Resources, 10
- ²³ Roth, 63.
- ²⁴ Barklay et al., 2004
- ²⁵ Indiana Department of Natural Resources, 10
- ²⁶ Smith et al.
- ²⁷ Saluda Reedy Watershed Consortium
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