Maryland Department of Natural Resources
Maryland Geological Survey
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**COASTAL AND ENVIRONMENTAL GEOSCIENCES**

**FILE REPORT NO. 12-04**

# LITTLE BLACKWATER CARBON SEQUESTRATION STUDY, SOIL CARBON ASSESSMENT YEAR 1 BASELINE

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February, 2012

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# *Introduction*

The forest carbon sequestration pilot project is a result of the Climate Action Plan issued in August 2008 by the Maryland's Commission on Climate Change. The Action Plan sets forth several policy recommendations related to carbon sequestration, including a specific recommendation for enhanced carbon sequestration through forest management. The afforestation site selected for the pilot project is located within the Little Blackwater purchase in Dorchester County, Maryland along Egypt Road. Within the 186 acre planting area, three 10-acre plots were selected as the pilot project demonstration site. Each of the test plots encompasses one of the three forest management scenarios, Low Management (LM) which is 100% hardwoods, Moderate Management (MM) which is 50-70% pines and 30-50% oaks, and High Management (HM) which is 100% pines. The three different management scenarios will allow for comparison of carbon captured among different distinct species composition as well as different management practices.

The goal of the carbon sequestration monitoring plan is to first establish a baseline condition of the planted parcel and then track the accumulation of carbon over time. The difference between carbon accumulated some time after planting minus the baseline carbon values is the amount sequestered over that time period. Maryland Geological Survey (MGS) was tasked with developing the monitoring plan for measuring carbon sequestration below-ground as forest growth occurs on the management plots. A random sampling was performed to select the below ground soil sampling sites for each study area. Ten sample sites were selected for each of the test plots and each were sampled using the same methodologies. At each sampling location, subsamples were collected from identified soil horizons A, B, and C, with appropriate subsampling within each horizon as necessary to fully characterize the below ground carbon. Total carbon values from each of the 10 sample sites were averaged for each soil horizon/subsample. The first sampling for below-ground soil carbon was performed in March 2011 and is thus the Year 1 sampling. The Year 1 carbon values will be used as the baseline below-ground soil carbon values of which all subsequent years will be compared to when calculating the amount of carbon sequestered over time for each test plot. The same sample sites used for the baseline data set will be revisited in following years.

# *Methods*

### *Sample Site Selection*

Three 10-acre plots within the Little Blackwater purchase were identified and selected as the pilot project demonstration site (Figure 1). ArcView 9.3 software was used to randomly select 10 sample sites within each test plot. A minimum distance between sites of 25 m was applied to provide ample coverage across each plot. The sample sites within each of the study plots are shown in Figure 2.

