2014 GLBRC Baseline Sampling Report

Intensive Site

Soil

Soil was sampled three times in the GLBRC main plots in 2014. Samples were taken on May 28, July 28 and October 20 in all replicates (R) 1-5 of all treatments (G) 1-10. Soil was sampled using ¾" diameter push corers. Four cores (0-25cm) were taken from each of the three sampling stations and all 12 cores composited for each plot. Inorganic nitrogen extractions and soil moisture determinations were done on subsamples from all soil sampled. Analysis of the inorganic nitrogen extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2014-2015.

On November 3 soil was sampled from the microplots in G1-10 R1-5. Ten cores (0-25cm) were composited from each microplot. These samples along with the October 20 main plot samples were air-dried and archived. Also, a subsample from each will be sent to the MSU Soil and Plant Nutrient Lab for standard analysis which includes pH, lime requirement, P, K, Ca, and Mg.

Gas

Gas was sampled fifteen times on the GLBRC main site using static chambers (round) between April 9 and November 21, 2014. Main site plots that were sampled include G1-10 R1-4, as well as the microplots in G5, 6, and 9. Added in 2014, gas samples were taken from microplots within G2, 3, and 4 where the cover crop was removed. For all gas sampling, frequency was twice each month, except for a one-month period (June) following fertilization when sampling was done weekly. Samples were taken between 8am and 12noon. Following the November 21 sampling some chambers were removed for the winter. Winter gas sampling began on December 19 and should continue monthly through March 2015. Main site plots sampled during the winter include G1-10 R1-4, but none of the microplots. All gas samples were analyzed for nitrous oxide, carbon dioxide and methane by Kevin Kahmark and Cathy McMinn using the Agilent/Gerstel automated GC in Academic 330.

Soil temperature and soil samples to determine moisture content were taken near each chamber where gas was sampled. Air temperature and light measurements were taken from just outside some chambers, while air temperature was measured inside those chambers as well.

An automated gas sampling system was used to analyze gas from all treatments in block 1 daily. Automated chambers were sampled four times each day. Samples were analyzed for nitrous oxide, methane and carbon dioxide. Additionally, during April 2014 – January 2015, samples were also routed through the NO_x box.

Water

Soil water samplers were used to collect water from the soil in G1-10 R1-4. Samplers were evacuated and leachate collected about twice each month. Thirteen collections were made between April 10 and November 24. The leachate collected was delivered to David Weed in the Hamilton Lab for analysis.

Plants

Above-ground biomass: Plant biomass samples were taken from the main plots at their peak and/or just prior to harvest. Species separations were completed on the majority of samples taken. The

plant sampling season began with cover crop samples taken from G2, 3, and 4 on May 27. Live leaf samples were taken from the G8 main and microplot trees July 14-15. In the main part of G8, understory samples were taken July 17-18. Leaves were collected in ground traps as they fell from the trees in G8 between July 17 and October 24. Traps were typically checked weekly and leaf litter collected. At peak biomass, mid-August through mid-September, plant samples were taken from G5, 7, 9 and 10. Soybeans were sampled at their peak in G4 on September 18. Peak corn samples were taken from G1-3 September 23-26. October 8-9, miscanthus ANPP was sampled from G6. For the first time in 2014, plant samples were taken to evaluate harvest efficiency in G5, 7, 9, and 10 on October 22-23, G1 on October 27 and G6 on November 10. On November 4, the residue remaining following machine stover collection was collected from the ground in G1, 2, and 3 to evaluate collection efficiency. Poplar tree diameters from both the main and microplot portions of G8 were measured December 9. One tree from each of the five replicates was harvested December 17-19. Height, diameter and weight measurements were recorded for each tree. All plant material from all samplings was dried at 60ºC for at least 48 hours. The dried biomass will be weighed, ground and archived. Subsamples will be analyzed for carbon and nitrogen by Stacey VanderWulp.

