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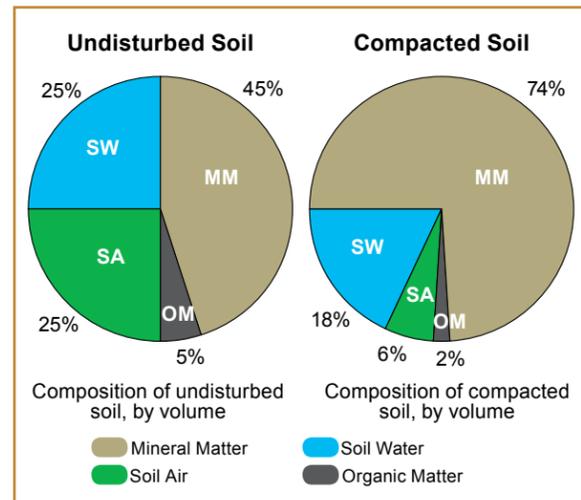
with developers and contractors to limit compaction and soil loss during construction operations.

Permitting

Disturbing over one acre for construction purposes typically requires a stormwater discharge permit issued by the State of Montana. For more information visit the Department of Environmental Quality site: www.deq.mt.gov/wqinfo/MPDES/StormwaterConstruction.asp.

Soil Components

All soil is made up of air, water, decayed plant materials, numerous kinds of living and/or dead organisms (organic matter), and mineral matter (sand, silt, clay). The soil composition, however, can be dramatically changed by pedestrian and vehicular traffic, especially when the soil is wet. Soil components most easily changed are the amounts of soil air and water.



Restoring Soil Quality

Organic Matter

Increasing organic matter content increases biological life, the number of soil pores, and soil permeability. Compost, or decomposed organic material, is a great source of organic matter. Compost improves soil structure, aeration, water retention, drainage, and nutrient quality. Keeping the organic material in existing vegetation and litter in place

near streams and lakes protects water quality by capturing sediment, nutrients, and other pollutants in runoff.

Deep Tillage

Deep tillage can be performed with machinery. Always have underground utilities and other underground plumbing or wires located and marked. It is best to perform deep tillage when moisture content is about 40 percent.



Vegetation

Establishing vegetation to cover bare soil is critical. A seeded lawn with a mixture of grass seed and compost is best for new lawns. It is often less expensive and establishes faster than sod. The higher organic matter content and improved soil structure in compost-seeded lawns can retain 80 percent more rainfall resulting in less watering and fertilizer than sod lawns and less storm water runoff. Well planned and maintained vegetation will also discourage the establishment of noxious weeds.

Native Landscaping

Native plants have a tremendous root structure. This deep root structure adds organic matter to the soil and increases water infiltration. Use native landscaping strategically to manage rainfall and diversify urban landscapes.

More Information on Soil Quality and Construction BMPs

Find additional information about soil quality by visiting the following websites:

- www.soils.usda.gov/sqi/
- www.lowimpactdevelopment.org
- www.cwp.org
- www.stormwatercenter.net
- www.mt.nrcs.usda.gov/soils/
- <http://watercenter.montana.edu/training/stormwater/>

More information on this topic is also available from your local NRCS or county conservation district office.



Soil Quality

... key to absorbing and infiltrating rainfall

Soil Quality

Soil is an important but often overlooked component of water management. Soil quality refers to the capacity of soil to perform its functions. Soil plays an important role in regulating runoff of storm water and in supporting trees, shrubs, lawns, and gardens. Urban activities, such as construction grading, often result in erosion, sedimentation, and soil compaction. Management practices are often needed to restore soil quality after development.



A healthy topsoil has high organic matter content with 50 percent pore space in the soil profile. High organic matter content allows water to be absorbed and infiltrated.

Erosion

Erosion on construction sites is one of the most serious problems facing urban soil quality. Erosion, which produces sediment, is accelerated when soil is disturbed or left bare and exposed to wind and water. Although erosion on construction sites often affects only a small percentage of a watershed, it can be a major source of sediment. The potential for erosion in construction areas can be 100 times greater than on agricultural land and the delivery rate to receiving waters is much higher.



Construction grading compacts the soil and exposes land to erosive rain and wind.

