The Massachusetts Buffer Manual

Using Vegetated Buffers to Protect our Lakes and Rivers

Prepared by
the Berkshire Regional Planning Commission

For
The Massachusetts Department of Environmental Protection

2003

About The Massachusetts Buffer Manual

In 2001 the Berkshire Regional Planning Commission was awarded a Nonpoint Source Pollution grant to conduct a demonstration and outreach project. The goal of this project was to promote the benefits of vegetated buffers. The three main objectives to achieve this goal were to 1) create a buffer guidance document, 2) plant five buffer demonstration sites and 3) talk about vegetated buffers to the public. This document, three of the buffers seen in Chapter 2 and several presentations made to lake groups and conservation commissioners are direct outcomes of this project. Russ Cohen of the Riverways Program was our partner and co-presenter for three of our "on the road" presentations. Many thanks, Russ.

Acknowledgements

To our Partners:

A very special thank you goes out to our project partners, without whose contributions the Buffer Project would not have been made possible. These plant specialists, landscape professionals and nurseries have voluntarily contributed their time, expertise and materials to our demonstration projects and to this document. Their support is greatly appreciated.

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To our Team:

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- Russ Cohen, Mass. Riverways Program
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Introduction

Massachusetts waterbodies are some of our greatest natural assets. They provide us with swimming, fishing, boating and relaxing. Most everyone dreams of living along the water. But as we live out our dreams and develop our shorelines, we threaten the health of the waterbodies that we have chosen to live on. Our traditional development practices removing natural vegetation, creating impervious surfaces and designing stormdrain systems have made it easy for stormwater runoff to carry pollution into our water bodies. It has also destroyed wildlife habitat, displacing animals that were once plentiful.

The Term "Water Body"

The intent of this manual is to help all waterfront property owners understand the benefits of maintaining or restoring vegetated buffers along our shorelines. This includes land along rivers, streams, lakes and ponds. For simplicity, we will use the generic term "water body" to refer to these four resources. Although this manual is written with freshwater resources in mind, the concepts discussed are also applicable to salt water resources.

Traditional development practices removed shoreline vegetation and displaced wildlife, as in this lakefront property.
Source: BRPC archive, 2002.

The new trends in landscaping are now creating a new, more natural look for waterfront properties. Recognizing that traditional development patterns have negatively affected the health of our waterbodies, landscape professionals are maintaining shoreline vegetation on newly developed lots. They are also adding a new mix of vegetation and color to old lots to create a fresh look. In both cases, these new trends help to protect water quality, provide wildlife a refuge and ultimately maintain or increase property values.

The main body of this manual is intended to help you look at your waterfront property in a new way. First we will explain what a vegetated buffer is and how it benefits the health of your water body. Next we will examine a few examples of buffers at work. Then we will offer creative new ways to help you landscape your shoreline without losing your yard, your view or your access to the water. An extensive list of native plants, which also includes the conditions (soil type, sunlight level, etc.) under which each plant will grow the best, is included in Appendix B.

Appendix A of this manual describes in more detail how pollution enters our water bodies and how vegetated buffers function to intercept that pollution. It also describes how important buffers are to wildlife. We hope it helps you understand your property and its direct connection to the water.

Chapter 1

What is a Vegetated Buffer and How Does it Work?

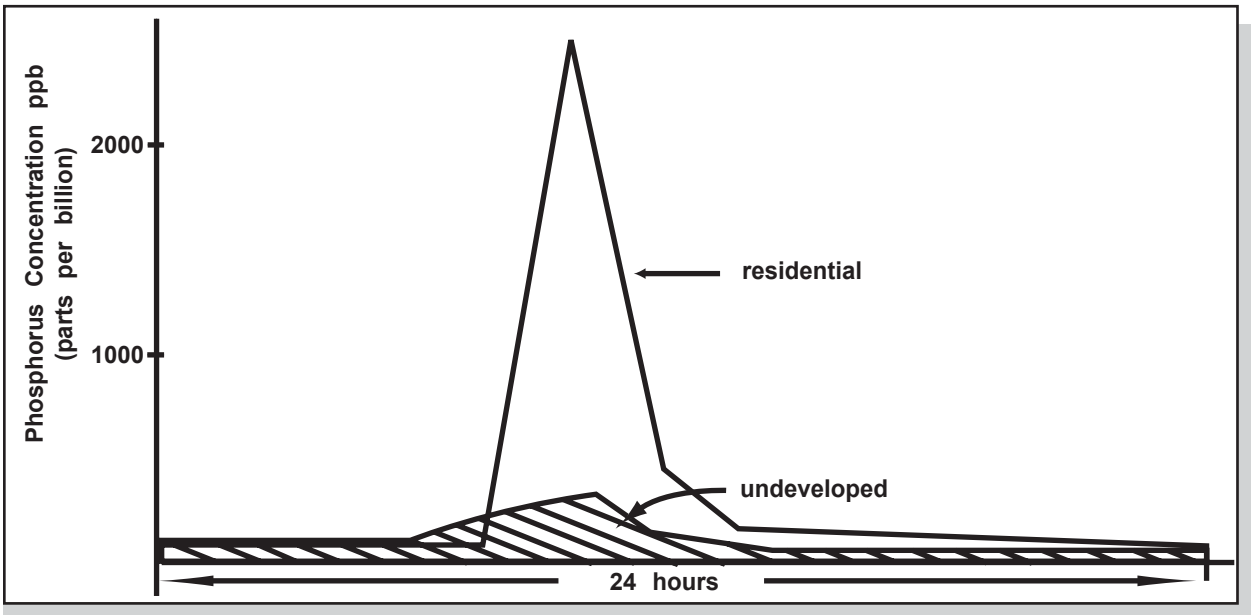
What Is a Vegetated Buffer and How Does It Work?

Simply put, a vegetated buffer is a protective area between a waterbody and human activity, such as development or agriculture. They are "living filters," because they capture many of the pollutants that travel through them. Buffers filter out sediment and debris from surface runoff. Plant root systems and chemical and biological activity in the soil can capture and transform nutrients and other pollutants and transform them into less harmful forms.

New polluting substances follow residential and commercial development. These pollutants include sediment, sand, salt, oil, gas, antifreeze, and other pollutants from the roads and driveways; pesticides and fertilizers from home gardens and lawns; and trash, pet droppings and other debris left by homeowners and visitors. Subsurface and groundwater flow can carry effluent from improperly functioning septic systems; it can also carry soluble nutrients from over-fertilized lawns and gardens.

Phosphorus, a pollutant of particular concern in freshwater, is one of those pollutants that follow residential development. One study in Maine found that even careful development of woodland into two-acre house lots caused a 2- to 10-fold increase in phosphorus concentrations in stormwater runoff (YCSWCD).

Phosphorus Concentration in Stormwater Runoff



This chart compares stormwater runoff from a residential development and runoff from adjacent forest for one storm. The residential development contained seven times as much phosphorus! Chart by Jeff Dennis, Maine Department of Environmental Protection.
Source: YCSWCD.