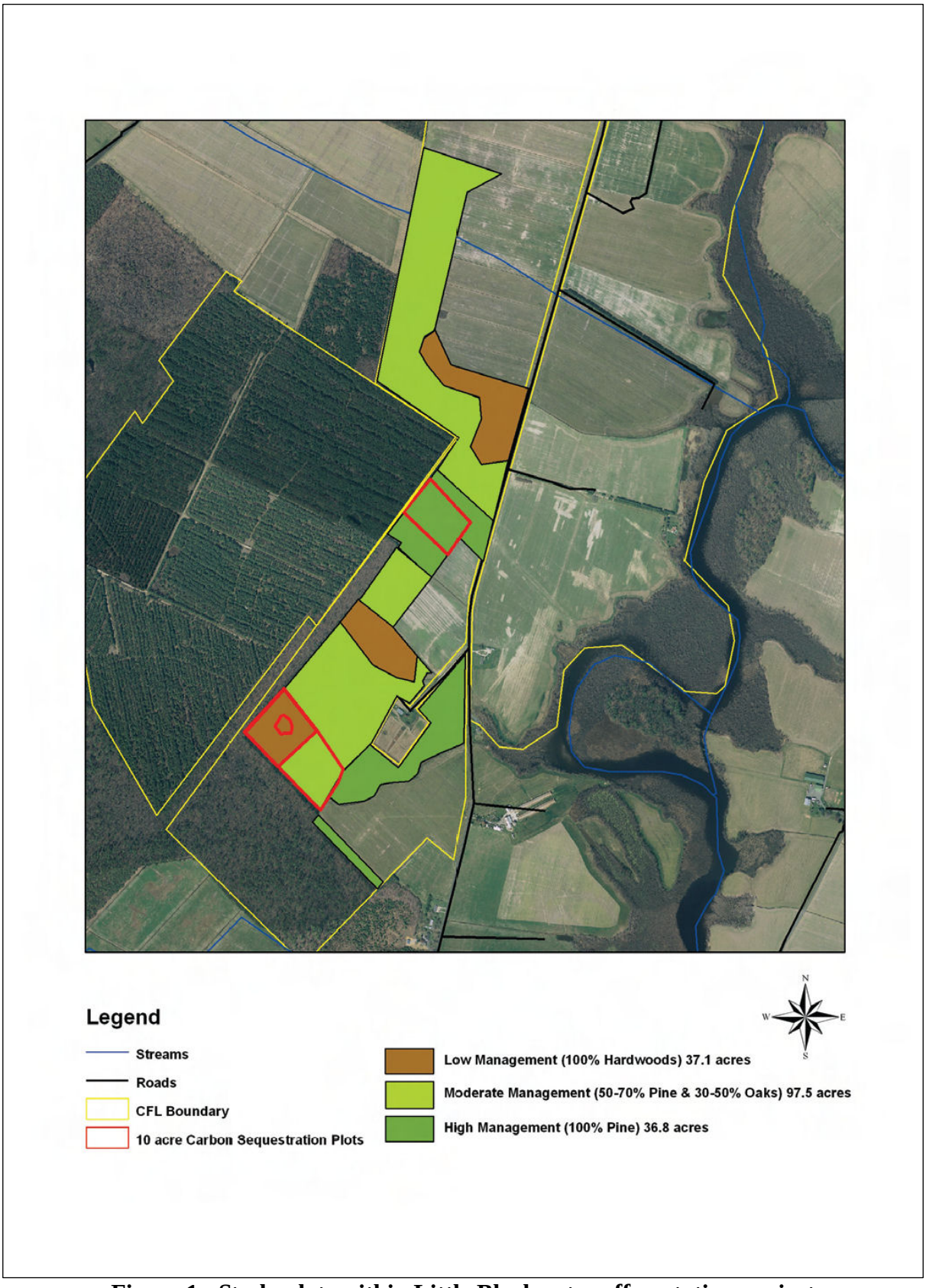



**Figure 1: Study plots within Little Blackwater afforestation project**

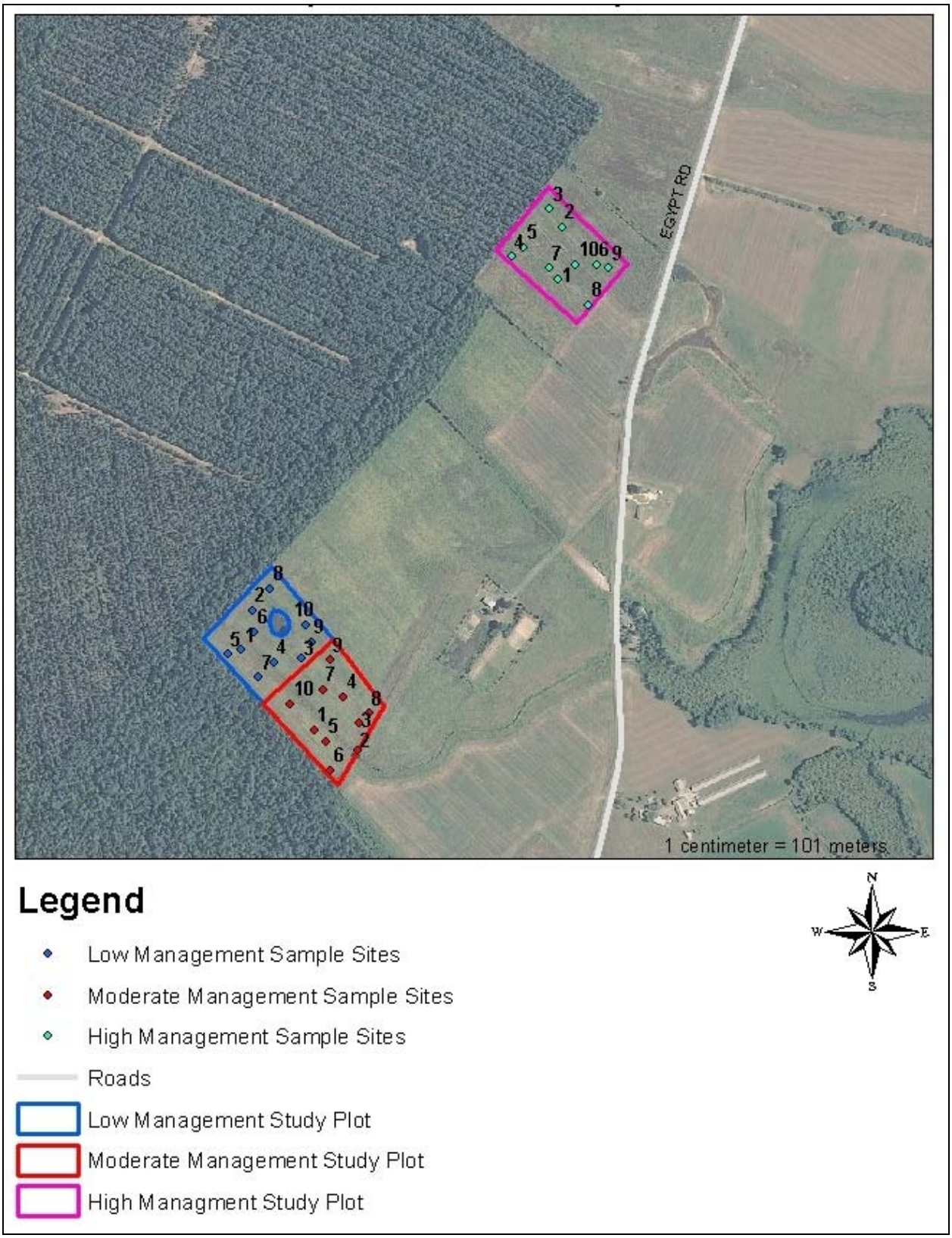
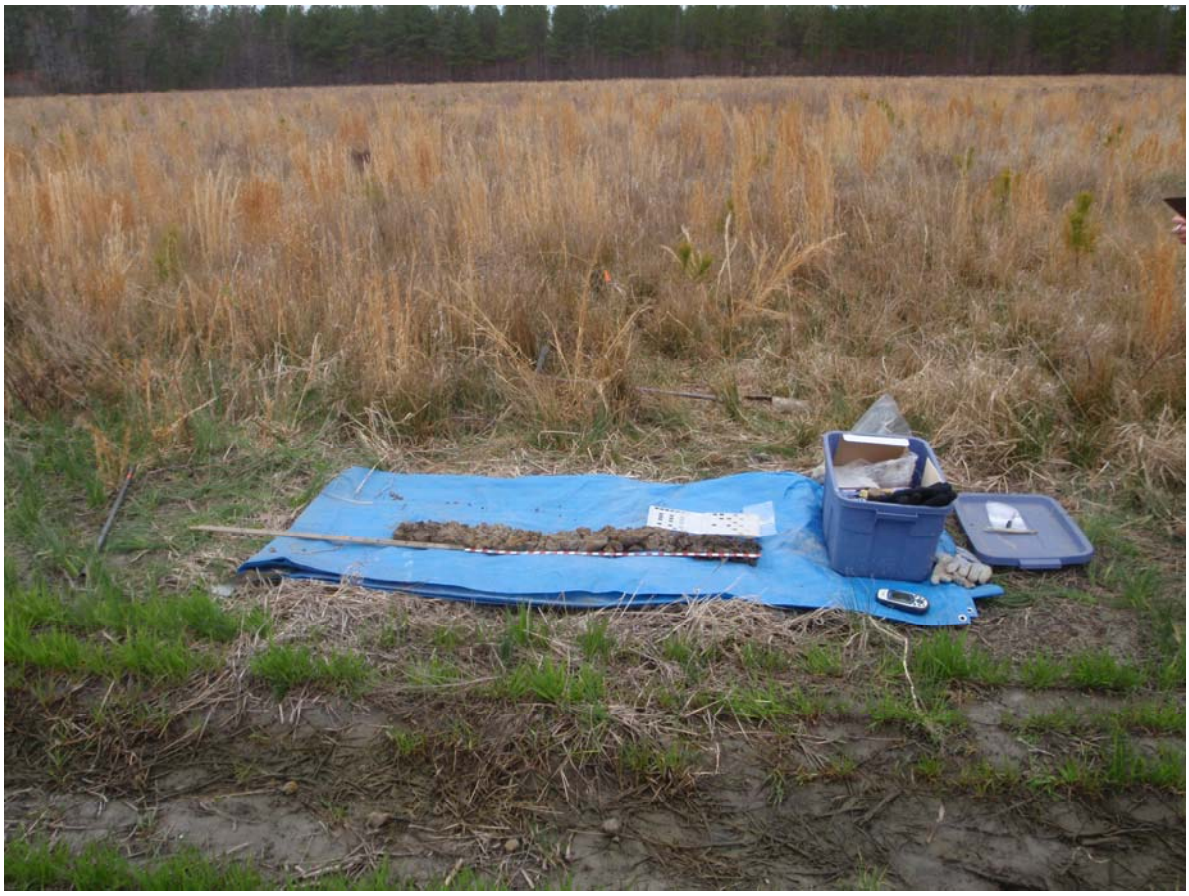



**Figure 2: Carbon sequestration study sample locations**

***Field Sampling***



**Picture 1: Sampling set-up at HM8. Sample site at orange flag in center of picture.**

Sample locations were located using a Magellan Meridian Marine hand-held global positioning system (GPS) with wide area augmentation system (WAAS) corrections and the actual core location was recorded (Table 1). A core sample was collected at each site using a 3-1/4" soil auger to a depth of at least 100 cm. Most sites were collected to a depth >125 cm to include the C soil horizon. The core sample was placed onto a tarp, split open, photographed and described. A ruler was placed along the core sample to provide scale for the sample depths and the photographs. The soil descriptions included soil texture, Munsell color, and the presence of any organic materials such as roots or sticks. Using plastic scoops, sub-samples were collected using plastic scoops from identified soil horizons A, B, and C, with appropriate subsampling within each horizon as necessary to fully characterize the belowground carbon. Subsamples depths were determined based on a combination of the changes in color, texture, mottling, and the soil bulk properties. Samples were collected from the center of the core to avoid contamination from the corer or handling. Latex gloves were also worn to avoid contamination during sampling. The samples were placed in 18 ounce Whirl-Pak sampling bags. A short description of each site was documented to include each sample locations proximity to trees, ground cover, presence/absence of surface water, and any notable nearby features such as drainage ditches or proximity to agricultural fields. The GPS unit was placed next to the sampling location during sample description and sub-sampling to allow maximum time for

position averaging. When sampling was complete at each site, the remaining soil was returned to the core hole.

