Lessons from the Weeds

If we keep our eyes and minds open, even weeds can teach us a thing or two about how to better manage our operations.

Story & photos by ***Ed Haag***

►Knapweed is associated with low phosphorous levels.

Invasive species may still be the yield-robbing bane of the conscientious producer but they can also be startlingly accurate indicators of what lurks beneath the surface.

It is hard to imagine weeds serving any other purpose than to drive a rancher to distraction, but Montana State University plant ecologist Bruce Maxwell has determined that emergence of specific weed infestations can be the first signs of problems caused by everything from mineral imbalances to unsound grazing practices.

"Weeds are generally species that have evolved to tolerate disturbances," Maxwell says. "They are the ultimate opportunists."

Joe DiTomaso, University of California–Davis weed specialist, agrees, pointing out that most of what we view as weed species have an uncanny ability to take advantage of even the slightest of changes. In his research he has observed major differences in the degree and type of weed infestation depending on the levels of nitrogen (N), the tillage practices, and previous crop rotations.

For both Maxwell and DiTomaso, knowing what conditions help specific weeds thrive can provide valuable clues to the root cause; and understanding why they flourish can lead to simple, cost-effective solutions.

"If a particular weed is starting to increase on your land over another one, then that means you are selecting for the conditions to allow that to show up," Maxwell says. "What a rancher should be thinking about is what weeds are increasing and how is that weed responding to soil conditions or farming practices."

DiTomaso admits that this is precisely what he does when he evaluates a weed infestation site.

"I will go out into the field and look at a situation and try to make an assessment of why the problem is there in the first place," he says, adding that this usually leads to two questions. "If I get rid of the weeds will they return? And how can I make this environment less vulnerable to future infestations?"

He adds, that as the cost of repeat herbicide treatments increases, this holistic approach to invasive species management has emerged as one of the premier approaches to weed science.

Harbingers of change

For Maxwell, one of the more common types of disturbances that could trigger an influx of weeds is a change in soil composition or condition. "For example, if purslane is starting to increase, that would indicate that you are probably building up your nitrogen," he says, cautioning that it is the influx of a particular weed that is the indicator and not necessarily the presence of the weed itself. "Just because it is there doesn't mean your practices are responsible. It might mean that field had a history of high nitrogen levels, so the weed got established."

Increasing levels of nitrogen can also encourage the spread of giant foxtail, velvet leaf and prostrate pigweed.

Depending on the circumstances, an influx of weeds can also point to the depletion of a particular mineral in the soil. "There are some indications that knapweed is associated with low phosphorous (P) levels," Maxwell says, adding that the remedy could involve introducing more of the mineral to the soil. "This would encourage other species that could compete with the knapweed."

For those ranchers concerned with changing salinity levels, Maxwell recommends close monitoring of a weed common in most parts of the country. "If there is a lot of kochia and no other weeds, then it is an indicator of salinity," he says. "It can tolerate higher salinity than a lot of other species."

While an emerging kochia population can be an indicator of increased salinity, more

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horsetails can be a precursor to a bout with hardpan or heavy soils. "Horsetail is usually found on clay ground in which you need to increase the tilth," Maxwell says.

For indications of soil deterioration on the surface Maxwell recommends looking to another plant. "Knotweed is a good indicator of surface compaction," he says. "You'll see it growing on tractor paths."

Solution often in the system

Because weeds are so adaptive, Maxwell believes repetitive farming practices can be particularly vulnerable to emerging infestations. In those situations the weeds become the indicators of a need to modify the system.

For ranchers relying on annual forage crops, this could be a problem. "The continuous use of warm-season annuals will encourage the spread of green foxtail," he says, adding that the weed indicator leads to the solution.

By planting a cold-season crop such as forage barley or winter wheat, the foxtail infestation can be controlled. "When the barley comes up early and establishes a canopy, you won't even see the foxtail."

Another example of how an emerging weed infestation functions as a wake-up call for change can be seen when the crop and harvesting technique remains the same year after year. These new infestations could provide a wake-up call for those producing and harvesting their own feedgrain.

"You are selecting for weed seeds that are small enough to go on through the system and out of the back of the combine rather than ending up in the hopper with the grain," Maxwell says, adding that it might be time to rotate into a perennial forage or at least an annual with a smaller seed.

