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Livestock Research

Pasture monitoring — Anderson Farm

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Cooperators:

- **Nathan and Sarah Anderson – Aurelia**

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http://bit.ly/pfi_livestock

In a Nutshell

- Managing animals on pasture offers the opportunity to improve productivity on a fixed land area.
- The Andersons run about 30 cows on their farm, which includes 65 acres pasture, also corn, soybeans and hay.
- Andersons monitored activity daily on their pastures.
- Interseeding pastures with new species and switching to rotational grazing have increased the forage production and carrying capacity of the pastures.
- Since 2010, pounds of calf weaned per acre has increased by 74%.Next, Andersons are increasingly interested in getting more native species, such as big and little bluestem, in their pastures.

Project Timeline:

May–October 2010-2013

Nathan Anderson monitors species diversity along a transect in a pasture on his farm near Aurelia.

Background

Livestock farmers who manage animals on pasture face the challenge and opportunity of improving profitability and productivity on what is often a fixed land area. Increasing forage yield and forage quality allow more animals to be raised on that acreage, or may allow for maintaining a given herd size without the need for stored feeds. At the same time, continuous living cover on pastures provides real environmental benefits: covered ground suffers less erosion and runoff and has improved soil quality. Diverse pastures including legumes and warm-season forages can provide year-round feed for an animal herd, reducing both the fiscal and environmental cost of harvesting, storing, and feeding hay. To improve forage yield and quality, Practical Farmers have experimented with seeding different forages into existing pastures, and have monitored the performance of the livestock, the forage, and the soil.

Nathan and Sarah Anderson run around 30 heifers and cows on their farm, and raise corn, soybeans, and hay. Winter cover crops on the row-crop acres provide some additional cattle feed while benefitting the soil. Cows and calves rotationally graze around 60 acres of pasture, which Nathan has improved through frost-seeding, interseeding, cedar tree removal, and careful observation. Calves are born in the spring, weaned the following winter, and marketed at around 17-18 months of age after getting a bit of grain to finish.

Materials and Methods

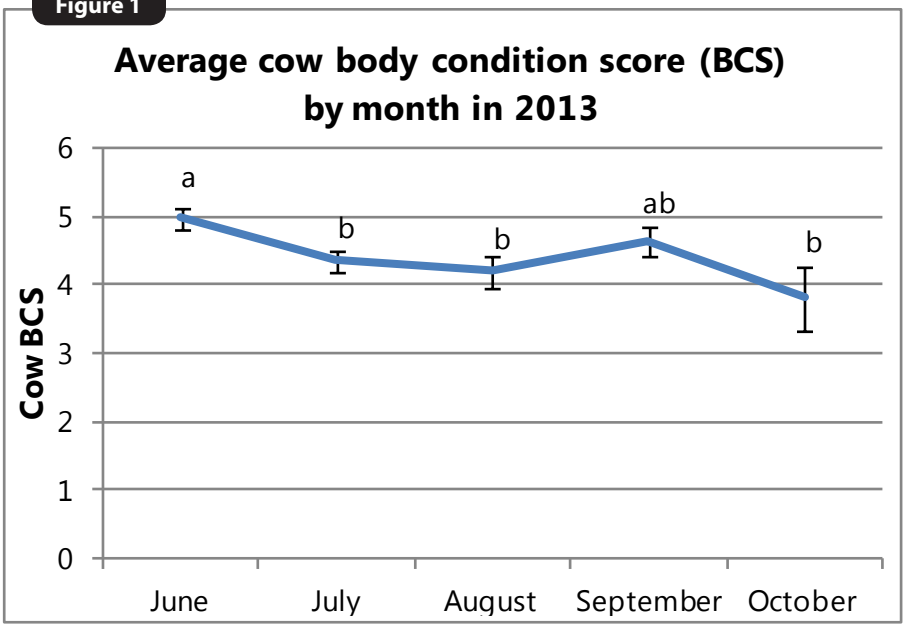
Nathan and Sarah monitored all activity on their pastures, including seeding, grazing, and haying. Calf weights and the body condition scores of five representative cows were taken at the trial's beginning and end, and more often when possible. Movement of animals into and out of paddocks was recorded, to estimate carrying capacity and pasture rest. They selected one pasture for botanical diversity monitoring, and established three 100-ft transects at representative locations across the pasture. At each transect, four 20-in^2 quadrats were randomly chosen. Within each quadrat, plant species and growth stage were identified, and percent bare ground and litter were estimated.

