LAKE HURON CENTRE FOR COASTAL CONSERVATION

Bluff Conservation

The Value and Function of Coastal Vegetation

Bluffs along Lake Huron owe much of their stability on the vegetation that acts to bind the soil, making it more resistant to erosion. Woody vegetation in particular enhances the stability of slopes. This factsheet discusses the role of vegetation on the stability of coastal bluffs and ravine slopes. Bluff instability can be generally described as surface erosion, shallow slope failure, and mass soil movement (i.e. slump).

Live plant foliage and woodland litter (partly decomposed leaves, twigs, etc.) break the force of falling rain and reduce the impact of raindrops, which can loosen soil and transport it down slope. The ability of the soil to absorb water is increased substantially by the presence of woodland litter, which acts as a sponge by holding water and releasing it slowly over an extended period. However, too much litter can be detrimental to your coastal property (see Word of Caution on page 4).

Low-growing plants catch and slow rainfall and allow some moisture to evaporate from leaf surfaces. Groundcovers and woodland litter also help reduce surface water runoff velocity and act as a filtering system for soil particles in suspension. Plants draw water up through their stems or trunks and branches to their leaves and into the air by the mechanism of transpiration, removing water from the soil.

Plant roots, especially the smaller feeder roots, provide a fibrous web that stabilizes and anchors soil. They function much like reinforcing steel in concrete structures, increasing the cohesive strength within a soil horizon. The roots of many brush and tree species penetrate deeply, increasing the soil's shear strength and reducing risk of shallow slope failures.

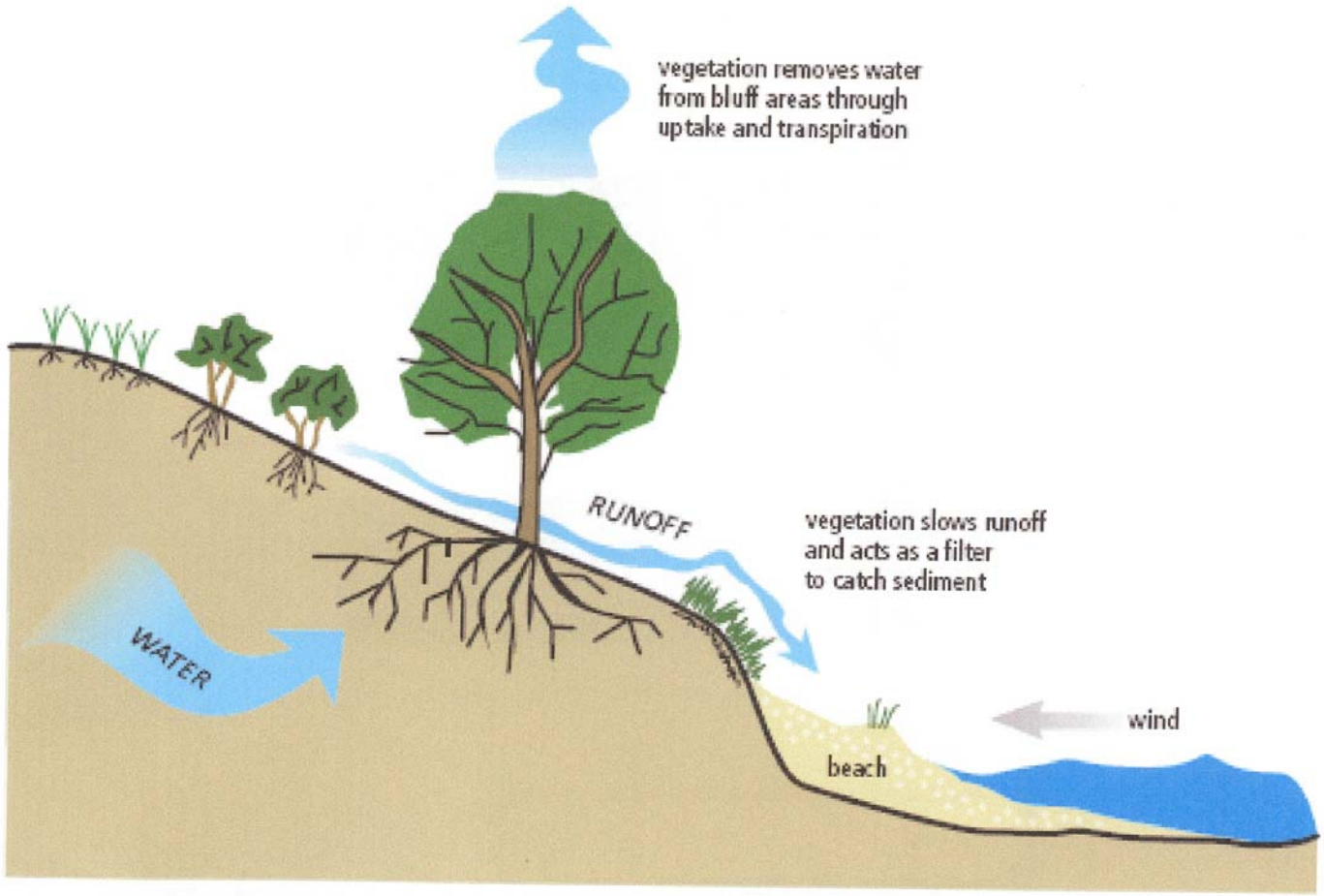
Vegetation, though more effective in protecting against surface erosion than in controlling mass soil movements triggered by groundwater, can still be valuable in sustaining slope stability. Many bluff sites along Lake Huron are marginally stable and the removal of vegetation on some slopes can precipitate a slope failure or reactivate an old one. Due to the complex root network formed by trees and shrubs, potentially unstable slopes are held together and the resistance of the soil to slipping, sliding, and washing away is increased.

