

OROVADA

Nevada State Soil



SOIL SCIENCE SOCIETY OF AMERICA



Introduction

Nevada has many state emblems such as the state flower (Sagebrush), state bird (Mountain Bluebird), state animal (Desert Bighorn Sheep), state rock (Sandstone) and so forth. Nevada also has a state soil, one that has significance or is very important to the state. The Orovada series is the official state soil of Nevada. Let's explore how important the Orovada soil is to Nevada!

History

The soil was first proposed in 1956 and eventually was established in 1972 in Nye County, Nevada. It is named for a small town of Orovada in Humboldt County, Nevada. The name of the town was coined in 1918 from the Spanish word "oro" which means gold and "vada" from Nevada. A class project by the students of the Orovada School culminated in the Governor of Nevada signing Senate Bill 152 in June 2001 (**Figure 1**) which officially designated the Orovada soil as Nevada's state soil.

What is Orovada Soil?

Orovada soils are deep and well drained and formed from sediments, derived from mixed rock sources, deposited by streams and rivers (*alluvium*) and from windblown materials (*loess*) and volcanic ash. These soils typically occur in the Great Basin section of the Basin and Range physiographic province. Orovada soils are desert or semi-desert soils and belong to the soil order called *Aridisols*. They are slightly weathered and show evidence of soil development. Every soil can be separated into three separate size fractions called sand, silt and clay. They are present in all soils in



Fig 1. Governor Kenny Guinn with Orovada School students and their teacher Mike Tiechert signs Senate Bill 152, authorizing the Orovada soil as the official state soil. June 8th 2001, in Carson City, Nevada. (PhotoCredit: Humboldt Sun)



Fig 2. Orovada soil profile. Credit: Smithsonian Institution's Forces of change. <http://forces.si.edu/soils/interactive/state-soils/index.html>



Fig 3. Orovada is well distributed in northern Nevada, and in one county each in Oregon and Idaho. Credit: Smithsonian Institution's Forces of change. <http://forces.si.edu/soils/interactive/state-soils/index.html>

different proportions and say a lot about the character of the soil. In Orovada soil (**Figure 2**), the *topsoil* or A horizon (the layer of soil that we plow or plant seeds in) is *fine sandy* loam in its feel, has light brownish gray or dark brown color and could be up to 20 cm (8 inches) thick. The upper part of the *subsoil* or B horizon (the layers below the topsoil) have light brownish gray to dark grayish brown color but the *soil texture* is loam to fine sandy loam. The lower part of the subsoil is light brownish gray very fine sandy loam and silt loam that has 20 to 80 percent silica and carbonate cementation.

Where to dig Orovada

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. Although, there are other types of soil in the State, Orovada soil is very extensive in northern and central Nevada where it covers more than 360,000 acres of land in 4 counties. Orovada soil also occurs in 1 county each in Oregon and Idaho (**Figure 3**). The Orovada soils are found on nearly level or gently sloping lands where the slope is not more than 15%. They occur on *fan Piedmont landscapes* (seen as a gentle slope starting from the base of mountains to a region of flat land).

Importance and Uses

What makes the Orovada soil so important is its use and how extensive it is in the State. Although, they are arid and semi-arid soils, they are arable when irrigated and are considered *prime farmland* (**Figure 4**). In general, soils can be used for agriculture (growing foods, raising animals, stables); engineering (roads, buildings, tunnels); ecology (wildlife habitat, wetlands), recreation (ball fields, playground, camping areas) and more. Orovada soils are used for growing crops, livestock grazing and wildlife habitat. When irrigation is provided, winter wheat and barley, alfalfa for hay and seed, and grass for hay and pasture are the



Fig 4. The Orovada soil is arable when irrigation is provided and it is considered a prime farmland. Credit: Clay Robinson.

principal crops grown on these soils. (**Figure 5**). Orovada soils are common on semiarid rangeland with sagebrush-grass plant communities. The semiarid rangelands supported by the Orovada soil are home to many species of birds, reptiles and mammals.



Fig. 5. A stand of alfalfa hay typically produced on the Orovada soil. Credit: USDA-NRCS

Limitations

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. *Soil Scientists* studied Orovada soil and identified that it is somewhat limited for many different kinds of uses. The primary limitation is the arid climate that produces generally less than 10 inches of precipitation. As a result of this dry climate, the soils are too dry to grow crops without *irrigation*; plants grown on this soil require water to be provided. Most soils that occur in arid and semiarid climates contain at least small quantities of soluble salts and sodium that accumulate in the root zone. Where the Orovada soil occurs in broad valley bottoms wind erosion may also be a problem when these soils are cultivated.

