RainScaping

A Do-It-Yourself Guide to Managing Your Home's Runoff

Snohomish County

www.rainscaping.info

RainScaping
Nature-inspired solutions
for your yard

Rainscaping Guide

A Do-It-Yourself Guide to Managing Your Home's Runoff

September 2024 (3rd Edition)

Compiled and Written by: Snohomish County Conservation & Natural Resources
Surface Water Management

Adapted with permission from: Resource Conservation District of Santa Cruz County
and Southern Sonoma County Resource Conservation District

Illustrations by: Snohomish County; Ritch Waldron, Wildways Illustrated; Page Gruys;
and from the Rain Garden Handbook for Western Washington

For more information: Snohomish County Conservation & Natural Resources
Surface Water Management
3000 Rockefeller Avenue, M/S 303, Everett, WA 98201
425-388-3464
www.RainScaping.info

This project has been funded wholly or in part by the United States Environmental Protection Agency under Puget Sound ecosystem restoration and protection cooperative agreement grant pc-00j20101 with Washington Department of Ecology. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Snohomish County
Conservation &
Natural Resources
Surface Water Management

DEPARTMENT OF
ECOLOGY
State of Washington

EPA United States
Environmental Protection
Agency

TABLE OF CONTENTS

INTRODUCTION 4

1 | UNDERSTAND YOUR RUNOFF 6

- Roofs 7
- Elevated Decks & Stairs 9
- Walkways & Patios 10
- Driveways & Parking Areas 11
- Soil, Yards & Slopes 12

2 | EVALUATE YOUR SITE 13

3 | FIND YOUR RAINSCAPING SOLUTION 22

- Berms & Trench Drains 26
- Compost (Amended Soils) 28
- Drainage Outlet Protection 31
- Drip-Line Protection 34
- Gutters & Downspouts 36
- Landscaping Naturally Wet Areas 39
- Lawn Alternatives 42
- Mulch 47
- Permeable Paving Options 50
- Rain Gardens 53
- Rainwater Collection Systems 58
- Retaining Walls & Terraces 65
- Underground Infiltration Systems 69

4 | MAINTAIN YOUR RAINSCAPING SOLUTION 83

5 | RESOURCES 90

RUNOFF FROM YOUR DOWNSPOUTS, LIKE THIS:

CAN CONTRIBUTE TO PROBLEMS LIKE THIS:

THE STORMWATER PROBLEM

Something as simple as water from a downspout can contribute to a number of unwanted consequences. Roofs and other impermeable surfaces alter natural hydrology and increase the volume of runoff when it rains (commonly called “stormwater”).

This can have a variety of harmful and unintended impacts, including:

- **To your home:** cracked foundations, mold and water damage from flooded crawl spaces, or standing water in your yard.
- **To your community:** potholes, damage to area roads and bridges, and landslides in severe cases.
- **To your environment:** swimming and fishing closures, streambank erosion, and degraded wildlife habitat.

Fortunately there are simple low-cost things that you can do to help decrease the volume of, and minimize the pollutants in, the runoff leaving your property. And many practices have the added benefit of beautifying your yard. Read on to find out what you can do.

SO WHY NOT TRY ONE OF THESE?

Here are just a few of the ideas you'll find in this guide to address runoff around your home.

Collect your roof water in a RAIN BARREL OR CISTERN

Photo: David Hymel

Plant a RAIN GARDEN in your yard

Install a BERM or TRENCH DRAIN on your driveway

Use PERMEABLE PAVING OPTIONS for your patio

1 | UNDERSTAND YOUR RUNOFF

There are five major areas around your home that can contribute to runoff. This guide examines each area for common problems related to runoff and suggests potential solutions you can implement around your home. Each solution is covered in detail in Sectiion 3 | Find Your Rainscaping Solution. These solutions are geared towards residential properties and are not complicated. The underlying concepts behind them follow a simple mantra: **SLOW** it. **SPREAD** it. **SINK** it!

The five runoff areas are:

1. Roofs
2. Elevated decks and stairs
3. Walkways and patios
4. Driveways and parking areas
5. Soils, yards and slopes

Source: Rain Garden Handbook for Western Washington

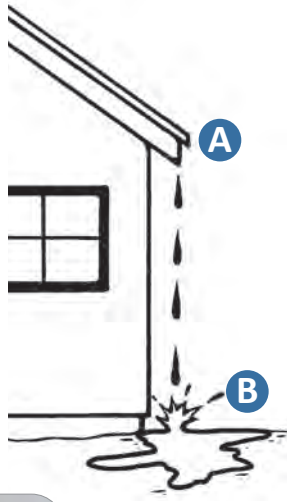
These are the five areas around your home having the most impact on runoff.

ROOFS

Your roof likely generates the most runoff from your home. While the majority of roofs are outfitted with gutters and downspouts, some are not. Protection measures for either possibility are discussed in this guide. Regardless of which system you use, all eaves and downspouts should be routed away from sensitive areas such as septic system drain fields, slopes, and building foundations.

Roofs Without Gutters

If it is not possible to install gutters because of cost or other issues, you will need to protect the ground below the eaves, which is referred to as the drip-line. Runoff from eaves can cause significant erosion, damage foundations, and flood your crawl space or basement, potentially causing mold growth.

POTENTIAL PROBLEMS	SOLUTIONS
A Non-guttered roofs can cause problems along the drip-line of your home. B Water from a non-guttered roof can cause erosion and damage structures and foundations. Ponding near foundations can also cause water intrusion and mold.   Mold and water damage can require costly repairs.	 A Adding gutters and downspouts works to direct water to a safe location away from bare soil and buildings (see Gutters and Downspouts).  B If adding gutters is not possible, make sure the ground slopes away from your foundation to prevent ponding. Add a clay layer 3 to 6 inches deep extending 10 feet from your foundation and add vegetation, mulch or rock below the drip-line to protect your home (see Drip-line Protection).

Most rain barrels hold 55 gallons.

Cisterns come in a range of sizes and can hold 200 to 1,000 gallons or more.

RAIN ADDS UP!

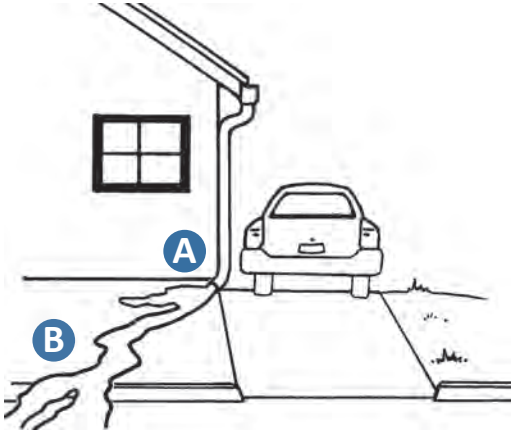
- It only takes 1 inch of rain falling on a typical 1,500 square foot roof to generate approximately 1,000 gallons of runoff.
- Annual rainfall in Snohomish County ranges from 32 inches in Stanwood to 84 inches in Darrington and Index.*
- In one year, you could collect as much as 32,000 to 84,000 gallons. That's enough water to fill 581 to 1,527 rain barrels.

** Rainfall data from PRISM Climate Group, Oregon State University.*

Guttered Roofs

Gutters and downspouts are an excellent choice for handling roof runoff but they must be properly sized, managed, and maintained to prevent damage to property and the environment. Undersized gutters clog and overflow more frequently, which can damage foundations. Directing downspout runoff too close to your home can damage foundations and create damp crawlspaces or basements. Instead, direct downspouts further from your house and add outlet protection measures to **SPREAD** and **SLOW** the flow. Always avoid sending runoff toward slopes, septic system drain fields, or buildings and other structures.

POTENTIAL PROBLEMS



A The downspout directs water too close to the house which can damage foundations and flood basements or crawl spaces. Water damage in your home can cause mold growth.

B Water from the downspout flows to the yard with nothing to spread or slow it down, and causes pooling water and erosion.

Photo: Northern Virginia Soil and Water Conservation District

Water from a downspout causes foundation damage, ponding, and erosion.

SOLUTIONS

A Extend downspout outlets at least 10 feet away from your foundation.

Photo: Plan-It Earth Designs, Portland, OR

B Direct downspout outlets to stable vegetated areas, splashblocks, energy dissipators, or level spreaders (see Drainage Outlet Protection).

ELEVATED DECKS & STAIRS

The area under decks, outdoor stairs, and other elevated structures, where water impacts the ground, is called the drip-line. Significant soil loss, damage to supporting structures, or worse, can occur if this area is not adequately protected.

POTENTIAL PROBLEMS

A Low decks may prohibit the addition of protective ground cover, leaving bare soil to erode.

B The runoff from high decks hits the soil with greater force than low decks, dislodging sediment and causing erosion. It can cause structural damage to supports and contribute to sediment and other pollutants entering nearby storm drains and streams.

C Runoff on steep slopes can cause significant erosion and even landslides. Soils, gravel and even mulch may be hard to keep in place on slopes.

SOLUTIONS

Photo: Eugene Sokol

A Adding drain rock, vegetation or mulch to the perimeter of low decks **SLOWS** and **SPREADS** water, limiting the movement of sediment. Drain rock may also be added under the deck (see Drip-line Protection).

B Adding drain rock under elevated structures **SLOWS** runoff and safeguards the drip-line area under elevated surfaces. Cover bare soil with mulch and dense plantings (see Drip-line Protection).

C Avoid removing vegetation on steep slopes (see Soils, Yards, and Slopes).

PET WASTE

▶ **THE PROBLEM:** Dog poop spreads diseases to people and pets.

▶ **THE SOLUTION:** Scoop the poop, bag it, and put it in the trash.

- **At home**, scoop at least weekly, ideally daily, especially before it rains.
  - Pathogens you can't see can be tracked indoors on paws, shoes, and flies.
  - Some pathogens can survive in your yard for weeks or years.
- **On walks**, bring extra bags, scoop every time, and carry it to the trash.

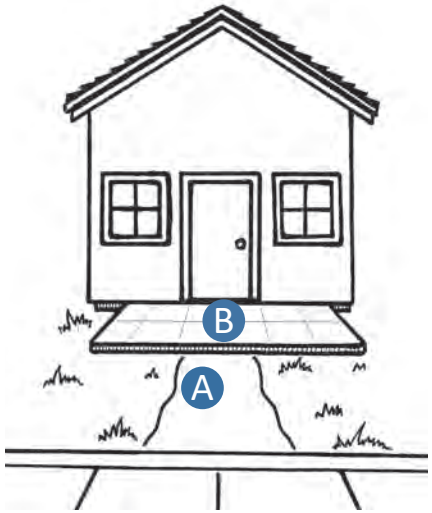
Find out more at www.snohomishcountywa.gov/3366

WALKWAYS & PATIOS

Walkways and patio areas often become conduits for runoff. For existing paved paths or patios, look for areas of standing water or visible signs of erosion where the path or patio surface meets the soil. Does your walkway drain to the street or toward your house?

When constructing a new walkway or patio always consider where it will drain. Angle it toward a vegetated area or try one of the new permeable paving options available that will reduce runoff and encourage water to **SINK** into the soil.

POTENTIAL PROBLEMS



A Foot traffic, even in low-use areas, can inhibit plant growth and cause compaction, reducing infiltration and leaving bare soil to erode.

B Hard durable surfaces such as patios are often constructed of concrete or other impermeable materials that don't allow water to **SINK** into the soils.

SOLUTIONS

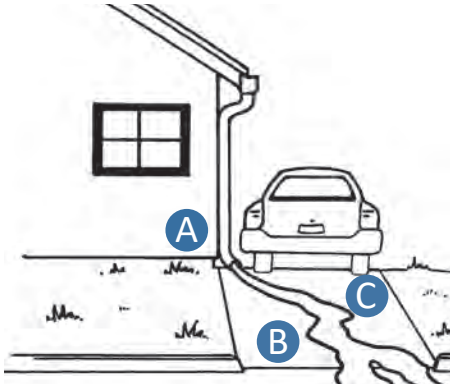
A Mulch low-traffic areas with gravel or wood chips to allow for runoff to **SINK** into the ground (see Amended Soils and Mulch).

B Use modular pavers for high-traffic areas and patios. For areas with excess runoff, use plant borders to allow more water to **SINK** into the ground. Turf blocks also work, but are not as easy to get established and maintain (see Permeable Paving Options).

DRIVEWAYS & PARKING AREAS

Most driveways are made of impermeable materials such as asphalt. Driveways generate large volumes of runoff which can cause flooding of your yard or your neighbor's property. This runoff can carry a variety of pollutants, such as oil and grease, soap from car washing, leaked antifreeze, and more. There are now a variety of solutions available to address driveway runoff including permeable paving options. Adding berms or trench drains and redirecting downspouts away from driveways and parking areas to stable vegetated areas, protected drainage outlets, or rain gardens helps to treat runoff and allows water to **SINK** in.

POTENTIAL PROBLEMS



A The downspout is directed toward an impermeable driveway (concrete or asphalt) that drains to the street. The resultant runoff may damage roads, cause erosion, exacerbate downstream flooding, and carry pollutants to nearby waterways.

B This driveway is constructed of impermeable materials (concrete, asphalt) and directs all of the runoff toward the street. The runoff may damage roads, increase downstream flooding, or carry pollutants to nearby waterways.

C Driveways that do direct water runoff away from the street can still contribute to erosion if the area collecting the runoff is not properly protected or maintained.

Runoff from residential homes can carry pollutants to local streams that can be harmful to wildlife.

SOLUTIONS

A If possible, redirect your downspout (see Guttered Roofs above). If not, install a driveway berm (like a small speed bump) or trench drain to existing driveways to **SLOW** and **SPREAD** runoff to vegetation or rock dissipators (see Berms & Trench Drains).

B Permeable paving or other materials such as modular pavers or turf blocks allow water to **SINK** into the soil and decrease runoff (see Permeable Paving Options).

Photo: David Hymel

C A rain garden captures runoff from roofs, driveways, and other hard surfaces and allows water to **SINK** into the ground (see Rain Gardens).

WHY VEHICLE LEAKS MATTER

When your car leaks oil and other fluids, it is often a sign of a larger problem. If you ignore oil leaks, they can lead to major engine damage and a more expensive repair bill.

Oil and other vehicle fluids from cars are also toxic. Fix your leak so that vehicle fluids don't end up in puddles where kids and pets like to play!

Fixing vehicle leaks is good for the environment. Oil and other vehicle fluids can harm wildlife and habitat. When it rains, stormwater runoff carries pollution to rivers, streams, and lakes. Vehicles drip an estimated 7 million quarts of motor oil into the ditches, lakes, and streams that flow into Puget Sound each year.

You can help:

- Check for leaks – slide a piece of cardboard under your car as soon as you turn off the engine. Check it for leaks in half an hour.
- Fix leaks – even those little leaks add up.
- Clean spills – use absorbent materials such as kitty litter to catch drips or spills and put in the trash.

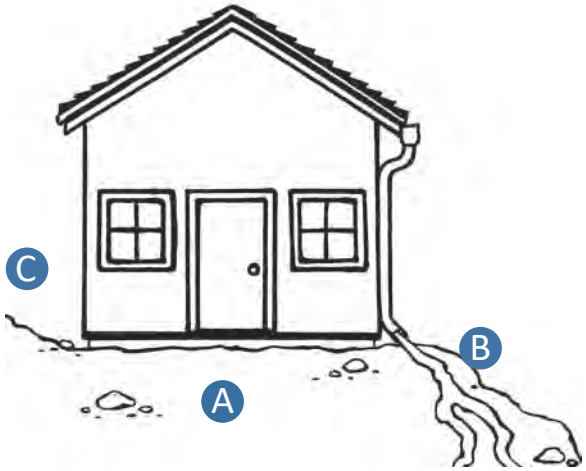
Find out more at Puget Sound Starts Here

SOILS, YARDS & SLOPES

Bare soils and sloped areas in your yard are vulnerable to the impacts of runoff. Runoff from slopes can cause erosion and create wet areas elsewhere. If directed toward structures, slope runoff can destabilize foundations or create damp crawlspaces and basements. Without a protective ground cover of vegetation, decaying leaves and needles, or mulch (wood chips, etc.), these areas erode and increase runoff.

Erosion reduces soil fertility, can compromise support structures for decks and buildings, and in extreme cases, leads to catastrophic events such as landslides. Erosion on bare soils can be identified by uneven soil surfaces, depressions in the soils that create small gullies, and any sign of soil loss. If water is flowing across bare soil anywhere on your property, at least some soil is being carried away (eroding) and ends up polluting local waterways. Since vegetation plays an important role in preventing soil loss, it is important to use plants adapted to your site. Plants with small stems that are close together, but not clumped, will **SLOW** and **SPREAD** water and reduce erosion. Plants that form woody roots (shrubs, trees, and some ground covers) can improve stability of slopes. Live tree roots strengthen slopes while fibrous and shallow rooted plants can actually hinder slope stability. Where possible, some slopes can be leveled with terracing.

POTENTIAL PROBLEMS



A Bare soils are highly susceptible to erosion.

B Slopes are prone to erosion. Erosion is not only harmful to the environment, but can also cause bodily harm if land movement occurs (e.g., landslide).

C Moderately sloped areas are also prone to erosion and can cause damage to surrounding structures if they become unstable.

Bare soils are susceptible to erosion and increase runoff that delivers sediments and other pollutants to streets and storm drains and eventually to local waterways.

SOLUTIONS

A Cover bare soils with mulch to protect soil and **SLOW** runoff.

B Retaining walls help level sloped areas, hold soil in place and **SLOW** runoff. They also add beauty to your yard and can double as benches and planter boxes (see Retaining Walls and Terraces).

C Using carefully chosen vegetation can help **SLOW** and **SPREAD** runoff in order to prevent soil erosion on slopes. Vegetation should be dense, evergreen, multi-layered with added mulch underneath. See www.resources.rainscaping.info for useful plant selection resources.

2 | EVALUATE YOUR SITE

To find the best RainScaping solutions for your property, conduct a simple, do-it-yourself evaluation of runoff around your home. Runoff is rainwater that does not soak into the ground. The evaluation consists of gathering a few key pieces of information, making a quick map of your property, and then walking your property on a rainy day to record your observations. Your site evaluation will target the five areas of your home and yard that rainwater can run off from.

These include: 1) roofs, 2) decks and stairs, 3) patios and walkways, 4) driveways/parking areas, and 5) soils, yards, and slopes. Your observations will include where runoff is currently going, how runoff is managed, and where there might be potential for using a new RainScaping solution that will "**SLOW** it, **SPREAD** it, and **SINK** it." Make it fun – the kids can don their rubber boots and join you!

STEP 1 GATHER YOUR TOOLS

Below is a list of items you will need:

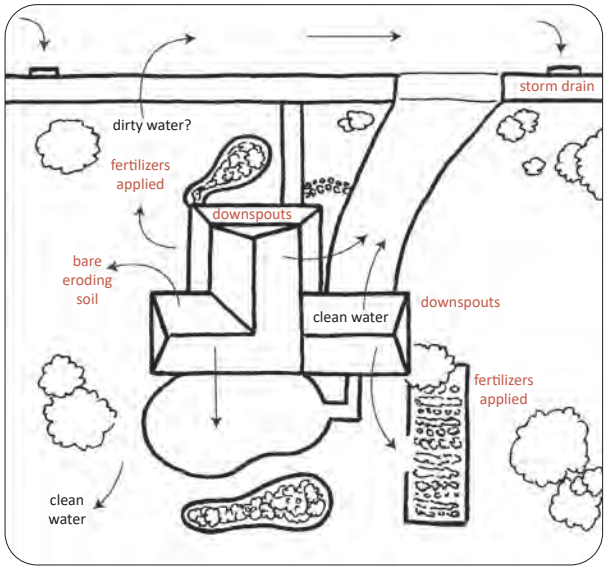
- notepad and pencil
- clipboard
- umbrella and rain gear
- property sketch or map
- phone with camera
- measuring tape/ruler
- shovel

STEP 2 CREATE A SIMPLE MAP

Use your map to record observations for how rainwater moves across your property as runoff, and where it eventually flows. One option is to use the Snohomish County Planning and Development Services (PDS) Map Portal (see sidebar on next page). Your simple map should include the following:

- property lines and structures (house, garage, decks, stairs, etc.)
- hard surfaces (driveways/parking areas, walkways/patios, etc.)
- yard and garden areas (trees, lawns, planting beds, etc.)
- important areas to note, such as slopes, nearby streams, lakes, or wetlands
- location of drainage features, such as downspouts, pipes, and any underground systems

Take basic measurements to add dimensions to buildings and hard surfaces. You will need these measurements for certain RainScaping solutions that require you to estimate the amount of runoff from your roof or other hard surfaces.



Evaluating your site with a simple map can help identify possible RainScaping Solutions to protect and beautify your property, reduce flooding, and improve local water quality

STEP 3 LOCATE WELLS AND SEPTIC SYSTEMS

These vital systems on your and your neighbors' properties are critical to locate and clearly mark on your map.

For septic systems, mark the location of all components including tank(s), drainfield, and replacement or reserve area. If you are not certain where your septic system is located, look up your system's record at www.snohd.org/159/as-built-records. You will want to avoid digging and stockpiling materials in these areas.

Some RainScaping solutions – such as rain gardens, underground infiltration systems or downspouts that direct rainwater to soak into the ground – must be set back from drinking water wells and septic systems. Snohomish County requires a setback of 100-feet from any drinking water well (on your or a neighbor's property), and typically 50-feet uphill and 10-feet downhill of septic system components.

STEP 4 WALK YOUR PROPERTY

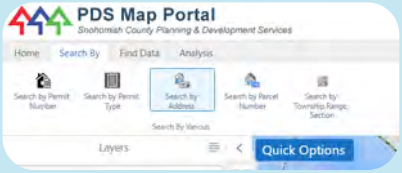
With your map completed, you are ready to head outside on a rainy day. For the most accurate results, wait until a few rain-drenched days have occurred that season (with more than 1/2 inch of rainfall) or until you can see water flowing on your property. During the walk, make notes of the following on your map, and consider taking pictures to refer to later:

- Direction of rainwater flowing from downspouts, pipes, or hard surfaces such as driveways (see sample drawing).
- Where your rainwater flows as it leaves your property (such as into the road, a storm drain, ditch, or a stream or lake).
- Areas of concern such as ponding, soggy soils, erosion, and bare soils.
- Potential location(s) where you are considering a RainScaping solution. These might include re-directing a downspout which currently drains onto your driveway to now flow into a rain garden or a rainwater collection tank (cistern or barrel).

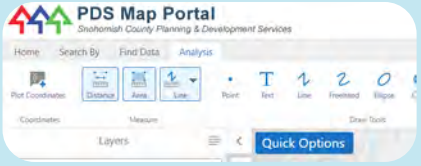
PDS MAP PORTAL

Snohomish County Planning and Development Services (PDS) offers an interactive mapping portal with tools for searching, measuring, and exploring property in unincorporated Snohomish County. To learn more about the portal or for assistance, view the videos and instruction guides available on the PDS Map Portal.

1. Open the PDS Map Portal.
2. Navigate to your property by using the search tab in the upper left-hand corner and clicking 'Search by Address'.

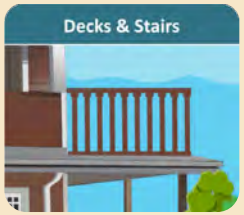


3. After finding your property, select 'Layers' in the lower right-hand corner of the screen, scroll the sidebar down to find 'Aerial Imagery,' and select the most recent photo.
4. Use the 'Analysis' tab in the upper left-hand corner of the screen to draw and measure on the map! Experiment with the distance, area, and line tools.



SOLUTIONS FOR AREAS OF RUNOFF

- Drainage Outlet Protection
- Drip-line protection
- Gutters & Downspouts
- Rain Gardens
- Cisterns
- Rain Barrels
- Underground Infiltration Systems



- Drip-line Protection
- Gutters & Downspouts

- Berms & Trench Drains
- Drainage Outlet Protection
- Permeable Paving Options
- Rain Gardens
- Underground Infiltration Systems

- Berms & Trench Drains
- Drainage Outlet Protection
- Permeable Paving Options
- Rain Gardens
- Underground Infiltration Systems

- Landscaping Naturally Wet Areas
- Lawn Alternatives
- Mulch
- Retaining Walls/Terraces
- Compost

Source: Rain Garden Handbook for Western Washington

STEP 5 IDENTIFY YOUR AREAS OF RUNOFF

When rainwater falls onto hard surfaces and compacted soils, it becomes runoff and washes pollutants (vehicle fluids, roof chemicals, yard care products, soil sediments, and more) into drains, streams, lakes, rivers, and Puget Sound. Yet where it can soak into the soil, both plants and soil microorganisms help clean the water before it reaches groundwater and local waterways.

Pinpoint hard surface areas at your home where rainwater runs off. Use the sidebar to the left to learn which RainScaping solutions may work to help it soak into the ground. You will use your list as you move on to the next step, Understand Your Soils.

STEP 6 UNDERSTAND YOUR SOILS

Soils across Snohomish County vary greatly, and soils can vary across a property as well. Rainwater may readily soak into one spot, while it may not in another. Understanding your soils will help you determine which RainScaping solutions will work and which will not.

You will need to observe the soil in each area where you are considering using a RainScaping solution and in any problem areas you are trying to address. Whenever possible, make your observations in the wettest season of the year – which is when the seasonal groundwater level is closest to the soil surface. Conducting your observations in the wet season will help you best determine which RainScaping solutions may be feasible and which are not.

First, take note as to whether the soil is soft underfoot or hard, whether it is seasonally soggy or not, and if there is standing water on the surface. Then, in each area where you are considering using a RainScaping solution, dig a 12-inch-deep hole. If it is hard to dig, determine what is making it so hard: soil is compacted, is full of clay, has a lot of rock or gravel, or a combination of these.

Then, note if water is present at the bottom of the hole. Groundwater is usually closest to the surface from December through April. If your observations are made during this rainy season and you see water in the hole, measure the distance between the ground surface and the surface of the water in the hole – this is the seasonal groundwater level. It is important to know the depth to seasonal groundwater when designing a rain garden or underground infiltration system. During dry times of the year, you may not observe this important characteristic of your soils.

Now, use the table on the next page to apply your observations to find RainScaping solutions that will work for your soils.

RAINSCAPING SOLUTIONS FOR YOUR SOIL

IF YOUR AREA'S SOIL IS	OBSERVATIONS TO NOTE	WILL RAINWATER BE ABLE TO SOAK INTO THE GROUND?	RAINSCAPING SOLUTIONS THAT WORK*	RAINSCAPING SOLUTIONS TO AVOID
WET (SEASONALLY OR ALL OF THE YEAR)	• Soggy when you walk on it • Mucky soils • Standing water on surface • Standing water when a hole is dug	No. Additional rainwater cannot soak into the ground since soils are already saturated.	• Compost • Mulch • Landscaping Wet Areas	• Rain Gardens • Underground Infiltration Systems
HARD TO DIG	• Compacted (compressed). Commonly caused by heavy traffic, or low organic matter (compost).	Not unless actions are taken to break up compaction during the dry season and stay off the soil in the wet season.	• Compost • Mulch • Permeable Paving Options	• Rain Gardens • Underground Infiltration Systems
	• Dense or clay (typically gray; sticky when wet)	No. Additional rainwater cannot soak into the ground.	• Compost • Mulch • Permeable Paving Options	• Rain Gardens • Underground Infiltration Systems
	• Rocky or gravelly	Perhaps. Rainwater will likely be able to soak into the ground. Some solutions will require further evaluation.*	• Compost • Mulch • Rain Gardens** • Underground Infiltration Systems** • Lawn Alternatives • Permeable Paving Options	None
EASY TO DIG	• Loose (friable) • Sandy soils • Full of organic matter	Yes. Unless the soil is mucky or wet, rainwater is likely to soak in (see wet soils).	• Compost • Mulch • Rain Gardens** • Underground Infiltration Systems** • Lawn Alternatives • Permeable Paving Options	None

* Note that several Rainscaping solutions can be used regardless of your soil's observable conditions – including rain barrels, cisterns, retaining walls/terraces, drainage outlet protection, dripline protection, and gutters and downspouts

** Rain Gardens and Underground Infiltration Systems will require more analysis including determining your soil's drainage rate. You will find a step-by-step guidance for soil analysis for these solutions in Section 3 | Find Your RainScaping solution.

