

Establishing and Managing Caucasian Bluestem

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Profit and size of beef cow herds may be largely determined by the pasture available during the hot summer months. With low forage production from natural pastures and undependable growing conditions, the number of animals that can be grazed on a particular area must be limited in order to minimize risks of having a pasture shortage which would mean selling animals or purchasing additional forage. In Virginia we have primarily cool-season grasses in our natural pastures. Much of our spring pasture is wasted because we cannot stock heavy enough to utilize this early season growth when quality is high and yet not have too many animals for summertime pasture. Grazing tall-growing, perennial, warm-season forage grasses such as Caucasian bluestem (CB) shows exciting promise for filling this production gap in June through September. Once established, the stand can remain indefinitely if managed properly. However, we must learn to manage and utilize this grass in a totally different manner than we have practiced in the past with cool-season grasses such as tall fescue, orchardgrass, and bluegrass. Our reward, however, can be the availability of excellent forage for summer grazing with great dependability year after year.

First green up does not occur until 8 weeks after green up of the cool-season grasses. CB will be ready for pasture by late May in the Piedmont and early June in southwest Virginia. This warm-season grass is capable of growing on low pH soils (as low as 5.2), medium phosphorus and potash soil, and with less nitrogen than is required for cool-season grasses or bermudagrass. Productivity during what we consider in Virginia as low rainfall periods is remarkable. This grass produces excellent forage for livestock in the midwest where average rainfall is less than what we receive in our driest years anywhere in Virginia. Seldom in Virginia do we have a year when we do not have a total recharge of soil moisture to a depth that plant roots will be growing. This means that if we start with excellent soil water content in mid May we should never have a year when this warm-season grass will not give dramatically more production than any of our cool-season grasses during the summer.

Seed variety and quality: There are no varieties of CB, so purchase seed from reputable dealers. The seeds are very fluffy when harvested. Unless you have a drill with a special grassland seed attachment, you need to purchase “debearded” seeds. After the seeds are debearded, they are still more bulky than orchardgrass and must be mixed with an inert carrier in order to obtain uniform delivery through the small grain or fertilizer metering device on a drill. The CB can be spread with fertilizer using a spinner or drop spreader, but the seeds are so light that even a slight wind will cause possible poor distribution. Close spacing of passes with spinner spreaders is needed.

CB is very difficult to test for purity and germination, in part because of a wide range of seed maturity. Seeds in a seed head mature over a long time span. Time of harvest and weather conditions can influence the degree of seed maturity from different parts of the seed head. Thus shriveled seeds cannot be removed in the cleaning process. Purchase your seeds based on a pure live seed (PLS) basis from a reputable dealer. A PLS of greater than 50% would be ideal. PLS is calculated as % purity times % germination \div 100. Thus 70% purity and 70% germination equals 49% PLS.

There are between 800,000 and 1,000,000 seeds per lb of pure seed depending on how much “fluff” was removed during the debearding process. A “ragdoll” germination test can be used to confirm seed viability. Only an experienced seed analyst can identify a seed, so a typical test using 100 seeds is not easily done for determining percentage germination. A “ragdoll test” can be used if a sensitive scale is available to weigh the seed instead of counting a definite quantity. Instead of counting seeds, you can use 100 mg of bulk seed. Be sure to select a uniform representative sample. A wet towel with a firm texture is ideal. Squeeze most of the water out of the towel. Place the 100 mg of seed on the moist paper towel. Fold the towel and roll it into a small tube. Place the “ragdoll” tube in a plastic bag with a zip closure. Place the “ragdoll” in a warm place (75 to 85°F is ideal). After about 4 days remove and

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count the seedlings. Repeat the count at 8 to 12 days. In order to confirm that your “ragdoll” is working properly, place some good viable seed of alfalfa, millet, or any other plant in a similar “ragdoll.” If the good viable seed germinates, you can have confidence that the “ragdoll” will test CB germination properly. This test will give results that should relate to PLS. If the bulk seed has 50% PLS, then there would be about 100 potential seedlings in the 100 mg of bulk seed in the “ragdoll.”

