Soils in the Athabasca Watershed

Soil is the thin layer on the earth's surface consisting of weathered mineral particles, organic materials, air, water and living organisms. Soil is the medium in which plants grow providing nutrients and water that are absorbed through plant roots. Thereby soil contributes to the regulation of water and atmospheric gases, which play an important role in climate regulation.

Soil is considered a non-renewable resource as one centimeter of soil can take hundreds to thousands of years to form from parent rock. Soils are central to human well being through the creation of food, fibers, fuel and medicinal products. Healthy soils absorb, store, purify and release water for plant growth and for fresh water supply. Soils buffer, filter and moderate the hydrological cycle thereby reducing the intensity of both droughts and flooding. Soils interact with the atmosphere through both absorption and emission of gases including carbon dioxide, methane and water vapor. There is twice as much organic carbon stored in soil than in vegetation.

Soil health is the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. Healthy soils are rich with soil organisms that help control insects, plant disease and pests as well as improve soil structure. Well structured soil recycles nutrients and increases water and nutrient holding capacity, which ultimately improves crop production. A healthy soil does not pollute the environment and mitigates climate change by maintaining or increasing its organic carbon content.

Soil degradation is the reduction in the capacity of soil to provide ecosystem goods and services. Soil degradation includes soil erosion, soil salinization, nutrient depletion and loss of soil biodiversity, loss of organic matter, soil compaction and soil pollution. Improvements in soil health such as reduced use of pesticides and more effective use of water can improve average crop yields.

Flooding on the Little Pine Creek, 2011, photo by Kyle Ashmead

The Intergovernmental Technical Panel on Soils of the Global Soil Partnership recommends providing the following to save our soils:

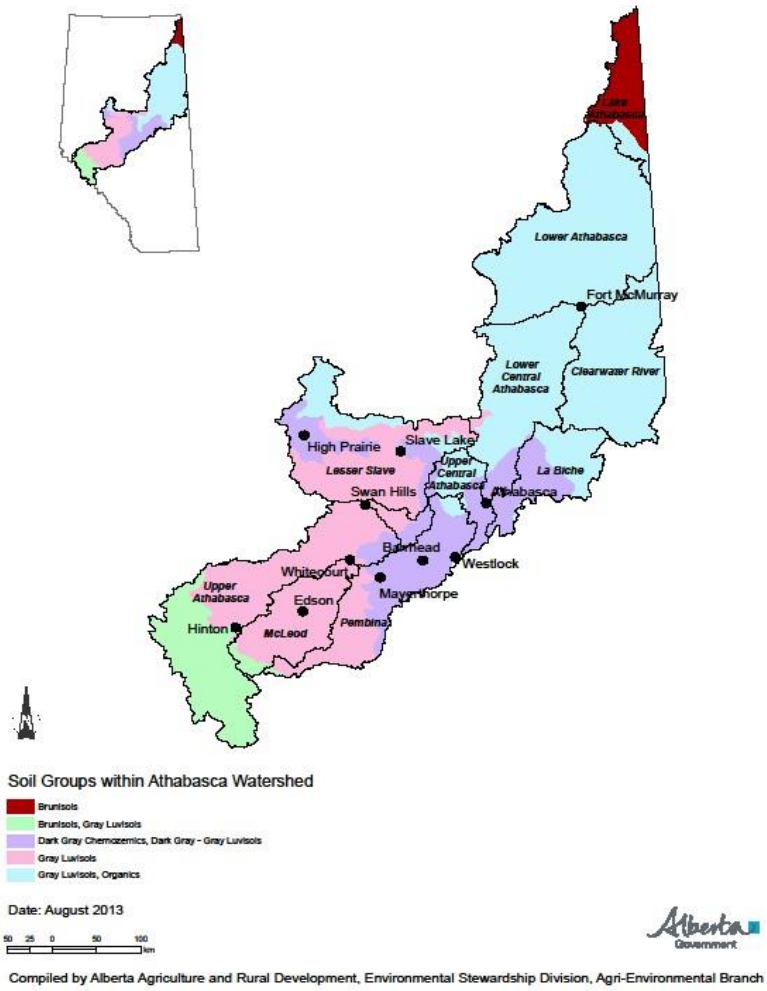
1. Suitable technologies
2. Sustainable, inclusive polices with:
- sustainable land management projects that include soil protection and reclamation
- economic value to actions that supply ecosystem services.
3. education systems with extension programs

"We must come to understand our past, our history, in terms of the soil and water and forest and grasses that have made it what it is." William Vogt, Road to Survival, 1948.

There are four soil groups within the Athabasca watershed:

Brunisols: occur in high elevation montane, sub-alpine and alpine areas as well as on the Canadian Shield. Thin soils, 2-15 cm and a limited frost-free period are a constraint to agricultural production.

Gray Luvisols: are soils with a rich organic matter layer occurring under boreal or mixed forests and in grassland–forest transition zones. Gray Luvisols develop under cool and moist climatic conditions. At the time of agricultural development, in western Canada the Frost Free Period was about 100 days. Recent data indicates a warmer and longer growing season. When cultivated, the generally silty, low organic matter luvisolic soils are of poor tilth and the cool climate areas limit the range of crops. Gray Luvisols can be improved by returning organic residues and manure to the soil and forage cropping.



Dark Gray-Gray Chernozems: Chernozemic soils are associated with grassland vegetation and are the most suitable group for agricultural production. Dark grays are developed in transition zones between grassland and forest vegetation. The nature of Chernozemic soils is largely determined by the accumulation of soil organic matter within the topsoil. Native grassland vegetation and climate mainly determine the amount and nature of organic matter within the soil. Plant material deposition below the ground in the grassland ecosystem has been the crucial factor whereby soil organic matter accumulates within Chernozemic soils.

Organics: Organic soils are the dominant wetland soils found in forested regions, they occur in wetlands throughout the boreal forest.Organic soils in this region are commonly called peat, bog, or fen soils. Organic soils form in wet conditions where the water table is at or near the surface or there is no drainage system of streams. The organic layer accumulates faster than it decomposes in the anaerobic conditions in which soil microorganisms do not function.

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