Rejuvenation of Forages

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When productivity of seeded forage stands decline rejuvenation may be an option to consider. There are a few things to determine prior to instituting a rejuvenation practice. The first is to determine what caused the decline in forage production. Second is to determine if and when rejuvenation is necessary. Finally what might be the most appropriate practice to implement.

Cause of Productivity Decline

The productivity of seeded forage stands decline over time following establishment. There is a very consistent pattern that forage stands go through in their lifetime. The second to fourth years after seeding are the most productive years, then there will be a gradual decline in production through years 5, 6 and 7. After about seven years following seeding, the forage stand is about half as productive as in early years. What has happened is that the stand has used up all the nutrients freed up in the tillage operations prior to seeding, and is functioning at the productive capacity of the soil. Many times there is consideration being given to re-seeding the stand because it is not producing as well as it used to. This is generally a mistake economically, as you may not recover the seeding cost or the lost production in the establishment year. There are options for improving the production of your forage stand.

If the stand is in good condition and the decline in production is only related to the aging of the stand then no rejuvenation practice would be recommended other than fertilization. If the condition of the stand is deteriorating then the cause of the deteriorating condition must be determined, otherwise the rejuvenation practice will only be a temporary measure, and productivity will continue to decline. The major contributors to forage stand condition decline are overstocking, season long grazing, or over-harvest or cutting in the critical period for hay stands.

When it is deemed that a rejuvenation practice will help improve the productivity of a forage stand, there are a number of options to choose from including: mechanical soil disturbance; fertilization, over-seeding; sod-seeding; breaking and re-seeding; herbicides, mowing and burning.

<u>Mechanical Soil Disturbance</u>

Old smooth brome and crested wheatgrass stands are spiked with the goal of improving production. The potential to improve production occurs in one of three ways. First, the disturbance increases the decomposition of forage root material, releasing nutrients (mainly nitrogen) into the soil making them available for plant use. This is the same effect as applying nitrogen fertilizer. A second impact is thinning the stand. Some old stands may become dominated by many small plants. Spiking can thin the stand resulting in taller, more robust plants that remain. A final effect is improved infiltration. Some soils may become very impermeable over time and spiking can increase water movement into the soil. These effects are very short lived and normally don't last more than 2 to 3 years. It should be noted that all

responses to mechanical soil disturbance are extremely variable.

Spiking is most commonly conducted with cultivators with 2-3 inch spikes, or rotary harrows. The positive impact is directly related to moisture availability. This treatment should be conducted as early in spring as possible in order to make the best use of moisture and allow for the greatest amount of time for the stand to recover. If dry conditions exist, there will be no benefit to spiking or rotary harrowing, and there could potentially be a thinning of the stand and a reduction in production. With good moisture conditions, there is potential for a positive production response in the two years following treatment. It should be noted that in the year of treatment there will likely be a production decline.

Fertilization

The reason a forage stand's production declines as it ages is that it is using up or locking up available soil nutrients. Fertilization can reverse this productivity decline by providing deficient nutrients. In forage stands in Saskatchewan, the nutrient that will have the largest impact is nitrogen, but soil tests should be conducted to determine if other nutrients are lacking, particularly phosphorous and sulphur. If any other nutrients are lacking, then the beneficial effect of nitrogen will be reduced.

Fertilization is moisture dependent. If there is not adequate moisture, the plants cannot make use of the extra available nutrients. Research has found that liquid fertilizer applied into the root zone with coulters, spoke wheel injectors or other similar equipment is the most effective method, and will have a greater impact on production than broadcast applied fertilizer. The reason is that the fertilizer is placed directly where the plant will use it, thus does not require moisture to move it and there is less loss through volatilization into the atmosphere.

Overseeding

Overseeding is the practice of broadcasting legumes onto the surface of an existing forage stand. The goal is to increase the legume component for improved forage quality and yield. Alfalfa and the clovers are the most commonly overseeded species. Seeding rates are 1/4 to ½ times the normal seeding rates for the species. Overseeding can be done in combination with spiking or rotary harrows where the cultivation incorporates the seed.

