



Managing soils in short-season, high-altitude zones

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YOU ARE A SHORT-SEASON, HIGH-ALTITUDE GARDENER IF:

- You live in Idaho at an elevation above 4,500 feet, **OR**
- Your USDA hardiness zone is 4 or lower, **OR**
- You have a frost-free growing season of 110 days or less

INTRODUCTION

Soils are a potentially limiting factor for gardening in cool-season climates. It is helpful to understand the implications of harsh climates and poor soils on plant care and landscape design if you are to successfully create beautiful and productive gardens.

Climate and geology directly influence the types of soils that are present within your yard. Soils among Idaho’s short-season, high-altitude regions are extremely variable, making management decisions difficult and complex. If you understand the general nature of Idaho’s major soil groups, however, the recommendations can be simplified.

The high desert areas of the Snake River Plain usually have silty or sandy loam soils with very high pH (alkaline). These soils are also common in some of the drier valleys of the central mountains. These soils are naturally infertile and have a relatively shallow topsoil layer.

Broad mountain valleys often have clay loam or clay soils that are high in organic matter and have neutral or slightly low pH (slightly acidic). These are some of the deepest and most fertile soils in Idaho.

Narrow mountain valleys and slopes tend to have gritty, stony soils interspersed with clay pockets and a slightly alkaline or near neutral pH. These soils have an almost nonexistent topsoil layer and are very shallow, infertile, and among the most difficult of Idaho’s soils to manage.



High desert. House and yard west of Rexburg in a native high desert setting with plenty of sagebrush.

HIGH DESERT SOILS

Nutrient management is the biggest issue when working with infertile, alkaline desert soils. They usually need routine applications of fertilizers containing nitrogen, phosphorus, and micronutrients to maintain healthy plant growth. These soils are also naturally low in organic matter, and you can solve many of their inherent problems by consistently and routinely applying liberal amounts of composts, manures, and other plant residues. If your soils are high in salts, as some desert soils are, be sure to use composts rather than manures to avoid adding more salts.

Another serious problem you are likely to have with high-desert soils concerns the high pH. Most traditional landscape and garden plants are native to higher rainfall regions that have strongly acid soils. These plants struggle to extract nutrients, especially iron, zinc, and manganese, from alkaline desert soils, even when soil levels of these nutrients are adequate. The end result is that many perennials, shrubs, and trees develop leaf-yellowing symptoms we refer to as iron chlorosis. In severe cases, the plants may actually die.

This problem cannot be solved with applications of fertilizer to the soil, even fertilizers that specifically contain iron and zinc. The best approach is avoidance—through selection of plants that are adapted to these difficult soils. Plant materials available for your use in the high deserts are limited, but the alternative is unhealthy plants and constant frustration.

Managing desert soils includes maintaining adequate soil moisture. Dry summers require that you irrigate frequently. Luckily, the predominant loamy desert soils take up water easily and make it readily available to plants. There are exceptions. Sandy soils in particular require more frequent irrigations with very small amounts of water.



High desert soil. High desert silt loam soil, common in the upper Snake River Valley, is typically shallow, high in pH, and infertile.

DEEP, FERTILE, VALLEY SOILS

If you consider plant nutrition, the dark-colored, broad-mountain-valley soils are the easiest to manage of all the soils found within Idaho's short-season regions. They naturally provide high levels of fertility and require minimal amounts of nitrogen- and phosphorus-containing fertilizers. It is less critical that you amend these soils with organic matter because they are naturally high in humus. On the other hand, you can use additions of composts and fertilizers to take the place of synthetic fertilizers and improve soil texture.

Fertile mountain valley soils tend to be high in clay. They have the ability to hold large amounts of water and provide it to plants. This, combined with the summer precipitation that may fall at higher elevations, means your need for irrigation is less than in desert climates. It is usually adequate to irrigate three to six times each summer.

