Underground soil remedy

Testing strips of prairie grassland to improve crop production

Prairie grassland plays a role in many of the Edward Lowe Foundation's land stewardship initiatives, and about 300 acres at Big Rock Valley (BRV), its 2,000-acre campus in southwest Michigan, have been restored to this natural ecosystem. In one novel project, strips of prairie grassland are being tested as a tool for improving cropland.

Planting prairie grass along the edges of roadways and fields has become a popular way to control water runoff and prevent erosion, and researchers at Iowa State University have expanded on this idea by integrating prairie grass strips in contours and slopes of crop fields to reduce sediment movement. Going a step further, the foundation is experimenting with prairie conservation strips to revitalize the interior of agricultural fields.

"The vast majority of historical prairies were converted to cropland, because of the rich soil that was a result of the prairies," explains Jarod Reibel, the foundation's conservation stewardship land manager. "For the same reasons that prairies were turned into cropland, along with other benefits, we want use prairies to build up the soil naturally, essentially hitting the rewind button on the system."

In contrast to crops such as corn and soybeans that have relatively shallow roots, the roots of native prairie plants grow as deep as 15 feet — double the size of an NBA basketball player. This extensive underground system provides numerous benefits, such as:

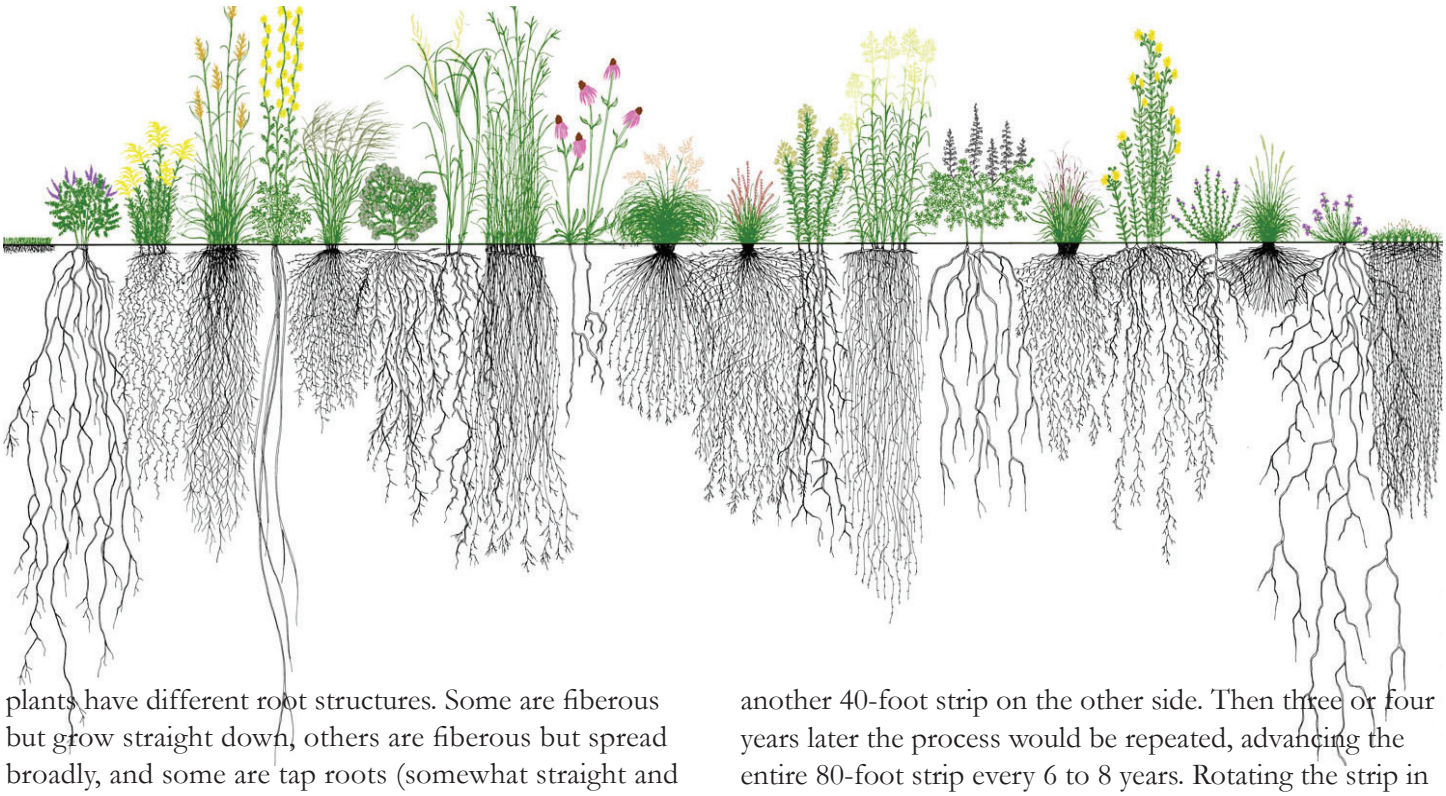
Shown in the foreground is an 80-foot strip of native prairie grass that has been planted in a crop field near the entrance to Big Rock Valley. Another strip can be seen in the distance on the far right.