Buffers Capture Pollution

The mechanisms by which vegetated buffers capture pollution are a combination of physical, biological and chemical processes. The overriding reason that these processes are allowed to work is because vegetated buffers disperse and slow down the flow of surface waters, trap sediment, extend retention times and increase the rate of infiltration. Buffers can:

- Impede velocity: The stems of plants and leaf litter within the buffer physically slow the pace of surface runoff. The slower the movement of water, the less power it has to erode soil and carry sediment.
- Filter pollutants: As the velocity of runoff is slowed, the debris and sediment that is traveling in runoff gets filtered out. It is estimated that 80-90% of phosphorus reaches our freshwaters adhered to sediment, and buffers can capture the vast majority of that sediment.
- Extend retention times: The longer that runoff is in contact with the soil, the more time plants and soil microorganisms have to absorb and transform pollution into less harmful forms.
  - Plant root systems and chemical and biological activity in the soil can capture and transform nutrients and other pollutants into less harmful forms. Trees and shrubs have deep and extensive root systems, allowing them to take in nutrients, such as soluble phosphorus, from subsurface water.
  - Water is cooled to a more natural temperature as it percolates through the soil and makes it way to the receiving waterbody.

The root mass of one typical hardwood is extensive, enabling it to take in nutrients over a vast subsurface area. When multiplied by dozens of other trees and a host of shrubs and herbaceous vegetation, a forested buffer is effective at capturing subsurface nutrients
Source: Welsch, 1991.

Buffers Provide Wildlife Habitat

Our shoreline areas support the greatest diversity of wildlife in New England, as they are a transition zone where the terrestrial and aquatic worlds meet. As waterfront property owners, we are the first line of defense in protecting our shorelines and waterbodies. What we do on our property directly affects the lake or stream we live on, and thus we are caretakers not only of our own yard, but of the lake or stream itself.

- Habitat: Shorelines are transition zones for both terrestrial and aquatic wildlife. It is especially important to have shoreline vegetation for rare species and for those species that need both aquatic and terrestrial habitat to complete their life cycles (turtles, many amphibians, many birds).
- Travel corridors: Wildlife needs travel corridors to move freely from one habitat to another.
- Food source: Buffers provide aquatic ecosystems with the basic organic matter that drives their food webs.
- Cool water temperatures: Vegetation along the shoreline shades and cools the water. In general, cooler water is better able to hold life-giving oxygen. Also, temperature spikes are detrimental to the health and reproductive rates of aquatic creatures.

Red spotted eft
Source: BRPC archive, 2003

Painted turtle
Source: MN DNR, 2002

Many reptile and amphibian species require both water and land to complete their life cycles. Turtles spend much of their lives in water, but need land as a place to lay their eggs. Many salamander and frog species spend most of their lives on land, but need water to lay their eggs.

Home Owner Benefits

Vegetated buffers provide landowners with several additional benefits.

- Flood control: Buffers absorb and help break the force of high velocity floodwaters that overflow their banks. The higher the velocity of the flow, the higher the ability to cause property damage.
- Erosion control: Roots hold bank soil together while trunks and stems protect banks by absorbing the erosive energy of waves, ice and boat wakes. This is especially important on properties located on recreational lakes or rivers where motorized traffic is heavy.
- Privacy: A buffer with a healthy mix of trees provides privacy.
- Property value: Properties with mature trees are valued at up to 20% more on the real estate market (Fitzpatrick, 2002).
- Comfort: Deciduous trees provide shade in the summer and allow solar rays through bare branches in the winter.
- Seasonal delights: Ferns provide fiddleheads in the spring, and fruit-bearing shrubs provide berries for people and wildlife.
- Wildlife attraction: Wildflowers and flowering shrubs provide rich color and fragrances to a landscape, which in turn attracts hummingbirds and butterflies. See the plant list in Appendix B for more specific information.

Goose Barrier

Last (and often not least), vegetated buffers are goose barriers and will deter Canada geese from coming up onto your lawn to feed, rest and defecate. Geese like to have a wide, unobstructed view and they need to have close and easy access to the water to escape predators, such as coyotes or Fido. This is especially important when they have goslings that cannot yet fly. Although succulent green grasses (such as residential lawns) are a favorite food, geese will not travel through tall grasses or dense vegetation to get to them, because of the barrier created by that vegetation.

Source: MN DNR, 2002

Canada geese are creatures of habit, and will often return to the water body at which they were born, to mate and raise goslings. When geese are provided with easy and abundant food, their chance of successfully raising large broods is greatest. Several generations of geese returning and raising young can cause them to become overpopulated. This situation can be detrimental to the flock, to water quality and to recreational values. The simplest way to avoid this situation is to bar them from your lawn and other grassy areas.

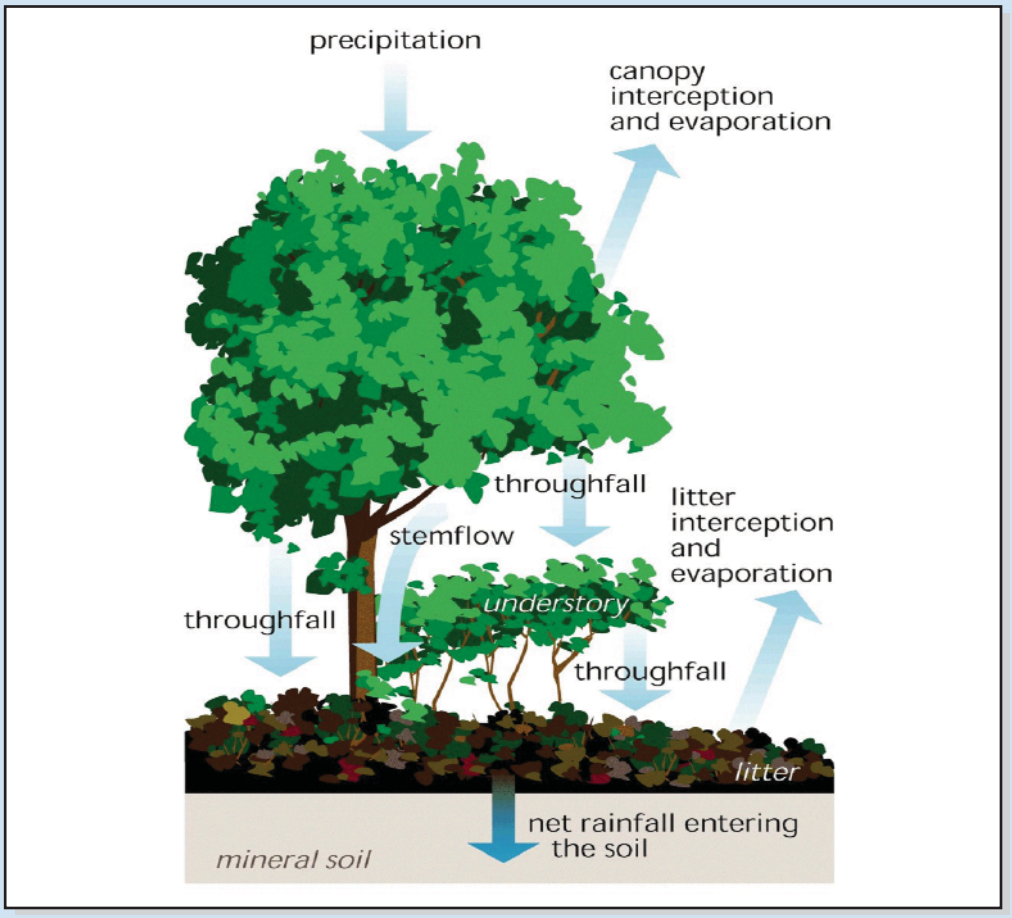
This introduction is a summary of the benefits that vegetated buffers can provide to homeowners, wildlife and water quality. A more detailed explanation of each of these benefits, can be found in Appendix A.

