Be prepared to monitor and replace flexible pipe. This slope failure at the Garfield Nature Trail occured when a pipe that conveyed stormwater to the bottom of the slope broke.

Photo by Sound Native Plants.

A landslide at Percival Creek caused by stormwater runoff that was improperly piped onto the slope.

Steep slopes are considered critical areas and are covered by many city regulations intended to protect slopes from failure and protect homes from damage.

REFERENCES

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Myers, Rian D. 1993. Slope Stabilization and Erosion Control Using Vegetation: A Manual of Practice for Coastal Property Owners. Shorelands and Coastal Zone Management Program, Washington Department of Ecology. Olympia. Publication 93-30. www.ecy.wa.gov/programs/sea/pubs/93-30/intro.html

Managing Vegetation on Coastal Slopes
Manashe, Elliott. 1993. Vegetation Management: A Guide For Puget Sound Bluff Property Owners. Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia. Publication 93-31 www.ecy.wa.gov/programs/sea/pubs/93-31/intro.html

Managing Drainage on Coastal Bluffs
Myers, Rian D., Michele Lorilla, and Jane N. Myers. 1995. Surface Water and Groundwater on Coastal Bluffs: A Guide for Puget Sound Property Owners. Shorelands and Water Resources Program, Washington Department of Ecology. Publication 95-107. www.ecy.wa.gov/programs/sea/pubs/95-107/intro.html

Department of Ecology Shorelines Website
Another useful resource is the Department of Ecology Puget Sound Shorelines website. This page contains information on beaches, bluffs, buying property, building, homeowner tips, laws and permits. www.ecy.wa.gov/programs/sea/pugetsound/index.htm

City of Olympia Municipal Code
Relevant sections of the Olympia Municipal Code (16.60 Tree Replacement & Protection Ordinances and 18.32 600-645 Critical Areas: Landslide Hazard Areas) are available on the web at www.olympiamunicipalcode.org

For additional copies or information visit www.olympiawa.gov or contact:
Community Planning & Development at 360-753-8314, P.O. Box 1967, Olympia WA 98507-1967,
or Public Works Water Resources at 360-753-8588, P.O. Box 1967, Olympia WA 98507-1967.

City of OLYMPIA

A Homeowner's Guide to

Protecting Your Slopes

Steep slopes with grades of over 40% are most vulnerable to failure – but even moderate slopes with grades over 10% can fail when impacted by impervious soil layers, runoff, springs, seeping groundwater, or past movement.

Protect slopes by managing stormwater, establishing deep-rooted vegetation, and removing excess weight.

Is Your Slope Hazardous?

Gravity is constantly moving soil downslope. This movement is often very slow and not noticeable. The natural downward movement of soil can be accelerated by factors including human land use and land use practices. Is your slope in danger?

- ☐ Steep slopes with **grades of over 40%** are most vulnerable to failure.
- ☐ Moderate slopes with **grades over 10%** can fail when impacted by features such as impervious soil layers, springs or seeping groundwater, or past movement.
- ☐ Slopes with only **low-growing, shallow-rooted vegetation** are more likely to slump, collapse, or landslide when rainfall or other water sources saturate the ground.

Before slope stabilization.

Photo by Sound Native Plants.

After slope stabilization.

Protect & Stabilize Your Slopes

Maintain your slope for long-term stability, inspect your slope frequently, and take preventive action before it's too late. Remember the three steps to protecting slopes:

- **Manage your stormwater;**
- **Establish deep-rooted vegetation; and**
- **Remove excess weight.**

Learn more about protecting and stabilizing your slopes inside this homeowner's guide.

Inspect and maintain your stormwater pipes. Broken pipes can contribute to erosion and landslide problems.

1. Manage Your Stormwater

Your goal is to direct runoff away from the slope to prevent the slope face from becoming saturated with water – a major cause of slope failure.

Inspect Your Downspouts

- **Check and redirect water flow.**
Check to see where your downspouts and surface runoff flow. Direct downspouts so water flows away from the slope. Disperse water onto lawns or landscaped areas as far from the slope as possible.

- **Redirect runoff with flexible pipe.**
Consider using flexible piping to transport downspout runoff away from the slope. Consider using a dispersement tray at the end of the pipe to distribute the water over a larger area instead of concentrating it at one point. This can help deter erosion or pooling of water elsewhere in the yard.

Creative Stormwater Management

These options require some additional cost, research, and/or technical assistance, but are doable by many homeowners.

- **Create a "Rain Garden."**
A "rain garden" is a decorative garden in a shallow depression that is designed to capture and infiltrate the water. You can also install gravel trenches or sumps to help runoff infiltrate into the ground.

Rain Gardens help downspout water infiltrate into the ground.

