Forage News

MISSISSIPPI STATE UNIVERSITY EXTENSION
Center for Forage Management and Environmental Stewardship

# Can Weeds Be Environmental Indicators in Forage Systems?

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In forage systems, weed control is not always motivated by potential profit. Weeds can cause high economic, social and environmental cost in forage systems. They cost Mississippi farmers over $1.5 million a year. Weeds impact forage yields, lower the nutritional quality of a forage stand, and impact animal health through toxicity or cause physical damage through thorns or spines. For example, an average weed infestation may be expected to reduce hay yields by 10 to 15 %. That could translate in a loss of $14 to $21 per ton of hay produced.

There are over 100 weed species that has been documented in Mississippi's forage system, with some of them having a significant economic and environmental damage such as cogongrass and smutgrass. Weeds in forage systems (pasture or hay) are the result of environmental factors such as low pH, low or inadequate fertility, poor soil drainage, soil compaction, pest and disease incidence, and poor hay and grazing management practices. For example, buttercup prefer wet soil, broomsedge prefer low pH and K soils, foxtail can be prevalent in overgrazed pastures, and Jonhsongrass prefer low pH soil.

**Table 1.** Weeds seeds that germinated (+) or did not germinate (-) after passing through the livestock digestive system.

| | Livestock Class | | |
|---|---|---|---|
| **Weed Type** | **Cattle** | **Horse** | **Sheep** |
| Buttercup | + | + | + |
| Chickweed | + | + | + |
| Cheatgrass | - | - | - |
| Curly dock | + | + | + |
| Dandelion | - | - | + |
| Foxtail (green) | + | + | + |
| Lambsquarter | + | + | + |
| Oxeye daisy | + | + | + |
| Pigweed | + | + | + |
| Plantain (broadleaf) | - | - | - |
| Quackgrass | + | + | + |
| Thistle (Canada) | - | - | + |
| Wild carrot | - | - | + |

An effective weed management program starts by having healthy pastures. This means using the proper forage species and variety, maintaining an adequate fertility program, using rotational grazing management system (providing rest periods), and implementing an Integrated pest management program (weeds, insects and diseases). If pasture health declines by ignoring any of the management practices mentioned above, weeds will become opportunistic and can become easily established. A common example in Mississippi's pastures is the tendency to overgraze and the use of continuous grazing systems. Overgrazing will provide a bare ground which is the perfect environment for weeds to get established. This means that they will need to be controlled by other means such as mechanical (chopped) or chemical (herbicide) methods.

It has been estimated that one pound of weed produced translates into one pound of forage lost. To avoid this type of loss, an integrated weed management program that is both economically and environmentally sustainable should be put

in practice. That means scouting, preventing and controlling weeds when they are in their young stage. Properly applied weed control is one of the most cost-effective management practices available to pasture farmers. The best time to control weeds is when they are less than six inches tall. Weeds that are more mature are harder to control and will require higher herbicide rates which translates in a higher economic investment. Depending on the type of weeds present and the percent of weeds in a pasture, some weed control treatments could be expensive. Although many weed control practices (grazing management) are cheap when compared to other pasture improvement methods (especially pasture renovation), it is important to consider the cost of the initial treatments, the lifespan of the treatment (residual effect), and the cost of maintenance treatments.

Therefore, there are a few indicators that could be used to assess the local impact of weeds in pasture ecology and the environment:

1. *Vegetative Factors:*
    a. Botanical composition: it could means a reduction in the percentage of desirable forage species or an increase in the proportion of weeds. Pastures can be classified as "excellent" if 76-100 percent of desirable indicator species are present, "good" for 51-75 percent, "fair" for 26-50 percent, and "poor" for 0-25 percent.
    b. Increase in bare ground: a measure of overgrazing or loss in fertility that impact the persistence of the desirable forage species.
    c. It should be emphasized that monitoring changes in vegetation needs to be done over a considerable period of time in order to detect long-term change that impact desirable forage species in a more permanent nature. For example, changes in climatic conditions such as drought (more short-term changes), not necessarily indicate trends towards irreversible pasture degradation since original vegetation can return when climatic conditions are favorable.

2. *Soil Factors:*
    a. Bulk density: It is the mass of soil for unit volume. Any increase in bulk density will indicate increasing compaction, less water infiltration, more water run-off and a potential erosion problem. Soils that are loose and porous have low bulk densities, and those that are more compact will have higher values. Clay, clay loam and silty loam soils normally have bulk density ranging from 1.00 to 1.60 g/cm$^3$; sand and sandy loam soils range from 1.20-1.80 g/cm$^3$.
    b. Organic matter: loss in organic matter is usually related to high microbial activity and loos of root mass from desirable forage species. The loss of organic matter can affected the rate of carbon sequestration and the same time decrease water holding capacity, nutrient availability, cation exchange capacity, and soil electrical conductivity. The amounts of organic matter in mineral soils can vary widely. Low levels of organic matter are often in the range 0-1.5%, medium 1.6-3.0%, and high >3.0%.