1-4 What are buffers?

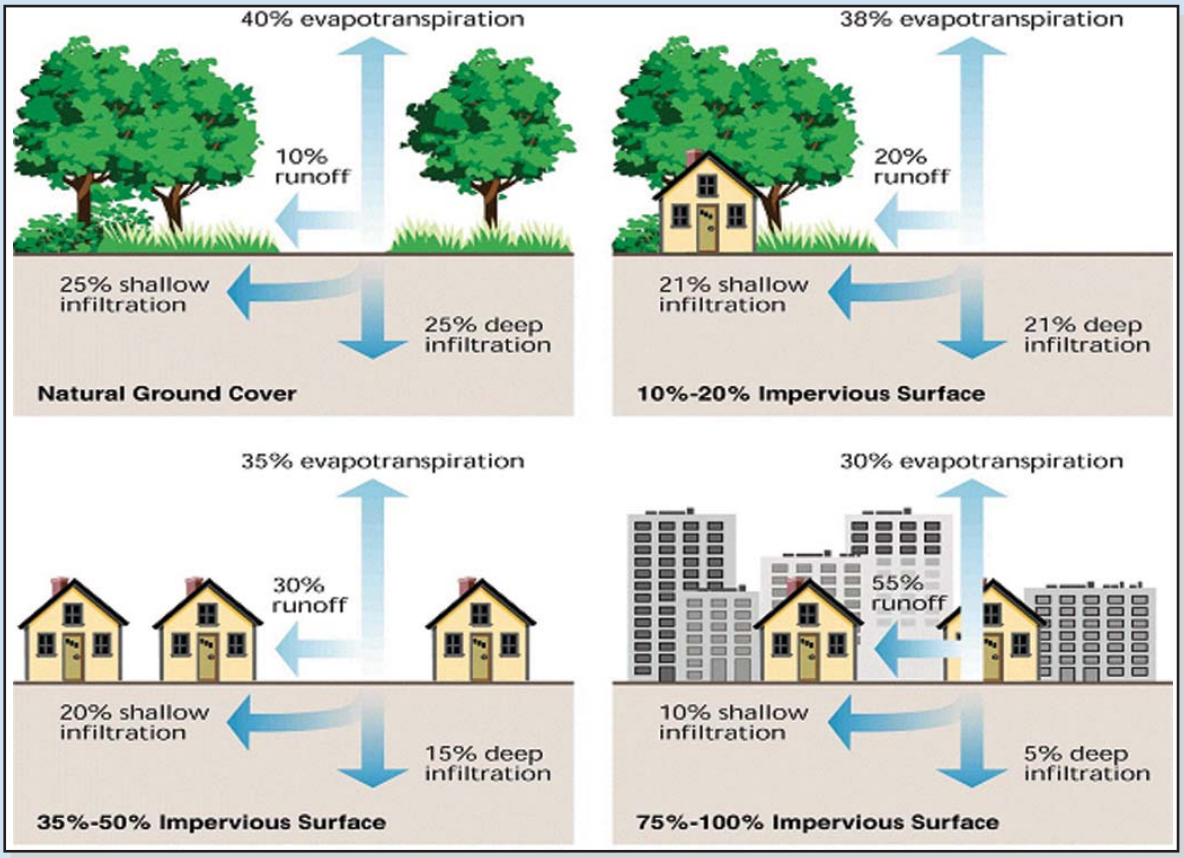
How Development Alters Stormwater Runoff and Affects Water Quality

Stormwater runoff is the single largest contributor to water quality degradation in the state of Massachusetts. The pollutants carried by runoff that cause the most concern in lakes and streams are sediment, nutrients, and pathogens, all three of which can be largely captured in vegetated buffers.

When rain falls to the ground in a rural or forested area, as much as 50% of it slowly percolates into or infiltrates the soil, while another 40% may reenter the atmosphere as evaporation or transpiration. This is because the tree canopy intercepts falling rain, allowing some to return to the atmosphere and allowing some to gently fall to the ground. The woody debris and leaf litter accumulated on the forest floor act like a rough sponge, slowing down, filtering and absorbing most of the limited runoff that accumulates. This gives vegetation, soil and microorganisms time to absorb and filter most pollutants out of the runoff before it gets to the water body.



Vegetation disperses rainfall, allowing it to settle more gently and erode less.
Source: FISRWG, 1998.



Relationship between impervious surface and stormwater runoff. In short, the greater the runoff, the greater its capacity to carry pollution.
Source: FISRWG, 1998.

In contrast, development disturbs the soil and creates impervious surfaces such as building rooftops, roads, and parking areas. These hard surfaces replace the tree canopy and spongy forest floor. In residential areas, the infiltration rate may be reduced to 35%, while stormwater runoff may be increased to 50%. Stormwater runs off impervious surfaces at an accelerated rate, collecting trash, debris, sediment, bacteria, petrochemicals, and other substances as it moves. The particles that are collected scour the ground and create soil erosion. As a result, an increased amount of runoff from developed areas delivers an increased amount of pollution to the nearest water body. This situation becomes even more acute as the shorelines of water bodies become developed and the runoff is quickly and directly delivered into the water without the chance for infiltration.

Shoreline vegetation provides that last chance to capture pollutants traveling in stormwater. Forested areas can capture, absorb and store 15 times more rainfall than grass or turf (Palone & Todd, 1998).

1-6 What are buffers?

Chapter 2

Buffer Examples

Buffer Examples

Vegetated buffers come in all shapes and sizes. In this chapter we will look at five buffers from around Massachusetts. Some of the local buffers were planted with the support of a U.S. Environmental Protection Agency Nonpoint Source Pollution Program grant, awarded and administered by the Massachusetts Department of Environmental Protection (DEP). The focus of this grant program is to mitigate the impacts of pollution by designing and installing mechanisms to capture it. Our mechanism was the planting of vegetated buffers along a small residential property (example 2), at a parking lot expansion project (example 4) and along a public recreational trail (example 5). All three of these examples were designed by landscape architects who donated their time to the various projects.

