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Weed or Seed — Which Came First?

This title brings back memories of my days as a graduate student and the answerless questions posed to me by my instructors and graduate committee. Questions of this type were not to see if a student could talk his way into a knot of contradictions, although I can personally attest to that happening. Rather, the question (in this case — the title) was intended to pique the reader's interest in this fascinating aspect of weed ecology so that the lessons can be applied to managing weeds.

Weeds are propagated by seed (annuals and perennials) or vegetative structures (perennials). For our purposes, I will limit the discussion to seeds, although much of the information is generally applicable to perennial weeds as well. Annual weeds flower and produce seed — lots of seed. A single pigweed can produce approximately 200,000 seeds. A large number of weeds in a food plot will produce astronomical numbers of seed. Some weeds produce large numbers of tiny seed (pigweeds, annual ragweed, lambsquarters, and crabgrass), while other species produce fewer seed that are bigger in size (morning glories, cocklebur, and sicklepod/coffeeweed). Some of the weed seed become diseased or fall victim to predation by insects or animals, while others leave the area transported by animals, wind, rainfall, or human activities. Of course, weed seed enter the area the same way — a constant flow in and out. Seed entering the soil profile may remain dormant for an extended period of time, until specific environmental conditions unlock the code for germination. The dormancy code is unique to the genetics of the weed species. Add agricultural practices and environmental conditions to the effects of the genetic code and it is easy to see why weed seed dormancy is a complicated topic.

WEEDS SHOWING UP IN UNEXPECTED PLACES

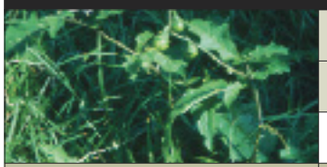
To begin this discussion, consider land use patterns. It is safe to say that most of the hunting sites where food plots are apt to be located have been plowed and planted to crops at some point in the last 300 years (during which the North American continent was being settled). While a potential food plot site may be nestled in the middle of a mature forest, the site probably was not always a mature forest. During the process of old field succession from a cultivated field to a forest, the types and numbers of plants changed with each species producing seed and contributing to the seedbank. Of the weed seed produced, most are lost during the first four years. The surviving seed can move downward into the soil profile through naturally occurring cracks or fissures in the soil, animal burrows, or earthworm tunnels. Buried seed, in the absence of oxygen and light, can remain dormant for years. An extreme example is the discovery of viable lupine seed buried for 10,000 years in the permafrost of Yukon Territory in Canada. Of relevance to our interest, refer to Table 1 that lists viability of many common weed seeds in controlled burial experiments. It is easy to see why weeds appear out of nowhere the minute a harrow slices into the soil.

Use whatever means are available to deplete the seedbank and prevent weeds from producing seed. This strategy pays in food plots by giving us a chance to control troublesome weeds, some of which have few control options.

DEPLETING WEED SEED

The dormant weed seed are there in the soil — waiting for the correct temperature, oxygen level, and exposure to light. You can count on it. Based on what I previously outlined, it would be prudent to count on a weed explosion as soon as the site is cleared and tilled. An important strategy used to partially deplete numbers of viable weed seed is the use of stale seedbed tillage before planting. This is a proactive approach, initiated several weeks or months before seeding the forage. Shallow and thorough tillage with a disk harrow or power tiller simultaneously kills weed seedlings and stimulates

TABLE 1. WEED SEED VIABILITY AFTER BURIAL IN NEBRASKA[1]



	Years of burial when seed were exhumed				
	0	2	6	12	17
	Germination (%)				
Barnyardgrass	17	58	9	2	0
Large crabgrass	12	45	1	0	0
Yellow foxtail	94	85	56	9	0
Cocklebur	10	59	37	0	1
Lambsquarters	28	35	14	16	7
Jimsonweed	93	93	88	95	90
Redroot pigweed	66	38	9	7	1
Tall waterhemp	40	39	0	14	1
Velvetleaf	15	27	60	29	35
Common mullein	98	88	90	90	95
Musk thistle	44	36	23	0	0
Canada thistle	60	29	25	17	7
Curly dock	76	93	94	73	61
Hemp dogbane	74	13	1	0	0
Horsenettle	0	7	6	4	5
Ivyleaf morning glory	69	10	6	6	3

