

Five Principles of Soil Health

While producers in Arizona may currently use efficient practices in growing crops or grazing livestock, certain practices aimed at improving soil health may actually make their production even more efficient and profitable by reducing costs of irrigation, fertilizer and pesticide use, tillage, etc. on farmlands, and by increasing animal production and reducing feeding costs on rangelands. According to Natural Resources Conservation Service (NRCS) Soil Health Expert Jay Fuhrer, there are five principles of soil health. Our own AACD Technical Consultant, Dr. Lamar Smith, has analyzed and synthesized them for us here:

1. Keeping soil covered to reduce water loss, reduce soil temperature, and reduce erosion hazard. Water use efficiency on irrigated farmland can be improved by keeping as much plant cover and residue on the soil as possible. This reduces soil temperature and wind which reduces evaporation loss from the soil surface, a major source of water loss. On rangelands, also maintaining a good grass and litter cover reduces evaporation because it acts as a mulch on the soil surface. Reducing excessive cover of shrubs and trees can also increase water use efficiency by reducing the interception and transpiration losses of the woody plants and improving the distribution of litter and herbaceous cover over the soil surface.
2. Minimize soil disturbance by reducing tillage, moderate grazing, and proper application of pesticides and fertilizers. Tillage of croplands can adversely affect soil structure and increase compaction, both of which reduce the infiltration of water into the soil and the ability of the soil to store water available to plant roots. Reducing tillage by “no till” planting or by rotating amount crops can help to maintain soil structure and reduce compaction. Excessive grazing on rangelands can also damage soil structure by reducing plant and litter cover or treading. Excessive use of pesticides, fertilizer, or herbicides can also disturb soil fauna and chemical properties.
3. Increase diversity of plant life forms and growth patterns. Plants differ in their growth forms and patterns. For example, some are cool season plants, some are warm season; some have deep tap roots, some have shallower fibrous roots; some fix nitrogen; etc. Maintaining a diverse mixture of plant types and different growth patterns on rangeland contributes to the amount of forage, ground cover, and wildlife habitat produced and lengthens the period of nutritious forage availability, thus reducing supplemental feeding costs. On farmlands, rotating between row crops and cover crops, warm season and cool season crops, etc. can help to improve soil structure, reduce pest problems, and increase efficiency of fertilizer use.
4. Maintaining live plants to sustain soil organisms which contribute to soil health. Soil organisms such as bacteria, fungi, worms, and insects provide valuable functions in promoting good soil structure (i.e., water holding capacity), breaking down plant residues into organic matter, and conversion of soil chemicals into plant available nutrients. Many of these organisms depend on a year-round supply of living plant material to survive and function. Therefore, practices that maintain living plants on the soil to the extent possible will help to provide a healthy population of these organisms.
5. Integrating livestock grazing to help retain nutrients in the soil and reduce fertilizer need. Livestock grazing on rangelands is how these lands convert plants into high quality food for human consumption – this principle is a given for rangelands. On farmlands, the idea behind this principle is to use livestock to consume forage crops and/or crop residues on the land where it is

produced rather than harvesting the crop or residue and taking it off the land to feed animals in confinement. Grazing the animals on the croplands will return the nutrients and organic matter to the soil, thereby reducing nutrient and organic matter loss to the farmland. This practice will not be feasible on some of Arizona's croplands but may work in some cases.

Source material from NRCS ([click here](#)). By clicking on the individual links below, you can download pdf files for each Principle in their original source format:

[Soil Health: Principle 1 of 5](#)

[Soil Health Principle 2 of 5](#)

[Soil Health: Principle 3 of 5](#)

[Soil Health: Principle 4 of 5](#)

[Soil Health: Principle 5 of 5](#)