We will also look at a shorline buffer from Minnesota. This demonstration site was overseen by the Department of Natural Resources. Minnesota, the land of 10,000 lakes, has taken a leading role in studying the effects of development on water quality and has recently banned the use of phosphorus fertilizers in certain parts of the state (visit Chapter 3 for more information).

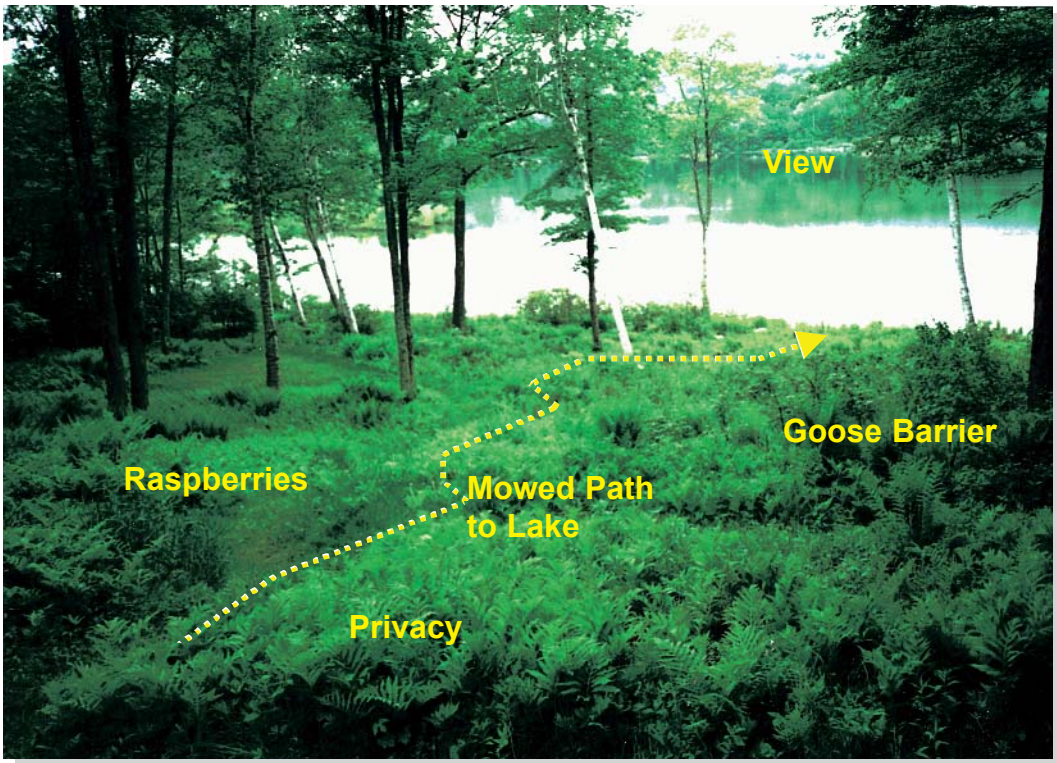
In all the examples shown here, native plants were used exclusively. A native species can be found to meet most landscape desires. Native flowers such as blue flag iris, cardinal flower and great blue lobelia are as brilliant and showy as non-natives. Shrubs such as native azaleas, mountain laurel and sweet pepperbush display colorful flowers, while blueberry bushes provide fruit to humans and wildlife.

1. Residential Waterfront

Specifics of the Site

Our first property is located on a recreational pond. The pond is relatively small and shallow, so even slight pollution concentrations have the potential to alter water quality significantly. The yard provides wildlife with a variety of habitats.

The owners have cultivated a lush mixture of trees, shrubs and ferns along the shoreline. A small mowed lawn for lounging, relaxing and holding family events has been maintained around the house. The open lawn around the house and the canopied buffer along the shore provide a pleasant mix of sun and shade in the summer.



View of the pond from the house
Source: BRPC Archive, 2001

View of the house from the pond
Source: BRPC Archive, 2001

Priorities of the Landowner

- Maintain privacy. The property is partially screened by mature trees and tall ground vegetation.
- Maintain view of the pond. This is accomplished by selectively pruning branches of the trees and restricting the height of herbaceous undergrowth. Unwanted shrubs or saplings are weed-whacked once every one or two years. Note that in pruning for a view, all the lower branches have been removed, diminishing the value of the area for birds and small mammals that need the lower branches for refuge from predators.
- Maintain easy access to the water. This is accomplished by mowing a path through the under-growth which connects the lawn to the water. Note that the path is winding. A straight pathway can become a channel for stormwater, while a winding path slows the flow of water, allowing for more infiltration.

Buffer Design

The owner of the property pruned lower tree limbs to create a view of the prond. The vegetated understory is allowed to grow naturally.

Other Applications for This Design

The abundance of ferns gives this landscape a lush appearance. In general, ferns do better under a canopy that provides shade and help to keep the soil moist. So creating or maintaining tree shade is important. To attain a denser mix of vegetation along the shore, you can simply stop mowing there and see what sprouts. You can help the transition to a more natural setting by planting a few shrubs within the zone to add variety and depth. As stated earlier, you should keep a sharp eye out for invasive species, which might find your "no mow zone" a fine place to colonize.

2. Residential Waterfront

Specifics of the Site

The property is one of many in this neighborhood of one-acre-or-less lots. The house is in line with its neighbors and is set back approximately 30 feet from the water. The house faces the east, so it receives direct morning sun and is shaded in the afternoon. The soil is gravelly, having been altered during development. Ideally the buffer would be planted right along the shoreline, but this shore is being undermined by wave action. Water is washing in between the rocks, washing away soil and leaving large air pockets in the soil. Stabilization of the shoreline is the next improvement project.

