

SEITZ

Colorado State Soil



SOIL SCIENCE SOCIETY OF AMERICA



Introduction

Many states have a designated state bird, flower, fish, tree, rock, etc. And, many states also have a state soil – one that has significance or is important to the state. The **Seitz** is the official state soil of **Colorado**. Let's explore how the **Seitz** is important to the state of Colorado!

History

In 1972, Seitz soils were first established in the area around Rio Grande County, Colorado. The soil got its name from the Seitz stream which was close to where soil scientists described the soil. The Seitz soil is the foundation for the grand and scenic views associated with Colorado and the large variety of outdoor recreational opportunities the state has to offer.

What is Seitz Soil?

The Seitz soils located primarily in southwestern Colorado are predominantly found at higher cooler elevations. These soils are found on hills, ridges, high valleys, and mountain slopes. Seitz soils are used as pastureland for grazing cattle, forestry, and outdoor recreation like hiking, camping, and winter sports because they are found in the mountainous areas of Colorado.

Seitz soils are very deep, well drained soils developed in colluvium and slope alluvium. This means that as the rock on the mountainsides weather, the weathered material begins to creep and fall downslope due to gravity and water. As these materials reach a more stable position in the landscape, they accumulate and, over time, further weathering occurs, creating the Seitz soil. They are found on hills, ridges, mountain slopes, and valley sides, on slopes ranging from 2 to 65 percent.

Every soil can be separated into three separate size fractions called *sand*, *silt*, and *clay*, which makes up the *soil texture*. They are present in all soils in different proportions and say a lot about the character of the soil. The topsoil (the layer of soil that we plow and plant seeds in) has a texture that is *clay loam to sandy loam* and usually has a lot gravel or rock fragments. It can be dark gray to black color when moist, and could be half rock fragments at the surface! The soil below where a farmer can plow (typically 20 cm) is topsoil. Topsoil typically has organic matter and fine roots that absorb water and nutrients for tree growth. The different horizontal layers of the soil are called *soil horizons*. Seitz soils typically have about 5 horizons. (**Figure 1**) The subsoil is the layers of soil below where fine roots grow. The subsoil is where large tree roots anchor the trees to the ground and in Seitz soils it has a yellowish-brown color, less organic matter and loses some properties which make it good for growing trees. For this reason preventing erosion is important for plant growth.



Fig. 1. Seitz soil profile.
Credit: NRCS

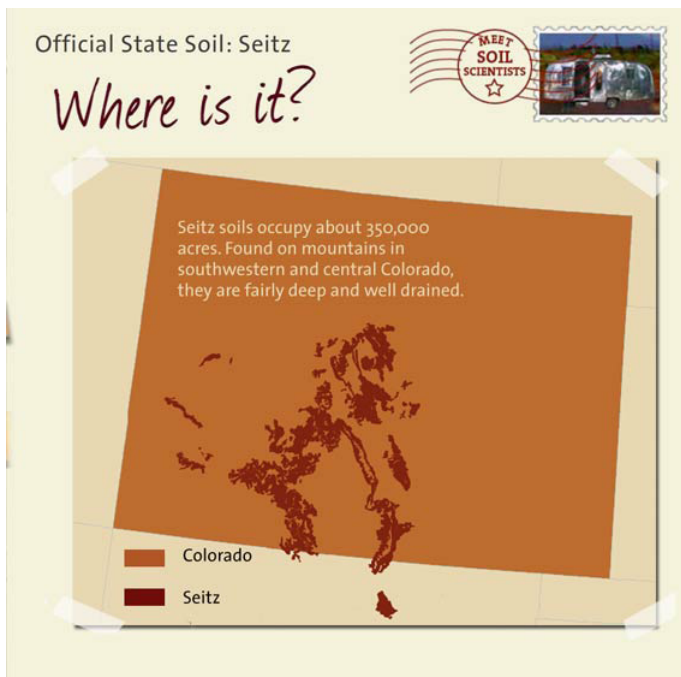


Fig. 2 Seitz soil series is the official state soil of Colorado. Credit: Smithsonian Institution.