STEP 7 CHECK TO SEE IF YOUR PROJECT NEEDS A PERMIT

While this guide presents great solutions, it is important to recognize when and where they are NOT appropriate. Some site conditions make it difficult or impossible to use certain RainScaping solutions. For example, problematic areas include properties that have geologically hazardous areas on-site, including but not limited to landslide and erosion hazard areas. Depending upon the size and specific location of your project, some RainScaping solutions will require a Land Disturbing Activity Permit from Snohomish County or a permit from another agency. Permits are likely to be required if work is to take place within any critical areas (wetlands, lakes, streams, rivers, and marine areas) or their buffers (adjacent land as specified in Snohomish County Code Section 30.62A).

Below are a few questions to ask yourself before planning a project to see if you may need a permit. However, it is recommended to always check with Snohomish County Planning and Development Services (PDS) to determine if a permit is necessary for your project.

Are you working near roadways?

Some RainScaping solutions may involve working in, or routing rainwater to, a Snohomish County right-of-way. Right-of-ways are areas set aside for public use (primarily transportation) in which the County has primary rights to determine its use and maintenance. County right-of-way includes roads and areas beyond the developed road. The areas can include ditches, culverts, storm drains, and/or enclosed drainage systems. Any work within the right-of-way or discharging rainwater into a right-of-way requires a permit to ensure that work is done safely and will not cause problems such as downstream flooding. Contact the Public Works Customer Service Center to see if your RainScaping project needs a right-of-way permit.

Does your home connect to a neighborhood stormwater system?

Developments built after 1979 may have a shared stormwater system within a neighborhood. Shared systems are often the responsibility of the Homeowners Association (HOA) and possibly the county and include yard drains, pipes, ditches, storm drains, water quality facilities, and stormwater detention facilities or ponds to reduce downstream flooding potential. If you plan on disconnecting your home's drainage from a shared system, first make sure your site conditions are appropriate for soaking in the rainwater. Do this by following all nine steps of Section 2 | Evaluate Your Site. Then, refer to the specific information about the RainScaping solutions you are considering. Finally, contact your HOA before making changes to your system, especially if there is an overflow into the shared system.

To find out if your property drains into a shared system, contact your HOA or Snohomish County Surface Water Management at surfacewater@snoco.org or 425-388-3464.

How big is your project?

The do-it-yourself RainScaping solutions in this guide are intended to be small-scale and will be exempted from Land Disturbing Activity (LDA) Permits. If your RainScaping solution is large and meets certain criteria, an LDA Permit will be required.

Photo: Shawnee Mission Post

Upon request, utility companies will mark the utility locations on your property using colored flags or spray paint.

DIAL 811 – CALL BEFORE YOU DIG!

It's required by law in Snohomish County to mark buried utilities before you dig to test for soil and groundwater conditions, or before installing any RainScaping solution that requires digging deeper than 12-inches, such as a rain garden or underground infiltration system.

Call 811 or submit a request to https://digsafewa.com/homeowners at least 3 working days before you dig to have a FREE public utility locator mark areas near public roadways. Utility locates expire after 45 days and the property owner is responsible for calling 811 to have utilities re-marked after that.

The free public service usually does not mark private utilities between the street and your house. These may include power, irrigation, septic, and water lines. If you are not sure about the locations of private utilities on your property, hire a private utility location service to locate these for you. Search online to find "private utility locators" in your area.

The most common criteria large RainScaping solutions may exceed are:

- Clearing more than 7,000 square feet
- Collecting and concentrating rainwater/ stormwater from more than 5,000 square feet of drainage area, such as roof or pavement surfaces
- Cutting or filling more than 100 cubic yards (about 8 dump trucks) in an 18-month period

A project may also require an LDA permit if it is located in a critical area (see next question). Refer to the PDS assistance bulletin on “Land Disturbing Activities” for more information on actions that require LDA permits and the permitting process.

Is your project in a critical area?

Snohomish County has special protections for environmentally sensitive areas regulated in Snohomish County's Critical Areas Code:

- 30.62A – Wetlands and Fish & Wildlife Habitat Conservation Areas
- 30.62B – Geologically Hazardous Areas
- 30.62C – Critical Aquifer Recharge Areas

Activities within or near a critical area may require a permit, including RainScaping projects. Permitting ensures sensitive areas are protected and that activities do not put your or neighboring properties at risk.

You will find detailed information on Snohomish County's critical areas and related permitting requirements in the following resources:

- View the "Critical Areas" data layer in the PDS Map Portal. Information on using the Map Portal is in the sidebar earlier in this section.
- PDS Critical Areas website
- PDS assistance bulletin, "Critical Areas Regulations for Residential Projects."

You are responsible for determining whether your project will impact a critical area that is on or near your property. If you have questions about determining the presence of possible critical areas, contact the PDS Ask Permit Tech program for more information. Always check with PDS to see if permits are needed before implementing your RainScaping Solution.

Critical areas most likely to be encountered when planning a RainScaping project are erosion hazard areas, landslide hazard areas, wetlands, and fish and wildlife conservation areas. View descriptions of these types of critical areas in the table on the next page.

STEP 8 REVIEW YOUR RESULTS & CHOOSE YOUR SOLUTIONS

Congratulations, you have now determined RainScaping solutions that may work for your property. Note their potential locations on your sketch.

When choosing between multiple RainScaping solutions on your list, carefully review design considerations, installation effort and cost, as well as maintenance requirements of each. To learn more, visit Section 3 | Find Your RainScaping Solution to view an at-a-glance summary table of all solutions as well as detailed guidance for each RainScaping Solution.

COMMON CRITICAL AREAS

WETLANDS

Swamps, marshes, bogs, or other water-saturated soil areas that contain vegetation

DESCRIPTION

Wetlands capture and clean water, reduce flooding and erosion, and recharge groundwater. They are critical habitat for plants and wildlife.

Most are not yet mapped and may require a critical area study by a wetland consultant. Many are shown under the "Critical Areas" data layer in the PDS Map Portal.

CONSTRAINTS

Land surrounding wetlands, or "buffers," are also protected. Buffer size is determined by the Wetland Rating System. Do not plan RainScaping solutions in or near wetlands or wetland buffers. Any work in these areas may require several permits.

LANDSLIDE HAZARDS

Subject to shifts or movements in the earth due to soil types, slopes, and water saturation

DESCRIPTION

Includes slopes with a vertical height of ten or more feet and surrounding flat areas. Several criteria define hazard areas. Some are roughly mapped on the "GIS-Modeled Potential Landslide Hazard Areas" data layer in the PDS Map Portal. Refer to PDS's Landslide Hazard Area webpage or contact PDS for additional details.

CONSTRAINTS

Most RainScaping solutions should be avoided on or near steep slopes. Work near slopes can contribute to increased landslide risks. Water can add weight and/or lubricate soils which can destabilize slopes. RainScaping may be feasible near slopes but requires permits and a civil or geotechnical consultant.

EROSION HAZARDS

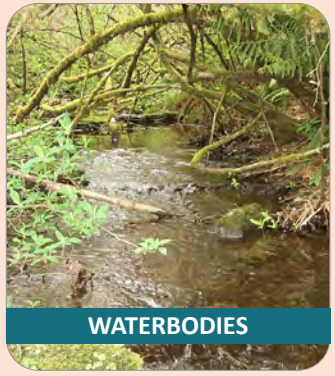
Areas with soils at high risk of erosion from water

DESCRIPTION

These hazard areas include certain types of soils and areas next to streams, rivers, and the shorelines of waterbodies subject to wind and wave erosion. Most erosion hazard areas are identified under the 'Critical Areas' data layer in the PDS Map Portal.

CONSTRAINTS

Soils at high risk of erosion, like those on steep slopes, may need special planning to ensure RainScaping solutions do not concentrate rainwater over sensitive areas, wash soil away from your yard or onto neighboring properties, or muddy nearby waterways.



WATERBODIES

Lakes, streams, rivers, and marine areas (also known as "Fish and Wildlife Habitat Conservation Areas")

DESCRIPTION

Protected waterbodies include streams, lakes, rivers, and Puget Sound. The land surrounding these waterbodies, or "buffers," are also protected and provide critical habitat protection for fish and wildlife.

Most are mapped under the "Critical Areas" layer in the PDS Map Portal, though a consultant study may be required to determine the exact location and type of waterbody. The size of the buffer is determined by the type of the waterbody in accordance with State water typing rules.

CONSTRAINTS

RainScaping solutions should not result in clearing, grading, filling, or building within waterbodies or their buffers. Any work in these areas may require several permits.

STEP 9 PREVENT SOIL EROSION

Pollutants can bind to sediment. When soils are left bare, rainwater carries it onto neighboring properties and into drainage systems where it eventually will flow into natural waterways. This sediment clogs storm drains, fills in ditches, and can pollute waterways which can harm aquatic life such as spawning salmon.

Muddy water flowing downslope onto neighboring properties or into county right-of-way can also become a legal challenge both during and after construction of any project – including landscaping.

Many RainScaping projects involve digging into soil. Take action to prevent sediment from running off your property, both during and after completing a RainScaping project.

Pay special attention to the downslope side of your project, wherever soils are bare and areas where rainwater flow may concentrate. At the completion of your project, ensure that soils are fully covered with mulch, sod or vegetation. The table below shows actions to prevent sediment pollution and help reduce your liability during construction.

HOW TO PREVENT EROSION (BEFORE, DURING & AFTER PROJECT)	DESCRIPTION	MATERIALS & INSTALLATION
Erosion Control Fencing 	An erosion control fence separates work space from areas intended to remain undisturbed. If installed property, the fabric holds back soil and diverts muddy water from flowing downhill. See manufacturer's guidance for proper installation.	Erosion control fences are sold at hardware or home improvement stores. They should be erected on the downhill side of soil exposures, along property lines or around temporary piles of material that could wash away. Maintain these fences until plantings are well established, even after the project is completed, in order to prevent muddy water from leaving your property.
Cover Up Piles of Mulch, Soil or Compost 	Plastic sheeting and tarps should cover piles of soil, mulch, compost, and debris to prevent rainwater from washing the material away. Covering can also help prevent weeds from growing on the piles.	Cover piles of mulch, soil or compost with tarps or reusable plastic sheeting, being sure to weigh down edges and corners with rocks or sandbags to hold it down.

(Chart continues on next page)

HOW TO PREVENT EROSION (BEFORE, DURING & AFTER PROJECT)	DESCRIPTION	MATERIALS & INSTALLATION
Sweep Pavement 	Regularly sweep up and dispose of sediments, mud, and debris throughout construction of your project to prevent these pollutants from washing off pavements and into our local waterbodies. In addition to keeping our waterbodies healthy, this regular sweeping will help prevent materials from clogging drainage and stormwater systems.	If a lot of material is on the public street or sidewalk, contact Snohomish County Public Works Road Maintenance (425-388-7500).
Limit Exposed Soils 	During construction, cover all exposed soils with blankets or tarps – being sure to weigh down edges and corners. Consider constructing projects in phases to avoid exposing large areas of soils for prolonged periods of time. Long-term erosion control measures may be necessary, especially on sloping areas. Be sure to plant and mulch the area. On sloped sites, it may be necessary to also use staked jute or coir netting to hold the mulch in place.	Calculate the square footage of the exposed soil area to determine the quantity of materials needed. A list of local suppliers of erosion control materials, such as mulch, jute fabric, and coir netting is available at www.resources.rainscaping.info. Specialists at supply stores can help provide guidance on which material may be best for your site. Follow manufacturer's guidance while installing erosion control methods.
Protect Storm Drains 	During construction, prevent yard and driveway drains from clogging by using storm drain filter socks. Any work in your yard that may affect storm drains in county streets and/or rights-of-way will require a right-of-way permit. The permit applicant must show how they intend to protect these storm drains from receiving soil, debris, and pollutants while the work is taking place.	Filter socks are available at most landscape retailers. If you have a yard drain or trench drain in your driveway, these can temporarily be protected with felt-like filtering fabric placed beneath the drain cover and box beneath it. These fabrics should be removed promptly after risk of debris is no longer present. If sediment does get in into drains on your property be sure to clean it out right away. If sediment gets into drains in the county right-of-way, contact Road Maintenance (425-388-7500).

3 | FIND YOUR RAINSCAPING SOLUTION

Now that you have taken the steps in Section 2 | Evaluate Your Site, you should be ready to choose a RainScaping solution that best fits your needs and your unique site conditions. This section includes an overview table of all the RainScaping solutions, followed by detailed information for each individual solution for how to plan, design, and install it. Here are a few tips to keep in mind:

OVERVIEW TABLE OF RAINSCAPING SOLUTIONS

The Find Your RainScaping Solution table on the next pages provides an at-a-glance look of all RainScaping solutions. Use this table to compare solutions based on where they can be used, benefit they provide, effort to install, and to get a sense of their relative cost and maintenance effort.

USING NATURE-INSPIRED RAINSCAPING SOLUTIONS

The most natural RainScaping solutions include using mulch, adding compost, landscaping wet areas, or switching to lawn alternatives. These are often the simplest to plan, easiest to install and maintain, and the least expensive overall. Benefits of these include:

- **SLOWING** down water to allow it to **SINK** (infiltrate) into the ground
- Filtering out nutrients, sediments, and other pollutants before they reach our waterways
- Helping to stabilize slopes through strong and deep root structure as plants establish
- Improving soil infiltration and reducing soil compaction

These natural solutions are often incorporated into more complex and structural RainScaping solutions, such as underground infiltration and retaining walls. For instance, a rain garden must include inlet pipes, overflow areas, specific size and depth calculations, and a very specific soil mix – yet a successful rain garden relies on selecting the right plants to use and once planted, covering all bare soil with the right mulch.

RAINSCAPING SOLUTIONS MAY NEED A PERMIT

Permits are required in some instances. This determination is based upon the project size, types of activities it includes, as well as where the RainScaping solution will be located. Be sure to review Section 2 | Evaluate Your Site (Steps 7 through 9) for an overview of how to determine whether your project will require a permit and the steps you must take to prevent soil erosion.

DON'T FORGET MAINTENANCE

All RainScaping solutions require ongoing maintenance to remain effective. Refer to the details of each solution to learn what maintenance will be necessary the time of year to do them. A checklist of common and seasonal maintenance needs is included Section 4 | Maintain Your System.

Find Your RainScaping Solution

RainScaping is an environmentally friendly way to **work with nature** and use rainwater to **improve your yard**. RainScaping solutions can conserve water and attract pollinators. They also protect our lakes and streams by soaking up and cleaning rainwater that picks up pollution from our patios, yards, driveways and roofs.

Finding the right solution for your site involves these steps:

1. Understand your runoff
2. Evaluate your site
3. Find your solution
4. Consider maintenance needs

Visit www.rainscaping.info for step-by-step instructions and helpful resources!

Description	Runoff From	Solution For	Installation Effort	Installation Cost	Maintenance Effort
Berms & Trench Drains					
 Install on hard surfaces to direct runoff to the yard where it can soak in. *Photo: Iron Age Designs*	• Driveway • Patios & Walkways	• Reducing erosion • Helping prevent basement & crawl space flooding		$-$$	
Compost					
 Add to lawns and planting beds to build healthy soil.	• Yard	• Reducing maintenance • Improving lawn & garden health • Helping rainwater soak in		$	
Drainage Outlet Protection					
 Install at the outlet of downspouts, pipes, or berms to slow runoff and spread it out. *Photo: Valley Conservation*	• Downspouts • Pipe Outlets	• Reducing erosion		$	
Drip-Line Protection					
 Add plants, mulch, or rocks below decks or roofs with no gutters.	• Decks • Roof	• Reducing erosion • Helping prevent basement & crawl space flooding		$-$$	

Description	Runoff From	Solution For	Installation		Maintenance Effort
			Effort	Cost	
Gutters & Downspouts					
 Add to a roof to direct rainwater to the yard or lawn where it can soak in.	• Decks • Roof	• Reducing erosion • Helping prevent basement & crawl space flooding		$$	
Landscaping Naturally Wet Areas †					
 Landscape wet areas with plants that will thrive there.	• Base of Slope • Yard	• Adding beauty to your yard • Providing habitat for birds & pollinators • Repurposing problem areas		$-$$	* *See Notes*
Lawn Alternatives					
 Grow edible gardens, groundcovers, or planting beds to reduce some lawn area. *Photo: Linda Andrews*	• Slopes • Yard	• Adding beauty to your yard • Providing habitat for birds & pollinators • Helping rainwater soak in		$-$$	* *See Notes*
Mulch					
 Cover bare soil with wood chips or leaves to reduce runoff, weeds, and watering.	• Slopes • Bare Soils • Planting Beds	• Reducing maintenance • Improving lawn & garden health • Helping rainwater soak in • Reducing erosion		$	
Permeable Paving Options					
 Use alternative paving materials that allow water to pass through to the soil below.	• Driveway • Patios & Walkways	• Helping rainwater soak in • Adding visual interest • Reducing compaction and erosion in heavy-traffic areas		$$$	▲ *See Notes*
Rain Gardens					
 Direct runoff into a landscape area designed with special soils and plants, allowing water to pond and slowly soak in. *Photo: David Hymel*	• Driveway • Patios & Walkways • Roof	• Adding beauty to your yard • Providing habitat for birds & pollinators • Helping rainwater soak in		$$$	* *See Notes*

Description	Runoff From	Solution For	Installation		Maintenance Effort
			Effort	Cost	
Rainwater Collection System (Cistern)					
 Capture and store large amounts of rainwater from your roof to re-purpose for watering.	• Roof	• Slowing down rainwater • Storing rain for later use • Reducing your water bill		$$	
Rainwater Collection System (Barrel)					
 Capture and store small amounts of rainwater from your roof to re-purpose for watering.	• Roof	• Slowing down rainwater • Storing rain for later use • Reducing your water bill		$	
Retaining Walls/Terraces †					
 Transform a slope into a series of flat areas resembling steps.	• Slopes • Yard	• Increasing usable space in yard • Reducing erosion • Helping rainwater soak in		$$$	
Underground Infiltration Systems †					
 Direct runoff into an underground trench, pit (dry well), or chamber where the water slowly soaks into the ground. *Photo: Nick Hansen*	• Patios & Walkways • Roof	• Helping rainwater soak in		$$	

* Maintenance is highest in the first 2-3 years as plants establish. Regular mulch application can reduce maintenance.

▲ Maintenance may be lower for modular pavers and flagstone.

† May require permits.

BERMS & TRENCH DRAINS

▶ USES: DRIVEWAYS, WALKWAYS, AND UNPAVED ROADS

Add a berm or trench drain to **SLOW** water down and divert it to an area it can infiltrate.

Driveway berms act like a speed bump to redirect runoff and can be made of concrete, asphalt or recycled rubber.

Berms and trench drains are used to divert water and break up the impermeable surface area into smaller sections. Smaller sections help reduce volumes directed to any one area, **SPREAD** water out to a larger area, and increase potential infiltration. The techniques described here can be installed on existing driveways and private roads, both paved and unpaved. Trench drains act like berms to capture and redirect flow from hard surfaces to areas where the water can be dispersed. Berms and trench drains work well when used in combination with other rainscaping solutions such as energy dissipators, compost (amended soils), or rain gardens. For additional guidance on driveway berm and trench drain design, refer to Chapter 5 (BMP T5.11) of the Snohomish County Drainage Manual.

BERMS

A berm is essentially a speed bump that is used for redirecting runoff and for breaking up runoff into small volumes so that it does not have enough energy to erode soils. Berms also divert water away from streets and allow it to **SINK** in.

For paved surfaces, berms can be made of concrete or asphalt, or pre-fabricated of recycled rubber or plastic, and fastened to concrete or asphalt with epoxy, large nails, or bolts. An option for unpaved driveways is to partially bury a rubber “conveyor belt” that collapses when driven across. Berms can be small in size so they can easily be driven over. Typical sizes are 6 inches to 1 foot wide and 1 to 3 inches high depending on the steepness of slope.

Berms should be installed at a 30 to 45 degree angle relative to a level line across the sloping driveway. A 45 degree angle is halfway between the level line and the run of the slope. A 30 degree angle is about a third of the way from the level line. This will prevent water from ponding behind the berm. In most cases, the outlet of berms should be protected with energy dissipation measures like rocks or stable vegetation to **SLOW** and **SPREAD** the flow of runoff (see Drainage Outlet Protection).

✓ Maintenance

Keep the outlets clear of debris and sediment so water drains freely. Inspect annually and make necessary repairs to berms and ensure there is no erosion over time.

DO

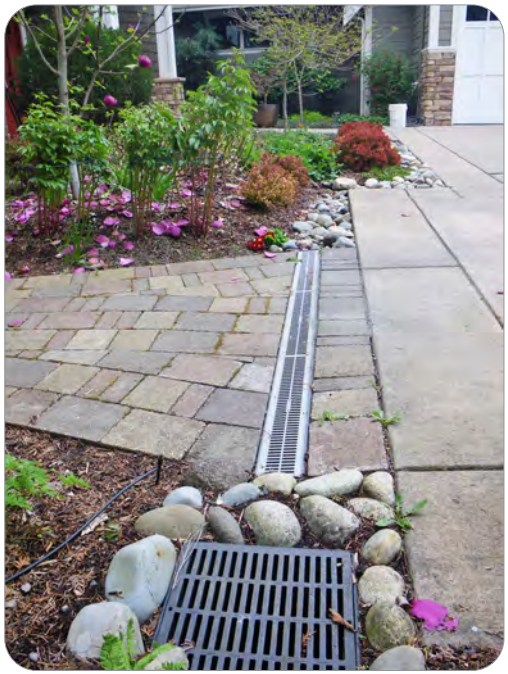
- ✓ Install energy dissipation measures at all outlets (see Drainage Outlet Protection).
- ✓ Install at 30 to 45 degree angles relative to a level line across the sloping driveway.

DO NOT

- × Direct runoff to erodible surfaces.
- × Outlet water onto steep slopes.
- × Direct water to a drinking water well, septic system or neighbor’s property.

Photo: Iron Age Designs

Trench drains also **SLOW** and re-direct water but are built flush with the driveway.



Keep trench drains clear of debris, leaves, and sediment. Make sure its outlet is protected from erosion. This photo shows a yard drain used in combination with a trench drain.

TRENCH DRAINS

A trench drain (also known as a slotted drain) installed across the width of your walkway or driveway is another option to handle surface runoff. It consists of a metal-grated pipe-like structure that transports runoff to a safe location. Decorative grates that cover the trench are available. Trench drains are installed flush with the driveway surface, making them more aesthetically appealing than berms. The drain should be sloped no less than 3/4 inch per 10 feet to reduce clogging from sediment and debris. It may also be angled at 30 to 45 degrees relative to the driveway. Although trench drains may be installed on any driveway, they are not recommended for driveways with slopes greater than 5 percent.

✓ Maintenance

Ensure that the grate is clear of debris and leaf litter before and during storm events. Check that the outlet is protected, non-eroding, and clear of debris and sediment so water drains freely.

DO

- ✓ Ensure the drain is sufficiently sized to receive most runoff in an average storm.
- ✓ Install energy dissipation measures at all outlets (see Drainage Outlet Protection).
- ✓ Install at 30 to 45 degree angles relative to the driveway.

DO NOT

- × Install trench drains in areas with large amounts of leaf debris.
- × Outlet water onto steep slopes.
- × Direct water to a drinking water well, septic system or neighbor's property.

COMPOST (AMENDED SOILS)

▶ USES: SOILS, YARDS, AND SLOPES

A rototiller can be used to lightly mix compost into the existing soil.

Quality compost should be dark brown or black, have a sweet, earthy smell, and a fibrous texture.

Amending your soils with compost is one of the simplest and most effective methods to improve drainage across your yard. Most yards in Snohomish County will benefit from amending soils with compost. Construction practices, which often remove native soils and leave behind only a shallow layer of topsoil, can result in poor soils in developed areas of Snohomish County which are typically low in organic matter and which drain poorly. The resulting poor soil health can cause you multiple challenges, including drainage issues, increased runoff, and weakened plants that do not weather heat or prolonged wet seasons – ultimately requiring higher maintenance.

Compost adds organic matter and improves soil structure, which improves drainage and retains moisture during dry seasons. Healthy soil acts as a sponge, allowing more rainwater runoff to **SINK** into the ground and be available for your plants when they need it. Compost also feeds beneficial organisms in the soil which help to break down the pollutants that are in runoff.

Improving the organic matter and structure of your soils will save you time and money by reducing your need to water and fertilize. Plus it helps produce healthier plants.

Compost helps improve soil drainage, though it may not be enough on its own. In areas with substantial drainage issues, such as the bottom of a slope, areas with a thin layer of topsoil, or the outlet of a seep, soil improvements alone are unlikely to be enough to manage excess water. In heavily used areas such as walking paths, soil amendment may even be counterproductive and alternative solutions such as permeable pavers are likely to yield better results. These types of situations will likely require other RainScaping solutions (see Section 3 | Find Your Rainscaping Solution), which often work well in combination with amending your soils with compost.

WHAT TO USE & WHAT TO AVOID

High quality compost should be used to avoid the introduction of weed seeds to your garden and ensure nutrients are available for your plants. Quality compost is dark brown or black, has a sweet, earthy smell, a fibrous texture, and does not contain weed sprouts. To avoid weed seeds, select compost with the US Composting Council's Seal of Testing Assurance (STA). Compost is available in bulk or bags. Check your local nursery or home improvement store for bagged compost, or this list of local mulch and compost suppliers for bulk compost.

Avoid adding sand as a soil amendment. Since our soils are typically high in clay content, adding sand creates concrete-like soil and the drainage is unlikely to improve.

Avoid using fresh or incompletely composted manure of any kind. Manure that has not been fully composted will likely contain fecal matter and excess phosphorus, both known pollutants.

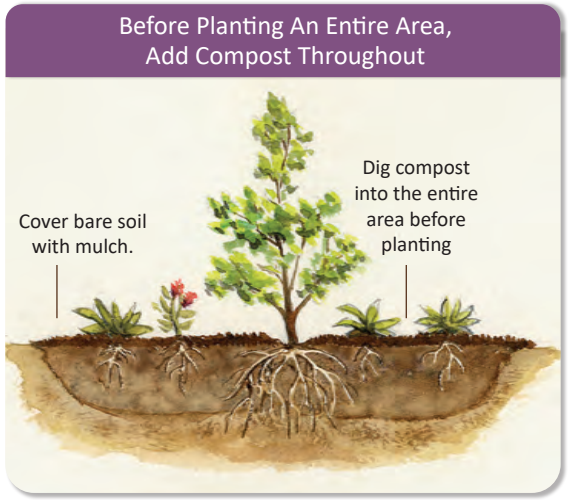
PLANTING BED APPLICATIONS

Compost added to planting beds will improve drainage along with soil and plant health. The amount to add and how to do so will depend upon the application. Below are recommendations for how to improve soil health and drainage with compost in common planting bed applications. For more information about maintaining healthy planting beds, refer to the *Growing Healthy Soils* and *Choosing the Right Plants* publications.

Establishing New Planting Beds

In areas without established plants and roots, mix compost into the soil profile using these steps:

- Loosen soil at least 10 to 12 inches deep throughout the planting bed.
- Use a shovel or digging fork, or a rototiller for large areas. Try a pick or mattock to break through compacted layers.



Source: City of Seattle; Illustration by Wilda Boyd

- Thoroughly mix 2 to 3 inches of compost 8 to 12 inches deep into the soil. Be sure to add compost in throughout the entire planting bed, not just in individual planting holes. Adding compost just to planting holes can hamper plant growth, as the roots will not spread out into the native soil.

Photo: Peggy Campbell

Compost added as mulch to an established planting bed.

Improving Planting Bed Health

In areas with existing plants, do not dig compost into the soil. Rather, simply add a thin layer over the top of the soil and let the soil microbes and worms do the rototilling for you (see Mulch).

