

Bermudagrass - New Seeding

Crop Highlights
<ul style="list-style-type: none"> • Success with seed has been limited • Use newer, cold-tolerant, seeded-type hybrids; avoid Arizona common and Giant type common • Best results occur when bermudagrass is sprigged, especially with irrigation • Turf-type bermudagrass hybrids are available but not productive in a hay system • Not tolerant of shading by other species including weeds

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.5

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 - 40 lbs N/ac.
3. After 4 weeks, an additional 20 – 40 lbs N/ac can be applied if weed pressure is not at a competitive level
4. Cease N applications at least 4-6 weeks prior to the Bermudagrass entering winter dormancy (generally early October).
5. During the first season of establishment, mow as needed to control weeds.

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0 - 20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.
2. If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
3. If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Broadcast and incorporate potash at or prior to seeding.
2. Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or prior to seeding and the remainder in late August or early September.

Magnesium

1. Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
2. If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
2. Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

- MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is 6.6 or higher AND M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

1. Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.

Big Bluestem - New Seeding

Crop Highlights

- Light chaffy seed and, if not debearded, it requires a warm-season grass drill or special attachment
- Slow to establish; weed competition is a problem
- Do not cut or mow the first growing season
- Leave a 6 to 8 inch stubble when cutting
- Big blue stem stores its residual or regrowth carbohydrates in the lower stem base
- If cut again after seed head emergence, allow adequate time for regrowth before frost

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 - 40 lbs N/ac.
3. During the establishment phase or the first growing season, mow no closer than the top of the warm-season grass to remove weed seed heads.
4. If the crop produces a seed head the first season, it can be cut, but leave 6-8 inches of stubble to improve regrowth potential

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0-20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.
2. If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
3. If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Broadcast and incorporate potash at or prior to seeding.
2. Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or before seeding and the remainder in August or September.

Magnesium

1. Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
2. If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
2. Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

- MnAI = Mn availability index
 Soil pH = Soil pH measured in water (1:1 V:V)
 M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is 6.6 or higher AND M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

1. Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.

Eastern Gamagrass - New Seeding

Crop Highlights
<ul style="list-style-type: none"> • Seed is very large • This seed requires cold scarification for germination • Unscarified seed has been successfully planted when seeded in December once soil temperature falls below 50° F. • Plant seeds using a corn planter on 30 inch row spacing • Can be harvested 3 to 4 times a year if a 6 to 8 inch stubble is left to assist recovery

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.5

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 - 40 lbs N/ac.
3. When the crop reaches 30-36" tall or begins to show seed head development, harvest leaving 6-8" of stubble. Apply an additional 40-60 lbs N/ac after harvest.

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0-20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.
2. If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
3. If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Broadcast and incorporate potash at or prior to seeding.
2. Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or before seeding and the remainder in late August or September.

Magnesium

1. Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
2. If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
2. Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

- MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is 6.6 or higher AND M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

1. Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.

Indiangrass - New Seeding

Crop Highlights
<ul style="list-style-type: none"> • Chaffy seed and, if not debarbed, it requires special drill to successfully seed this species • New stands can take two years to establish sufficiently to be cut for hay or grazed • Once established, limit cuttings to maintain stand • Leave adequate time for recovery before frost • Requires high stubble (at least a minimum 6 to 8 inches) • Indiangrass, a native warm-season grass, heads late in the summer

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 lbs N/ac.
3. During the establishment phase or the first growing season, mow no closer than the top of the warm-season grass to remove weed seed heads.
4. If the crop produces a seed head the first season, it can be cut, but leave 6-8 inches of stubble to improve regrowth potential

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0-20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.
2. If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
3. If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Broadcast and incorporate potash at or prior to seeding.
2. Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or prior to seeding and the remainder in late August or September.

Magnesium

1. Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
2. If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
2. Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

- MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is 6.6 or higher AND M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

1. Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.

Little Bluestem - New Seeding

Crop Highlights

- Chaffy seed and, if not debearded, it requires special drill to successfully seed this species
- Plant after soil temperatures reach 60° F. or about May 15 to early June
- Much shorter stature than other warm-season grasses and lower yielding

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
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Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 - 40 lbs N/ac.
3. During the establishment phase or the first growing season, mow no closer than the top of the warm-season grass to remove weed seed heads.
4. If the crop produces a seed head the first season, it can be cut, but leave 6-8 inches of stubble to improve regrowth potential.

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0-20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.

- If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
- If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

- Broadcast and incorporate potash at or prior to seeding.
- Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or prior to seeding and the remainder in late August or September.

Magnesium

- Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
- If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
- If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

- Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
- Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
- Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

MnAI = Mn availability index

Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

- If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
- Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
- If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac AND soil pH is 6.6 or higher AND M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

- Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
- Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

- Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.

Switchgrass - New Seeding

Crop Highlights
<ul style="list-style-type: none"> • Switchgrass seed is non-chaffy, hard, and has a shiny or oily appearance • Switchgrass seed can be planted with most drills unlike the bluegrasses or Indiangrass • Plant after soil temperatures reach 60° F. or about May 15 to early June • New stands can take two years to establish sufficient to hay • Switchgrass, a native warm-season grass, heads earlier than bluestem or Indiangrass

Yield Goal

Yield goals are not made for new seedings of perennial forages. Instead, these recommendations are designed to promote good establishment of the forage for future productivity and discourage weed competition.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Do not apply N at seeding to avoid stimulating weed competition.
2. When seedlings are 2 to 4 inches tall and if weed pressure is not at a competitive level, broadcast 20 - 40 lbs N/ac.
3. During the establishment phase or the first growing season, mow no closer than the top of the warm-season grass to remove weed seed heads.
4. If the crop produces a seed head the first season, it can be cut, but leave 6-8 inches of stubble to improve regrowth potential.

Phosphorus

Table 2. Recommended phosphorus rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs P ₂ O ₅ /ac	120	110	100	85	75	65	50	40	0 - 20	0	0

1. If soil test P is “Low” or “Medium” (e.g., 50 FIVs or less), broadcast and plow down the recommended rate of phosphate prior to seeding.
2. If soil test P is “Optimum” (e.g., 51 to 100 FIVs), broadcast and incorporate phosphate prior to seeding or surface broadcast at or shortly after planting.
3. If soil test P is “Excessive” (e.g., greater than 100 FIVs), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium rate to reach optimal soil test levels to support good forage establishment and future productivity.

Fertilizer	UD FIVs										
	0	10	20	30	40	50	60	70	80	90	100
lbs K ₂ O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Broadcast and incorporate potash at or prior to seeding.
2. Application rates of 120 lbs K₂O /ac or higher should be split into two treatments. Apply ½ of the recommended rate at or prior to seeding and the remainder in late August or September.

Magnesium

1. Magnesium (Mg) is recommended when soil test Mg is less than 38 FIVs to reduce the risk of grass tetany, especially in the spring.
2. If soil test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If soil test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

Soluble Mg	UD FIVs								
	0	5	10	15	20	25	30	35	40
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Apply 20 - 40 lbs S/ac to ensure that adequate sulfur is available to meet crop needs.
2. Broadcast S prior to seeding or use ammonium sulfate as an N source to supply needed S when deficiency is expected.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$\text{MnAI} = 101.7 - (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

- MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

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4. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. **Apply only when adequate growth is present to aid absorption of foliar Mn.**

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

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If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water **Apply only when adequate growth is present to aid in the adsorption of foliar Zn.** Application should be repeated if symptoms re-appear.

Boron

1. Boron deficiency is not usually observed in this crop. If B deficiency symptoms appear, contact your county agent for assistance with diagnosis and corrective recommendations.