

Avoid Compaction, Increase Water Infiltration

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Using heavy equipment at your agricultural operation puts your soil at risk of being compacted. Compaction limits water infiltration and can significantly impact the productivity of your soils. Producers should avoid soil compaction at all costs; it has a number of detrimental effects but no positive impacts. Fortunately there are a number of common sense practices to avoid compaction and maintain good water infiltration.

Compaction occurs when tractors or other heavy equipment push soil particles closer together, increasing soil bulk density. As density increases, porosity decreases. Soil macropores diminish, restricting the movement of water and nutrients and slowing root growth. Compaction is greatly exacerbated by running equipment on soil that is too wet. If soil moisture is near or greater than field capacity, it is too wet to work, and some soils should be clearly drier than field capacity to avoid compaction. Field capacity usually occurs 2-3 days after rain or irrigation events, when any water not being held by the soil has moved downward from gravitational forces. While clay soils are the most susceptible to compaction, sandier soils can be affected too. Once a clay soil is compacted, the damage can be permanent or very long-term. Some growers can break up compacted soils with tillage and rippers, but this can negatively impact soil structure and health, which causes its own share of issues. Maintaining good soil structure is essential to maintaining plant health, avoiding erosion and maximizing water infiltration capacity.

When producers till, they may loosen the upper portions of the soil (at the expense of soil structure and aggregates), but this often creates a plow pan below the area touched by the plow, disc or other tillage equipment used. These plow pans can become more significant over time, especially in clay soils, where water may not be able to penetrate the pan over time. Water will build up or run horizontally in the soil instead of percolating down. Deep ripping may help break up plow pans, but it cannot break it all up, and undo damage to soil structure caused by the compacted plow pan.

While working fields with vegetative cover or in no-till management can help diminish compaction, these fields are at risk too. As many grape growers need or want to mow in late winter, they are at risk of compacting soil, and need to weigh the tradeoffs of their immediate needs with the long-term needs of their soils health and productivity.

The best approach is to avoid plow pans or compaction of any type. There are several management approaches to achieve this:

- **Avoid working the fields when soil is too wet.** This is when the most damage and compaction tends to occur. Muddy soil is certainly too wet. If the soil balls up or creates a longer ribbon when kneading it, it is probably too wet to be worked. On a wet year like this it will be tempting to get into the fields earlier than is ideal. Holding off on entering the fields may provide more important long term benefits.
- **Use lighter equipment.** The heavier the equipment the more compaction. Axle loads 10 tons and over can cause permanent subsoil compaction. Aim to keep loads under 6 tons. Tractors 100 hp and above present greater risks.

- **Use tillage sparingly.** Tilled soil is more susceptible to compaction. If possible, only till in the upper portion of the soil, maintain as much vegetation on the ground as possible to avoid erosion, and avoid inverting upper and lower layers. Only till as much as is absolutely necessary.
- **Reduce the area being impacted by heavy equipment.** This can mean reducing the number of trips in one area, creating wider spacing of equipment, and avoiding use of the same tractor ruts repeatedly. An alternative approach is to create permanent traffic lanes and not run equipment outside these lanes. This can be effective but challenging, as all equipment must be scaled to the same width.
- **If possible, use flotation tires, double tires and tracks.** This spreads the load and contact pressure over a greater area, thus reducing high impact compaction zones
- **Increase soil organic matter, vegetative cover and soil life.** This improves soil structure and porosity and makes soil more resistant to compaction and more likely to recover.

It is difficult to completely avoid soil compaction, especially during a wet winter as we are having in 2016-2017. However, by taking steps to avoid compaction, growers can maximize soil health and water infiltration. Short term management needs should be balanced with long term goals and benefits provided by having healthy, uncompacted soil.