- Increasing the soil's ability to absorb water, which not only reduces runoff and wet conditions, but also helps during droughts.
- Delivering more oxygen to soil, which increases organic matter.
- Helping control invasive weeds.
- Storing large amounts of carbon.

In addition to deep roots, longevity is another plus. Prairie grasslands are viable 365 days a year as opposed to the four- or five-month lifecycle of corn and soybeans.

"When you think of most row crop systems, fields are planted in the spring and harvested in the fall, which leaves a barren area for a portion of the year." Reibel says. "We don't completely understand all the benefits of prairies in this type of system, but prairies are an active system year-round. Their benefits likely apply to extending outward areas as well as the prairie strip itself."

The prairie strips at BRV are composed of many different plant species — up to 70 different varieties. That's important because different



plants have different root structures. Some are fiberous but grow straight down, others are fiberous but spread broadly, and some are tap roots (somewhat straight and thick). "The diversity of varieties creates a massive, solid, spaghetti-like root structure," explains Jay Suseland, the foundation's director of ground maintenance. "In contrast, because the crops are a monoculture, all of their roots tend to grow in the same direction in alignment with their respective rows."

Prairie strips in agricultural fields also pose numerous above-ground advantages. Because of the shading and potential snow retention offered by prairie strips, adjacent crops might produce higher yields. In addition, prairies harbor many important predator insects that can help control pest infestations in crops and reduce pesticide costs. The prairie strips also provide a travel corridor and habitat to wildlife.

In 2014 the foundation's land stewardship team began planting 80-foot strips of prairie within selected fields at BRV, leaving about 440 feet of cultivated cropland between the strips. "Our plan is to plow up these interior strips every 7 to 10 years and move them over to the next 80-foot section," says Suseland. "In the meantime, the strips of soil should become greatly enhanced and more productive."

The project still is in early days, and there are numerous questions to address, such as the methodology and frequency for rotating the prairie strips.

One idea is to plow half of the prairie strip after three or four years and return it to cropland — while starting another 40-foot strip on the other side. Then three or four years later the process would be repeated, advancing the entire 80-foot strip every 6 to 8 years. Rotating the strip in phases would give wildlife and beneficial insects time to relocate into the next strip that is being established.

"We are approaching the point where we'll work with researchers in order to study what has happened over time, and figure out how to rotate the strips without losing all of the progress that we've made, which will be a complex task," says Reibel. "We always talk about how to restore prairies, but no one really talks about how to pick up a prairie and move it more than 80 feet."

Another issue to consider is optimizing seed mix and its cost. Currently the foundation is testing two types of seed mixes: one with 70 species, and another with 20 species. The latter, with fewer species, is more cost-effective because the seeds aren't as expensive. Other economic factors to consider include the loss of income due to the acreage not being used for crops.

"We understand these prairie strips may not be economically sensible right away, but over time their environmental benefits coupled with the soil benefits could result in a boost in crop production," Reibel says. "The world's population will continue to increase, while the amount of land stays consistent, meaning we will need to feed more people with the same amount of space. Although we can continue to add large amounts of fertilizer to keep soil productive, the use of prairies may be one healthier alternative."

Illustration courtesy of Heidi Natura and the Conservation Research Institute