Where to dig a Seitz

Yes, you can dig a soil. It is called a soil pit and it shows you the *soil profile*. The different horizontal layers of the soil are called *soil horizons*. This does not mean that other types of soil cannot be found there but that the **Seitz** is the most common. Seitz covers about 350,000 acres of land in 17 counties in south-central and southwestern Colorado. (**Figure 2**) This does not mean that other types of soil cannot be found in those counties but the Seitz is the most common. Other common mountainous soils found in Colorado include Beeno, Fairfield, Ruby and Stunner series. While soils common to the eastern High Plains of Colorado include Denver, Nunn, Olney, and Pleasant.

Importance and Uses

Soil and land found in the mountainous areas of the US typically do not have favorable properties for growing crops. Mountains soils tend to be more shallow and rocky than soils used in farming. However, these soils are usually great for the production of wood, as a home to wildlife, for year-round outdoor recreation, and as an area of land to capture and store drinking water in the soil. In Colorado Seitz soils provide jobs and money to the local economy through the production of timber via forestry activities, as well as sites for outdoor recreation in state and national forests and parks. (**Figure 3**)

Limitations

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. Soil experts, called *Soil Scientists*, have soils and have determined that Seitz soils are suited for forestry, pastureland, and recreation. However, because it is primarily located on hill and mountain sides, the rocky soils can be easily eroded. This means that over time, the soil can be carried down slope by heavy rains into nearby streams and rivers. Soil erosion can be much worse if there is excessive grazing by livestock or poor management of the soil during timber harvesting. The result is that the nutrient poor topsoil can be



Fig. 3 Colorado Seitz soils provide sites for outdoor recreation in state and national forests and parks.

further degraded over time, thereby making it less able to hold water and nutrients. The erosion of the top soil makes it even less suitable for plant and forest growth. The loss of soil and plant growth means less suitable land for the production of meat and timber, as well as less land for wildlife. Because the soils are rocky and steep, they also are difficult sites to build homes and buildings. Without good management practices, soils such as Seitz are highly vulnerable.

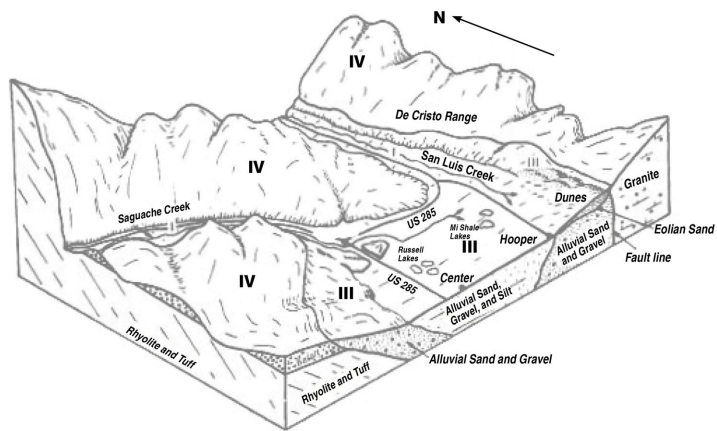
Management

Seitz soils are primarily used for the production of wood and recreation. The soils are poor in nutrients and generally not good for growing crops. The combination of rocky soil and cold temperatures makes them unsuitable for farming. Seitz soils are typically forested and can be a home to a wide variety of animals including grouse, mule deer, elk, and black bear. Seitz soils that have been cleared of forest and not replanted are used for grazing of animals because they can be used as pasture land.

