

Economics of Managing Crested Wheatgrass Pastures Infested With Wolf Plants

Crested wheatgrass, a long-lived, perennial forage is used extensively for pasture on the Canadian Prairies. This introduced grass is best used as early spring pasture for it greens up early and forage quality is highest at this time. An undesirable characteristic of this bunchgrass is its tendency to form wolf plants when individual plants are lightly grazed or are not grazed. Wolf plants are stemmy plants that produce seed stalks that persist for several years, and livestock avoid grazing them.

Although there is a common belief that wolf plants assist in holding snow and improve soil moisture, research in Saskatchewan has proven that this assumption is false. In Saskatchewan wolf plants can produce more than 50% of the forage in pastures, but this forage is not utilized by most grazing animals.

Wolf plants are symptoms of pasture management that needs to be fine tuned. Before any attempts are made to control wolf plants, past and current management must be assessed. If the cause of wolf plant formation is not identified, they will re-develop, and the full economic benefits of grazing crested wheatgrass will not be realized. In the simplest analysis, wolf plants form because crested wheatgrass plants are allowed to develop seed stalks that persist. Once wolf plants begin to form, the problem compounds itself because as more seed stalks develop cattle are less likely to graze these plants.

Selective grazing is caused by stocking crested wheatgrass pastures too lightly, grazing the grass after plants have nearly completed their growth for the year, or resting pastures too long. Once developed, wolf plants persist essentially as long as the stand of grass.

A Permanent Solution to a Temporary Problem or a Temporary Solution to a Permanent Problem

Improved grazing management is the only permanent solution to wolf plants in crested wheatgrass. If grazing management is not changed, wolf plants will persist or re-develop after pasture renovation. In short, improved grazing management should strive to get equal use of all plants in the pasture. Uniform grazing can be achieved by subdividing pastures, or increasing the number of animals that graze a pasture. The first alternative is usually the best for if the herd size is increased there may not be enough forage on the rest of the operation to meet the needs of grazing or feeding animals at other times of the year. For more information on grazing systems, see *Managing Saskatchewan Rangelands*, *Grazing Systems for Rangelands of Southern Saskatchewan*, or contact your Rangeland Agrologist. Both publications are available at Saskatchewan Agriculture and Food Rural Service Centres.

Determining Residual Forage in Wolf Plants

Before any attempts are made to control wolf plants, the amount of forage that is present in them, and could be accessed by improved management, should be determined. Forage produced in wolf plants each year can easily be determined by estimating total standing crop (green and dead material) of wolf plants and, from this, potential forage availability can be estimated.

To estimate residual forage, sample wolf plants throughout the pasture when the seedheads of the current year on crested wheatgrass are fully developed. A good estimate can be obtained by clipping the wolf plants in about 10 plots, one square yard in size, at ground level. Samples should be dried in an oven and weighed. The sample weights should then be converted to pounds per acre by multiplying by 4,840. Residual forage can be estimated by plotting the values on the line in Figure 1, or multiply the pounds per acre by 0.41 and add 28. For example 0.75 pounds of total standing crop per square yard represents 1516 pounds residual forage per acre. Example calculations are $0.75 \times 4840 = 3630$; $3630 \times 0.41 = 1488$; $1488 + 28 = 1516$ pounds residual forage per acre.

Economic Analysis

Economic analyses were considered for crested wheatgrass pastures with wolf plants using 40 site-years of data collected in southern and central Saskatchewan. We

considered four management alternatives for an 160 acre pasture in our economic analyses. Management practices included: 1) no change in management, leaving wolf plants intact; 2) cross-fencing and water development; 3) swathing and baling hay every 5, 10 or 15 years, and; 4) prescribed burning at 5, 10 or 15 year intervals. Assumptions of the analyses were: 1) stand longevity averages 30 years; 2) forage value of standing crested wheatgrass was \$13.61 per ton; 3) cost per animal unit month (AUM) was \$15.00, and; 4) interest rates were 8%.

