Soil & Mulch:
The foundation of a healthy yard

Healthy soil holds plants in place, provides nutrients, and holds water and oxygen plants need.

Healthy soil is the foundation of a healthy lawn and garden and is key to long-term plant health. Soil anchors plants in place, provides nutrients, and holds water and oxygen plants need. Many plant problems are due to poor soil conditions. Improving soil health helps plants thrive and can reduce maintenance and amounts of water and chemicals used. Healthy soil also absorbs rainwater better, reducing runoff and protecting the water quality in area streams, lakes, and Puget Sound. Understanding your soil is the first step to improving soil health.

There's more to soil than just dirt

Soil contains:

Minerals

Soil is the product of the forces of weathering (such as wind and water), living organisms (including plants, animals, and soil microorganisms), and topography over time on underlying rocks and minerals.

Organic matter

Any material originating from a living organism, like the remains of plants and other organisms, organic matter provides nutrient stores for plants.

Air and water

In healthy soil, air and water should make up about half the soil volume. They are essential for oxygen exchange with plant roots and transporting nutrients to plants.

Living organisms, such as insects, earthworms and microscopic life

There are about 1 billion organisms in 1 gram of topsoil. These organisms help keep soil healthy by breaking down organic matter. This process releases energy, nutrients, and carbon dioxide, creating food for living plants.

Understanding your soil

Soil acts like a sponge with big air spaces (macropores) that allow water to infiltrate and small air spaces (micropores) that help provide water holding capacity. A soil's ability to drain and hold water depends on the number of micropores and macropores. Macropores include earthworm and root channels and allow water to drain and provide oxygen to plant roots and organisms. Micropores are very small and capable of holding water against the force of gravity, much like a sponge. Some of the water held in micropores is available to plants. Soil that has a balance of macropores and micropores provides both drainage and water-holding capacity for good plant growth.

Protect your soil's health

- Some pesticides can negatively affect soil microorganisms and earthworms. Pesticides should only be used as a last resort.
- Don't overfertilize. Only use appropriate amounts of fertilizer to meet plant needs (see *Natural Lawn Care* brochure).
- Don't overwater. Overwatering can contribute to plant disease and too much water in the soil can displace air spaces from roots (see *Watering* brochure).
- Prevent soil compaction by controlling foot traffic and keeping heavy equipment off landscapes. Minimize the use of rototillers which till to the same depth repeatedly- this can create a compacted layer below the tilled soil. Also, avoid tilling when soil is too wet; if soil crumbles when you try to mold it, it is dry enough to till.

Soil texture

There are three general "textures" to soil determined by the size of the soil particles.

Sandy soils contain large particles that are visible to the naked eye. Sandy soils are loose and drain easily but do not store water or nutrients very well for plants.

Clay soils are made up of tiny particles that feel sticky when wet, and dry into dense chunks or fine powder. They hold nutrients and water well, but drain poorly.

Loamy soils include a mix of sand, silt, clay and organic matter. Loamy soils are generally loose and well-drained but able to store moisture and nutrients.

To evaluate your soil texture, rub a moist handful of soil between your fingers. If it is rough, gritty and breaks up easily, it is sandy. If it feels sticky, slippery and slightly like plastic, it is clay. If it can make a solid lump that doesn't crumble, it is clay. If it won't form a lump but crumbles, it is sandy. If it is somewhere in between, it is loamy.

Soil structure: how solid is your soil?

Soil structure refers to how small soil particles bind together to form larger ones. Soil can be compacted, well-structured with plenty of pores, or somewhere in between. Good soil structure is important for adequate oxygen availability and water movement in the soil.

Organic matter

Adding organic matter, such as compost, is one good way to improve the environment for plants in nearly all soils. Organic matter builds and stabilizes soil structure, thus reducing erosion and improving soil. It holds water and nutrients for plants and soil organisms. It also is a long-term source of nutrients as micro-organisms break it down to release nutrients. Productive soil consists of a dynamic community of organisms (fungi, bacteria, earthworms, and others) which ultimately depend on organic matter as a food source.

Soil nutrients

Soil supplies 13 essential plant nutrients. Each nutrient plays one or more specific roles in plants. Plants also require carbon, hydrogen, and oxygen, which they get from water and air. A soil nutrient is classified as a primary nutrient, secondary nutrient, or micronutrient, based on the relative amount needed by plants. If a soil's nutrient supply is deficient, fertilizers can provide the additional nutrients needed for healthy plant growth. Soil organic matter increases a soil's ability to hold nutrients and make them available for use by plants.

Fertilizing and amending soil supplies plants with essential nutrients needed for growth. Fertilizing should be based on observed plant needs and soil tests. Before fertilizing, learn about the levels of nutrients already present in your soil. Obtain a soil test from a soil-testing lab every three years to monitor nutrient levels, pH, and organic matter content. A soil test may not include nitrogen levels because nitrogen in soil is very changeable over short periods of time (see *Natural Lawn Care* brochure).

Taking a soil core helps you understand your soil.

Amending your soil

One way to improve the soil on your site is to incorporate compost or other organic material throughout the entire planting area before planting.

