

2016 KBS and Arlington GLBRC Agronomic Protocol

January 1, 2016

G1: Annual grain monoculture: Continuous Corn (no crop rotation). This treatment represents a best management practice for conventional, high-intensity grain produced for biofuel, with some portion of the corn stover removed for cellulosic yield.		
Site	KBS	Arlington
Planting	Plant Dekalb DKC50-82 in late April or early May. Variety DKC50-82 is a Roundup Ready Genuity Smartstack RIB (refuge in a bag) corn blend.	Plant Pioneer P0157AMX between mid-April to early May. P0157AMX is a 101 day triple stack variety of Roundup Ready and BT corn
Cover Crop	No cover crops used	No cover crops used
Tillage	No-till	No-till
Harvest	Harvest corn in October or November. After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)	Harvest corn in October or November as DRY GRAIN (<23% moisture) . After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)
Fertilization	<p>Recommendations from MSU Soil and Plant Nutrient Laboratory</p> <ul style="list-style-type: none"> • 0.1 N: Corn price ratio • Medium Soil Productivity • Fertilizer recommendations based on corn silage (not corn grain). <p>Total nitrogen recommendations: 150 lb N ac⁻¹ (168 kg N ha⁻¹).</p> <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Sidedress: 41 gal/A 28% N solution (121 lbs N acre⁻¹, 136 kg N ha⁻¹).</p> <p>Phosphorus (P): No additional P other than starter fertilizer listed above.</p> <p>Potassium (K) applied pre-plant as 0-0-60: 335 lb ac⁻¹ (376 kg ha⁻¹) → [201 lb K₂O ac⁻¹ (226 kg K₂O ha⁻¹)]</p> <p>Apply the K to Reps 1, 2, 3, and 5. Rep 4 does not need any K applied.</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2015</p>	<p>Based on UWEX BMP's for:</p> <ul style="list-style-type: none"> • 0.10 N: Corn price Ratio • Very High Yield Potential Soils • Fertilizer recommendations based on corn silage (not corn grain) <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Side-dress 28% UAN: Adjust rate based on NO₃⁻ credits from spring soil sampling</p> <p>Unadjusted base rate based on an N:corn price ratio (0.10) and accounting for starter is: 170 kg N ha⁻¹ G1R1 base rate: 160 kg N ha⁻¹</p> <p>Phosphorus (P): applied pre-plant as 18-46-0 to selected plots base on UWEX recommendations.</p> <p>G1R1: apply 56 Kg 18-46-0 ha⁻¹ pre-plant</p> <p>Potassium (K): applied pre-plant as 0-0-60 to selected plots base on UWEX recommendations.</p> <p>G1R1: apply 112 kg 0-0-60 ha⁻¹ pre-plant G1R2: apply 112 kg 0-0-60 ha⁻¹ pre-plant G1R3: apply 196 kg 0-0-60 ha⁻¹ pre-plant G1R4: apply 56 kg 0-0-60 ha⁻¹ pre-plant G1R5: apply 196 kg 0-0-60 ha⁻¹ pre-plant</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2016</p>
Weed Control	<p>Burn down: Roundup (22 oz/A) + 2,4-D Ester (1 pt/A 7 days before planting) at label rates.</p> <p>Preemergence: Broadcast Lexar at 3 qts/A (Lexar is a premix of: Dual II Magnum (1.36 pt/A) + Callisto (5.34 oz/A) + atrazine 4L (1.3 lb/A)).</p> <p>Postemergence: Apply Roundup at label rates as needed to control weeds.</p>	<p>Actual herbicides may vary depending on weeds and seasonal constraints:</p> <p>Burn-down: Roundup + 2,4-D Ester at label rates</p> <p>Pre-emergence: Dual II Magnum at 1.74 l ha⁻¹ (1.5 pts/ac)</p> <p>Post-emergence: Roundup + Laudis at label rates as needed</p>
Micro-plots	<p>Corn Stover Retention: Leave stover on west 6 rows of each plot, all replications.</p> <p>Harvest of micro-plots: Using a Kincaid plot combine harvest the middle 5' (2 rows) of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</p>	<p>Corn Stover Retention: Leave stover on west 6 rows of each plot.</p> <p>Harvest of micro-plots: Using a 2 row combine harvest the middle two rows of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</p>

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G2: Annual grain monoculture: Continuous Corn (no crop rotation) with a cover crop. This treatment represents a best management practice for conventional, high-intensity grain produced for biofuel, with some portion of the corn stover removed for cellulosic yield. The cover crop biomass will also be harvested.		
