

# TOPSOIL QUALITY GUIDELINES FOR LANDSCAPING

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May 1997

AG/SO-02

## INTRODUCTION

Quality topsoil is the basis for quality landscapes. The growth rate, health and visual appearance of landscape plants are directly related to soil quality. Quality topsoil is also a limited resource. As urban development continues, locating quality topsoil becomes more difficult and the price increases. Availability and price may also mean that marginal topsoils are used in certain landscapes. This publication describes guidelines for topsoil and provides suggestions for homeowners, landscapers, and architects on acquiring quality topsoil.

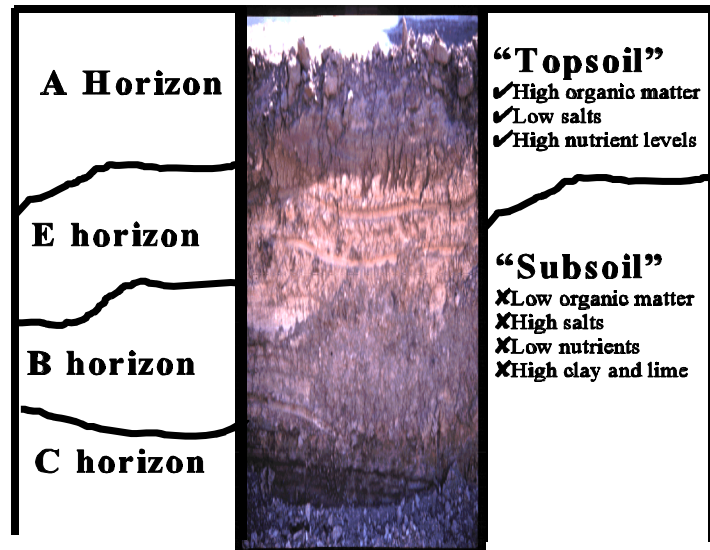
## WHAT IS TOPSOIL?

Soil is differentiated into layers called *horizons* (Photo 1). The surface layer—the A horizon—is usually darker than the subsurface layers—the E, B and C horizons. Organic matter gives the A horizon its characteristic dark color while enhancing desirable physical properties such as tilth (ease of tillage), structure, water infiltration, and water holding capacity. Topsoil is defined as the A horizon *only*, while the E, B and C horizons compose the subsoil. Subsoil horizons have higher levels of clay, salt and lime than topsoil. These properties make subsoils poor quality substitutes for true topsoils.

In Utah, A horizons commonly range from 2 to 10 inches thick. Many topsoil suppliers, particularly those that have topsoil “pits,” do not sell true topsoil but rather subsoil materials. The true topsoil was removed from the surface of the pit on the first sale, and the remaining material is subsoil being sold as topsoil. Subsoils may be acceptable topsoils if they meet the guidelines described in this publication.

## TOPSOIL QUALITY GUIDELINES

Four main chemical and physical properties influence topsoil quality: soluble salts, pH, texture, and organic matter. The sodium adsorption ratio (SAR) is an additional property to consider if salinity and/or soil pH approach unacceptable levels. It is imperative that topsoil meet specific standards for these properties. If soil falls outside of acceptable ranges for any one of the properties, reject the material or realize the need to spend considerable time and money improving soil conditions before plants will thrive. The old cliché “an ounce of prevention is worth a pound of cure” applies to acquiring quality topsoil.



*Photo 1. Weber County, Utah, soil profile with horizon and topsoil-subsoil designations.*

Make a concerted effort to acquire high quality soil, even if it costs more initially. It will be less expensive in the long term than treating recurring problems and having to replace landscape plants that fail due to poor soil conditions.

Soils with the 'Ideal' classification for all of the properties described in this guide have virtually no limitations for growing common landscape plants. Soils with the 'Acceptable' classification may require selection of plants which are tolerant of those conditions (e.g., high pH), or modification to improve soil conditions. 'Unacceptable' class soils require major improvements before most landscape plants will survive.

