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Advanced Soil Health Regeneration Practices

By: Jim Boak, Charles Lalonde, Rick Hendrix, Brian Market and Mary Ferguson

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Purpose

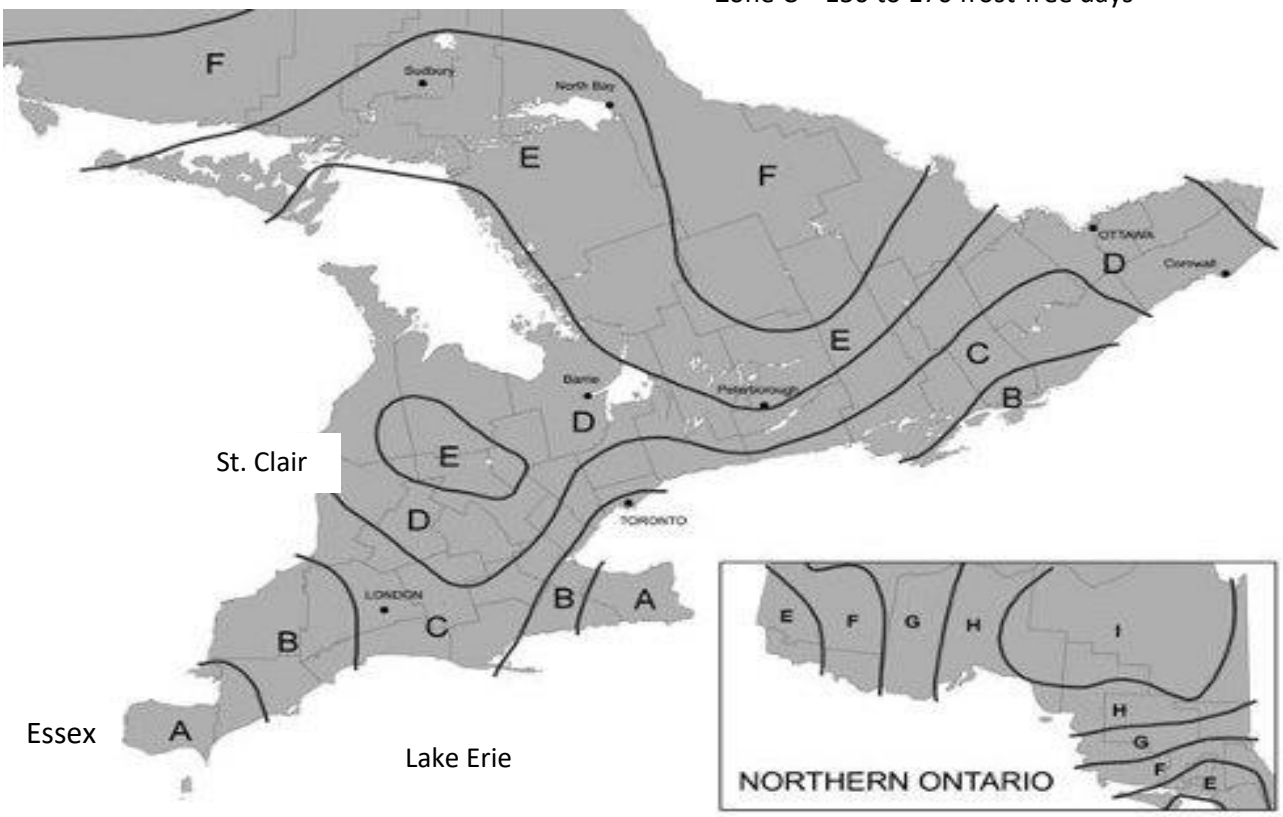
This document explores opportunities to better protect our water resources and extend living crops throughout the growing season that align with soil health management principles specifically in the southwestern Ontario region of the Great Lakes basin. The following is a technical overview on implementing alternative environmental and economically responsible practices.

The practices described in this document can be implemented anywhere in the Great Lakes basin. The soil map below outlines double-crop opportunities in Zones A, B and C.

