

An aerial photograph showing a lush green field on the left, a dense line of trees in the center, and a large field of crops (likely corn) on the right. A dirt road or path runs diagonally through the scene, separating the trees from the crops. The crops are arranged in neat rows, and the field is bordered by a line of trees. The overall scene is a mix of natural and agricultural landscapes.

Planting Hedgerows to Boost Biodiversity and Protect Crops

Laura Arneson Horn

Scientia

PLANTING HEDGEROWS TO BOOST BIODIVERSITY AND PROTECT CROPS

From a bird's eye view, farmlands are conspicuous. Unlike wildlands, swaths of agricultural fields form neat squares, fitting together in a landscape-sized jigsaw puzzle. The edges of the puzzle pieces stand out most: dark emerald lines contrasting against the light green interior crisscross across the land. These narrow, vegetated strips – or hedgerows – have been planted for centuries but are receiving renewed interest. Often referred to as 'living fences', hedgerows are buzzing communities that provide various ecosystem services. **Laura Arneson Horn**, the owner of Wild Bee Project in Salt Lake City, works to establish hedgerows and promote their positive impacts on native pollinators and other beneficial insects.

Ecosystem Services of Hedgerows

Hedgerows have been planted in Europe for hundreds of years to enclose animals and define farm boundaries. The narrow strips of woodland habitat are planted with woody trees and shrub species interspersed with herbaceous plants.

Although hedgerows were initially planted to delineate ownership boundaries and provide livestock boundaries and shelter, these edge habitats have been more recently recognised as essential ecosystems.

Hedgerows harbour tremendous biodiversity in a landscape often dominated by monoculture and managed lands. This is partly due to their intentional design – the interior woody, shaded habitat attracts forest-adapted animals and plants. At the same time, the outer, sunnier, herbaceous layer provides a niche for grassland species. Hedgerows have been shown to provide habitat for

hundreds of plants, insects, mammals and fungi that would otherwise be driven out of inhospitable farmland areas. All this activity translates below-ground to increased soil diversity.

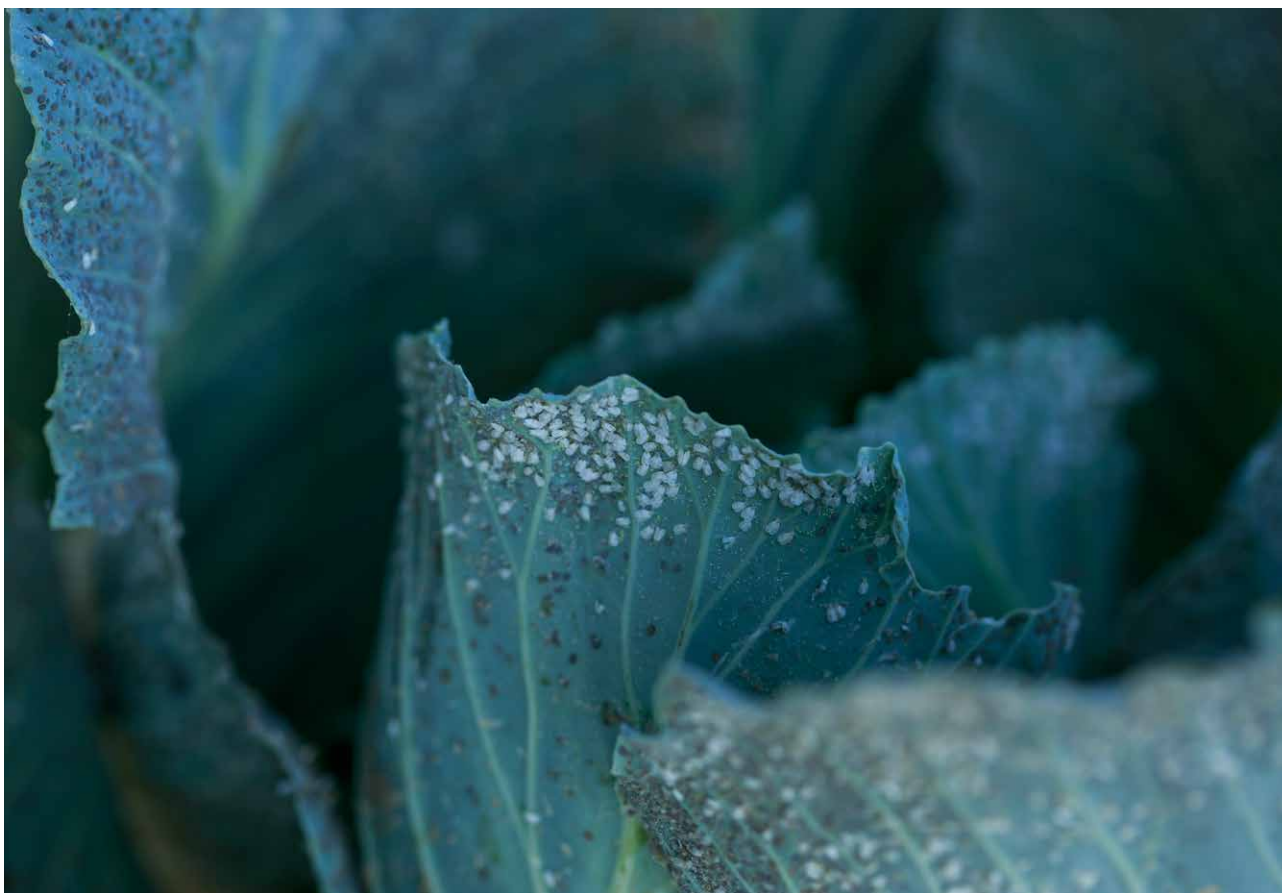
Beyond creating a biodiversity sink, hedgerows are well-known for connecting isolated, fragmented farms. They give refuge to species who either live near the farms or travel through.