Site	KBS	Arlington
Planting	Plant a short season corn variety (88-96 day) Pioneer P9188AMX (Acre Max Extra) In mid to late May (after cover crop harvest). Variety P9188AMX is a 91 day CRM. With YGCB, HX, LL, RR2, and single-bag integrated refuge in a bag solution.	Plant FS 36TV4 RIB in mid to late May. FS 36TV4 RIB is an 86 day triple stack variety of Roundup Ready and BT corn.
Cover Crop	<p>Harvest: Harvest previous years cover crop by 2nd week of May</p> <p>Planting: (Fall 2015) Over seeded cover crop mixture into corn at a rate of 2 bu/ac winter rye + 108 lbs/ac Austrian Pea.</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the north half (45 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots (except west 15 ft (6 rows) of Block 1 at KBS due to gas chambers). The north half (45 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop.</p>	<p>Harvest: Harvest 2015 planted cover crop by 2nd week of May</p> <p>Planting: Fall 2015 - Planted cover crop after grain and stover harvest at a rate of 1.5 bu/ac winter rye + 80 lbs/ac Lynx Winter Pea. 2016 - The cover crop is to be planted as soon as possible following harvest irrespective of the harvest status of the remaining annual treatments. Plant at the same seeding rates as fall of 2015. The cover crop biomass will be harvested next spring (2017).</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the northern 1/3rd (47 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots. The northern 3rd (47 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop. Due to lysimeter installation in the northern area of eastern micro-plot in block 4, the southern 3rd (47 ft) of the east edge will NOT have the cover crop harvested. This is ONLY for block 4.</p>
Tillage	No-till	No-till
Harvest	Harvest corn in October. After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)	Harvest corn in October as DRY GRAIN (<23% moisture) . After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)
Fertilization	<p>Recommendations from MSU Soil and Plant Nutrient Laboratory</p> <ul style="list-style-type: none"> • 0.1 N: Corn price ratio • Medium Soil Productivity • Fertilizer recommendations based on corn silage (not corn grain). <p>Total nitrogen recommendations: 150 lb N ac⁻¹ (168 kg N ha⁻¹).</p> <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Sidedress: 41 gal/A 28% N solution (121 lbs N acre⁻¹, 136 kg N ha⁻¹).</p> <p>Phosphorus (P): No additional P other than starter fertilizer listed above.</p> <p>Potassium (K) applied pre-plant as 0-0-60: 335 lb ac⁻¹ (376 kg ha⁻¹) → [201 lb K₂O ac⁻¹ (226 kg K₂O ha⁻¹)]</p> <p>Apply the K to Reps 1, 2, 3, and 5. Rep 4 does not need any K applied.</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2015</p>	<p>Based on UWEX BMP's for:</p> <ul style="list-style-type: none"> • 0.10 N: Corn price Ratio • Very High Yield Potential Soils • Fertilizer recommendations based on corn silage (not corn grain) <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Side-dress 28% UAN: Adjust rate based on NO₃⁻ credits from spring soil sampling Unadjusted base rate based on an N:corn price ratio (0.10) and accounting for starter is: 170 kg N ha⁻¹</p> <p>G2R1 base rate: 150 kg N ha⁻¹</p> <p>Phosphorus (P): applied pre-plant as 18-46-0 to selected plots base on UWEX recommendations G2R1: apply 112 kg 18-46-0 ha⁻¹ pre-plant Potassium (K): applied pre-plant as 0-0-60 to selected plots base on UWEX recommendations. G2R1: apply 280 kg 0-0-60 ha⁻¹ pre-plant G2R2: apply 112 kg 0-0-60 ha⁻¹ pre-plant G2R3: apply 196 kg 0-0-60 ha⁻¹ pre-plant G2R4: apply 196 kg 0-0-60 ha⁻¹ pre-plant G2R5: apply 112 kg 0-0-60 ha⁻¹ pre-plant</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2016</p>
Weed Control	<p>Burn down: Roundup (22 oz/A) + 2,4-D Ester (1 pt/A 7 days before planting) at label rates.</p> <p>Preemergence: is to be determined</p> <p>Postemergence: Apply Roundup at label rates as needed to control weeds * herbicide program may need to be altered to accommodate rotation with cover-crop</p>	<p>Burn-down: Roundup + 2,4-D Ester at label rates Pre-emergence: Dual II Magnum at 1.74 l ha⁻¹ (1.5 pts/ac) Post-emergence: Roundup + Laudis at label rates as needed * herbicide program may need to be altered to accommodate rotation with cover-crop</p>
Micro-plots	<p>Corn Stover Retention: Leave stover on west 15' (6 rows) of replications 2, 3, 4, and 5. The micro-plot will be located on the east 15' (6 rows) of block 1 at KBS to avoid gas chambers.</p> <p>Harvest of micro-plots: Using a Kincaid plot combine harvest the middle 5' (2 rows) of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</p>	<p>Corn Stover Retention: Leave stover on west 6 rows of each plot.</p> <p>Harvest of micro-plots: Take cover crop microplots (see cover crop notes above) <i>Using a 2 row combine harvest the middle two rows of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</i></p>

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G3: Annual Grain: Corn-Soybean crop rotation, with a cover crop (<i>corn entry point</i>). Corn (2016) – Soybeans (2017) - Corn (2018) with some portion of the corn stover removed for cellulosic yield. The cover crop biomass will also be harvested.		