Converting Lawn to Planting Beds

"Sheet mulching" is a great method for converting lawn areas into planting beds without the use of herbicides. This method uses layers of different organic materials, which smother the grass below and build soil health as they decompose – all without using herbicides. For complete sheet mulching instructions, see Lawn Alternatives. Wait two to three months after applying sheet mulching before planting the area. Be sure to cover any bare soil with mulch after planting.

LAWN APPLICATIONS

Lawns thrive in healthy, well-draining soils and full sun. Below are recommendations for how to improve soil health and drainage with compost in common lawn applications. For more information about maintaining a healthy lawn, refer to the *Natural Lawn Care* publication.

Establishing New Lawn Areas

Amending soil with compost prior to seeding a new lawn area can improve soil drainage and improve the long-term health of your lawn.

- Loosen soil at least 6 to 8 inches deep throughout new lawn areas.
- Use a shovel or digging fork, or a rototiller for large areas. Try a pick or mattock to break through compacted layers.
- Thoroughly mix 1 to 2 inches of compost into the top 6 inches of soil prior to seeding the lawn area.

Full Lawn Renovation

A complete lawn renovation can work wonders for both the health of your lawn and its ability to allow runoff to soak into the soil below, yet will require the existing lawn to be fully smothered. To start this process, use a method called "sheet mulching." For complete sheet mulching instructions, see Lawn Alternatives. However, in this application, use 2 inches of compost mulch rather than wood chip mulch to

ensure that the resulting soil will allow your grass to thrive. Complete smothering of your lawn will take 2 months before you can till under the sheet mulch material. This is a good time to add lime or fertilizer if any is needed. After tilling, rake the soil smooth and level it out using a roller (available from rental companies), then reseed and water.

Improving Lawn Health

Compost can also be applied to improve drainage and lawn health in an existing lawn area.

- Aerate the lawn.
- Overseed with a Northwest blend lawn seed.
- Top dress with ¼" to ½" of compost.

Top dressing lawn with compost.

HOW MUCH COMPOST IS NEEDED?

To calculate how much compost you need, simply use the following formulas:

- Cubic Feet = Thickness of Application (inches) x Area of Coverage (square feet) ÷ 12
- Cubic Yards = Thickness of Application (inches) x Area of Coverage (square feet) ÷ 324

Alternatively, use a calculator to find out how much compost you need. For a great online option, visit www.savingwater.org and search for "Compost and Mulch Calculator."

✓ Maintenance

Once planting beds have been established, continuous amendment with compost is not necessary. Instead, switch to regular mulch applications (see Mulch).

For established lawns, use the methods described above for improving lawn health on areas that become weedy, thin, or compacted.

DO

- ✓ Use compost to improve soil health in your lawn and garden and to allow more runoff to soak into the ground.
- ✓ Use high-quality compost, ensuring that it is fully decomposed and free of weeds.

DO NOT

- ✕ Amend soils in areas with existing root systems. Instead, apply mulch to the surface and let worms and soil microbes till these nutrients into the soil over time.
- ✕ Add compost only to a planting hole for an individual plant. Instead, add compost throughout the entire planting or apply mulch to the surface.
- ✕ Amend your soil with sand.
- ✕ Amend your soil with manure that has not been fully composted.

DRAINAGE OUTLET PROTECTION

▶ USES: DOWNSPOUTS, PIPES OR CULVERT OUTLETS

Photo: NDS

Pipes and downspouts without proper outlet protection can cause erosion. This erosion can damage your property and pollute local waterways.

Photo: Credit Valley Conservation

Add outlet protection, such as a rock pad or mulched landscaping, to **SLOW** water and let it **SINK** into the ground.

Anytime water flows of out of a downspout, pipe or culvert it has the potential to cause damage. The fast-flowing water released to bare soils or steep slopes can cause harmful erosion. As it flows across yards, driveways, and streets it can also pick up pollution and carry it into our local streams, rivers, and lakes. Water that outlets onto hard, compacted, or impermeable surfaces such as driveways cannot **SINK** into the ground and can contribute to downstream flooding.

The good news is that these problems can be avoided by using proper drainage outlet protection. Use one or more of the four techniques presented below to protect your drainage outlets. They will help **SLOW** water down and/or **SPREAD** it out so it can **SINK** back into the soil. They work especially well when used in combination.

SPLASH BLOCKS

Splash blocks are simple devices that reduce the initial force of the water at downspout outlets. They prevent erosion and allow the water to **SPREAD** out before flowing into an area of stable vegetation. Splash blocks also help move water further away from your foundation. No water should be released within 10 feet of your foundation to protect your basement or crawlspace. If additional length is needed, you can combine a splash block with a rock pad underlain by an impermeable liner like plastic or bentonite clay waterproofing membrane to allow water to flow away from your foundation (see Rock Pads).

ROCK PADS

Rock pads are also known as “energy dissipators” because they absorb the energy of the fast-flowing water. They allow the runoff to **SLOW** and **SPREAD** across the width of the pad and work to prevent scouring and erosion at the outlet. Rock pads can be used with or without a splash block and typically outlet to stable vegetation. Rock pads are made by creating a level area and filling it with about 6 inches of rock. A wood border can be added to contain the rock. The design of the rock pad (size and rock type) will depend upon the outlet size as follows:

- **Downspouts and smaller outlets (8 inches or less)** – Pads for small outlets are typically 2 feet by 3 feet. If a narrower pad is desired, extend the length to 4 or 5 feet to ensure it is sufficient to **SLOW** and **SPREAD** the water. Any type of rock – from gravel to cobble – can be used, though larger rock is more effective for higher flows. Make sure that the

WORKING NEAR SLOPES

Avoid directing outlets to steep slopes. If there are no other options, seek guidance from a geotechnical engineer. For gentle slopes, the combination of a rock pad, level spreader, and stable vegetation tend to work well to **SPREAD** the water out so it can infiltrate quickly and not cause channelized erosion. See Section 2 | Evaluate Your Site for more information on working on or near slopes.

Splashblocks **SLOW** runoff and carry it away from your home's foundation or crawl space.

Photo: Plan-it Earth Design

A rock splash pad combined with mulched landscaping **SLOWS** the runoff and **SPREADS** it out so it can better **SINK** into the ground.

A level spreader is typically a notched board that **SPREADS** the flow of water coming out of a pipe across a wider area. Often rock pads are placed between the pipe outlet and the spreader board to **SLOW** the flow.

drainage flows away from your foundation. Install a plastic or bentonite clay waterproofing membrane under any portion of the rock pad within 10 feet of your home.

- **Culverts or outlets larger than 8 inches** – Larger pipes are usually associated with right-of-ways, easements, and streams or wetlands. Work on these pipes will likely require the assistance of an engineer and permits. To determine if you need a permit, contact Snohomish County Planning and Development Services (PDS) - "Ask a Permit Tech" program or call 425-388-3311.

LEVEL SPREADERS

Level spreaders are erosion control devices. They are boards of synthetic or pressure treated wood that have been notched along the top edge. As the name implies, these evenly **SPREAD** runoff across a wider area. This allows the water to more readily **SINK** into the soil where pollutants naturally get filtered out. Level spreaders are often used in combination with a rock pad to spread out higher flows from larger pipes or culverts. They are also used to spread out water for outlets within 5 feet of a property line or on gentle slopes. Level spreaders are not typically needed for individual downspouts unless several downspouts are combined to flow out of a single outlet.

STABLE VEGETATED AREAS

Stable vegetated areas are a great way to **SLOW, SPREAD,** & **SINK** the water on your property and are almost always used in combination with a splash block, rock pad, or level spreader. Examples include lawns or densely planted landscape beds. To be considered stable, plants or coarse mulch must cover the entire area without any bare soil peeking through. Plants with lots of small stems, such as grasses and groundcover, work well to **SLOW** and **SPREAD** the runoff while woody plants and trees work to stabilize soils. Spaces between plants should be covered in coarse mulch – such as wood chips – to help the water **SINK** in and prevent soil from washing away (see Mulch).

✓ Maintenance

It is important to inspect your system regularly, especially after a storm event, to clear debris, to ensure there are no signs of pooling water or erosion, and to ensure that runoff is being diverted to a safe location.

DO

- ✓ Protect ALL outlets on your property from causing erosion.
- ✓ Direct downspouts to splash blocks, rock pads, or vegetated areas and ensure water moves 10 feet away from and downslope of your foundation.

DO NOT

- × Direct water to impermeable surfaces (streets, driveways sidewalks etc.).
- × Direct water to waterbodies.
- × Direct water close to property lines and driveways.
- × Outlet to bare soils or areas prone to erosion.
- × Outlet to steep slopes without guidance of a geotechnical engineer.

INSTALLING A LEVEL SPREADER – THREE STEPS

BEFORE YOU BEGIN

Before you install a level spreader be sure it will work in the desired space and with your site conditions. Level spreaders are typically 4 to 8 feet long. Longer is better when dealing with larger flows. The ground abutting the ends of the spreader should be higher so that water does not go around the board. Alternatively, a longer spreader can be used. Also, look downstream of the board and ensure that the land, vegetation, or mulch will not tend to channel the flow of water. Be sure the spreader isn't too close to the outlet to avoid flows splashing over it. Consider using a rock pad to **SLOW** water down before it reaches the spreader.

- Tools needed: saw, drill, level, shovel, rubber mallet
- Materials:
  - Rocks for energy dissipation (see details on previous page)
  - 2" wide level spreader board cut to desired length
  - 4" x 4" support posts
  - Bolts to anchor spreader board to support posts

STEP 1 INSTALL A ROCK PAD AT OUTLET (OPTIONAL)

To prevent erosion, consider installing a rock pad between the outlet and the level spreader. Sizing guidelines are in the rock pad description.

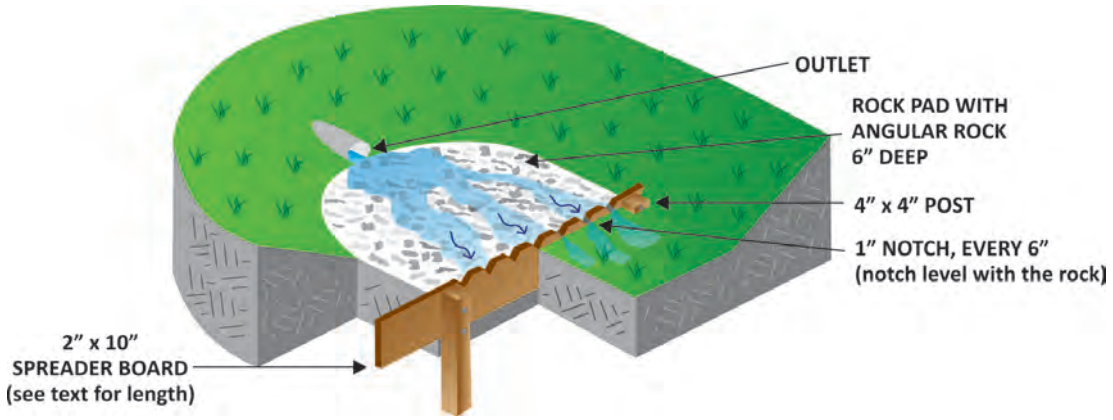
STEP 2 NOTCH YOUR LEVEL SPREADER BOARD

A notched board tends to disperse flows better than a straight length of board especially if it becomes "out of level."

- Start by selecting a 2" X 10" wide board. Synthetic boards work well as they are easily cut with a hand saw, are long-lasting and don't contain toxic materials that may leach into the water.
- Cut 1" deep notches approximately every 6 inches along the entire length of the board. Notches can be any shape, but V-shaped notches are best at spreading flow and preventing clogging.

STEP 3 INSTALL THE LEVEL SPREADER

- Install your notched level spreader board with the notched edge up. The bottom of the notches should be at ground level. If the bottom of notches are higher than the downstream ground, place rock on the downstream side to prevent erosion as water flows through the notches.
- Drive support posts into the ground. Typically two 4"x 4" posts per 4' spreader board will ensure it remains upright
- Adjust the spreader board as needed to ensure it is level.
- Bolt the spreader board into the posts ensuring that the board stays level.



DRIP-LINE PROTECTION

▶ USES: UNDER ROOF EAVES, DECKS, STAIRS

Stable vegetation under your roof's eaves will prevent erosion at your home's foundation.

A drip-line is the area below any elevated surface that receives runoff. For roofs, it is the ground below eaves. For decks and stairs, it is the area underneath where water drips between deck boards or stair treads. The drip-line techniques described in this section help create a protective cover over exposed soil and reduce erosion. Drip-line protection also **SLOWS** runoff and allows it to **SINK** back into the soil. This is critical in areas where runoff-induced erosion might undermine your foundation, support structures, and footings or where runoff might flood your crawlspace or basement.

VEGETATION PROTECTION FOR DRIP-LINES

Roof Drip-Lines

You can plant and maintain mature vegetation below your roof drip-lines. If there is existing vegetation (such as lawn or a bordered planter bed), simply maintain these areas. Some examples of adequate drip-line vegetation include:

- Healthy groundcover or lawn that has been established directly up to the foundation of your home
- Plants, shrubs or flower beds that are completely bordered by wood, rock or lawn with mulch between the plants to cover bare soils

For plant ideas and a list of local suppliers of native plants, see www.resources.RainScaping.info.

Deck/Stair Drip-Lines

Where adequate sunlight is available, plant hardy groundcover, grasses, or other low growing vegetation to prevent soil erosion. Use drought tolerant plants that do not require supplemental watering once established to prevent additional runoff or water near your structure. If you have structures on your property that are low to the ground and are inaccessible underneath, add plants around the perimeter.

MULCH AND ROCK PROTECTION FOR DRIP-LINES

Roof Drip-Lines

Wood chip mulch or drain rock can be used to protect soil from erosion and promote infiltration into permeable soils. Install drain rock or mulch under the drip-line at a minimum depth of 3 inches. This treatment must extend 6 inches inside the eaves and a minimum of 12 inches beyond the eaves of a single-story roof, 18 inches beyond the eaves of a two-story roof and 24 inches beyond the eaves of a three-story roof. This treatment prevents erosion and allows runoff to infiltrate.

You can use any size of rock you like to achieve the desired aesthetic effect. Consider larger rock (at least 3/4 inch) if you have higher volumes of water such as a roof valley. Be sure to choose washed rock so water can infiltrate for a longer period of time before maintenance is needed. Installing non-woven

geotextile fabric beneath the rock and then bordering the rock with wood or other material is a helpful way to reduce maintenance and increase effectiveness. You also need to ensure that the ground slopes slightly (5 percent) away from the foundation for a minimum of 10 feet.

If you have a wet basement/crawl space or mold, place bentonite clay waterproofing membrane extending 10 feet out from your foundation. Slope the surface away from your foundation and cover with mulch and plants. Severe dampness may require a drainage contractor and repairs.

Deck/Stair Drip-Lines

To **SLOW** runoff and reduce soil erosion under elevated decks, stairs, and walkways it is important to install drain rock under and around these structures if there is not adequate vegetation established.

Before installing drain rock, ensure that ground surfaces slope 5 percent away from the foundation for a minimum of 10 feet. Walkable surfaces (sidewalk, patio, deck) must slope 1 to 2 percent and away from a foundation. To reduce maintenance and further protect from soil erosion, install non-woven geotextile fabric beneath where the rock is to be placed. Border the rock with wood or other material.

Then, install a 3-inch layer of drain rock under the entire footprint of the overhead structure and extend 1-foot past its edge. If your overhang structures are low to the ground and are inaccessible underneath, install a 3-inch layer of rock or other mulch approximately 1 foot wide around the outside perimeter of the structures.

✓ Maintenance

Regularly prune plants to keep them 6 inches from your structures. Periodic replacement of plants, drain rock or mulch may be needed. Weeds should be pulled when small and before they go to seed. Inspect your home frequently to ensure that water is not saturating or eroding either the structure or the foundation.

DO

- ✓ Make sure rock is washed.
- ✓ Keep soil a minimum of 6 inches below siding.
- ✓ Replenish rock or mulch to prevent bare soil.
- ✓ Prune plants to be 6 inches from your structures.
- ✓ Use Western Washington natives or plants adapted to your particular soil and rainfall conditions.
- ✓ Minimize fertilizer use to prevent water pollution.

DO NOT

- × Allow runoff to flow toward the house or other structure.
- × Apply within 6 inches of structural siding.
- × Plant invasive species such as ivy, vinca or lamium.
- × Allow soil or plants to trap moisture directly against your siding or foundation.
- × Leave bare soils uncovered and more vulnerable to weeds and erosion.

Added wood chip mulch at this roof's drip-line helps prevent erosion and allows runoff to infiltrate.

Added drain rock under this deck's drip-line will **SLOW** runoff and reduce erosion.

GUTTERS & DOWNSPOUTS

▶ USES: ROOFS

Gutters collect the rainwater that drains from a roof and directs the runoff to the ground via a downspout.

GUTTER PROFILES

Ogee-shaped gutters can hold more water, but rounded gutters collect less debris.

Gutters and downspouts are necessary to capture and convey rainwater from a roof to your yard. They serve to easily send roof runoff to a RainScaping solution where it can **SLOW** down, **SPREAD** out, and **SINK** into the ground.

If you do not have gutters, consider installing them or see Dripline Protection options to prevent soil erosion.

Water coming out of a downspout is fast-moving and can cause erosion. To **SLOW** the water down, see Drainage Outlet Protection.

NEW INSTALLATIONS OR RETROFITS

Properly sized gutters and downspouts are crucial for proper performance. In general, the larger your downspout, the less likely it is to get clogged with debris. While installation is fairly simple, calculating the correct size system for your roof can prove more difficult. You will need to know your roof area and pitch or slope and your location's annual rainfall. The sidebar offers general guidelines for calculating roof area. For assistance with calculating correct gutter and downspout sizes, or other specific questions, we recommend contacting a gutter or roofing professional.

Also consider where your downspouts drain. Site downspouts so that they do not drain to the uphill side of your structure unless you're using another infiltration strategy to move the water around the house. Where possible and safe, divert downspouts away from impermeable surfaces such as concrete driveways, walkways, or compacted soils. Instead, direct them to well vegetated areas of your property, a minimum of 10 feet away from your foundation, allowing runoff to **SINK** into the soil. This decreases water volume on streets and reduces the potential for downstream flooding.

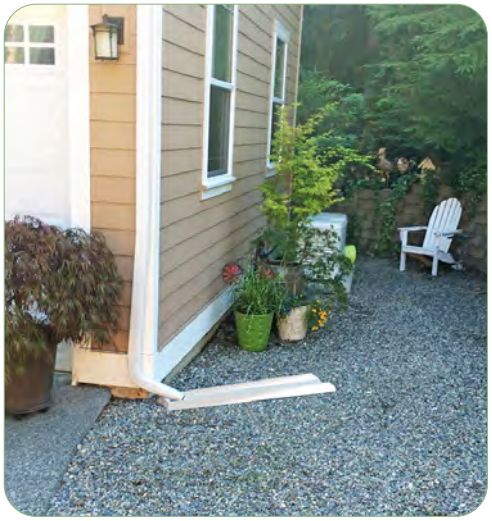
GUTTERS

Select gutters at least 5 inches wide. Use materials made from galvanized steel (29 gauge minimum) or aluminum (1/4 inch minimum). (Note: galvanized gutters should be painted to reduce the potential impacts of leaching zinc into soils and waterways.) To enhance flow, slope gutters according to the manufacturer's recommendations, commonly 1/16 inch to 1/8 inch per 1 foot of sectional gutter; 1/16 inch to 1/8 inch per 10 feet of seamless gutters. Tilt the gutter forward, keeping the front 1/2 inch lower than the back. For straight runs exceeding 40 feet, use expansion joints at connections. Select elbows with 45-, 60-, 75- or 90-degree angles.

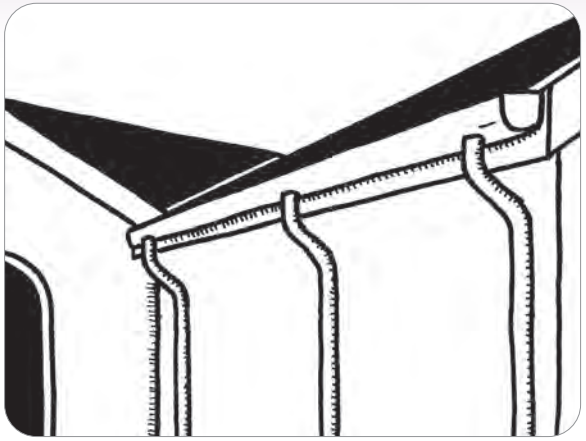
Gutters not only come in different sizes, they also come in different shapes. It's important to understand that the shape of your gutter determines the amount of water it can handle during a storm. Ogee shaped gutters, for example, can hold more water than rounded gutters. However the ogee gutter's sharp edges and corners can collect sediment and debris.

DOWNSPOUTS

Space downspouts from 20 to 50 feet apart. Adding additional downspouts can increase capacity where necessary and help **SLOW** water down and **SPREAD** it out. Do not exceed 45-degree angle bends. Where needed, you can use 4-inch diameter extensions (flexible or rigid) to convey water to infiltration areas such as rain gardens or to other safe outlets at least 10 feet away and downslope from structures and steep slopes. All downspouts and pipes that outlet onto surfaces without substantial plant cover should use one of the practices described in Drainage Outlet Protection. Do not direct downspout outlets to driveways or other impermeable hard surfaces unless there are no safe alternatives. Instead, route them to vegetated areas.



All downspout outlets should have splash blocks or other features that **SLOW** runoff and prevent erosion.



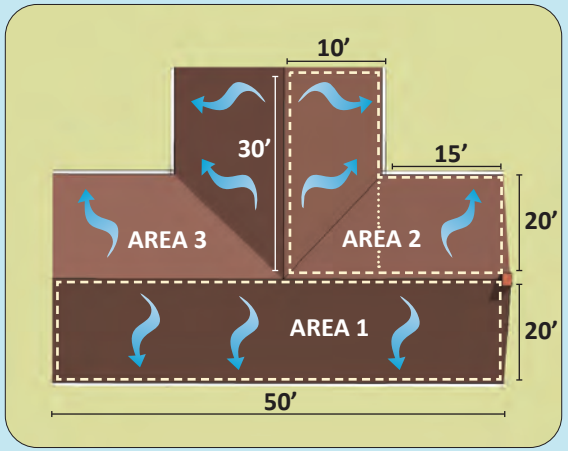
A maximum of 700 square feet of roof area should drain to each downspout. Adding an additional downspout helps reduce the volume and velocity of runoff at any given point reducing the potential for erosion.

DO

- ✓ Check and clean gutters frequently, especially before the rainy season and after severe storms.
- ✓ Direct runoff to a rain garden, underground infiltration trench, or other stable vegetated area away from structures.
- ✓ Collect runoff in a cistern or rain barrel.

DO NOT

- ✕ Release water onto bare soil.
- ✕ Direct runoff to steep slopes, foundations, or to the uphill side of your structure.
- ✕ Direct water to a drinking water well, septic system or neighbor's property.



CALCULATING ROOF AREA

You will want to plan your downspouts so that no more than 700 square feet of roof drain to each downspout and splash block. When finding the square footage of an area of your roof, do not consider slope. Instead, treat your roof as flat. Measure the length and width of each side of your building including the roof overhangs. Multiply the length times the width to find the area of each surface. For more complex roofs, you will need to break up the roof into smaller sections and then add up the areas that drain to a common gutter.

Formula

LENGTH x WIDTH = AREA in square feet (sq. ft.)

Example

- Area 1:
  50 X 20 = 1000 sq. ft. (Needs 2 downspouts)
- Area 2: (Calculate Area 3 the same way)
  10 X 30 = 300 sq. ft.
  15 X 20 = 300 sq. ft.
  Total = 600 sq. ft. (Needs 1 downspout)

✓Maintenance

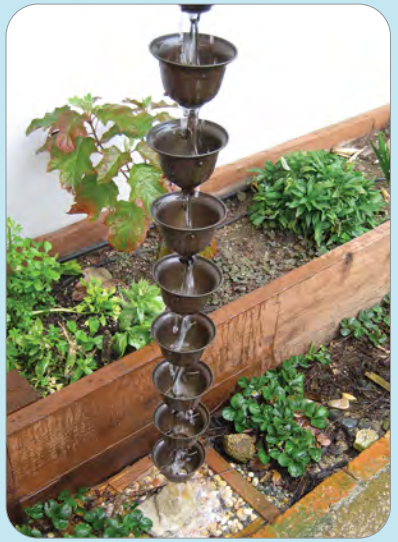
Setting up a maintenance schedule is one of the easiest and most cost-effective solutions to many roof runoff issues.

- The vegetation on your property will impact your maintenance schedule. Gutters on homes surrounded by deciduous trees will need to be cleaned in late fall after the leaves have been shed. Gutters on homes surrounded by evergreen trees will need cleaning before the rainy season and after any storm that causes tree debris to fall. In areas with trees or vegetation, trim trees and vines away from gutters to maintain a minimum 24-inch clearance zone.
- Add gutter screens (see photos) and clean them regularly to reduce debris build-up.
- You can also add drip-line protection below gutters that clog often (see Drip-line Protection).
- Check your system for leaks, damaged parts, rust, and evidence of past erosion. Make sure to check hidden outlets under decks or staircases that might be forgotten.

This type of screen covers the gutter opening with a mesh or lid that keeps debris out while allowing runoff water to flow through it.

A simple wire mesh or plastic strainer sits inside the downspout inlet and is easy to clean when it fills with debris.

You can retrofit a strainer cup that pulls out of the downspout for regular cleaning and inspection.



RAIN CHAINS

A rain chain can be used instead of a downspout in some situations.

Rain chains (‘kusari-doi’ in Japanese) have been used for hundreds of years in Japan. Not only are they visually appealing, they also provide some runoff reduction through evaporation and spillage.

When installing rain chains, make sure to avoid copper and galvanized zinc which can leach toxic metals. Take the same precautions for outlet protections as you would with standard downspouts. Make sure you extend your outlet flow downslope and far enough away from your house.

LANDSCAPING NATURALLY WET AREAS

▶ USES: SOILS, YARDS & SLOPES

Photo: City of Everett

There are many plants well adapted to wet soils and poor drainage. These plants can be very beautiful, and many attract birds, wildlife and pollinators.

Some areas are just naturally wet. This can be the result of severe soil compaction or the underlying soils being naturally slow-draining or the area's position on the landscape, such as low spots, seeps, and slope bottoms. A wet site's underlying soil conditions – whether naturally occurring or severely compacted or altered – cannot be expected to change, which is why it is extremely important to protect it and prevent further damage. While soil amendments, such as compost, can improve overall soil health and drainage, they will not change the character of the underlying soil, the position on the landscape, nor repair severely compacted or altered soil. It is much easier to work with a wet area than to constantly battle the drainage and site conditions through costly and complex digging or drainage features.

To work with naturally wet conditions and to protect the soil, cover bare soil with woody mulch, avoid walking or working on it when saturated, and choose plants that thrive in wet places. There are many plants well adapted to wet soils which can be very beautiful and many attract birds, wildlife, and pollinators. These plants will **SLOW** runoff down, **SPREAD** it out, and help water to **SINK** into the ground.

It's worth noting that landscaping wet areas is distinctly different from installing a rain garden in your yard. Rain gardens require well-draining soils that can handle a lot of runoff directed into them. Since naturally wet areas do not have well-draining soils, directing additional runoff to them may cause additional problems.

PROTECTED WET AREAS

The recommendations in this section do not apply to wetlands, streams, rivers, lakes, and marine waters. These areas and the land adjacent to them called buffers, are referred to as critical areas. Critical areas are defined and regulated by Snohomish County Code 30.62A in accordance with federal and state laws. These areas have special protections and working in them requires permits. To determine if a permit is required for your project, contact Snohomish County Planning and Development Services (PDS) Ask Permit Tech program or call 425-388-3311. See Section 2 | Evaluate Your Site for more information about critical areas.

DO

- ✓ Landscape naturally wet areas in your yard with moisture-loving plants.
- ✓ Create natural walking pathways with permeable pavers, gravel, or woody mulch.
- ✓ Check with Snohomish County Planning and Development Services (PDS) before working in a wet area that might be a critical area.