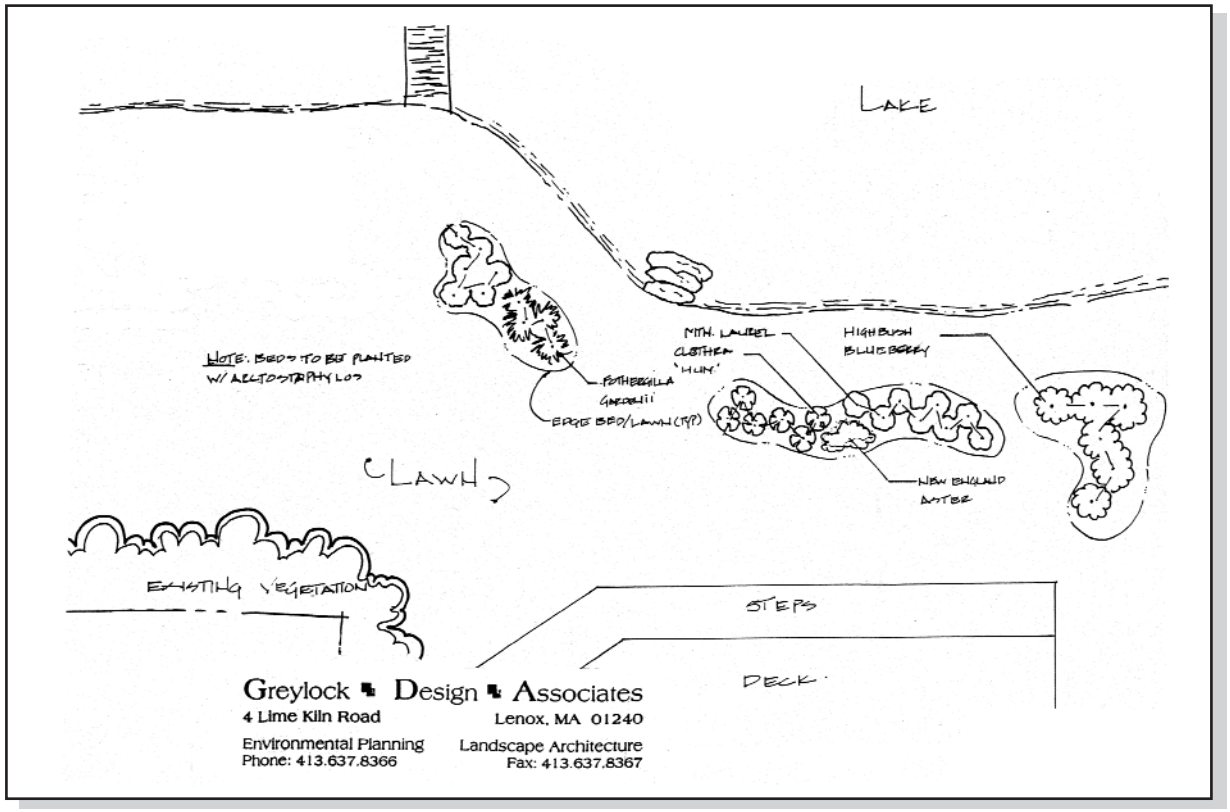
Priorities of the Landowner

- Maintain aesthetics. As the waterfront yard is a relatively small area, the buffer would be a very prominent landscape feature on the property. The owner prefers a diversity of shrubs that provide color throughout the seasons.
- Maintain an unobstructed view of the lake.
- Deter geese - from the lawn in particular and the waterfront area in general. Increasing numbers of geese are invading the lawn, making it unpleasant and possibly unhealthy for grandchildren to play and swim in the area.
- Feature low-maintenance plants.
- Maintain approximately 20 feet of lawn between the house and the buffer for family events.

A small buffer on a small lot. This buffer is approximately 60 feet long and 6-8 feet wide. The buffer has stopped Canada geese from visiting the lawn - much to the owner's delight! ▶
Source: BRPC archive, 2002.

◀ *This buffer provides year-round color: Spring welcomes green foliage and an array of pink flowers; summer is predominantly green, with dashes of purple from the irises, asters and blueberries; autumn color is predominantly yellow.*
Source: BRPC archive, 2002.

Buffer Design



Source: Greylock Design Assoc., 2002

Robert Akroyd of Greylock Design Associates of Lenox designed the buffer according to the needs of the landowner. He chose to plant the buffer with a mix of shrubs, perennial wildflowers and ground cover. Shrubbery allows a continual view of the lake, and the plants provide an array of color throughout the year. In addition to the plants shown on the planting plan, bearberry, an evergreen ground cover, was planted between the shrubs and several blue flag were planted facing the house. The iris temporarily fill in open spaces between young shrubs.

Due to proximity to the water's edge, fertilizers were not used to boost plant growth. Compost was added during planting to improve the soil's texture and moisture-holding capacity. The nutrients within the compost are released slowly, giving plants a chance to absorb them.

Other Applications for This Design:

Small house lots are the perfect place for landscaped buffers of this sort. The fruit and flowers of the buffer attract birds and butterflies, the foliage provides shade and refuge for small animals, and the shrubs add depth and complexity to the root system. Small sections of buffers can also be planted in public recreation areas to filter runoff and capture subsurface pollutants.