- **Pipe the flow to the slope bottom.**
If a downspout must discharge at the top of a steep slope it is better to pipe the flow to the bottom of the slope. If you own the property all the way to the bottom of the slope and are prepared to monitor and replace the flexible pipe if it breaks, flexible piping can be used to convey water down the slope. Broken pipes that discharge onto the side of a steep slope will erode into the slope and cause slope failure.

If you don't own the property all the way to the bottom of the hill, it is illegal to discharge water onto your neighbor's property.

- **Consider planting terraced slopes.**
A more highly-engineered option is to grade the slope with terraces and add plants. The landscaped areas will retain and infiltrate rainwater to reduce the amount of water reaching the slope face.

2. Establish Deep-Rooted Vegetation

Roots help hold the slope together by binding surface soil layers to deeper soil layers. This helps the surface layers to resist sliding down the slope. Trees provide the deepest and largest network of root support. Shrubs and low-growing vegetation provide some support, but not as much as trees.

- **Install weed barriers with caution.**
Plastic weed barriers and non-porous landscape fabric can lead to slope failure because surface runoff cannot soak into the ground. Install only "highly-permeable" landscape fabric across the slope face. If multiple rows are needed to cover the slope, place the first layer at the top of the slope. Overlap the next row of fabric on top of the previous layer to allow water to flow under the downhill layers. This will prevent water saturation from concentrating at any one point.

- **Maintain slope integrity with trees.**
Homeowners should maintain a uniform cover of trees on their slopes. This means planting new trees before old trees die and when trees have been removed or are damaged.

Photo by Sound Native Plants.

Limbing-up, when done minimally and properly, is a pruning method that maintains views and tree health while protecting slopes.

Trees are critical to slope protection because they provide the deepest and largest network of root support. Roots bind surface soil to deeper soil layers to reduce the chances of slope failure.

- **Maintain views with proper tree selection and pruning.**
Views can be maintained while protecting the slope if the vegetation on the slope is managed and maintained correctly. Existing trees can be pruned, if done correctly. Topping is not pruning and is very damaging to trees. Many varieties of trees, including dwarf varieties of common species, do not grow excessively tall and maintain views and slope stability.

- **No topping, please.**
Clearing slopes and topping trees for views is not recommended, and in many situations is not allowed by the City. For advice on proper pruning and tree health contact a certified arborist through the International Society of Arboriculture at www.isaarbor.com/find/Arborist/findarborist.aspx.

- **Tree removal can cause problems.**
It can take several years for the effects of tree removal to show up because the tree roots can still provide support for many years. Once the roots die back and decay there is no deep-rooted support for the slope and failure is more likely.

- **Get permission before removing trees.**
Existing trees can only be removed if replaced with other trees as part of a slope stabilization or restoration project done with permission and/or a permit from City. Creating or keeping a view and protecting the slope requires the long-term maintenance of an individually-created planting plan.

3. Remove Excess Weight

Slope failure can be caused by a slope's inability to support excess weight from buildings, sheds, patios, foot paths, fallen trees, and yard debris.

- **Don't dump debris.**
Grass, brush, construction materials, soil, rocks and other debris will kill existing vegetation (even trees) by suffocating the roots. By killing the vegetation the roots no longer help hold the slope in place. Also the debris adds extra weight onto the slope – especially when saturated with rain. The wet pile could slide downhill taking soil and vegetation with it. For a one-time pickup of yard or construction waste, call Solid Waste at 360-753-8368, option 2. For bi-weekly pickup of yard waste call Utility Billing at 360-753-8340.

- **Remove excess weight from the slope.**
Remove all excess weight from the top of the slope. Plan future modifications near the slope carefully, and consider how weight is applied.

Steep **Slopes** are Highly **Regulated**

Steep slopes are considered critical areas and are covered by City tree removal and landslide hazard ordinances. These ordinances do not prevent you from working on or managing your slope, but do help ensure that the work is done correctly to minimize slope failure and protect homeowners from damage.

Here are some common questions:

Can I cut down a tree on my slope?
Yes, but only if it is certified a "Hazard Tree" or it is part of a City-approved Slope Stabilization Plan. A qualified forestry professional or certified arborist must certify that the tree is hazardous. Slope Stabilization Plans must be supported by the necessary planning that is documented in City-approved written reports.

Can I prune a tree on my slope?
Yes, if it is done to preserve the health of the tree. Remember, topping is not pruning. It is a violation of City ordinances to cause damage to a tree by the way it is pruned.

Can I plant new trees on my slope?
Yes. Careful planning and consideration should be given to the location and type of tree.

Can I remove fallen trees from my slope?
Yes. Fallen trees can be removed providing that other parts of the slope are not damaged during removal. If damage is a possibility, fallen trees can remain on steep slopes.

For specific questions about permits or permission for steep slope work, contact the City of Olympia Community Planning & Development Dept., located in the Smith Building at 837 7th Ave. SE, or call 360-753-8314.