DO NOT

- ✗ Attempt to change the underlying soils of naturally wet areas.
- ✗ Work in or walk on the soil when it is soggy.
- ✗ Direct additional runoff into naturally wet areas.

STEP BY STEP INSTRUCTIONS FOR LANDSCAPING NATURALLY WET AREAS

STEP 1 ASSESS YOUR SITE CONDITIONS AND CONSIDER YOUR GOALS

Strategic landscaping can define outdoor spaces, attract wildlife, provide privacy, and much more.

Start by making a simple map of your yard and note the following:

- **Light.** Identify which areas are sunny, partly sunny or shaded.
- **Soil moisture.** Naturally wet areas vary in their degree of soil moisture, and different plants will thrive in different degrees of soil moisture. Note areas that are seasonally wet (soggy only in rainy months) and areas that are wet year-round.
- **Problem areas.** Identify areas with steep slopes or compacted soils that may benefit from additional site preparation, plants better suited to the conditions, or installing permeable pathways.

Take into consideration:

- **Views.** Identify areas to accentuate or block.
- **Privacy.** Are there areas where plants can provide desired privacy?
- **Wildlife.** Are there certain birds, butterflies, turtles, or other beneficial species you want to attract?
- **Foot traffic.** Identify natural pathways for people and pets to keep feet dry. Use permeable paver, gravel, or woody mulch pathways to protect the soil. Avoid using lawn in wet areas as it tends to become a muddy mess.

STEP 2 CREATE A PLANTING PLAN

The next step is to come up with a planting plan that accomplishes your goals and uses plants that will thrive at your site with minimal care.

To create a list of plants well-suited to your yard's wet site and unique conditions identified in Step 1, view the Choosing the Right Plants and The Plant List publications. Additional resources are listed on the next page.

Many plant resources will provide light requirements, but few provide clear guidance on soil moisture requirements. Resources provided in this section focus on the soil moisture needs of plants, helping you choose those suited to your yard's naturally wet areas.

Source: Adapted from "Choosing the Right Plants" (City of Seattle)

To help reduce your need to weed and mulch, space plants so they are as far apart as their mature width (i.e., a shrub that grows up to 3-feet wide should have that amount of space around it). That way, at maturity, the plants will fully cover the soil and leave little room for weeds to grow.

STEP 3 PREPARE YOUR SITE

Prepare your planting area by removing weeds prior to planting. If the area is currently lawn, use a process called 'sheet mulching' to prepare your site.

Sheet mulching smothers grass with a layer of up to six sheets of wetted newspaper that is covered by wood chips. There is no need to dig out turf. Sheet mulching leaves you with rich, fertile soil with minimal weeds. Simply follow these easy steps:

- Mow the lawn short.
- Cover the area with overlapping sheets of newspaper, up to 6 sheets thick, or used coffee bags (sometimes available for free from local companies). Be sure to wet these thoroughly before covering them up.
- Then cover the wetted newspaper with 3 to 6 inches of wood chips. If applying during a dry season, be sure to thoroughly water the wood chips afterward.
- For best results, wait 3 to 4 months before planting.

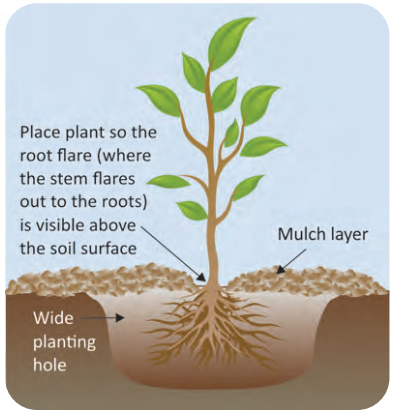
For more information, view the *Growing Healthy Soils* publication.

STEP BY STEP INSTRUCTIONS (CONT)

STEP 4 PLANT RIGHT

Plant wet areas at the end of the dry season (late summer through early fall) before the soil saturates with autumn rain. Set your new garden area up for success by planting right. Here's how:

- Pull aside mulch before digging.
- Dig a wide hole deep enough to spread the plant's roots and only as deep as the root ball.
- Slide the plant out of its pot and find the root flare (where the stem flares out to the first roots). If you cannot see the root flare, remove soil until you expose it.



- Gently shake soil loose to expose the roots.
- Loosen the rootball. Spread out circling roots. If needed, use a sharp tool like a hori-hori knife to cut into densely matted roots.
- Place the plant in the hole and spread the roots, making sure the root flare is above the soil surface. For plants without a root flare (vegetables, perennials, ferns, annuals), the top of the existing roots must be at or slightly above the soil surface.
- Backfill the hole with native soil (not potting soil).
- Firm the soil with your hands and water thoroughly. Check the level of the plant after watering. If the soil settled, gently place additional soil under the plant to raise its root flare above the surrounding soil.
- Rake the mulch back over the soil, keeping it at least 2 inches from the stem.

STEP 5 MAINTAIN YOUR PLANTINGS

If you have selected plants well suited to your site, over time you will have relatively low maintenance. However, for the first 2 to 3 years new plantings will require watering, mulching, and weed control.

- **Watering.** For the first 1 to 3 years, your plants will need deep but infrequent watering during the dry season to help roots establish. Once established, most native plants need little to no watering.
- **Mulching.** Mulch helps prevent erosion, controls weeds, retains moisture, and feeds your plants. Reapply mulch annually, or as needed to maintain appropriate mulch layer depth. See Mulch for information on mulch applications.
- **Weed control.** Frequent weeding is needed in the first few years until your plants reach maturity. Most weeding can be done by hand. Weeds are easiest to pull when small and the soil is moist.

RESOURCES

The following resources indicate plants by their soil moisture needs, helping you choose those suited to your yard's naturally wet areas.

- *Great Plant Picks* – select "Moist" or "Wet" soil type in the advanced search
- *King County Native Plant Guide* – select "Moist" or "Wet" moisture requirement
- *LakeWise Shoreline Planting Guide* (PDF) – plants indicated by soil moisture planting zone
- *Rain Garden Handbook for Western Washington* (PDF) – Appendix A: Plant List indicates soil moisture planting zone
- *The Plant List* (PDF) – see Moisture-Loving Plant section
- WSU *Grow Your Own Native Landscape* (PDF for purchase) – soil moisture indicated in plant's "habitat" description. (Visit https://pubs.extension.wsu.edu/ and search for "MISC-0273")

Mulching new planting areas helps prevent erosion, controls weeds, retains moisture, and feeds your plants.

LAWN ALTERNATIVES

▶ USES: SOILS, YARDS & SLOPES

There are many great alternatives to lawn, which can beautify your yard, reduce maintenance, and provide habitat while reducing runoff issues.

Lawns provide areas for play and relaxation and can be a great feature of your yard. The downside of lawns is that even in ideal growing conditions, they require a lot of time and effort to maintain. Growing a healthy lawn can also be nearly impossible in areas that are shady, have poorly draining soils, or are on a slope.

Lawns can also increase runoff. In fact, even well aerated lawns are second only to hard surfaces like driveways in being the least absorbent surfaces on your property. Rainwater easily washes over grass because of its smooth, uniform texture. Lawn soils are also often compacted from heavy use or the original house construction. During construction, native soils are often removed, and any remaining soil can become heavily compacted. After construction, sod is often laid on top of a thin layer of imported topsoil. Although it may initially look great, the poor underlying soils will cause the health of the lawn to degrade.

Turf grass is also not very good at cleaning and filtering pollution because of its shallow roots.

As a result, too much lawn area leads to more runoff and more pollution – such as fertilizers, pesticides, and pet waste – flowing to our local lakes and streams.

ALTERNATIVES TO LAWN

Luckily, there are many great alternatives to lawn. These alternatives can reduce maintenance, beautify or add function to your yard, and improve the ability of your garden to **SLOW** runoff, allowing it to **SPREAD** out and **SINK** into the ground. Lawn alternatives work well in combination with other RainScaping solutions, such as compost, mulch, and rain gardens.

For lawn areas you decide to keep, you can reduce runoff and have a healthier lawn by using natural lawn care practices like mulch mowing, aeration, and top-dressing. These practices will reduce your need to fertilize and use herbicides and will allow more water to **SINK** into the ground. To learn more, visit www.naturalyard.surfacewater.info.

DO

- ✓ Rethink the size of your lawn.
- ✓ Consider alternatives, particularly in problem areas.
- ✓ Choose a wide variety of plants
- ✓ Establish a buffer of native trees and shrubs along streams, rivers, and lakes.

DO NOT

- ✗ Grow lawn where it cannot thrive, such as shade, soggy soils, and steep slopes.
- ✗ Forget to prepare your site by sheet mulching.
- ✗ Remove trees or shrubs or do any work in the buffer area or shoreline of a wetland, stream, lake, or river without a permit.

PLANTING BEDS

Replacing some or all your lawn with planting beds is a great way to beautify your yard, reduce runoff, and lower your maintenance. To attract birds, wildlife, and pollinators, choose a wide variety of trees, shrubs, and flowers. To find plants well-suited to your yard's specific conditions, view the *Choosing the Right Plants* and *The Plant List* publications. To avoid unintended consequences of pesticides, view the Natural Pest, Weed & Disease Control publication.

Replacing lawn areas with planting beds is a great way to beautify your yard, reduce runoff, and lower your maintenance.

PROVIDING HABITAT WITH PLANTING BEDS

Photo: Rod Gilbert

HABITAT PLANTING

To create habitat for birds, beneficial insects, and other critters, choose a wide variety of plant types and species. Be sure to include a variety of habitat layers – combining trees, shrubs, and groundcover plants – and select a diverse mix of plant types, such as evergreen and deciduous, woody (trees and shrubs), and herbaceous (perennials, ferns, and bulbs), including those that flower and produce fruit. For ideas, check out the book *Landscaping for Wildlife in the Pacific Northwest* by Russell Link.

Photo: Whatcom County

SHORELINES (LAKES/STREAMS)

Shorelines can be difficult places to grow lawns. They are often wet and easily erode. Replacing shoreline lawn with shrubs, trees, and perennials is a great way to add beauty to your property and reduce maintenance. Deeper-rooted plants help stabilize and protect your shore while soaking up and cleaning runoff. The county has resources to help you get started including planting guides, free site visits, help creating planting plans and even free native plants for your shoreline. Learn more at www.streams.surfacewater.info or lakewise.org.

POLLINATOR GARDENS

Pollinators, such as butterflies, bees, and hummingbirds, require nectar as their primary food source. Butterflies and moths need specific larval host plants. Bumblebees burrow nests in bare soil, so leave some mulch-free spots for them. Hummingbirds rely on trees and shrubs for nesting materials and nest sites. Be sure to plant a wide variety of plants for blossoms across the seasons, including natives. View the Xerces Society and WSU Extension pollinator garden resources.

GROUNDCOVERS

Replacing lawn with groundcover plants can provide open space without many of the drawbacks of maintaining lawn. Plus, there are many groundcovers that thrive in places where lawns will not, including shady areas, slopes, and wet spots. Some are durable enough to walk on. To find great groundcover options for your site, view *The Plant List* and *Choosing the Right Plants*.

Photo: Peggy Campbell

Photo: Peggy Campbell

Low Oregon grape (left) and creeping thyme (right) are just two of the many groundcover options available for replacing lawn areas.

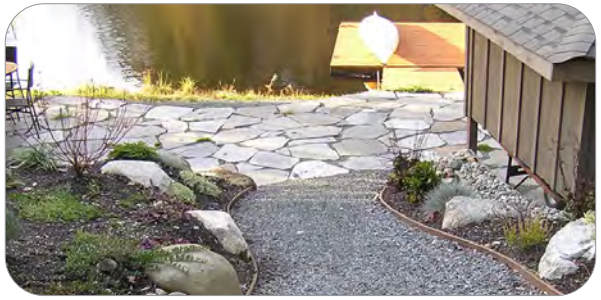
EDIBLE GARDENS

Converting a sunny lawn into an edible garden is a great way to reduce runoff, protect pollinator habitat, and build healthy soil – all while growing delicious, nutritious food! To build soil health and reduce runoff from areas of bare soil, be sure to use a cover crop or mulch during the rainy season. Many valuable resources are available to Snohomish County residents interested in growing their own food, including the *Growing Food in the City* publication, Snohomish Conservation District's Lawns to Lettuce program, and WSU Extension's Growing Groceries classes.

Replacing lawn areas with edible gardens can be a great way to reduce runoff, build healthy soil, and growing delicious food.

PERMEABLE PATHWAYS

Replacing heavily trafficked lawn areas with permeable pathways, such as modular pavers, flag stone, and turf block, can reduce soil compaction, allowing more runoff to soak into the ground. These pathways can also improve the function and aesthetics of your yard, eliminating patchy and soggy lawn areas in favor of an attractive pathway that can be walked upon rain or shine. For more information, see Permeable Paving Options.



Flag stone (left) and modular pavers (right) work great for walkways and patios.

STEP BY STEP INSTRUCTIONS FOR REPLACING LAWNS

The following instructions focus on the steps necessary to convert your lawn to a planting bed alternative.

STEP 1 ASSESS YOUR SITE CONDITIONS AND GOALS

Strategic landscaping can define outdoor spaces, attract wildlife, provide privacy, and much more.

Start by making a simple map of your yard and note the following:

- **Light.** Identify which areas are sunny, partly sunny or shaded.
- **Soil moisture.** Note areas that are soggy or difficult to mow at times. Take a shovel and dig a few holes during the rainy season to see how wet the soil is.
- **Problem areas.** Identify areas with steep slopes or compacted soils that may benefit from additional site preparation, plants better suited to the conditions, or installing permeable pathways.

Take into consideration:

- **Views.** Identify areas to accentuate or block.
- **Privacy.** Are there areas where plants can provide desired privacy?
- **Wildlife.** Are there certain birds, butterflies, turtles, or other beneficial species you want to attract?

Source: Adapted from "Choosing the Right Plants" (City of Seattle)

- **Foot traffic.** Identify natural pathways for people and pets to keep feet dry. Use permeable paver, gravel, or woody mulch pathways to protect the soil. If your grassy walking path receives light foot traffic and the soil is well-draining, consider replacing it with groundcovers that tolerate some foot traffic.

STEP 2 CREATE A PLANTING PLAN

The next step is to come up with a planting plan that accomplishes your goals with plants that will thrive with minimal care in your lawn area's light and soil moisture conditions

To find plants well suited to your yard's unique conditions, view the *Choosing the Right Plants* and The Plant List publications. To help reduce your need to weed and mulch, space plants so they are as far apart as their mature width (i.e., a shrub that grows up to 3-feet wide should have that amount of space around it). That way, at maturity, the plants will fully cover the soil and leave little room for weeds to grow.

STEP 3 PREPARE YOUR SITE

Prepare your planting area by removing weeds prior to planting. If the area is currently lawn, use a process called 'sheet mulching' to prepare your site.

Sheet mulching smothers grass with a layer of up to six sheets of wetted newspaper that is covered by wood chips. There is no need to dig out turf. Sheet mulching leaves you with rich, fertile soil with minimal weeds. Simply follow these easy steps:

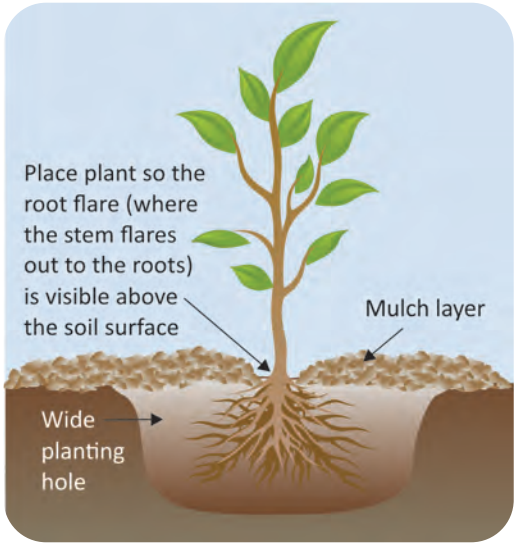
- Mow the lawn short.
- Cover the area with overlapping sheets of newspaper, up to 6 sheets thick, or used coffee bags (sometimes available for free from local companies). Be sure to wet these thoroughly before covering them up.
- Then cover the wetted newspaper with 3 to 6 inches of wood chips. If applying during a dry season, be sure to thoroughly water the wood chips afterward.
- For best results, wait 3 to 4 months before planting.

For more information, view the *Growing Healthy Soils* publication and online plant resources at www.resources.rainscaping.info.

STEP 4 PLANT RIGHT

Set your new garden area up for success by planting right. Here's how:

- Pull aside mulch before digging.
- Dig a wide hole deep enough to spread the plant's roots and only as deep as the root ball.
- Slide the plant out of its pot and find the plant's root flare (where the stem flares out to the first roots). If you cannot see the root flare, remove soil until you expose it.
- Gently shake soil loose to expose the roots.
- Loosen the rootball. Spread out circling roots. If needed, use a sharp tool like a hori-hori knife to cut into densely matted roots.
- Place the plant in the hole and spread the roots, making sure the root flare is exposed above the soil surface. For plants that do not have a root flare (vegetables, perennials, ferns, annuals), the top of the existing roots must be at or slightly above the soil surface.
- Backfill the hole with the native soil (not the potting soil).



- Firm the soil with your hands and water thoroughly. Check the level of the plant after watering. If the soil settled, gently place additional soil under the plant to raise its root flare above the surrounding soil.
- Rake the mulch back over the soil, keeping it at least 2 inches from the stem.

Planting in fall is ideal. This allows winter rains to help your plants grow a bigger root system before next summer's dry season. Planting in spring will also work, but you will need to water diligently through the spring and summer until the wet season arrives.

STEP 5 MAINTAIN YOUR PLANTINGS

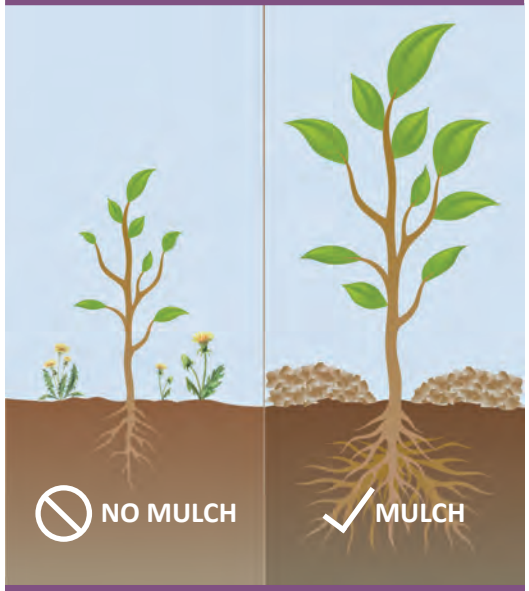
Depending on your chosen lawn alternative, it is likely that your new garden bed will be relatively low maintenance over time. However, for the first two to three years your new plantings will require some watering, mulching, and weed control while the plants establish.

- **Watering.** For one to three years, your plants will need deep but infrequent watering during the dry season that will help the plants establish their roots. Once established, most native plants will need little to no watering.
- **Mulching.** Replenishing mulch helps prevent erosion, controls weeds, retains moisture, and feeds your plants. Simply reapply mulch annually, or as needed to maintain the appropriate mulch layer depth. See Mulch for information on appropriate depth for different types of mulch applications.
- **Weed control.** Frequent weeding is needed in the first few years until your plants reach maturity. Most weeding can be done by hand. Weeds are easiest to pull when small and the soil is moist.

MULCH

▶ USES: SOILS, YARDS & SLOPES

BENEFITS OF MULCH



Applying mulch results in:

- Less watering
- Fewer weeds
- Improved soil health
- Better nutrient availability
- Improved soil stability

The term "mulch" can be used to refer to any organic material that is spread over the ground, including wood chips, leaf litter, straw, and grass clippings.

Covering bare soils in your landscape with mulch is the simplest way to achieve a low maintenance, healthy landscape, and protect the environment. Mulch prevents soil erosion because it **SLOWS** rainwater down when it hits the ground. Mulch also feeds the soil's beneficial organisms that create structure and spaces within the soil allowing rainwater to **SINK** into the ground where pollutants can be broken down before they can reach our waterways.

Benefits of mulch include:

- **Less Watering:** Retains soil moisture and limits evaporation
- **Fewer Weeds:** Shades soil to prevent weed seeds from sprouting
- **Improved Soil Health and Nutrient Availability:** Protects soils from compaction and slowly releases nutrients to your plants
- **Improved Soil Stability:** Helps prevent minor surface erosion, which is particularly important on sloped areas

Mulch applications also work well in combination with other RainScaping solutions, such as drip-line protection, drainage outlet protection, amended soils, and rain gardens.

HOW & WHERE TO APPLY MULCH

Different types of mulch can be useful for different types of garden areas. Refer to the table later in this Mulch section to identify the mulch best suited for your specific garden areas and how thick to lay it. Learn more about building healthy soils in the Growing Healthy Soils publication.

HOW MUCH MULCH IS NEEDED?

Use the following to calculate how much mulch you need:

- Cubic Feet = Thickness of Layer to Apply (inches) x Size of Area to Mulch (square feet) ÷ 12
- Cubic Yards = Thickness of Layer to Apply (inches) x Size of Area to Mulch (square feet) ÷ 324

For a great online calculator, visit www.savingwater.org and search for "Compost and Mulch Calculator."

WHERE TO BUY MULCH

- Arborist wood chips are often free by the truck load from tree services. Visit www.chipdrop.com or ask your local arborist to learn how to receive a load.
- Leaves and grass clippings from your yard can be used as long as they are free of herbicides.
- Compost is available in bulk or bags. Check your local nursery, home improvement store, or view a list of local suppliers of mulch and compost.
- Straw bales are available at local farm supply stores.

SPECIAL CONSIDERATIONS

Slope Protection

Protection: In general, wood chip mulch is best for slopes as it is not as easily washed away. On slopes it is very important to not exceed the recommended thickness of the mulch layer (see table on the next page) since it may become too heavy when wet or saturated, which can contribute to slope failure.

For steeper slopes or slopes experiencing erosion, other erosion control methods may be more effective. These include using biodegradable erosion control fabric (e.g., jute, coir, burlap) in combination with planting the slope for long-term stabilization. To support the slope and **SLOW** runoff, consider adding retaining walls and terraces (see Retaining Walls and Terraces). When in doubt, consult with an earthwork contractor or geotechnical engineer. Certain slopes are regulated as critical areas and any work on or near them may require permits (see Section 2 | Evaluate Your Site).

Stream, Lake, and Shoreline Protection

Wood chips mulch should be used near and alongside streams, lakes, and other shorelines. By decomposing slowly, wood chip mulch helps prevent water pollution through the slow release of nutrients for plant use. Avoid other mulch types near water, which quickly decompose and release high levels of nutrients that can pollute waterways, contribute to harmful algal blooms and cause excessive growth of aquatic plants.

STEP-BY-STEP INSTALLATION

1. Remove weeds, including their roots, before spreading mulch.
2. Spread mulch to the recommended thickness, using the table as a guide. Take care to ensure that mulch is kept at least 2 inches away from plant stems.
3. Re-apply annually or as needed to maintain a sufficient layer of mulch. If you see bare soil, reapply.

DO

- ✓ Cover bare soils in your yard with mulch.
- ✓ Remove weeds before spreading mulch.
- ✓ Reapply mulch annually, or as needed, to maintain the recommended thickness.

DO NOT

- × Apply mulch within 2 inches of plant stems or within 6 inches from structural siding.
- × Use fine/medium bark as mulch because it can plug the soil and/or repel water when dry.
- × Apply quickly decomposing mulch near water (lakes, streams, etc.).
- × Exceed the recommended thickness of mulch on slopes.

✓ Maintenance

Keep soils covered under a layer of mulch to reduce weeds and the need to water, save you time and money, and improve plant health. Reapply mulch annually, or as needed, to maintain the recommended thickness (see table on next page).

MULCH MYTHS DEBUNKED

There are a few common misconceptions about the drawbacks of mulch. Fortunately, Washington State University Extension provides science-based information that debunks mulch myths.

Myth: Wood chip mulch will tie up nutrients and cause deficiencies in plants.

Truth: **Evidence shows that woody mulch increases nutrient levels in soil and plants. Low nitrogen may occur in a narrow zone where the mulch meets the soil surface. This is one reason why mulch is so effective at reducing weeds. However, wood chip mulch is best used in areas with woody plants and should not be used in annual beds or vegetable gardens where the plants do not have deep roots.**

Myth: Wood chip mulch made from diseased trees can infect healthy plants.

Truth: **Evidence indicates that this is simply not the case. Fungi found in wood chip mulch typically act as decomposers, not pathogens. Plus, in healthy soils, beneficial fungi are able to outcompete pathogens.**

WHICH TYPE OF MULCH TO USE

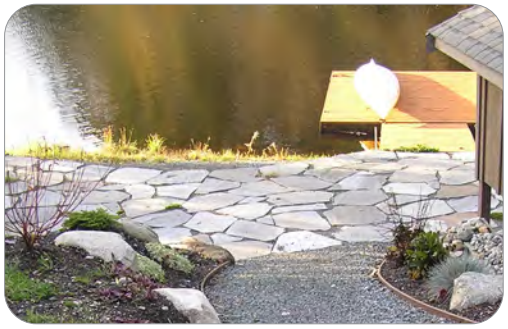
	TYPE	CHARACTERISTICS	GARDEN AREAS TO USE	THICKNESS TO APPLY
	**Wood Chips (Arborist Chips, Hog Fuel)**	• Breaks down slowly • Tends to stay in place	• Trees, shrubs, and perennial beds	• 3 to 6 inches
	**Leaves**	• Lightweight • Use a mower to shred leaves to prevent them from blowing away	• Flower beds • Vegetable gardens • Trees, shrubs, and perennial beds	• 1 to 3 inches on flower beds and vegetable gardens • 2 to 4 inches on tree, shrub, and perennial beds
	**Bark Nuggets (Coarse Bark)**	• Breaks down slowly • Tends to stay in place • Avoid fine/medium grade "beauty bark" as it can plug the soil	• Trees, shrubs, and perennial beds	• 2 to 4 inches
	**Compost**	• Fully decomposed already • Readily releases nutrients • Builds soil health, but may promote weed growth if not covered with another mulch type • Avoid using near water (streams, lakes, etc.)	• Flower beds • Vegetable gardens • Lawn	• 1 inch on beds • 1/4 to 1/2 inch over lawns
	**Straw**	• Lightweight • Breaks down slowly	• Vegetable gardens	• 1 to 3 inches
	**Grass Clippings**	• Breaks down quickly • High in nitrogen	• Lawn (mulch mow)	• Leave grass clippings on the lawn when mowing; use a mulching blade if possible

PERMEABLE PAVING OPTIONS

▶ USES: WALKWAYS, PATIOS, PARKING AREAS, DRIVEWAYS

Turf block

Modular pavers



Flag stones

Permeable paving options shown above allow runoff to pass through and **SINK** into the soil.

Permeable materials are path, patio or driveway surfacing materials that allow runoff to pass through and **SINK** into the soil. Popular choices are modular pavers, flag stones, turf block, and permeable asphalt and concrete. These materials allow runoff to **SINK** into the ground below, limit runoff, and improve water quality by filtering pollutants in the soil below.

Most permeable materials require an appropriately deep base layer underneath composed of sand, free-draining gravel, and sometimes non-woven drainage fabric. This base foundation not only increases the amount of stored runoff, it also prevents subsurface compaction and makes installation easier.

There are now permeable options for almost any application. For specifics on installation and use, contact your local retailer or product manufacturer. For guidance on design and restrictions on suitable locations (called infeasibility criteria), refer to Chapter 5 (BMP T5.15) of the Snohomish County Drainage Manual. Install walkable surfaces with a slight slope (1-2 percent) away from foundations.

TURF BLOCKS

Turf blocks (concrete or plastic blocks with holes, pictured top right) provide soil stability for driveways and walkways. Turf blocks **SLOW** and **SINK** runoff, as well as improve water quality by filtering pollutants. The blocks' grid pattern spreads out loads above to a wider area, reduces compaction, and retains the material it is filled with to provide soil stability.

Photo: Immanuel Giel, Wikimedia

Turf blocks can be planted or filled with sand or gravel. They work best for walkways, driveways or overflow parking areas.