3. Residential Waterfront

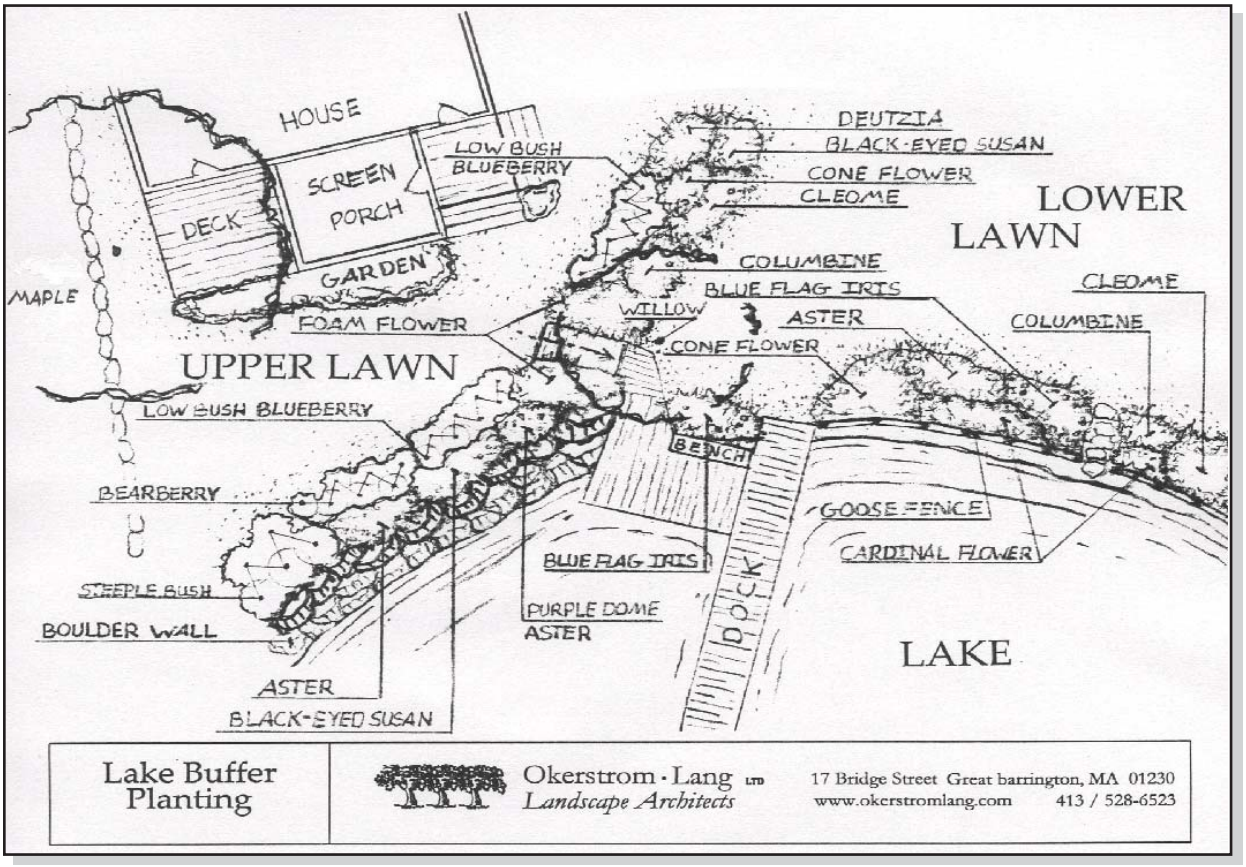
Specifics of the Site

This property is one of many large-lot properties along a recreational pond. The house is set back on a hill overlooking the water. The house faces west and receives full sun all day. A large lawn is located to the south where the owners have access to the dock and water. The wave action from motorboats on the lake undermines the shoreline soils.

Priorities of the Landowner

- Maintain direct access to the water for swimming and canoeing.
- Maintain views of the water.
- Provide color throughout the growing season.
- Feature low-maintenance plants.
- Maintain lawn for family gatherings.
- Deter geese from entering the property. Every year the numbers of geese on the property are increasing. The geese can be offensive and make using the lawn and swimming in the water undesirable.

Buffer Design

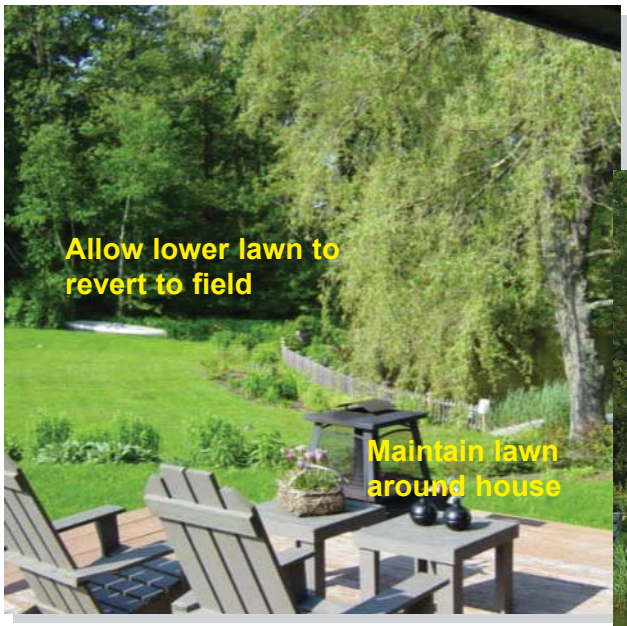


Source: Okerstrom Lang, Ltd., 2003

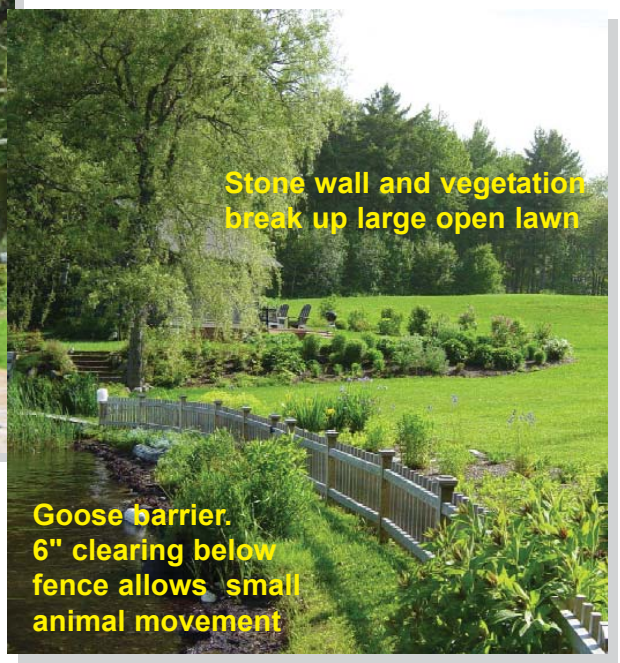
2-6 Buffer examples

Okerstrom Lang, Landscape Architects of Great Barrington, designed the buffer to meet the needs of property owners. The designers chose low growing, native perennials along the shoreline that would provide a variety of color. Since it will be several years before the buffer completely fills in, a small picket fence with a gate was installed to deter the geese. The gate allows access to the water for swimming and canoeing, and the six-inch clearing below the fence allows small animals, such as turtles and amphibians, to crawl beneath it.

Gardens were also planted on top of an existing stone wall and on the other side of the stairs leading down to the dock. This created a separation of space with an upper lawn and a lower lawn. The plants were chosen to be low growing so that a clear view of the water will be maintained. This buffer is a mixture of low-growing shrubs (low-bush blueberry), ground cover (bearberry) and native perennial wildflowers. The owners are considering allowing the lower lawn to grow into a field, where they would maintain a mowed path to the pond. This will provide cover for nesting turtles, birds and other wildlife.



◀ *View of the pond from the house. Source: Okerstrom Lang, Ltd., 2003.*



View of the house from the pond. Source: Okerstrom Lang, Ltd., 2003. ▶

Other Applications for This Design

Large expansive lawns are a thing of the past. This design illustrates how large open areas can be broken up into smaller segments and revegetated in new ways. Revegetating shoreline areas are most important. Allowing overly large lawns to revert to field or a more natural mix of field, shrubs and trees will restore habitat that was once lost to the bulldozer.

4. Wetland Garden at The Berkshire Botanical Garden

Specifics of the Site

The Berkshire Botanical Garden (BBG) is a nonprofit arboretum, with a need to expand its parking lot. Pretreatment of stormwater runoff was required prior to its discharge into the local storm drain system. Planting a buffer to mitigate runoff was the first option, but topography and the layout of the property precluded this option. Instead, it was decided that a wetland garden, planted with a mix of wetland and upland plants, would be created in a prominent location on the grounds to serve both as a functioning pretreatment structure and as an educational tool about nonpoint pollution. The garden, which can be visited at the BBG, is located at the intersection of Routes 102 and 183 in Stockbridge.

Priorities of the Landowner

- Capture sediment from the parking lot and capture nutrients in stormwater runoff.
- Capture at least 80% of total suspended solids, as required by the Massachusetts Stormwater Management Policy, before discharging runoff into the storm drain system.

Construction of a retention basin, which is being converted into a wetland garden. It captures sediment and other pollutants.
Source: BRPC archive, 2001.