Seeding rate and inert carrier: A seeding rate of 2 lb PLS/acre is recommended. This rate will give about 1.8 million seeds/acre or about 41 seeds per square foot. The lb of bulk seed needed can be calculated (lb bulk seed/acre = $2 \div \text{PLS}$ when PLS is expressed as a decimal value). For example, if PLS is 50% then 4 lb of bulk seed is needed per acre ($2 \div 0.5 = 4$). Three or four seedlings per sq. ft. at the end of the season will be an adequate stand.

A carrier of soybean oil meal (SOM) and triple superphosphate (TSP) can be used so the fluffy seed will pass through the small grain metering device. The SOM gives a little “lubrication” and reduces the harshness of the material being delivered through the small grain box. The TSP gives some concentrated weight which helps move the seed/carrier mixture. Prepare the carrier mixture with a 50:50 ratio by weight of SOM and TSP. The amount of carrier needed per lb of bulk seed will depend on how thoroughly the seed was processed while being debarbed. The more debarbing of the seed, the more flowable the seed will be and the less carrier will be needed. A 1:19 ratio of bulk seed to carrier is a place to start. Thus if 4 lb of bulk seed are needed per acre then 80 lb of mix (39 lb of SOM and 39 lb of TSP) would be needed. The TSP in this mix will provide 17 lb of P_2O_5 (0-44-0) per acre. Drill calibration is important. Having a large volume and weight of seed/carrier mix to use makes calibration and uniform delivery easier than just using seed alone. Seed and carrier can be stored as a mixture.

Seeding depth and planting: Ideal seeding depth is less than 1/4 inch. Seeds are more often placed too deep than too shallow. A firm soil under the seed is essential. Broadcasting seeds onto a granular surface of a conventional seed bed and cultipacking would be adequate. If a grain drill is used to put the seeds in rows, then create a very shallow furrow and drop the seeds behind the disk openers so that the major soil coverage is caused by the press wheels. Succeeding rain will help cover the seeds.

For no-till planting a good grain drill often can be used since a trashy surface is not desirable. If a no-till drill is used, be sure that the leading coulter does not push trash into the furrow (hair pinning) without slicing through cleanly. **You should delay the planting until the soil surface is rather dry.** Creating a granular soil structure as the disk opener passes will give an ideal place for the seeds to drop. Arrange the delivery tube to drop the seed just behind the double disk opener if possible. A narrow press

wheel or center ribbed-wheel will cover and firm the soil adequately. A rainfall will finish the coverage. Plantings made into quite dry soil have been successful because of favorable moisture below the surface when no-till practices have been used.

Date of planting: CB needs a warm soil to germinate. It should be planted at about the same time as millet and sorghum-sudan or later (June 10 to July 10). Plant earlier if the field’s weed potential is minimal. Planting CB in early July provides enough time for seedlings to develop a strong root system and begin forming daughter tillers. Formation of daughter tillers should indicate that a plant will survive the winter. Planting as late as possible will allow time to kill more weeds and lessen competition from unwanted vegetation. Also, the soil surface is more likely to be dry if CB is planted in June. CB planted by mid June can accumulate 2 to 3 ton/acre of hay by mid October. Seed heads will develop viable seeds in the establishment year if planted by about July 1.

Selecting the field: CB does well on a wide variety of soil types. Unlike cool season grasses, it is drought-tolerant and produces well on shallow, rocky soils. Because no-till seeding is ideal for CB, steep slopes can be planted without having to deal with such tillage problems as soil erosion and rock exposure. It is important when planting steep slopes to select a drill or make the necessary adjustments so that the disk opener follows the leading coulter. Drills having a fixed position, unitized coulter-disk opener assembly are preferred. If planting conditions are favorable, only the disk opener action is needed.

Soil pH should be 5.2 or above. If soil tests indicate medium or higher P_2O_5 and K_2O , then no fertilizer is needed at planting. No nitrogen should be applied at planting; however, if a good weed-free stand is obtained by early August, then 30 to 40 lb of N/acre can be applied on fields where growth is slow and plants are a pale yellow color from nitrogen deficiency. CB is a good scavenger of nutrients; therefore, N is seldom needed in the establishment year.