Management

Orovada soils are low in organic matter and clay. Crops grown on the Orovada soil respond well to applications of liquid or solid fertilizer. Proper irrigation water management is necessary to produce agricultural crops on the Orovada soil. An adequate supply of good quality irrigation water and an adequate drainage system is needed to reclaim areas of this soil where salts and sodium may have accumulated (**Figure 6**). These soils have low or medium surface runoff.



Fig. 6. Surface irrigation and use pivots provide water to support cultivation of alfalfa (left) and wheat (right). Credit: Clay Robinson

Orovada Soil Formation

Before there was soil there were rocks and in between, CLORPT. Without CLORPT, there will be no soil. So, what is CLORPT? It is the five major factors that are responsible for forming a soil like the Orovada series. It stands for **C**Limate, **O**rganisms, **R**elief, **P**arent material and **T**ime. CLORPT is responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Orovada (and all other soils) are determined by the influence of CLORPT. When weathering takes place, environmental processes such as rainfall, freezing and thawing act on rocks causing them to dissolve, fracture or break into pieces. CLORPT 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. The Orovada soil developed under an arid climate with cool moist winters, warm dry summers, mild temperatures and scant rainfall. The mean annual precipitation is 200 to 250 mm (8-10 inches) and the mean annual temperature is 7 to 19 degrees C, and the frost-free period is 100 to 130 days. The influence of the precipitation and temperature resulted in the depletion of organic matter and a concentration of *soluble bases*.

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. Orovada developed under sagebrush/ grass and other plant remains on the surface but these readily degrade in the soil. Orovada soils have little accumulation of organic matter.

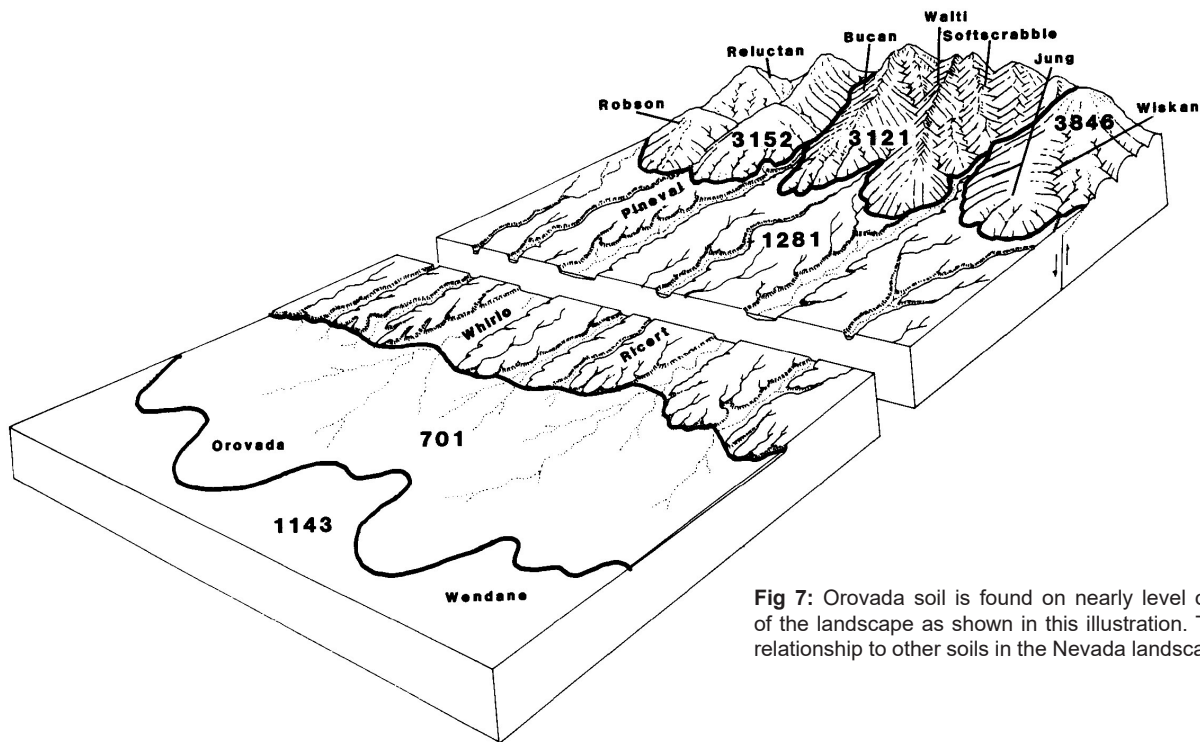


Fig 7: Orovada soil is found on nearly level or gently sloping portions of the landscape as shown in this illustration. The image also shows its relationship to other soils in the Nevada landscape. Credit: USDA-NRCS.