Results

Cow and calf performance

Five cows were scored for body condition on a 1-9 scale (BCS, 1=emaciated, 9=obese) each time the cattle moved into new paddocks. Cow BCS was lower (*P* = 0.02) in July, August, and October compared to June (**Figure 1**). This is likely due to reduced forage growth and availability during the "summer slump," when cool-season grasses slow regrowth in the heat of the summer. Cows nursing calves also may lose some weight and BCS just because of the increased energy demands. Both of these factors in BCS loss were probably made worse by the past few summers; pastures were already stressed following the drought during the 2012 growing season, and then received little precipitation and experienced extremely high temperatures during the trial period in 2013.

Figure 1



Calves were weighed at the beginning of the grazing season (late May 2013) and at weaning (early January 2014). Average daily gain (ADG) was calculated using the difference in the two weights. Across all calves, ADG averaged 1.96 lb/d, and did not differ between bull and heifer calves, nor between calves that had to be treated for pinkeye or other illnesses (*P* > 0.05, **Table 1**).

Table 1

	Average calf final weights and average daily gain (ADG) in 2013	
	Weaning weight (lb)	ADG (lb/d)
Bull calves	550	1.96
Heifer calves	556	1.96
All calves	549	1.96

Nathan noted that the majority of the calves that got pinkeye were offspring of some heifers he introduced to the herd in August. While the occurrence of pinkeye was greater in 2013 than Nathan normally observes, this suggests that there may be a genetic component to pinkeye resistance, as his "home-grown" cows and their calves were better able to fight it off.

Transects and pasture performance

Nathan established three transects when he started the project in 2010. Each transect represents a good portion of the grazed acres on the farm (bottom ground, hillside, and ridgetop). At each transect, four quadrats were sampled for ground cover, plant spacing, and litter on May 28 2013, and the results below are averages of those observations (**Table 2**).

- **Transect 1**: primarily a hayfield, but strip-grazed in 2012 when forage was low because of the drought. Seeded in spring 2009 with alfalfa, white clover, red clover, and bromegrass. No-till seeded in spring 2013 with orchardgrass, meadow fescue, bromegrass, and Italian rye.
- **Transect 2**: hillside, bottom about 120 ft from a stream. Continuously grazed through 2009, frost-seeded with red clover and alfalfa in spring 2010, and rotationally grazed since.
- **Transect 3**: along ridgetop. Continuously grazed through 2009. Not grazed during 2012 growing season, but grazed after a killing frost in fall 2012.

Bare ground and litter percentages vary among transects. Bare ground was greatest in the hillside (Transect 2); plants often have difficulty establishing well on sloping ground. Plant spacing did not vary widely among transects. It is logical that litter was greatest in Transect 3, the pasture that had been grazed the least: during the summer when it was not grazed, forage could accumulate (though to a limited extent because of the drought), and even when grazing occurred, some of that forage would have senesced and become unpalatable to the cattle. Thus it was more likely to be trampled than consumed, contributing to the litter layer. Meanwhile, the hayfield

Table 2

	Percent bare ground, plant spacing, and percent litter of observed transects		
Transect	1	2	3
Bare ground (%)	4.4	10.8	6.3
Plant spacing (in)	1.6	1.3	1.1
Litter (%)	5.8	6.5	18.0

had the least litter, likely because when hayed there is little dead vegetation to remain as litter.

The heights and growth stages of the forage species found are shown in **Table 3**.

Nathan has monitored these transects since 2010, and has changed management or introduced new seedings during that period. There is evidence of transitions taking place:

- **Transect 1** previously was mostly legume, with only some bluegrass and a few patches of brome. There was no red clover in 2010, but there was sweetclover, which was absent in 2013; overall the number of species and species per square foot did not differ between years.
- **Transect 2** did not have any apparent red clover or alfalfa in 2010, the year in which it was seeded, but both species were present in 2013, increasing the species count from 0.7 species/ft^2 in 2010 to 0.9 species/ft^2 in 2013.
- **Transect 3** was not seeded between 2010 and 2013, but little and big bluestem (prairie species) and birdsfoot trefoil were present only in 2013. Dormant seed in the seed bank of that pasture may be starting to germinate, given the different management – no more continuous grazing, and extra long rests because of the drought. Bluegrass disappeared during that same timeframe, again perhaps because of the elimination of continuous grazing: bluegrass tends to take over when pastures are overgrazed, which is common with continuous grazing.