Site	KBS	Arlington
Planting	Plant a short season corn variety (88-96 day) Pioneer P9188AMX (Acre Max Extra) In mid to late May (after cover crop harvest). Variety P9188AMX is a 91 day CRM. With YGCB, HX, LL, RR2, and single-bag integrated refuge in a bag solution.	Plant FS 36TV4 RIB in mid to late May. FS 36TV4 RIB is an 86 day triple stack variety of Roundup Ready and BT corn.
Cover Crop	<p>Harvest: Harvest previous years cover crop by 2nd week of May</p> <p>Planting: (Fall 2015) Over seeded cover crop mixture into corn at a rate of 2 bu/ac winter rye + 108 lbs/ac Austrian Pea.</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the north half (45 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots (except west 15 ft (6 rows) of Block 1 at KBS due to gas chambers). The north half (45 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop.</p>	<p>Harvest: Harvest 2015 planted cover crop by 2nd week of May</p> <p>Planting: Fall 2015 - Planted cover crop after grain and stover harvest at a rate of 1.5 bu/ac winter rye + 80 lbs/ac Lynx Winter Pea. 2016 - The cover crop is to be planted as soon as possible following harvest irrespective of the harvest status of the remaining annual treatments. Plant at the same seeding rates as fall of 2015. The cover crop biomass will be harvested next spring (2017).</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the northern 1/3rd (47 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots. The northern 3rd (47 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop.</p>
Tillage	No-till	No-till
Harvest	Harvest corn in October. After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)	Harvest corn in October as DRY GRAIN (<23% moisture) . After grain harvest remove plant stover (except not in 6 west rows, see micro-plots, below)
Fertilization	<p>Recommendations from MSU Soil and Plant Nutrient Laboratory</p> <ul style="list-style-type: none"> • 0.1 N: Corn price ratio • Medium Soil Productivity • Fertilizer recommendations based on corn silage (not corn grain). <p>Total nitrogen recommendations: 150 lb N ac⁻¹ (168 kg N ha⁻¹).</p> <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Sidedress: 41 gal/A 28% N solution (121 lbs N acre⁻¹, 136 kg N ha⁻¹).</p> <p>Phosphorus (P): No additional P other than starter fertilizer listed above.</p> <p>Potassium (K) applied pre-plant as 0-0-60: 335 lb ac⁻¹ (376 kg ha⁻¹) → [201 lb K₂O ac⁻¹ (226 kg K₂O ha⁻¹)]</p> <p>Apply the K to Reps 1, 2, 3, and 5. Rep 4 does not need any K applied.</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2015</p>	<p>Based on UWEX BMP's for:</p> <ul style="list-style-type: none"> • 0.10 N: Corn price Ratio • Very High Yield Potential Soils • Fertilizer recommendations based on corn silage (not corn grain) <p>Starter: 14 gals/A of 19-17-0 (29 lbs N acre⁻¹, 33 kg N ha⁻¹)(26 lbs P₂O₅ acre⁻¹, 29 kg P₂O₅ ha⁻¹)</p> <p>Side-dress 28% UAN: Adjust rate based on NO₃⁻ credits from spring soil sampling</p> <p>Unadjusted base rate based on an N:corn price ratio (0.10) and accounting for starter is: 170 kg N ha⁻¹ (note: no soybean N credit because rye biomass is removed following soy and before corn)</p> <p>G3R1 base rate: 160 kg N ha⁻¹</p> <p>Phosphorus (P): G3R1: apply 56 Kg 18-46-0 ha⁻¹ pre-plant</p> <p>Potassium (K): applied pre-plant as 0-0-60 to selected plots base on UWEX recommendations. G3R1: apply 112 kg 0-0-60 ha⁻¹ pre-plant G3R2: apply 196 kg 0-0-60 ha⁻¹ pre-plant G3R3: apply 56 kg 0-0-60 ha⁻¹ pre-plant G3R4: apply 196 kg 0-0-60 ha⁻¹ pre-plant G3R5: apply 196 kg 0-0-60 ha⁻¹ pre-plant</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2016</p>
