



Cover crops for Sustainable Agroecosystems

Grace Augustinowicz

YEAR 1

ANNUAL



SUMMER



**FALL
WINTER**



SUMMER



**FALL
WINTER**

YEAR 2

ANNUAL

YEAR 3

PERENNIAL



YEAR 4

PERENNIAL

YEAR 5

PERENNIAL



Are cover crops grasses, cereals, grains or legumes?

Rye

Botanical definition:

- Monocotyledonous plant of the family Gramineae

Function:

- grain, a cover crop and a forage crop
- flour, bread, beer, crispbread, some whiskeys, some vodkas, and animal fodder



Grass varieties

- Winter wheat, fall rye, sorghum

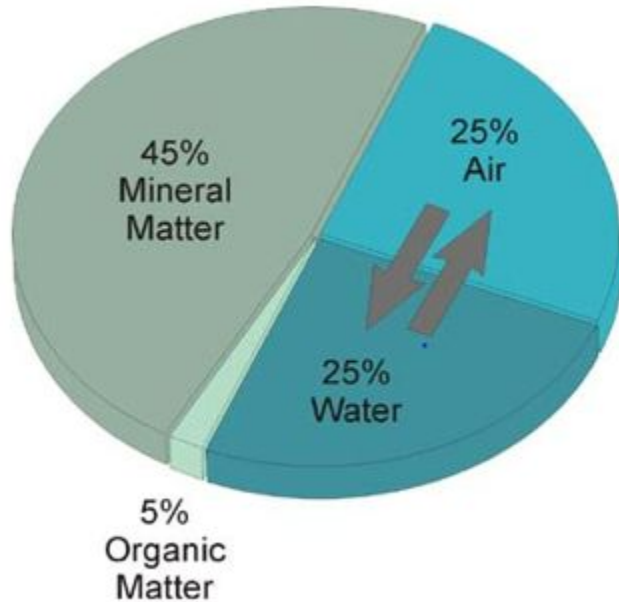
Non-grass varieties

- Buckwheat, oilseed radish, marigold, oats, millet

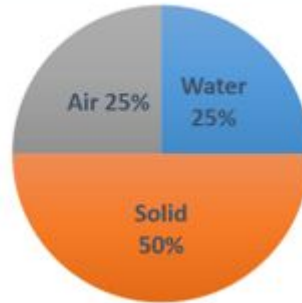
Legumes:

- Clover, vetch, alfalfa, peas

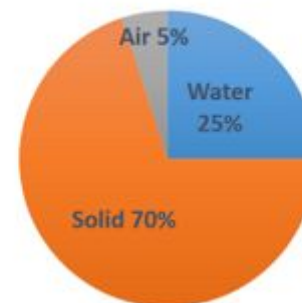
Function - Soil Health



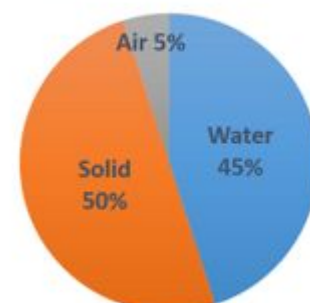
Good Plant Growing Conditions



Compacted Soil



Poorly Drained Soil



Source: Julie Wilson, UBC LFS SoilWeb 200/Soil Components/Soil Air. December 2013

