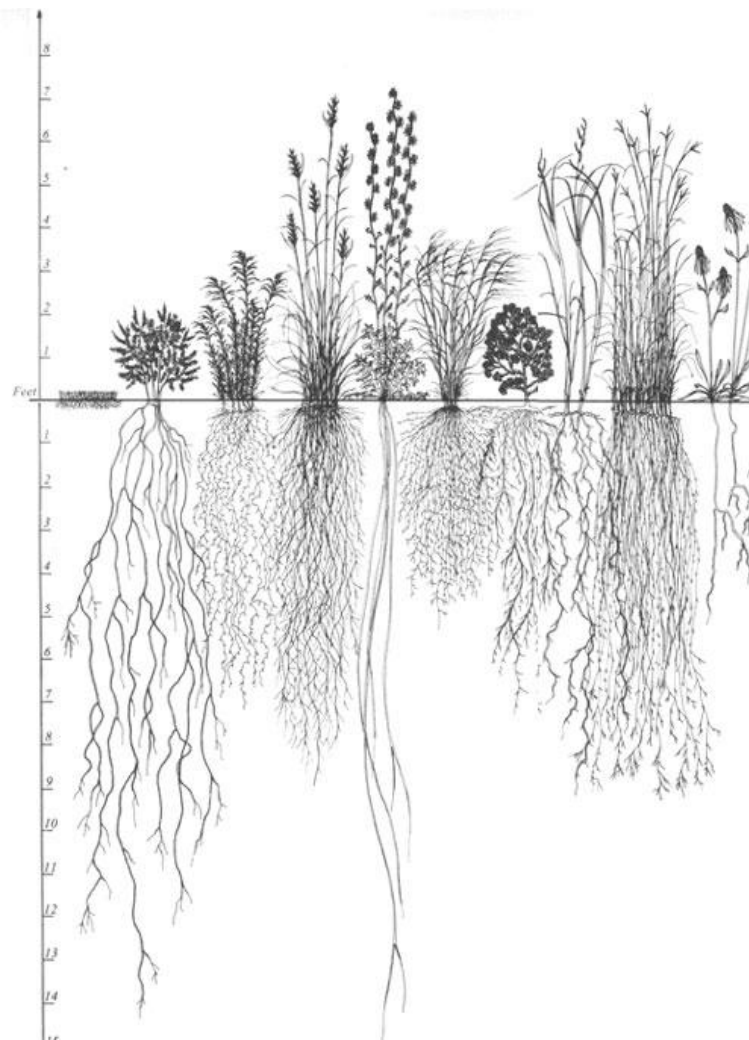




Carbon Sequestration

Grasslands

Prairie systems contain much more soil organic carbon than other ecosystems due to rooting characteristics of the vegetation that grows there. Globally, 34% of all carbon in terrestrial systems (vegetation and soils) is contained in grasslands. Unlike forests where vegetation is the primary store of carbon, grasslands store most carbon in the soil.



Deep Root System

Native grassland species have extensive root systems, some growing up to 15 feet deep. In fact, most of native grassland species' biomass is found belowground.

Grasslands dominated by native species store more carbon in soil than those dominated by non-native species. Native prairie species are known to have up to twice the deep root biomass than introduced species.¹

Deep root systems deposit carbon into deep soil layers, which is important because the rate of root decomposition decreases with soil depth.² Deep roots of native species are more likely to enter very stable carbon pools and leads to carbon accumulation.¹

Illustration by Heidi Natura of the Conservation Research Institute shows depth of root systems in various native plants.

Carbon Sequestration in Grasslands

Root Turnover

Each year as much as one half of a native prairie plant's root system dies and regenerates. This annual root turnover contributes large amounts of organic material to the soil system. Living roots also contribute organic material through exudation of carbohydrate-containing compounds and sloughing dead cells. All these root materials slowly decompose and eventually a portion is converted to soil organic carbon. Root-derived soil organic carbon is well protected against oxidation because it is buried deep in the soil profile.

Disturbance – a hindrance and a help

Disturbance, depending on the type, can either reduce or enhance soil organic carbon accumulation. Disturbance to prairie soils from tillage results in losses of soil organic carbon from oxidation to the atmosphere in the form of carbon dioxide. Some prairie soils have lost more than 50% of the soil organic matter as a result of breaking the sod and subsequent tillage for crop production. Soil organic carbon is protected from oxidation and release to the atmosphere when disturbance from tillage is eliminated.

Naturally occurring periodic fires increase the carbon storage of prairies. Fire, a natural disturbance to prairie systems, causes oxidation of organic carbon while simultaneously stimulating root growth and increasing organic matter additions to the soil. Fire results in a net gain of carbon to the soil system because enhanced root growth exceeds oxidative losses.

¹ Wilsey B.J. and H. Wayne Polley. *Oecologia* (2006) 150: 300-309

² Gill R.A. and I.C. Burke. *Plant and Soil* (2002) 241:233-242