Weed Control	<p>Burn down: Roundup (22 oz/A) + 2,4-D ester (1 pt/A 7 days before planting) at label rates. To control early season weeds.</p> <p>Preemergence: is to be determined</p> <p>Postemergence: Roundup at label rates as needed to control weeds. Insecticide as needed to control aphids. * herbicide program may need to be altered to accommodate rotation with cover-crop.</p>	<p>Burn-down: Roundup + 2,4-D Ester at label rates Pre-emergence: Dual II Magnum at 1.74 l ha⁻¹ (1.5 pts/ac) Post-emergence: Roundup + Laudis at label rates as needed * herbicide program may need to be altered to accommodate rotation with cover-crop</p>
Micro-plots	<p>Corn Stover Retention: Leave stover on west 15' (6 rows) of replications 2, 3, 4, and 5. The micro-plot will be located on the east 15' (6 rows) of block 1 at KBS to avoid gas chambers.</p> <p>Harvest of micro-plots: Using a Kincaid plot combine harvest the middle 5' (2 rows) of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</p>	<p>Corn Stover Retention: Leave stover on west 6 rows of each plot. Harvest (yield check) corn from the Corn Stover Retention micro-plots separately from main plot. Compare yield to opposite plot edge. Harvest of micro-plots: Take cover crop microplots (see cover crop notes above) <i>Using a 5' combine, harvest the middle of the outer 15' on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</i></p>

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G4: Annual Grain: Corn-Soybean (<i>soybeans entry point</i>). Soybeans (2016) – Corn (2017) - Soybeans (2018) with some portion of the corn stover removed for cellulosic yield. The cover crop biomass will also be harvested.		
Site	KBS	Arlington
Planting	Pioneer P22T69R RR soybeans in May, following cover crop harvest.	Plant O'SOY196NR2Y1 soybeans at 175,000 seeds/ac on 15" rows in May, following cover crop harvest. This is a 1.9-2.1 maturity group bean.
Cover Crop	<p>Harvest: Harvest 2014 planted cover crop by 2nd week of May</p> <p>Planting: Fall of 2014 planted cover crop after grain harvest at a rate of 1.5 bu/ac winter rye + 60 lbs/ac Austrian Pea. Fall of 2014 the cover crop is to be planted as soon as possible following harvest irrespective of the harvest status of the remaining annual treatments. Plant at same seeding rates as fall of 2013. The 2014 cover crop biomass will be harvested the following spring (2015).</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the north half (45 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots (except west 15 ft (6 rows) of Block 1 at KBS due to gas chambers). The north half (45 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop.</p>	<p>Harvest: Harvest 2015 planted cover crop by 2nd week of May</p> <p>Planting: Fall 2015 - Planted cover crop after grain and stover harvest at a rate of 1.5 bu/ac winter rye + 80 lbs/ac Lynx winter Pea. 2016 - The cover crop is to be planted as soon as possible following harvest irrespective of the harvest status of the remaining annual treatments. Plant at the same seeding rates as fall of 2015. The cover crop biomass will be harvested next spring (2017).</p> <p>Cover crop harvested area: Harvest all cover crop areas (main plot and micro-plot areas) except for the northern 1/3^d (47 ft) of the east edge (the 15' wide stover harvested micro-plot) of all plots. The northern 3/4 (47 ft) of the east edge will NOT have the cover crop harvested. This area will have the cover crop treated with a herbicide and plant the corn into the residue of the cover crop. Due to lysimeter installation in the northern area of eastern micro-plot in block 4, the southern 3/4 (47 ft) of the east edge will NOT have the cover crop harvested. This is ONLY for block 4.</p>
Tillage	No-till	No-till
Harvest	Harvest soybeans in September or October. Do not remove soybean stover.	Harvest soybeans in September or October. Do not remove stover. Harvest (yield check) soybean from the Corn Stover Retention micro-plots separately from main plot.