Hold that water

Living and working in a state where water is at a premium, DiTomaso sees value in weeds that are indicators of excessive irrigation. He notes that the common California weed curlydock is one of those plants.

"When I see a pasture with a lot of curlydock, I right away think the rancher is either over-irrigating or the land is in a flood plane," DiTomaso says.

While curlydock is an indicator of excessive irrigation or flooding, Saltcedar (*Tamarix ramosissima*) is an indicator that a flooding regimen has been altered. "*Tamarix* tells us there is not the level of flooding there used to be," DiTomaso says.

He adds that there is some promising work being done to control *Tamarix* — an invasive weed that is considered the No. 1 consumer of badly needed water in the West — by restoring original water-release patterns to modified waterways.

Weeds as indicators of cattle preference

As Maxwell points out, repetitive farming practices that trigger weed infestations don't necessarily just involve planting and harvesting. The repetitive use of livestock too can precipitate a weed infestation. He uses as an example how the emergence of leafy spurge can be an indicator of overgrazing by cattle. Because cows have a distinct preference for grasses compared to broadleaf weeds, more spurge will survive grazing, thus increasing its population ratio over grasses.

No small problem, the economic effect of leafy spurge is staggering. Infestations in the Dakotas, Montana and Wyoming alone are estimated to cost agricultural producers and taxpayers $144 million per year in production losses, control expenses and other effects to the economy. Across North America, it is estimated that spurge has affected 2.7 million acres.

Historically, cattle ranchers are particularly vulnerable to the economic effect of spurge. When the plant's tissue is damaged, it emits a milky sap that irritates the skin and makes the plant unpalatable to cattle. Once a site reaches the 50% infestation level, cattle refuse to graze at all, making the land worthless to the rancher.

Wisdom in weeds heeded

While ranchers in the West have traditionally viewed spurge as a production robber, for Maxwell and his colleagues in weed science, it has emerged as a stellar example of how looking at an invasive plant as an indicator can lead to an extremely effective control program.

As a young researcher in Montana in the early 1980s, Maxwell was well aware of the spurge problems the owners of the 43,000-acre N-Bar Angus ranch were facing. At the time, almost 10% of the central Montana ranch's acreage was heavily infested with spurge. All efforts to control the infestation with herbicides proved to be a temporary fix at best.

While the owners of the N-Bar battled their spurge infestations, Pete Fay, livestock researcher at Montana State University, was conducting a unique feeding experiment involving sheep and spurge. For years, spurge had been considered toxic to sheep. Unconvinced that it actually harmed livestock, Fay's sheep-feeding studies proved that sheep could consume the notorious plant without side effects and that they actually preferred it to grasses and were able to gain weight on it.

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►**Above:** An emerging kochia population can be an indicator of increased salinity.

►**Below:** The appearance of curlydock usually means that a pasture is being overwatered.

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The experiment's unexpected results offered N-Bar's management team new hope in their ongoing war on spurge. If sheep could be successfully pastured on the ranch's infested acreage then it might offer local grasses the competitive edge in re-establishing themselves.

After consulting with Fay, the N-Bar owners asked a local sheep operator to try grazing a band of his animals on one of the N-Bar's numerous spurge sites. As Maxwell recalls, the initial on-ranch project proved a major success, with spurge being reduced and the lambs doing better on the weed than their counterparts did on conventional pasture.

By 1990 approximately 3,000 sheep were being pastured on the N-Bar's spurge-infested acreage. Initially, the older, more established infestations were grazed in a circular pattern so that disbursement allowed for each area to be grazed for several weeks, twice a year.

This system reduced the spurge plant density to the point cattle actually entered the infested areas and grazed on the grasses. In this way, the N-Bar's owners have successfully rotated sheep and cattle twice a season on land that was once considered useless for beef production.

As of 2002, when the ranch changed hands, the N-Bar was grazing about 4,000 ewe/lamb pairs and the number of gallons of herbicide it used for leafy spurge control had dropped from 500 gallons (gal.) per year in the early 1980s to 10 gal. after the year 2000.

For Maxwell, the success of the N-Bar's innovative dual-species spurge control program is, again, proof positive that if we are willing to keep our eyes and minds open, even weeds can teach us a thing or two about how to better manage our operations. AJ