Strategic environmental weed control management practices also depend on understanding how different weeds reproduce and their persistence. Weed seeds can survive in the soil for many years before they can germinate and grow. This is commonly known as seed dormancy. Plants can produce a large number of seeds (Fig.1) that increase the seed bank each year. Although the number of surviving weeds from one season to another can decrease after the first year, the rate of decline is slow and they can persist for decades in the soil (Fig. 2). Grass

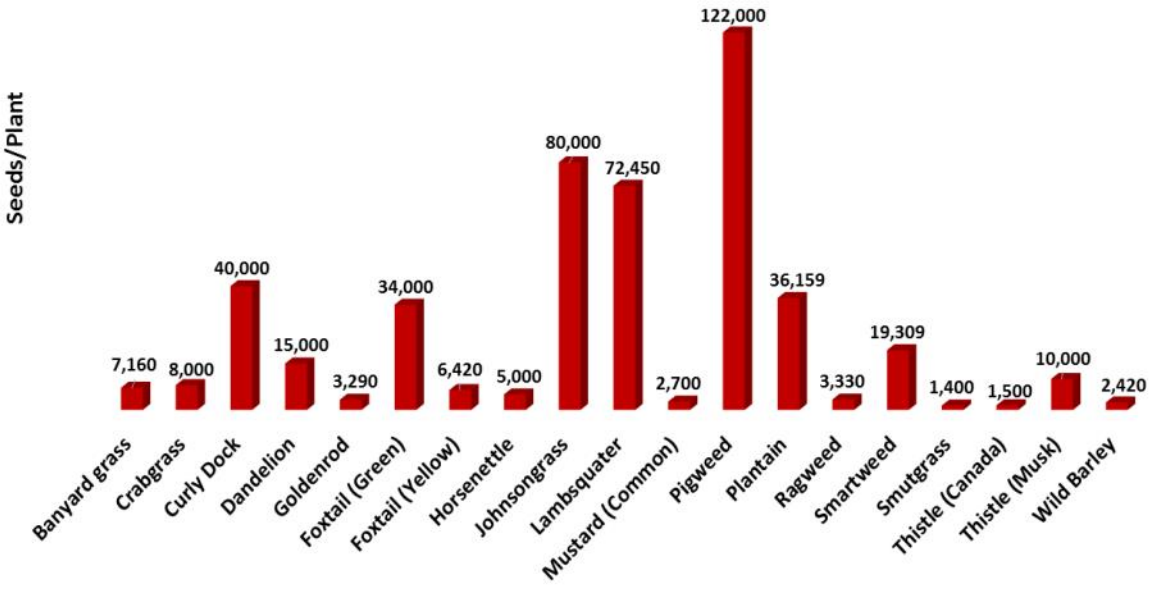


**Figure 1.** Estimated seed production from a single weed plant per year.

seed tend to be less persistence than broadleaf seeds, but does not mean that they are less invasive. Weeds seeds in a soil with periodic cultivation tend to persist shorter than undisturbed weed seeds. This usually because they can be stored below the germination zone. Keep in mind that factors such as soil temperature, soil moisture, and nutrient availability can influence seed germination and changes in seed dormancy. Some of these weeds can also survive the digestive tract of animals grazing in the pastures and continue being viable (Table 1). These seeds can then be dispersed into other pastures. Mitigation and weed control before reaching the reproductive stage become paramount to avoid seed dispersion.

It also important to remember the effectiveness of using herbicides is influenced by many factors such as weed leaf surface, climate, time of the day, growth stage of the weed, soil nutrition, land cultivation, soil organic matter, soil texture, soil moisture and chemical compatibility. A leaf with a waxy cuticle or hairs can affect the retention and absorption of the herbicide. Adding a surfactant can increase the herbicide wetting ability and penetration into the leaf. High humidity and high temperatures usually favor the best control with systemic herbicides. Avoid spraying herbicides under windy conditions to avoid drift and cause damage to susceptible crops. It is also recommended to apply herbicides in the morning after the dew has lifted from the leaf surface. This usually relates to the carbohydrate levels in the leaves being at lower levels in the morning which increase the number of open pores and plants being more photosynthetically active.

As we mentioned earlier, weeds in the seedling stage will be more susceptible to herbicides. Seedlings are more actively growing which have a greater translocation of carbohydrates and water and allows the movement of herbicides to growing points at a faster rate. With perennial weeds such berries and thistle the root system is target point. In this case, herbicide application at the bud or early flower stage is more effective because root reserves have been mobilized to develop the reproductive parts and then newly produced carbohydrates along with the herbicide is moved back to the root system.