**Table 1. Sample locations with target and actual sample location coordinates.**

| Management Area | Sample ID | UTM NAD84 Meters | | Actual Sample Location | |
|---|---|---|---|---|---|
| | | Easting | Northing | Easting | Northing |
| LM | 1 | 403131 | 4262896 | 403135 | 4262891 |
| LM | 2 | 403151 | 4262970 | 403151 | 4262972 |
| LM | 3 | 403242 | 4262880 | 403243 | 4262883 |
| LM | 4 | 403191 | 4262872 | 403191 | 4262873 |
| LM | 5 | 403105 | 4262887 | 403105 | 4262885 |
| LM | 6 | 403155 | 4262929 | 403156 | 4262928 |
| LM | 7 | 403163 | 4262845 | 403162 | 4262847 |
| LM | 8 | 403185 | 4263009 | 403184 | 4263008 |
| LM | 9 | 403260 | 4262910 | 403263 | 4262910 |
| LM | 10 | 403250 | 4262942 | 403251 | 4262942 |
| MM | 1 | 403266 | 4262746 | 403264 | 4262745 |
| MM | 2 | 403346 | 4262708 | 403345 | 4262710 |
| MM | 3 | 403350 | 4262760 | 403349 | 4262758 |
| MM | 4 | 403322 | 4262809 | 403322 | 4262808 |
| MM | 5 | 403288 | 4262726 | 403289 | 4262726 |
| MM | 6 | 403298 | 4262672 | 403297 | 4262676 |
| MM | 7 | 403282 | 4262823 | 403282 | 4262821 |
| MM | 8 | 403369 | 4262778 | 403369 | 4262776 |
| MM | 9 | 403296 | 4262877 | 403296 | 4262875 |
| MM | 10 | 403222 | 4262795 | 403224 | 4262795 |
| HM | 1 | 403720 | 4263587 | 403720 | 4263586 |
| HM | 2 | 403728 | 4263682 | 403727 | 4263681 |
| HM | 3 | 403704 | 4263716 | 403703 | 4263716 |
| HM | 4 | 403634 | 4263627 | 403633 | 4263627 |
| HM | 5 | 403656 | 4263644 | 403656 | 4263643 |
| HM | 6 | 403792 | 4263613 | 403792 | 4263613 |
| HM | 7 | 403703 | 4263606 | 403703 | 4263605 |
| HM | 8 | 403776 | 4263537 | 403778 | 4263537 |
| HM | 9 | 403814 | 4263606 | 403815 | 4263606 |
| HM | 10 | 403753 | 4263613 | 403754 | 4263613 |

***Laboratory Analysis***

In the laboratory, each sample was mixed thoroughly within the sample bag and a sub-sample was dried in porcelain dishes. The samples were then prepared for analysis grinding in a ball mill. Sediments were analyzed for total carbon, total nitrogen, and total sulfur (CNS) using a Carlo Erba NA1500 analyzer. This analyzer uses complete sample combustion followed by separation and analysis of the resulting gasses by gas chromatographic techniques employing a thermal conductivity detector. The NA1500 Analyzer was configured for CNS analysis using the manufacturer's recommended settings. As a primary standard, 5-chloro- 4-hydroxy- 3-methoxy-benzylisothiourea phosphate is used. Blanks (tin capsules containing only vanadium pentoxide) were run at the beginning of the analyses and after 12 to 15 unknowns (samples) and standards. Replicates of every ninth sample were also run. As a secondary standard, a NIST reference material (NIST SRM #1646a - Estuarine Sediment), (NIST-SRM #2702 - Inorganics in Marine Sediment; NIST-SRM #8704 - Buffalo River Sediment, or National Research Council of Canada #PACS-2 - Marine Sediment) was run after every 6 to 7 sediment samples. The recovery of the standard reference material (SRM) was excellent and the agreement between the NIST certified values and MGS's results was well within one standard deviation of replicate analyses. The sample preparations and analyses were completed in accordance with the standard procedures of the Maryland Geological Survey (Park, et al, 1999). The percent recovery of carbon was greater than 94% for all three standards used (Appendix A).

## *Results and Discussion*

Prior to study site selection, it was confirmed that the study areas contained similar soil profiles. This was done using the USDA Natural Resource Conservation Service Web Soil Survey (Soil Survey Staff, 2010). Both the MM and LM study sites are entirely within the Othello silt loam series while the HM study site also contains Elkton silt loam and Othello and Kentuck soils. All these soil series contain similar physical properties with similar typical pedon's. The core descriptions found at all sample sites coincide with the soil series descriptions with similar soil horizon thicknesses and soil colors. Based on the similarities in soil types between the three study sites, it was confirmed that the results are comparable between sites.

Core samples were collected at 10 sample sites within each of the 3 management areas. Subsamples were collected from identified soil horizons A, B, and C, with appropriate subsampling within each horizon as necessary to fully characterize the below-ground carbon. Total carbon was measured using a dry combustion method. Currently, dry combustion is recommended as the best method for the analysis of total C in soil and litter (Sollins et al., 1999). Since the Little Blackwater project is designed as afforestation, the land was previously used as agricultural soil and therefore there is not currently an organic litter layer present on the surface. As an organic layer forms, additional samples will need to be collected to quantify the increased Carbon content on the surface above the A horizon. It will take years for the organic layer to form and its presence will need to be determined during future sampling.

Total carbon values from each of the 10 sample sites were averaged for each soil horizon/subsample within each management area. The total carbon values were found to be

highest near the surface in the A horizon and decreased with depth. Lowest total carbon values were associated with the C horizon (Figure 3). Carbon values were slightly higher in the A horizon in the HM study area than in the MM and LM sites. This was due to the higher carbon value of 2.53% at HM5-A. Although the average is slightly higher, all A horizon

