

2015 GLBRC Baseline Sampling Report

Intensive Site

Soil

Soil was sampled three times in the GLBRC main plots in 2015. Samples were taken on April 30, July 13 and October 7 in all replicates (R) 1-5 of all treatments (G) 1-10. Soil was sampled using ¾” diameter push corers. Three cores (0-25cm) were taken from each of the three sampling stations and all 9 cores composited for each plot. Inorganic nitrogen extractions and soil moisture determinations were done on subsamples from all soil sampled. Analysis of the extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2015-2016.

Also on October 7, soil was sampled from the microplots in G1-10 R1-5. Nine cores (0-25cm) were composited from each microplot. These samples along with the October 7 main plot samples were air-dried and archived. Also, a subsample from each was 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 eighteen times on the GLBRC main site using static chambers (round) between April 17 and November 10, 2015. Main site plots that were sampled include G1-5, and 10 in R1-4, as well as the microplots in G2, 3, and 4 in R1-4 - where the cover crop was removed. For all gas sampling, frequency was twice each month, except for an eight-week period following fertilization when sampling was done weekly. Samples were taken between 8am and 12noon. Following the November 10 sampling some chambers were removed for the winter. Winter gas sampling began on December 17 and should continue monthly through March 2016. Intensive site plots sampled during the winter are G1, 3, 5 and 10 in 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 when gas was sampled. Air temperature was logged both inside and outside, while light was measured outside, of some chambers using HOBO dataloggers.

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 immediately for nitrous oxide, methane and carbon dioxide.

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. Fifteen collections were made between April 13 and December 7. 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 26. Live leaf samples were taken from the G8 main and microplot trees on July 10. In the main part of G8,

understory samples were taken July 21. Leaves were collected in ground traps as they fell from the trees in G8 between July 21 and October 30. Traps were typically checked bi-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 G3 on September 14. Peak corn samples were taken from G1, 2 and 4 on September 21. October 5-6, miscanthus ANPP was sampled from G6. Continuing the sampling that began in 2014, plant samples were taken to evaluate harvest efficiency just prior to machine harvest in G1, 5, 7, 9, and 10 on November 2 and 3, and G6 on November 16. On November 5, the residue remaining following machine stover collection was collected from the ground in G1, 2, and 4 to evaluate collection efficiency. Poplar tree diameters from both the main and microplot portions of G8 were measured November 23. One tree from each of the five replicates was harvested November 24. Height, diameter and weight measurements were recorded for each tree. All plant material from all samplings was dried at 60°C 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: No sampling for roots was done on the GLBRC in 2015. However, on April 23 in LTER T5 poplars, twelve deep soil cores (0-122cm) were taken to look at poplar rooting depth.

Phenology: Weekly checks for emergence began in early April 2015. Following emergence, phenology data was collected twice each month from May 29 – November 13. Average plant height measurements were taken three times, including once near or at peak. All phenology data was collected by Matt Arndt.

Leaf Area Index (LAI): Measurements of light for LAI calculation were taken twice each month between May 29 and November 13. Sampling was done beginning just after sunrise and typically took 60-75 minutes. All readings were taken by Rick Corder using an AccuPAR LP-80 Ceptometer.

Scale-up Fields

Soil

On April 28, 2015, soil was sampled (0-10 cm) in all scale-up fields for CN analysis to account for any seasonal differences in the timing of deep core sampling. This is because in 2009, deep soil cores were taken in the spring; but in 2014 they were taken in the fall.

Soil was sampled on December 10 and 15 in all the GLBRC scale-up fields at Lux Arbor and Marshall Farms. Soil was sampled using $\frac{3}{4}$ " 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 extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2015-2016.

The December soil samples will be 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 eighteen times in the GLBRC scale-up fields using static chambers (round) between April 17 and November 10, 2015. All seven plots were sampled, L1-3 and M1-4, with four

chambers in each plot. Sampling frequency was twice each month, except for an eight-week period around 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 when gas was sampled. Air temperature was logged both inside and outside, while light was measured outside, of some chambers using HOBO dataloggers.

Plants

Plant biomass samples were taken from all plots when they were at or near their peak. Species separations were completed on all ANPP samples taken. The prairie plots, L3 and M2, were sampled August 24-27. The switchgrass samples were taken from L2 and M3, and the control field M4 sampled, September 4, 8-10. Lastly, L1 and M1 corn fields were sampled September 22, 23. At Ilya Gelfand's request, a residue sample was collected from the ground near each station following machine harvest in all scale-up fields (so not M4). All plant material from all samplings was dried at 60°C 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.

Switchgrass Nitrogen/Harvest Experiment

Soil

Soil samples were taken on November 17. Four cores (0-25cm) were composited from each plot. H1 and H2 were each sampled and kept separate. 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. Fifteen collections were made between April 13 and December 7. The leachate collected was delivered to David Weed in the Hamilton Lab for analysis.

Plant

While no samples are taken by hand, a sub-sample is saved from the machine harvest. This biomass is dried and will be ground, archived, and analyzed for CN.

Written by Stacey VanderWulp