Overseeding success is extremely variable. Even in a very degraded stand there is significant competition from already established plants. The key to success will be seeding into moist soil, thus this practice needs to be completed early in spring. The legumes will only establish in areas where there is little or no competition. A person should not expect uniform establishment across a field, but as few as 2-3 new legume plants per square foot can significantly increase production.

Sod Seeding

Sod seeding is a costly and aggressive practice, and should only be considered with poor

condition stands where no other alternative exists. Sod seeding is the act of killing off the existing vegetation with a non-selective herbicide and using a zero tillage capable seeder to seed directly into the sod. The success of sod-seeding is related to the degree of control of the existing vegetation. It is critical that there be complete control, as competition from the previous stand will reduce establishment of the newly seeded species. In order to ensure adequate control of the existing vegetation, the plants must be actively growing and have sufficient leaf area to be covered and take in the herbicide. There are two times to apply herbicide: in the spring when there is adequate active growth and in the late summer when the stand has regrown from spring or early summer grazing. There will need to be a minimum of 3-4 inches of leaf area in order for the plants to adequately take up the herbicide.

Early spring or the dormant season (late October) are generally the most effective times to sod seed a forage stand. Forages should be seeded shallow, at no greater than 3/4 of an inch, with on row packing to close the furrow made in the sod. Sod seeding must also occur into moist soil.

Breaking and Re-seeding

Like sod seeding, breaking and reseeding should be a last resort. This is the most costly of practices. Breaking and reseeding does give you the opportunity to seed in a species that is more adapted to the local conditions or to select a species that can meet gaps in the production system. Success in breaking and reseeding, similar to sod seeding, is related to control of the existing vegetation, available moisture, and shallow seeding into a firm seed bed.

The breaking of a forage stand often requires heavy tillage implements, and multiple passes. This results in the drying of the soil, breakdown of organic matter, and exposure to erosion.

Herbicides

Herbicides are used to control unwanted plants that are competing with the seeded forage species. Pasture sage, leafy spurge, and invading woody species are some of the species most commonly controlled. It is important that the plant be actively growing and treated at an early stage of growth in order to optimize control.

The cause of the weedy species being in the forage stand must be determined and the cause eliminated prior to treatment or the troublesome species is likely to return after a short period of time. Pasture sage is a good example of this. It is an opportunistic species that dominates in over-grazed pastures. The stocking rate needs to be adjusted or a grazing system implemented to correct the over-grazing situation. Once this is done the control of the pasture sage will allow the desired species to recover productivity at a much faster rate. One caution is to be aware of the effect of the herbicide on non-target species. For example most broadleaf herbicides will kill any legumes in the stand. Thus a stand made up of a combination of grasses and legumes has few herbicide choices available.

Mowing

Mowing is used to control the top growth of some unwanted species. The theory is that by mowing a stand it cuts down unpalatable or taller growing weedy species, and most seeded forages will regrow more quickly than the weedy species providing a competitive advantage.

Mowing is most commonly used to impact woody species, thistles, and absinth. Once again, practices to prevent the re-occurrence of the undesired species must be implemented, such as planned grazing systems. Mowing rarely completely eliminates the problem plant.

Fire

Fire is used in two circumstances: to control woody plant species, and to eliminate excess build up of litter. Fire is a common tool in brush control, and is very effective at controlling top growth if there is adequate fine fuel to carry the fire.

In situations where an area has been idled or there has been excess production, the old growth will shade out new tillers, thus reducing the productivity of the stand. Mowing or fire can be used to remove the old growth, thus allowing light into the lower canopy.

Fire is an inexpensive tool, but is also dangerous and requires adequate equipment and manpower. Fire will reduce the productivity of a stand in most situations, in the year of the fire.

Grazing Management and Rejuvenation

Grazing management and the development of planned grazing systems is essential to maintaining the health of your seeded pasture. Pasture land will likely continue to deteriorate, even if rejuvenation takes place, if season long grazing is practiced. Planned grazing management should be conducted in conjunction with any rejuvenation activity. In fact, incorporating a deteriorating pasture into a paddock grazing system allows for rest from grazing during the growing season. This regular period of rest may actually recover the health and productivity of the pasture and may be the only rejuvenation tool required.