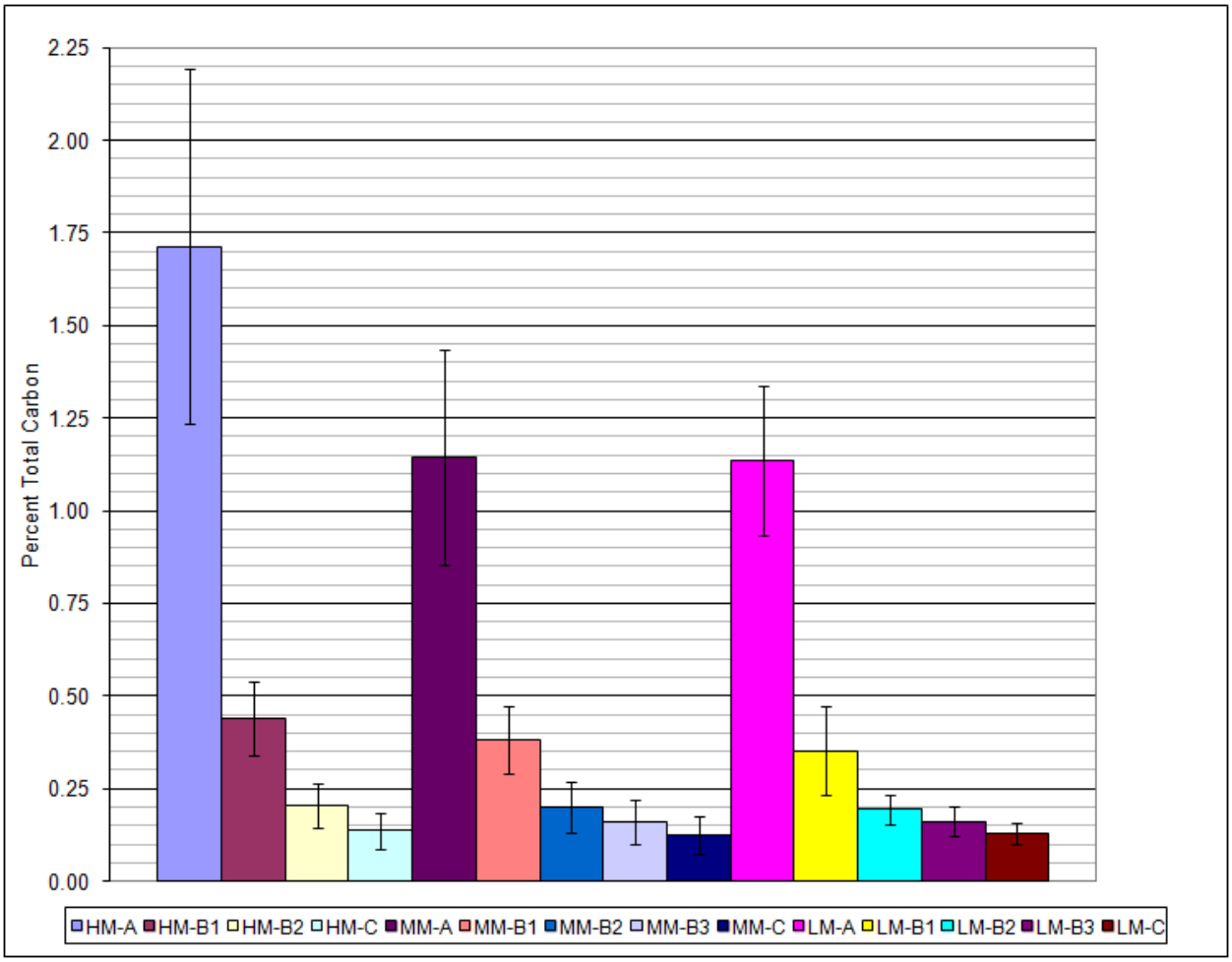



**Figure 3: Percent total Carbon as average for each soil horizon/subsample**

averages are within the standard deviation. The carbon values from each of the three management areas are within the standard deviation for all of the soil horizons. The B2 horizon is nearly identical at all three sites with values of 0.205% at the HM site, 0.201% at the MM site and 0.195% at the LM site. An average was not calculated for soil horizon HM-B3. This horizon was only distinct and subsampled at HM1 and HM9 which provided only 2 samples for averaging. Two HM sample locations contained a combination of HM-B3 and HM-C (HM2 and HM5). The values from both these subsamples were included in the HM-C average. This is likely the reason for the HM-C average carbon value of 0.136% being slightly higher than the average carbon values at MM-C and LM-C of 0.123% and 0.128% respectively. The difference is not significant with the resulting values remaining well within the standard deviation.

Year 1 carbon values will be used as the baseline below-ground carbon values to which all subsequent years will be compared when calculating the amount of carbon sequestered over time for each test plot. Methodologies used for Year 1 sampling should be replicated for all

future annual samplings and the same sample sites will be revisited in following years. Long-term studies indicate that afforestation effects on below-ground carbon may occur at depth over a longer time frame than is traditionally studied (Kimble et. al, 2003). Therefore, sampling should continue to include the entire soil profile with appropriate sub-sampling within each soil horizon. Many components of the forest ecosystem store carbon including above ground tree biomass, tree roots, soils, litter, and understory. Previous cumulative carbon sequestration studies have shown that with varying tree species, the cumulative carbon uptake increases rapidly over the first 5 years but varies over subsequent years among different tree species. Loblolly pine peaks around 10 years while ponderosa pine has a much slower, steady increase over 75 years (Richards et. al, 1993). The below-ground soil carbon is only a single component of the cumulative sequestration and will need to be combined with the other components in order to get a full analyses of the total carbon sequestered within the Little Blackwater study plots.

# *References*

**Kimble, J. et al.,** 2003, The potential of U.S. forest soils to sequester carbon and mitigate the greenhouse effect., CRC Press LLC, p. 211-238.

**Park, M.J., C.P. Williams, and R. Smith,** 1999, Laboratory manual for sample preparation and procedures for chemical and physical analyses. Maryland Geological Survey Circular File No. 1

**Richards, K.R., R. Moulton and R. Birdsey**, 1993, "Costs of Creating Carbon Sinks in the U.S.," *Energy Conservation and Management*, 34(9-11): 905-912.

**Soil Survey Staff**, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed 12/08/2010.

**Sollins, P. et al**., 1999, Soil carbon and nitrogen: pools and fractions, in Standard Soil Methods for Long-Term Ecological Research**,** Robertson, G.P. et al., Eds., Oxford University Press, New York, p. 89-10

# Appendix A: QA/QC recovery of standard reference materials

| SRM | Nitrogen | | Carbon | | Sulfur | |
|---|---|---|---|---|---|---|
| **NIST SRM 1646a- Estuarine Sediment** | | | | | | |
| | (MGS value) | | (MGS value) | | Certified value | |
| Referenced Values | 0.059 | | 0.600 | | 0.352 | |
| **MGS Results** | | **% Recovery** | | **% Recovery** | | **% Recovery** |
| Average | 0.053 | 89.9 | 0.566 | 94.4 | 0.376 | 106.7 |
| Std Dev | 0.005 | | 0.013 | | 0.105 | |
| | | | | | | |
| **NIST SRM 8704- Estuarine Sediment** | | | | | | |
| | (MGS value) | | Certified value | | (MGS value) | |
| Referenced Values | | | 3.351 | | | |
| **MGS Results** | | **% Recovery** | | **% Recovery** | | **% Recovery** |
| Average | 0.180 | | 3.265 | 97.4 | 0.213 | |
| Std Dev | 0.010 | | 0.063 | | 0.014 | |
| | | | | | | |
| **Canadian SRM PACS-2** | | | | | | |
| Marine Sediment | (MGS value) | | Certified value | | Certified value | |
| Referenced Values | 0.27 | | 3.3 | | 1.29 | |
| **MGS Results** | | **% Recovery** | | **% Recovery** | | **% Recovery** |
| Average | 0.258 | 95.4 | 3.172 | 96.1 | 1.270 | 98.4 |
| Std Dev | 0.000 | | 0.000 | | 0.000 | |