Zone A - 170 to 190 frost-free days

Zone B – 160 to 170 frost-free days

Zone C – 150 to 170 frost-free days



Climate Zone Map of Ontario 1976 – 2005. Source: Weather Innovations Incorporated

Essex County is effectively an island. It is cradled by Lake St Clair, the Detroit River and Lake Erie. Erie and St Clair are shallow lakes and warm up more quickly and to a higher temperature than any of the other lakes in the Great Lakes basin. This allows for early spring planting conditions and a growing season that goes late into the fall. The average elevation is 200 meters above sea level which provides farmers with the longest growing season in the country, even longer than parts of Michigan, Indiana and Ohio. This allows farmers the opportunity to grow crops other than corn, soybeans and wheat, despite corn and soybeans being the preferred crops grown. Thus, Essex County farmers can grow a double crop of corn,

soybeans, buckwheat or sunflowers after an initial crop of wheat, rye, barley or oats and still have time to cover the soil after the second crop with a cover crop. The county is blessed with abundant sunlight and rainfall for two crops. Unfortunately, Essex County doesn't have the healthiest soil in the province because of the tradition-based practice of excessive tillage rather than strategic approaches. The result is valuable topsoil being flushed into drains and into Lake Erie, ultimately influencing the levels of phosphorus, sediment and the increased presence of harmful algal blooms each year.

Soil health in serious decline and our lakes are in serious trouble. What can we do to change? What are responsible options that can be implemented immediately?

Double-Cropping in Zones A, B and C

Logical double-crop opportunities are corn, soybeans and buckwheat. Equipment is readily available for planting, harvest, storage and handling. Winter cereals or oilseeds can be swathed near the end of June and planting can be done the same day in the swathed area. There are swathers that have side discharge capability which would allow the producer to plant 20', 30' or 40' cleared areas. The area covered by the dual swath is left to dry for combining and then baling. The additional advantage being that most of the weed seeds and small grains lost in threshing would be removed from the field. It would be quite normal to harvest 45 – 50 bu/acre soybeans and 120 bu/acre of second crop corn in Essex County if we were to implement swathing as part of a double-crop program.

Left picture: 35 bu/ac double-crop soybeans.
Right picture: Double-crop 2400 HU corn near Essex planted July 3, 2019, black layered September 26, 2019.

Innovative Soil Protection and Regeneration Methods

Inter-planting / inter-seeding

This is the practice of planting a companion crop between the rows of the commercial crop. Because there is plenty of moisture and sunlight, this practice is good for the soil while increasing the crop yield. This practice results in deep-rooted cover crops and allows for the option of pasturing livestock. Inter-seeding is a little easier to implement in corn than in soybeans because there is no risk of the inter-seeded crop interfering with harvest ability or grain quality. The practice also has the advantages of assisting with weed control, keeping the ground cooler in the hot season, reducing moisture evaporation and minimizing run-off during heavy rains. Broadcast seeding is not recommended unless using irrigation or, when you are following the applicator with a rotary harrow or row crop cultivator to lightly cover the

seeds. The equipment for this practice is readily available and can easily double as a nutrient side-dress applicator so only one field pass is required.

Benefits to the Soil

- Protects against soil erosion
- Reduces evaporation by keeping the soil cooler throughout the summer
- Builds organic matter
- Supports biodiversity

Essex County 2019

Relay Cropping

One of the definitions of relay cropping is the practice of planting a fall seeded crop before the spring planted crop is harvested (e.g. planting winter wheat or winter canola into soybeans). The practice is both simple and practical, requiring the same equipment used in side-dressing and inter-seeding with a few quick adjustments. Soybeans in 20”, 22.5” and 30” twin rows are best suited to this practice, allowing winter wheat and winter canola growers to get their fall seeded crops planted in time to minimize or even eliminate the risk of winterkill.

Benefits to the Soil

- Allows for earlier planting of the second crop
- Protects against winterkill

The interplant side-dress machine returns to plant a winter wheat or winter canola bio strip or a cover crop at mid-leaf drop, three weeks prior to harvest. The soil is well protected over the winter with a combination of crop residue and winter wheat or winter canola growth.

Bio Strip Planting

Bio strip planting is the practice of fall planting alternating strips of two crop species, one which will die during the winter from freezing temperatures and one which will survive. Spring crops are then planted into the "dead" strips. For example, planting parallel rows of oats, sunflowers or oilseed radish, which will die over winter, and be replaced with corn or soybeans in the spring. The alternating fall planted strips are seeded with cereal rye, vetch or clover which will survive the winter.

