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Establishing and Managing Warm-Season Grasses for Conservation Buffers

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Conservation buffers go by many different names depending on the field location, type of vegetation planted, and primary purpose of the intended planting. Whether the conservation buffers are called 'vegetated filter strips,' 'contour strips,' 'buffer strips,' 'riparian buffers,' 'grass buffers,' 'grass hedges,' or 'grassed waterways,' these small strips of land in perennial vegetation are designed, in part, to buffer the landscape against the negative effects of water moving across the land (Figure 1). Conservation buffers can increase soil organic matter and reduce erosion by slowing water runoff and trapping sediment, resulting in the interception of fertilizers and pesticides and enhanced water infiltration. According to the USDA Natural Resources Conservation Service (NRCS), properly installed and maintained buffer strips can remove (1) 50% or more of the nutrients and pesticides; (2) 60% or more of certain pathogens; and (3) 75% or more of sediment in runoff water. In eastern Nebraska, planting 28"-wide grass hedges of switchgrass in corn fields reduced runoff by an average of 52%, and sediment loss by 53%. In Iowa, native grass strips protect water quality by reducing runoff water by as much as 60%, and nitrogen (N) and phosphorus (P) transport by 90%, while simultaneously not affecting crop yield except in those places taken out of crop production. Although these responses are striking, they don't come without a cost. Taking cropland out of production still requires the landowner to pay property taxes, which can exceed $100 per acre in eastern Nebraska.

Conservation buffers often are planted in areas that are susceptible to erosion, along drainages, or in areas that should not be cropped due to environmental sensitivity, such as fragile soils or critical habitat. Areas bordering drainages and creeks provide a natural separation between agricultural chemical use and water sources. Conservation buffers can also provide (1) habitat for a wide variety of wildlife species, including both resident and migratory species; (2) connecting corridors that facilitate wildlife movement between habitat areas; and (3) habitat for bees, butterflies, and other beneficial pollinators. Establishing conservation buffers can be expensive, especially for high-diversity plantings. USDA

Figure 1. Water movement through cropland can have a significant detrimental effect on the soil resource and water quality, and it can also significantly impair agricultural operations. (Photo: Rob Mitchell)

Table 1. Suggested species and cultivars for conservation buffers in the eastern half of Nebraska. These grasses should be planted 2 to 3 weeks before or after the recommended corn planting date (late April to early June) at a depth of ¼" to ½". Use a grassland drill with depth bands and an active agitator for species with fluffy seeds. To control broadleaf weeds in the planting year, apply 1 qt/ac of 2,4-D 6 to 8 weeks after planting. Always read and follow label directions.

	Suitable Habitat	Growth Form	Seed Type	Recommended Composition	Seeding Rate	Herbicides in Planting Year	
						Grassy weeds	Do Not Use
BIG BLUESTEM *Andropogon gerardii* Recommended Cultivars: Bonanza, Goldmine, Pawnee	Upland	Sod-forming	Fluffy	Monoculture; or Mixture (prone to lodging in monoculture) ≥50% in mixtures	6 to 10 PLS lbs/ac in pure stands, adjust % for mixture	4 oz/ac Plateau®, Imazapic 2SL (active ingredient [a.i.] imazapic)	
INDIANGRASS *Sorghastrum nutans* Recommended Cultivars: Chief, Scout, Warrior	Upland	Bunchgrass (weak rhizomes)	Fluffy	Monoculture; or Mixture 30–50% in mixtures	6 to 10 PLS lbs/ac in pure stands, adjust % for mixture	4 oz/ac Plateau®, Imazapic 2SL (a.i. imazapic; atrazine intolerant as seedling)	atrazine
SWITCHGRASS *Panicum virgatum* Recommended Cultivars: Cave-in-Rock, Liberty, Shawnee	Upland Liberty does well in wet areas	Bunchgrass (weak rhizomes)	Smooth	Monoculture; or ≤10% of mixture	5 to 8 PLS lbs/ac in pure stands, adjust % for mixture	32 oz/ac Facet® L (a.i. quinclorac; imazapic intolerant) Add 1–2 lb/ac atrazine if labeled	imazapic
LITTLE BLUESTEM *Schizachyrium scoparium* Recommended Cultivars: Blaze, Camper	Upland	Bunchgrass (weak rhizomes)	Fluffy	Mixture (avoid monoculture) ≤20% in mixtures	6 to 10 PLS lbs/ac in pure stands, adjust % for mixture	4 oz/ac Plateau®, Imazapic 2SL (a.i. imazapic)	
SIDEOATS GRAMA *Bouteloua curtipendula* Recommended Cultivars: Butte, Trailway	Upland (avoid wet sites)	Bunchgrass	Multiple spikelets	Mixture (short-lived; poor competitor; avoid monoculture) ≤10% in mixtures	6 to 10 PLS lbs/ac in pure stands, adjust for mixture	4 oz/ac Plateau®, Imazapic 2SL (a.i. imazapic)	
PRAIRIE CORDGRASS *Spartina pectinata* Recommended Cultivars: Red River, Savoy	Lowland, flood-prone sites	Sod forming	Fluffy clusters	Monoculture	5 PLS lbs/ac Not recommended in mixtures	32 oz/ac Facet® L (a.i. quinclorac) Add 1–2 lb/ac atrazine if labeled	