Below-ground biomass: Cover crop roots were collected by digging up the roots of one rye stem following the above-ground sampling at each station in all G2-4. Corn and soybean roots were sampled in the same way, by digging up the roots for one stem following ANPP sampling. Root in-growth cores were installed in perennial treatments, G5-10, on April 17-23. There were 6 cores put into each plot. Three of the six cores were removed on July 28. The remaining three cores were removed on November 5. For all root samples, once collected from the field, they were refrigerated until the soil could be sieved and roots removed. All root samples were dried at 60ºC for at least 48 hours. During the winter 2015, roots will be weighed and ground. Subsamples will be analyzed for carbon and nitrogen by Stacey VanderWulp.

Phenology: Weekly checks for emergence began in early April 2014. Following emergence, phenology data was collected twice each month from May – November. Average plant height measurements were taken three times, including once near or at peak. All phenology data was collected by Rachel Medina.

Leaf Area Index (LAI): Measurements of light for LAI calculation were taken twice each month between May 22 and November 7. Sampling was done beginning just after sunrise and typically took around 75 minutes. All readings were taken by Rick Corder using an AccuPAR LP-80 Ceptometer.

Scale-up Fields

Soil

Soil was sampled on December 3 in all the GLBRC scale-up fields at Lux Arbor and Marshall Farms. Soil was sampled using ¾" diameter push corers. Ten cores were taken to a depth of 25 cm at each of the 10 stations in each plot and combined. Inorganic nitrogen extractions and soil moisture determinations were done on subsamples from all soil sampled. Analysis of the inorganic nitrogen extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2014-2015.

The December 3 samples were air-dried and archived. Also, a subsample from each will be sent to the MSU Soil and Plant Nutrient Lab for standard analysis which includes pH, lime requirement, P, K, Ca, and Mg.

Deep soil cores (1m depth) were sampled from all the stations in the scale-up fields from December 1-4. These cores will be processed during winter 2015. Cores are separated by depth, 0-10, 10-25, 25-50 and 50-100cm. Bulk density will be calculated for each depth and analysis for carbon and nitrogen content completed. A frozen subsample will be sent to the Tiedje lab for microbial analysis. The remaining soil will be air dried, with the dry soil going into the archive and to the MSU Soil and Plant Nutrient Lab for standard analysis.

Gas

Gas was sampled fifteen times in the GLBRC scale-up fields using static chambers (round) between April 9 and November 21, 2014. All seven plots were sampled, L1-3 and M1-4, with four chambers in each plot. Sampling frequency was twice each month, except for a one-month period (June) following fertilization when sampling was done weekly. Samples were taken between 12:45pm and 4:30pm, on the same day as the main site. All gas samples were analyzed for nitrous oxide, carbon dioxide and methane by Kevin Kahmark and Cathy McMinn using the Agilent/Gerstel automated GC in Academic 330.

Soil temperature and soil samples to determine moisture content were taken near each chamber where gas was sampled. Air temperature and light measurements were taken from just outside some chambers, while air temperature was measured inside the chambers as well.

Plants

Plant biomass samples were taken from all plots when they were at or near their peak. Species separations were completed on all samples taken. The prairie plots, L3 and M2, were sampled August 20-22. The switch grass samples were taken from L2 and M3, and the control field M4 sampled, September 15-17. Lastly, L1 and M1 corn fields were sampled September 29-30. All plant material from all samplings was dried at 60ºC for at least 48 hours. All dried biomass will be weighed, ground and archived. Subsamples will be analyzed for carbon and nitrogen by Stacey VanderWulp.

Switch grass Fertility Gradient

Soil

Soil samples were taken on December 9. Four cores (0-25cm) were composited from each H1 plot, the H2 portion was no sampled. The field-moist soil was analyzed for pH by Erica Annis.

Water

Soil water samplers were used to collect water from the soil in blocks 2-4. Samplers were evacuated and leachate collected about twice each month. Thirteen collections were made between April 10 and November 24. The leachate collected was delivered to David Weed in the Hamilton Lab for analysis.

Written by Stacey VanderWulp 1/14/2015