



Approaches to Weed Management

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Rangelands comprise approximately 36% of the United States. Over 3000 plant species reside on the natural resource landscape of New Mexico. These plants provide goods and services for livestock producers, wildlife, and the general population. Maintaining biodiversity and sustained rangeland conditions is the goal of good land stewardship. However, rangelands are complex with plant composition changing depending on a variety of factors. Unwanted plants can pop up even with the best management practices.

Weeds are defined as undesirable plants or a plant that is out-of-place. They can be any type from grasses, forbs, shrubs, to trees. Perspective or management objectives drives this definition. A livestock producer may see any plant that is not a good forage as a weed, while an ecologist may strive for biodiversity and see the majority of plants as beneficial. Despite perspective, when a plant is deemed a weed, a control strategy is sought. These approaches to weed management seek the quickest and easiest way to remove them. Herbicides have become the most commonly used approach for this reason. Nevertheless, herbicides are not necessarily the best approach in the long run. Understanding 'why the plant is there' before addressing the 'how to control it' will help weigh all control options and improve management efficacy.

Disturbance is the disruption of normal plant function causing stress. Unwanted species have developed traits to adapt and capitalize on stressors. Annual weeds tend to germinate earlier than desirables when soil temperature and moisture are optimal. Growth may also be rapid, depleting available resources before others can take advantage. The goal of any plant is to produce seeds for future generations. The number of seeds produced is dependent upon species. Weeds tend to be prolific seed producers, putting more seeds in the soil than their counterparts. They also may have specific seed characteristics such as burs for attachment or feather-like structures for long distance wind dispersal. Furthermore, seed may have protective coatings to withstand animal digestion or delayed germination when in the soil.

Resources such as light, water, and soil nutrients are essential for plant growth. Any limitations to resource acquisition can cause reduced plant vigor and growth opportunities for more adapted species. Drought, fire, or grazing reduces aboveground foliage, reducing photosynthesis, increasing the risk of weed manifestation. Additionally, removal of plant mass is generally proportional to increases in the amount of bare soil. Lack of occupancy by desirable plants allows a niche for invasive plant introduction. If weed seeds are already present, opening up the soil creates and advantageous germination site for

resource take over and growth. In contrast, when decadent plant material accumulates over time, it can limit available leaf area and photosynthetic capacity. Removal by fire or grazing opens the canopy, allowing light penetration and bolsters growth. Thus, there is a balance between too much and too little removal for optimal plant fitness and weed prevention. Finally, extreme temperatures and disease limit plant growth and again provide opportunities for weeds to pop up. Overall, weeds take advantage of any opportunity to be present, reproduce, and subsist but understanding the why helps direct the how of management and control efforts.

Weed control methods can be categorized into prevention, cultural, mechanical, chemical, or biological. Complete removal is unlikely so control should be tailored towards reducing impact. Preventative strategies refer to any method that aims to prevent establishment of undesirable plant species. There is not much that can be done for weeds that have an airborne distribution mechanism. However, animals can be temporarily held in a dry lot or corral prior to release to new locations, localizing potential introductions. Equipment can also harbor hitchhikers and washing regularly in designated areas can help reduce introduction.

Cultural control is any method that maintains or increases plant vigor to prevent introduction or increased numbers of weeds. Seeding competitive species can greatly reduce weeds but on rangelands success is often limited to timing and the occurrence of rain. Overgrazing has been attributed to reduced productivity and weed infestation and should be avoided. Considering timing, intensity, distribution, and duration can aid in proper grazing even during dire situations such as drought. Fire promotes increased pasture conditions and reduced weeds but has its associated risks.

Mechanical control refers to any technique that uses machinery or equipment to remove weeds. A shovel can be the best mechanical method but requires extensive effort and time commitment. It is most effective for small or isolated infestations. More common methods include tillage and mowing but are often unfeasible on rangelands due to topography. Furthermore, excessive disturbance from tillage has been shown to favor weeds and benefits need to be carefully weighed against risk of invasion. Removal of trees and brush through mechanical means has been shown to be beneficial with increases in grass and forb species.

Chemical control refers to the use of herbicides. There are many herbicides on the market having different application methods, being broad or species specific, and targeting different metabolic pathways of the plant. Many restrictions occur to prevent unwanted or unforeseen impacts and therefore the label should always be followed.

Biological control is one of the least used methods but is rapidly expanding. It is the use of any natural enemy of the weed to reduce its occurrence. Enemies can range from targeted grazing to dietary specific insects.

Rangelands are highly dynamic, and weeds will occur despite best efforts to manage for them. Each weed is unique requiring an understanding of why the plant is there in the first place. Addressing the why before the how will help improve efficacy of control and lessen the impact of weeds.



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