conservation programs often provide incentives to enroll conservation buffers, and they may provide cost-share for establishment as well as long-term payments for enrolling conservation acres. State wildlife agencies, Nebraska's Natural Resource Districts, and private organizations like Pheasants Forever may provide the use of grassland drills or make annual payments for establishing conservation buffers.

Species and Cultivar Selection

The native warm-season grasses big bluestem, Indiangrass, switchgrass, little bluestem, and sideoats grama all form an excellent foundation for conservation buffers. Prairie cordgrass is especially well-suited to wet areas, sites that are flood-prone, and areas that stand water for extended periods. However, each species has individual characteristics that make them best suited for specific situations (Table 1). For example, big bluestem is an excellent choice for conservation buffers due to its ability to form a dense sod, and its ability to compete well with other species. In monocultures, big bluestem has a tendency to lodge, reducing its value as winter cover for wildlife. Mixing big bluestem with Indiangrass, switchgrass, little bluestem, and sideoats grama reduces lodging and increases the amount of standing cover over winter, resulting in improved wildlife habitat value. Newer warm-season grass cultivars, such as 'Bonanza' and 'Goldmine' big bluestem, 'Scout,' 'Warrior,' and 'Chief' Indiangrass, and 'Shawnee' and 'Liberty' switchgrass, have more rapid establishment compared to other cultivars. With the exception of 'Liberty,' these newer cultivars have improved livestock performance compared to other cultivars. For more information on adapted cultivars for each species, see Anderson et al. (2011).

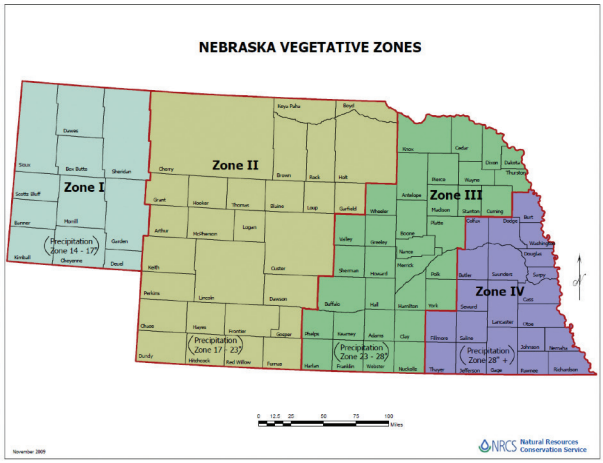

Figure 2. NRCS vegetative zones in Nebraska.