# Appendix B: Laboratory Results for All Samples

Note: Values with standard deviation are mean values for replicate runs

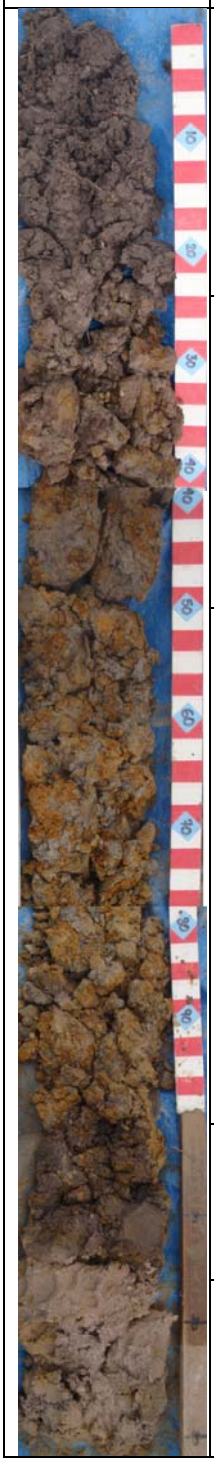
| Sample ID | Total Nitrogen | Std Dev | Total Carbon | Std Dev | Total Sulfur | Std Dev |
|---|---|---|---|---|---|---|
| HM1-A | 0.0959 | | 1.4361 | | 0.0191 | |
| HM1-B1 | 0.0483 | | 0.5695 | | 0.0272 | |
| HM1-B2 | 0.0235 | | 0.1609 | | 0.0343 | |
| HM1-B3 | 0.0252 | | 0.1283 | | 0.0000 | |
| HM1-C | 0.0115 | | 0.0741 | | 0.0161 | |
| HM2-A | 0.0787 | | 1.0373 | | 0.0164 | |
| HM2-B1 | 0.0314 | | 0.2955 | | 0.0261 | |
| HM2-B2 | 0.0236 | | 0.1973 | | 0.0310 | |
| HM2-B3/C | 0.0216 | 0.0001 | 0.1546 | 0.0051 | 0.0000 | 0.0000 |
| HM3-A | 0.1227 | | 2.0818 | | 0.0214 | |
| HM3-B1 | 0.0364 | | 0.4318 | | 0.0201 | |
| HM3-B2 | 0.0207 | | 0.1602 | | 0.0000 | |
| HM3-C | 0.0103 | | 0.0813 | | 0.0000 | |
| HM4-A1 | 0.1202 | | 1.9561 | | 0.0164 | |
| HM4-A2 | 0.1566 | | 3.2787 | | 0.0269 | |
| HM4-B | 0.0310 | | 0.3800 | | 0.0251 | |
| HM4-C | 0.0225 | | 0.1969 | | 0.0196 | |
| HM5-A | 0.1440 | | 2.5314 | | 0.0221 | |
| HM5-B1 | 0.0539 | 0.0008 | 0.7687 | 0.0096 | 0.0086 | 0.0121 |
| HM5-B2 | 0.0346 | | 0.2856 | | 0.0237 | |
| HM5-B3/C | 0.0278 | | 0.2043 | | 0.0000 | |
| HM6-A | 0.1084 | | 1.3097 | | 0.0000 | |
| HM6-B1 | 0.0451 | | 0.5472 | | 0.0270 | |
| HM6-B2 | 0.0247 | | 0.1751 | | 0.0324 | |
| HM6-C | 0.0121 | | 0.1021 | | 0.0167 | |
| HM7-A | 0.1270 | | 1.9864 | | 0.0000 | |
| HM7-B1 | 0.0406 | | 0.5626 | | 0.0269 | |
| HM7-B2 | 0.0243 | | 0.2213 | | 0.0249 | |
| HM7-C | 0.0220 | 0.0002 | 0.1781 | 0.0045 | 0.0086 | 0.0121 |
| HM8-A | 0.1204 | | 1.9520 | | 0.0194 | |
| HM8-B1 | 0.0233 | | 0.2186 | | 0.0243 | |
| HM8-B2 | 0.0206 | | 0.1610 | | 0.0233 | |
| HM8-C | 0.0171 | | 0.1206 | | 0.0000 | |
| HM9-A | 0.0903 | | 1.1106 | | 0.0172 | |
| HM9-B1 | 0.0277 | | 0.2373 | | 0.0216 | |
| HM9-B2 | 0.0256 | | 0.1808 | | 0.0141 | |
| HM9-B3 | 0.0277 | | 0.1745 | | 0.0000 | |
| HM9-C | 0.0077 | | 0.1129 | | 0.0107 | |
| HM10-A1 | 0.1412 | 0.0017 | 1.7393 | 0.0264 | 0.0228 | 0.0011 |
| HM10-A2 | 0.0794 | | 1.0599 | | 0.0164 | |
| HM10-B1 | 0.0314 | | 0.3745 | | 0.0000 | |
| HM10-B2 | 0.0245 | | 0.3044 | | 0.0209 | |

| Sample ID | Total Nitrogen | Std Dev | Total Carbon | Std Dev | Total Sulfur | Std Dev |
|---|---|---|---|---|---|---|
| MM1-A | 0.0857 | | 1.1721 | | 0.0000 | |
| MM1-B1 | 0.0472 | | 0.5115 | | 0.0185 | |
| MM1-B2 | 0.0234 | | 0.1704 | | 0.0264 | |
| MM1-B3 | 0.0350 | 0.0005 | 0.2026 | 0.0037 | 0.0102 | 0.0144 |
| MM1-C | 0.0296 | | 0.1584 | | 0.0159 | |
| MM2-A | 0.1420 | | 1.8938 | | 0.0200 | |
| MM2-B1 | 0.0399 | | 0.3598 | | 0.0173 | |
| MM2-B2 | 0.0259 | | 0.2232 | | 0.0000 | |
| MM2-C | 0.0195 | | 0.1364 | | 0.0000 | |
| MM3-A | 0.0763 | | 0.8789 | | 0.0000 | |
| MM3-B1 | 0.0423 | | 0.4609 | | 0.0217 | |
| MM3-B2 | 0.0280 | | 0.2309 | | 0.0270 | |
| MM3-C | 0.0195 | | 0.1250 | | 0.0000 | |
| MM4-A | 0.0846 | 0.0012 | 1.0825 | 0.0004 | 0.0000 | 0.0000 |
| MM4-B1 | 0.0290 | | 0.2892 | | 0.0197 | |
| MM4-B2 | 0.0220 | | 0.1753 | | 0.0272 | |
| MM4-C | 0.0117 | | 0.1094 | | 0.0000 | |
| MM5-A | 0.0827 | | 1.0430 | | 0.0185 | |
| MM5-B1 | 0.0389 | | 0.3945 | | 0.0287 | |
| MM5-B2 | 0.0259 | | 0.2495 | | 0.0303 | |
| MM5-B3 | 0.0249 | | 0.2254 | | 0.0254 | |
| MM5-C | 0.0248 | | 0.2339 | | 0.0224 | |
| MM6-A | 0.0733 | 0.0020 | 0.9167 | 0.0031 | 0.0161 | 0.0021 |
| MM6-B1 | 0.0399 | | 0.4347 | | 0.0000 | |
| MM6-B2 | 0.0167 | | 0.1437 | | 0.0311 | |
| MM6-B3 | 0.0179 | | 0.1264 | | 0.0211 | |
| MM6-C | 0.0127 | | 0.1113 | | 0.0000 | |
| MM7-A | 0.0807 | | 1.0880 | | 0.0143 | |
| MM7-B1 | 0.0397 | | 0.4332 | | 0.0237 | |
| MM7-B2 | 0.0232 | | 0.2194 | | 0.0174 | |
| MM7-B3/C | 0.0101 | | 0.0977 | | 0.0120 | |
| MM8-A | 0.0718 | | 0.9281 | | 0.0000 | |
| MM8-B1 | 0.0256 | 0.0004 | 0.3130 | 0.0053 | 0.0084 | 0.0118 |
| MM8-B2 | 0.0093 | | 0.1176 | | 0.0000 | |
| MM8-C | -0.0010 | | 0.0507 | | 0.0000 | |
| MM9-A | 0.0876 | | 1.2023 | | 0.0000 | |
| MM9-B1 | 0.0237 | | 0.2457 | | 0.0273 | |
| MM9-B2 | 0.0090 | | 0.1261 | | 0.0252 | |
| MM9-B3 | 0.0083 | | 0.0889 | | 0.0223 | |
| MM9-C | 0.0098 | | 0.0864 | | 0.0000 | |
| MM10-A | 0.0908 | | 1.2465 | | 0.0000 | |
| MM10-B1/E | 0.0595 | | 0.9391 | | 0.0203 | |
| MM10-B2 | 0.0290 | 0.0007 | 0.3494 | 0.0179 | 0.0265 | 0.0023 |
| MM10-B3 | 0.0232 | | 0.2262 | | 0.0269 | |
| LM1-A | 0.0699 | | 0.9683 | | 0.0000 | |
| LM1-AR | 0.0673 | | 0.9103 | | 0.0000 | |
| LM1-A2/E | 0.0506 | | 0.7988 | | 0.0000 | |

