

# SOIL Compaction

**Soil**

Soil Erosion

Soil Quality Degradation

Subsidence

Compaction

Organic Matter

Salts and Chemicals

**Water**

**Air**

**Plants**

**Animals**

**Energy**

**Soil Quality Degradation - Compaction**

Management induced soil compaction resulting in decreased rooting depth that reduces plant growth, animal habitat and soil biological activity.

**What is it?**

Compaction occurs when soil particles are pressed together, reducing pore space between the particles and pushing out the air normally located there. It is manifested as an increase in bulk density. A severely compacted soil can become effectively impermeable. Soils are either naturally compacted (heavy, clay soil) or compaction is caused by management activities. Compaction is assessed using measurements of bulk density, penetration resistance, porosity, and root growth patterns.

**Why is it important?**

Compaction reflects the soil’s ability to function for structural support, water and solute movement, and soil aeration. It may cause restrictions to root growth, and poor movement of air and water through the soil. Compaction can result in shallow plant rooting and poor plant growth, influencing crop yield and reducing vegetative cover available to protect soil from erosion. By reducing water infiltration into the soil, compaction can lead to increased runoff and erosion from sloping land or waterlogged soils in flatter areas. In general, some soil compaction to restrict water movement through the soil profile is beneficial under arid conditions, but under humid conditions compaction decreases yields.

**What can be done about it?**

Long-term solutions to soil compaction problems revolve around decreasing soil disturbance and increasing soil organic matter. A system that uses cover crops, crop residues, perennial sod, and/or reduced tillage results in increased soil organic matter, less disturbance and reduced bulk density. Additionally, the use of multi-crop systems involving plants with different rooting depths can help break up compacted soil layers. Grazing systems that minimize livestock traffic and loafing, provide protected heavy use areas, and adhere to recommended minimum grazing heights reduce bulk density by preventing compaction and providing soil cover.

**Compaction at a Glance**

Problems / Indicators - Bulk density, penetration resistance, porosity, root growth patterns	
Causes	Solutions
<ul style="list-style-type: none"> <li>Working wet soil</li> <li>Excess traffic, machinery or livestock</li> <li>Heavy machinery</li> <li>Repeated tillage at same depth</li> <li>Poor aggregation</li> <li>Low organic matter</li> </ul>	<ul style="list-style-type: none"> <li>Avoid working wet soil</li> <li>Reduce traffic/tillage operations, rotate</li> <li>Controlled traffic patterns</li> <li>Subsoil or rip compacted areas</li> <li>Diversify cropping system</li> <li>Conservation tillage</li> <li>Cover crops</li> <li>Animal manures and compost</li> <li>Non-compacting tillage</li> </ul>