



NORTHWEST CENTER FOR ALTERNATIVES TO PESTICIDES

This weed guide was built from a survey of farmers at the Grower's Own Organic Farming conference about the most troublesome weeds farmers have to deal with. There were a lot of weeds listed, but the overwhelming majority of people were fed up with these 4 weeds:

1. **Field Bindweed** (*Convolvulus arvensis* L.)
2. **Quackgrass** (*Elytrigia repens* (L.))
3. **Puncturevine** (aka Goathead) (*Tribulus terrestris*)
4. **Canada Thistle** (*Cirsium arvense* (L.) Scop.)

They are fearsome foes indeed, but the University Extension Offices of Western USA have a lot of good info we can arm ourselves with to fight them. I looked at Extension Office recommendations of Idaho and every neighboring state, did a little extra digging, and compiled all of the info into as cohesive of a guide as I could.

As I sifted through page upon page upon page of weed information, some patterns emerged between most of these weeds: mainly that their extensive root systems and the longevity of their seeds. Three of these four problematic plants will spread by rhizomes, roots have been found extending 30ft underground, and can grow back from fractions of an inch of a root. Some of these plant's seeds have been found to have multiple decades of longevity if stored well, but most of these seeds will last more like 5-10 years when in the soil. Digging several feet down and pulling out every single little bit of root isn't plausible, and even after that you'll have to play defense against any sprouting seeds who will try to create a root system as quickly as possible. Dealing with these weeds is not going to be a quick fix... it is a marathon, it is a siege, it is a long fight that is going to take years and need all of the tools in your toolbelt.

Let's look at some of these tools in general:

Timing - If the weed gets time to photosynthesize or, even worse, to go to seed, it is solidifying it's hold in your land. Hitting it early in the season, denying it the chance to accumulate resources, and taking action to hurt it and use up its resources are the general advice for attacking these perennial weeds with tenacious roots.

Tilling & Cultivating - A single tilling on it's own may actually help the weed, as it will cut up the roots into smaller bits that will each grow into their own plant if they are allowed to. Needs to be followed up with further tilling or other techniques. The aim is usually to pull the roots to the surface to dry them out and kill them before they can re-root.

Shade & Competition - Using grasses (like sudangrass, winter wheat, and others) and/or legumes (forage soybeans, peas, hairy vetch, and others) to create a canopy above the weed that shades it out can be very effective in fighting these weeds.

Grazing - Usually not the most effective, but animals eating the above ground growth (and sometimes below ground) is useful.

Biological Controls - Well-researched insects, bacteria, or fungi that can be released to feed upon and harm the weed. Usually not enough to kill these weeds on their own, but can weaken them and make it more susceptible to other practices.

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1. Field Bindweed (*Convolvulus arvensis* L.)

To attack bindweed, you need to be able to attack the roots: bindweed roots have been found 30ft underground, and they also have extensive lateral shoots. These roots make bindweed resilient to tilling as it can grow back from small chunks of root, definitely as small as 2 inches long. You can eventually exhaust the roots by continual plowing (every 12-14 days, ideally when drier out) for 2 to 4 seasons. This is a long time to not grow anything in a field and also is going to be very detrimental to the soil. Doing tilling on its own isn't a great plan. In fact, there is no one thing that is going to be a silver bullet for your bindweed woes. You are likely going to need several tactics to BEGIN to manage bindweed, much less fully control or eradicate it. Let's look at the tools available to you and how best to implement them:



Timing - The long term fight is against the energy stored in the roots. If you only attack at the end of the season, those leaves have collected a lot of energy that has been stored in and used to strengthen the roots. Hitting bindweed early in the year and denying it chances to photosynthesize is best.

Grazing - Grazing by sheep, cattle and chickens will suppress aboveground growth and thereby help deplete storage reserves in the roots. Pigs will grub out roots and rhizomes from the plow layer.

Biological Controls - There's a handful of potential biologicals that show potential, but the main ones that have been approved are Bindweed Gall Mites (*Aceria malherbae*) and Field Bindweed Moth (*Tyta luctuosa*). Neither of these will wipe out bindweed, but will damage it some. Best to introduce into a space with bindweed nearby that you aren't planning on messing with much (the farmer I talked to said his pasture worked great), creates a breeding ground for them to attack bindweed across your property from.

Tilling & Cultivating - After any cultivating and tilling, make sure to clean roots and stems from equipment before moving out of each bindweed patch to ensure you don't spread the bindweed around your land. If you ever have a chance in the field, hitting the roots with a tilling (like 6"), waiting for shoots to come up (12-14 days) and then cultivating in a way that removes shoots.

Shade & Competition - Bindweed doesn't like shade. If you can grow a plant that comes up early and creates a thick canopy (with 98% shade cover), some people have found that it can kill all shoots. This can be done with crops like winter grains, early planted spring grains, or forage soybeans; perennial grasses that form a so or bunch grasses planted closely with legumes; or cover crops like German millet, sudangrass, or overwintered rye. Here's a specific regime of cover cropping: "sequence of cover crops such as overwintered rye, oats plus peas, then buckwheat or sorghum-sudangrass, and finally overwintered rye plus hairy vetch, with disking before planting each cover crop, will suppress bindweed and prepare the field for a good vegetable crop."