Figure 3. Soybean stubble is an excellent seedbed for no-till seeding. Good weed management and rainfall in the seeding year will provide about half of the fully established yield potential of the site and cultivar. Establishment can be delayed and seeding year yield reduced in years with below average spring and summer rainfall. (Photo: Rob Mitchell)

Establishing Native Warm-Season Grasses

Native warm-season grasses such as big bluestem, Indiangrass, and switchgrass have a reputation for being difficult to establish and taking 3 years to get a usable stand. This may have been the norm 25 years ago, but it is not true today. New herbicides and cultivars have made it possible to seed native warm-season grasses in the spring and have a fully established stand 15 months after planting. These native warm-season grasses are well-adapted to all sites in NRCS Vegetative Zones III and IV in Nebraska, and more limited sites in Zones I and II (Figure 2). To achieve such success, a few guidelines should be followed.

When adequate precipitation is received, warm-season grasses are readily established when quality seed of adapted cultivars are used in conjunction with the proper planting date, seeding rate, seeding depth, seeding method, and herbicides for weed control. In the central Great Plains and the Midwest, warm-season grasses can be planted 2 or 3 weeks before to 2 or 3 weeks after the recommended planting dates for corn, typically from late April to early June. Warm-season grasses should be seeded with at least 30 pure live seed (PLS) per ft^2 based on the quality of the seedlot. Number of seeds per pound varies with species and seed lot, so calibrate your drill based on known seeds per pound to convert your seeding rate to pounds per acre (Table 1).

Excellent results can be obtained by planting no-till into soybean stubble or similar seedbed with a properly calibrated no-till grassland drill with depth bands that plant seeds ¼" to ½" deep followed by press wheels in 7.5- to 10-inch rows (Figure 3). Big bluestem and Indiangrass seeds are fluffy if not processed, so use a grassland drill with a chaffy seed box equipped with an active flow mechanism to prevent seed bridging. Prairie cordgrass can be seeded effectively, but it can also be grown in plugs or containers and transplanted to wetland areas that may be too wet for equipment. If warm-season grasses are planted in buffer areas after crops that leave heavy residue such as corn or sorghum, it may be necessary to graze the residue, shred or bale the stalks, or use light tillage to reduce the residue. However, we typically recommend no tillage for areas to be planted to conservation buffers, because these areas tend to be prone to erosion.

The cultural practices are similar for all native warm-season grass species. However, native warm-season grasses have different herbicide tolerances, so weed control needs to be specifically tailored to the species being planted (Table 1). Weed competition is the major reason warm-season grasses are slow to establish. For big bluestem and Indiangrass, applying 4 ounces of Plateau® (active ingredient imazapic) per acre immediately after planting and prior to big bluestem seedling emergence provides good grassy and broadleaf weed control. For switchgrass and prairie cordgrass, applying 32 ounces of Facet® L (quinclorac) per acre immediately after planting provides similar weed control. Switchgrass seedlings do not tolerate imazapic, so caution must be used when selecting herbicide options when seeding warm-season grass mixtures. During the seeding year, escape broadleaf weeds can be treated with 2,4-D at 1 qt/ac^{-1} after grass seedlings have five leaves. Weed control will account for only 5–10% of establishment costs. After a successful establishment year and with good management, warm-season grasses need only occasional weed control. Volunteer trees like ash, elm, honeylocust, and eastern redcedar often invade waterways. Occasional burning or individual plant treatments with herbicides or mechanical methods like loppers or a grubbing hoe can

quickly remove small trees. Herbicides must be used following the herbicide label and federal and state laws. Always read and follow label directions and contact your local university Extension office for specific guidance in your area.