When the holes are filled with topsoil and planted with grass or low-growing walkable groundcovers, the roots will help to improve infiltration.

For daily and long-term parking, consider filling the holes with sand or gravel instead -- which eliminates the challenge of trying to have plants survive under vehicles.

✓ Maintenance

Planted turf block may require regular mowing (depending on plant choices), weeding, and watering.

DO

- ✓ Choose low growing and drought-tolerant grasses or groundcovers.
- ✓ Use only in well-draining or moderately-draining soils.
- ✓ Use erosion control measures during installation (see Section 2 | Evaluate Your Site).

DO NOT

- × Use in high traffic areas or long-term parking areas.
- × Aerate.

MODULAR PAVERS & FLAG STONES

Modular Pavers

Modular pavers are normally made of pre-cast brick, concrete, stone, or other material. They come in various shapes, normally interlock, and can be set to form shapes and patterns. Modular pavers are designed to allow more runoff to **SINK** into the ground than traditional pavement. Runoff flows into the void spaces between and below pavers.

Modular pavers are typically installed over base layers of sand, gravel, and rock. The space between pavers are typically filled with washed coarse sand or pea gravel, though some are also designed for vegetation. Pavers typically have a spacer that ensures the ideal distance between pavers is maintained for maximum infiltration. An example installation of modular paver is shown in the adjacent diagram, but exact materials and depths vary. Follow the recommendations specified by the manufacturer for your paver installation. Pavers can be placed in high use areas such as parking lots, patios, and walkways.

Modular pavers work great for parking areas, patios and walkways.

Flag Stones

Flag stones are larger and may be placed directly on the soil. A low-growing groundcover may be planted between flag stones to allow for greater infiltration. Flag stones are best for patios and walkways.

✓ Maintenance

Keep the area clear of sediment to prevent clogging. Annual sweeping with a wet/dry vacuum cleaner or a hard bristle broom helps maintain permeability. The gaps between pavers may require occasional weeding and sand or gravel replenishment. Because permeable pavers are easily lifted and reset, they are easy to repair or replace.

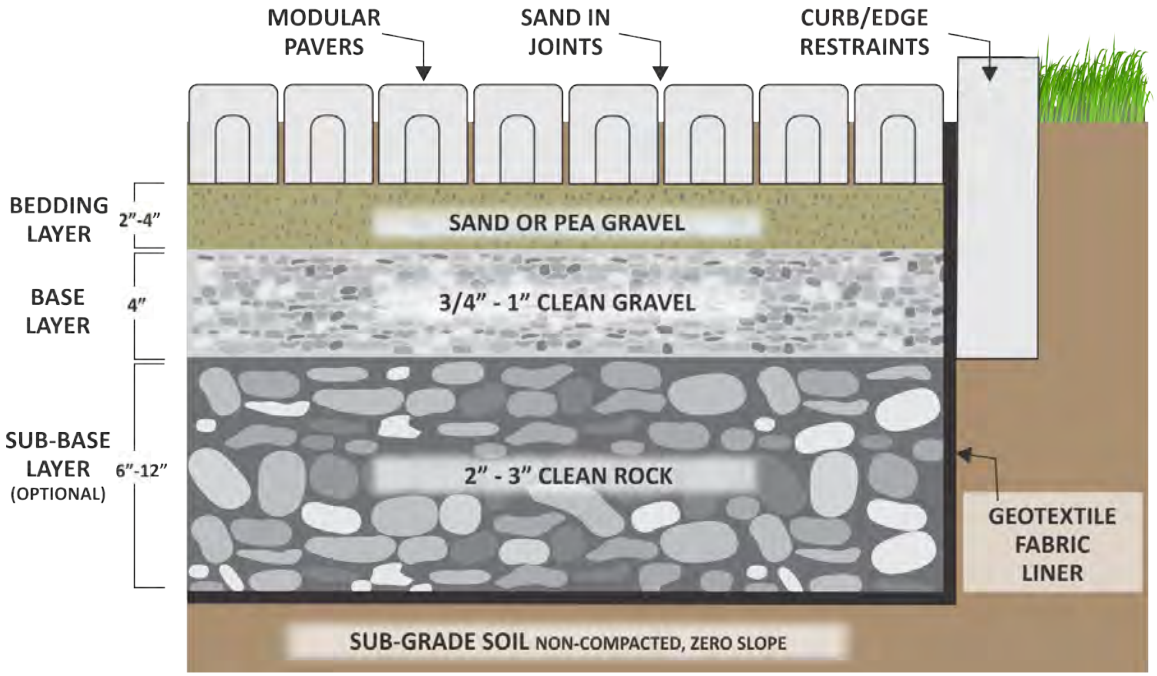
DO

- ✓ Use only in well/moderate-draining soils.
- ✓ Plant vegetation in between or around pavers.
- ✓ Use foundation materials specified by manufacturer.
- ✓ Build slightly higher than the surrounding yard for best drainage.
- ✓ Use erosion control measures during installation (see Section 2 | Evaluate Your Site).

DO NOT

- × Use in areas with high sediment loads that can clog porous areas.

EXAMPLE INSTALLATION OF MODULAR PAVERS



PERMEABLE ASPHALT & CONCRETE

Permeable pavements contain pore spaces that allow runoff to **SINK** through the pavement itself. The water seeps through the material to a rock base layer underneath and pollutants are naturally filtered out by the underlying soil.

The two different types of permeable pavements are permeable asphalt and permeable concrete. The underlying soil must have a moderate to high drainage rate to be considered for permeable pavement installations since they are not as flexible as other pavements and may be damaged if saturated during freezing conditions. The bottom of the rock base/ reservoir should be completely flat so that runoff will be able to infiltrate through the entire surface.

Permeable pavement should be located a minimum of 2 to 5 feet above the seasonally high groundwater table and at least 100 feet from drinking water wells. Ideal uses include walkways, residential parking areas and driveways.

Photo: National Ready Mixed Concrete Association

Permeable pavement allows water to seep through and be naturally filtered by the soils below.

Although installation is becoming easier and permeable pavements are a cost-effective alternative to traditional paving, appropriate construction techniques and maintenance are necessary to ensure their effective performance. Hiring a licensed contractor experienced in these materials is strongly recommended. For cross section drawings of permeable asphalt and concrete, consult Chapter 11 of the Snohomish County Engineering Design and Development Standards (EDDS).

✓ Maintenance

Keep the surface clear of soil, rocks, leaves, and other debris. Vacuum annually, using a wet/dry vacuum or specialized vacuum for large areas, to remove debris from the porous surface of the pavement. Other cleaning options may include power blowing and pressure washing. Always follow the manufacturer's maintenance recommendations.

DO

- ✓ Consider consulting a landscape architect or civil engineer to recommend a design customized to your site.
- ✓ Plant or mulch any surrounding bare soil areas.
- ✓ Follow the manufacturer's maintenance recommendations.
- ✓ Use erosion control measures during installation (see Section 2 | Evaluate Your Property).

DO NOT

- × Seal or repave with non-permeable materials.

BEFORE YOU BUILD

To determine if a permit is required for your project, contact Snohomish County Planning and Development Services (PDS) Ask Permit Tech program or call 425-388-3311.

For example, you will need a Land Disturbing Activity (LDA) permit if you are adding or replacing 2000 square feet or more of "hard surfaces" including permeable paving options. If permits are not required, you still must take measures to prevent sediment erosion during construction (see Section 2 | Evaluate Your Site).

FINDING A PROFESSIONAL

Before you design and install permeable paving options, you may want to hire a landscape architect or civil engineer for design and engineering guidance (see Section 5 | Resources). Be sure you let them know you want to infiltrate the water on your property.

Remember, you can always contact Snohomish County Conservation & Natural Resources Surface Water Management (SWM) for technical advice (surfacewater@snoco.org or 425-388-3464).

See www.resources.rainscaping.info for more information.

RAIN GARDENS

▶ USES: ROOFS, WALKWAYS, DRIVEWAYS, PARKING AREAS

Photo: RainWise – Seattle/King County

Photo: RainWise – Seattle/King County

Photo: RainWise – Seattle/King County

Rain gardens are both beautiful and functional. They allow runoff to **SINK** into the ground and filter out pollution in the process.

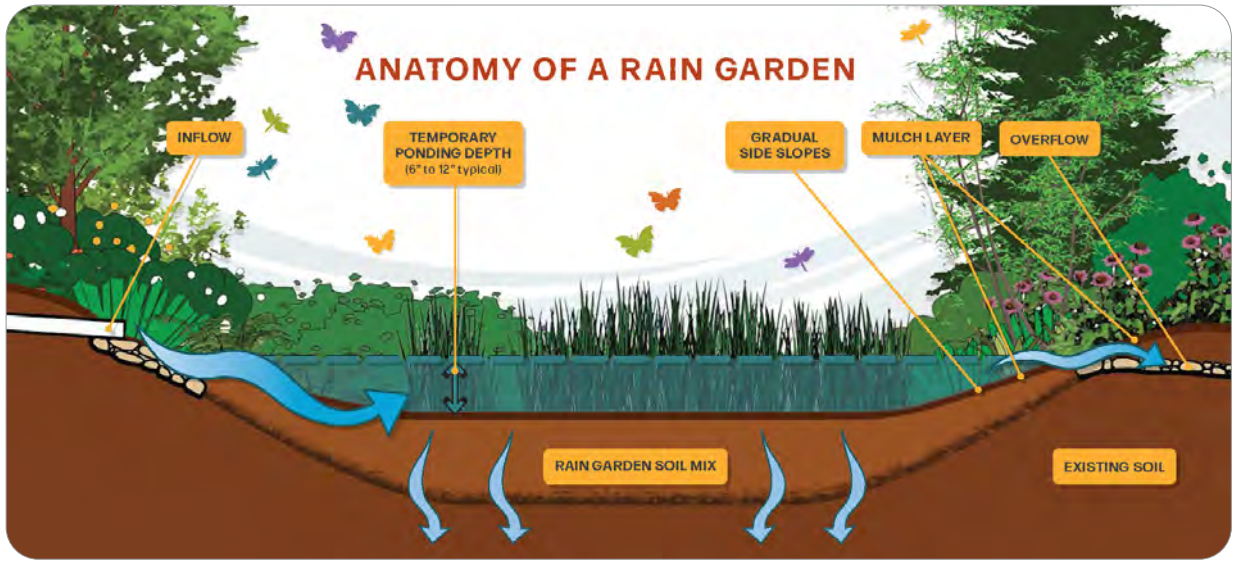
A rain garden is a landscape area designed to collect, absorb, and filter rainwater. The design allows temporary ponding of rainwater, and requires special soil and selected plants. As plants grow and fill in, the rain garden becomes a beautiful and effective way to manage rainwater onsite.

Rainwater is directed into the rain garden from a roof or hard surface. Within a rain garden, the water **SLOW**s, **SPREAD**s, and **SINK**s into the ground below. The soil and plants filter out pollutants that wash in with rainwater. Mulch covering the soil helps further **SLOW** the water to prevent erosion, discourage weeds, and keep plants evenly moist.

RAIN GARDEN HANDBOOK

The Rain Garden Handbook for Western Washington is our region's complete resource to create a rain garden.* It guides you through each step necessary to plan, build, plant, and maintain a rain garden. View or download the FREE Rain Garden Handbook at www.resources.rainscaping.info.

* The Rain Gardens section of the Snohomish County's RainScaping Guide offers a summary of the Rain Garden Handbook. To correctly determine whether a rain garden is feasible on your site, diligently follow the Rain Garden Handbook's full guidance.



Source: Rain Garden Handbook for Western Washington

A RAIN GARDEN PLAN BEING IMPLEMENTED

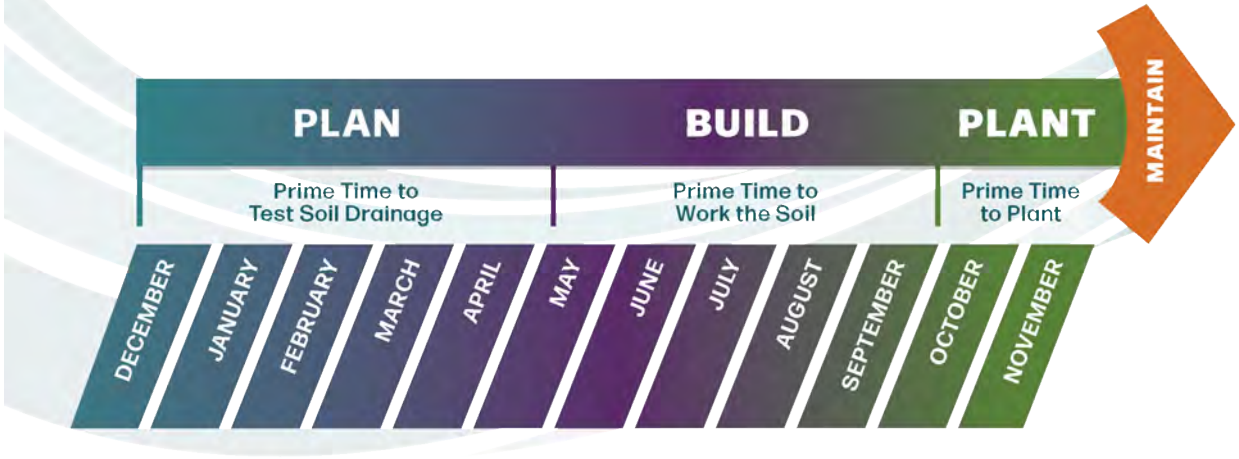
Photos: David Hymel

BUILD: Verify the size and depth matches your PLAN calculations. Fully cover soil with mulch. Line the inflow and overflow with cobble.

PLANT: Choose and space plants based on planting zone and growth habit. As-needed, replenish mulch and cobble to prevent weeds and erosion.

MAINTAIN: Routine maintenance minimizes weeds, prevents erosion, and ensures the rain garden looks great and performs well.

RECOMMENDED TIMELINE TO INSTALL A RAIN GARDEN



DO

- ✓ Test the soil drainage rate in the preliminary area where the rain garden is to be located.
- ✓ Size your rain garden based on the contributing area (roof, driveway, etc.) and your annual rainfall.
- ✓ Level the excavated bottom of your rain garden.
- ✓ Use an approved rain garden soil mix.
- ✓ Cover soil with 3 to 4 inches of woodchip mulch.
- ✓ Protect the inflow and overflow with cobble.

DO NOT

- × Locate in poor-draining soils.
- × Compact the soil during construction and planting.
- × Install close to a lake, stream, or river.

FOUR STAGES TO INSTALL AND SUSTAIN A RAIN GARDEN

The Rain Garden Handbook outlines four stages to successfully create and sustain a rain garden. Each stage includes instruction, photos, examples, and tips.

STAGE 1 PLAN (DEC THROUGH APRIL)

As beautiful as they are and as intriguing as one seems, a rain garden will not work at all sites. Carefully follow guidance laid out in the Rain Garden Handbook to determine if one is feasible for your site. The planning stage is where you will determine:

- a preliminary area of a rain garden,
- your soil's drainage rate,
- the minimum size a rain garden your site will need,
- whether a rain garden will work on your site or not.

Location & Feasibility

Here are key considerations that will help you determine rain garden location and feasibility:

- **Slope:** Consult with a geotechnical engineer if the location is near or on a slope greater than 10%.
- **Structures and septic systems (yours or adjacent property's):** Allow at least 10-feet between the rain garden area and a building's foundation. Allow a minimum setback of 50 feet uphill or 10 feet downhill from septic systems.
- **Underground utilities:** Avoid locating a rain garden within 5 feet of any utility.
- **Drinking water wells:** A rain garden must have a minimum setback of 100-feet from drinking water wells – on your or an adjacent property.

Site Drainage

The rate at which water **SINKS** into the ground (soil drainage rate) is key to knowing if a rain garden might work there.

- Determine what area(s) might drain to your rain garden. Rainwater must be able to flow by gravity to the rain garden.
- Test the soil in your preliminary area. Follow the Rain Garden Handbook to:
  - check for shallow groundwater,
  - determine your soil texture, and
  - calculate your soil's drainage rate.
- Use your soil drainage rate to see if a rain garden may be feasible:
  - Moderate- to well-draining soil. A rain garden might be feasible if all other site conditions laid out in the Plan section of the Rain Garden Handbook are satisfied.
  - Poor-draining soil. A rain garden will not work. To find RainScaping Solutions that work, see Section 2 | Evaluate Your Site in the RainScaping Guide.

Determine Its Size

Once you know your soil's drainage rate, walk through the steps to determine what size your rain garden needs to be. Easy-to-follow steps, examples and a sizing chart are available in the Plan section of the Rain Garden Handbook.

DIAL 811 – CALL BEFORE YOU DIG!

It is required by law to mark buried utilities before you dig deeper than 12 inches. This includes digging to test for soil and groundwater conditions, or before installing a RainScaping solution.

Call 811 or submit a request to https://digsafewa.com/homeowners at least 3 working days before you dig to have a FREE public utility locator mark areas near public roadways. Utility locates expire after 45 days and the property owner is responsible for calling 811 to have utilities re-marked after that.

The free public service usually does not mark private utilities between the street and your house. These may include power, irrigation, septic, and water lines. If you are not sure about the locations of private utilities on your property, hire a private utility location service to locate these for you. Search online to find "private utility locators" in your area.

Upon request, utility companies will mark the utility locations on your property using colored flags or spray paint.

STAGE 2 BUILD (MAY THROUGH SEPT)

Building a rain garden is best done in the dry season. Here are a few key steps in the process:

- Locate, design, and protect the inflow and overflow. The inflow is where rainwater enters the garden through a pipe or a rock-lined swale. The overflow is the pathway for water to spill out if the rain garden completely fills in a heavy storm. To protect from erosion, line them with 2” or larger cobble rock extending at least 4 feet beyond where water enters.
- Have underground utilities re-marked, if needed. Utility locates expire after 45 days and it is the homeowner’s responsibility to call 811 to have them re-marked before construction.
- Verify the depth of excavation needed to accommodate the ponding depth, soil mix depth, mulch, and overflow containment area.
- Verify that the bottom of the excavated rain garden is completely level.

- Avoid soil compaction.
  - Keep equipment out of the rain garden.
  - Place soil into the rain garden in lifts or layers.
  - Cover the soil with woodchip mulch (3 to 4 inches deep).
  - If you choose to apply woodchip mulch after planting, place cardboard or lumber on the soil to step and kneel on while planting.

STAGE 3 PLANT (OCT THROUGH NOV)

Fall is the ideal planting season. Steady rainfall fall through spring helps new plantings develop deeper and wider root systems in advance of the summer dry season.

Planting Zones

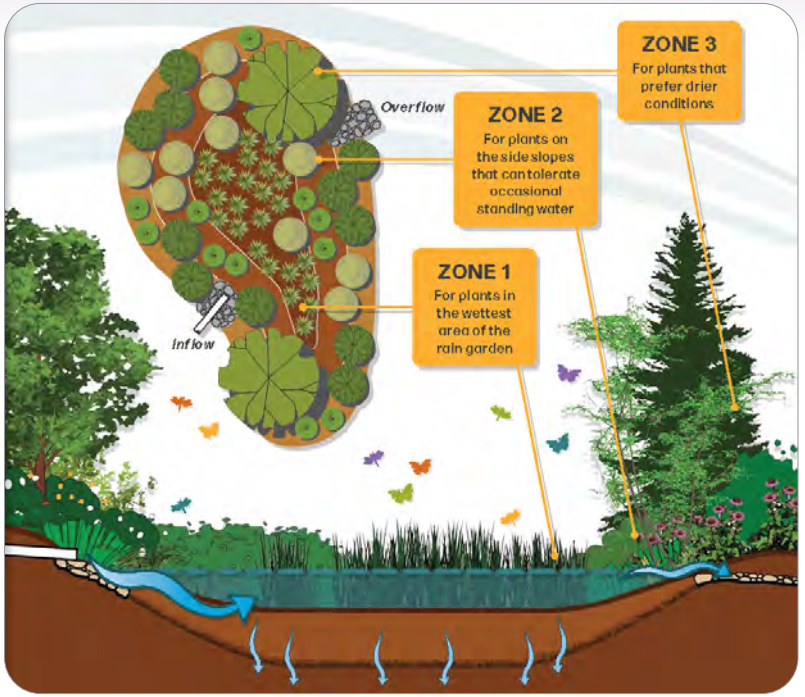
Each rain garden has three distinct planting zones:

- **Zone 1** – The bottom of the rain garden requires plants that can be wet in winter and survive dry conditions in summer.
- **Zone 2** – Side slopes need to be stabilized with plants that can tolerate occasional standing water and will thrive in drier conditions the rest of the time.
- **Zone 3** – The perimeter and/or berm around the rain garden requires plants that grow in drier soil.

Plant Selection & Planting Plans

To help you select plants for your rain garden, review the landscaping guidelines, plant selection, plant spacing tips, and sample planting plans included in the Rain Garden Handbook.

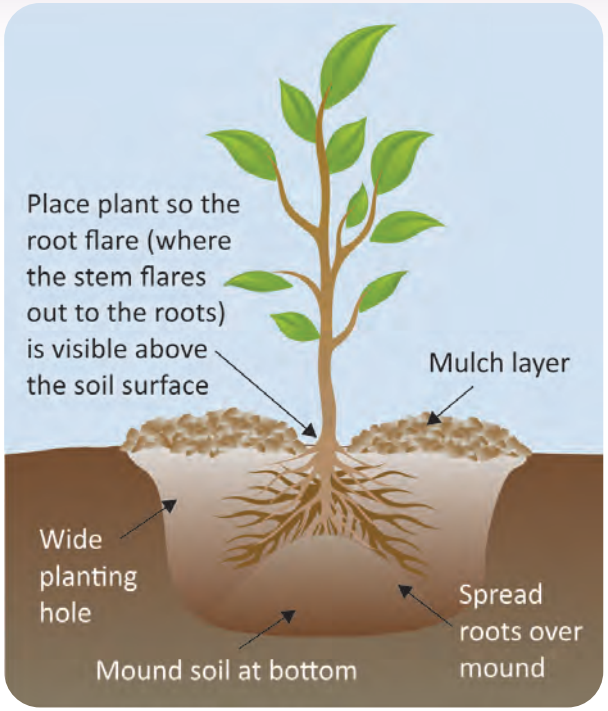
For a list of commonly available plants for rain gardens, see Appendix A of the Handbook. The list features each plant's suitable planting zone, photo, mature size, and description.



"RULE OF THIRDS" DESIGN TIP

Garden designer and author Ann Lovejoy developed her ‘rule of thirds’ to guide the design of gardens that hold their looks throughout the year. In addition to creating pleasing, year-round interest, use of her rule of thirds helps attract birds, butterflies, and pollinators to the garden.

- 1/3rd evergreen plants – provides winter interest and summer shade
- 1/3rd deciduous – adds autumn color
- 1/3rd “ephemeral” – offers seasonal color from bulbs, perennials, and ferns



When planting, be sure the root flare remains above ground, spread the roots out and cover with soil, apply mulch, and water thoroughly.

Space new plantings far enough apart so they have room to mature.

Planting

To start your plants off right, follow these tips:

- **Before planting**. Water plants well prior to taking them out of their pots.
- **When planting**.
  - Protect the soil from compaction by either covering the soil with woodchip mulch (3 to 4 inches deep) or using cardboard or wood to step or kneel onto while moving about and planting.
  - Slip each plant out of its growing container, find and expose its root flare (see the illustration to the left) before digging the planting hole. Then dig the planting hole only as deep as the roots go below the root flare.
  - Loosen the root ball to help new roots grow out into the surrounding soil. Place the loosened root system in the hole – keeping the root flare above the soil line – and backfill with the rain garden soil. See the illustration to the left.
- **After planting**.
  - Water each plant thoroughly by hand. Cover the soil with woodchip mulch, making certain the mulch is not touching plant stems.
  - Until steady rainfall resumes in fall, be sure to water deeply each week.
  - For the first two to three summers, monitor and water as needed. Replenish mulch to maintain a 3- to 4-inch depth.

STAGE 4 MAINTAIN (ONGOING)

To enjoy a beautiful rain garden that is also low maintenance:

- Keep the water flowing by clearing debris from the inflow and overflow during and after storms.
- Replenish mulch to cover up exposed soil. Mulch helps reduce weeds, prevent erosion, and minimize the need for summer watering.
- Provide routine maintenance, including trimming plants and checking berms for any settling.

Refer to the Seasonal Maintenance Checklist and Troubleshooting Guide in the Rain Garden Handbook for a detailed checklist by season.

Remove any weeds by hand before they set seed. Replenish mulch to a depth of 3 to 4 inches to prevent new weeds from getting started.

RAINWATER COLLECTION SYSTEMS

▶ USES: ROOFS

Connect your downspout to a rain barrel or cistern to capture rainwater for garden use.

Collect more water by connecting several tanks together.

Collecting rainwater for summer watering is a great way to put it to good use. Plus, by storing the water, you can help **SLOW** and reduce the amount of runoff, preventing potential flooding and pollution.

The concept of a rainwater collection system is simple: collect rooftop rainwater from a downspout, then use the stored water in your yard and garden. Rainwater is typically collected in one of these types of tanks:

- Cisterns – large storage capacity, typically holding 200 to 1000+ gallons
- Rain barrels – small storage capacity tanks, holding 55 to 60 gallons

A rainwater collection system consists of a single tank (cistern or rain barrel) or several tanks connected together (see comparison table on next page). To get started, you will first need to choose the right system. Then follow this step-by-step guide to set it up and care for it.

CHOOSING THE RIGHT SYSTEM

When choosing a rainwater collection system, consider the amount of water you can collect (based on your downspout's roof area), your summer watering needs, and your available space to locate it. Use the chart on the next page to help you determine which system meets your need.

COLLECTING RAINWATER IS LEGAL

Photo: RainWise – Seattle/King County

Lawn & Garden Use

Rainwater collection is regulated by the Washington State Department of Ecology. Under current policy, you do not need a permit if the rainwater is:

- used on the property where it is collected, and
- collected from rooftops that have another purpose beside collecting rainwater.

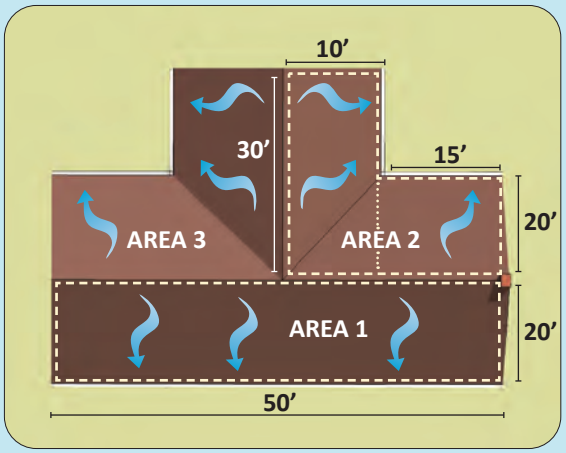
RainScaping guidance for rainwater collection systems is limited to home lawn and garden use.

Potable Water

Snohomish Health Department has specific rules for treatment and testing of rainwater for drinking water. Refer to the Snohomish County Health Department code for requirements.