The practice of crimping the surviving cover crop can dramatically reduce the need for herbicide and protects the soil from wind, heavy rains and baking from the sun. Bio strip planting does NOT add significantly to capital and operating costs. The winter killed species blend can be broadcast incorporated with a fall fertilizer program then quickly incorporated with field cultivators, disc harrows, compact discs, etc. Following this field operation, the over-winter species can be planted in whichever row widths the planter is set up for. Seed drills and air seeders with the corresponding runs blocked off work well for this purpose.

Benefits to the Soil

- Increases the microbial activity in the soil
- Protects against soil erosion
- Promotes better weed control

Left picture: Two rows of an oat and radish blend at 7.5" spacing planted between two rows of cereal rye, vetch and winter peas at 7.5" spacing.
Right picture: Same basic layout as pictured on the left using sunflowers and peas as the winter kill species.

Green Planting

Green planting is the practice of no till planting into a fall planted or very early spring planted cover crop. Traditionally growers who have struggled with this method have chosen inappropriate species and set their population targets too high in the fall. The second hurdle is – over thinking the planting equipment. Cereal rye and triticale are the two safest species to start with. They can be seeded at 20 - 30 lb. per acre either broadcast incorporated or planted with a planter or no-till drill. If the green cover crop is heavy,

wait for it to head out before crimping, and then plant. With a light stand, the plants mature faster, the stems are thicker, and the ground is less shaded allowing you to plant first then crimp the cereal after the crop has emerged or shortly before emergence.

Living roots are the grocery store for our soil biome. Biomass matters – the greater the biomass, the greater the surface protection and improved capacity for soil nutrient cycling.

Benefits to the Soil

- Allows for earlier planting
- Increases biodiversity
- Minimizes compaction
- Reduces weed pressure and chemical use

Soybeans - If you get your stand of cereal rye at the right population you can crimp after you plant.

Crimper designs have been very well researched. Crimpers are not expensive and can in some cases, replace herbicides with the proper management. Green planting improves soil health and plant health dramatically. Run-off from heavy rains is virtually eliminated and soils are protected from the elements. The process starts in the fall and protects the soil through the six weeks of planting when surface coverage is minimal. You can start small and learn the ropes with green planting your drainage ditch borders, surface furrow drains and areas that should be protected by a grassed waterway.

Cover Crops

Planting a cover crop is one of the simplest, most effective soil health improvement practices of all time. There is a ton of free information available and the support level from the industry is unequivocal. Go to http://mccc.msu.edu/ for more information. Every acre of crop land should be cover cropped.

Benefits to the Soil

- Allows for earlier planting
- Increases biodiversity
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This oat pea mixture was grown after the harvest of forage sorghum, this crop was then harvested for forage and re-grew to make a fall cover, which left a perfect no till planting environment in the following spring.

Soil Loss

Farmers who fail to protect their field edges can expect soil loses of several tonnes each year. The loss of valuable soil reduces soil fertility and its water holding capacity. Edge of field losses are significant when the ditch bank is not protected by a buffer strip. Some of the pictures below are sadly, all-too-typical here in Ontario. This puts an environmental target on the backs of all farmers. It's time to voluntarily correct soil mismanagement now, before society demands nutrient application restrictions that affect profitability. Farmers can calculate their field soil losses at: https://www.ars.usda.gov/southeast-area/oxford-ms/national-sedimentation-laboratory/watershed-physical-processes-research/research/rusle2/revised-universal-soil-loss-equation-2-overview-of-rusle2/.


Examples of problem field conditions that are easily correctable.

In the above example, there is no environmental protection offered through vegetation. Typically, bare soil allows an average loss of 3 kg. of soil per 3 meters and carries herbicides and nutrients with it to the drainage ditch. Is 400 tonnes soil loss acceptable for these fields?

In Essex County only one farmer in ten has protected their drainage ditches and fields from soil loss and less than 25% of crop land is covered during the winter.


There is a right and wrong way of doing things.




Pictures 1 and 2 above (left to right) are typical examples from farms without protection.
Picture 3 shows an example of adequate bank buffers.
Picture 4 shows an excellent grassed waterway.

Author Contact Information

Name	*Email*	*Mobile*
Jim Boak	leadingedgefarmer@gmail.com	519-670-1004
Brian Market	BMDCN@hotmail.com	519-996-8665
Rick Hendrix	rick@hflfabricating.com	519-247-3806
Charles Lalonde	charles.lalonde73@gmail.com	519-993-0877
Mary Ferguson	mary.ferguson@rogers.com	519-841-4554

All photos are courtesy of Jim Boak.