**Supplemental Material**

Supplemental Table S1. Species planted by species mixture treatments in the southern (Becker, Lamberton, and Waseca) and northern (Roseau) locations in Minnesota, USA.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  | Southern locations | Northern locations |
| Type | Common name | Latin name | SG | GM | LG | HD | SG | GM | LG | HD |
| Grass | Switchgrass | *Panicum virgatum* | X† | X | X | X | X | X | X | X |
| Grass | Big bluestem | *Andropogon gerardii* |  | X | X | X |  | X | X | X |
| Grass | Indiangrass | *Sorghastrum nutans* |  | X | X | X |  | X | X | X |
| Grass | Canada wild rye | *Elymus canadensis* |  | X | X | X |  |  |  | X |
| Grass | Virginia wild rye | *Elymus virginicus* |  |  |  | X |  | X | X | X |
| Grass | Little bluestem | *Schizachyrium scoparium* |  |  |  | X |  |  |  | X |
| Grass | Slender Wheatgrass | *Elymus trachycaulum* |  |  |  | X |  |  |  | X |
| Grass | Sideoats grama | *Bouteloua curtipendula* |  |  |  | X |  |  |  | X |
| Legume | Leadplant | *Amorpha canescens* |  |  | X | X |  |  | X | X |
| Legume | Canada milk vetch | *Astragalus canadensis* |  |  | X | X |  |  | X | X |
| Legume | Wild blue indigo | *Baptisia australis*  |  |  | X | X |  |  |  |  |
| Legume | Purple prairie Clover | *Petalostemum purpurea* |  |  | X | X |  |  | X | X |
| Legume | Showy tick trefoil | *Desmodium canadense* |  |  |  | X |  |  | X | X |
| Legume | Partridge pea | *Chamaecrista fasciculata* |  |  |  | X |  |  |  |  |
| Legume | Bush clover | *Lespedeza capitata* |  |  |  | X |  |  |  |  |
| Legume | Perennial lupine | *Lupinus perennis* |  |  |  | X |  |  |  |  |
| Legume | American licorice | *Glycerryza lepidota* |  |  |  |  |  |  |  | X |
| Legume | Pale pea | *Lathyrus ochroleucus* |  |  |  |  |  |  |  | X |
| Legume | White prairie clover | *Petalostemum candidum* |  |  |  |  |  |  |  | X |
| Legume | American vetch | *Vicia americana* |  |  |  |  |  |  |  | X |
| Forb | Stiff goldenrod | *Solidago rigida* |  |  |  | X |  |  |  | X |
| Forb | Maximillian sunflower | *Helianthus maximilianii* |  |  |  | X |  |  |  | X |
| Forb | Yellow coneflower | *Ratibida pinnata* |  |  |  | X |  |  |  | X |
| Forb | Butterfly milkweed | *Asclepias tuberosa* |  |  |  | X |  |  |  | X |
| Forb | Cup plant | *Silphium perfoliatum* |  |  |  | X |  |  |  |  |
| Forb | Wild bergamot | *Monarda fistulosa* |  |  |  | X |  |  |  | X |
| Forb | Rough blazingstar | *Liatris aspera* |  |  |  | X |  |  |  |  |
| Forb | Golden Alexander | *Zizia aurea* |  |  |  | X |  |  |  |  |
| Forb | Purple coneflower | *Echinacea pallida* |  |  |  |  |  |  |  | X |
| Forb | Northern bedstraw | *Galium boreale* |  |  |  |  |  |  |  | X |
| Forb | Black-eyed susan | *Rudbeckia hirta* |  |  |  |  |  |  |  | X |

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†X denotes species was planted in designated species richness treatment

SG = switchgrass monoculture, GM = four species grass mixture, LG = eight species legume/grass mixture, HD = 24 species high diversity forb/legume/grass mixture

Supplemental Table S2. Species identity and mean percent cover ranked by the three most abundant species present in 2017 in each planted species mixture treatment, by N fertilizer combination (0 or 67 kg N ha-1) at Becker, Lamberton, Roseau, and Waseca, MN. Only species that were observed in more than one replication per treatment combination are listed except those identified by \*, indicating that no two plots of the treatment combination shared similar species. See Supplemental Table S1 for full species names. SG = switchgrass monoculture, GM = four species grass mixture, LG = eight species legume/grass mixture, HD = 24 species high diversity forb/legume/grass mixture. Underlined species names are those originally planted in the respective treatment. Bold species had greater than 70% cover where present. Weeds include those species not originally seeded as part of this experiment.

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| --- | --- | --- | --- | --- | --- |
|  |  | SG | GM | LG | HD |
| Becker |  | 0 | 67 | 0 | 67 | 0 | 67 | 0 | 67 |
|  | Species 1 | P. virgatum–33 | P. virgatum–52 | weeds–1 | **A. gerardii–78** | P. virgatum–28 | S. rigida–50 | **P. virgatum–70** | B. australis–40 |
|  | Species 2 | Z. aura–30 | S. rigida–35 | **B. australis–99\*** | S. nutans–30 | S. rigida–25 | E. canadensis–20 | weeds–1 | P. purpurea–4 |
|  | Species 3 | S. rigida–13 | weeds–6 | **A. gerardii–80\*** | weeds–1 | B. australis–22 | weeds–4 | A. gerardii–40\* | A. canadensis–3 |
| Lamberton |  |  |  |  |  |  |  |  |  |
|  | Species 1 | weeds–3 | A. gerardii–7 | B. australis–43 | S. rigida–43 | **B. australis–72** | A. gerardii–63 | A. gerardii–32 | **P. virgatum–97** |
|  | Species 2 | **B. australis–95\*** | S. nutans–25 | S. rigida–25 | P. virgatum–32 | S. rigida–45 | weeds–50 | P. virgatum–30 | weeds–3 |
|  | Species 3 | S. nutans–35\* | weeds–8 | A. gerardii–23 | weeds–6 | weeds–16 | E. canadensis–41 | B. australis–18 | S. rigida–40\* |
| Roseau |  |  |  |  |  |  |  |  |  |
|  | Species 1 | S. perfoliatum–43 | P. virgatum–24 | P. virgatum–60 | **P. virgatum–74** | P. virgatum–29 | P. virgatum–37 | **P. virgatum–90** | **P. virgatum–83** |
|  | Species 2 | P. virgatum–33 | B. australis–10 | B. australis–41 | S. nutans–11 | B. australis–23 | S. perfoliatum–20 | S. perfoliatum–32 | S. rigida–6 |
|  | Species 3 | M. fistulosa–23 | S. rigida–4 | S. rigida–3 | A. gerardii–6 | M. fistulosa–17 | B. australis–17 | B. australis–8 | R. pinnata–4 |
| Waseca |  |  |  |  |  |  |  |  |  |
|  | Species 1 | A. gerardii–42 | B. australis–10 | weeds–1 | weeds–1 | S. rigida–28 | P. virgatum–54 | A. gerardii–53 | B. australis–62 |
|  | Species 2 | P. virgatum–20 | S. rigida–13 | **A. gerardii–98\*** | A. gerardii–10\* | H. maximilianii–23 | weeds–1 | P. virgatum–47 | weeds–3 |
|  | Species 3 | B. australis–8 | H. maximilianii–8 | **E. canadensis–90\*** | **S. rigida–75\*** | P. virgatum–23 | B. australis–85\* | S. nutans–5 | P. purpurea–1 |