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2. Quackgrass (*Elytrigia repens* (L.))

Quackgrass is tough to control for similar reasons to Bindweed: extensive root systems, that when chopped up can grow into more plants. A big difference is that Quackgrass roots are relatively shallow (under a foot) compared to bindweed's 30+ feet deep. Again, it doesn't provide a silver bullet on how to deal with quackgrass, but it does make some tactics (primarily tilling/cultivating) more effective. Let's take a look:

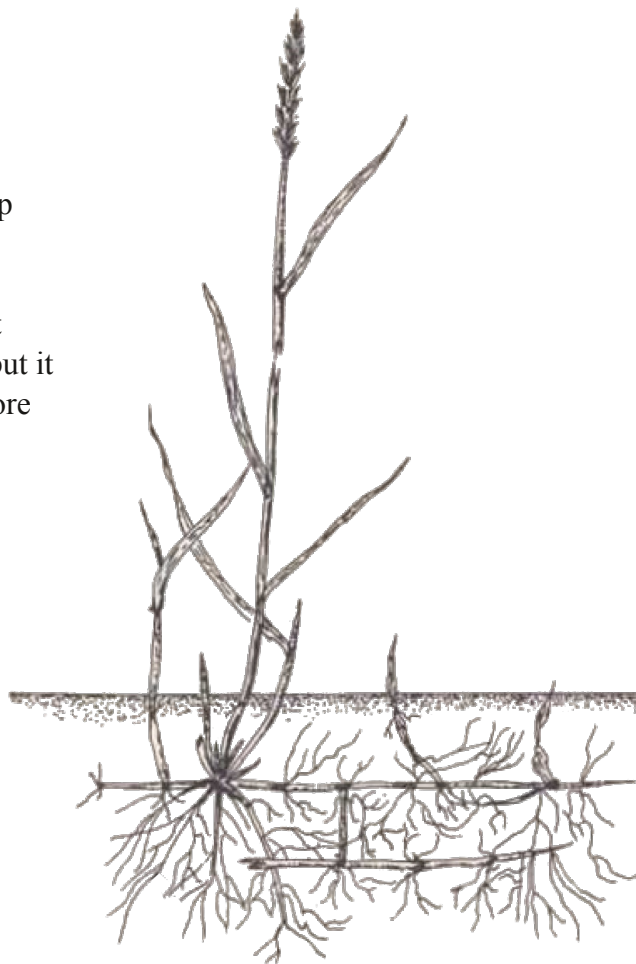
Tilling & Cultivating - The first tillage of the year should be aimed at cutting the rhizomes into the smallest pieces possible. Thus, beginning with rotary tillage or disking is more effective than moldboard or chisel plowing.

Tilling the soil with a chisel plow or field cultivator at the beginning of a dry period. The aim of the tillage is to loosen the soil around the rhizomes while leaving the rhizome pieces as long as possible. Then use a spring tooth harrow to work the rhizomes to the soil surface to dry. Use the harrow every few days to speed drying of the soil and bring more rhizomes to the surface so that most dry thoroughly before the next rain.

Beginning tillage immediately after harvest and preventing fall quackgrass growth is more important than repeated cultivations later in fall.

Grazing - Cattle, sheep and horses find quackgrass desirable forage. Pigs will grub out the rhizomes and eat them. Normal grazing often has minimal effect on quackgrass. It is difficult to significantly deplete the carbohydrate reserves stored in the extensive rhizome system.

Biological Controls - No approved biologicals (or biologicals in general) for quackgrass.



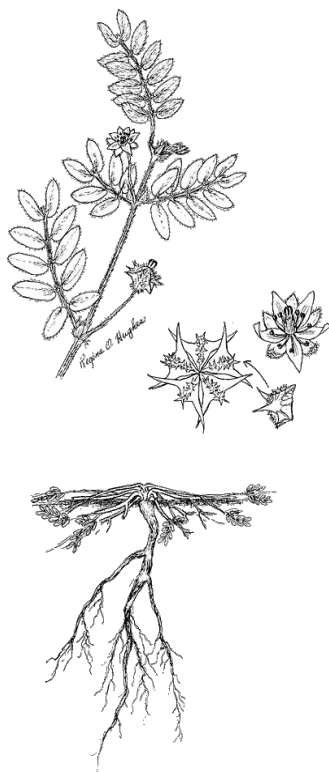
Timing - The long term fight is against the energy stored in the roots. If you only attack at the end of the season, those leaves have collected a lot of energy that has been stored in and used to strengthen the roots. Hitting quackgrass early in the year and denying it chances to photosynthesize is best.

Shade & Competition - Under-sown cover crops also have the potential to control quackgrass if they can attain growth of at least 900 pounds per acre. Interseeding red fescue with a winter wheat cash crop at planting will suppress quackgrass, whereas red clover can actually benefit rhizome production. A dense, vigorous stand of winter grain like wheat will competitively suppress quackgrass.