Previous annual crop: Weeds can be a major obstacle for CB establishment, especially summer annuals, such as barnyard grass, crabgrass, foxtail, and also fall panic grass. These can be reduced by planning ahead. One year before planting CB, a smother crop such as dwarf pearl millet can be planted in the summer, followed by a cereal grain in the winter. Since foxtail (German) millet is a one-cut crop, dwarf pearl millet is preferred as a smother crop. It will grow longer and give several grazings or two hay cuts. If some growth remains on the millet during winter, a cereal grain cover crop may not be needed. If used, the cereal grain can be grazed or cut for hay by late April or mid May so that regrowth or weeds, if any, can be easily controlled before planting.

Soybean, corn, or small grains can be used as a previous crop. If corn was harvested for grain, the stalks may need to be raked and baled to eliminate excess trash. A cereal grain could be planted after corn is removed for silage if a winter cover crop is needed. One year prior to CB planting, a field should be plowed or chisel plowed, if needed, to bury excess trash, increase infiltration, or smooth the land where it is too rough for operating machinery.

Minimize surface residue: As with no-till alfalfa and other small-seeded forages, CB cannot be planted into very much surface residue. Many perennial grasses in pastures or hay fields accumulate too much trash which prevents good seed to soil contact. The trash often is pushed down in front of the coulter and seed is placed in the fold (hair pinning). About 50 percent or more bare ground is desirable before planting. Burning surface trash is ideal if it is dense enough to carry a fire. When properly timed, the burn will kill small weeds and be equivalent to the use of an herbicide. Local fire departments, soil conservation units, or forestry service personnel may be sources of help in safe burning.

Previous sod crop: Graze the area as close as possible or make hay during the first week of May. If the area cannot be grazed then an herbicide may be needed in early April to prevent excess growth. About mid May, when adequate leaf area has developed on the vegetation, spray with glyphosate (Roundup) or Gramoxone. If you use low gallonage technology, then 2 quarts per acre (2 lb a.i.) will be adequate. Gramoxone at 1.5 pints/acre plus surfactant can be used if the weeds and grasses present can be controlled with this contact herbicide. About 4 to 6 weeks later or as close to the day of planting as possible, spray again. Gramoxone at 1 pint/acre should be sufficient for the second spray. If persistent weeds or perennial grasses are present, use a second application of glyphosate. As mentioned earlier, excess trash is a problem where fields cannot be grazed. Use of a herbicide followed by burning is an ideal combination. Glyphosate in mid April or paraquat in early May will cause desiccation of vegetation by mid May that can be burned. Then 3 to 4 weeks later another application of herbicide can be used immediately before planting. Each field condition requires specific herbicide procedures, so obtain information from a qualified individual for recommendations.

Seeding into a conventional seedbed: Field operations typically used for other small seeded forages can be used to prepare a clean seedbed. Be sure that the soil is especially firm. If a pickup truck driven over the field leaves a noticeable wheel track depression, then more packing may be needed. Conventional seeding may not be ideal because tillage will cause the soil to lose moisture in the warm dry weather during mid June when these operations are needed. Seed can be broadcast and then cultipacked. Seed placement in rows with a grain drill would be ideal. Seed should be placed no deeper than 1/4 inch.

Consider cultipacking after drill planting in order to obtain good seed-soil contact. Weed problems may be greater than with no-till plantings since germinable seed will be brought to the soil surface during tillage. Grassy weeds can be controlled to some extent by clipping at a height just above the CB seedlings. Broadleaf weeds can be controlled by clipping or with 2,4-D applied only after the CB seedlings are in the 4th leaf stage. Use the lowest rate of 2,4-D possible and wait as long as possible before spraying in order to allow CB seedlings to gain as much vigor as possible.

No-till planting: No-till seeding methods conserve soil, require less time and fuel, and allow rocks to remain below the soil surface. Proper procedures will reduce water run-off and evaporation, which improves the water supply to the seedling. If herbicides are used to suppress existing vegetation during 6 to 8 weeks before planting, there will be adequate water for rapid germination.

A standard grain can be used if there is minimal trash and the soil is soft, such as when planting into a previous soybean, corn, millet, or cereal grain crop. A drag chain and packer wheel should follow each drill opener. If needed, a cultipacker should be used to firm the soil. With no-till methods, it is tempting to plant when the soil is too wet and seed is placed too deep. Ideally, the soil surface should be rather dry. When trash is dry and soil is firm, the disk or coulter can cut a clean seed slot without hair pinning. Some granular soil should result from the disk opener. Seed should be placed on top of granular soil or less than 1/4 inch deep. Rainfall can wash soil to fill the furrow left by the disk opener and cover the seed much deeper than when originally planted. Germination and emergence will occur in 5 to 7 days when the soil is warm and moist.