Determining the Economic Viability of Controlling Wolf Plants in Your Pasture

For practical purposes, if wolf plants are present in a crested wheatgrass pasture, money is being lost. Depending on the amount of residual forage in a pasture, the present value of lost production over a 30-year period ranges from about \$2.59 per acre each year to nearly \$26.00 per acre annually (Table 1). Thus, over the long-term, the costs are high if management is not intensified to use residual forage in wolf plants.

Costs of water development and fencing required when intensifying management are shown in Table 2. Water development will not be needed in all situations if existing water is strategically located and fences are creatively laid out. The annual costs of water development and fencing 160 acres with a 4-strand barbed wire fence averaged \$0.51 per acre. Water development and fencing with a single strand electric fence cost \$0.32 per acre.

Table 1. The present value of loss in production over a 30-year period due to wolf plants in crested wheatgrass pastures. The present value of lost production assumes that the average annual loss is constant over the 30-year life of the pasture, and a discount rate of 8% was applied.

Total standing crop of wolf plants (#/acre)	Average annual loss of residual forage (#/acre)	Present value of production (\$/acre)
100	41	2.59
200	82	5.18
300	123	7.78
400	164	10.37
500	205	12.96
600	246	15.55
700	287	18.14
800	328	20.48
900	369	23.32
1000	410	25.91

Table 2. Costs of water development and cross-fencing an 160 acre crested wheatgrass pasture. The costs are depreciated over 30 years and interest on the investment is 8%.

Additional investment	Capital investment (\$)	Annual investment (\$/acre)	Annual operating cost (\$/acre)	Total annual cost (\$/acre)	Total annual cost (\$/acre)
Water development	1,000	0.18	0.05	0.23	0.23
0.5 miles, 4-strand barbed wire fence	1,200	0.22	0.06		0.28
0.5 miles, single-strand electric fence	400	0.07	0.02	0.09	
Total cost (\$/acre)				0.32	0.51

As shown in Figure 2, annual value of forage that is not grazed exceeds the cost of fencing and water development above the point where the lines meet. If the forage in wolf plants exceeds about 75 pounds per acre, a substantial economic loss is incurred.

Swathing and baling the crested wheatgrass every 5, 10 or 15 years is economically feasible if residual forage in wolf plants averages about 175, 75, and 25 pounds per acre, respectively (Figure 3).

Since there is a loss of forage when prescribed burning is used to improve the accessibility, the economic advantages are reduced relative to the two previous options. Burning every 5, 10 or 15 years is profitable when residual forage in wolf plants exceeds about 350, 175 and 50 pounds per acre, respectively (Figure 4).

Management Implications

- Wolf plants are symptoms of poor grazing management.
- If wolf plants are present, significant amounts of money are being lost.
- Wolf plants in crested wheatgrass represent a significant, untapped forage resource.
- Regardless of the chosen alternative, grazing management must be intensified to prevent the development of wolf plants and to maximize availability of forage.

- The order of profitability and sustainability of management practices are: 1) haying, water development and cross-fencing; 2) haying without cross-fencing or development of water, and; 3) burning without developing water or new fences. If management is not changed, financial losses are substantial because of lost forage potential.
- Residual forage can be easily determined by estimating total dry weight in pounds per acre of standing crop of wolf plants, multiplying by 0.41 and adding 28.
- It is profitable to employ management practices to exploit the forage in wolf plants when residual forage equals or exceeds about 25 pounds per acre. In essence if wolf plants are present in a pasture, money is being lost.
- Accessing the residual forage in wolf plants of crested wheatgrass can lengthen the grazing period or allow for increased AUM's. It can also reduce grazing pressure on other forage resources.

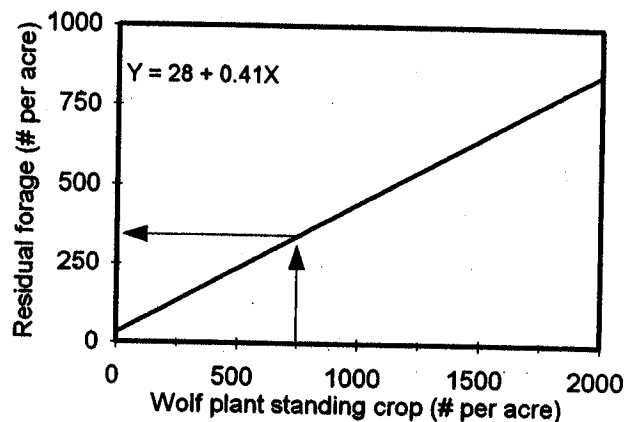


Figure 1. The relationship between total standing crop in wolf plants and residual forage in wolf plants. The arrows show how residual forage in wolf plants can be determined if total standing crop of wolf plants is known. The equation can be used for a more precise estimate of residual forage where X is total standing crop of wolf plants.