"Compost" is the dark, earthy material produced by decaying plants and animal wastes. It contains organic matter and microorganisms which help create soil structure, and allow soil to retain nutrients and water while being well-drained. Some other amendments containing organic matter are listed below. In native soils with adequate organic matter, addition of organic matter in the form of compost is not necessary. However if organic matter has been lost, which is typical in urban and disturbed soils, an organic matter amendment can provide benefits.

Mix in organic matter before planting:

Lawns

Screened particles should be less than half an inch. Apply 10% to 20% by volume tilled down to 6 inches. You can also incorporate additional nutrients indicated by a soil test at that time. Less compost may be needed if a soil test indicates adequate organic matter. Be aware that using high rates of organic matter may result in soil settling as the organic matter decomposes over time.

Vegetable and ornamental beds

Before planting, use a shovel or digging fork to mix amendments into the top 8 to 12 inches of soil. Thoroughly mix organic matter into the entire bed (not just the planting holes). Mix in 10% to 20% organic amendment by volume (1 inch of compost mixed into 10 inches of soil is 10%; 1 inch of compost mixed into 5 inches of soil is 20%). Within this range, larger quantities can be used with lighter sandy soils; smaller quantities should be used with heavier clay soils. Annual beds can be amended on a yearly basis.

Trees & shrubs

Amending only the planting hole will make the hole act like a big pot, so roots will not easily grow out into the surrounding soil. Plant into native soil and dig the hole only as deep as the rootball, but several times wider. Loosen the top 12 inches of soil around the hole to increase aeration. Mix in 10% to 20% organic amendment by volume. Less may be needed if a soil test indicates adequate organic matter.

Topdressing

Compost can be applied as topdressing to established lawns (one quarter inch per application), perennial beds, trees and shrubs (1 inch per year) and annual beds (1 to 2 inches per year).

Best choices for soil amendments include:

Compost made from yard debris can be purchased or made by home composting yard trimmings. Pier

Biosolids are made from a blend of wastewater biosolids and other weed-free materials.

Fresh or composted leaves are a good source of potassium. Fresh leaves decompose quickly.

Manures or manure composts. Fresh manures are very high in nitrogen and can burn plant roots if not diluted enough. Manure composts are more stable.

Coconut coir is a renewable product from coconut palms that improves moisture and nutrient storage in sandy soils.

Topsoil mixes are good for raised beds, but obtain mixes that do not contain poor fill soil or weed seeds.

How do I know good compost?

Poor compost can make nutrients unavailable and introduce weed seeds.

Signs of good compost are:

- a sweet, earthy smell;
- dark brown or black color;
- fibrous, consistent texture and moisture content;
- it is well-mixed and easy to spread;
- lack of weed sprouts or other growths.

Mulch

Mulch is a protective layer of material such as wood or bark chips, grass clippings, or compost placed on the soil surface. Mulching is one of the easiest and most beneficial practices you can use in your garden. Mulches reduce evaporation, limit weed growth, limit soil erosion, and reduce temperature changes in soil. Organic mulches also improve soil as organisms break them down and mix them into the soil.

What to use

Wood or bark chips

Coarse, woody materials such as bark mulch and wood chips are good for weed control in landscape beds and do not break down as quickly. If wood chips or shavings come from lumber, be sure that the lumber has not been treated. Do not mix woody mulches into soil because they bind up nitrogen. Woody mulches can be spread 2 to 4 inches deep.

Compost

Compost mulches enrich soil but may not control weeds very well. However, spreading compost over beds in the fall will help smother winter and annual weeds. Compost used as mulch can be spread up to 3 inches deep.

Leaves

Deciduous leaves can be collected in the fall, shredded with a lawnmower or shredder, composted over the winter before applying to plant beds, or applied immediately. Evergreen leaves take longer to decompose and are better suited for pathways. Shredded or composted leaved can be spread up to 3 inches deep.

When… Apply annually or as needed.

Mulch in spring to conserve soil moisture and deter weed seeds from sprouting. Wait until soil has warmed from winter but soil moisture has not evaporated.

Mulch in fall to curb soil erosion, deter weeds, and retain soil warmth.

Where… Mulch annual and perennial planting beds and container plants

Mulch tree and shrub beds out to the plant's drip line or cover the entire planting bed. Make mulch rings at least 3 feet around trees in lawns.

How… Remove weeds and grass, and water the soil before spreading mulches.

Leave about an inch of space between mulch and plants.

Use 1 to 3 inches of mulch around shallow-rooted plants, soft-stemmed perennials, and annuals.

Three inches of harder, woody mulch can be used around other shrubs and trees. Up to 8 inches of mulch can be used for large trees.

Resources:

Improving Garden Soils with Organic Matter, Publication EC 1561, Oregon State University Extension Service, May 2003
Home Gardeners Guide to Soils and Fertilizers, Publication EB 1971, Washington State University Extension Service, January 2005

Washington State University-Skagit Co. Extension: **skagit.wsu.edu** or **gardening.wsu.edu**
Washington State University-Puyallup Research & Extension Center soils program: **puyallup.wsu.edu/soilmgmt**
Tacoma-Pierce County Health Department: **tpchd.org/NaturalYardCare**
Skagit County Public Works Solid Waste Division: **skagitcounty.net/publicworks** (Solid Waste Division)
Soils for Salmon: **soilsforsalmon.org**

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