By providing these ecosystem services, hedgerows indirectly work for the farmer. The diverse plant life in a hedgerow attracts pollinators such as wild bees, which also pollinate crops on nearby farms and improve farmers' yields. Bats, birds, and other insects are also drawn to hedgerows, where they predate on insect pests, reducing the need for farmers to manage pests by spraying chemical insecticides, which that can have devastating effects on the local environment.



Finally, these small slices of woodland can be substantial carbon sinks, helping to offset the greenhouse gas emissions associated with agriculture.

Because of their numerous benefits, planting diverse hedgerows on every farm seems like a no-brainer. To some extent, planting hedgerows in farm areas that did not traditionally have them – such as fields in central California – is becoming more common. However, hedgerows are not cheap and require significant maintenance,



including regular trimming and planting. Beyond the cost, some farmers fear that hedgerows might also attract unwanted animals, such as starlings, which may feed on the crop themselves.

Laura Horn, a conservationist in Salt Lake City and owner of the Wild Bee Project, understands both the benefits of hedgerows and the hesitancy of farmers. That is why she is working to help farmers plan, install, and maintain hedgerows. Beyond managing the nuts and bolts of hedgerow planting, she prioritises education, ensuring that the farmers perceive hedgerows as beneficial, motivating them to continue expanding hedgerows on their own.

Conservation Biological Control

Much of Horn's work at the Wild Bee Project focuses on 'conservation biological control', colloquially referred to as 'farmscaping', the practice of planting habitat on a farm to support pollinators and other beneficial insects that attack crop pests. In Horn's work, this habitat often takes the form of hedgerows.

In 2018, she started to investigate whether hedgerows could help to control the cabbage aphid. With more farmers in the region growing kale and brassica crops year-round to satisfy customer demand, cabbage aphid problems have increased. The cabbage aphid has a host of numerous natural enemies, making them an ideal candidate for a farmscape study.

To help Utah producers prevent more losses, Horn sought collaborations with farmers in the Salt Lake City area to investigate whether hedgerows could encourage beneficial insects to predate on cabbage aphids. In partnership with other local contractors, she aimed to establish aphid-control hedgerows at six farms and evaluate their potential to attract natural enemies of cabbage aphids.

Horn and her colleagues took a scientific approach: the team planted control plots at varying distances from hedgerows. This way, they could compare the control plots and established plots to evaluate whether hedgerows can reduce aphid damage to kale crops.

As usual, Horn also emphasised education. She designed three hedgerows to serve as demonstration sites to educate other local urban farmers. Throughout the project, the team also conducted cost-benefit analyses, to identify ways to lower the barrier to adopting conservation control practices such as planting hedgerows.

She visited six different sites and worked with the staff to identify the best hedgerow locations, and discussed the unique goals each farmer was hoping to address with a hedgerow. The project demanded creativity, as many of the farms were small and in urban areas, without large areas to dedicate to planting hedgerows.



By the end of the study's first year, Horn and her team successfully established six hedgerows at six different sites, with three of them acting as demonstration sites.

Hedgerow Planting 101

In the naturally arid and urban area surrounding Salt Lake City, Horn worked with farmers to select the most appropriate native species for their hedgerows, customising each one to the farm's goals, space, and resources.

Horn planted hedgerows adjacent to the greenhouse in one site, designing it to capture water runoff. The drought-tolerant mix of grasses, shrubs, and flowering perennials require very little maintenance, provide continuous food and shelter for beneficial insects and other wildlife, and are a source of herbs for the farm.

In another nearby farm, she planted a hedgerow adjacent to the growing area near an access road and irrigation ditch. At this site, the width of the hedgerow was severely limited, so the team planted columnar shrubs and bunchgrasses that could fit the narrow space and provide a windbreak and barrier to pest seeds that were carried by the wind.