Insect concerns: Grasshoppers, crickets, corn flea beetles, and other insects can be a problem with seedlings. When all green plant food is killed with herbicides, hungry insects may cause damage to new seedlings. Horse nettle is a host for corn flea beetle. If small pin size holes appear in horse nettle leaves, then corn flea beetles are in the field. No insecticide has label clearance for use on CB because low usage does not provide an economic incentive for a company to do the necessary testing. However, research data have shown a consistent advantage to the use of a granular systemic insecticide placed in the row with the seed at planting. Counter (20 G formulation) is effective at 1/2 lb a.i. per acre. Careful monitoring of early seedling growth is essential. If seedlings become unthrifty or have necrotic streaks along the leaf, then an insecticide may be needed.

Post emergence management: Grassy weed competition can be minimized by clipping above the leaves of seedlings. Broadleaf weeds can be controlled with light rates of 2,4-D and/or Banvel, but apply only after the seedlings have 4 fully expanded leaves. If CB seedlings are

developing daughter tillers, spraying is safe. Delay the use of herbicides as long as weeds are not competitive for light or soil water in order to reduce the potential for seedling damage.

Growth by mid August may be 15 to 25 inches tall. At this time, cattle could be used to graze enough to remove about half the leaf area. Once frost has killed the leaves, cattle can graze without restriction or harvest for hay. The fine stems and leaves will have low protein, but will provide considerable value as stockpiled forage.

Management of established stands: An herbicide can be used any time weeds are a problem in an established stand. Research has shown established CB to be very tolerant of simazine; however, there is no label clearance for its use. Simazine at 2 lb a.i./acre applied in early May has been effective for weed control. Simazine can be applied after CB has developed leaf area with no concern for foliar burn. If perennial, triazine-tolerant broadleaf weeds are present, a tank mix that includes 2,4-D and/or Banvel can be used whenever target weeds are susceptible.

Hay harvest: First hay harvest should be taken at late boot stage of development. This will occur by June 15 to 25. Cutting at 3 to 4 inches will benefit regrowth. Cutting closer will not give much more hay value because few leaves remain on the stubble. A second hay cut can be expected in early August. If not to be grazed, a third hay harvest should be made about 2 weeks before the first frost date.

Maintenance fertility: Apply phosphate and potash as needed to maintain medium soil test levels. Applications may not be needed especially if CB is used for grazing, since animals return most of the nutrients as manure and urine. Where early season growth is slow and yellowish, or maximum first growth is needed, then nitrogen applied at 50 lb/acre may be needed in mid May. Nitrogen may be needed at about 50 lb/acre after the first hay cut, after the first time a paddock is rotationally grazed, or in late June if continuously grazed. Apply limestone when soil test is below pH 5.2.

Grazing management: Grazing can begin about June 5 to 10. Growth is very rapid for the first few weeks. Begin grazing when there is about 8 inches of growth. First time grazing should begin early enough that growth doesn't become too tall before all areas have been grazed once. Cattle can graze to leave a 3- to 4-inch stubble. Controlled rotational grazing is the best management. Begin early and initially rotate often. About 25 days are needed after grazing for about 10 to 12 inches of regrowth before grazing a paddock again. If the next paddock is ready for grazing before the current paddock is adequately grazed, consider making hay and skipping to another paddock in the sequence. Continue grazing until late September if growth is adequate. Regrowth during September and

October can be grazed as stockpiled forage without restriction after frost kills leaves.

Regrowth of CB from each hay harvest or grazing will develop seedheads, whereas cool-season species develop seedheads only once during initial growth in the spring. Animal gains can be excellent if adequate amounts of vegetative forage is available for grazing, which is the same consideration as for cool-season species. Protein concentration when beginning to graze a paddock was generally above 9 % during 1993 and 1994 except in late June when cattle could not keep up with growth in the first cycle (Fig. 1). Better control of grazing would prevent protein being less than 8%. For 4 years, steers at the Glade Springs Research Station have gained a remarkable 3 lb/head/day for several weeks during the summer on CB. A farmer in Missouri produced 469 lb live weight per acre on steers (2.4 lb/head/day) during June to mid August. Then he harvested seed from the area (700 acres). In the fall he grazed the area after frost where he had 3000 lb/acre of stockpiled forage.