Further Readings

Grazing Systems for Rangelands of Southern Saskatchewan. Grazing and Pasture Technology Program. Regina, SK.

Crested Wheatgrass. Agriculture Canada Contribution 1983-18E.

Managing Saskatchewan Rangeland. Saskatchewan Agriculture Development Fund. Regina, SK.

Management of Crested Wheatgrass Pastures. Agriculture Canada Publication 1473.

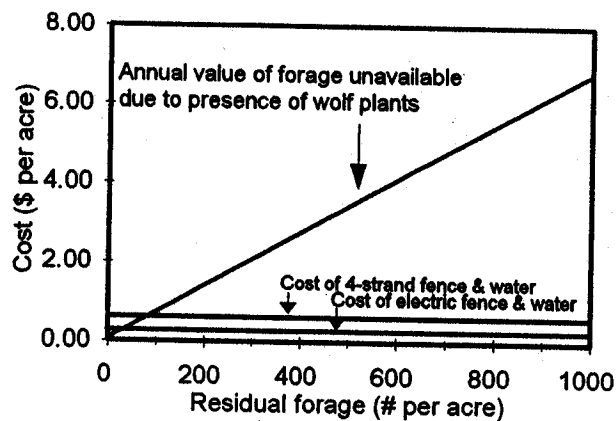


Figure 2. Annual cost of forage not available for grazing and the annual cost of fencing and water development per acre. Break even is represented by the point where the cost of fencing and water development and the annual value of forage meet.

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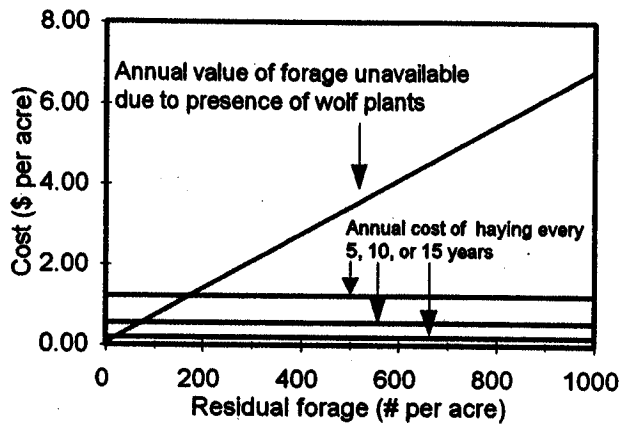
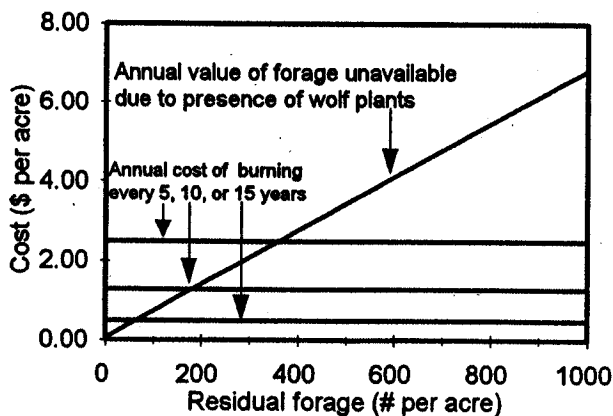


Figure 3. The annual cost of forage not available for grazing and the annual cost of swathing and baling crested wheatgrass hay every 5, 10, or 15 years. Break even is represented by the point where the cost of harvesting and annual value of forage meet.



Forage 4. The annual cost of forage not available for grazing and the annual cost of burning crested wheatgrass every 5, 10, or 15 years. Break even is presented by the point where the cost of harvesting and annual value of forage meet.



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