



# Chapter

# 1

What is a Vegetated  
Buffer and How  
Does it Work?







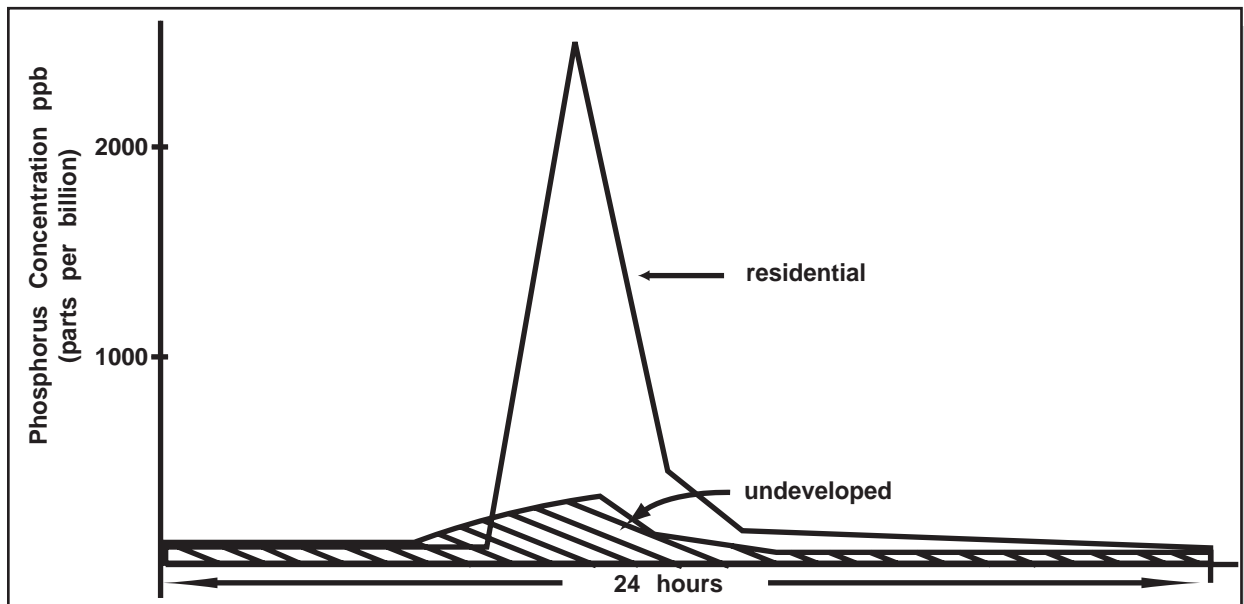
## What Is a Vegetated Buffer and How Does It Work?

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 its 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.



Source: MN DNR, 2002

### 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.

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.

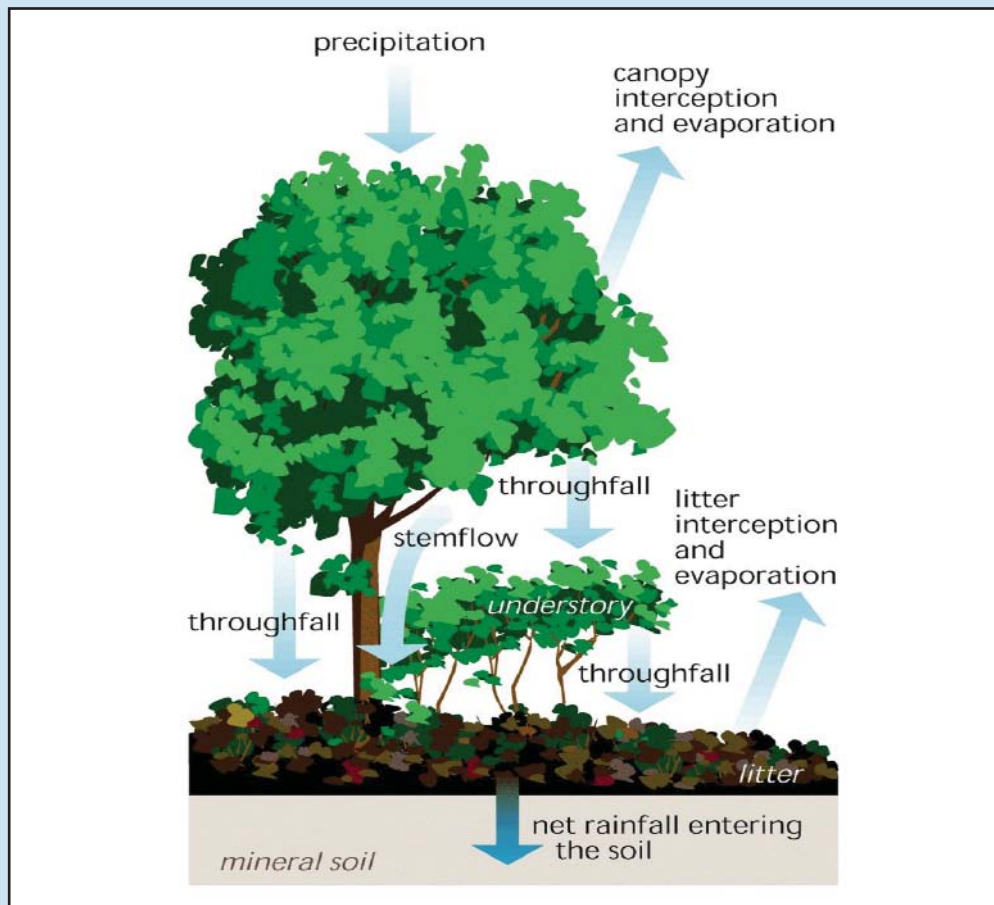
This introduction is a summary of the benefits that vegetated buffers can provide to homeowners, wildlife and water quality. A more detailed explanation of each of these benefits, can be found in Appendix A.