| Sample ID | Total Nitrogen | Std Dev | Total Carbon | Std Dev | Total Sulfur | Std Dev |
|---|---|---|---|---|---|---|
| LM1-B1 | 0.0290 | | 0.3864 | | 0.0000 | |
| LM1-B2 | 0.0145 | | 0.1764 | | 0.0294 | |
| LM1-C | 0.0094 | | 0.1216 | | 0.0000 | |
| LM2-A | 0.0701 | | 1.0058 | | 0.0000 | |
| LM2-B1 | 0.0291 | | 0.3799 | | 0.0204 | |
| LM2-B2 | 0.0183 | | 0.2096 | | 0.0000 | |
| LM2-B3/C | 0.0125 | | 0.1232 | | 0.0000 | |
| LM3-A | 0.0715 | | 1.0711 | | 0.0000 | |
| LM3-B1 | 0.0292 | 0.0005 | 0.3562 | 0.0154 | 0.0217 | 0.0005 |
| LM3-B2 | 0.0186 | | 0.2343 | | 0.0220 | |
| LM3-B3 | 0.0142 | | 0.1426 | | 0.0000 | |
| LM3-C | 0.0076 | | 0.1464 | | 0.0139 | |
| LM4-A | 0.0838 | | 1.2703 | | 0.0181 | |
| LM4-B1 | 0.0513 | | 0.6044 | | 0.0000 | |
| LM4-B2 | 0.0177 | | 0.1875 | | 0.0219 | |
| LM4-C | 0.0250 | | 0.1741 | | 0.0000 | |
| LM5-A | 0.0740 | | 0.8808 | | 0.0000 | |
| LM5-B1 | 0.0333 | | 0.3360 | | 0.0158 | |
| LM5-B2 | 0.0247 | 0.0002 | 0.2157 | 0.0032 | 0.0233 | 0.0009 |
| LM5-C | 0.0145 | | 0.1288 | | 0.0000 | |
| LM6-A | 0.1207 | | 1.4517 | | 0.0237 | |
| LM6-A2/E | 0.0938 | | 1.1916 | | 0.0224 | |
| LM6-B1 | 0.0342 | | 0.3043 | | 0.0000 | |
| LM6-B2 | 0.0271 | | 0.1694 | | 0.0000 | |
| LM6-C | 0.0217 | | 0.1672 | | 0.0000 | |
| LM7-A | 0.1100 | | 1.4002 | | 0.0199 | |
| LM7-B1 | 0.0394 | | 0.4304 | | 0.0222 | |
| LM7-B2 | 0.0277 | | 0.2523 | | 0.0216 | |
| LM7-B3 | 0.0286 | 0.0008 | 0.2191 | 0.0050 | 0.0065 | 0.0092 |
| LM7-C | 0.0104 | | 0.1193 | | 0.0000 | |
| LM8-A1 | 0.1037 | | 1.3054 | | 0.0230 | |
| LM8-A2 | 0.0690 | | 0.9441 | | 0.0248 | |
| LM8-B1 | 0.0351 | | 0.3187 | | 0.0318 | |
| LM8-B2 | 0.0248 | | 0.1937 | | 0.0262 | |
| LM8-B3 | 0.0219 | | 0.1740 | | 0.0000 | |
| LM8-C | 0.0177 | | 0.1115 | | 0.0124 | |
| LM9-A | 0.0782 | | 1.0277 | | 0.0000 | |
| LM9-B1 | 0.0327 | | 0.3664 | | 0.0174 | |
| LM9-B2 | 0.0223 | 0.0001 | 0.2027 | 0.0064 | 0.0319 | 0.0021 |
| LM9-B3 | 0.0222 | | 0.1509 | | 0.0302 | |
| LM9-C | 0.0111 | | 0.1062 | | 0.0130 | |
| LM10-A | 0.0818 | | 0.9762 | | 0.0000 | |
| LM10-B1 | 0.0225 | | 0.2080 | | 0.0184 | |
| LM10-B2 | 0.0173 | | 0.1203 | | 0.0000 | |
| LM10-C | 0.0080 | | 0.0852 | | 0.0000 | |

# Appendix C: Core Photographs and Descriptions

Site: High Management #1 Total length – 130 cm Date collected – 3/30/11
Notes: 0.5m from pine tree, small drainage trench 1m away, surface water present

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-24 | A | 5Y 4/1 | Olive gray silt loam with many fine roots throughout |
| | 24-50 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; firm, blocky structure; some fine roots throughout |
| | 50-99 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; firm, blocky structure; a few very fine roots throughout |
| | 99-115 | B3 | 10YR 3/2 | Dark yellowish brown sandy loam |
| | 115-130 | C | N6 With 10YR 6/6 | Medium light gray gravelly, fine sand with some dark yellowish brown iron accumulations; saturated |

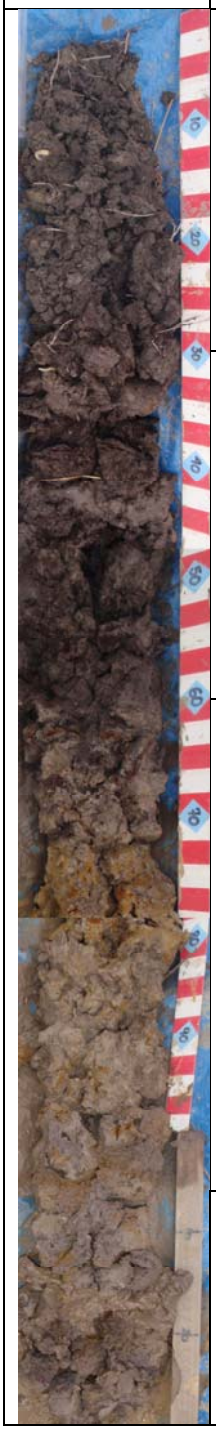
Site: High Management #2 Total length – 118 cm Date collected – 3/30/11
Notes: 0.5m from pine tree, 2 rows of trees from ditch, no surface water present

