From Forest Nursery Notes, Winter 2013

266. The spread offense against weeds. Peachey, E. Digger 56(2):41-45. 2012.

The spread offense against weeds

These tools will help growers combat weed shifts and resistance to herbicides

This is a solitary plant of *Conyza canadensis* (marestail) on a fence row, ready to distribute its wind-dispersed seeds. This species is becoming more prevalent in the Pacific Northwest. Scientists are concerned, because the weed has become glyphosate resistant in many areas of the United States.

By Ed Peachey

Weeds, like most organisms, respond to favorable environments. Given some space and time, they will quickly fill any void.

We can slow their expansion a number of ways, and the strategy used will depend on whether the attack is on annual or perennial weeds. In either case, the best defense is a good offense. And the best offense is one that makes sure that the selection pressures applied to weeds in your fields are spread among the weed management tools available.

I liken this strategy to the use of the "spread offense" in football. It is a popular strategy for West Coast teams, and it uses the entire width of the playing field.

Stopping seed production

The best offense for summer annual weeds is one that stops seed production. Many annual weeds, if left unguarded, will produce an abundance of seeds. Any practice that slows weed growth, or discourages successful establishment of seedlings, will help.

Cultivation and tillage can be used to remove weeds that have emerged, but cultivation is difficult to apply to the entire field. Escapees usually emerge around trees or shrubs.

Tillage also can be used to stimulate weed emergence and reduce the number of living weed seeds in the soil. Summer annual weeds such as pigweed, lambsquarters, knotweed, and particularly nightshade are very responsive to the changes in the soil caused by tillage. They often germinate very quickly after soil is tilled.

This strategy is very effective, but it requires that irrigation be available if rainfall is not forecasted, so that weed seeds have enough moisture to germinate.

Preemergence herbicides reduce weed emergence, but they do not affect

42 ▶

An ongoing series provided by
Oregon State University
in partnership with OAN

56(2):41-45


CURT KIPP

Cultivation and tillage is one strategy that nurseries can use to remove weeds that have emerged in the soil and stimulate weed emergence so the seeds can be removed from the soil.

the viability of weed seeds that remain in the soil and do not germinate. They only kill the seeds that have germinated, and that is usually a small fraction, perhaps 10 percent, of what is in the soil.

Starving perennial weeds

A good offensive strategy for perennial weeds restricts the amount of carbohydrate from leaves that is sent to roots or other storage tissues (tubers, rhizomes) in an attempt to starve the plant to death.

Again, cultivation or mechanical methods can be effective in reducing the number of leaves making food for the roots, but new shoots must be destroyed shortly after emergence from the soil, or carbohydrates will be sent to the roots below and prolong survival.

Burndown herbicides can also be

used. Translocated herbicides such as glyphosate, fluroxypyr and triclopyr (for broadleaf perennials), and clethodim or fluazifop (for perennial grasses) are by far the most effective on perennial weeds, but depending on the herbicide and weed of interest, timing can influence effectiveness.

Weed shifts

All of these weed control practices exert a certain selection pressure on weeds. Using the same practice over and over will naturally select for a set of weeds that tolerate that practice, whether it is cultivation, tillage or herbicides.

Weeds shifts will happen. However, herbicides present a unique situation because they often act on a specific biochemical site in the plant. Continual and exclusive use of the same herbicide will sometimes cause a weed shift simply because it is weak on a certain weed. The weed then produces seed, resulting in more of the same species and a population explosion.

Occasionally, use of the same herbicide over and over to control the same weed will select for a particular type of the weed that is resistant to the herbicide. In other words, you may have been able to kill a particular weed with the herbicide in the past, but now the same rates of this herbicide have very little effect.

This is a particular problem in annual weeds that depend on seed production to maintain their status. Perennial weeds are much less likely to develop resistance to herbicides than annual weeds because seed production is less important for their survival.

The primary concern with perennial weeds is simply weed shifts that can be caused by continued use of the same herbicide or practice over time.

There are a number of herbicide resistant species in the Pacific Northwest, and you may have noticed declining herbicide efficacy in some

44 ▶

of your fields. Weeds such as annual bluegrass may be resistant to herbicides used in grass seed production in the Willamette Valley, including diuron.

A particularly insidious resistance that should be avoided is glyphosate or Roundup resistance. The cost of glyphosate has dropped by more than 50 percent over the last two decades, which makes it tempting to rely on this herbicide exclusively. There are a number of species that have developed resistance to glyphosate, primarily where Roundup-ready soybeans and cotton are grown in other areas of the United States.

Marestail (*Conyza canadensis*) is resistant to glyphosate in many areas. We have seen more and more of this weed in the Pacific Northwest. It pops up along roadsides, in perennial crops, and in unattended areas.

Changing up your game

Rotation of selection pressures is the key to preventing unwanted weed species shifts. An integrated mix of physical and chemical methods will theoretically give the best results.

The same is true when using herbicides. Specific herbicide selection pressures can be rotated by alternating the modes of action used on a field.

It is important to become familiar with the different herbicide modes of action. There are several references are available that will help, including University of Idaho publication PNW 437, which you can find online at www.cals.uidaho.edu/edComm/pdf/pnw/pnw0437.pdf. Some herbicide containers now come with a number on the front of the container designating the mode of action.

There are some simple steps that can be taken to avoid glyphosate resistance. Obviously rotation of herbicides will help. Back off on the selection pressure exerted by glyphosate. Use other burndown herbicides, such as Rely.

Use of non-chemical methods such as cultivation, mulching, or flaming will significantly reduce selection pressure for glyphosate resistance.

If glyphosate must be used, say to manage more difficult perennial weeds, do not back off on the rate. Keep the rate high. Scouting should be used to monitor whether specific weeds are escaping glyphosate applications.

If you determine there are escapes, it is best to not apply a second application. Rather, use non-chemical means or herbicides with a different mode of action to kill these escapes so they cannot produce seeds.

Another option to slow development of glyphosate resistance is to use preemergence herbicides. Preemergence herbicides apply a selection pressure that is different than glyphosate, plus if there are plants that escape an herbicide application and produce seeds, the preemergence herbicide may knock out many of them, and prevent them from producing seeds later.

There are a number of preemergence herbicides that can be used in field grown nurseries. Each has specific plant species and situations where they can be used safely and effectively. Refer to the Pacific Northwest Weed Management Handbook (http://pnwhandbooks.org/weed/) for summaries of the herbicides currently labeled for use in nurseries.

Stretching the field of play

The most effective weed management strategies are those that alternate or rotate practices and spread out selection pressures over the weed management tools available. It is a matter of applying the right pressure at the right time so that weeds do not get a foothold.

Remember, however, that weeds adapt to favorable conditions very quickly, and that overuse of any practice can cause unwanted weed shifts, and in some cases development of plants that are resistant to herbicides.

Ed Peachey is an assistant professor, senior research at Oregon State University in Corvallis, Ore. He can be reached at peacheye@hort.oregonstate.edu.