As a result of the gradual loss of root strength after tree removal, marginally stable slopes may fail several years after clearing or thinning.

An un-vegetated bluff face generally suggests a site is either too steep to support vegetation or that recurrent erosion makes the establishment of plants unlikely. Bare areas may be indicative of a recent or active slope failure.

What You Need to Consider Prior to Removing a Tree along the Bluff

Tree Roots. The root systems of trees form an interlocking network, especially on many shoreline



Function of bluff vegetation. (Source: U.S. Army Corps of Engineers and University of Wisconsin)

sites where rooting can be shallow. Sometimes rooting is only two to three feet deep. The depth of root penetration is largely a function of soil depth and type, soil moisture, and the presence or absence of a dense layer of clay or till.

Trees compensate for shallow rooting by increased spread of root systems. Research indicates that a tree's root system will extend considerably beyond the dripline, often as much as two to three times as far. Extensive lateral root systems are common where soil moisture is excessive, soil is shallow, and impervious soil layers provide a barrier for vertical growth. Where soils are porous, well-drained, deep, and no impervious layer exists, deeper rooting will occur.

Generally, the influence of a tree's roots on a given site will be related to the tree's age and size. Larger trees will have more extensive, often deeper and better developed root systems. Dominant trees, those larger and taller than the surrounding ones, have been more exposed to wind and usually have developed stronger root systems as a result.

Before cutting trees, consider the effects of removal on tree rootmass over time. As roots of dead trees decay, their stabilizing influence diminishes over a three to nine year period. *As a result of the gradual loss of root strength after tree removal, barely stable slopes may fail several years after clearing or thinning.*

A Valuable Asset

Trees are invaluable long-term investments for protecting waterfront property from erosion and landslides. Once a tree is removed, its functions can never be replaced. What if a tree is blocking your view? Before reaching for the chain saw:

- Consider limbing or pruning, but NOT topping! Topping makes trees vulnerable to disease.
- Instead of removing an entire stand of trees, remove one or two and infill with native shrubs. Instead of clearing for a view, establish “windows” (see photo below).
- If a tree must come down, leave its roots in place for bank structure, and leave some trunk for wildlife habitat.
- Plant shrubs or young trees around the base of a cut tree.

Site Disturbance

Site disturbance, whether caused by natural processes or human impacts, affects the vigour and species of plant communities and how long they have had to develop and mature.

Clear cutting a lake vista can have profound implications for bluff instability. The effects of such cutting will become evident with time. As roots of dead trees decay, their stabilizing influence diminishing over a three to nine year period

Selective cutting and pruning can provide an effective “window” to view the lake. Windows maintain the protective function of the trees from storm winds.

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Providing Leadership in Coastal Conservation

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References

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Natural processes contributing to site disturbance include erosion (both surface and mass soil movements), extreme episodes of wind, rain or cold, and unusual storm events that de-stabilize the toe of slopes due to storm waves.

Human impacts that can cause severe site disturbance include vegetation clearing, road building, and grading of shore areas.

The impact of removing mature trees from a site, while not as disruptive as clearing and grading, can severely alter microclimate conditions. Many smaller native trees and shrub species have adapted to the low-light conditions under forest cover. When large trees, such as Maple, Ash, Basswood and Birch, are removed these understory plants suffer from light increases and may die and be replaced by less desirable species, including non-native, invasive species.

Neighbouring Properties

Off-site influences can impact the plants growing on your property and indirectly increase the potential for erosion in various ways. Adjacent clearing can modify the hydrologic and drainage characteristics on your property. Sudden increases or decreases in surface and sub-surface water can subject the vegetation (especially evergreen trees) to environmental stresses that can weaken them. Off-site clearing can also remove wind protection or change wind patterns. Share this information with your neighbour so he too can fully realize the benefit and value of vegetation and can help make informed decisions

Slope Management Tips:

- If you live on a bluff, manage drainage carefully to avoid large quantities of water from saturating the soil and destabilizing the slope.
- Direct drainage from roof downspouts and down the bluff beyond the base of the bank.
- Use porous surfaces (bricks, flagstones, or gravel) rather than pavement around your buildings.
- Inspect and maintain your drainage and septic system annually.
- Protect vegetation. During construction, minimize clearing and re-vegetate slopes as soon as possible.
- Don't overwater your lawn.
- Landscape with plants that require little watering once established. Native plants are best.

A word of caution: thick piles of lawn clippings and other yard waste can smother the vegetation that stabilizes slopes and banks. Clippings can also clog watercourses and stifle aquatic plants and animals. Use a composter rather than dumping your yard waste into sensitive areas.

Keep in mind that vegetation alone cannot protect against erosion in all cases. Vegetation cannot withstand wave attack at the toe of a slope, nor will it prove effective in stabilizing a slope already subject to deep-seated mass soil movements. If you suspect problems of this nature, consult with the Maitland Valley Conservation Authority (519-335-3557), to see if you need to seek the services of a geotechnical engineer.