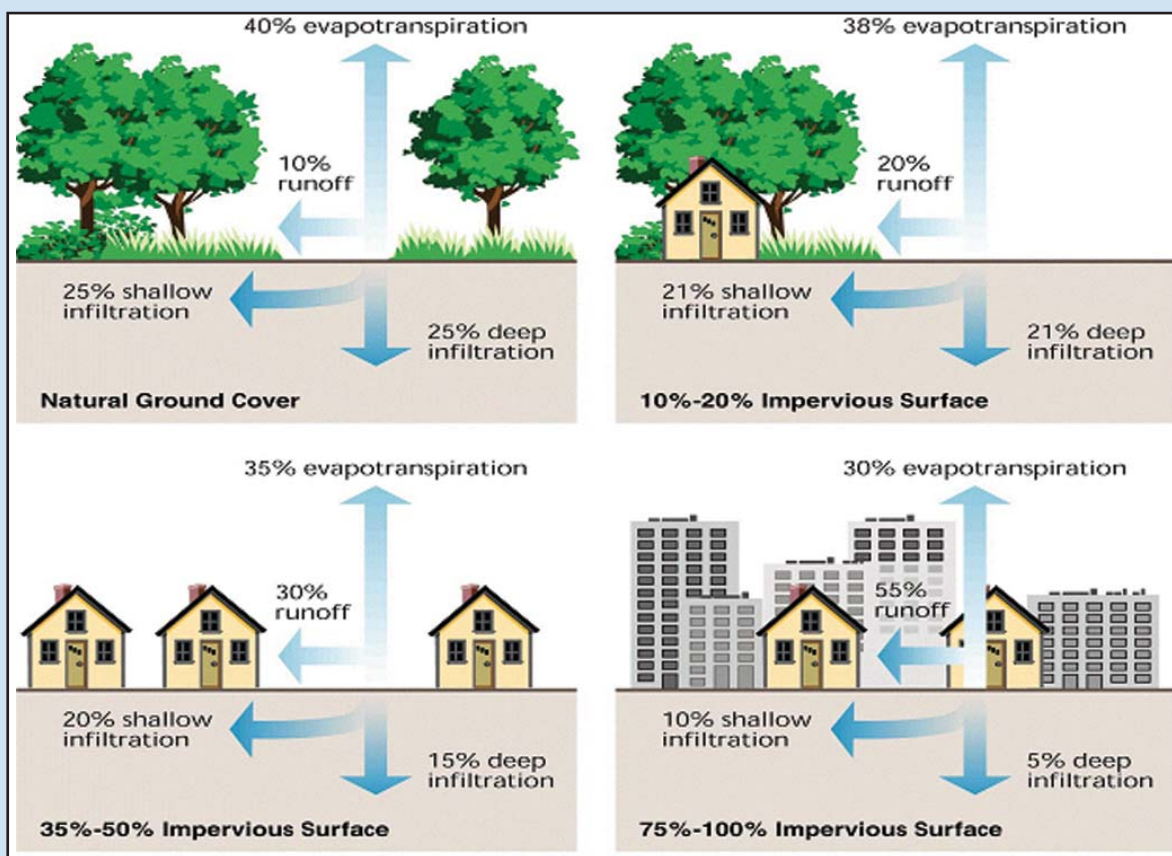
## How Development Alters Stormwater Runoff and Affects Water Quality

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?