Increasing Diversity

Another important consideration for these buffer strips is diversity of the seeding mixture. Remember that seeding perennial plants is a series of trade-offs. For example, seeding a single-species' buffer strip is a huge improvement over no buffer strip. However, adding more grass, forb, and legume species to the buffer strip provides additional benefits to pollinators and wildlife. A common mixture like 45% big bluestem, 45% Indiangrass, and 10% sideoats grama provides rapid establishment and diversity on the site as well as long-term stand persistence. Legumes like partridge pea, Illinois bundleflower, roundhead lespedeza, and alfalfa or other forbs like the goldenrods and the milkweeds can be added to the mixture to provide pollinator habitat and diversity. If a diverse mixture of native warm-season grasses, forbs, and legumes is desired, all components of the mixture should be planted at the same time. The trade-off here is how rapidly the stand becomes established. In single-species plantings, planting rate, planting date, planting depth, and herbicides for weed control are specifically selected for the species, and typically result in rapid establishment. However, seeding mixtures presents additional challenges during establishment, especially by limiting the herbicides that can be used to rapidly establish the stand to keep erosion to a minimum during the planting year. Be aware that although diverse mixtures are highly desirable, they can provide additional establishment challenges like limited herbicide options and slow establishment.

Determining Seeding Success

A 'frequency grid' is an easy way to monitor grass and weed seedlings during the seeding year (Figure 4). A frequency grid can be made from a piece of concrete re-mesh with 6" × 6" squares. Cut the re-mesh into a 5 × 5 grid with 25 squares. When grass seedlings are easy to see and have 3 to 4 leaves, select at least 10 different locations in your field. At each location, place the frequency grid on the ground, and count the number of the 25 squares that have a grass seedling rooted inside and record that number. Flip the grid and repeat three more times for a total of 100 squares. Add the number of squares that contained at least one seedling and you have the percent frequency of grass seedlings for that location. Repeat the process at nine other locations and calculate the average stand frequency percent for the 10 locations. A stand frequency of ≥50% indicates a successful stand, whereas stands between 25 and 50% are marginal to adequate and stands with less than 25% frequency may need to be over- or re-seeded.

Figure 4. Establishment success can be determined with a frequency grid (https://www.youtube.com/watch?v=AXZN7-PmldU). In the frequency grid in this field, 20 of the 25 squares have a seedling present, which, if consistent across the entire field, would be a grass seedling frequency of occurrence of 80%, an excellent stand. (Photo: Rob Mitchell)

Managing Native Warm-Season Grasses

Remember, the primary functions of most conservation buffers are to reduce runoff, reduce erosion, and trap sediment and nutrients, so management practices should not compromise those functions. Consequently, any grazing or haying (if permitted in the conservation plan or program) should be seen as a bonus, not a necessity to make it economically feasible. Research supports that grass buffers provide better N, P, and sediment removal than trees, and harvesting grasses has little impact on their ability to protect water quality (Jiang et al. 2020). We typically do not recommend haying in warm-season grass conservation buffers, because warm-season grass re-growth is not reliable following mid-summer haying. However, dormant-season grazing can be an effective way to reduce the amount of standing dead material to promote rapid growth the following spring. Dormant-season grazing is best accomplished by allowing livestock access to the conservation buffer during late autumn and winter while grazing the surrounding crop residues. It is not necessary to exclude livestock from the conservation buffer but avoid feeding and calving in the buffer area to reduce trampling, soil compaction, and stand quality, which ultimately results in increased erosion. Fertilizer is not recommended for conservation buffers, even if the buffers are occasionally grazed

or hayed. During the planting year, applied N encourages weeds, increases competition for establishing seedlings, increases establishment cost, and increases economic risk associated with establishment if stands should fail. In established stands, the conservation buffers will likely receive nutrients in runoff from surrounding cropland, so fertilizing would defeat some of the purpose of the conservation buffer.

Given favorable precipitation with limited excessive runoff, warm-season grasses are typically well-established 12 months after seeding by following these basic guidelines: (1) plant high quality certified seed of adapted cultivars; (2) develop a firm seedbed; (3) use a well-calibrated grassland drill; (4) plant seeds ¼" to ½" deep; (5) seed 2 to 3 weeks before or after the recommended corn planting date; (6) control weeds early with recommended herbicides; and (7) monitor weather conditions, and try to plant before a predicted rainy period. Although cool-season grasses like smooth bromegrass work well in grassed waterways, native warm-season grasses are preferred for most other conservation buffers due to their deeper root systems, increased stand density and height, and their ability to remove significantly more sediment, N, and P than cool-season grasses.

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