**Soluble salts.** High levels of soluble salts (Photo 2) make it difficult for plants to absorb water, and can have direct toxic effects on many landscape plants. Electrical conductivity of the soil solution ( $EC_e$ ) is the measurement for soluble salts. Soluble salts are removed (leached) relatively easily by applying excess, low salt water to a well drained soil. Leaching must be done before seeding or transplanting as plants are most sensitive to salts at these stages.

**Guidelines for soluble salts ( $EC_e$ ) in soil:**

- Ideal: less than 2 dS/m or mmho/cm
- Acceptable: less than 4 dS/m or mmho/cm
- Unacceptable: greater than 4 dS/m or mmho/cm

Only plants with moderate salinity tolerance grow well in soils with an  $EC_e$  near 4 dS/m. See the related Utah State University Extension Bulletins "Salinity and Plant Tolerance" and "Selection and Planting of Landscape Trees" for more information about salinity tolerance.



**Photo 2. Salt crystals on the soil surface. This soil has an  $EC_e$  of 4.4 dS/m.**

**pH.** PH is an indication of the acidity or alkalinity (basic nature) of soil. Soil pH must be measured with a pH electrode to obtain an accurate value. Paper test strips will not accurately measure soil pH. A pH of 7.0 is neutral, while values below 7.0 are acidic and values above 7.0 are alkaline or basic.

**Guidelines for soil pH:**

- Ideal: between 5.5 and 7.5
- Acceptable: between 5.0 and 8.2
- Unacceptable: below 5.0 or above 8.2

Most plants do well at the range of pH's listed as acceptable; however, some acid-loving plants will not grow well at pH's above 7.0. Examples of these include blueberries, raspberries and azaleas. Other sensitive plants are susceptible to iron deficiency at soil pH's of 7.8 or above (photo 3). See the related Utah State University Extension Electronic Publication "Control of Iron Chlorosis in Ornamental and Crop Plants" and "Selection and Planting of Landscape Trees" for more information about pH tolerance and controlling iron chlorosis. It is extremely difficult to change soil pH. Select soil with the appropriate pH for the desired vegetation. Most soils in Utah have pH's in the mid-7.0 to low 8.0 range.



**Photo 3. The effect of high soil pH on iron deficiency in maple (photo courtesy of Larry Rupp).**

**Texture.** Texture refers to the proportion (%) of sand-, silt-, and clay-sized particles in soil. The percentages by weight of sand, silt and clay are used with a texture triangle in assigning soils to a specific texture class (e.g., silt loam). Texture influences the water-holding capacity, aeration (gas exchange),

drainage, tilth, compaction and nutrient retention properties of soil. A mixture of sand, silt, and clay is desirable. Soils are unacceptable if they are dominated by one particle size.

**Guidelines for sand, silt and clay content of soil:**

Acceptable if soil is: less than 30% clay, and  
less than 70% sand, and  
less than 70% silt

**Guidelines for soil texture class:**

Ideal: loam (L)  
silt loam (SiL) (less than 70% silt)  
Acceptable: sandy clay loam (SCL) (less than 70% sand, less than 30% clay)  
sandy loam (SL) (less than 70% sand)  
clay loam (CL) and silty clay loam (SiCL) (less than 30% clay)  
Unacceptable: clay (C), sandy clay (SC)  
silty clay (SiC), silt (Si)  
sand (S), loamy sand (LS)

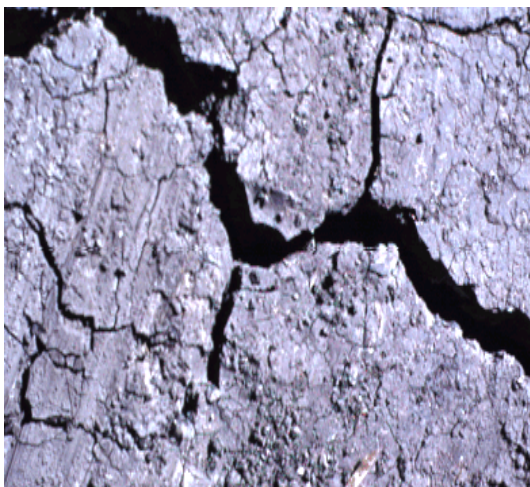
It is not feasible to change soil texture on a large scale. Excessively large amounts of sand, silt or clay are required to change soil texture. Large quantities of organic matter can improve the physical characteristics of soil dominated by one particle size (Photo 4).