[1]Burnside, O. C., R. G. Wilson, S. Weisberg, and K. G. Hubbard. 1996. Seed longevity of 41 weed species buried 17 years in eastern and western Nebraska. Weed Sci. 44:74-86.

another flush of weeds. Repeating the process again in two weeks controls the emerged weeds and stimulates another batch to germinate. An aggressive program of this type repeated several times at two-week intervals greatly reduces the weed seedbank in the plow layer. The keys are aggressive tillage that pulverizes the soil and fastidiously adhering to the two-week intervals of repetition. Other production practices, such as incorporating lime and fertilizer, can be combined with the stale seedbed tillage to increase efficiency.

The stale seedbed tillage approach is generally more effective in weed seed depletion than using fallow applications of glyphosate (Roundup and generics). Both fallow tillage and glyphosate kill weeds, but tillage stimulates another flush of weed emergence and glyphosate does not. After all, the intent of this broad strategy is to deplete weed seed in the plow layer by using exhaustive germination. This does not mean that fallow applications of glyphosate should be shelved. Fallow applications of glyphosate are a key component in the management of perennial weeds such as briars, bramble, poison ivy, common bermudagrass, and quackgrass. A reasonable approach is to integrate a fallow glyphosate application with the fallow tillage regime. Neither approach to managing stale seedbeds is mutually exclusive.

There are advocates of no-till food plots that use specialized grain drills to plant forages with minimal soil disturbance. In fact, farmers routinely over-seed dormant perennial forage grasses with cool-season grasses or clover to provide winter grazing for livestock. Advocates of no-till question the wisdom of using stale seedbed tillage to deplete the weed seedbank since tillage might stimulate even more weed seed than if left non-disturbed (non-tilled). I cannot argue their logic. However, research has shown that tillage is capable of burying 80 percent of the weed seed located near the soil surface, but returns only 38 percent back to the soil surface when tilled again. The point here is that more weed seed are buried than retrieved — a net reduction in weed seeds when tilled. In contrast, sustained no-till crop production causes a rapid build-up of viable weed seeds in the shallow layers of the soil, all primed for rapid germination and emergence. No-till food plots have a role where weed populations have been previously reduced by intensive weed management, but not in cases where food plots are located on "new ground."

PREVENTING WEED SEED PRODUCTION

In order to make significant progress in depleting the weed seedbank, preventing weed seed production needs to be a high priority. Nebraska studies showed that intensive weed control for six seasons in corn, which included no weed seed production, reduced the number of weed seed in the soil by 98 percent. Weeds are not very forgiving because in the same study, it took only three years of poor weed control before weed seed numbers rebounded to within half of the original density.

Many years ago, I had the pleasure of meeting a very successful 'old school' farmer in southeastern Georgia who understood the value of not allowing weeds to produce seed. For several decades, entire fields were scoured for weeds that escaped earlier control efforts before they went to seed. Fallow land was routinely tilled to prevent weeds from producing seed. The end result on his family farm was excellent weed control with few herbicide inputs. These principles have direct application in food plots. Use whatever means are available to deplete the seedbank and prevent weeds from producing seed. This strategy pays in food plots by giving us a chance to control troublesome weeds, some of which have few control options.

If you are ever asked: Which came first the weed or the seed? Now you might know the answer—along with more information than you probably cared to know.

ARE THERE WEED SEEDS IN POULTRY MANURE?

With recent surges in the price of synthetic fertilizers, poultry litter is being touted as an alternative fertilizer source for food plots. Poultry litter, whether raw or composted, is indeed an excellent fertilizer. A recurring question is why weed problems are worse when poultry litter is used as a fertilizer. Casual comments suggest that weed seed are present in poultry litter. Research has shown that poultry litter is basically free of weed seed contaminants. However, poultry litter stimulates germination and emergence of weeds already present in the soil. The relationship between weeds and poultry litter will be discussed in detail in the next issue of *The Whitetail News.*