Fertilization	<p>No N or P applied in 2015 to soybeans.</p> <p>Potassium (K) applied as 0-0-60 K₂O: 135 lb ac⁻¹ (152 kg ha⁻¹) → [81 lb K₂O ac⁻¹ (91 kg K₂O ha⁻¹)]</p> <p>Apply the K to Reps 1, 2, 3, and 4. Rep 5 does not need any K applied.</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2015</p>	<p>Based on UWEX BMP's for:</p> <ul style="list-style-type: none"> Very High Yield Potential Soils <p><u>Starter:</u> none</p> <p><u>Nitrogen:</u> none</p> <p><u>Phosphorus (P):</u></p> <p>No additional P other than starter fertilizer listed above</p> <p><u>Potassium (K):</u> applied pre-plant as 0-0-60 to selected plots base on UWEX recommendations.</p> <p>G4R1: apply 56 kg 0-0-60 ha⁻¹ pre-plant G4R2: apply 56 kg 0-0-60 ha⁻¹ pre-plant G4R3: apply 196 kg 0-0-60 ha⁻¹ pre-plant G4R4: apply 112 kg 0-0-60 ha⁻¹ pre-plant G4R5: None</p> <p>Fall Soil Sampling: 3 x 15cm cores are to be taken from main plot & stover-retention micro-plot in Fall 2016</p>
Weed Control	<p>Burn down: Roundup (22 oz/A) + 2,4-D Ester (1 pt/A 7 days before planting) at label rates.</p> <p>Preemergence: is to be determined</p> <p>Postemergence: Apply Roundup at label rates as needed to control weeds.</p> <p>* herbicide program may need to be altered to accommodate rotation with cover-crop</p>	<p>Burn down: Roundup + Dual II Magnum + 2,4-D Ester at label rates to control early season weeds. No pre-emergence herbicide will be used in 2015.</p> <p>Post-emergence: Roundup at label rates as needed to control weeds. Insecticide as needed to control aphids or spider mites</p> <p>* herbicide program may need to be altered to accommodate rotation with cover-crop</p>
Micro-plots	<p>Corn Stover Retention: For corn years only: Leave stover on west 15' (6 rows) of blocks 2, 3, 4, and 5. The micro-plot will be located on the east 15' (6 rows) of block 1 at KBS to avoid gas chambers.</p> <p>Harvest (yield check) corn from the Corn Stover Retention micro-plots separately from main plot. Compare yield to opposite plot edge.</p> <p>Harvest of micro-plots: Using a Kincaid plot combine harvest the middle 5' (2 rows) of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</p>	<p>Corn Stover Retention: For corn year only (not 2016) same as G1 stover retention micro-plot. Harvest (yield check) soybeans from the Corn Stover Retention micro-plots separately from main plot. Compare yield to opposite plot edge.</p> <p>Harvest of micro-plots: Take cover crop microplots (see cover crop notes above) <i>Using a 2 row combine harvest the middle two rows of the outer 15' (6 rows) on both the east and west of each plot for use as yield check for stover retention and stover removal micro-plots.</i></p>

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G5: Perennial Grass – Monoculture Switchgrass		
Site	KBS	Arlington
Planting	Cave-in-rock was planted June 19, 2008 and overseeded in July 7, 2009 because of poor stand establishment of switchgrass in 2008.	Cave-in-rock was planted in 2008 and rep 5 was over-seeded in June of 2009 because of incomplete planting in 2008.
Cover Crop	N/A	N/A
Tillage	None	None
Harvest	<p>Same as G6, G7, G9, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Main plot harvest width will be 60 feet.</p> <p>Micro-plot harvest: see below.</p> <p>Main plot harvest is with JD 7350 forage chopper.</p>	<p>Same as G6, G7, G9, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence.</p> <p>Harvest micro-plots (see below) from the West and East edge of plot (15') using haybine/chopper combination. Same as main plot.</p>
Fertilization	<p>Nitrogen (28-0-0) will be applied at 50 lbs N acre⁻¹ (56 kg N ha⁻¹), which is 16.7 gals/A, 28% weighs 10.67 lbs/gal.</p> <p>Nitrogen application to the East 75' of each plot only.</p> <p>No P or K in 2015.</p> <p>No P or K was applied in 2010, 2011, 2012, 2013, and 2014.</p>	<p>Nitrogen will be applied as ESN (44-0-0) at 56 kg N ha⁻¹</p> <ul style="list-style-type: none"> • N application to E 75' only <p>No P or K in 2016 (should be discussed with 4.1 team)</p> <p>No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015</p>
Weed Control	<p>If needed PRE application of Roundup at 22 oz/A applied before switchgrass begins to grow.</p> <p>If needed: PRE or POST application of Drive or Paramount (quinclorac) 0.5 lb/A + atrazine 0.5 lb/A.</p>	<p>If needed PRE application of Roundup at 22 oz/A applied before switchgrass begins to grow.</p> <p>Broadleaf herbicides if necessary as a post emergence application</p>