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A | 5Y 4/1 | Olive gray silt loam with many fine roots throughout |
| | 26-48 | B1 | N4.5 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; firm, blocky structure; some fine roots throughout |
| | 48-84 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; firm, blocky structure; a few very fine roots throughout |
| | 84-118 | B3/C | N4 | Medium gray sandy clay grading to silty sand with depth; a few small pieces of gravel; darker with depth |

Site: High Management #3 Total length – 130 cm Date collected – 3/30/11
Notes: 25cm from pine tree, surface water present

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-24 | A | 5Y 4/1 | Olive gray clay loam with very many medium and fine roots throughout |
| | 24-65 | B1 | N5 With 10YR 6/6 | Medium gray clay loam with dark yellowish orange iron accumulations; a few fine roots throughout |
| | 65-124 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; slightly sandier with depth |
| | 124-130 | C | N6.5 | Medium light gray to light gray fine to medium sand with gravel |

Site: High Management #4 Total length – 125 cm Date collected – 3/30/11
Notes: 75cm from pine tree, near tree line; thick brush; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-30 | A1 | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots throughout |
| | 30-60 | A2 | 5Y 4/1 With 5Y 3/2 And N1 | Olive gray silty loam with peaty organics throughout |
| | 60-105 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations |
| | 105-125 | C | N4 With 10YR 6/6 | Medium dark gray clayey sand with dark yellowish orange iron accumulations; small gravel throughout |

Site: High Management #5 Total length – 135 cm Date collected – 3/30/11
Notes: 2.5m from pine tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-24 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots throughout |
| | 24-45 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; dry and lumpy |
| | 45-106 | B2 | N6 With 10YR 6/6 | Medium light gray clay loam with dark yellowish orange iron accumulations; dry and firm |
| | 106-135 | B3/C | N5 With 10YR 6/6 | Medium gray sandy loam with dark yellowish orange iron accumulations; small gravel throughout; very sandy 133-135 cm |

Site: High Management #6 Total length – 108 cm Date collected – 3/30/11
Notes: 2m from pine tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-20 | A | 10YR 4/2 Grading to 5Y 4/1 | Dark yellowish brown grading to olive gray silt loam with very many medium and fine roots throughout |
| | 20-40 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure; some roots |
| | 40-75 | B2 | N5.5 Grading to N6 With 10YR 6/6 | Medium gray to medium light gray clay loam grading to medium light gray with dark yellowish orange iron accumulations; increased sand with depth |
| | 75-108 | C | N6 | Medium light gray silty sand with gravel throughout |

Site: High Management #7 Total length – 138 cm Date collected – 3/30/11
Notes: 2m from pine tree, no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-22 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots throughout |
| | 22-45 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; a few roots throughout; several thin sandy laminates |
| | 45-120 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations |
| | 120-138 | C | N6 With 10YR 6/6 | Medium light gray sandy loam with dark yellowish orange iron accumulations; saturated |

Site: High Management #8 Total length – 125 cm Date collected – 3/30/11
Notes: 25cm from pine tree; no surface water; just in from agricultural field near second row of trees

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-28 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots throughout; slightly more clayey with depth |
| | 28-75 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; some roots |
| | 75-100 | B2 | N5.5 Grading to N6 With 10YR 6/6 | Medium gray to medium light gray clay loam grading to medium light gray with dark yellowish orange iron accumulations; slightly sandier; wet |
| | 100-125 | C | N6 With Mottling | Medium light gray silty sand with gravel throughout; mottled with olive gray, dark yellowish brown, and moderate yellowish brown |

Site: High Management #9 Total length – 115 cm Date collected – 3/30/11
Notes: 2m from dead pine tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-20 | A | 10YR 4/2 | Dark yellowish brown silt loam with very many medium and fine roots throughout |
| | 20-50 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure; some roots; firm |
| | 50-90 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; very dry and crumbly |
| | 90-100 | B3 | 10YR 3/2 | Dark brown sandy loam |
| | 100-115 | C | N6 | Medium light gray gravelly fine sand with a few dark yellowish orange iron accumulations; saturated |

Site: High Management #10 Total length – 125 cm Date collected – 3/30/11
Notes: 1m from pine tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-15 | A1 | 5Y 4/1 | Olive gray silty loam; very many medium and fine roots throughout; some gravel |
| | 15-30 | A2 | 5Y 4/1 | Olive gray silty loam; many medium and fine roots throughout; no gravel |
| | 30-48 | B1 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; very firm; a few small roots |
| | 48-125 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; Much more iron accumulations than above; very firm; blocky structure |

Site: Moderate Management #1 Total length – 150 cm Date collected – 3/31/11
Notes: Several trees within 3-4 m radius, nearest tree 75 cm; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-25 | A | 5Y 4/1 | Olive gray silty loam; very many medium and fine roots throughout |
| | 25-65 | B1 | 5Y4/1 With 10YR 6/6 | Olive gray clay loam with dark yellowish orange iron accumulations; some roots |
| | 65-110 | B2 | N4.5 Grading to N6 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; a few roots |
| | 110-135 | B3 | N5 grading to N4 with 10YR 6/6 | Medium gray grading to medium dark gray slightly sandy clay with dark yellowish orange iron accumulations; very few roots |
| | 135-150 | C | N4 | Medium dark gray clayey sand with gravel |

Site: Moderate Management #2 Total length – 115 cm Date collected – 3/31/11
Notes: Near T intersection of ditches, 2 m to ditch; 3 m from planted tree and 7 m from large pine tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-15 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots throughout; firm |
| | 15-41 | B1 | 5Y 4/1 grading to N4 With 10YR 6/6 | Olive gray grading to medium dark gray clay loam with dark yellowish orange iron accumulations; very firm and clayey; roots throughout |
| | 41-81 | B2 | N5.5 Grading to N6 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; dry and crumbly; some roots |
| | 81-115 | C | N4 With 5Y 4/1 | Medium dark gray with olive gray sandy clay grading to gravelly sand below 95 cm |

Site: Moderate Management #3 Total length – 137 cm Date collected – 3/30/11
Notes: 4.5 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-31 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots; fewer roots below 10 cm |
| | 31-75 | B1 | N4 With 10YR 6/6 | Medium dark gray clay loam with dark yellowish orange iron accumulations; very firm; some roots throughout |
| | 75-118 | B2 | N5.5 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations |
| | 118-137 | C | N4 With 5Y 4/1 | Medium dark gray with olive gray sandy silt with some gravel |

Site: Moderate Management #4 Total length – 135 cm Date collected – 3/30/11
Notes: 1 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 26-78 | B1 | N4.5 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; some roots throughout |
| | 78-110 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations |
| | 110-135 | C | N5.5 With 10YR 6/6 | Medium gray to medium light gray silty gravelly sand with dark yellowish orange iron accumulations |

Site: Moderate Management #5 Total length – 150 cm Date collected – 3/31/11
Notes:1 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-23 | A | 5Y 4/1 | Olive gray silty loam; very many medium and fine roots throughout |
| | 23-60 | B1 | 5Y4/1 Grading to N5.5 With 10YR 6/6 | Olive gray clay loam grading to medium gray to medium light gray with dark yellowish orange iron accumulations; some roots; firm; blocky structure |
| | 60-100 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; a few roots; very clayey |
| | 100-132 | B3 | N4 With 10YR 6/6 | Medium dark gray slightly sandy clay loam with dark yellowish orange iron accumulations |
| | 132-150 | C | N4 With 10YR 5/4 | Medium dark gray sandy gravel with moderate yellowish brown |