Farmers at a historic farmhouse yard needed a hedgerow to serve one of its original functions – as a 'living fence' to enclose the garden. Horn worked with the farmers to pick modern cultivars of traditional shrubs, which aesthetically matched the historic farmhouse and provided a 'historic' hedgerow.

Collecting Data

In the two years following hedgerow planting, Horn and her team assessed the abundance of beneficial insects such as ladybugs, hoverflies and wasps on kale crops at four of the six study sites. The team also measured aphid infestation by counting the number of aphids per plant and surveying farmers to get an idea of aphid infestation levels pre-hedgerow planting.

Using this data, the researchers investigated whether kale planted closer to a hedgerow would experience less damage from cabbage aphids. In some farms, anecdotal evidence has suggested that kale planted directly adjacent to a hedgerow

experiences less severe aphid infestation than kale planted 15 metres away from a hedgerow. However, this was not the case at all the farms; in some situations, kale planted adjacent to hedgerows had similar levels of infestation as kale planted almost 30 metres from a hedgerow.

Many of Horn's observations have provided valuable insights into how best to install hedgerows in northern Utah. For example, Horn and her colleagues intentionally incorporated flowering perennials into the hedgerows to see if they would attract beneficial insects more than annuals.

'I found after a couple growing seasons that cool-season perennial grasses were the most practical foundation for a hedgerow in this arid region,' says Horn. 'Having a base row of grasses allows farmers to double their hedgerow area after two years by dividing plants, which is not true for shrubs or even most perennial flowering plants.'

She noted that the seeded annual flowers, such as cilantro and buckwheat, are more effective for attracting hoverflies, whose larvae predate on the cabbage aphid. These small hoverflies were found through mid-summer on most farms surveyed. While annual plants may directly provide the resources needed by beneficial insects, including pollen and nectar, perennials probably offer better shelter and wind protection, critical for hoverflies to move between plants.

The team's work is an important first step in cultivating and sustaining farmers' interest in hedgerows. 'Most farmers I worked with are able to maintain and expand their plantings over time as they saw fit, after receiving assistance with the initial plan and installation through my project,' Horn explains.

With more urban farmers in the region installing hedgerows, Horn and others will have more long-term data that may offer increased insight into the specific benefits hedgerows can provide in controlling crop pests.

Outreach

As part of the project, Horn gave multiple tours of the demonstration sites, workshops, and talks. One of the farms plans to double their hedgerows, while others lauded the benefits of their hedgerows. Horn continues to publish in extension newsletters targeted at farmers, where she describes the benefits of hedgerows and which plants work best on different farms.

Although the project did not show any scientific link between hedgerows and a reduction in cabbage aphid infestation, it succeeded greatly in forging new relationships and connections between urban farmers in Salt Lake City. Most importantly, many farmers now view a perceived economic benefit from the hedgerows, with many reporting that they will continue to expand their hedgerows into the future.



Meet the researcher

Laura Arneson Horn

Wild Bee Project

Salt Lake City, UT

USA

Laura Arneson Horn is a conservationist and owner of the Wild Bee Project, an organisation dedicated to helping vegetable farmers attract beneficial insects and increasing awareness of native wild bees. After receiving her MS in Biology from Utah State University in 2004, Horn spent a decade as an environmental specialist for a consulting firm in Utah. An avid bee-lover, she noticed a need for specialists who could consult with farmers to help attract native pollinators and beneficial insects. She started the Wild Bee Project in 2015 to address this need. Her work at the Wild Bee Project is broad, with outreach projects running alongside scientific studies primarily funded by federal grants. Horn has spearheaded projects to help farmers plan and execute natural pest control strategies, mainly through planting on-farm hedgerows. Horn also conducts talks and workshops to spread her love of the wild bees of northern Utah to farmers and enthusiasts alike.

CONTACT

E: wildbeeproject@gmail.com

IG: [@wildbeeproject](https://www.instagram.com/wildbeeproject)

W: <http://www.wildbeeproject.com/>

KEY COLLABORATORS

James Loomis, Green Phoenix Farm and Wasatch Community Gardens, Salt Lake City, UT

Kristin Kropp, Backyard Urban Garden Farms, Salt Lake City, UT

John Borski, Borski Farm, Kaysville, UT

Luke Petersen, Petersen Family Farm, Riverton, UT

FUNDING

Sustainable Agriculture Research and Education (SARE) program

FURTHER READING

LA Horn, Supporting Natural Enemies of the Cabbage Aphid with Hedgerow Plantings, Final Report for Grant OW18-007, Sustainable Agriculture Research and Education (SARE) 2021.

L Horn, Conservation Biological Control in Utah, Utah Pests Quarterly Newsletter, 2020, 14, 3-4.