Source: Leslie Dampier, UBC LFS SoilWeb 200/Soil Components

Soil Health - Soil Organic Matter

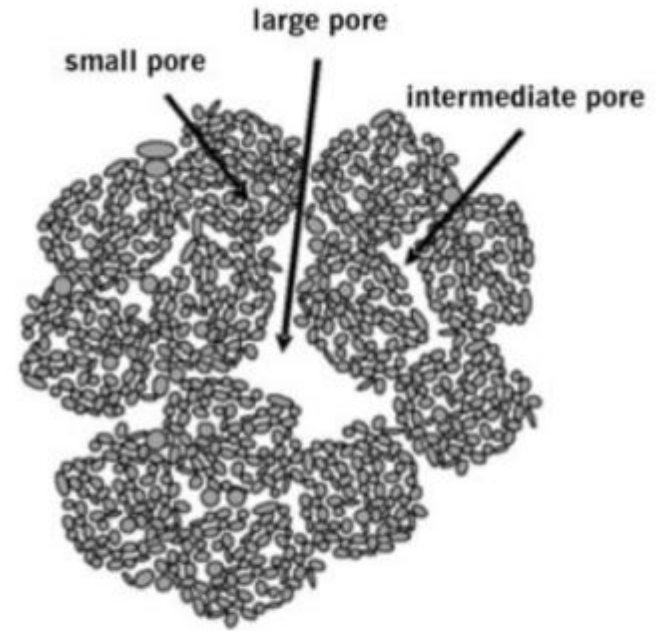


FIGURE 3.3 A soil aggregate or "crumb" with good tilth. Source: From reference 68. Used with permission.

Soil Health and cover crops

Cover crop are used to:

Increase and maintain percentage of organic matter in the soil

- Fall and some winter cover crops will die over the winter
- Farmers/gardeners incorporate overwintering cover crops into their soil in the spring ,
- Decompose, acting as green manure,
 - Used in combination with compost, manure, limestone, they help to build humus and returns nutrients back to the soil
 - Local source of soil amendments
 - Decreases the cost of soil amendments

Soil Health and cover crops

Enhance and maintain good soil structure

- Roots of cover crops break through the soil, increasing porosity and reducing soil compaction
- Provide habitat for soil microorganisms - organic matter
- Protect the soil from erosion and nutrient runoff
- Impede and slow down the establishment of weeds
- Help maintain soil moisture during the summer

Provide habitat for beneficial species, such as pollinators and pest predators

Used in orchards to manage and improve under canopy

Can be grown as food

- grains - set a section aside to learn about traditional harvesting practices, a loss art
- microgreens (Farmer to Farmer Podcast - Jack Algier from Stone Barns Center)

Great seed saving ambassadors - loss art

Look beautiful - multifunctionality of agriculture

Cover crops - Management practices

Can be planted alone, or in combination with other cover crops - mix

Fall/Winter

- Protects soil from erosion and runoff
- Provides habitat for wildlife
- Nutrient source

Spring

- Decrease weed establishment



Intercropped:

- Spring establishment of cover crops
- No-till
- Prevents weed establishment
- Keeps soil moisture
- If well managed, no competition with market crops



Cover crop planting and establishment in our region

- Augustinowicz, G. 2021, Assessing the impacts of agriculture on soil quality in a five-year-livestock rotation in the Fraser River delta, British Columbia, University of British Columbia.
- Bradbeer, D., Lansdorp, O., Travers, M., Jack, K., Halpin, L. 2012. Winter Cover Crops on the Fraser River Delta: 20 Years of Greenfields. Delta Farmland and Wildlife Trust.
- Hermawan, B. 1995. Soil structure associated with cover crops and grass leys in degraded lowland soils of Delta, University of British Columbia.
- Liu, A., Ma, B.L. & Bomke, A.A. 2005. Effects of Cover Crops on Soil Aggregate Stability, Total Organic Carbon, and Polysaccharides. Soil Science Society of America Journal, vol. 69, no. 6.
- Odhiambo, J., Temple, W., Bomke, A. 2012. Managing Cover Crops for Conservation Purposes in the Fraser River Delta, British Columbia, Crop Management, Cases and Tools for Higher Yield and Sustainability. Dr. Fabio Marin (Ed.), ISBN: 978-953-51-0068-3, InTech.