Micro-plots	<p>No-Nitrogen fertilizer strip. No N fertilizer will be applied to the west 15 feet of each plot for all replications.</p> <p>Harvest (yield check) switchgrass from the No-Nitrogen micro-plots separately from main plot (60 ft wide). Compare yield to opposite plot edge. (compare the west and east 15 feet of each plot edge).</p> <p>Harvest of micro-plot: Harvest the middle 7.6' of the outer 15' on both the east and west of each plot using a JD 7330 with Wintersteiger/Kemper biomass harvester.</p>	<p>Harvest of N micro-plots: No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge. Harvest protocol for micro-plots will depend on equipment available. Ideally the middle ~5ft. of each micro-plot will be harvested but if we cannot obtain adequate equipment we will use the 14.5ft. haybine to harvest the majority of the micro-plots</p>

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G6: Perennial Grass – Monoculture Miscanthus		
Site	KBS	Arlington
Planting	<p>Miscanthus x giganteus was planted May 20-23, 2008</p> <p>In 2011 the middle part of plot G6R4 was replanted with rootstock that has been growing at KBS for the last three year</p>	<p>Miscanthus x giganteus was planted in May of 2008 and winter-killed.</p> <ul style="list-style-type: none"> • South section of plot (30' x 90') was re-planted in 2010 with the same rootstock • South Central section of plot (30' x 90' just N of 2010 planting) was planted in 2011 with the same rootstock • North Central section of plot (30' x 90' just N of 2011 planting) was planted in 2012 with the same rootstock • North section of plot (30' x 90' just N of 2012 planting) will be planted in 2013 with the same rootstock
Cover Crop	None	None
Tillage	None	None
Harvest	<p>Same as G5, G7, G9, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Main plot harvest width will be 60 feet.</p> <p>Micro-plot harvest: see below.</p> <p>Main plot harvest is with JD 7350 forage chopper.</p>	<p>2010, 2011, 2012, and 2013 plantings same as G5, G7, G9, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence</p> <p>Compare W 15' of to E 15' (N fertilizer micro-plot / see below)</p>
Fertilization	<p>Nitrogen (28-0-0) will be applied at 50 lbs N acre⁻¹ (56 kg N ha⁻¹), which is 16.7 gals/A, 28% weighs 10.67 lbs/gal.</p> <p>Nitrogen application to the East 75' of each plot only.</p> <p>No P or K in 2015.</p> <p>No P or K was applied in 2010, 2011, 2012, 2013, and 2014.</p>	<p>Nitrogen will be applied to all plantings as ESN (44-0-0) at 56 kg N ha⁻¹</p> <ul style="list-style-type: none"> • N application to E 75' only <p>No P or K in 2016 (should be discussed with 4.1 team)</p> <p>No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015</p>
Weed Control	None	<p>Pre-emergence: Prowl (1-2pts) + 2,4-D + Glyphosate</p> <p>Post-emergence: 2,4-D ester 0.61 l ha⁻¹ (8oz ac⁻¹) as needed</p>
Micro-plots	<p>No-Nitrogen fertilizer strip. No N fertilizer will be applied to the west 15 feet of each plot for all replications.</p> <p>Harvest (yield check) miscanthus from the No-Nitrogen micro-plots separately from main plot (60 ft wide). Compare yield to opposite plot edge (compare the west and east 15 feet of each plot edge).</p> <p>Harvest of micro-plot: Harvest the middle 7.6' of the outer 15' on both the east and west of each plot using a JD 7330 with Wintersteiger/Kemper biomass harvester.</p>	<p>Harvest of N micro-plots: No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge. Harvest protocol for micro-plots will depend on equipment available. Ideally the middle ~5ft. of each micro-plot will be harvested but if we cannot obtain adequate equipment we will use the 14.5ft. haybine to harvest the majority of the micro-plots</p>

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G7: Perennial Grass – Multi-species		
Site	KBS	Arlington
Planting	None Planted June 18, 2008 and overseed in June 2009 because of poor establishment in 2008.	None
Cover Crop	None	None
Tillage	None	None
Harvest	Same as G5, G6, G9, and G10 Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Main plot harvest width will be 60 feet. Micro-plot harvest: see below. Main plot harvest is with JD 7350 forage chopper.	Same as G5, G6, G9, and G10 Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Harvest micro-plots (see below) from the West and East edge of plot (15') using haybine/chopper combination. Same as main plot.