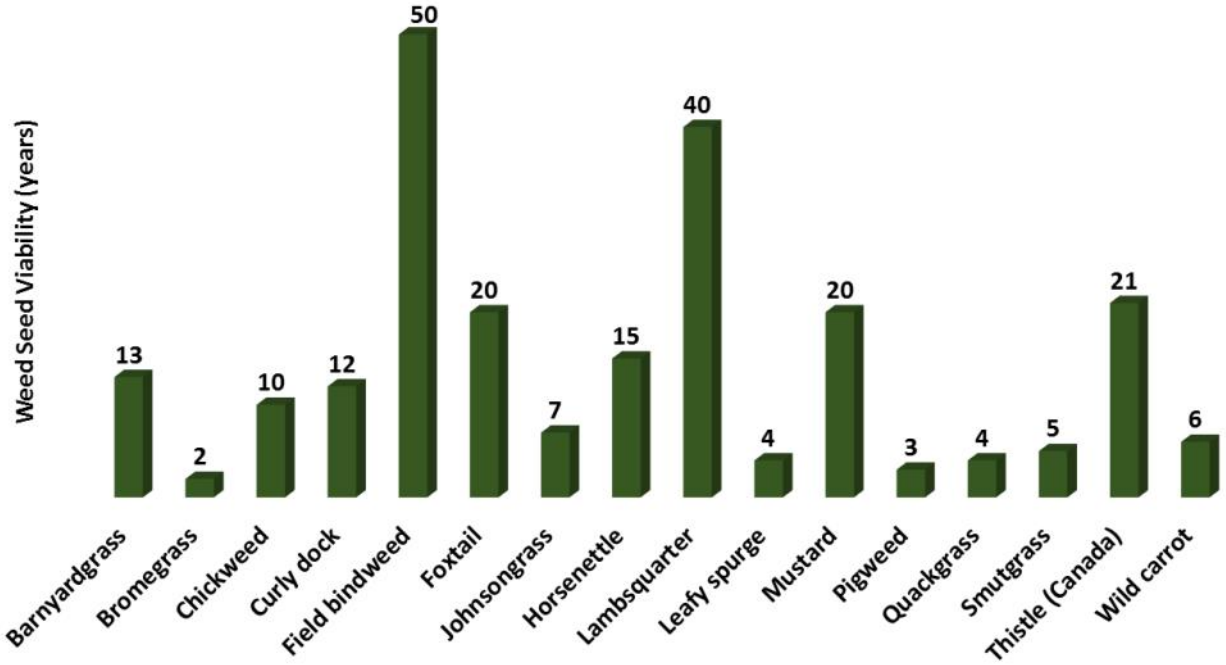


**Figure 2.** Number of years that some weed seeds may remain viable (alive) in the soil.

Soil management can also impact weed control. Producers tend to forget that soil nutrition can also impact weed management. While adequate fertility provide a competitive advantage for the forage crop, weeds have the greatest herbicide injury when nutrient levels are high because they actively growing. When renovating a pasture or rotating between summer annuals or winter annuals, cultivation can help with weed control. Cultivation allows more seed to germinate and the same time making the herbicide application more effective. Cultivation also decreases the root reserves in perennial weeds, making more susceptible to chemical control.

Soil properties such as organic matter, soil texture and soil moisture also have an impact in herbicide efficacy. Soils with higher clay content might require higher rates of herbicides than do sandy soils because of the binding of the herbicide with soil colloids in high organic soils. Soil texture (percent of sand silt and clay) influences herbicide rates because of the amount of surface for chemical binding. Usually silty and clayey soils may require higher herbicide rates. Soil moisture is required for the incorporation of herbicides, especially those that require root uptake. Herbicides applied to the soil have a better efficacy in warm, most soils.

There are several points that forage and livestock producers should keep in mind to successfully manage and control weeds in their forage systems: (1) Manage the pastures to prevent weeds from becoming invasive using intensive grazing management coupled with proper fertility; (2) proper identification and knowledge of the weeds present in the pasture or hay field; (3) develop and inventory and mapping strategy of the weed populations; (4) make weed control decisions of the potential damage based on level of invasiveness, seasonality (annual vs. perennial), cost of control and weed threshold; (5) rotate herbicides to break possible resistance cycles and shift in weed species and types; (6) avoid the use herbicides until weather and soil conditions are suitable as indicated on the label; and (7) read the label to determine compatibility of herbicide products and appropriate application rates under local conditions.

*For upcoming forage related events visit:*
***http://forages.pss.msstate.edu/events.html***

September 15-17, 2015 – MS Grazing Land Coalition Initiative, Natchez, MS
September 23, 2015 – Cattlemen's College, Prairie, MS
September 24, 2015 – Cattlemen's College, Poplarville, MS
October 2, 2015 – Hay Contest Entries Due
November 6, 2015 – Mississippi Forage & Grassland Conference, Newton, MS