RAINWATER COLLECTION SYSTEM OPTIONS

Tank Type & Storage Capacity	**SINGLE BARREL** **55- to 60-gallon capacity** 	**CISTERNS** **200 to 1,000+ gallon sizes**  *Photo: RainWise – Seattle/King County*	**CONNECTED TANKS** **Barrels, Cisterns or both**  *Photo: Snohomish Conservation District*
Description	A barrel or food-grade plastic drum	Manufactured water storage tanks come in a wide variety of shapes, sizes, and colors to fit available space and aesthetics	Use multiple tanks to increase storage capacity. Connect them at the bottom with flexible hose.
Watering Needs	Water stored in a single barrel is typically used up after just a few weeks of dry weather	The larger capacity of a cistern allows watering over an extended length of time	The size and number of tanks determine length of watering capacity.
Weight When Full (1 gallon of water weighs 8.35 pounds)	When full, a 60-gallon barrel weighs over 500 pounds. The level base under the barrel must support this weight.	When full, a cistern will weigh over a thousand pounds. The level base must support this weight.	The level base must support the weight of all the tanks when full.
Installation Effort	Can be done in a day with commonly available tools	Can be done in a weekend with commonly available tools	Multiply the level of effort by the number of tanks
Installation Cost (do-it-yourself)	Tank: $ Supplies: $	Tank: $$ – $$$ Supplies: $ – $$	Tank: $$ – $$$ Supplies: $$ – $$$
Tank Suppliers	■ farm supply stores ■ hardware/home improvement stores	■ farm supply stores ■ online specialty suppliers	■ farm supply stores ■ hardware/home improvement stores ■ online specialty suppliers
Annual Maintenance Effort	Low	Low	High: must maintain each individual tank



CALCULATE ROOF AREA DRAINING TO EACH DOWNSPOUT

When finding the square footage of an area of your roof, do not consider slope. Instead, treat your roof as flat. Measure the length and width of each side of your building including the roof overhangs. Multiply the length times the width to find the area of each surface. For more complex roofs, you will need to break up the roof into smaller sections and then add up the areas that drain to a common downspout.

Formula

LENGTH x WIDTH = AREA in square feet (sq. ft.)

Examples

- Area 1 Downspout:
  50 X 20 = 1000 sq. ft.
- Area 2 Downspout: (Calculate Area 3 the same way)
  10 X 30 = 300 sq. ft.
  15 X 20 = 300 sq. ft.
  Total = 600 sq. ft.

KNOW HOW MUCH WATER YOU CAN COLLECT

In general, a downspout that drains 500 square feet of roof area will collect about 250 gallons of water with 1-inch of rainfall.

To determine how much rainwater you can collect in a year from a downspout, you will need to know the roof area (see sidebar) and the annual precipitation of your area in Snohomish County.

Annual precipitation varies by location – western Snohomish County receives about 35 inches, or 2.9 feet per year. Precipitation increases as you move east towards the Cascades – areas around Monroe receive about 49 inches or 4 feet per year. Perform an internet search to find the average annual precipitation where you live, or approximate it by using the Rainfall Regions for Western Washington map in Section 1 of the Rain Garden Handbook for Western Washington. Convert inches into feet by dividing by 12.

Calculate the rainwater your downspout can collect

ROOF AREA in square feet x ANNUAL RAINFALL in feet x 7.48 (conversion factor) = VOLUME in gallons.

Examples

- A 500-square-foot roof area near Everett (35 inches, or 2.9 feet per year):
  500 x 2.9 x 7.48 = 10,846 gallons per year
- A 500-square foot roof area near Darrington (77 inches, or 6.4 feet per year):
  500 x 6.4 x 7.48 = 23,936 gallons per year

DETERMINE YOUR WATER NEEDS

Most people envision that collecting water with a single rain barrel during the rainy season will meet all their watering needs. Because our region receives sporadic to little rainfall during the summer, it is not uncommon for a rain barrel to go dry after a week or two of watering. Install a larger tank (cistern) or connect several rain barrels together to increase your stored rainwater capacity.

Knowing how much water your garden uses during the summer dry season will help you to decide your system’s storage capacity (tank size and/or number of tanks). Here are two options for determining summer water usage:

- Review your water utility statements to compare summer month usage with other months of the year. The difference is typically the amount you use in your yard.
- Approximate garden usage based on the size of all areas to be watered (lawn, vegetable garden, trees, shrubs, and flower beds).

In general, 1-inch of water per week in summer is needed for a vegetable garden and to keep a lawn green. This amount is equivalent to 0.623 gallons of water per square foot per week. If your soil is covered in mulch, your watering needs will be reduced (see Mulch).

Your garden's weekly water need is found by multiplying the area of your garden (LENGTH x WIDTH in feet) by 0.623 gallons per square foot. For a full summer of watering, simply take your weekly watering need and multiply it by the number of weeks you may need to water.

For help planning, sizing, and installing a complex system, contact a rainwater collection system specialist/installer.

CALCULATE YOUR WATERING NEED:

Area of garden (LENGTH x WIDTH in feet) x 0.623 gallons per sq ft x number of watering weeks = Gallons your garden area will need water per week

Examples

- During 7 weeks of watering, an 8’ x 4’ vegetable garden will use 140 gallons of water. (8 ft x 4 ft) x 0.623 gal/sq ft x 7 weeks = 140 gallons
- During 12 weeks of dry weather, a 20’ x 20’ lawn will use 2,990 gallons to remain green. (20 ft x 20ft) x 0.623 gal/sq ft x 12 weeks = 2,990 gallons

FINDING SPACE FOR YOUR SYSTEM

Before installing, verify that your preferred location will work for the rainwater collection system, including sufficient space for the tank(s) you select. The ideal location will be:

- Next to an existing downspout;
- Close to the area(s) where you will use the water;

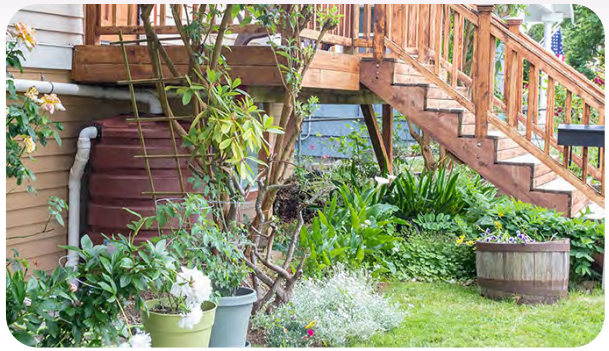


Photo: RainWise – Seattle/King County

Tanks may be positioned to blend in with landscaping.

- Higher in elevation than the area to be watered – unless you plan to install a pump; and
- Able to allow the safe overflow of excess water away from foundations when the tank is full (see Overflow details below).

If your location is not ideal, you may be able to use one or more of the following to help easily convey your downspout's rainwater to a more ideal tank location: install an aqueduct (overhead open-trough conveyance), extend the downspout so that it runs along the house, or add a pump (see Installation Step 9).

There are many ways for your rainwater collection tank to blend into your yard. Consider painting, using plants to camouflage, or fencing your tank. If you decide to paint your tank, wash and sand the surface with a medium grit sandpaper before coating the tank with an outdoor primer. After painting, seal with a clear coat.

ROOFING MATERIAL & EDIBLE PLANTS

Not all specialists agree that roof runoff is safe for watering edible plants. Rainwater from the following roofs should especially be avoided whenever watering edible plants:

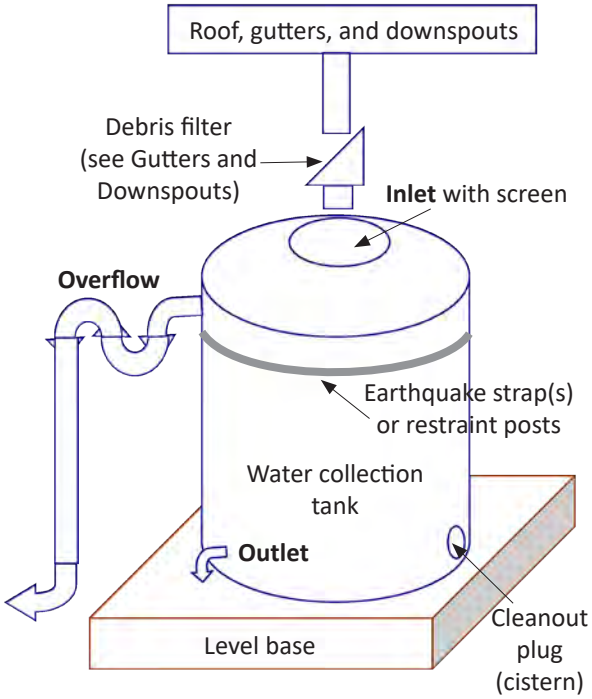
- Treated wood-shake roofs
- Roofs treated with chemicals to control moss, algae or rot
- Roofs with zinc strips
- Roofs made of copper or having copper gutters

If you choose to use your roof runoff to water your edible garden, reduce the risk of contaminating edible plants by:

- Diverting the ‘first flush’ from your tank (see Step 8)
- Watering the soil and not the plants themselves
- Keeping your cistern clean and sanitized. Rutgers University suggests adding one ounce of chlorine bleach for every 55 gallons of water and waiting 24 hours before applying the water to your garden.

DESIGNING A RAINWATER COLLECTION SYSTEM

System Components



- First-flush diverter (optional)
- Pump (optional)

Rainwater Collection Tanks

Regardless of the type(s) and size of tank(s) you choose for your collection system, each tank needs three basic openings with corresponding hardware, uses the same installation steps, and requires maintenance. A tank can come preassembled, or you can build your own. Solid colors are available, which keep the inside of the tank dark to prevent algae growth. If using a translucent tank, considering painting the outside to prevent algae.

If you want to make your own rain barrel, see www.resources.rainscaping.info under "Rainwater Collection Systems" for step-by-step instructions.

TANK OPENINGS & HARDWARE

Every rainwater collection tank needs a place for rainwater to enter (an inlet), to come out (outlet), and for excess rainwater to safely exit (overflow).

- **INLET.** Rainwater enters from a downspout through a hole on the tank's top. To keep leaves, sediment, mosquitos, and other particulates out, secure a metal or mesh screen over the inlet and keep it clear of debris.
- **OUTLET.** The outlet consists of a leak-proof fitting and a hose fixture (spigot or hose bib) threaded into the fitting. The outlet is located on the side of the tank 2 to 4 inches from the bottom.
  - Fixtures made of brass are the most durable.
  - Be sure to wrap threaded hardware with plumber's tape to prevent leaks.
  - A leak-proof fitting may already be installed. If you need to install one, a heavy-duty bulkhead fitting is preferable because it is the most durable. Caulk the fitting to prevent leaks.
  - To help drain the tank between winter storms, consider adding a low-flow orifice that allows a trickle of water to flow out. Be sure to close in spring.
- **OVERFLOW.** When the tank is full and additional rainwater flows in, excess water must safely exit through the overflow. The overflow is located on the side of the tank close to the top and consists of the opening, a leak-proof fitting, and an open hose or pipe for excess water to flow out. To accommodate heavy storms, it is recommended to use a pipe for a cistern overflow (up to 3 or 4 inches in diameter).
  - Be sure to wrap threaded hardware with plumber's tape to prevent leaks.
  - A leak-proof fitting may already be installed. If you need to install one, a heavy-duty bulkhead fitting is preferable because it is the most durable. Caulk the fitting to prevent leaks.
  - The overflow should outlet to a safe spot away from structures (see Step 6 below).

DO

- ✓ Place tank on a level, elevated base.
- ✓ Strap tank to anchored structure.
- ✓ Direct overflow safely to your yard and away from foundations.
- ✓ Regularly clear gutters and inlet screens of debris.
- ✓ Clean sediment out each August.

DO NOT

- ✗ Use it for drinking, washing or cooking.
- ✗ Drain tank next to foundations, driveways, or slopes.
- ✗ Use a clear or translucent tank without paint.

INSTALLING A RAINWATER COLLECTION SYSTEM

GATHER YOUR SUPPLIES

TOOLS NEEDED

- ✓ Level
- ✓ Hacksaw for cutting downspout
- ✓ Drill

MATERIALS

- ✓ Tank(s)
- ✓ Level base and raised foundation
- ✓ Pipe glue or plumber's tape
- ✓ Earthquake strap(s)
- ✓ Overflow pipe/hose
- ✓ Self-cleaning downspout leaf filter (optional)
- ✓ Flexible downspout elbow (optional)

STEP 1 PREPARE THE BASE

Water is heavy. All tanks need to be set on a level base that supports the tank's weight when full. The base can be a 4" deep layer of packed crushed rock/gravel, concrete pavers over packed earth, or poured concrete.

If the location has soil that is soft and/or soggy (at any time of year), to prevent the soil from settling under the weight of a full tank, dig out the soil at least 4" deep and replace with crushed rock or gravel, packed firmly in place.

STEP 2 CREATE THE FOUNDATION

A level foundation is needed on top of the base in order to elevate the tank for ease of access to the tank's spigot (sufficient height to fill a watering can), and to help provide pressure for water to flow out by gravity through your hose to your garden area. If water does not flow out with sufficient pressure for your watering needs, a pump will be necessary (see Step 9 below).

Cinder blocks, laid side-by-side fully support the bottom of the tank(s)

Interlocking bricks surround and retain a bed of packed, crushed rock

STEP 3 SET THE TANK IN PLACE

To ensure you cut the downspout to the correct length, set the tank(s) in place on your prepared base and foundation. Measure and mark where the downspout's outlet needs to be once any downspout filters and elbows are added. Make tank placement adjustments before connecting the downspout.

STEP 4 CONNECT THE DOWNSPOUT

Once the final placement of the tank is determined, use a hacksaw to cut the downspout. Divert the cut downspout to the tank's inlet hole by using a flexible downspout elbow. If your tank's inlet is not covered by a screen, install a screen to keep debris (and mosquitos) out of the tank. Adding a self-cleaning leaf filter to your downspout or gutter (See Gutters and Downspouts) will help keep debris out of the tank while allowing rainwater to flow in. If your downspout previously connected to an underground pipe, be sure to close the pipe's opening with a PVC cap.

STEP 5 CONNECT MULTIPLE TANKS TOGETHER (IF APPLICABLE)

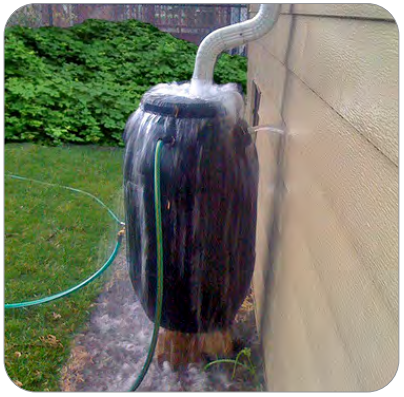
When connecting two or more tanks, you must use flexible hose between each tank to allow for any slight settling. To connect the hose to the tank: drill, tap, and insert a ¾-inch x 2-inch Schedule 80 PVC nipple two inches from the bottom of each tank. Wrap all threaded nipples with plumber's tape. Ensure the tanks are level with each other before connecting the flexible hose. Secure each connection with a hose clamp.

By connecting the tanks together at the bottom, they will drain as one. It is important to insert the overflow (see Step 6) into the first tank in the line. Insert an outlet spigot in the last tank in the line.

STEP 6 INSTALL AN OVERFLOW PIPE/HOSE

Heavy storms can quickly fill and overtop a tank. The tank's overflow is an open pipe or hose connected to a hole near the top of the tank to allow excess water to be directed to a safe location. Use a 3 or 4 inch pipe for the overflow so that the tank overflows at the same rate that it fills. This is especially important for a downspout that drains a very large roof area.

The overflow pipe or hose must remain open and route the water to a vegetated area using one of the practices described in Drainage Outlet Protection. Do not direct your overflow to a driveway or other impermeable hard surfaces unless there are no safe alternatives. Never direct the overflow on or above a slope or within 10 feet of a building's foundation.



STEP 7 MAKE YOUR TANK SAFE

For earthquake safety, strap your tank to an anchored structure (not just the siding) if it is taller than it is wide. Keep children and animals safe by securing the tank's lid closed.

STEP 8 FLUSH THE FIRST STORM

The first storm of the rainy season will wash bird droppings and debris from your roof into your tank. There are two options to use:

OPTION 1: Install a diverter

Install a 'first flush diverter' in your downspout. This will capture the initial runoff each time it rains. The captured runoff is slowly and safely released out of the bottom of the diverter to the ground below and kept out of your tank. Routinely clean the diverter.

OPTION 2: Manually divert the first storm

Allow the first flush to enter the tank(s), and then drain the tank(s) by opening the outlet spigot and directing the water to the overflow/discharge location. When empty, close the spigot to allow the tank(s) to fill.

STEP 9 USING STORED RAINWATER

If your tank is higher in elevation than the area you plan to use the water, the water will flow by pressure and gravity through a hose. If water does not flow with sufficient pressure for your watering needs, a pump will be necessary.

To use a pump, you may need an electrical connection nearby. For help selecting an appropriate pump, ask a pump specialist at a plumbing supply, hardware, or home improvement store. You will need to know the maximum distance and height the water must travel, and the flow rate of your irrigation system – drip lines, soaker hoses, sprinklers, or garden hose.

STEP 10 MAINTENANCE

Regular maintenance:

- In August, clean each tank by rinsing out accumulated sediment. If algae is present, scrub it out with a long-handled brush. For cisterns, a cleanout plug may be added to the base of the tank for easy brush access.
- Keep gutters clear of leaves and debris to reduce clogging of tank inlets.
- During the rainy season, check and clean filters and screens regularly.
- If you find a lot of debris trapped in gutters, downspouts, and tank filters, consider installing a debris filter that helps keep debris out (see Gutters and Downspouts).

During the rainy season (October through April):

- Check your tank's overflow system to ensure it is properly draining to a safe location. If overflow is causing erosion or flooding, redirect the overflow pipe/hose using one of the practices described in Drainage Outlet Protection.

In advance of freezing weather:

- Wrap small fittings and overflow pipes with bubble wrap or other insulation.
- Consider draining tank(s) to your overflow site and keep the spigot open to prevent damage from ice expansion. After the freezing weather is past, check the fittings for leaks and close the spigot to allow the tank(s) to refill.

RETAINING WALLS & TERRACES

▶ USES: SLOPED AREAS

Retaining walls can be an effective solution to create level areas for planting while protecting steep soil excavations from erosion.

Terraces create relatively level 'steps' on slopes for plantings and landscaping to **SLOW** rainwater down.

A retaining wall holds back soil to stabilize a slope and reduce erosion. Installing more than one retaining wall across a slope is known as a terrace. The use of a retaining wall or terrace creates a flat or gentler sloping area that is easy to plant, walk on, and enjoy. This flat or gentler slope helps to **SLOW** the flow of rainwater runoff so it can **SINK** into soils. Planting the area helps to further stabilize soil and capture and use the rainwater.

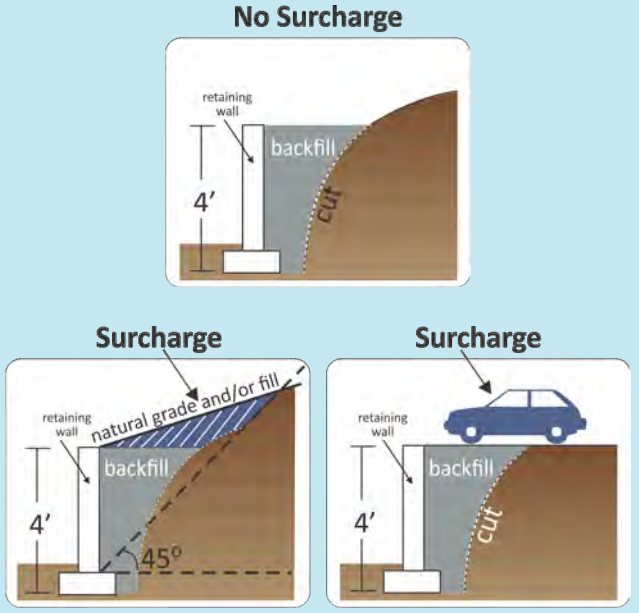
While retaining walls and terraces can be highly effective, they must be carefully designed and are not appropriate in all situations. If improperly installed or inappropriately used, they can pose a serious threat to life and property.

Consult with a qualified professional before designing or installing a retaining wall. A licensed landscape architect or civil or geotechnical engineer can assist with planning retaining wall projects and applying for permits.

A building permit with an engineering plan may be required (see sidebar). Depending on the size of your project and if it is in or near a critical area, you may also need a Land Disturbing Activity (LDA) permit. Always use proper sediment control measures when working on a slope. Further details are included in Section 2 | Evaluate Your Site.

BUILDING PERMITS

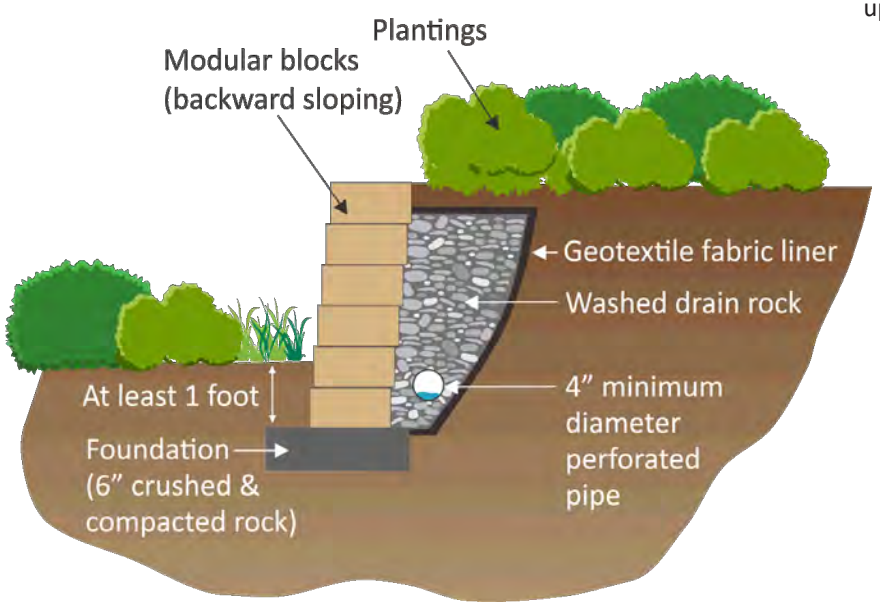
Building permits and engineered plans are required for any retaining wall that exceeds 4 feet in total height (including the buried portion of the wall). Building permits are also required for any wall which supports a surcharge above or behind the wall. A surcharge is any additional load placed on or against the wall, such as fill material (see images). For more information, contact Snohomish County Planning and Development Services (PDS) Ask Permit Tech program or call 425-388-3311. Refer to the PDS assistance bulletin on Retaining Walls.



RETAINING WALL DESIGN

Retaining walls may be constructed with a variety of materials include modular blocks, angular boulders, gabion baskets, or poured concrete. There are numerous types of retaining walls, each with a different purpose, so always check with a qualified design professional before embarking on a wall project.

Most soil retaining structures lean slightly into the hillslope, although some concrete walls can be vertical. The base of the wall should be embedded below the soil surface. Many walls are built on a structural foundation. Typically, this foundation is a 6-inch layer of level and compacted crushed rock. The top of the foundation is often buried a minimum of 12 inches below the ground surface.



Before you begin construction, you must remove any soils that contain organic matter (decaying leaf litter, compost, roots, etc.) that will cause the wall to settle in the future around your retaining wall. These soils are typically dark brown or black in color and have an earthy aroma. While prized by gardeners, the organic matter in these soils can hold an enormous amount of water. The water's extra weight may cause your wall to fail. Simply move the organic rich soils to another part of your yard where it will benefit your plants. If located under your footing, the organic matter in these soils may decay over time and cause your wall to sag. To reduce the chance of sagging, remove at least a foot of the organic-rich soil and replace it with compacted, crushed rock before installing the footing.

A drainage system is a necessary component of retaining wall design. Walls can fail if water builds up within the soils behind it. Consult a design professional to determine the type of features your drainage system will need for your site, as well as where to safely direct the water that it captures.

A critical aspect of your retaining wall's design is its backfill area. The backfill area is where the wall is supported, drainage is intercepted, and adjacent soil is stabilized. It is important to prevent fine particles in the adjacent soil from clogging the washed drain rock backfill. Prevent clogging by placing non-woven (felt-like) geotextile over the exposed soil to separate it from the drain rock.

As you build the wall, place, and tamp down layers of washed drain rock between the wall and the slope. The layer of drain rock should be at least one foot wide. Within the lowest layer of drain rock, install a perforated PVC pipe at least 4-inches in diameter. The pipe should be sloped slightly downward so water can flow by gravity to your drainage outlet. Continue to add layers of drain rock. The rock can extend to the surface, or you can stop within a foot of the surface, cover with non-woven drainage fabric and finish with topsoil and plantings.

TERRACE DESIGN

A terrace is a relatively level 'step' constructed into the face of a slope and is typically a series of retaining walls. Terracing can provide benches of usable space for plantings and landscaping to **SLOW** rainwater down. However, terraces must be carefully planned to comply with regulations and protect your and neighboring properties from slope failures. In general, the width of terraced benches should be at least equal to the height of the lower wall supporting the flat surface. A certified landscape architect, or licensed civil or geotechnical engineer can assist with planning and designing terraces, and applying for permits if needed.

RETAINING WALL MATERIALS

MODULAR BLOCK WALLS

Pre-constructed modular blocks are made specifically for retaining walls. They have an interlocking design, with a lip on the lower back edge of each block that slips neatly over the block below. As each layer is laid, the structure will continue to slope backward ever so slightly which increases the wall stability. When constructing, ensure your crushed rock footing is packed and level. As you build your wall, verify that each layer is level before adding the next. Taller walls will require additional design features for stability.

Your qualified professional or engineering team can help you select the appropriate block and design for your wall. Purchase from landscaping supply companies or directly from modular block distributors. **Caution:** small modular blocks typically available at large home-improvement stores have limited applications. When using small modular blocks, the retaining wall must: be less than four feet in total height (including the buried blocks which act as a footing), not support a surcharge (see sidebar on first page of Retaining Walls & Terraces), and have adequate drainage.

ROCKERIES

Most rockeries are not true retaining walls. Instead, they tend to be a wall of boulders that cover freestanding soils. The soils may have been excavated to create a flat area below or behind them. The rockery face protects the exposed soil from eroding. In some cases, short rockeries may accommodate fill dirt placed behind them to create a relatively level terrace.

Rockeries are typically constructed with angular rocks 18 inches or larger in diameter. Rockeries must lean slightly back towards the slope for stability. Before setting any rock, place non-woven drainage fabric against the soil slope. A trench is typically dug along the toe of the slope and the largest boulders are placed in the trench. Subsequent rocks are laid with at least three bearing points on previously laid rocks. As the wall is built, fill cavities between and directly behind the boulders with angular rock that is is 2 to 6 inches in diameter to help prevent erosion. Water can freely pass through the wall, so a drain pipe is not needed.

GABION BASKETS

Gabion baskets are cages made from heavy-duty wire and filled with rock. The rock must be larger than the openings of the cage and less than 18 inches in diameter. Gabion walls have the look of rockeries with the ease of installation offered by modular block walls. They are a good option for short walls. The design should include a gravel footing, drainage, and partial burial of the gabion basket.

Photo: Rae Allen on Flickr

POURED CONCRETE WALLS

Cast-in-place poured concrete walls are aesthetically pleasing and can be engineered to support tall, vertical faces. They must be reinforced by steel and require special design for their foundations and drainage. Consult with a design team including structural and geotechnical engineers.

WOOD RETAINING WALLS

Wood is NOT recommended for retaining walls. Toxic chemicals from creosote and treated wood can leach into the soil. Even treated wood decays over time when in contact with soil. Wood retaining walls do not provide long-term stability.

STRAW WATTLES

Straw wattles combined with hillside plantings that form deep roots can be a less expensive and more natural RainScaping solution to help prevent minor hillside erosion.

Wattles are long, straw-filled tubes that are fastened into the soil across a slope to help trap sediments. Wattles biodegrade, so their success depends on establishing plants at the location of the wattle that will form dense vegetation with strong root structure fairly quickly. Refer to the county's native plants website for plants best suited for hillside planting and for local native plant nurseries.

Jute netting and/or mulch are often laid down in addition to the wattles to further reduce the risk of erosion and to suppress weeds while plantings establish. A list of local sources for wattles, jute matting, and mulch is available at local suppliers of Mulch, Compost and Erosion Control Materials.

✓ Maintenance

At least once a year, conduct a thorough check of your retaining walls to observe their condition. Consult a geotechnical engineer if you see any buckling outward or sagging, or if cracks appear in the ground above the wall. These conditions are serious concerns and are indications of inadequate design or installation.

Short rockeries can be used to create relatively level terraces for plantings

DO

- ✓ Provide adequate drainage behind retaining walls.
- ✓ Use a qualified professional, such as a licensed landscape architect or civil or geotechnical engineer, to design your wall.

