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Weeds [from *Encyclopedia of the Great Plains*]

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WEEDS

According to the U.S. Department of Agriculture, countless hours and millions of dollars are spent each year to control weeds, and millions more—hours and dollars—are lost in yield reductions. However, what exactly is a weed? And what makes a plant a weed? Many people are surprised to learn that a weed is technically “a plant out of place.” So

one person's weed can be someone else's salad green, pharmaceutical, transgenic crop, or wildflower!

What are the characteristics of plants that often grow out of place? One characteristic is a tendency to reach high numbers rapidly and to replace or slow the growth of more desirable plants. Traits allowing rapid population growth include early development, fast reproduction, and many long-lived seeds. Structures that aid dispersal often help weedy plants colonize far and wide. Finally, many weeds lack effective enemies, such as insects and diseases that reduce plant growth and reproduction.

Most of the economically important weeds in the Plains were introduced, with many coming from Eurasia; most arrived as contaminants of seed brought in to expand agriculture. While each list will be a little different, only a few plants really cause serious problems. Less than 1 percent of the plants listed in the *Flora of the Great Plains* are considered serious weeds, and only 1 percent or so of those are serious enough to be designated as legally noxious. Similar ratios have been found in other regions too, leading to the "tens rule." This rule states that, on average, one out of ten species that are introduced actually establish, and one out of those ten species escape into the wild, and then one out of the ten that escape become pests (0.1 percent).

Given the agricultural economy of the region, weedy plants have a special importance in the Great Plains. Plants that are good at competing with crops or forage plants in pastures and rangeland create problems. Some weeds can reduce crop yields dramatically, such as heavy stands of pennycress (*Thlaspi arvense* L.) in winter wheat or annual grasses like giant foxtail (*Setaria faberi* Herrm.) in row crops. Control of weeds in crops adds to the cost of food production. Plants that invade our gardens, lawns, and golf courses cause consternation, and their control can be expensive, economically and environmentally. Finally plants that invade native plant communities in parks, preserves, and natural roadside stands of prairie jeopardize natural heritage.

Options for reducing weed densities include mechanical, cultural, chemical, and biological methods. Each method has advantages and disadvantages. Mechanical methods include hand cutting and tilling. The advantages, including relatively low input costs, are balanced against disadvantages, such as the time and labor needed to cut weeds. Cultural methods involve reducing the weed's effects on desired plants by altering fertility, managing grass growth, or timing disturbances to suppress weed performance. The advantages are longer-term decreases in weed densities, while the disadvantages include a need for tighter planning and possibly added inputs. Chemical control involves spraying with selective or broad-spectrum herbicides. This has the advantages of speed and coverage but the disadvantages of chemical costs, increasing resistance of weeds, and environmental release of chemicals. Biological control involves the use of natural enemies to lower weed densities, either by intro-

ducing foreign or engineered species or by augmenting native enemies that feed on the weed. Here the advantages are persistence and low maintenance costs, while the disadvantages are more limited control and the risk of side effects to forage and native species. Integrated weed management programs combine methods that reduce weeds and enhance the growth of desired plants. Clearly the strategy that provides for effective limitation of weed density with the smallest economic and environmental cost is preferred.

Weed control does not necessarily mean extermination. Once a species is established it is usually impossible, or at least extremely expensive, to eradicate. Weed control is really a management issue. The issue is a challenging one, involving trade-offs and compromises. One compromise is increasing the tolerance for the presence of some noneconomic, non-environmentally threatening weeds. An indiscriminate "cure" can sometimes be worse than the problem, reducing multiple beneficial species along with the targeted pest plant species. This lesson was learned the hard way, when the side effects of broad-spectrum pesticides and generalist biocontrol agents became evident.

However, weedy species can be valuable as well. For example, some weeds contain chemical compounds of medicinal values (e.g., thistles), and many plant compounds have yet to be researched or used. Others contain genetic material with clues to effective pest control, drought tolerance, or growth acceleration. Still others are important for wildlife, and many contribute to our "feeling of nature" when outdoors. Economically useful weedy plants in the Plains include dandelion for greens, chamomile for tea, thistles for honeybees, and countless species for cover and soil retention. It is likely that researchers will find that wild weedy plants hold secrets to problems that have yet to be identified. So a weed is a potentially useful plant that is sometimes out of place and in the way. Knowing this can increase the ability to appreciate and use plants, while limiting their numbers where it really matters.

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