Table 3

Height and growth stages of forage species identified and species density in three observed transects

	Transect	1		2		3	
	Plant	**Height** (in)	**Stage**[1]	**Height** (in)	**Stage**	**Height** (in)	**Stage**
Legumes	alfalfa	16	2	15	2	--	--
	red clover	7	1-3	9	1	9	2
	white clover	6	1	10	1	8	2
	sweetclover	--	--	12	2	17	2-3
	birdsfoot trefoil	--	--	--	--	6	2
Grasses	bluegrass	9	1	9	1	--	--
	bromegrass	19	1	19	2	20	2
	timothy	--	--	12	1	15	2
	big bluestem	--	--	8	--	11	1
	little bluestem	--	--	--	--	8	1
	yellow nutsedge	--	--	8	1	--	--
	panicgrass	--	--	5	1	--	--
	sideoats grama	--	--	--	--	6	1
Species/ft^2		0.5		0.9		0.8	

In 2013, Nathan and Sarah had their cattle on pasture from May 31 through Sept 26, after which the cattle went to crop stubble and cover crops. During the pasture season, the animals grazed around 35 acres for just over 100 days. By reporting the days cattle were moved from paddock to paddock, the approximate amount of forage consumed on a given paddock can be estimated.

The cowherd started at 23 cow-calf pairs, about 1100 lb each; a bull (1500 lb) and some heifers (950 lb) were added later. Cattle consume about 3% of their body weight per day as live forage dry matter (DM); thus, the cowherd consumed just less than 1200 lb of forage DM per day. Over the 100 days, then, they consumed about 120,000 lb of DM. This averages out to about 2800 lb DM/ac of forage consumed. Cattle generally consume about 50% of the available forage – so the pastures may have produced as much as 5600 lb DM/ac. In 2010, when pasture monitoring began, Nathan had only 12 cows and the bull, and was grazing about 30 acres for 120 days. That year the estimated forage consumption was about 2000 lb DM/ac, or about 4000 lb DM/ac produced. However, these are very rough estimates of forage yield; when there were fewer cattle, they may have consumed a lower percentage of the available forage, so the actual forage produced may have been greater.

After grazing pastures, the cowherd moved to a cropfield of just over 50 ac, to graze soybean stubble and cover crops. They grazed for 34 days, so using similar calculations as above, there was approximately 580 lb DM/ac. According to Nathan's hay records, his large round bales are about 600 lb each, or about 480 lb of DM since hay is around 15% moisture. The 50 ac of cropground, then, provided the same forage as 67.5 round bales. Hay prices in midsummer in Iowa were around $55/bale of this size (ISU Extension); if the Andersons had bought hay during this period, they would have spent over $3700.

Nathan and Sarah took three cuttings of hay off of one pasture (**Table 4**). Across the cuttings, 5712 lb of forage DM/ac was harvested as hay. This suggests that the earlier estimates of forage production by pastures – 5600 lb DM/ac max – are not unreasonable.

Labor

Nathan and Sarah logged the hours they spent doing work on the farm, both short-term hours (such as moving cattle, checking fence, and setting up new paddocks) and long-term hours (building brand new fence, cutting cedars, and fence maintenance). From late May through the end of October – 162 days – they worked about 164 hours (49 long-term and 115 short-term), averaging just over an hour per day.

Table 4

Total and per acre hay* yield in 2013
*hay assumed to be 85% DM

	Acres	Hay yield (tons)	Hay yield (tons/ac)	DM yield (tons/ac)
Front Pasture	5.6	18.8	3.4	2.9

Economics

Nathan and Sarah began monitoring the pasture in 2010. Since then, the cowherd and pastures have grown and improved. **Table 5** summarizes some of the differences since the project began.

The Andersons have increased their carrying capacity since pasture monitoring began. While pasture size increased between 2010 and 2013, the pastures support more animals per acre in 2013 than they could in 2010. Nathan attributes this difference to better management: cutting cedars to open up more area for grass, interseeding legumes and other forage species, and rotational rather than continuous grazing. About 20 of the long-term hours Nathan and Sarah logged in 2013 went to cutting cedars, and this weaning data suggests that it is time well-spent. Reclaiming acres is far cheaper than buying or renting more!

Table 5

Calf weaning weight and average daily gain (ADG) relative to acres grazed in 2010 and 2013

Year	Total pasture size (ac)	Number of calves weaned	Average calf weaning weight (lb)	Average calf ADG (lb/d)	Total pounds weaned (lb)	Pounds weaned per grazed acre (lb/ac)
2010	30.6	12	567	2.26	6802	222
2013	34.1	24	549	1.96	13173	386
Average	32.4	18	558	2.11	9988	304

Conclusions and Next Steps

Nathan and Sarah will continue to monitor their pastures in the future. At a field day in August 2013, Nathan expressed his interest in getting more native species, such as big and little bluestem, in his pastures; one area that could not be grazed during the drought this summer already shows some new and different species. An ongoing task is managing the cedar population; even after being removed, the soil under the trees is acidic and few forage species survive.

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