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3. **Puncturevine** (aka Goathead) (*Tribulus terrestris*)



This is the oddball of this publication: the only plant that doesn't aggressively spread by roots. But it is still a terror nonetheless, particularly for its spiky seedpods that can coat the bottom of a boot, injure animals, or cause a flat in a thin tire (like on a bicycle).

Prevention - If you find goathead seeds stuck in your shoe or some such, make sure to dispose of it in a way that makes it hard to reproduce (throw in trash, burn with fire, one of my friends chews it into paste and spits it on the ground). Same goes with a plant that's produced any burs, they are likely to have some viable seeds and will grow more plants if left on the land, even if fully uprooted.

Hand Tools - Puncturevine has a single taproot that can be pulled up by hand pretty easily, or can be cut up by hitting with a hoe. If the ground is hard and not all of the root is removed/dug up, it is possible for the plant to recover and grow more stems.

Tilling & Cultivation - Shallow tilling, 1 inch or less, can be used to control small plants in the spring (prior to flower and seed development). Tilling deeper in the soil may just bury seeds that will survive longer.

Shade & Competition - Areas with bare ground are ideal sites for puncturevine growth, even with only limited amounts of rainfall. To discourage puncturevine infestation, plant neglected areas with site appropriate plants, such as a desirable grass, along field borders.

Biological Controls - The puncturevine seed weevil (*Microlarinus lareynii*) and the puncturevine stem weevil (*Microlarinus lypriformis*) are two biocontrol agents that have been researched and approved for the biological control of puncturevine. Weevils contributed to the death of about one third to one half of puncturevine plants in research plots by late August, even when plants received supplemental irrigation.

Seed Removal - It is easiest to collect seeds after frost has killed the plants and the dry seeds can be vacuumed up with a shop vac or collected from the ground by pressing, dragging, or rolling pieces of old carpeting or some such material on the ground which will pick up the mature seeds. With several passes, most of the seed on the soil can be removed.

Grazing - For puncturevine, grazing is explicitly NOT recommended. It has toxins that can cause liver damage in ruminants, and in sheep specifically it can cause susceptibility to sun burns (especially on their face).

Timing - Puncturevine spreads mainly by seed, so the more you can attack it before it flowers or goes to seed, the better. All methods will need to be repeated as new seeds germinate during the year and for at least four years due to seed viability.



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4. Canada Thistle (*Cirsium arvense* (L.) Scop.)

Canada thistle's roots are somewhere between quackgrass and bindweed: don't go as deep as bindweed (30+ ft) but are more aggressive than quackgrass. Canada thistle's roots can go down 7+ ft, fragments larger than 0.1 inch or 0.05 ounces fresh weight will usually produce new plants, and smaller fragments may also if they are near the soil surface. Definitely a tough foe, but one we can still take down, let's see how:

Grazing - High intensity, low frequency grazing is most effective against Canada thistle.

Shade & Competition - Sudangrass and sorghum-sudan hybrids suppress Canada thistle. It usually doesn't completely outcompete the thistle, so mowing both the grass and thistle when Canada thistle is tall but not yet flowering will be needed. Alternatively to sudangrass, because alfalfa is mowed several times per year over a period of several years, this crop is very useful for managing Canada thistle.

Biological Controls - The only two biologicals that are approved for use are: Canada Thistle Gall Fly (*Urophora cardui*) & Canada Thistle Stem Weevil (*Hadroplontus litura* formerly *Ceutorhynchus litura*). Both cause small amount of damage, but are not incredibly effective at fighting an infestation of Canada thistle. Still in research is the use of the fungal pathogen *Puccinia punctiformis* (aka thistle rust). It lives as a systemic parasite in roots, and infected individuals develop dark red pustules on the leaves and stem, causing stem dwarfing and tissue death. The timing can be a bit tricky, but it is actually pretty easy and very safe to disperse it. You can find more info about thistle rust and how to propagate it from this Montana State University video: <https://www.youtube.com/watch?v=QukA6h3xFas>



Timing - The long term fight is against the energy stored in the roots. If you only attack at the end of the season, those leaves have collected a lot of energy that has been stored in and used to strengthen the roots. Hitting bindweed early in the year and denying it chances to photosynthesize is best.

Tilling & Cultivating - A single cultivation event increases and disperses the population of propagating rootstock, thereby increasing the abundance of this species, so multiple cultivations or integration with additional suppression tactics are required for control. Shoot emergence from root fragments decreases in early fall, but production of underground shoots continues, suggesting that fall tillage could still be effective for reducing reserves. Repeated removal of the shoots before they attain several leaves will exhaust the storage roots within two years and eliminate the weed. Several studies found a 21-day weeding schedule was optimal. Since buds on the roots will continue to sprout well into the fall, persistence is required.



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www.pesticide.org/western_weed_guide

Download it, print off more copies, and hand them out or email them to your friends! At this link you can also find a detailed list of sources and longer, more in-depth writings about each weed including identification, look alikes, introduction to the US/Idaho, and more.

*We hope this helps you sustainably
manage your weeds!*

