Tall Larkspur Control with Ammonium Sulphate Fertilizer

Connie Clementson

Located in northwestern Colorado is the Yampa Ranger District of the Medicine Bow-Routt National Forests. The mountains surrounding the Yampa valley are known for their lush and productive Aspen-Forb plant communities. What many ranchers consider their biggest obstacle to grazing these federal rangelands is the proliferation of Tall Larkspur (*Delphinium occidentale* and *Delphinium barbeyi*).

A study to explore the possibilities of using ammonium sulphate fertilizer to control the ranchers' most troublesome patches of tall larkspur was established in 1988. When this research was initiated, most ranchers were dealing with the larkspur problem with such mythical management techniques as feeding mineral salt supplements and 'bleeding'[1] (Knight and Pfister 1997). Others applied herbicide treatments which were expensive and restricted in their use.

The majority of research that had been completed dealing with tall larkspur control during this time period was limited to herbicide treatment with 2,4,5-T which was no longer available for use in the 1980's.

Because of the poor success of 'myth' management and the restrictions/costs of herbicide, we were interested in methods that allowed ranchers to 'spot' treat their most troublesome patches of larkspur with an easy and inexpensive treatment. The interest to pursue fertilizer treatment of these patches was a result of 2 research efforts completed in the 1970's:

1. In the early 1970's research, the idea of using ammonium sulphate fertilizer (Cronin et al. 1977) to kill the larkspur plants was completed. The idea was to over-fertilize the plants so that they would die. The researchers **broadcast** the fertilizer on several patches of tall larkspur at different application rates. The results were mixed, but it was noted that at the highest application rate that larkspur leaves died.
2. In 1979, the Intermountain Experiment Station (Forest Service) explored the idea of applying **concentrated** amounts of fertilizer to individual plants. The researchers learned that the amount of plant death was directly related to timing of fertilizer application (timing of the growth of the plant) and the rate of application (the heaviest application rate was the most successful).

Approach

We wanted to incorporate the ideas used in the previous studies but possibly reduce the amount of fertilizer and somehow augment the ability of the fertilizer to produce death in the plant at lower application rates. We had these questions:

Larkspur Plot in 1988 prior to fertiizer treatment. The major species included bluebells, false hellebore and tall larkspur.

The same plot in 1997, nine years after treatment. The major species include mountain brome, bluegrass, wheatgrass, Richardson's geranium, senecio and potentilla.

a) Could we cut the patches of tall larkspur (with a gasoline-powered weed eater) to facilitate easier application [Previous studies indicated it was not uncommon for crews applying the fertilizer to miss 10 to 15% of the plants due to dense vegetation or brush? (Little 1979)].
b) Could we apply a smaller amount of fertilizer on the cut plants and still get the same 'kill' rate?
c) Could the amount of fertilizer be reduced even more if we applied it during the pre-flower stage (bolt) when the highest rate of 'energy' is needed by the plant?

[1]Bleeding is when the blood vessel under the cow's tail is cut. The cow is 'bled' until the blue blood turns back to red.

Study Area

We decided to try our ideas out on the Lone Spring Cattle and Horse Grazing Allotment (Routt County). The permittees had historically experienced moderate loss from several small 'patches' of tall larkspur in meadow areas within a mixed Aspen and Lodgepole Pine forest on this allotment.

The average elevation of the Lone Spring Butte area is 9,400 feet with a mean annual precipitation of about 25 inches per year, mainly coming in the form of snow. The soils are of shale origin and are generally clayey.

The general vegetation composition in the area comprises tall willows and large-leafed sedges near the stream corridors. Tall larkspur, false hellbore, mountain bluebells, senecio, wild geranium, bluegrass, mountain brome, wildrye, needle and thread grass, thurber fescue, and Idaho fescue are common in the open parks.

Method

On 23 June 1988 the permittees and the Forest Service set up study plots to test three separate treatment methods:

Plot # 1 was cut to stubble height (ground level) and received 1/2 cup of fertilizer at the base of each tall larkspur plant.

Plot # 2 was cut to approximately 10 inches in height and received 3/4 cup of fertilizer at the base of each tall larkspur plant.

Plot # 3 was left uncut and received 1 cup of fertilizer at the base of each tall larkspur plant.

Plot # 4 was the control and did not receive any fertilizer.

Although the plots were not fenced, the permittee agreed to defer this pasture until the later part of the grazing season (September). The spaces between the plants were not treated. All plots were treated during the pre-flower ('bolting') stage of growth.

Results

On 14 July 1988, three weeks after the plots were treated, we observed that all the tall larkspur plants and a small area around each plant base had turned brown and died in Plots 1 and 2. The plants between, however, remained healthy and green.

When we looked at Plot 3, some of the tall larkspur plants appeared to have some dead leaf tissue. A majority of the plants had not developed blossoms or, if they did, the blossoms had wilted and died. Overall, the larkspur appeared 'sick' but not dying.

The tall larkspur plants in the control plot appeared healthy with most of the plants reaching heights of 3 to 5 feet and were blooming. We were very excited with the high mortality results but were not 'sold' on using the method for future treatment since we didn't really know if the tall larkspur plants would re-grow the next year. So in the summer of 1989, the plots were revisited. There was 100% mortality rate on all three study plots (Schalnus, personal conversation) and a healthy stand of "mostly grasses" dominated the plots!

The larkspur plot in 1988, three weeks after treatment. In the foreground is Plot #2 (the cut plot) with Plot #3 in the background. Approximately 80% of the leaves of the larkspur plants appeared yellow and the plants had not developed blossoms.

Based on that report, a five year action plan was established to treat other 'hot spots' on the allotment. The permittee continued these treatments for the next four years with repeated success (used the Plot # 3 method of treatment). These areas occurred in both open meadows and under Aspen overstory with similar successful results.

Long-term Results

As with all treatment methods, we questioned what the long-term effect(s) might be from treating the larkspur with the fertilizer. So in 1997, we made a final visit to our study plots.

Within any of the treated plots, we did not find any tall larkspur present. Additionally, no false hellbore, mountain bluebells and dandelion were in the plots. The main plants identified nine years after treatment included mountain brome, bluegrass, wheatgrass, needle and thread grass and thurber fescue. Forbs included sticky geranium and senecio. The control plot retains it’s original species composition.

Close-up of Plot #2 where larkspur plants were cut approximately 8–20' in height.

Conclusions

For the spot control of tall larkspur, there are definite advantages for using ammonium sulfate fertilizer compared to herbicide treatments. These include but are not limited to:

1. The fertilizer is granular so it is easy to pack into areas of difficult access or rough terrain.
2. The fertilizer can be purchased at any local feed store.
3. There is no requirement for a certified applicator.
4. The application method is simple and easy to learn.
5. The cost of application of the fertilizer is much less than the cost of the application of herbicide.
6. The larkspur mortality occurs within one year (uncut plot) and continues for many years (at least for nine years).
7. With the addition of a weed eater, the application rate can be reduced by up to 50%, which could ultimately lead to a cost savings and more complete treatment of the target plants.
8. Plots that were cut with the weed eater died the same season they were treated, allowing for grazing to occur in the immediate area without further threat of livestock grazing them.
9. Application of the fertilizer does not appear to adversely affect nearby vegetation in the area.

Literature Cited

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Author is a Range Management Specialist Yampa Ranger District Medicine Bow Routt National Forest Routt County, Colorado.