Productivity for 100 days under controlled grazing can be estimated at about 240 animal unit days (AUD) per acre. Note that in 1993 CB produced 288 AUD/acre and in 1994 there were 300 AUD/acre in an experiment near Blacksburg (Table 1). Continuous grazing would be expected to produce less than with controlled rotational grazing, unless the stocking rate was high and cattle were moved to other pasture during any time period that CB was grazed to about 3 to 4 inches. If such management were possible, then the grazing practice takes on some degree of "control."

An estimate of the number of acres needed for a herd of cattle (or how many cattle are needed per acre) should be based on animal units (AU). One AU is considered as one mature nonlactating cow maintaining a body weight of 1000 lb (no gain or loss of weight). This requires 17.6 lb of feed intake per day (1.76 percent of body weight) if the source of feed is 60 % digestible (10.6 lb TDN). Each class or size of animal will have an AU requirement that will depend mainly on body weight, lactation, and daily gain or loss of body weight. Information is available that gives these estimated AU values. When AU needs of the herd or desired group of cattle are determined, then an estimate is needed of the AU productivity of one acre of CB.

Consider the following example: A pasture that produces 240 animal unit days (AUD) per acre in 100 days would provide 2.4 AU per day per acre if growth was uniform during the entire grazing period. This is equal to 0.42 acres per AU. For CB a uniform growth rate is rather dependable unless limited by low rainfall. Consider an example of starting the season with 600 lb stockers gaining 2 lb/head/day. That would be 0.7 AU per head. You would need 3.4 stockers per acre (2040 lb live weight) initially

(2.4 ÷ 0.7). Thus a starting goal for 10 acres of CB would be 34 stockers or 24 nonlactating cows (1000 lb/head). If production of more than 240 AUD per acre were possible, then more cattle could be grazed. As with cool-season species, the early season growth may be highest at a time when animal feed requirements are least. The solution can involve selling some animals in late season, making hay if needed in early season, moving cattle to rested cool-season pastures in late season, or feeding some hay if needed in late season.

As a guide for planning **paddock size** in a rotational grazing system, we have calculated the number of animal units that would be needed per acre to graze for 5 days with

25 days rest between grazing cycles (an ideal goal). Six paddocks would be needed to make this system work. Forage available for grazing when beginning to graze a paddock averaged 1900 lb/acre during 1993 and 1994 at Blacksburg (Table 1). This represented a height of 8 to 10 inches of growth at the beginning of each grazing period. From the example in the previous paragraph, 14.4 AU would be needed per acre during the 5-day grazing period.

If 3.4 stockers per acre gained 2 lb/head/day for 100 days, then 680 lb live weight gain per acre would be produced. This is good production for hot summer periods when natural pastures are sometimes so poor that little net live weight gain occurs.

Table 1. Caucasian bluestem (CB) grazing data for 1993, 1994, and 1995. All cattle were grazed on switchgrass when adequate CB was not available. Cattle included steers (beginning weight range 800 to 1100 lb/hd) and in 1994 some dry dairy cows (avg. wt. of 1240 lb/hd).

