Grazing to Greener Pastures

Before you start shelling out cash for herbicides, you might consider drafting your cattle into your war on weeds.

by ***Ed Haag***

Emilio Laca, associate professor of plant sciences at the University of California, Davis, says controlled grazing systems optimize yields and help establish more productive pastures. And, if implemented properly, they can have a significant effect on invasive weed populations. He is convinced that using one's head rather than one's checkbook can lead to a long-term solution in dealing with weed infestations established after years of opportunistic encroachment.

"We have been successful at using prescribed stocking rates to reduce the incidence of specific weeds that otherwise would contribute to a reduction in a pasture's productivity," Laca says, adding that traditional grazing paradigms often favor the spread of these plants rather than help deter their encroachment.

"We can't just address one issue and ignore the rest of the system. This works best with a multiyear plan including the replanting of desirable species."
— Emilio Laca

He points out that while grazing can seriously affect the future productivity, function and composition of a pasture, most ranchers have a limited knowledge of how plant communities interact within a pasture and how grazing affects those interactions.

"It is assumed that grazing, plant growth and ecological interactions are uniform and vary continuously over space and time," Laca says. He notes most pasture management decisions are based only on seasonal forage demand, animal density and duration of grazing.

By limiting our grazing strategies to just those three factors and ignoring the complex interactions between plants and their surrounding environment, Laca says we are overlooking a very powerful tool that could be used to control some of our most aggressive weeds.

For Laca, two recently emerging trends are encouraging researchers to take a closer look at how grazing can influence the ecological balance between plant species. Both the rising costs of feeding cattle and the rising costs of herbicides make the use of tactical grazing to control weeds and maintain pasture quality even more attractive than it might have been only a couple of years ago.

He says it's fortunate that as the need for low-cost pasture maintenance strategies such as controlled grazing rise in importance, agricultural scientists are developing the tools needed to proceed with much-needed research.

"Technologies to monitor and control animal distribution are evolving rapidly," Laca says. "They create management and research opportunities to experimentally address this new paradigm where there is a tighter link between manipulation of grazing and practical results."

Taking on a tough customer

He cites, as an example, ongoing efforts to use cattle grazing to control Medusahead, a noxious annual common to California. This invasive species from Eurasia has a formidable reputation for being able to move into previously productive rangeland and destroy its grazing potential with impunity. Currently infesting more than 5 million acres in northern California alone — with an estimated production loss of $20 per acre per year — this insidious grass plant threatens another 62 million acres in the western U.S.

Medusahead's inordinately high silica content provides the plant with an ideal mechanism to compete in a pasture environment. The silica content in the mature plants renders them unpalatable to livestock and wildlife, and it minimizes decomposition once the annual plant dies. What remains of the previous season's Medusahead plants is a thick thatch that effectively chokes out all competition, moving the pasture ecology closer to a monoculture.

In spite of its ability to establish itself as the dominant species within a grazed pasture environment, Laca believes he and his fellow researchers have discovered vulnerability in the plant's growth cycle in relation to more desirable grasses that are competing directly with the Medusahead.

"Its weakness is that it tends to mature after the good forage in the pasture has already matured," he says. "If we can hit that Medusahead plant with grazing right after the other forage has produced seed and before it produces seed, we can reduce it very significantly."

Laca notes that while more conventionally accepted grazing strategies based on maximum forage production can actually encourage the spread of the invasive plant, structuring animal movement to optimize the exposure of young, vulnerable Medusahead plants to grazing activity can have the opposite effect.

Tailoring the strategy

In order to effectively combat invasive species like Medusahead with cattle grazing, Laca emphasizes that a single-event, single-species approach rarely leads to long-term success.

"We can't just address one issue and ignore the rest of the system," he says. "This works best with a multiyear plan including the replanting of desirable species."

Because one of the primary tools in controlling weeds through grazing involves utilizing very high stocking rates, Laca points out that the average rancher is limited in his response to large infestations.

"One can only treat a fraction of the land per year, so it has to be planned over several years," he says, adding that a long-term

comprehensive plan is essential to the success of a weed control program.

For Laca, the primary considerations when applying precision grazing to invasive species are the spatial distribution of the grazing, the timing and duration of the grazing, the category of livestock used, the number of animals involved and the pasture area targeted.

"For example, with Medusahead, when all these factors are combined we can achieve 70% to 80% of uniform herbage disappear within one to two weeks," Laca says.

In order to limit the spatial distribution of livestock to the targeted infestation area, Laca's first choice is movable electric fencing. Recognizing that intensive grazing with electric fences can be labor-intensive, he and his colleagues have also experimented with supplement tubs for two purposes: to attract grazing cattle to the infested areas and to provide an overseed mechanism in which clover seed, blended into the supplement mix, will be ingested by the cattle and deposited in their feces for germination next year.

"Reseeding areas that have been intensively grazed with more desirable plants that can compete with Medusahead is a very important part of any long-term control program," Laca says. "Unless you are able to introduce a competitive plant to the space the Medusahead once occupied, that space is very likely to be reinvaded."

Laca notes that candidate plants for repopulating formerly infested pastures will vary depending on where the grazing program is being implemented. For example, in his work with controlling Medusahead, squirreltail, a short-lived native perennial, has proved to be competitive, even when broadcast-seeded in unprepared seedbeds. He attributes this to squirreltail's early germination and high allocation of growth to roots. Other plants used to repopulate pastures in northern California are California broom, subclover and annual rye grass.

Timing can be critical

While spatial distribution and reseeding are essential to optimizing the effectiveness of grazing, when and for how long the cattle are exposed to the weeds is of equal importance, Laca says. He cites, as an example, the role timing plays in using intensive grazing to control Medusahead. "Timing interacts with grazing duration and stocking density because the population of Medusahead plants exhibits significant variation in timing of spike emergence," Laca says. "Once a spike emerges, the probability that it will be grazed declines rapidly because livestock avoid the coarse and sharp awns."