Although these soils hold large amounts of water, they can still be somewhat difficult to irrigate because they are fairly impermeable. The practical result is that most types of sprinklers put water on the ground faster than it can sink in, a problem made worse if your property has some slope. A practical solution is to adopt "pulse irrigation" techniques. Run sprinklers for a few minutes at a time, with a longer rest period in-between to allow water to soak into the ground.

The heavy nature of these soils creates other problems. Particularly, it is critical that you avoid compaction, a direct result of walking on, driving on, or working clay soils when they are too wet. Compaction reduces water absorption, making infiltration even more problematic, and also prevents oxygen from getting to the roots. You will need to practice patience with these soils and not till or drive on them in the spring until they adequately dry.



Broad mountain valley. House and yard in the broad mountain valley of the Teton Basin near Driggs with high mountains in the background.

STONY MOUNTAIN SOILS

Soils common to the high mountains and narrow valleys of central and eastern Idaho are shallow, have little or no topsoil, and hold limited amounts of nutrients and water. In some locations, these gritty soils are interspersed with pockets of heavy clay that are almost impermeable to water.

These soils are difficult to till and almost equally hard to amend. Plants that naturally thrive in these soils are usually native to the area and actually prefer these conditions. You will have difficulty growing most vegetables and traditional annuals, perennials, and shrubs, which need deep, rich soil. Trees fall somewhere between native plants and traditional herbaceous plants, meaning they can grow in stony soils if you are willing to supply proper amounts of fertilizer and water.

Developing property with stony soils means you face a difficult decision—whether to adopt the use of native plants in your landscape or to apply the extreme measures needed to develop a soil suitable for a traditional landscape. Adopting native plants is the simplest and least expensive method for dealing with stony, mountain soils. You can also find great satisfaction in creating beauty that is in harmony with nearby uncultivated lands. However, even most native plants will benefit from several inches of added compost or good topsoil.

If you choose to adopt a traditional “lawn and tree” landscape design, it will be necessary to expend considerable time and money to amend the soil. You can accomplish this in one of two ways. The first is to remove nuisance boulders then simply haul in topsoil (possibly mixed 50:50 with compost) and apply an 8- to 12-inch layer over the native soil. Flower and vegetable beds may need more topsoil, as much as 14 inches.



Broad mountain valley soil. Broad mountain-valley clay loam soil, common around Ashton and Driggs, is typically deep, near neutral in pH, and highly fertile.



Narrow mountain valley. House and yard in a narrow mountain valley near Ashton.



Narrow mountain valley soil. Stony soil common to Idaho's mountain slopes and narrow valleys is typically very shallow, acidic, and infertile.

If you choose to add topsoil, carefully control the source. It does little good to apply poor quality soil on top of rocks. Ideally, the soil you choose should have a near neutral pH, a loam or sandy loam texture, and a high level of organic matter.

The second way to amend your soil is to remove stones large enough to disrupt tillage, add a layer of imported topsoil and compost, and till the mixture into the native soil. This technique lets you get by with adding less material than if you completely replace the soil, but it still requires 4 to 6 inches of amendments. Regardless of which method you choose, aggressive soil amendment will result in suitable soil conditions for most traditional garden plants. Your challenge then becomes coping with climate and weather limitations that are common to high-altitude, short-season environments.

High-elevation property with pockets of heavy clay soil may require special treatment. Like fertile mountain valley soils, these clay soils inhibit water penetration and compact easily when wet. However, because these clay pockets can be very low in organic matter, they can be even harder to manage.

You should amend these soils with organic matter, where feasible. Even amended, these soils will have low water permeability and likely will require the use of pulse irrigation techniques (a few minutes on, a few hours off) to prevent runoff.

These soils can also create problems for newly planted trees and shrubs when a planting hole becomes an impermeable well that traps water around the roots. You can relieve this problem by (1) digging the planting hole, (2) drilling several small shaft holes in the bottom that penetrate completely through the clay layer and into the rocky soil below, (3) filling the bore holes with gravel or organic matter, and (4) planting. This will permit water drainage and keep the roots of the new plants healthy.

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