Buffer Design

Okerstrom-Lang Ltd., a landscape architecture firm in Great Barrington, designed the wetland garden basin in coordination with BBG horiculturist Dorthe Hviid. The garden is located behind the Visitor Center and is very visible from the main road, so it had to be designed to be attractive as well as functional. Turf lawn was dug out, and the hollow of the basin was bermed to contain exceptional flows. The garden is approximately 20 feet by 20 feet. Plants selected for around the berm are a mix of upland shrubs and ground cover. Plants selected for the inside of the garden are a mix of wetland shrubs and herbaceous plants.

Most storm drain systems discharge untreated runoff directly into the nearest water body in older lakeside neighborhoods. Detention basins can be retrofitted into existing stormdrain systems to capture pollutants.
Source: BRPC archive, 2002.

Other Applications for This Design:

The wetland garden is a modified detention basin. These basins trap sediment and filter pollution. They can work in conjunction with the planting of buffers to treat polluted runoff in older lakeside developments. Stormwater runoff was typically collected in storm drain systems and discharged into the lake untreated. Chances are, the same old system is still in place, with polluted runoff being discharged directly into the lake. While buffers can filter runoff from shorelines, detention basins can be installed at the end of the storm drain system to treat road runoff.

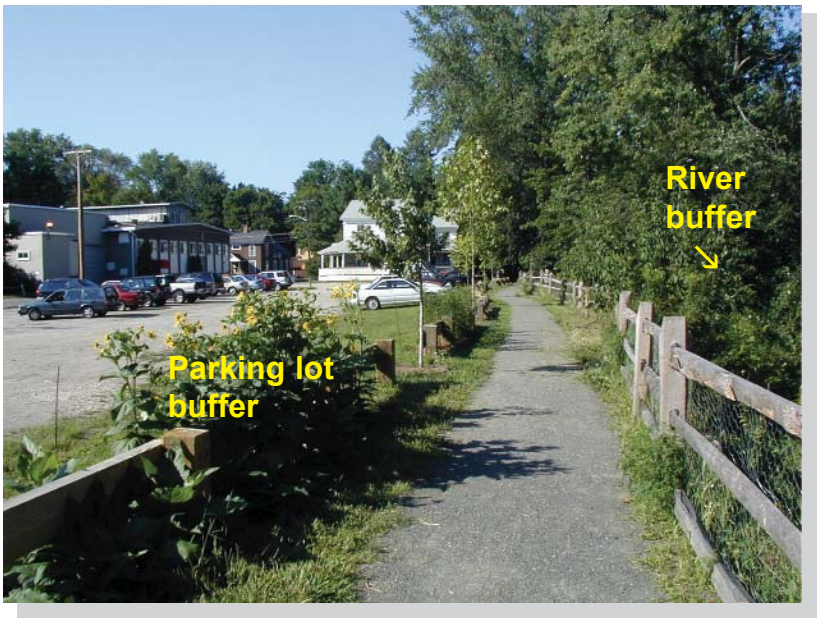
5. Recreational Trail Improvement

Specifics of the Site

Recreational trails along water bodies can be a source of pollution if they are not properly designed or if they are allowed to erode. The Great Barrington Housatonic RiverWalk is a pedestrian greenway. The project is an effort to reclaim the beauty of a "working river" abused by years of industrial waste and neglect. The denuded riverbank has been revegetated, and the trail has been designed to protect water quality by minimizing erosion and capturing and filtering stormwater runoff.

Priorities of the Landowner

- Revegetate the bank with fast-growing plants to stabilize the bank, minimize soil erosion and give a native plant community a chance to establish.
- Create an attractive buffer along the edge of the parking lot, to filter and cool parking lot runoff.



The Riverwalk trail, looking north. The river is below to our right and the parking lot is to our left.
Source: BRPC archive, 2002.

Buffer Design

Openspace Management of Great Barrington provided the landscape design for the buffer and trail system, and Marconica, Inc., along with a corps of volunteers, planted the vegetation on the riverbank and along the parking lot buffer.

The Housatonic River lies immediately east of the trail. The slopes of the riverbank are very steep, so it was important to maintain infiltration of stormwater and keep trail runoff from creating erosive channels. To accomplish this the trail was constructed with "porous" pavement that allows water to percolate through. Grasses were planted along the edge of the trail, to filter sediment and help to evenly spread runoff flow, thereby minimizing channel creation. To further filter runoff and stabilize the bank, a mix of tree saplings, shrubs and herbaceous vegetation was planted between the trail and the river. The split-rail fence is not only a safety feature, it keeps people from going down the embankment and trampling the much-needed vegetation.

A commercial parking lot lies immediately west of the trail. A 6-foot wide buffer consisting of grass, young trees and native perennial wildflowers was planted between the parking lot and the trail. The grass will filter sediment and allow infiltration of runoff. Parking lot stormwater will be returned to the river through subsurface flow, and will be in a cleaner and cooler condition. Once again, a fence will help keep people off the buffer and prevent trampling of vegetation.

Standing along the water's edge you can see the steep slope of the riverbank. It is why minimizing runoff is so important. A combination of herbaceous cover, shrubs and trees is the best mixture for long-term bank stabilization. ▶
Source: BRPC archive, 2002.

◀ *Note the increase in vertical layering of vegetation with perennial wildflowers and young trees. Once established, the vegetation will provide valuable shading to cool stormwater.*
Source: BRPC archive, 2002.

Other Applications for This Design

Plant buffers between water bodies and parking lots, eroded trails and bare-ground sections of public recreation areas. Fences and dense shrubs can be strategically placed to keep people out of sensitive environments.

