LIVING WITH WEEDS

Putting Weeds into Ecological Context

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Roadside weeds at Grasslands National Park
Photo credit: Brenda Frick

INTRODUCTION

We have a love-hate relationship with weeds. On the one hand, we gather dandelions for our moms when we're toddlers; we make necklaces of horsetail when we're children; we throw cleavers at each other in adolescence. On the other hand, we learn the weed mantra: "see it, kill it" and we shame each other whenever a weed pops up above the crop in a neighbour's field.

Weed science tells us "a weed is a plant growing where it's not wanted". But this tells us that it's all about us – our wants, our perceptions. It doesn't tell us much about the weed. Instead we should consider what characteristics make a plant thrive untended in disturbed agro-ecosystems, and what roles these 'weeds' play in our agricultural ecosystems.

"Weeds are flowers, too, once you get to know them"

- Eeyore, A.A. Milne

Learning about weeds is a way of understanding the complex ecosystem of the farm. It allows us to more effectively manage, and to move past the fear-based relationship with nature, to a greater understanding and appreciation.

WHAT MAKES A PLANT WEEDY?

Typical weeds have a number of characteristics in common. Most importantly, they are the first responders after a disruption. Disturbances are common, even in natural systems – from gopher mounds to the hoof action of thousands of bison; there have always been areas that were stripped bare. Weeds assure that bare patches are short-lived; weeds green the world.

In agriculture we make a lot of disturbances. We knock back vegetation to provide a clean slate for our crops, and this is an invitation for weeds. If the crop won't fill that space, quickly and completely, the weeds will. By increasing the amount of disturbance across the landscape, we've increased the opportunity for weeds.

We've probably all seen them – the gaps where seeder passes don't quite meet. They burst forth with weeds. Figure 1 indicates an extreme example: in places where the seeder failed, the weeds did not. Where the crop was

Figure 1- Organic oat field near North Battleford, Saskatchewan. Left: seeder failure; right: successfully seeded oats bordering seeder miss

Photo credit: Brenda Frick

successfully seeded, you can see its tremendous ability to suppress the weeds.

How do weeds manage to fill these gaps? They need to have at least some of these characteristics:

1. They are able to disperse widely. Their seeds travel – by wind, by water, stuck to animals, inside animals, in hay, in equipment, in grain. Some of them have traveled with people as they migrate to new agricultural areas.

2. They are persistent. Many weeds have variable dormancy – they don't all germinate at once. This means that they can't all be controlled at once. Managing weeds is thus a perennial task, and sometimes they escape management.

3. Weeds are often highly productive – many produce abundant biomass. This contributes to their competitiveness. Most produce large numbers of seeds. Although their lives are often harsh, and most seeds die, some will survive and reproduce.

4. They are quick – quick to establish, quick to grow and take up space, quick to use resources, and quick to set seed. They are competitive even with the rapidly growing species we grow for crops.

5. They adjust and survive - Some weeds are all-purpose species. They adjust to the management practices used against them, adjusting emergence times, heights, nutrient use, and temperature and moisture requirements.

6. Some weeds have more than one means of spread – for instance the rhizomes of quack grass or the root buds of Canada thistle. This contributes to their potential to cover ground.

WEEDS ARE LIKE CROPS

Some of the similarities are obvious: oats, wild oats; tame mustard, wild mustard; tame buckwheat, wild buckwheat; quinoa, lamb's-quarters; millet, green foxtail; cow cockle, prairie carnation. Weeds not only resemble crops, they share history and ancestors. Many of our crops were domesticated from weeds. Weeds and crops have co-evolved. And of course, volunteer crops are often quite successful weeds. Volunteer canola for instance, was the 4th most abundant weed in Saskatchewan in the weed survey conducted in 2014-2015.

Crops also tend to share many of the characteristics of weeds: they are highly productive, they grow rapidly, and they are widespread and broadly adapted. The process of turning a weed into a crop is largely one of reducing dormancy and shattering. It is no wonder weeds and crops share a preference for similar habitats. When we create an environment for crops we are also creating an environment for weeds.

WEEDS ON ORGANIC FARMS

For the most part, the weeds seen on organic farms are the same weeds that are seen on non-organic farms in the same neighbourhood. The major factor that determines what sort of weeds are seen in a field is usually year – which probably means weather that year; and if perennial forages are included in the rotation.

That being said, weeds are often more abundant on organic farms. A single organic field is likely to have more individuals and more species than usually found in a single non-organic field. Weeds that are more likely to be seen in organic fields include wild mustard, lamb's-quarters, Canada thistle, bluebur, and redroot pigweed. For most of these, their reduced presence on non-organic farms at survey time is likely due to their strong susceptibility to herbicides.

WEEDS PROVIDE ECOSYSTEM SERVICES

Weeds green the landscape. Why is that important? Green cover protects the soil. Bare soil heats to extreme temperatures in the sun (think asphalt). By shading the ground, weeds create a more moist and habitable environment for organisms in and near the soil surface. Weed roots provide habitat and food for soil organisms involved in nutrient cycling. Weeds also provide resistance to the wind, reducing wind speed at the soil surface, evaporative moisture loss, and wind erosion.

By rooting in the soil, weeds stabilize the soil and reduce water erosion. Quack grass, with its extensive rhizomes, is used in reclamation, to stabilize soil along inclines, for instance. When weeds die, their roots provide channels for water infiltration.