He notes the appropriate dates to begin grazing Medusahead can change depending on weather conditions. Warm, dry spring weather will usually mean that its optimum grazing period will begin in early May; while a cold, wet spring will move that period to the end of May.

Laca adds that the duration of the grazing period will depend on the stocking rates. The ideal goal is to have enough animals to achieve a uniform and high level of forage utilization within a seven-day period. He points out that longer grazing periods with lower stocking densities are less effective because more tillers have a temporal window to flower and escape grazing.

Because the nutritional values of weeds, such as Medusahead, are limited, even when they are at their most palatable stage, Laca recommends using cattle with low nutritional requirements, such as dry cows and culls, for weed-control grazing.

To help ranchers in northern California develop their own Medusahead grazing-assisted control program, Laca and his

CONTINUED ON PAGE 158

Table 1: Estimated number of animal units (AU) required to achieve a uniform and high level of forage utilization based on the estimated number of pounds biomass per acre, the size of the plot and the duration of the grazing, 1-, 5- and 25-acre plots

		Forage productions at peak standing crop, lb./acre					
Days	**Acres**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**	**3,500**
5	**1**	5	7	9	11	14	16
6	**1**	4	6	8	9	11	13
8	**1**	3	4	6	7	9	10
10	**1**	2	3	5	6	7	8
12	**1**	2	3	4	5	6	7
5	**5**	23	34	46	57	68	80
6	**5**	19	28	38	47	57	66
8	**5**	14	21	28	36	43	50
10	**5**	11	17	23	28	34	40
12	**5**	9	14	19	24	28	33
5	**25**	114	171	228	285	342	399
6	**25**	95	142	190	237	285	332
8	**25**	71	107	142	178	214	249
10	**25**	57	85	114	142	171	199
12	**25**	47	71	95	119	142	166

1 AU = 1 cow = 26 lb. forage per day.

Table 2: Estimated number of animal units (AU) required to achieve a uniform and high level of forage utilization based on the estimated number of pounds biomass per acre, the size of the plot and the duration of the grazing, 50-, 100- and 200-acre plots

		Forage productions at peak standing crop, lb./acre					
Days	**Acres**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**	**3,500**
5	**50**	228	342	456	570	684	797
6	**50**	190	285	380	475	570	665
8	**50**	142	214	285	356	427	498
10	**50**	114	171	228	285	342	399
12	**50**	95	142	190	237	285	332
5	**100**	456	684	911	1,139	1,367	1,595
6	**100**	380	570	759	949	1,139	1,329
8	**100**	285	427	570	712	854	997
10	**100**	228	342	456	570	684	797
12	**100**	190	285	380	475	570	665
5	**200**	911	1,367	1,823	2,278	2,734	3,190
6	**200**	759	1,139	1,519	1,899	2,278	2,658
8	**200**	570	854	1,139	1,424	709	1,994
10	**200**	456	684	911	1,139	1,367	1,595
12	**200**	380	570	759	949	1,139	1,329

1 AU = 1 cow = 26 lb. forage per day.

Grazing to Greener Pastures CONTINUED FROM PAGE 157

associates have developed a table that lists the number of animal units required to achieve a uniform and high level of forage utilization based on the estimated number of pounds biomass per acre, the size of the plot and the duration of the grazing (see tables 1 and 2).

The Montana model

Bret Olson, Montana State University (MSU) professor of range ecology, sees precision grazing as an excellent way to control weed infestations in smaller areas but points out that in large tract, native range settings, controlled grazing is often impractical. "What you do when you control cattle is limit their ability to select their feed, and they are forced to eat what they normally wouldn't," Olson says. "In a range setting, you are not controlling them, so they can select their preferred plants."

Instead, researchers working within the open range context must look to behavior modification and other means to promote the grazing of weeds. "That is the big $64,000 question at this time," Olson says. "Can we teach or otherwise encourage cattle to alter their diet selection to include weeds they normally won't eat?"

For Olson the answer lies in studying individual weeds to determine what mechanisms in each plant are responsible for discouraging their consumption by cattle. He cites, as an example, secondary compounds found in some weeds that negatively affect rumen function.

"If the weed is palatable enough and the animal eats it, but if it has a secondary compound that has a negative effect on rumen microbes, they in turn will reduce

their activity, and there will be a feedback, in effect, telling the animal to not eat the plant," Olson says. By introducing an agent through a field supplement that binds up that secondary compound and acts as a buffer, Olson says cattle might be encouraged to consume a weed they would otherwise ignore.

While some earlier field studies in this area have proved disappointing, Olson says that using buffers to encourage weed grazing shows promise and should be researched more extensively.

One area that MSU rangeland researchers are currently pursuing is behavior modification. Confined cattle were fed spotted knapweed, thoroughly mixed in with a more familiar forage, for a period of time and then released in a knapweed-infested environment. While the data from the study has yet to be tabulated, observations indicate to Olson that the difference in consumption of knapweed between the conditioned cows and the control group was not striking.

For Olson, one of the most promising of methods for encouraging grazing of weeds in a range setting is the use tantalizers.

He recalls a range specialist who sprayed molasses on an infestation of musk thistle and then turned his cattle out on the stand. The cattle not only consumed the thistle sprayed with the molasses, they came back the next year and consumed the new crop of thistle, which had not been sprayed.

"We have done some very preliminary pilot studies spraying weed infestations with molasses and then turning the cattle out on them," he says. While the cattle did consume the sprayed weeds, the researchers at MSU have yet to initiate a study to determine that the single treatment of molasses was enough to condition the same cattle to return to that infestation the next year and consume it without the molasses.