Soil Ponding: A Guide for Agricultural Producers

What Is Ponding?

Ponding occurs when soil receives more water than it can absorb (infiltrate). This can happen during periods of heavy rainfall, causing water to collect on the surface instead of soaking in. Such pooling often occurs in low-lying areas, resulting in puddles - 'ponds'.

Causes

Soil type influences drainage and ponding. Finer-textured soils, like clay, tend to hold more water but drain slowly, leading to increased chances of ponding. Coarser, sandy soils tend to hold less water but drain quickly, reducing chances of ponding. However, in all soil types, increased amounts of organic matter allows for better infiltration (less ponding) while compaction increases ponding (less infiltration).

Terrain topography, particularly slope, also plays a crucial role in determining where water accumulates, especially in concave areas where runoff can gather. Additionally, microtopography, such as small bumps or depressions, influences the flow of water across the landscape. In low-lying areas, water can rapidly accumulate in the soil, causing the surface to become still or stagnant if not managed effectively. This stagnant water remains in place without flowing or draining away, leading to issues like ponding, where water collects in pools on the surface.

Land management practices, particularly concerning soil compaction, significantly influence the occurrence of ponding on agricultural fields. Compacted soils, which have less pore space for water to move through and drain slowly, are more susceptible to ponding and runoff. This risk is heightened by practices like heavy machinery usage, which can worsen soil compaction and diminish the soil's ability to absorb and drain water efficiently. Alternatively, practices that increase soil organic matter, such as adding manure or incorporating crop residues, can improve soil structure, enhance pore space, and reduce the risks of ponding and runoff.

Consequences

Ponding, where water stands on the soil surface for a prolonged amount of time can harm plants and soil health. It displaces air pockets in the soil, depleting oxygen in as little as two to four days, resulting in oxygen deprived, stressed plants. Stagnant water worsens oxygen loss and promotes soil pathogens, attacking seeds and seedlings, slowing growth, and increasing disease risk.

Mitigation and Prevention

To prevent and mitigate ponding, it's crucial to focus on improving soil structure to enhance water infiltration. This can be done by emphasizing practices that are aligned with the regenerative principles that prioritize minimal disturbance and soil armor. Healthy soils, nurtured through practices like conservation tillage, retain moisture longer. By minimizing soil disturbance, conservation tillage promotes soil aggregation, preserving soil structure and enhancing its ability to absorb water efficiently.

Incorporating cover crops like tillage radishes further promotes soil health by increasing organic

matter and fostering beneficial microbial activity. Mulching or leaving crop residues in the field, another essential practice, acts as a protective layer, shielding the soil surface from erosive forces and reducing runoff.

When possible, planting flood-tolerant perennial species in areas that are prone to ponding is a great way to improve soil health and reduce the headaches of repeated crop failure/poor performance in these localized areas of the field. These integrated strategies work synergistically to enhance soil health, increase water holding capacity, and minimize the impacts of ponding and flooding on agricultural lands.

By adopting these regenerative practices, you can build soil resilience, reduce the need for external inputs, and cultivate sustainable farming systems that are better equipped to withstand extreme weather events and environmental challenges.

A quick observation to gauge soil health and water infiltration: Healthy soil should resemble chocolate cake, not chocolate pudding.

Sources:

1. BC Climate Change Adaptation Program. (2022). Landscape Level Approaches to Mitigate Flood Impacts for Farms & Ranches. https://www.bcclimatechangeadaptation.ca/library/farm flood-readiness-toolkit/
2. Beachman, T.J. (2020). Ponding, flooding early can set up disease problems later. Indiana Prairie Farmer. https://www.farmprogress.com/corn/ponding-flooding-early-can-set-up disease-problems-later
3. Midwestern Bio Ag. (n.d.). Effective Water Movement and Storage. https://www.midwesternbioag.com/stewardship/water/
4. Murphy, E. (2013). Ponding, plugging and pugging: How to care for wet spring soils. Oregon State University. https://extension.oregonstate.edu/crop-production/soil/ponding-plugging pugging-how-care-wet-spring-soils
5. Straffelini E, Cucchiaro S, Tarolli P. (2021). Mapping potential surface ponding in agriculture using UAV-SfM. Earth Surf. Process. Landforms. https://onlinelibrary.wiley.com/doi/full/10.1002/esp.5135
6. University of Missouri. (2020). Ponding creates potential for crop damage. https://www.agriculture.com/agronomy-insider/ponding-creates-potential-for-crop damage#:~:text=Low%2Dlying%20areas%20collect%20water,as%20it%20reaches%20field% 20capacity.