Fertilization	Nitrogen (28-0-0) will be applied at 50 lbs N acre ⁻¹ (56 kg N ha ⁻¹), which is 16.7 gals/A, 28% weighs 10.67 lbs/gal. Nitrogen application to the East 75' of each plot only. No P or K will be applied in 2015. No P or K was applied in 2010, 2011, 2012, 2013, and 2014.	Nitrogen will be applied as ESN (44-0-0) at 56 kg N ha ⁻¹ <ul style="list-style-type: none"> • N application to E 75' only No P or K in 2016 (should be discussed with 4.1 team) No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015
Weed Control	None: Drive herbicide is not labeled for Canada wild rye.	None
Micro-plots	No-Nitrogen: No N fertilizer applied to west 15 feet of each plot for all replications. Harvest (yield check) Multi-species grass from the No-Nitrogen micro-plots separately from main plot (60 ft wide). Compare yield to opposite plot edge. (compare the west and east 15 feet of each plot edge). Harvest of micro-plot: Harvest the middle 7.6' of the outer 15' on both the east and west of each plot using a JD 7330 with Wintersteiger/Kemper biomass harvester.	Harvest of N micro-plots: No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge. Harvest protocol for micro-plots will depend on equipment available. Ideally the middle ~5ft. of each micro-plot will be harvested but if we cannot obtain adequate equipment we will use the 14.5ft. haybine to harvest the majority of the micro-plots

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G8: Short-rotation trees (Poplars)		
Site	KBS	Arlington
Planting	Planting Date: May 1, 2008 Variety NM 6: Populus nigra x populus maximowiczii, Spring 2014 allow tree regeneration to develop from stumps from trees that were harvested in January 2014.	Planting Date: May 9, 2008 Variety NM 6: Populus nigra x populus maximowiczii, Spring 2015 allow continued regeneration to develop from stumps from trees that were harvested in December 2014. Fill in gaps using new NM6 whips started in deep pots in greenhouse
Cover Crop	None	None
Tillage	None	None
Harvest	Expected Harvest Date: January 2014 Harvest on six year rotation cycle, in mid-winter to avoid soil compaction and minimize nutrient loss.	Harvested December 2013 Harvest on six-year rotation cycle, in mid-winter to avoid soil compaction and minimize nutrient loss. Decommissioned
Fertilization	No N application in 2015 (poplar trees will have N applied one time for each planting rotation). No N will be applied in 2015. In 2010, 140 lbs N/A was applied as ammonium nitrate (34-0-0) NH ₄ NO ₃ . No P or K will be applied in 2015. No P or K was applied in 2010, 2011, 2012, 2013, and 2014. Collect peak crop leaf tissue analysis for N, P, & K. Take N, P, & K analysis form the main plot area and the no-nitrogen micro-plot area.	No N application in 2015 (poplar trees will have N applied one time for each planting rotation). No N will be applied in 2015 In 2010, 213 kg N ha ⁻¹ was applied as ammonium nitrate (34-0-0) to E 75' of plot. No P or K in 2016 (should be discussed with 4.1 team) No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015 Collect peak crop leaf tissue analysis for N, P, & K. Take N, P, & K analysis form the main plot area and the no-nitrogen micro-plot area.
Weed Control	None in 2010, 2011, 2012, and 2013, None expected in 2014	None in 2010, 2011, 2012, 2013. Spot spraying in 2014. Pre-emergent herbicide application in 2015: Oust @ 2 oz/AC Scepter @ 5.6 oz/AC Prowl H20 @ 6 pts/AC RoundUp WeatherMax @ 2 pts/AC FS Transform Plus @ 12 oz/AC
Micro-plots	No-N strip. No N fertilizer applied to south 15 feet of each plot, for all replications. The no-N strip will be used to compare yield to opposite plot edge (north edge of plots).	No-N strip. No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge.

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G9: Old Field Community		
Site	KBS	Arlington
Planting	No planting needed; plants provided by seed bank and natural colonization.	No planting needed; plants provided by seed bank and natural colonization.