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. Orovada soil commonly occurs on nearly level or gently sloping landscapes and is well drained (Figure 7).

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. Orovada soils developed from loess that is high in volcanic ash on top of alluvium derived from mixed rocks. The parent material gives the soil the characteristic fine soil texture.

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. Generally, 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.

Ecoregions, Soils and Land Use in Nevada

There are five broad ecoregions (Level III) in Nevada (Figure 8). These are (1) Northern Basin and Range, (2) Central Basin and Range, (3) Sierra Nevada, (4) Mojave Basin and Range, and (5) Arizona/New Mexico Plateau. Ecoregions are areas where ecosystems are generally similar. Ecosystems are identified through analysis of patterns and composition of geology, landforms, soils, land use, vegetation, climate, wildlife and hydrology, and how they affect or influence ecosystem quality and integrity so as to differentiate one ecosystem from another. In the Northern Basin and Range, the common soil type is Mollisols which are soils with dark surface or plow layer characteristically formed

under grass in climatic conditions with seasonal moisture deficit. Because this ecoregion is drier and not suitable for agriculture, rangeland is most common (80% of the region) but drylands and irrigated agriculture takes place in the eastern basins. 65% of the Central Basin and Range ecoregion is located in Nevada, 25% in Utah, and the rest in Idaho, California and Oregon. Although, not as hot as the Mojave and Sonoran Ranges, this region has arid climate, is essentially a desert due to inadequate water. The soil changes upslope from Aridisols and Entisols into Mollisols but is not fertile and cultivation agriculture is not as successful here. Land use is mainly for livestock grazing and military use. Water use dynamics vary across this ecoregion and are associated with irrigation demand to support ranching industry, municipal water for population centers, and government-mandated water conservation program.

The Sierra Nevada is oriented in the north-south direction with only 2% of it being in Nevada, the remainder being in California. It's mainly made up of granite which is exposed and glaciated on the eastern side. Uplift, faulting and repeated glaciation have sculpted the Sierra Nevada landscape and in the process deposited till and sediments. Many soils of the Sierra Nevada are weakly developed and classified as Entisols and Inceptisols. Being young soils, they lack depth, the texture is made of coarse material and there is little clay development. They occur on ridge tops and higher elevations, and in resistant parent material at lower elevations. The broad basins and ranges of the Mojave Basin and Range are generally lower, warmer and drier than those of the Central Basin and Range. Entisols and Aridisols are the common soil types in this ecoregion and because of sparse vegetation, they are subject to wind erosion due to frequent use of off-road vehicles and motorcycles in some areas, and to water erosion during storm events. Animal grazing is difficult due to lack of water and forage. The Arizona/New Mexico Plateau is the smallest ecoregion in Nevada and is transitional between the higher, forested and mountainous ecoregions and lower, more arid shrublands. It contains some semiarid shrublands and sub-humid grassland which makes it more suitable for grazing cattle.