Some weed species root deeply. For instance, Canada thistle roots can extend up to 2 m in depth and 5 m in diameter. The thistle extracts nutrients from depths unavailable to most crop plants. When the thistles are incorporated into the soil, those nutrients become available throughout the surface layers of the soil. Their roots can break up subsoil and improve drainage and aeration.

Weeds are also important food for wildlife from birds and beetles that eat seeds, to all manner of insect predators and pollinators and vertebrate grazers. Similarly, weed roots are important in supporting mycorrhizae, and other members of the soil food web.

WEEDS IN THE CROP

Weeds also provide a number of services to crops around them. A few wild oats in a lentil crop, for instance, can reduce wind damage, and help raise lower pods off the ground. Volunteer legumes can provide nitrogen to cereals crops; wild mustard can acidify the soil around its roots and thus improve phosphorus solubility.

Weeds in crops can help protect the crop from insect damage. Weeds can act as a catch or trap crop for insects, leading them away from the crop. Weeds at field edges can be mowed to provide fresh regrowth that is more attractive than the older crop, for instance. Many insects that are crop pests find their target crop by smell. Some weeds, such as yarrow, stinkweed, and bluebur have strong smells that mask the odour of the crop, making it hard for the pests to find the crop. Some insect pests are quite dependent on their target. The female fly of the canola root maggot, for instance, has a specific dance she performs when choosing a place to lay her eggs. If she lands on a canola plant after each of three successive flights, she lays her eggs. If any of those flights lands her on a different species, for instance, a weed in the canola field, she will fly away without laying her eggs.

Most weeds have small flowers. These provide a critical nectar source for a variety of beneficial insects such as predatory wasps, hoverflies and other desirable predatory insects. Weeds can also provide benefits by attracting and maintaining pollinators throughout the season. One study in northern Alberta suggested that if up to 30% of canola fields were replaced with natural vegetation, the increase in pollinators would overcome the decrease in canola acres, in terms of canola seed production.

WEEDS BENEFIT THE FARM

Weeds are a natural part of the farm ecosystem. They aren't going away, so perhaps it's better to learn to live with them. It's a matter of balance. Weeds that get ahead of the crop can cause yield reductions, and economic loss. Sometimes it's necessary to take action when weed number or vigour is overwhelming. Usually it's best not to let weeds go to seed. But a few short weeds in the understory are not much of a problem. A few weeds may be better than a bare patch, if you aren't planting a cover crop.

With livestock, again, it's a matter of balance. A few weed species can be toxic, but only a few, and generally only where they constitute a large proportion of the feed.

Weeds can provide a number of benefits as well, to the overall health of the farm. Weeds feed the soil, and protect it. Many weeds, especially dandelions, quack grass, and wild oats are excellent forage or green feed; kochia specifically has been baled for hay during dry years. Most weeds are tolerated in reasonable proportions in animal rations. Weeds can be grazed directly, either at the termination of weedy green manures, or during stubble-grazing. Stubble grazing is a particularly good way to reduce the potential for volunteer crops as weeds. Weed seeds collected at harvest can provide a viable market stream – organic feed, or they can be used directly on the farm as poultry or hog feed, once they have been through a hammer mill to kill them.

Many weeds are highly nutritious for people as well. Lamb's-quarters, dandelion, common chickweed, redroot pigweed, wild mustard, and shepherd's-purse, are used as greens; dandelions and pineapple weed, as flowers; plantains, wild oats, wild mustards, common mallow, as seeds; Canada thistle, quack grass, and cattails as shoots and goat's-beard, chicory, and dandelions as roots.

There is a long history of the use of many weeds as medicinals. Some of the more common medicinal weeds are shepherd's-purse, plantain, groundsel, dandelion, tansy, chickweed, mallow, yarrow, stinging nettle, purslane, and lamb's-quarters.

Weeds in the mustard family store oil in their seeds. Wild mustard and stinkweed offer the potential to use that oil for biodiesel. Stinkweed meal, left after crushing stinkweed seed for oil, is an effective herbicide, though its use in trials was limited to small areas.

Weeds can indicate soil conditions. For instance, foxtail barley suggests an alkali soil or salt accumulation; lady's-thumb a waterlogged soil. Lamb's-quarters can indicate phosphorus deficiency, whereas redroot pigweed suggests adequate phosphorus. Dandelions do poorly in soils low in potassium. Many other weed-nutrient interactions have been suggested, primarily for weeds outside our area. However, an abundance of a particular type of weed may be a signal that is time for a soil test or a change in management.

A final benefit of weeds is a bit more esoteric. Many weeds are beautiful: Canada thistle and monarch butterflies adorning needlepoint designs, goat's-beard seed heads and baby's breath captured in bouquets, tall stalks of dock decorating snow drifts, bluebur's delicate forget-me-not flowers; field bindweed's miniature morning-glories. And what of dandelions – the first flower of childhood and of spring, the mother's day flower?

Weeds are beautiful in character as well. They have much to teach about persistence and flexibility, and ultimately humility. They remind us that we are not completely in charge, and that nature is still alive and well.

SUMMARY – WEED ECOLOGY

Land that won't grow weeds, won't grow crops either. Weeds are a natural part of agro-ecosystems, filling in the gaps and covering ground. They provide benefits to soil; they deter pests; they take part in nutrient cycling. They provide feed, and if we are willing, food, medicine, beauty, and humility.

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