DO NOT

- ✕ Install without checking on permit requirements.
- ✕ Use wood for retaining walls.

UNDERGROUND INFILTRATION SYSTEMS

▶ USES: ROOF, WALKWAYS, AND PATIOS

Photo: Millenium Lawn and Landscapes

Photo: Eco Plumber, Portland

There are a variety of underground infiltration systems that you can select from depending on your site conditions.

Underground infiltration systems are drainage systems designed to collect rainwater and allow it to infiltrate into the surrounding soils. As the water **SINKS** into the ground, sediment and other pollutants are filtered to improve water quality.

There is also less runoff volume and subsequent flooding. It also helps to recharge groundwater and provide water to streams during the dry season.

The four types of underground infiltration systems recommended for use in Snohomish County are dry wells, infiltration trenches, dispersion trenches, and perforated stub-out connections. The type that will work best for your property will depend on your soil and groundwater conditions (see next page).

SITE AND DESIGN REQUIREMENTS

Underground infiltration systems should only be undertaken with sufficient planning as they will not work in all locations. A thorough site evaluation is required to determine if your site is suitable. The evaluation must:

- Locate drinking water wells and septic systems on your and neighboring properties
- Locate underground utilities and your property's boundary lines
- Identify property features that require special permits such as geologically hazardous areas, wetlands, and waterbodies (Section 2 | Evaluate Your Site).
- Evaluate the soils including texture, drainage rate, and conditions that make infiltration difficult, such as shallow groundwater, hardpan, or fill material.

Follow the "Installing an Underground Infiltration System – Five Steps" to learn how to evaluate your site and then use the findings to select and design the most appropriate system. You may elect to do the work on your own or to hire an experienced drainage contractor (see sidebar on page 71).

GROUNDWATER PROTECTION

Groundwater is used as drinking water in many parts of Snohomish County. In many of these areas, the seasonal water table is shallow for some or all of the year—making groundwater highly susceptible to contamination. To make sure your infiltration system does not contaminate groundwater, do not direct any rainwater runoff from driveways, parking areas, and yard areas into your underground infiltration system.

The State of Washington regulates some underground infiltration systems known as Underground Injection Control (UIC) wells. Carefully review the information on page 71 to determine if your infiltration system qualifies as a UIC well. If your system qualifies as a UIC well, you must register it with the State of Washington.

UNDERGROUND INFILTRATION SYSTEM OPTIONS

DRY WELL

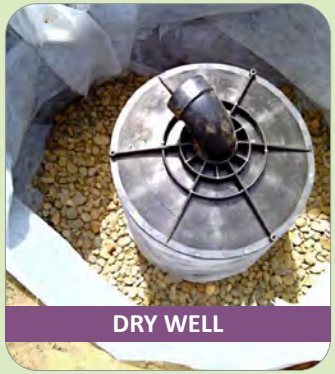


Photo: Eco Plumber, Portland

Water infiltrates through a pit filled with gravel. Capacity can be increased with a proprietary dry well chamber as shown here.

DESCRIPTION
Rock-filled pit that can be exposed at the soil surface or covered with topsoil/lawn.

SIZING
Size requirement depends on site conditions. The size range typically starts at 4 feet by 4 feet and increases in size based upon soil drainage. Larger systems are needed for poorer soils.

SOIL CONSTRAINTS
For well-draining soils only. Cannot have shallow groundwater, hardpan or fill within 1 foot of the well bottom.

INFILTRATION TRENCH

Photo: Millenium Lawn and Landscapes

Water infiltrates into the ground through a gravel-filled trench. A perforated pipe in the middle of the trench helps **SPREAD** the water across the trench.

DESCRIPTION
Rock-filled trench that can be exposed at surface or covered with topsoil/ lawn.

SIZING
Each trench is typically 2 feet wide and 20 to 100 feet long depending on site conditions. Multiple trenches may be needed to infiltrate flows.

SOIL CONSTRAINTS
For well- or moderate-draining soils (moderate requires longer trenches). Cannot have shallow groundwater, hardpan or fill within 1 foot of the trench bottom.

DISPERSION TRENCH

Similar to an infiltration trench, but water can overflow at the surface and **SPREAD** out across your yard.

DESCRIPTION
Rock-filled trench that must have rock exposed at surface for overflow water.

SIZING
Each trench is typically 2 feet wide and 10 to 50 feet long depending on site conditions. Requires 25 feet of adjacent vegetation downslope of the trench to allow overflow to **SPREAD** across the yard.

SOIL CONSTRAINTS
Suited to any soil type.

PERFORATED STUB-OUT

Similar to an infiltration trench, yet allows water to overflow to a ditch or stormwater drain (image shows trench before the addition of topsoil).

DESCRIPTION
Rock-filled trench that must have an overflow (stub-out connection) to a ditch or storm drain. Connection to the county drainage network requires a permit.

SIZING
Trenches are typically 2 feet wide. Length is dependent on the distance to the stub-out connection.

SOIL CONSTRAINTS
Suitable for poor-draining soils or sites with limited available space. Cannot have shallow groundwater within 1 foot of the trench bottom.

Underground infiltration systems that meet one of the following criteria may qualify as a UIC well:

- Consists of a hole that is dug deeper than its length or width, OR
- Contains a perforated pipe or a similar type of structure

Your underground infiltration system is exempt from registration if it is used solely to infiltrate residential roof runoff or water from sump pumps used to control basement flooding.

If registration is required, you will need to design and maintain it per state guidelines. Seek help from a licensed civil engineer with experience in residential drainage design.

✓Maintenance

Regular maintenance is required for an underground infiltration system to function properly and to prevent it from clogging. A properly functioning infiltration system should drain within 72 hours after a storm event. If your infiltration system is partially or completely clogged, promptly troubleshoot your system or consult an experienced drainage contractor or a licensed geotechnical engineer for help to identify the problem and to determine repair requirements.

General guidelines:

- Add features that keep debris out of your system and prolong its life. These include: leaf guards, monitoring ports/cleanouts, and yard drains or catch basins.
- Keep gutters and downspouts clear of debris if the runoff is coming from your roof.
- Clean out yard drains and catch basins at least once a year to remove sediment, leaves, and other debris – especially in the fall and after storms.
- If your system has exposed rock, keep the rock clear of garbage, soil, and plant debris to avoid clogs.

DO

- ✓ Perform a thorough site analysis before building.
- ✓ Determine if any permitting requirements, property setbacks, site limitations, or restrictions apply to your project before you begin.
- ✓ Consider having the infiltration system professionally designed.
- ✓ Perform regular maintenance.

DO NOT

- × Attempt to design and install without a site evaluation.
- × Forget to register your system with the Department of Ecology if it qualifies as an Underground Injection Control (UIC) well.

BEFORE YOU BUILD

To determine if a permit is required for your project, contact Snohomish County Planning and Development Services (PDS) Ask Permit Tech program or call 425-388-3311.

FINDING A PROFESSIONAL

Before you design and install an underground infiltration system, consult a drainage professional – especially for sites with constraints (high seasonal groundwater, poorly draining soils, limited space, etc.). Be sure to specify that your goal is to infiltrate the water on your property. See Section 5 | Resources to learn more about professionals who can assist with your RainScaping project. Specialists include:

- Soil testing: geotechnical engineer, geologist, septic design professional
- Design guidance: licensed civil and geotechnical engineer
- Installation: drainage or earthwork contractor, landscape design professional

Remember, you can always contact Surface Water Management (SWM) for technical advice on drainage issues.

INSTALLING AN UNDERGROUND INFILTRATION SYSTEM – FIVE STEPS

STEP 1 FIND THE RIGHT LOCATION FOR YOUR SYSTEM

Carefully assess your property to find a location where your system will work (see Section 2 | Evaluate Your Site). Be sure that the runoff you wish to infiltrate can flow by gravity to your system.

A **Buildings.** Maintain a distance of 10 feet from building foundations, retaining walls, and edges of an infiltration system

B **Property lines.** Be sure no concentrated water flows off your property.

Source: Adapted from Rain Garden Handbook for Western Washington

C **Edges of steep slopes or bluffs.** Consult a geotechnical engineer if the location is within 50 feet of a slope exceeding a 15 percent grade.

D **Drinking water wells.** Maintain the required 100-foot set back from any drinking water well – yours or your neighbors'.

E **Wetlands, lakes, streams, or marine areas and their buffers.** These are called critical areas; work in or near them requires permits. See Section 2 | Evaluate Your Site.

F **Underground utilities.** Call before you dig! Dial 811 to have all utilities on your property located and marked.

G **Septic tank, drainfield or reserve drainfield areas.** Leave a setback from your or your neighbors' septic systems – 50 feet uphill and 10 feet downhill. Find septic system maps (As-Builts) at www.snohd.org/159.

STEP 2 EVALUATE SOILS FOR ABILITY TO INFILTRATE RAINWATER

Evaluating your soils is key to designing an effective system. Dig a test hole 3 feet deep in your desired location. If you are considering a trench design, dig multiple test holes along the length of the planned area. In each hole, check for conditions that limit infiltration (see below), test your soil drainage rate, and evaluate your soil texture.

CONDITIONS THAT LIMIT INFILTRATION

FILL

As development occurs, fill material is added to level out the ground. Fill includes non-native soils, leftover construction materials, and even garbage. These materials typically have a slower drainage rate than native soils or have limited infiltration because they were compacted by heavy machinery. Check for fill material in your test hole starting at 6 inches deep. Fill can be hard to identify, but look for:

- Garbage and construction debris – plastics, glass, brick fragments, charcoal
- Buried topsoil – a layer of dark brown/black soils buried under other soils
- Loose soil – our native soils are typically dense in comparison to fill

HARDPAN

In our region, you may find a layer of glacial till known as “hardpan” anywhere from inches to several feet below the surface. Hardpan is a dense layer of clay or severely compacted soil which prevents infiltration. It is light gray or blue to tan in color. When digging your test hole, you will know you have reached hardpan if it is nearly impossible to dig.

CONCLUSION: If you encounter any of these conditions, an underground infiltation system may be infeasible. Your options are:

1. Look for a better site on your property.
2. Add an overflow to your system or choose a dispersion trench/perforated stub-out.
3. Consult a geotechnical engineer.
4. Seek an alternative RainScaping solutions such as compost (See Section 3 | Find Your RainScaping Solution).

SHALLOW GROUNDWATER

Shallow groundwater prevents additional water from infiltrating. It occurs in areas close to waterbodies and wetlands or in areas with certain geology types such as dense, compacted soils. It is also seasonal, so it is best to look for it in January through April, when soils tend to be most saturated.

After digging your test hole, observe it for at least a 24-hour period. At the end of that time, if you see standing water in the hole, shallow groundwater is present.

Look at the soils from your hole. If they are blue or blue-gray, orange, or have ‘mottled’ orange or rust-colored splotches/veins, shallow groundwater is likely present during the wet season.

Measure Your Soil Drainage Rate

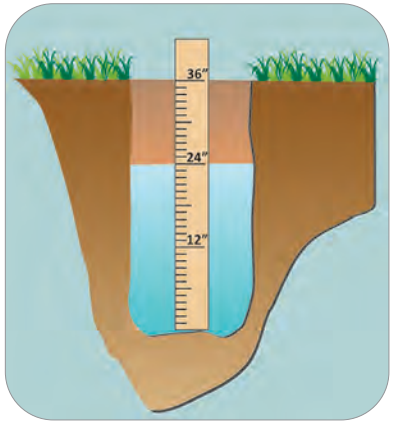
Testing your soil drainage rate lets you know if underground infiltration will work for your property. To obtain the most accurate drainage rate to ensure you design is effective, test your soils in January through April, when they tend to be the wettest). If testing in drier months, you must perform the test three times in succession, with the third test resulting in your final drainage rate.

- In your test hole(s), secure a yardstick or a self-made gauge with markings every half inch from the bottom. Fill the hole with water up to 12 inches from the top.
- After a 12-hour period, record how many inches the water level has dropped. If the water level drops 12 inches in less than 12 hours, you may stop the test at that time and record the water level and time elapsed.

Photo: Erica Guttman

Measure your soil drainage rate to know if underground infiltration will work for your property.

- To calculate your test hole soil drainage rate, divide the number of inches the water fell by the number of hours. Example: If 7 inches of water drains from the hole the drainage rate is: 7 inches divided by 12 hours = 0.6 inch/hour.



Source: Adapted from Rain Garden Handbook for Western Washington

Evaluate Soil Texture

Understanding your soil texture will help determine its drainage potential. Soil texture is determined by the amount of sand, silt, and clay in the soil. Loamy soil contains relatively equal amounts of all three components. The mixture of these components (and the presence/absence of shallow groundwater) determines your soil's drainage potential.

You can perform a simple test for soil texture, outlined below. You may also refer to the Natural Resources Conservation Service's Web Soil Survey online soil atlas. While this atlas is not a replacement for a soil texture test, it offers information on the underlying native and pre-development soils in your area.

To perform the soil texture test, collect soil from your test hole at three depths – 12 inches, 24 inches, and near the bottom. Keep these samples separate and lightly moisten each. For each depth's sample, take a handful, squeeze it gently, and then open your hand.

- If the soil feels very gritty and crumbles immediately, it is high in sand/mineral content. Sandy soils are well-draining.
- If the soil feels somewhat gritty, but holds together in a loose ball, it has a reasonable amount of organic matter in it and is considered a loamy soil. Loamy soils are moderate-draining.
- If the soil feels sticky, smooth and slippery, and forms a tight ball, the soil is high in clay. Clay is rather impermeable and becomes very hard when it dries out. Clay soils are poor-draining.

Photo: Curtis Hinman

Clay soil – feels sticky, smooth, and can be molded.
Sandy soil – feels gritty and crumbles easily.

Interpret Your Results

Using the table provided, the results of your drainage rate test can help determine if the soils on your property will allow water **SINK** in. You can use your soil texture tests from different depths to confirm the infiltration potential of your soils. Use the most poor-draining soil texture gathered from your test hole to determine underground infiltration options.

Make sure your test hole is three feet deep. Soil textures can vary with depth.

INTERPRET YOUR SOIL TEXTURE & DRAINAGE RATE

DRAINAGE RATE	SOIL'S DRAINAGE	SOIL TEXTURE	IS UNDERGROUND INFILTRATION A POSSIBILITY?
>8.0 in./hr.	Well-draining	Coarse sand	Very likely. These soils are typically well-suited to all underground infiltration systems and process larger amounts of runoff. The exceptions are if shallow groundwater or shallow hardpan is present.
2.0 in./hr.	Well-draining	Loamy sand	
1.0 in./hr.	Moderate-draining	Sandy loam	Possibly. Soils may be acceptable for underground infiltration systems if designed correctly. Will require a large dry well or one or more longer infiltration trenches with an overflow for heavy rain events. Proprietary systems with higher storage capacity are also a good option. Alternate options include a dispersion trench or a perforated stub-out.
0.5 in./hr.	Moderate-draining	Loam	
0.25 in./hr.	Moderate-draining	Silty loam	
0.15 in./hr.	Moderate-draining	Sandy clay loam	
0.09 in./hr.	Poor-draining	Silty clay loam	Not likely. Infiltration systems are not likely to work effectively at these low drainage rates. Consult with a licensed geotechnical engineer or geologist to determine if a system will work on your site. Check your property for better soils elsewhere or consider other RainScaping practices. See RainScaping Solutions for Your Soil in Section 2 | Evaluate Your Site.
<0.05 in./hr.	Poor-draining	Clay and/or Hardpan	

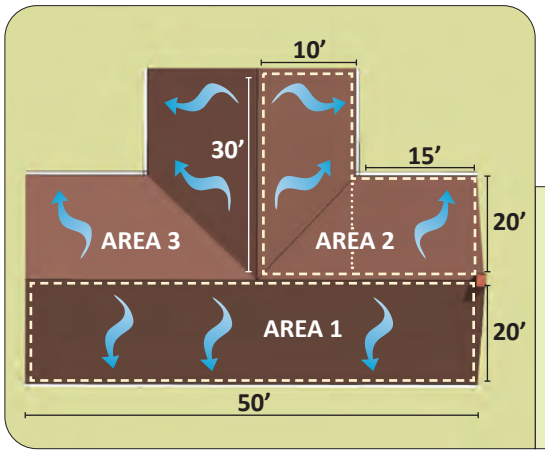
STEP 3 GET THE SIZE RIGHT – MEASURE THE AREA

The size of your infiltration system will depend on how many total square feet of impermeable area will drain to the system. You will need to identify and measure all areas including roofs, patios, and walkways. See below and Section 2 | Evaluate Your Site for guidance on how to calculate your total area.

Sizing Your System

To size your system, calculate the surface area that will drain to your system.

- For patios or walkways, simply take the length of the area times the width.
- To calculate roof areas, do not consider roof slopes. Instead, treat your roof as flat, like a footprint. Measure the length and width of each side of your building including the roof overhangs. Multiply the length times the width to find the area of each surface. For more complex roofs, you will need to break up the roof into smaller sections and then add up the areas.



Roof Example

- Area 1: 50 X 20 = 1000 sq. ft.
- Area 2:
  10 X 30 = 300 sq. ft.
  15 X 20 = 300 sq. ft.
  Total = 600 sq. ft.
- Area 3: Calculate the same as Area 2

STEP 4 DESIGN YOUR INFILTRATION SYSTEM

You now have all of the information you need to select the best system type for your property.

Design guidance is provided for each of the four traditional underground infiltration system options. Washed drain rock is used as the main construction material for each.

- Dry Well (Option 1)
- Infiltration Trench (Option 2)
- Dispersion Trench (Option 3)
- Perforated Stub-out Connection (Option 4)

Following the design guidance is information on how to safely connect and route your rainwater runoff to your system.

You may wish to consider a pre-fabricated system (see sidebar) which will have specific design and installation guidance from the manufacturer.

Photo: Earth, Stone & Water

Photo: Eco Plumber, Portland

Left: Pre-fabricated infiltration trench insert.
Right: Pre-fabricated vertical dry well storage tank.

PRE-FABRICATED SYSTEMS – AN EASY OPTION

Several companies make pre-fabricated inserts for dry wells or infiltration trenches that are viable alternatives to traditional systems. Inserts are lightweight and easy to install, and they have a large rainwater storage capacity. An engineering professional may be able to design a pre-fabricated system for a site with soils that are not suitable for a traditional infiltration system.

Installation: Each manufacturer provides specific instructions for installation and maintenance.

Sizing: Manufacturers offer online calculators to determine the number of units needed and the excavation area required based upon your site’s soil texture, drainage area, and typical rainfall.

Availability: Find pre-fabricated systems at home improvement stores, drainage supply stores, and online (see www.resources.rainscaping.info).

OPTION 1: Dry Well Sizing and Design

Dry wells are rock-filled pits that can be exposed or covered by topsoil and lawn. Their size depends on site conditions, typically starting at four feet by four feet. Larger systems are necessary for soils with moderately and poorly draining soils.

- Calculate the square footage of the area you plan to drain to your system by measuring its dimensions (see example calculations).
- Use the table provided to calculate the volume of drain rock needed based upon your soil's texture and the square footage of the area you plan to drain.
- Dry wells only work in areas with well-draining soils.
- The dry well base must be 1 foot above seasonal high groundwater or hardpan (see Step 6 of Section 2 | Evaluate Your Site).

SOIL TEXTURE	DRAIN ROCK VOLUME *per 1,000 sq. ft. of drainage area*
Coarse sand	60 cubic feet of drain rock
Medium sand	90 cubic feet of drain rock
Silty clay loam, Clay, and Hardpan	Seek infiltration alternatives such as dispersion trenches or a proprietary system

This table is based on the 2019 Stormwater Management Manual for Western Washington.

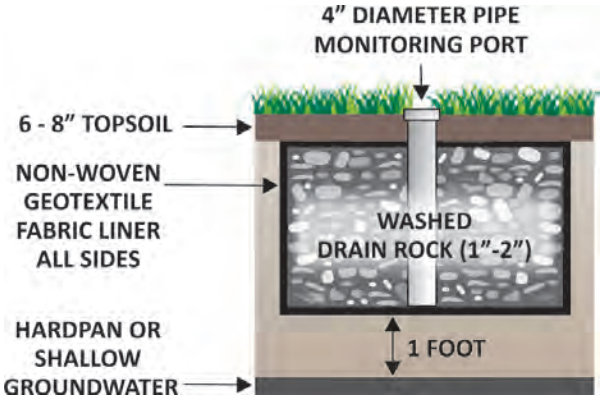
- Dimensions matter: Dry wells that are deeper than they are wide are considered Underground Injection Control (UIC) wells and require registration with the WA State Department of Ecology.
- If calculated dimensions seem large, consider installing multiple smaller dry wells, use a prefabricated system, or opt for an infiltration trench.
- Line the sides of your dry well with non-woven geotextile fabric (filter fabric) and fill with 1-inch to 2-inch washed drain rock. The rock can be left exposed or you can add 6 to 8 inches of topsoil after covering the rock with filter fabric (see images showing two design options).

Example Calculation (Dry Well):

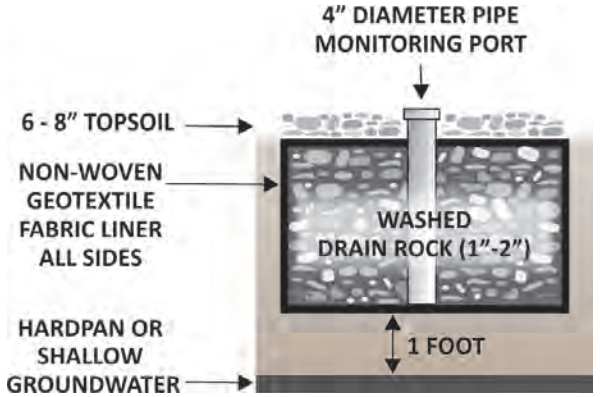
For an example home with 1,150 square feet of area to be drained, medium sandy soil, and hardpan at 4 feet:

1. Divide the number of square feet to be drained by 1,000: 1,150 / 1,000 = 1.15
2. Multiply the result by the volume of drain rock for medium sandy soil: 1.15 X 90 = 103.5 cubic feet
3. Now take the soil depth and subtract 1 foot for hardpan buffer (assumes the dry well will not be covered with 6 to 12 inches of topsoil): 4 - 1 = 3 feet
4. Divide the number of cubic feet of required drain rock by available depth for the drywell surface area: 103.5 / 3 = 34.5 square feet
5. The surface area result determines the dry well's approximate outer dimensions, e.g., 6 feet by 6 feet, 5 feet by 7 feet, 4 feet by 9 feet. If the dimensions are deeper than wide you must obtain a permit from the WA State Department of Ecology for an Underground Injection Control (UIC) well.

DESIGN WITH TOPSOIL & LAWN COVER



DESIGN WITH ROCK COVER



OPTION 2: Infiltration Trench Sizing and Design

Infiltration trenches are rock-filled trenches that can be exposed at the surface of the ground or covered with soil and lawn. Each trench is typically 2 feet wide and 20 to 100 feet long depending on site conditions. Multiple trenches may be needed to infiltrate flows.

Plan and Size:

- Infiltration trenches are typically 2 feet wide. They need to be at least 2 feet deep but should be deeper if you plan to cover them with 6 to 8 inches of soil.
- The trench bottom must be at least one foot above shallow groundwater, hardpan, or fill soils for best infiltration. If these conditions are shallower than a foot below the trench, opt for a dispersion trench.
- Calculate the length of your infiltration trench using the square footage of area you plan to infiltrate and your soil texture using the table provided.

Size your infiltration system using the square footage of the area you plan to infiltrate and your soil texture.

- Individual infiltration trenches should not exceed 100 linear feet in Snohomish County. If you do not have adequate space for a single long trench, link segments less than 100 feet in length or use a pre-fabricated system with higher storage capacity.

Example Calculation:

For an example home with 1,150 square feet of area to be drained and fine sand or loamy sand soils:

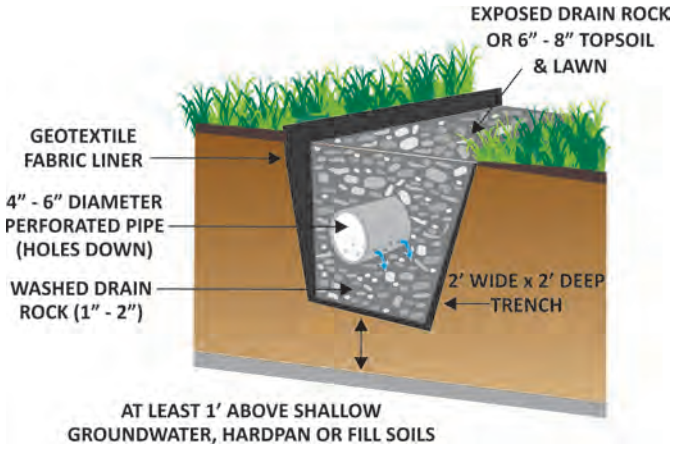
1. Divide the sum total of the surface area to be drained by 1,000: 1,150/1,000 = 1.15
2. Multiply the result by the figure in lineal feet listed for soil texture in the table shown on the right: 1.15 X 75 = 86.25 linear feet

Construct:

- Dig your trench and line the sides with felt-like drainage fabric (non-woven geotextile). As you work, avoid walking on or compacting the bottom of the trench.
- Fill the trench half full with washed drain rock that is uniform in size, typically sold in 1- to 2-inch sizes.
- Lay a 4- or 6-inch diameter, rigid, and perforated PVC pipe near the top of the drain rock with perforations facing downward. Connect pipes using PVC fittings and primer/glue.
- Carefully backfill the trench around the pipe. It is recommended the rock be left exposed to prevent your system from failing. Alternatively, you can cover with drainage fabric and 6-8 inches of topsoil.

SOIL'S DRAINAGE	SOIL TEXTURE	TOTAL TRENCH LENGTH *per 1,000 sq. ft. of drainage area*
Well	Coarse sands/ gravel	20 linear feet
Well	Medium sandy soil	30 linear feet
Well	Fine sand, loamy sand	75 linear feet
Moderate	Sandy loam	125 linear feet
Moderate	Loam	190 linear feet
Poor	All other soils	Not recommended

Source: Stormwater Management Manual for Western Washington



OPTION 3: Dispersion Trench Sizing and Design

Dispersion trenches are rock-filled trenches that must have rock exposed at the ground surface for overflow water. Each trench is typically 2 feet wide and 10 to 50 feet long, depending on site conditions. They require 25 feet of adjacent vegetation to allow overflow to **SPREAD** across the yard

Plan and Size:

- Ensure that there is at least 25 feet of vegetation downslope from your trench to allow overflow water to disperse on your property.
- Trenches should be level (built perpendicular to slopes) and at least 2 feet wide by 18 inches deep.
- The length of your trench is based on the square footage of area draining to it (roof, sidewalk etc.).
  - For areas up to 700 square feet, the trench should be at least 10 feet long by 2 feet wide.
  - For larger areas, calculate the length at a rate of 1 foot of trench per 70 square feet.
- Trenches should not exceed 50 feet in length. If multiple trenches are needed, they must be at least 50 feet apart.
- To evenly **SPREAD** water, you will need to install a notched grade board if your trench is longer than 10 feet in length, is built on uneven ground, or disperses onto moderately sloping ground between 15 and 20 percent grade.