Seitz Soil Formation

Before there was soil there were rocks and in between, CIORPT. Without CIORPT, there will be no soil. So, what is CIORPT? It is the five major factors that are responsible for forming a soil like the Seitz. It stands for **C**limate, **O**rganisms, **R**elief, **P**arent material and **T**ime. CIORPT is responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Seitz (and all other soils) are determined by the influence of CIORPT. Weathering takes place when environmental processes such as rainfall, freezing and thawing act on rocks causing them to dissolve or fracture and break into pieces. CIORPT then acts on rock pieces, marine sediments and vegetative materials to form soils.

Climate – Temperature and precipitation influence the rate at which parent materials weather and dead plants and animals decompose. They affect the chemical, physical and biological relationships in the soil. Over time as a result of climate, weathering and decomposition of plant material in soils develop different colors at different depths. Seitz soils developed under cool summer climates with cold winters in the Colorado Mountains. Because it is so cold, the soil does not breakdown as fast as soils in the High Plains of Colorado, where average temperatures are warmer.



- I Nearly level and gently sloping soils that are poorly drained and subject to flooding.
- II Nearly level and gently sloping soils that are poorly drained and affected by salt and alkali.
- III Nearly level to steep soils that are moderately well drained to excessively drained.
- IV Gently sloping to very steep, well drained soils, and rock outcrop.

Fig. 4 Relationship of soils, landform position (relief) and parent material. Seitz soils are located on the hill and mountain slopes. Credit: USDA-NRCS. Soil Survey of Saguache County, Colorado.

Organisms – This refers to plants and animal life. In the soil, plant roots spread, animals burrow in, and bacteria break down plant and animal tissue. These and other soil organisms speed up the breakdown of large soil particles into smaller ones. Plants and animals also influence the formation and differentiation of soil horizons. Plants determine the kinds and amounts of *organic matter* that are added to a soil under normal conditions. Animals breakdown complex compounds into small ones and in so doing add organic matter to soil. Seitz soils support Engelmann Spruce, Ponderosa Pine, and Rocky Mountain Douglas-fir trees. The trees are harvested for to make plywood or pulp to make things like paper.

Relief – Landform position or relief describes the shape of the land (hills and valleys), and the direction it faces which makes a difference in how much sunlight the soil gets and how much water it keeps. Deeper soils form at the bottom of the hill rather than at the top because gravity and water move soil particles downhill. Seitz soil has good drainage because it is located at higher elevations on mountain slopes (**Figure 4**).

Parent material (C horizon) – Just like people inherit characteristics from their parents, every soil inherits some traits from the material from which it forms. Some parent materials are transported and deposited by glaciers, wind, water, or gravity. Seitz soils are formed from “colluvium” or “alluvium” of granite and gneiss minerals. Colluvium is a general name for loose, unconsolidated sediments that have been carried downhill by rain and gravity towards the base of hill slopes and mountains. Colluviums can be over 10 feet thick! Alluvium is a name for loose soil or sediments formed by the movement of water. An alluvial fan is formed by soil and sediment being deposited where a narrow mountain stream opens up to a wide flood plain. A section of the Rocky Mountain National Park was closed when a landslide composed of colluvium fell down the mountain slope and destroyed the road (**Figure 5**).

Time – All the factors act together over a very long period of time to produce soils. As a result, soils vary in age. The length of time that soil material has been exposed to the soil-forming processes makes older soils different from younger soils. Gen-



Fig. 5 Alluvial fan created. in the Lake Lawn flood of in Rocky Mountain National Park. Credit: Susan Fisk