Ecoregions of Nevada

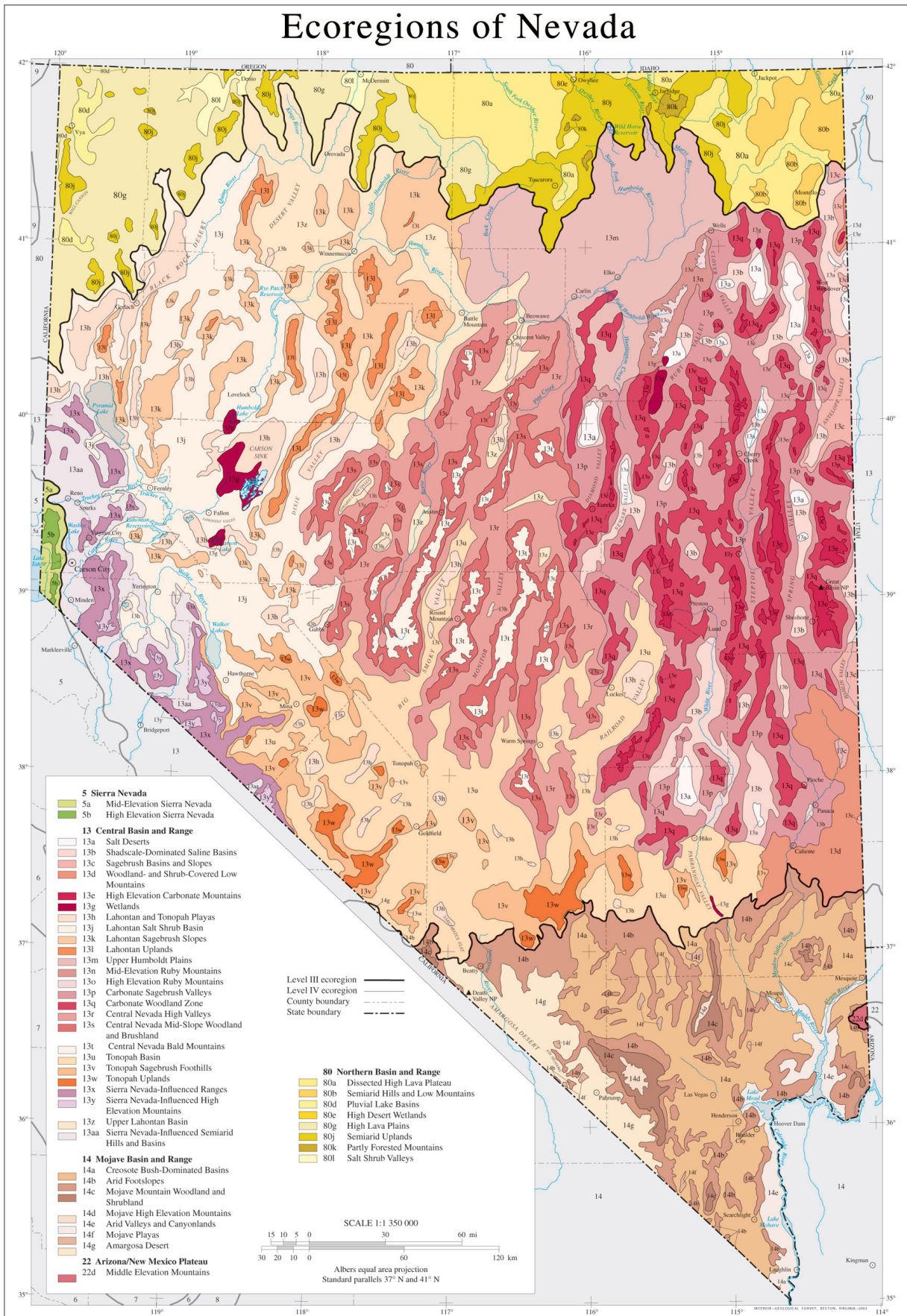


Figure 8. Nevada has five broad Ecoregions that are characterized by hot, dry, rugged ranges and basins. Source: USEPA, Western Ecology Division.

Glossary

Aridisols: Are soils that occur in climates that are too dry for “mesophytic” plants—plants adapted to neither a too wet nor too dry environments—to survive. The climate in which Aridisols occur also restricts soil weathering processes.

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.

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.

Fan Piedmont: Is the most extensive landform on piedmont slopes. Piedmont slope is the dominant slope at the foot of a mountain and many of its components include alluvial fans, fan piedmonts, fan skirts and inset fans.

Horizon: see Soil horizons

Landform: Any recognizable form or feature on the earth's surface, having a characteristic shape and produced by natural causes.

Landscapes: A wide view of the land from above that shows many different combinations of land shapes and features. Landscape is a collection of these natural landforms.

Loess: A loosely compacted deposit of windblown silt-sized sediment. Also a soil parent material transported to and deposited in current location by wind.

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

Prime Farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. It could be cultivated land, pasture, forest land, or other land but it is not urban or built-up areas or water areas.

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.

Soluble Bases: Elements (calcium, magnesium, sodium and potassium) that are present in soil as ions and form what is called Cation Exchange Capacity. The amount in the soil can be reduced through leaching.

Subsoil: (B horizon) The soil horizon rich in minerals that eluviated, or leached down, from the horizons above it. Not present in all soils.

Topsoil: (A horizon) The horizon that formed at the land surface. Mostly weathered minerals from parent material with a little organic matter added.

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/>

Smithsonian Institution — <http://forces.si.edu/soils>

Nevada Web Resources/Links

Natural Resources Conservation Service, Nevada Soils Homepage — <https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/soils/>

Natural Resources Conservation Service, Nevada State Website — <https://www.nrcs.usda.gov/wps/portal/nrcs/site/nv/home/>

Nevada Agricultural Experiment Station, University of Nevada, Reno — <http://naes.unr.edu/>

Nevada Association of Conservation Districts — <http://www.nacdnet.org/state/nevada/>

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