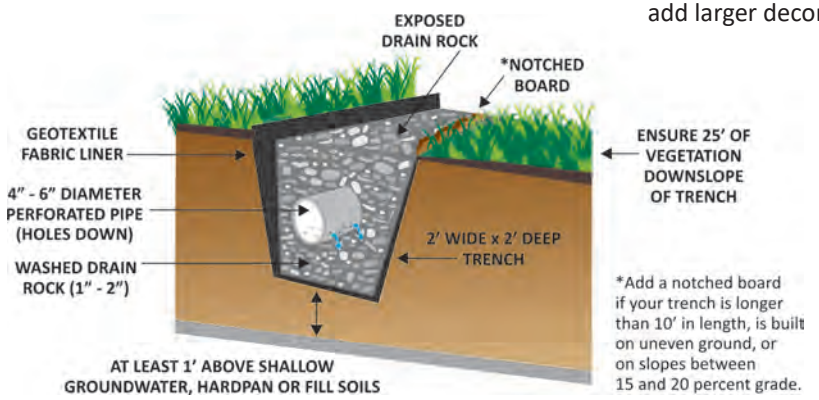
Example Calculation:

For an example home with 1,150 square feet of area to be drained:

1. The first 700 square requires a 10-foot-long trench. Subtract 700 from the total to find the remaining square feet to be drained: 1,150 - 700 = 450
2. There is one foot of trench per 70 square feet needed for the remaining area so divide the remainder by 70: 450/70 = 6.4
3. Add the two lengths together to find the total trench length: 10 + 6.4 = 16.4 feet

Construct:

- Dig your trench, making sure it is level as possible to ensure the water is distributed evenly across the length of the trench. If the trench is not level, use a notched grade board on the downslope side to evenly distribute the flow of water.
- Line the sides of your trench with felt-like drainage fabric (non-woven geotextile). As you work, avoid walking on or compacting the bottom of the trench.
- Fill the trench half-full with washed drain rock that is uniform in size, typically sold in 1- to 2-inch sizes.
- Lay a 4-inch or 6-inch diameter, rigid, and perforated PVC pipe in the middle of the trench with perforations facing down, at a depth where it will be covered by at least 6 inches of drain rock when the trench is filled in. Connect pipes with PVC fittings and primer/glue.
- If your design requires, add a notched grade board. This is a board that is installed flush with the surface of the ground. It should be installed on the downhill-facing edge of the trench. Refer to the Level Spreader RainScaping Solution (Drainage Outlet Protection) for detailed design of notched grade boards.
- Carefully backfill the trench around the pipe, leaving the gravel exposed at the surface. You may add larger decorative rock on the surface if desired.



OPTION 4: Perforated Stub-Out Connection Sizing and Design

Perforated pipe stub-outs (perforated stub-outs) are similar to infiltration and dispersion trenches, but perforated stub-outs include an overflow pipe that directs water to a ditch or storm drain. These systems are intended for soils that provide some infiltration during drier months yet may provide little or no infiltration during the wetter months. They are a good option when site conditions are not suitable for any other underground infiltration system.

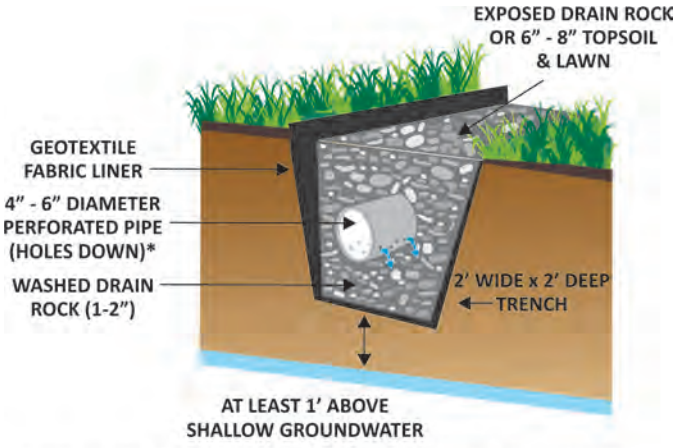
Perforated stub-outs that direct water to any aspect of the county's stormwater system (ditch, storm drain pipe, catch basin, etc.) will require a permit. Contact Snohomish County Planning and Development Services (PDS) prior to construction. Contact Snohomish County Public Works if the work involves the road way, road shoulder, or right-of-way.

Plan and Size:

- Stub-outs are not appropriate where shallow groundwater is less than 1 foot below the trench bottom during any time of the year, including the wet season (October through April).
- Trenches should be level (built perpendicular to slopes) and should be at least 2 feet wide by 18 inches deep. The length of the perforated pipe section should be as long as possible to minimize the amount of water overflowing from the stub-out system.

Construct:

- Dig your trench, then line the sides of the trench with felt-like drainage fabric (non-woven geotextile). As you work, avoid walking on or compacting the bottom of the trench.
- Fill the trench half-full with washed drain rock that is uniform in size, typically sold in 1- to 2-inch sizes.
- Lay a 4-inch or 6-inch diameter rigid and perforated PVC pipe in the middle of the trench, with perforations facing down, at a depth where it will be covered by at least 6 inches of drain rock when the trench is filled in. Connect pipes with PVC fittings and primer/glue.
- Carefully backfill the trench around the pipe. The rock can be left exposed (to allow for overflow) or covered with drainage fabric and 6 to 8 inches of topsoil.
- Use non-perforated pipe for all sections of your stub-out pipe that are routed under hard or heavily compacted surfaces (e.g. driveways and parking areas).
- Connect your stub-out overflow to a stormwater system per your permit.



*Overflow is directed to storm drain or ditch with a "stub-out connection"

Routing Runoff to Your System

To finalize your underground infiltration system design, determine how best to connect the runoff from your roof, patio or walkway. Include features that will help prevent your system from clogging such as:

A Leaf screens: Installing leaf screens in your downspouts will prevent leaves and other debris from clogging up your infiltration system pipes. Options include a downspout strainer inserted into the top of each downspout (see image below) or a self-cleaning leaf filter that is spliced into each downspout and located within easy reach for maintenance.

B Drain Pipe: Connect your downspout to your system using solid PVC pipe, fittings, and primer/glue. To prevent clogging and failure, avoid perforated and/or flexible drain pipe.

C Catch basins/yard drains: Install a catch basin before your infiltration system to trap dirt and debris before it reaches your system and clogs your drain rock. Catch basins are basically a plastic or concrete box that allows dirt and particles to settle out so only water can leave. Screens or downturned elbows are typically also added to the outlet pipe to prevent floatables from entering the infiltration system. The catch basin needs to be regularly cleared of debris to keep it working properly.

D Non-Woven Geotextile Fabric: Line the sides and bottom of your system with felt-like non-woven, geotextile filter fabric, also called drainage fabric, before filling with drain rock. It allows water to pass through while keeping out dirt that can clog pipes and fill voids between rocks. If adding topsoil, be sure to first cover the rock with the drainage fabric.

E Overflow Protection: Dry wells and infiltration trenches should include an overflow feature that directs any overflow runoff to a stable, vegetated area. It is best to leave rock exposed at the surface to provide a natural overflow. The catch basin may also serve as an overflow device. You may also install an overflow in your downspout (see illustration below).

F Access and monitoring ports: Ports make it easier to detect and fix problems by seeing water levels in the system. Ports also serve as cleanouts. A monitoring port is usually a 4-inch capped PVC pipe that comes to the surface. One should be installed in the middle of a dry well. For trench systems, install ports at the end of each trench, every 50 feet along longer trenches, and at elbows or turns.

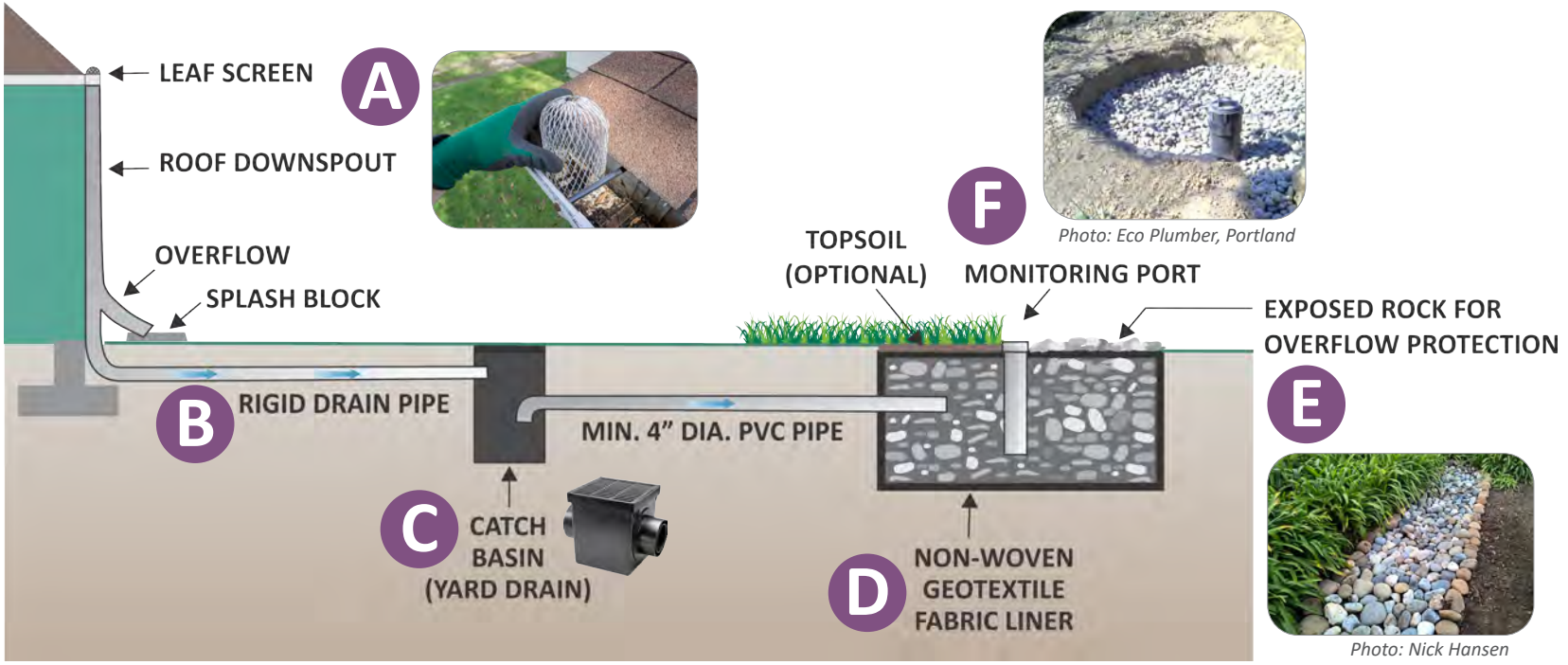


Photo: Eco Plumber, Portland

Photo: Nick Hansen

STEP 5 CONSTRUCTION

Before you begin construction, determine how much material you'll need and gather your supplies. Be sure to include drain pipes and fittings necessary to route the rainwater safely to your new infiltration system. Determine ahead of time what you will do with excavated soil.

Sourcing Your Materials

- **Washed drain rock** – sand, gravel and topsoil suppliers. "Washed" means fine sediments have been removed by the gravel mine. The drain rock should be uniform in size and is typically sold in 1- to 2-inch sizes. Avoid using pea gravel as it can clog your perforated pipe.

Washed drain rock is the best material for underground infiltration systems.

- **Drainage fabric** – landscape supply stores. Look for felt-like, non-woven geotextile fabric. Do not use landscape fabric.
- **Pipes, fittings, yard drains, and proprietary systems** – hardware, home improvement, or drainage supply stores. These stores also carry supplies such as a 4-inch to 6-inch perforated drain pipe, elbows, tees, primer/glue, access ports, and fittings.

Excavating Your System

To prevent soil compaction, avoid excavating when soil is wet. Options for excavating your system include:

- **Use hand tools** – to dig your trench by hand, you will need a shovel or a trenching shovel, and a pick ax or grub hoe.
- **Use power equipment** – to speed the digging process, consider renting appropriate power equipment such as a walk-behind trencher or mini-excavator. Exercise caution and follow all equipment safety guidelines.
- **Hire a professional** – Seek out a drainage contractor or septic system installer for excavation help (see www.resources.rainscaping.info).

Photo: Millenium Landscapes

Excavation can be done by hand or by power equipment such as a walk-behind trencher or mini excavator. Hand-dug trench and gasline (left); machine-dug infiltration trench (right).

Photo: Shawnee Mission Post

Upon request, utility companies will mark the utility locations on your property using colored flags or spray paint.

DIAL 811 – CALL BEFORE YOU DIG!

Be sure to have all your utilities (gas, power, water, communications, etc.) located and marked within all areas where digging will occur and before digging to test for soil and groundwater conditions. In addition to the 811 service that primarily locates utilities in public rights-of-way, utility locate businesses can be hired to locate and mark public and private utilities on your private property. Contact your utility providers directly for more information.
Note: Utility locates expire after 45 days and the property owner is responsible for calling 811 to have utilities re-marked after that.

4 | MAINTAIN YOUR RAINSCAPING SOLUTION

MAINTENANCE FOR RAINSCAPING SOLUTIONS

Regular inspections and maintenance are key to keep RainScaping solutions working. Use the table below to take action and ensure your RainScaping solutions perform as intended. If concerns arise, see "Troubleshooting Problems" guidance later in this section.

RAINSCAPING SOLUTION	MAINTENANCE ACTIVITY	FREQUENCY	TIMING	NOTES (SEE DETAILS IN SECTION 3)
 *Photo: Iron Age Design* **Berms & Trench Drains**	Clear debris	3 to 4 times annually	Rainy season	• Clear debris from outlets, inlets, and uphill side of berms
 **Compost (Amended Soils)**	Lawns: Aerate lawn and top dress with compost	Once every 1 to 3 years	Spring or fall	• After aeration, overseed and top dress with 1/4 to 1/2 inch of compost
	Planting beds: Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds
 *Photo: Valley Conservation* **Drainage Outlet Protection**	Inspect for erosion	Annually, as needed	After major storms	• Refer to Troubleshooting for guidance
	Clear debris	3 to 4 times annually	Rainy season	• Check for blockages and clear debris until water freely flows
	Replace decaying wooden level spreader boards	Every five years or as needed	Dry season	• Ensure the board is level and intact

(chart continues on next page)

RAINSCAPING SOLUTION	MAINTENANCE ACTIVITY	FREQUENCY	TIMING	NOTES (SEE DETAILS IN SECTION 3)
 **Drip-Line Protection**	Maintain vegetation	As needed	Anytime	• Prune 6 inches from siding
	Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds • Keep mulch 6 inches from structural siding
	Replenish rock or ground cover	As needed	Anytime	• Replenish to cover bare soils
 **Gutters & Downspouts**	Clear debris	Annually and as needed	Before major storms	• Clear gutters, screens, and downspouts • Install downspout strainers or gutter guards to reduce maintenance
	Inspect and repair	Annually and as needed	Rainy season	• Repair leaks to avoid structure damage • For standing water, adjust brackets to avoid mosquito breeding
	Prune vegetation	As needed	Anytime	• Trim plants at least 24 inches from gutters
 **Landscaping Naturally Wet Areas**	Maintain Plantings	As needed (essential in first 3 years)	Anytime	• Remove weeds by hand when soil is moist • Water as needed during dry season
	Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds • Keep mulch 2 inches from plant stems
 *Photo: Linda Andrews* **Lawn Alternatives**	Maintain plantings	As needed (essential in first 3 years)	Anytime	• Remove weeds by hand when soil is moist • Water as needed during dry season
	Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds • Keep mulch 2 inches from plant stems

(chart continues on next page)

RAINSCAPING SOLUTION	MAINTENANCE ACTIVITY	FREQUENCY	TIMING	NOTES (SEE DETAILS IN SECTION 3)
 **Mulch**	Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds • Keep mulch 2 inches from plant stems and 6 inches from structural siding
	Inspect slopes for erosion	Annually	Rainy season	• Refer to troubleshooting for guidance
 **Permeable Paving Options**	Clear sediment and debris	Annually and as needed	Dry season	• Sweep leaves regularly; vacuum per pavement manufacturer's recommendation
	Remove weeds from joints between pavers	As needed	Anytime	• Hand pull weeds
	Re-sand joints between modular pavers	Annually and as needed	Dry season	• Sweep fine sand over the blocks to prevent repositioning and settling and reduce weeds
 **Rain Gardens**	Maintain plantings	As needed (essential in first 2 years)	Anytime	• Remove weeds by hand when soil is moist • Water as needed during dry season
	Replenish mulch	Once every 1 to 3 years	Fall, winter, or spring	• Replenish mulch to appropriate depth after weeding to reduce watering and prevent new weeds • Keep mulch 2 inches from plant stems
	Clear inlets and outlets	3 to 4 times annually	Rainy season	• Check for blockages and clear debris until water freely flows

(chart continues on next page)

RAINSCAPING SOLUTION	MAINTENANCE ACTIVITY	FREQUENCY	TIMING	NOTES (SEE DETAILS IN SECTION 3)
  **Rainwater Collection Systems (Cistern & Rain Barrel)**	Clear debris	As needed throughout the rainy season	Rainy season	• Clear mesh, screens and strainers in collection system and gutters/downspouts
	Inspect tank and plumbing	Annually and as needed	Rainy season	• Repair leaks • Replace parts as needed
	Drain and clean tanks	Annually	Late summer	• Rinse out accumulated sediment • Disinfect annually if water is used for edible plants
 **Retaining Walls & Terraces**	Verify drains remain functional	Annually	Rainy season	• Check for blockages and clear debris until water freely flows • Keep outlets clear of debris
	Inspect walls for signs of failure	Annually and as needed	Rainy season	• If the wall is cracked, leaning, bulging, or sagging, contact a geotechnical engineer
 *Photo: Nick Hansen* **Underground Infiltration Systems**	Clear debris	3 to 4 times annually	Rainy season	• Clear debris from gutters, downspouts, and overflow
	Clean out yard drains	Annually	Dry season	• Remove debris • Dispose dried debris in trash
	Maintain vegetation	As needed	Anytime	• Keep plants trimmed back from yard drains and overflows to allow water to flow freely

TROUBLESHOOTING PROBLEMS

When problems occur, intervention is needed. For many RainScaping solutions, you may be able to resolve the issue yourself with guidance offered in the table below. For more complex issues or if the problem does not resolve, seek the services of a qualified professional.

	OBSERVATION	POTENTIAL CAUSES	TROUBLESHOOTING STEPS
PROBLEM: Water			
 Ponding water	**Ponding** near underground pipes	Pipes may be damaged, disconnected, or blocked	• Clear inlets and outlets of debris • Conduct a video camera pipe inspection. Rent a probe from a hardware store or consult a drainage contractor
	Ponding on permeable pavement surfaces	Pavement or paver joints may be clogged	• Clean per manufacturer's recommendations • Avoid chemical treatments to prevent surface damage and polluted runoff
 *Modified Photo: Alpha on Flickr* Overflowing gutters	**Overflowing gutters**	Downspouts may be clogged	• Clear downspouts and outlets of debris
		There may be too few downspouts draining the roof area	• Drain no more than 700 square feet of roof area to a single downspout
		Brackets holding up the gutter may have failed or shifted	• Adjust brackets to gently slope gutters toward downspouts
	Overflowing drains in yards, driveways or parking areas	Pipes or drains may be clogged	• Clear pipes and drains of debris • Conduct a video camera pipe inspection. Rent a probe from a hardware store or consult a drainage contractor
		Infiltration system may be undersized or improperly installed	• Consult a drainage professional (see Section 5 | Resources)
 Flooded foundations, basements, and crawlspaces	**Flooded** foundations, basements, or crawlspaces	Downspouts discharge too closely to house	• Extend the outlet to release water at least 10 feet from house
		Water from downspouts flows toward house	• Redirect outlets so water flows downhill and away from house • If soil around home is not properly sloped, consult an earthwork contractor
		Unknown causes	• Consult a drainage professional (see Section 5 | Resources)

(chart continues on next page)

	OBSERVATION	POTENTIAL CAUSES	TROUBLESHOOTING STEPS
PROBLEM: Vegetation			
 Dead plant	**Dead or dying plants**	Plantings may need deeper and more frequent watering	• Refer to the 'Smart Watering' publication • Consult a WSU Master Gardener for plant diagnosis and care
		Plants may not be suited to site conditions or are experiencing other problems	• Refer to the 'Choosing the Right Plants' publication • Consult a WSU Master Gardener for plant diagnosis and care
 Weeds	**Weed problems**	• Weed seeds readily grow on bare soils and thin mulch • Imported materials may have inadvertently been full of weed seeds	• Thoroughly hand weed • Cover bare soils with sufficient mulch (see Mulch section) • Consult a WSU Master Gardener for plant diagnosis and care
 Moss	**Moss** on permeable pavements	Moss naturally grows in moist, shady areas	• Clean per manufacturer's recommendations • Avoid chemical treatments to prevent surface damage and polluted runoff

(chart continues on next page)

	OBSERVATION	POTENTIAL CAUSES	TROUBLESHOOTING STEPS
PROBLEM: Soil, Sediment & Erosion			
 Soggy soils	**Soils remain soggy** after installing a RainScaping solution	Underlying soils may have been compacted during construction	• Compacted soils are difficult to resolve; to start, roughen the top six inches of soil and then amend with compost (see Amended Soils) • Top dress with wood chip mulch and plant the area (see Landscaping Naturally Wet Areas) • Use permeable paving options for heavy-traffic areas
		Area may not be properly sloped	• Create a gentle slope (1 to 2 percent) to allow water to spread across the area. Ensure that the area slopes away from foundations. • Consult an earthwork contractor
 Sediment	**Sediment consistently builds up** near my RainScaping solution	Bare soils are easily washed away by rainfall	• Protect bare soils from erosion with mulch or plantings, or use alternative erosion control methods. Learn more in Section 2 | Evaluate Your Site (Step 9), Mulch, and straw wattle information in Retaining Walls & Terraces.
 Eroding channels	**Rainwater is eroding channels** in my yard	When water is concentrated into a single path rather than spread across a broad area, it can quickly wash away soils and mulch	• Outlet pipes to the base of slopes where feasible • **SLOW** and **SPREAD** out the flow of water by constructing a rock pad or level spreader (see Drainage Outlet Protection) • Protect bare soils from erosion with mulch or plantings (see Mulch section)
 Slumping	**Slumping or cracking** is observed on or above slopes	Bare and/or saturated soils are easily eroded by rainfall	• Immediately consult with a geotechnical engineer or geologist to determine the cause of the instability and develop a solution

5 | RESOURCES

FINDING A PROFESSIONAL

While many RainScaping solutions can be planned, installed, and maintained by yourself, there are situations that call for a professional. These include projects that are complicated, need special equipment, or require a licensed professional's expertise. Remember to obtain three quotes before hiring a professional to assist with your RainScaping solution.

DESIGN PROFESSIONALS

LANDSCAPE ARCHITECTS
Licensed to evaluate sites to plan and manage yards and gardens for medium- to large-scale projects, and assist with regulations and permits.

LANDSCAPE DESIGNERS
Experienced in evaluating sites to plan and manage yards and gardens for small- to medium-scale projects and may assist with regulations and permits.

SEPTIC DESIGNERS
Licensed to evaluate soils to investigate problems or plan new septic systems, and may assist with regulations and permits.

UTILITY LOCATORS
Certified to investigate and mark the location of underground utilities on private property.

ENGINEERING PROFESSIONALS

CIVIL ENGINEERS
Licensed to plan and design construction projects, including earthwork and structures like retaining walls.

GEOTECHNICAL ENGINEERS
licensed to evaluate sites with critical areas and test soils for planning and design of construction projects like earthwork, underground infiltration systems, and structures like retaining walls.

GEOLOGISTS
Licensed to evaluate and test soils and critical areas for earthwork projects like underground infiltration systems.

WETLAND PROFESSIONALS
Experienced in identifying and marking wetlands, and may assist with regulations and permits.

PLANT PROFESSIONALS

CERTIFIED ARBORISTS
Certified in the science of tree care, pruning, maintenance, and removal of trees.

CERTIFIED PROFESSIONAL HORTICULTURALISTS (CPH)
Certified to assist with plant selection, identification, challenges, and maintenance.

ecoPRO CERTIFIED LANDSCAPE PROFESSIONALS
Certified in their demonstration of knowledge and commitment to sustainable landscape practices.

LANDSCAPE ARCHITECTS
Licensed to assist with plant selection for site conditions.

LANDSCAPE DESIGNERS
Experienced with plant selection for site conditions.

CONTRACTORS

DRAINAGE CONTRACTORS
Experienced in installation of underground pipes, unclogging existing pipes, waterproofing foundations, and repairing yard drains.

EARTHWORK CONTRACTORS
Experienced in moving or adding soil and/or amendments to your yard, and installing retaining walls and infiltration systems.

LANDSCAPERS
Experienced in planting and maintenance of yard and garden areas. Some may offer planning services, and/or minor earthwork services for small projects.

SPECIALTY CONTRACTORS
Range in expertise from gutter installation/repair, retaining wall construction, hardscape paving, demolition, and more.

FINDING A PROFESSIONAL (CONT.)

Use this table to find the right type of professional to assist, if needed, with your RainScaping project.

■ - Has expertise in this area
☐ - May be able to assist

		DESIGN PROFESSIONALS				ENGINEERING PROFESSIONALS				PLANT PROFESSIONALS			CONTRACTORS			
		Landscape Architect	Landscape Designer	Septic Designer	Utility Location	Civil Engineer	Geologist	Geotechnical Engineer	Wetland Professional	CPH Horticulturalist	Certified Arborist	ecoPRO Certified	Drainage	Earthwork	Landscaping	Specialty
Site Evaluation	Site evaluation assistance	■	☐	■	☐	■	☐	☐	☐	☐	☐	■	☐	☐		☐
	Critical area evaluation	■					■	■	■		☐					
	Foundation flooding	☐	☐					■					■			
	Underground pipes	☐	☐		■	■		■					■			
Soil Erosion & Health	Erosion troubleshooting	■	☐			■	■	■					☐	☐	☐	
	Erosion repair	■	☐									☐	■	■	■	
	Amendment and/or restoration	☐	☐				☐	☐		☐	☐	☐		☐	■	
Permeable Pavement	Permeable pavement design	■	☐			■		☐								■
	Permeable pavement installation		☐									☐			☐	■
Plants	Plant planning	■	■							■	■	■			☐	
	Plant care & maintenance		☐							■	■	■			☐	
	Plant troubleshooting	☐	☐							■	■	■			☐	
Rain Gardens	Rain garden planning & installation	■	☐			■				☐		☐			☐	☐
Rainwater Collection	Cistern/barrel planning & installation	☐	☐									☐	☐			☐
Retaining Walls & Terraces	Retaining wall planning & design	■	☐			■		■						☐	☐	☐
	Retaining wall installation	■	☐									☐		■	☐	■
	Retaining wall troubleshooting	■					☐	■								
Underground Infiltration & Drainage	Infiltration design	☐		☐		■	■	■								
	Infiltration troubleshooting				☐		■	■					☐			
	Drainage design	■	☐	☐		■		■					■			
	Drainage installation		☐									☐	■	■	☐	

For technical advice, you can always contact Snohomish County Surface Water Management: 425-388-3464, surfacewater@snoco.org
County staff can offer technical assistance to help understand what type of service provider may be needed, but cannot provide referrals.

To learn more, visit www.RainScaping.info or scan the QR code below.

Translations, interpretations, and ADA accommodations are available upon request. Call 425-388-3464. (TTY: 711)

Se encuentran disponibles traducciones, interpretaciones y adaptaciones de conformidad con la ADA a pedido. 425-388-3464. (TTY: 711) (Spanish)

Bản dịch, dịch vụ thông dịch và hình thức điều chỉnh ADA được cung cấp theo yêu cầu. 425-388-3464. (TTY: 711) (Vietnamese)

可根据要求提供翻译、口译和ADA 适应服务。425-388-3464. (TTY: 711) (Chinese Simplified)

可按要求提供翻譯、口譯和ADA 輔助服務。425-388-3464. (TTY: 711) (Chinese Traditional)

Услуги письменного и устного перевода, а также разумные условия в рамках ADA предоставляются по заявкам. 425-388-3464. (TTY: 711) (Russian)

요청 시, 통번역 서비스 및 ADA 지원을 받을 수 있습니다. 전화번호: 425-388-3464. (TTY: 711) (Korean)

Available ang mga pagsasalin, interpretasyon, at pagsasaalang-alang batay sa ADA kapag hiniling. 425-388-3464. (TTY: 711) (Tagalog)

ការបកប្រែភាសា ការបកប្រែភាសាផ្ទាល់មាត់ និងកន្លែងស្នាក់នៅដែនពិការអ្នកមានចំហប ADA អាចរកបានតាមការស្នើសុំតាមទូរស័ព្ទលេខ 425-388-3464. (TTY: 711) (Cambodian-Khmer)