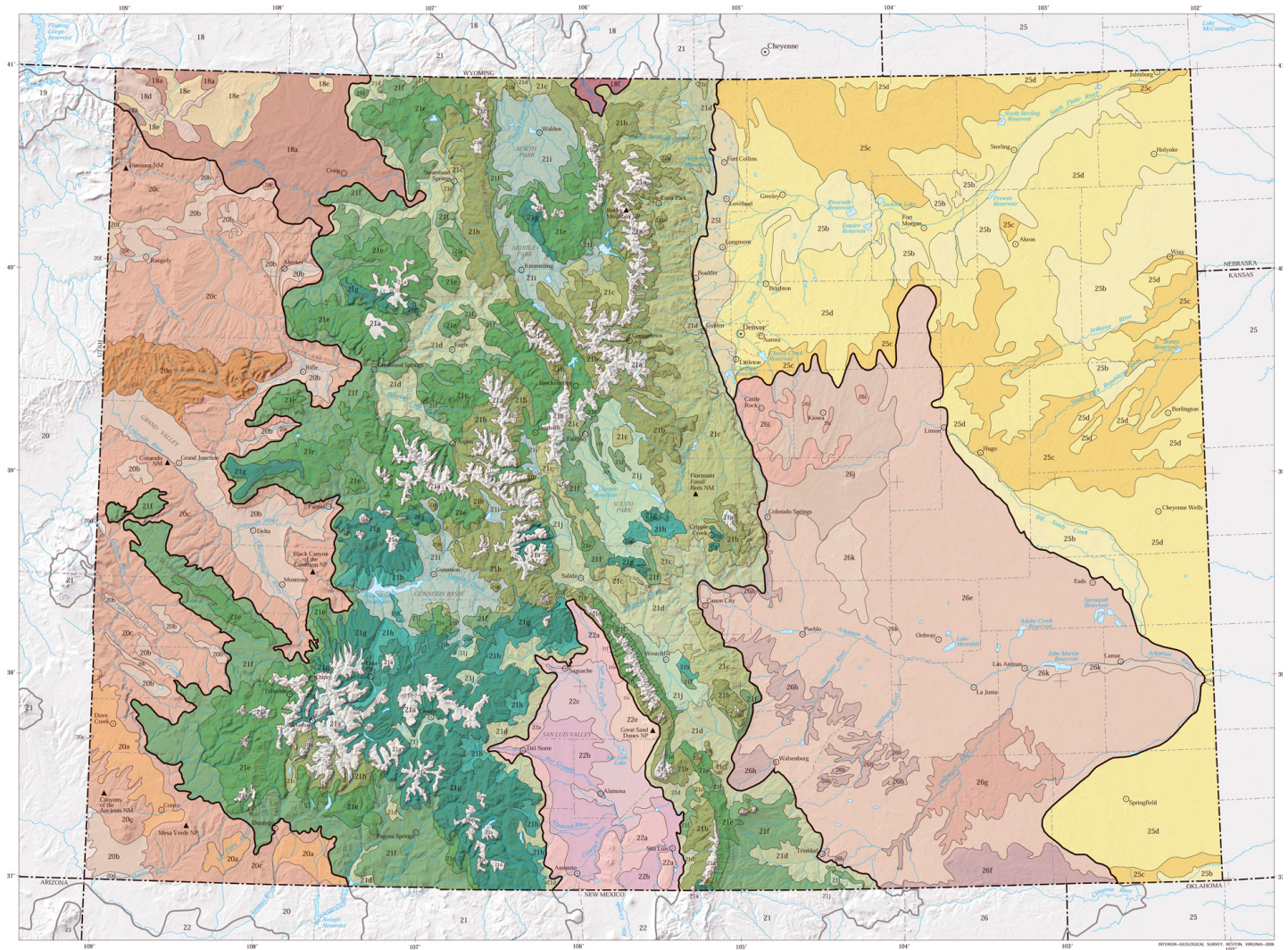
erally, older soils have better defined horizons than younger soils. Less time is needed for a soil profile to develop in a humid and warm area with dense vegetative cover than in a cold dry area with sparse plant cover. More time is required for the formation of a well-defined soil profile in soils with fine textured material than in soils with coarse-textured soil material. The effect of time on Seitz soils can be seen in many ways, including deposition of colluvial materials, multiple soil horizons, and dark colors at the soil surface as a result of plant decomposition.