Cover Crop	N/A	N/A
Tillage	None	None
Harvest	<p>Same as G5, G6, G7, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Main plot harvest width will be 60 feet.</p> <p>Micro-plot harvest: see below.</p> <p>Main plot harvest with JD 7350 forage chopper.</p>	<p>Same as G5, G6, G7, and G10</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence.</p> <p>Harvest micro-plots (see below) from the West and East edge of plot (15') using haybine/chopper combination. Same as main plot.</p>
Fertilization	<p>Nitrogen (28-0-0) will be applied at 50 lbs N acre⁻¹ (56 kg N ha⁻¹), which is 16.7 gals/A, 28% weighs 10.67 lbs/gal.</p> <p>Nitrogen application to the East 75' of each plot only.</p> <p>No-Nitrogen micro-plot: see below</p> <p>No P or K will be applied in 2015.</p> <p>In 2010, 2011, 2012, 2013, and 2014 50 lbs N/A was applied as 28-0-0.</p> <p>No P or K was applied in 2010, 2011, 2012, 2013, and 2014.</p>	<p>Nitrogen will be applied as ESN (44-0-0) at 56 kg N ha⁻¹</p> <ul style="list-style-type: none"> • N application to E 75' only <p>No P or K in 2016 (should be discussed with 4.1 team)</p> <p>No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015</p>
Weed Control	None	None
Micro-plots	<p>No-Nitrogen: No N fertilizer applied to west 15 feet of each plot for all replications.</p> <p>Harvest (yield check) Old Field Community from the No-Nitrogen micro-plots separately from main plot (60 ft wide). Compare yield to opposite plot edge. (compare the west and east 15 feet of each plot edge).</p> <p>Harvest of micro-plot: Harvest the middle 7.6' of the outer 15' on both the east and west of each plot using a JD 7330 with Wintersteiger/Kemper biomass harvester.</p>	<p>Harvest of N micro-plots: No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge. Harvest protocol for micro-plots will depend on equipment available. Ideally the middle ~5ft. of each micro-plot will be harvested but if we cannot obtain adequate equipment we will use the 14.5ft. haybine to harvest the majority of the micro-plots</p>

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G10: Native Prairie		
Site	KBS	Arlington
Planting	None Planted in 2008 and overseeded in June 2009 because of poor establishment in 2008.	None
Cover Crop	N/A	N/A
Tillage	None	None
Harvest	<p>Same as G5, G6, G7 and G9</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence. Main plot harvest width will be 60 feet.</p> <p>Micro-plot harvest: see below.</p> <p>Main plot harvest with JD 7350 forage chopper.</p>	<p>Same as G5, G6, G7 and G9</p> <p>Harvest so that 6 inches of stubble remain for wildlife cover. Harvest in fall after hard frost / senescence.</p> <p>Harvest micro-plots (see below) from the West and East edge of plot (15') using haybine/chopper combination. Same as main plot.</p>
Fertilization	<p>The main plot in G10 treatment will NOT receive nitrogen application. The nitrogen will be applied to micro-plots (see below).</p> <p>Only fertilize the micro-plots: Nitrogen application to the West or East 15' of each plot only. Please see micro-plot location below.</p> <p>Nitrogen (28-0-0) will be applied at 50 lbs N acre⁻¹ (56 kg N ha⁻¹), which is 16.7 gals/A, 28% weighs 10.67 lbs/gal.</p> <p>In 2010, 2011, 2012, 2013, and 2014 50 lbs N/A (16.7 gals/A) was applied as 28-0-0.</p> <p>Nitrogen micro-plot: see below</p> <p>No P or K will be applied in 2015.</p> <p>No P or K was applied in 2010, 2011, 2012, 2013, and 2014.</p> <p>Fertilizer is to be applied only to the micro-plot area located on the west 15' of replications 2, 3, 4, and 5; and on the east 15' of replicate 1 to avoid gas chambers.</p>	<p>The main plot in G10 treatment will NOT receive nitrogen application. The nitrogen will be applied to micro-plots (see below).</p> <p>Only fertilize the micro-plots: Nitrogen application to the West 15' of each plot only.</p> <p>Nitrogen will be applied as ESN (44-0-0) at 56 kg N ha⁻¹</p> <ul style="list-style-type: none"> • N application to W 15' only <p>No P or K in 2016 (should be discussed with 4.1 team)</p> <p>No P or K was applied in 2008, 2009, 2010, 2011, 2012, 2013, 2014, or 2015</p>
Weed Control	No herbicides option for weed control with the number of species within the prairie mix.	No herbicides option for weed control with the number of species within the prairie mix.
Micro-plots	<p>Nitrogen fertilizer will be applied to west 15' of blocks 2, 3, 4, and 5. The micro-plot will be located on the east 15' of the plot in block 1 at KBS to avoid gas chambers.</p> <p>Harvest (yield check) Native Prairie from the Nitrogen micro-plots separately from main plot (60 ft wide). Compare yield to opposite plot edge. (compare the west and east 15 feet of each plot edge).</p> <p>Harvest of micro-plot: Harvest the middle 7.6' of the outer 15' on both the east and west of each plot using a JD 7330 with Wintersteiger/Kemper biomass harvester.</p>	<p>Harvest of N micro-plots: No N fertilizer applied to West 15 feet of plot. Compare yield to opposite plot edge. Harvest protocol for micro-plots will depend on equipment available. Ideally the middle ~5ft. of each micr-plot will be harvested but if we cannot obtain adequate equipment we will use the 14.5ft. haybine to harvest the majority of the micro-plots</p>