

EPSc 413 SP17 Homework #4 ANSWER KEY

1. Decomposition of plant debris

Black oak leaf litter has a high C:N ratio. The addition of this material would cause net loss of nitrogen from soil as microorganisms use up soil N to digest the litter. In contrast, the soybean residue has a low C:N ratio, which would favor a rapid increase in soil N levels.

2. Hydric soils

Describe two of the indicators of hydric soils shown in Lecture 15.

3. Aerobic versus anaerobic soils

Organic matter is produced in both settings at rates that depend on temperature and water availability. Rates of organic matter production and deposition tend to be higher in wetlands. Organic matter decomposes much more slowly in wetland soils because these lack oxygen. In a well-drained soil, multiple organisms, including fungi, earthworms, and bacteria, can digest organic matter, converting it to carbon dioxide, which then leaves the soil as a gas. In a wetland, this breakdown only occurs by the action of bacteria and archaea, which breakdown organic matter much more slowly in the absence of oxygen, producing both carbon dioxide and methane, which both leave the soil as gasses. Because organic matter is produced in wetlands at a similar or faster rate than in well-drained soils and because this organic matter breaks down much more slowly in wetlands, organic matter builds up in wetlands, producing thick O horizons.

4. Salt-affected soils

a.

Saline soil: High conductivity (meaning high total salt content), low SAR or ESP (meaning a low sodium content), $\text{pH} < 8.5$

Sodic soils: Low conductivity (meaning low total salt content), high SAR or ESP (meaning a high sodium content), $\text{pH} > 8.5$

Saline-sodic soils: High conductivity (meaning high total salt content), high SAR or ESP (meaning a high sodium content), $\text{pH} < 8.5$

b. Natric horizons are common to sodic soils and typically indicate sodic conditions.

c. Sodic soils tend to have a pH between 8.5 and 10. The high sodium content causes dispersion of soil colloids and poor aggregation, producing a poorly structured soil. The poor structure inhibits water flow, producing a low hydraulic conductivity and low infiltration rates. Many plants do not tolerate high pH conditions and high Na concentrations. However, the poor structuring of sodic soils and resulting low infiltration rates of water and air are often the major limitations on plant growth.