Ecoregions, Soils and Land Use in Colorado

Within the borders of the Southern Rocky Mountains Physiographic Region (**Figure 6**), resides the Major Land Resource Area (MLRA) known as 48A, which stretches across Colorado to New Mexico, Utah, and Wyoming. The Seitz soil is found completely within region 48A, which is about 45,920 square miles (119,000 square kilometers) in size. Several national forests occur within this area in Colorado, including the Arapaho, Grand Mesa, Gunnison, Pike, Rio Grande, Roosevelt, Routt, San Isabel, San Juan, Uncompahgre, and White River. Elevation ranges from 6,500 to more than 14,400 feet (1,980 to more than 4,390 meters) in this area. This area includes Mt. Elbert, the highest peak in the Rocky Mountains, coming in at an elevation of 14,433 feet (4,400 meters)! In fact, more than 50 peaks in this area have elevations higher than 14,000 feet (4,270 meters).

The majority of the soils that occur in this area have developed on higher slopes and support forest vegetation, mainly trees and shrubs. A small portion of the soils are less sloping and are more hospitable to native grass growth.

Colorado Ecoregions



- | | | |
|---|--|--|
| <p>18 Wyoming Basin</p> <ul style="list-style-type: none"> 18a Rolling Sagebrush Steppe 18d Foothill Shrublands and Low Mountains 18e Salt Desert Shrub Basins 18f Laramie Basin <p>20 Colorado Plateaus</p> <ul style="list-style-type: none"> 20a Monticello-Cortez Uplands and Sagebrush Valleys 20b Shale Deserts and Sedimentary Basins 20c Semiarid Benchlands and Canyonlands 20d Arid Canyonlands 20e Escarpments 20f Uinta Basin Floor <p>— Level III ecoregion
 — Level IV ecoregion
 - - - County boundary
 - - - State boundary</p> | <p>21 Southern Rockies</p> <ul style="list-style-type: none"> 21a Alpine Zone 21b Crystalline Subalpine Forests 21c Crystalline Mid-Elevation Forests 21d Foothill Shrublands 21e Sedimentary Subalpine Forests 21f Sedimentary Mid-Elevation Forests 21g Volcanic Subalpine Forests 21h Volcanic Mid-Elevation Forests 21i Sagebrush Parks 21j Grassland Parks <p>22 Arizona/New Mexico Plateau</p> <ul style="list-style-type: none"> 22a San Luis Shrublands and Hills 22b San Luis Alluvial Flats and Wetlands 22c Salt Flats 22e Sand Dunes and Sand Sheets | <p>25 High Plains</p> <ul style="list-style-type: none"> 25b Rolling Sand Plains 25c Moderate Relief Plains 25d Flat to Rolling Plains 25l Front Range Fans <p>26 Southwestern Tablelands</p> <ul style="list-style-type: none"> 26e Piedmont Plains and Tablelands 26f Mesa de Maya/Black Mesa 26g Purgatoire Hills and Canyons 26h Pinyon-Juniper Woodlands and Savannas 26i Pine-Oak Woodlands 26j Foothill Grasslands 26k Sand Sheets |
|---|--|--|

Fig. 6 Colorado ecoregions – Credit: US-EPA. http://ecologicalregions.info/data/co/co_front.pdf

Glossary

Alluvium: Loose soil or sediments formed by the movement of water,

Clay: A soil particle that is less than 0.002 mm in diameter. Clay particles are so fine they have more surface area for reaction. They hold a lot of nutrients and water in the soil. A clay soil is a soil that has more than 40% clay, less than 45% sand and less than 40% silt.

Colluvium: Loose, sediments, soils, and debris that have been carried downhill by rain and gravity towards the base of hills and mountains.

Ecoregion: Represents areas with similar biotic and abiotic characteristics which determine the resource potential and likely responses to natural and man-made disturbances. Characteristics such as climate, topography, geology, soils, and natural vegetation define an ecoregion. They determine the type of land cover that can exist and influence the range of land use practices that are possible.