**Organic matter.** Organic matter is essential in the formation of soil structure (Photo 4), reducing soil compaction and retaining essential plant nutrients. Generally, the higher the level of organic matter, the better the soil quality. In Utah, native soil organic matter levels are low, often less than 1 percent by weight.

**Guidelines for organic matter content (% by weight):**

Ideal: greater than or equal to 2 percent  
Acceptable: greater than or equal to 0.5 percent  
Unacceptable: less than 0.5 percent

Soil organic matter content can be increased by adding composts and other organic amendments. Selecting a soil outside of the ideal or acceptable range for organic matter should be done with the understanding that additional organic matter must be added before vegetation is planted.



**Photo 4.** The effect of organic matter on soils with similar textures (silty clay). The soil on the left has no organic matter and, consequently, no structure. (Photo Courtesy of Larry Rupp.) The soil on the right contains 5% organic matter and is well aggregated.

**Sodium adsorption ratio (SAR).** The sodium adsorption ratio is a measure of the amount of sodium (an undesirable element) relative to calcium and magnesium (desirable elements) in soil. Soils with high SAR values tend to have poor structure, and low water infiltration and percolation rates. Soils with a high SAR usually have a high pH and EC<sub>e</sub>. If pH and EC<sub>e</sub> are within acceptable ranges, SAR should also be acceptable.

**Guidelines for SAR:**

Ideal:	Less than 3
Acceptable:	Between 3 and 7 for silt loam, silty clay loam and clay loam Between 3 and 10 for sandy clay loam, sandy loam and loam
Unacceptable	Above 10 for any soil texture class

**OTHER INDICATORS OF TOPSOIL QUALITY**

If possible, have soil tested to ensure that it meets these chemical and physical guidelines before purchasing and spreading the material. The cost to test soil for all of the parameters described in this bulletin is approximately \$25.00 to \$30.00 per sample.

There may be situations where a soil test is not possible, or where it is desirable to make a final inspection of the soil before delivery to the landscape site. In these cases certain visual indicators may be used to assess soil quality. Realize that visual appearance alone is not a good indicator of soil quality. A material may look like a quality topsoil while it is unacceptable due to high salinity, pH, or other factors. The following is a list of characteristics to look for when inspecting a soil:

- ✓ Check for signs of salt crusting or crystals on the surface. Soils high in soluble salts have light colored deposits on their surface (Photo 2). Don't select the material if there is evidence of salt unless the soil is tested for soluble salt level (EC<sub>e</sub>).
- ✓ Take a sample of soil and attempt to crush a few dry aggregates. Ideally, dry aggregates crumble under pressure. Be suspicious of material that is extremely hard. Hard soils indicate low organic matter or high clay content. Remember that this soil will behave similarly in the landscape.
- ✓ Wet a few aggregates and break them down to individual sand, silt and clay particles. Does the material feel gritty (indicating high sand), smooth (indicating high silt), or sticky (indicating high clay)? Ideally, there should be a combination of some gritty, smooth, and sticky particles. Recall that this material will behave in a similar way when wet in the landscape.
- ✓ Check topsoil color. Generally, light colored materials have lower organic matter contents than dark brown or black soils. Soils that are very light or white may contain excess salt and/or lime. Excess lime aggravates nutrient deficiencies, particularly iron chlorosis.

In some situations, purchasing topsoil is essential to create a successful landscape. In others, the purchased soil may be little or no better than soil already on site. Before making the decision to purchase new topsoil, determine whether the soil will be any better than material already on the site. If possible, have both soils tested. Compare the test results with these guidelines. Determine the cost of purchasing new topsoil and if the money is better spent improving the soil already on site.

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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert L. Gilliland, Vice-President and Director, Cooperative Extension Service, Utah State University, Logan, Utah. (EP/DF/5-97)