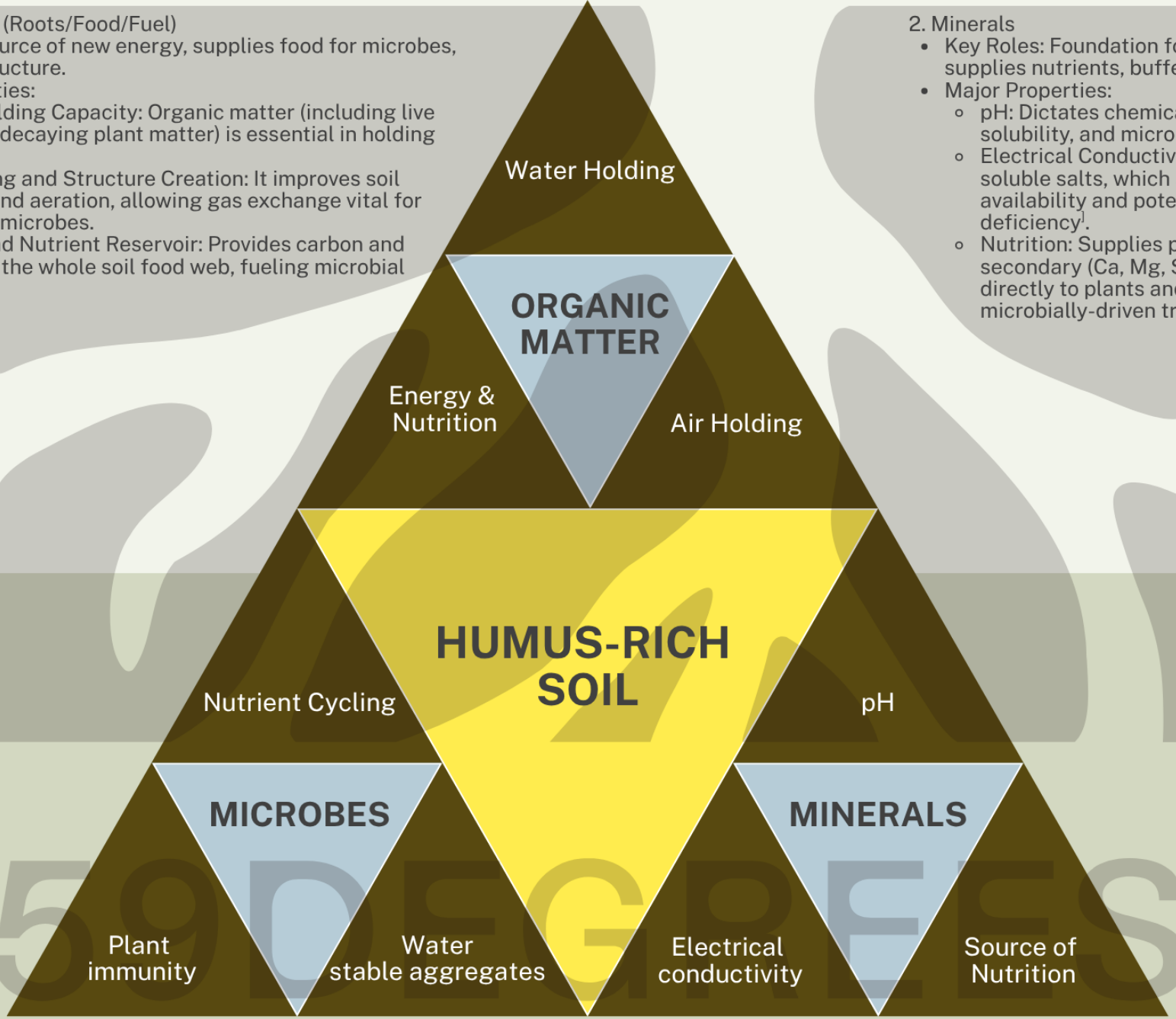
1. Organic Matter (Roots/Food/Fuel)
- Key Roles: Source of new energy, supplies food for microbes, builds soil structure.
- Major Properties:
  - Water-Holding Capacity: Organic matter (including live roots and decaying plant matter) is essential in holding water.
  - Air-Holding and Structure Creation: It improves soil porosity and aeration, allowing gas exchange vital for roots and microbes.
  - Energy and Nutrient Reservoir: Provides carbon and energy to the whole soil food web, fueling microbial activity.

2. Minerals
- Key Roles: Foundation for physical structure, supplies nutrients, buffers pH.
- Major Properties:
  - pH: Dictates chemical reactions, nutrient solubility, and microbial diversity[].
  - Electrical Conductivity (EC): Indicates total soluble salts, which affects nutrient availability and potential toxicity or deficiency[].
  - Nutrition: Supplies primary (N, P, K), secondary (Ca, Mg, S), and micronutrients directly to plants and indirectly through microbially-driven transformations[].



3. Microbes
- Key Roles: Drive nutrient cycling, organic matter breakdown, and symbiotic support for plants.
- Major Properties/Functions:
  - Nutrient Cycling: Microbes decompose organic matter, mineralize nutrients (N, P, S), solubilize minerals (e.g., releasing P and K), and fix atmospheric nitrogen making nutrients bioavailable.
  - Soil Structure: Microbial secretions (e.g., exopolysaccharides from bacteria, fungal hyphae) bind soil particles, aiding in aggregation and thus improving water retention, aeration, and root growth.
  - Disease Suppression and Symbiosis: Many microbes suppress pathogens and form symbiotic relationships with roots (mycorrhizae, rhizobia), further enhancing nutrient uptake and plant resilience.