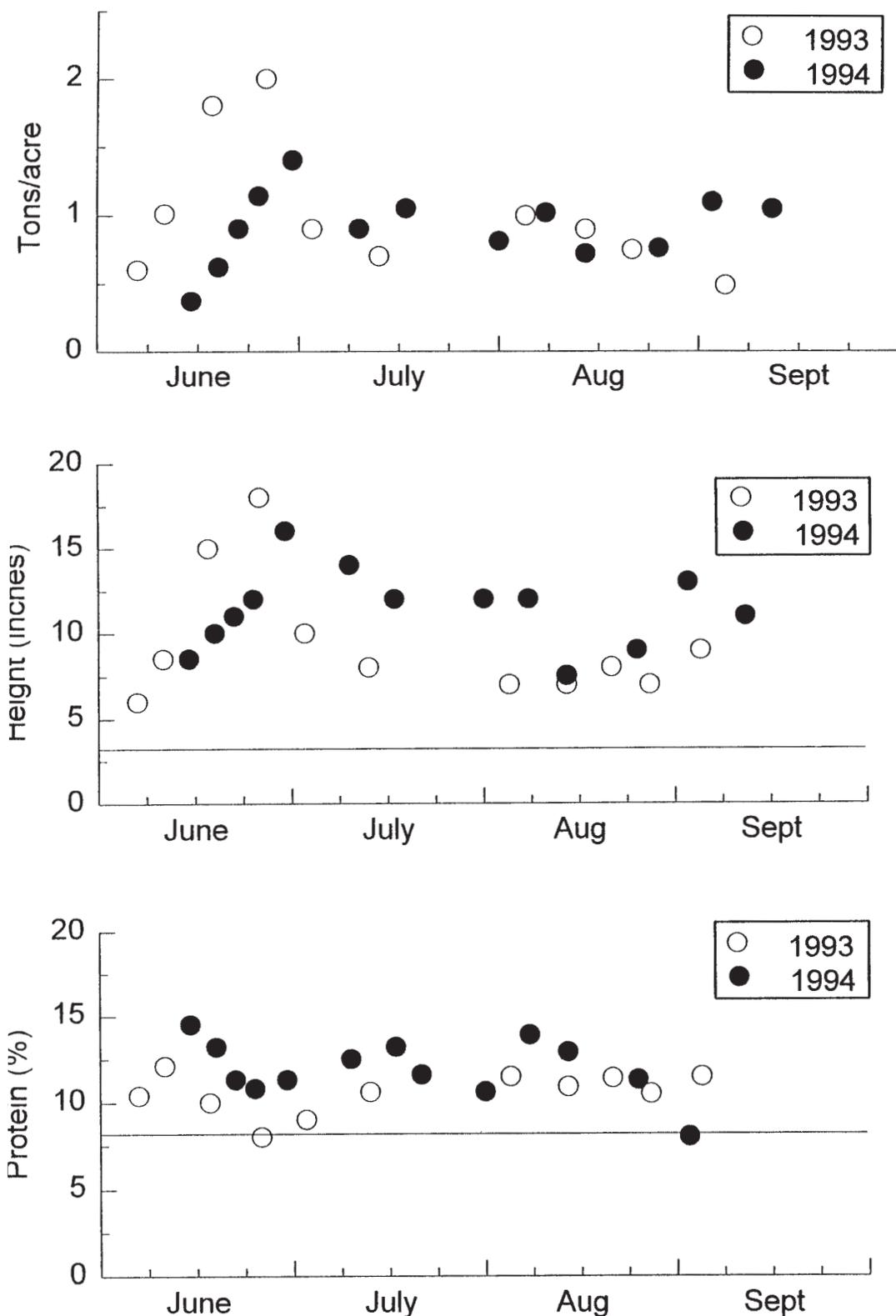
	1993	1994	1995
Begin grazing	June 8	June 15	June 3
End grazing	Sept 17	Sept 26	Aug 23 ¹
Days of grazing (days)	100	104	80
Acres grazed (4 paddocks) (acres)	2.6	3	3
Beginning live weight (lb.)	6850	13,250	11,670
Ending live weight (lb.)	8035	15,410	13,780
Gain per head per day (lb/head/day)	2.4	1.7 (2.4)**	2.3
Gain per acre (lb.)	456	580	684 ¹
Beginning grazeable forage* (lb/acre)	1900	1910	1390
Beginning height* (inches)	7.5	9.0	9.3
Days rest between grazing	21	24	26
Days grazed per paddock	6 to 7	3 to 5	4 to 5
Animal units days per acre	288	300	284 ¹

*Beginning grazeable herbage amount and height were averages for all paddocks during the 100 days.

**Beef steers gain in ().

¹In 1995, steers were removed on Aug. 23 to be used for another study. An additional 30 days of grazing gave estimated gain per acre and AUD per acre. Actual gain by Aug. 23 was 456 lb./acre, with 224 AUD/acre.

Figure 1. Crude protein, plant height, and grazeable dry matter of Caucasian bluestem as cattle began grazing each paddock during 1993 and 1994. Horizontal line indicates 8% crude protein. Samples for analysis were clipped to leave a 3 to 4 inch stubble.



Reviewed by Benjamin Tracy, associate professor, Crop and Soil Environmental Sciences