Cover crop management

1. Depending on the market crop, fall cover crops can be underseeded
2. Terminate fall/summer cover crops by:
 - Incorporating them into the soil, add compost, manure, limestone
 - Wait two to three weeks before starting your next crop

Termination must occur earlier in the season, and before seed production, as cover crops will compete with crops for nutrients, light, space and water

Allocate a portion to seed saving

Recommended cover crop varieties

Improve soil structure

- Grasses - large, fibrous networks
- Oilseed radish, no-till radish - tap root

Soil amendment - Nutrient source

- Legumes - fix atmospheric nitrogen
- Oilseed radish

Pollinators

- Vetch, clover, peas

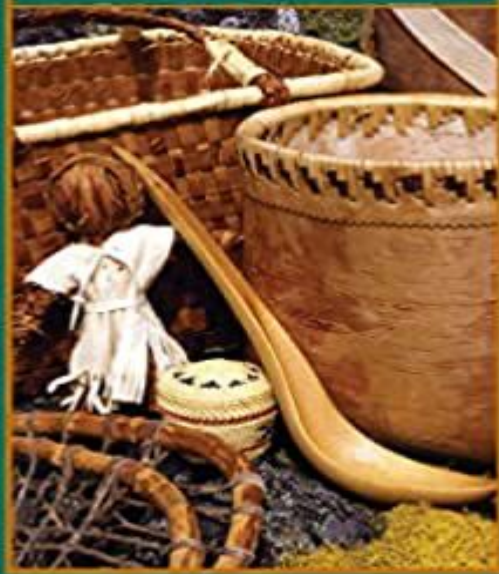
Sold as single varieties (fall rye) or a mix of varieties varieties (fall mix, spring mix, restoration mix, etc) - BC has one of the largest number of seed producers in NA

ROYAL BC MUSEUM HANDBOOK

PLANT TECHNOLOGY

OF FIRST PEOPLES IN BRITISH COLUMBIA

NANCY J. TURNER



Keeping It Living



*Traditions of Plant Use and Cultivation
on the Northwest Coast of North America*

Edited by DOUGLAS DEUR & NANCY J. TURNER

Land Use Changes in the Fraser River delta (1897 - 2018)

1827 to 1990 - Boyle et al., 1997

25% loss of forested areas

90% loss of wetlands

26% increase urban development and agriculture

1984 to 2018 – Paul et al., 2018

14% forested areas

25% wetlands



Photo: Delta Farmland and Wildlife Trust
n.d. History of Farming in Delta.



Photo: Delta Farmland and Wildlife Trust. n.d. History of Farming in Delta.

Photo left: Delta Archives, photograph #CR-133
2004-11-14)



Changes in land cover led to the gradual deterioration of soil quality

1943 to 1983 - Lower Fraser Basin

- 20% loss of SOM (Golding and Lavkulich, 1990)
- Bulk density increased between 26% and 58% (Golding and Lavkulich, 1990)

1984 to 2018 - Lower Fraser Valley

61% of the Fraser delta area studied by Paul et al. (2020) experienced SOC loss

Agricultural practices in the Fraser River delta

- Intense tillage, working the land when too wet or too dry (Neufield et al., 2017)
- Shift from livestock/crop to vegetable production (Odhiambo et al. 2012; Principe, 2002)



Delta BC, April 3, 2018



Delta BC, October 2, 2018

Regenerative agricultural practices in the delta

- Grassland set-asides (GLSA) (Lussier, 2018, Yates, 2014)



Photos: Delta Farmland and Wildlife Trust.



Photos: Delta Farmland and Wildlife Trust.

Winter Cover Crops on the Fraser River Delta: 20 Years of Greenfields

Delta Farmland & Wildlife Trust



"Promoting the preservation of farmland and associated wildlife habitat on the Fraser delta through sustainable farming and land stewardship"

*David Bradbeer, Olga Lansdorf,
Marc Travers, Kiara Jack,
Luke Holpin*

Resources

SARE - Sustainable Agriculture Research and Education (SARE) program

<https://www.sare.org/?s=cover+crops&custom-order=relevance&cat location%5B%5D=west&cat location%5B%5D=national&cat sare category%5B%5D=education-and-training&cat sare category%5B%5D=soil-management&cat sare category%5B%5D=sustainable-communities&re=1>

Western Cover Crop Council

<https://westerncovercrops.org/>

UBC LFS SoilWeb200: An Online Educational Tool

<http://soilweb200.landfood.ubc.ca/>

KPU ISFS Integrating hogs in a cover-vegetable rotation for healthy soils and humans

<https://www.kpu.ca/isfs/integrating-hogs-in-cover-vegetable-rotation>

Questions?