Compaction

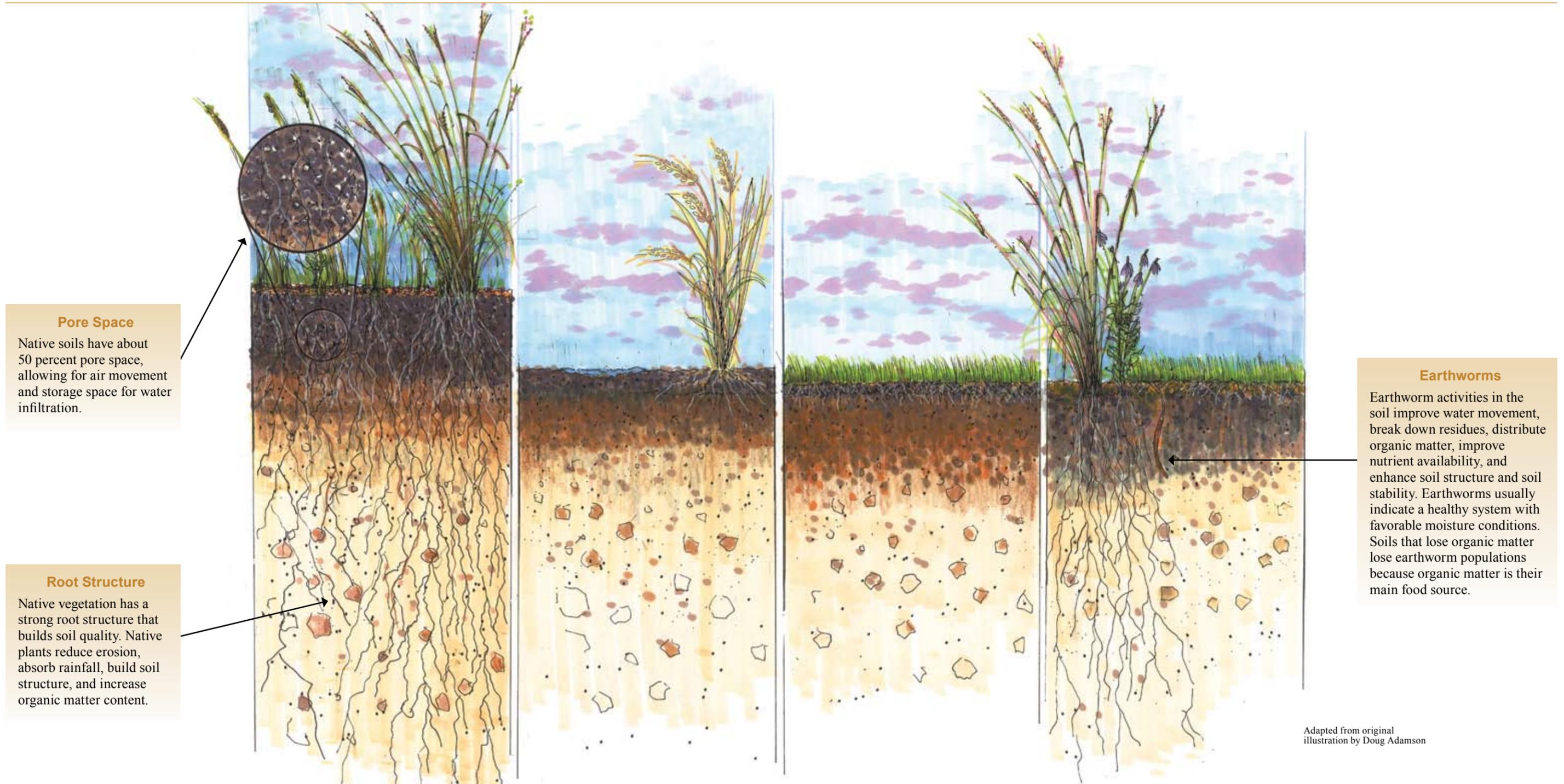
Compaction is the other serious issue facing urban soil quality. It occurs when soil particles are pressed together. As soil particles are squeezed together, soil density increases and pore space for air and water are reduced. Lack of pore space in the soil reduces water intake and movement throughout its layers. Compaction also limits root growth and the biological diversity of the soil. These problems are compounded when organic matter content is lost by topsoil removal. For homeowners, compacted soil with low organic matter makes it difficult to establish and maintain lawns and landscaping. In urban communities, soil compaction can lead to low infiltration rates, increased erosion and storm water runoff, decreased water quality due to more polluted runoff, and increased flooding.

It is essential that exposed land and compaction be minimized during urban construction. Communities need to work

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Evolution of Soil in Montana



Pore Space
Native soils have about 50 percent pore space, allowing for air movement and storage space for water infiltration.

Root Structure
Native vegetation has a strong root structure that builds soil quality. Native plants reduce erosion, absorb rainfall, build soil structure, and increase organic matter content.

Earthworms
Earthworm activities in the soil improve water movement, break down residues, distribute organic matter, improve nutrient availability, and enhance soil structure and soil stability. Earthworms usually indicate a healthy system with favorable moisture conditions. Soils that lose organic matter lose earthworm populations because organic matter is their main food source.

Pre-Settlement Montana Soil
Hardy, vigorous native plants, grasses, and trees grew on the Montana landscape before settlement. Natives adapt to summer heat and winter cold, drought, and windy conditions. These soils contain about 5 percent organic matter.

Agricultural Land
Years of deep tillage and soil erosion from farming caused the loss of more than half the topsoil on most of Montana's farmland slopes. Soils on agricultural land typically have only 1 to 2 percent organic matter content, a 60 to 80 percent reduction from native soils.

Compacted Urban Soil
Many of today's urbanized areas have disturbed and compacted soils. These areas have very little organic matter left to absorb rainfall and less pore space for water to infiltrate.

Restored Montana Soil
Soil quality is best restored by doing deep tillage, applying compost, and planting native vegetation. This will increase pore space and raise organic matter content which will allow rainfall to infiltrate and be stored in the soil.

Adapted from original illustration by Doug Adamson