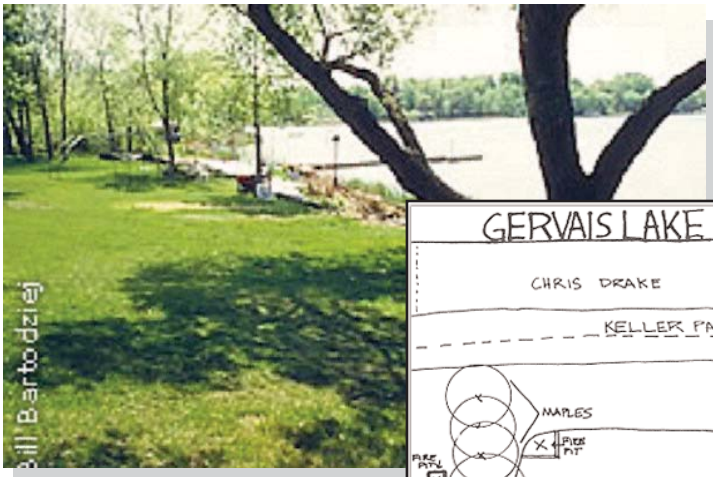
6. Restoring the Lakefront in Minnesota

Specifics of the Site

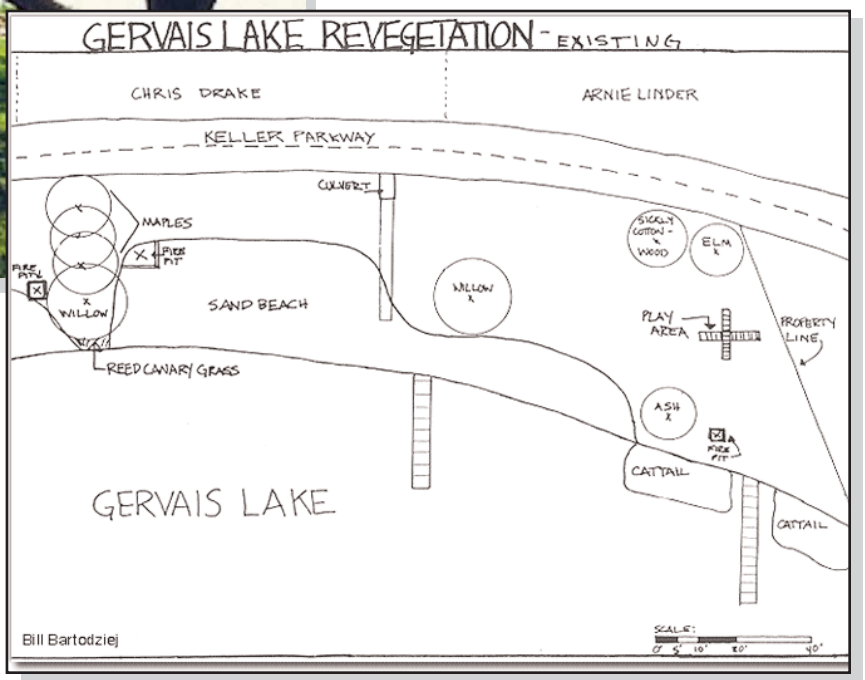
Most of the native vegetation along a portion of the shoreline along Lake Gervais had long been removed and replaced with grass. The site, used jointly by the two landowners for recreation and picnicking, looked "very nice and clean and neat." Their properties were bisected by a local road, with the houses located upland of the road. A sandy beach ran along the length of the property. The owners were becoming tired of the fertilize-it-and-mow-it routine, but were concerned that invasive species would colonize the site if they created a "no mow zone." Reed canary grass, an invasive species, was already present. So, they partnered with the local watershed district to create a Shoreline Restoration Demonstration project and return the site to a more lush and natural condition.

Priorities of the Landowners

- Create a more natural look and feel, one that will filter runoff from the road and from areas of activity.
- Maintain some grassy areas for personal use.
- Minimize erosion.
- Discourage invasive species colonization.



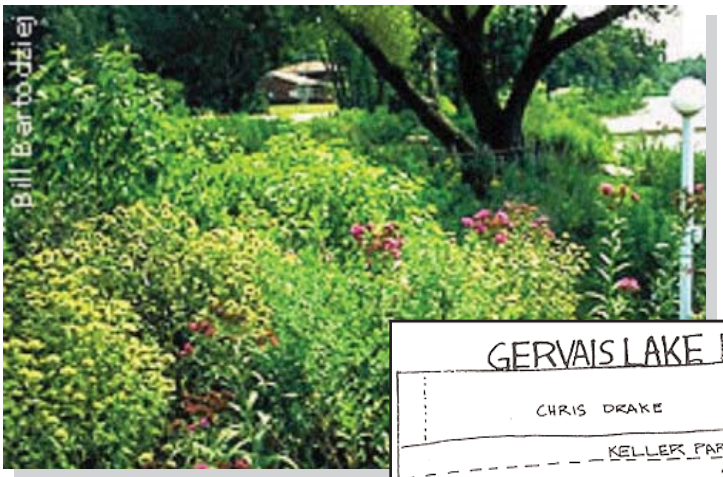
◀ *Pre-restoration condition. This willow tree was one of only a few trees left on the site. Grass was the dominant vegetation.*
Source: MN DNR, 2002.



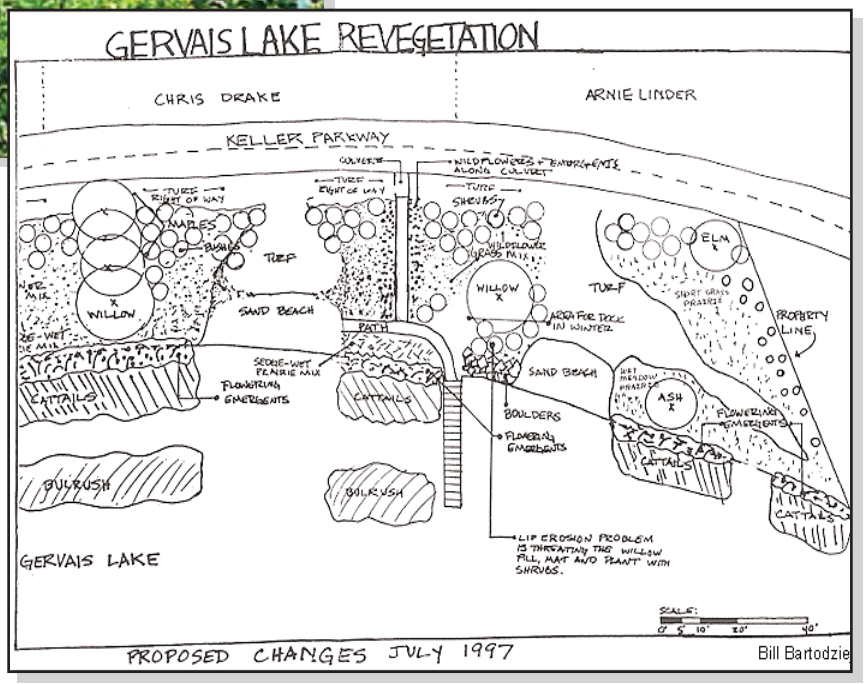
This is a map of Pre-restoration condition of the site. ▶
Source: MN DNR, 2002.

Buffer Design

Bulrush and cattails were planted in the shallow water along eroded banks to absorb the force of waves and wakes. The beach and lawn areas were reduced and replaced with a mix of native grasses and shrubs. The wildflowers provided color and attracted scores of butterflies and hummingbirds. Although at first their neighbors were skeptical of the new landscape, it is now very well accepted. In fact, most of the questions the owners receive from visitors are related to how it can be replicated on their own properties. It has become a focal point of the neighborhood, where people come to walk and enjoy the flowers.



◀ *The shoreline is now lush with wildflowers that filter runoff and attract butterflies and other wildlife.*
Source: MN DNR, 2002.



The design for the new landscape. Note the reduction in turf and beach and the addition of shrubs, wildflowers. Note also additional plantings of cattails and bulrushes. ▶
Source: MN DNR, 2002.

Other Applications for this Design

Revegetating eroded recreational shoreline areas would be a perfect application for this design. Creating a walkway through the vegetation would give people an opportunity to saunter through and enjoy the flowers without "bushwhacking" into the buffer. This design would also be perfect for those who would like to increase their chances of viewing butterflies and birds.