Horizon: see Soil horizons

Organic matter: Material derived from the decay of plants and animals. Always contains compounds of carbon and hydrogen.

Sand: A soil particle between 0.05 and 2.0 mm in diameter. Sand is also used to describe soil texture according to the soil textural triangle, for example, loamy sand.

Silt: A soil particle between 0.002 and 0.05 mm diameter. It is also used to describe a soil textural class.

Soil Horizon: A layer of soil with properties that differ from the layers above or below it.

Soil Profile: The sequence of natural layers, or horizons, in a soil. It extends from the surface downward to unconsolidated material. Most soils have three major horizons, called the surface horizon, the subsoil, and the substratum.

Soil Scientist: A soil scientist studies the upper few meters of the Earth's crust in terms of its physical and chemical properties; distribution, genesis and morphology; and biological components. A soil scientist needs a strong background in the physical and biological sciences and mathematics.

Soil Texture: The relative proportion of sand, silt, and clay particles that make up a soil. Sand particles are the largest and clay particles the smallest. Learn more about soil texture at www.soils4teachers.org/physical-properties

Subsoil: horizon subsurface zone that has been transformed by soil-forming processes, often including transfers of particles from the horizons above it. Not present in all soils.

Topsoil: (A horizon) – The uppermost zone of a soil where organic matter has accumulated at the land surface.

Additional Resources

Soil! Get the Inside Scoop. David Lindbo and others. Soil Science Society of America, Madison, WI.

Know Soil, Know Life. David L. Lindbo, Deb A. Kozlowski, and Clay Robinson, editors. Soil Science Society of America, Madison, WI.

Web Resources

Soils for Teachers—www.soils4teachers.org

Soils for Kids—<http://www.soils4kids.org/>

Have Questions? Ask a Soil Scientist—<https://www.soils.org/ask>

Soil Science Society of America—<https://www.soils.org/>

USDA Natural Resources Conservation Service, State Soils Homepage—<http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=stelprdb1236841>

USDA Natural Resources Conservation Service, Educational Resources—http://soils.usda.gov/education/resources/k_6/

USDA Natural Resources Conservation Service. Seitz – Colorado State Soil. <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=stelprdb1236841>

USDA Natural Resources Conservation Service. 2010. From the Surface Down: An Introduction to Soil Surveys for Agronomic Use. 2nd Edition. <ftp://ftp-fc.sc.egov.usda.gov/NSSC/>

Author: Bradley W. Miller PhD, Environmental Scientist,
US EPA-OECA-OCEFT-NEIC

Reviewed and edited by:

Riley Dayberry, Assistant State Soil Scientist,
ColoradoUSDA-NRCS

William “BJ” Shoup, State Soil Scientist,
Colorado USDA NRCS



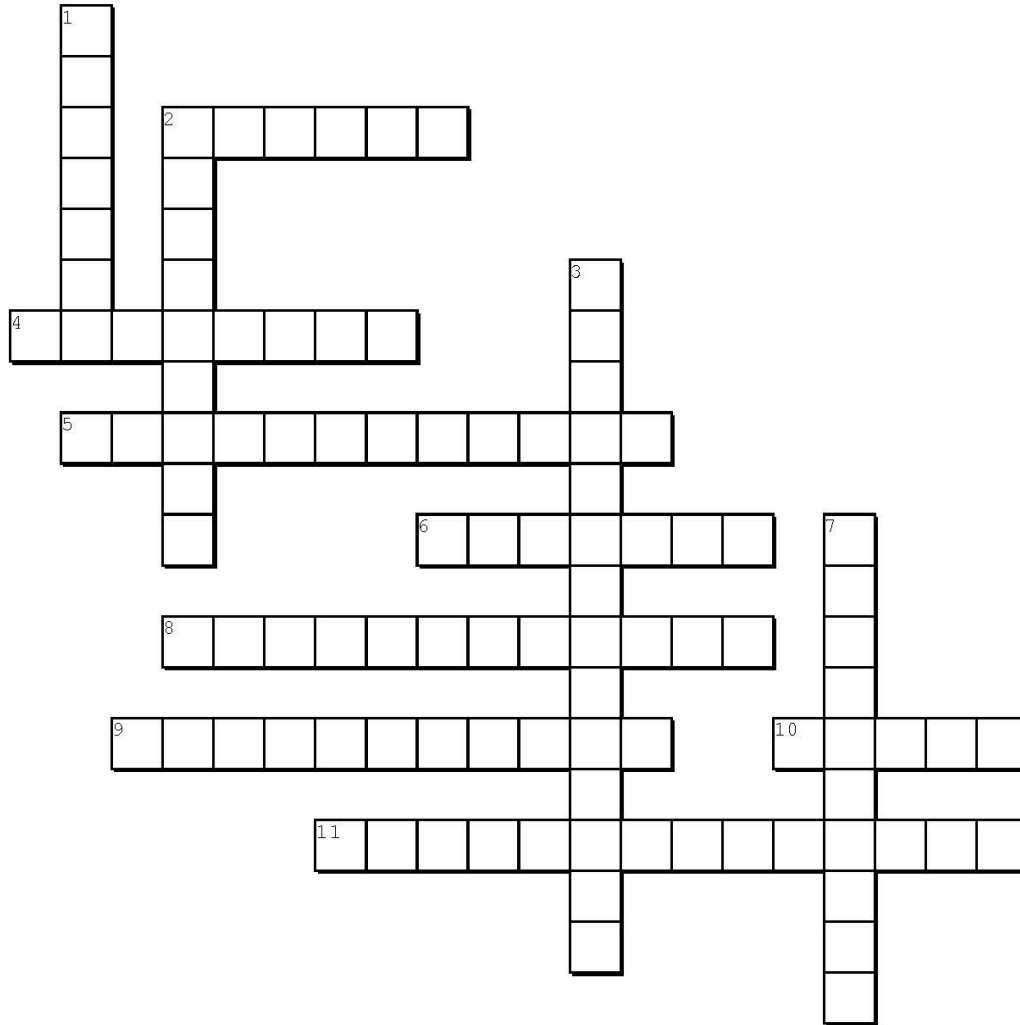
5585 Guilford Road
Madison WI 53711-5801
Tel. 608-273-8080 • Fax 608-273-2021
www.soils.org • headquarters@soils.org

This state soil booklet was developed under the auspices of the Soil Science Society of America's K-12 Committee—their dedication to developing outreach materials for the K-12 audience makes this material possible.

Name: _____

Seitz Soil Crossword

Complete the crossword below using words from the Seitz soil booklet glossary and text.



Created on TheTeachersCorner.net Crossword Maker

CIORPT Recreation Topsoil Organic matter Subsoil Seitz Pastureland
Alluvium Soil Profile Soil Scientist Soil Horizon Colluvium

Across

2. climate, organisms, relief, parent material and time
4. Loose soil or sediments formed by the movement of water.
5. A ___ the sequence of natural layers, or horizons, in a soil.
6. The uppermost zone of a soil where organic matter has accumulated.
8. A layer of soil with properties that differ from the layers above or below it.
9. Animals use Seitz soils as _____ for grazing.
10. The _____ soil is the unofficial state soil of Colorado
11. Material derived from the decay of plants and animals.

Down

1. Soil horizon that includes particles from above.
2. A _____ is a loosely compacted deposit of windblown silt-sized sediment. Loose, sediments, soils, and debris that have been carried downhill.
3. A _____ studies the upper few meters of the Earth's crust in terms of its physical and chemical properties.
7. Seitz soil is used for _____ like hiking and camping