Site: Moderate Management #6 Total length – 130 cm Date collected – 3/31/11
Notes: 1 m from nearest tree; 10 m from ditch and established tree line; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-23 | A | 5Y 4/1 | Olive gray silty loam; very many medium and fine roots throughout |
| | 23-50 | B1 | 5Y4/1 Grading to N4 With 10YR 6/6 | Olive gray clay loam grading to medium dark gray with dark yellowish orange iron accumulations; some roots |
| | 50-90 | B2 | N5.5 Grading to N6 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations grading to medium light gray; a few roots |
| | 90-110 | B3 | N4.5 with 10YR 6/6 | Medium dark gray to medium gray slightly sandy clay loam with dark yellowish orange iron accumulations |
| | 110-130 | C | N4 | Medium dark gray gravelly sandy silt grading to sand |

Site: Moderate Management #7 Total length – 125 cm Date collected – 3/30/11
Notes: 2 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-22 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 22-52 | B1 | N4 With 10YR 6/6 | Medium dark clay loam with dark yellowish orange iron accumulations; some roots throughout |
| | 52-90 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure |
| | 90-125 | B3/C | N5.5 With 10YR 7/6 | Medium gray to medium light gray silty gravelly sand with light yellowish orange iron accumulations; sandier with depth |

Site: Moderate Management #8 Total length – 125 cm Date collected – 3/30/11
Notes: 4 m from nearest pine (no nearby hardwoods visible); no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-22 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 22-70 | B1 | N5 With 10YR 6/6 | Medium gray clay loam with dark yellowish orange iron accumulations; some roots throughout |
| | 70-111 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations |
| | 111-125 | C | N6 With 10YR 5/6 | Medium light gray gravelly sand with light yellowish orange iron accumulations |

Site: Moderate Management #9 Total length – 144 cm Date collected – 3/30/11
Notes: 1.5 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A | 10YR 4/2 | Dark yellowish brown silt loam; very many medium and fine roots throughout |
| | 26-50 | B1 | N4.5 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; some roots |
| | 50-76 | B2 | N5 With 10YR 6/6 | Medium gray clay with dark yellowish orange iron accumulations; a few roots; blocky structure |
| | 76-113 | B3 | N5 Grading to N4.5 with 10YR 6/6 | Medium gray grading to medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; blocky structure; dry and crumbly |
| | 113-144 | C | 5Y 4/1 With N3 And 10YR 6/6 | Olive gray fine silty sand with dark gray and dark yellowish orange; gravel near bottom; note clean gravelly sand below 144 cm |

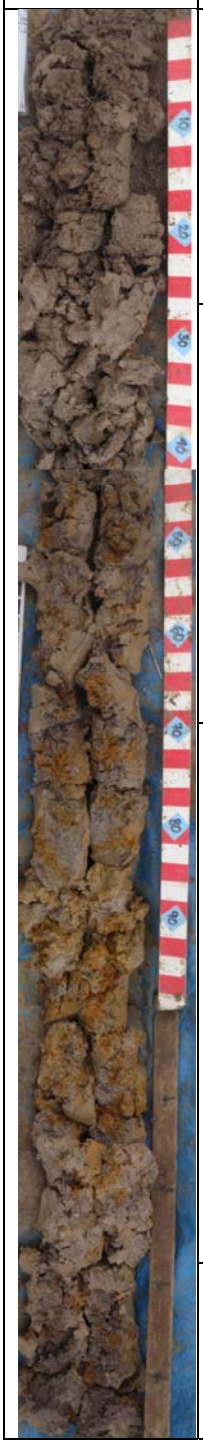
Site: Moderate Management #10 Total length – 135 cm Date collected – 3/31/11
Notes: 1 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-25 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 25-43 | B1/E | 5YR 3/2 | Grayish brown silt loam; slightly more clay than above; roots throughout |
| | 43-98 | B2 | 5Y4/1 And N4 With little 10YR 6/6 | Olive gray and medium dark gray clay loam with very little dark yellowish orange iron accumulations |
| | 98-135 | B3 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay with dark yellowish orange iron accumulations; wet and sticky; more accumulations than above |

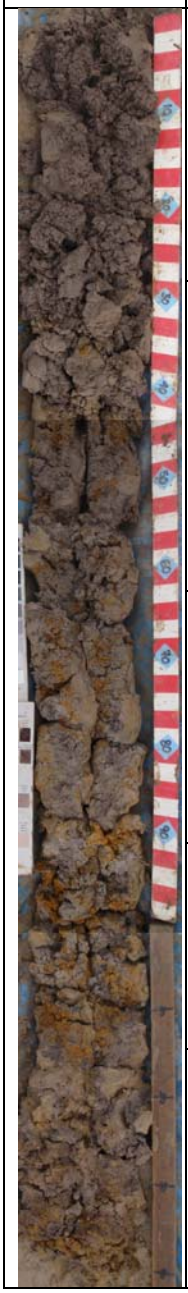
Site: Low Management #1 Total length – 142 cm Date collected – 3/31/11
Notes: 1 m from nearest tree (oak); no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-24 | A1 | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 24-38 | A2/E | 5Y 3/1 | Olive gray to olive black silt loam; some roots |
| | 38-78 | B1 | 5Y 3/1 Grading to N4 With 10YR 6/6 | Olive gray to olive black clay loam grading to medium dark gray with dark yellowish orange iron accumulations; a few roots |
| | 78-121 | B2 | N5 Grading to N5.5 with 10YR 6/6 | Medium gray grading to medium gray to medium light gray clay loam with many dark yellowish orange iron accumulations |
| | 121-142 | C | N5.5 With 10YR 5/4 | Medium gray to medium light gray silty sand with gravel mixed with moderate yellowish brown; very wet |

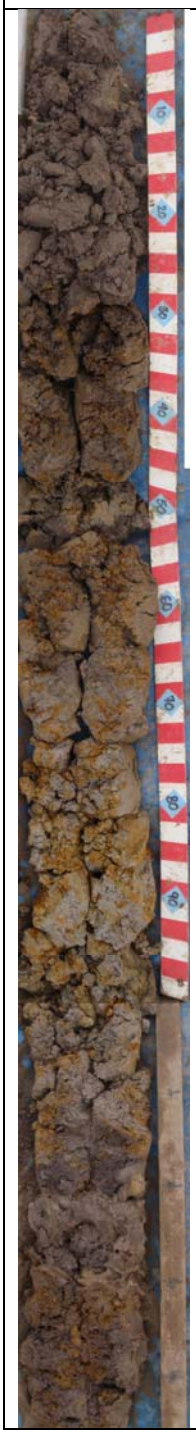
Site: Low Management #2 Total length – 158 cm Date collected – 3/31/11
Notes: 4 m from tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-28 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots; a few iron accumulations at depth |
| | 28-70 | B1 | N4 With 10YR 6/6 | Medium dark gray clay loam with dark yellowish orange iron accumulations; some roots throughout |
| | 70-127 | B2 | N5.5 Grading to N6 With 10YR 6/6 | Medium gray to medium light gray grading to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure; a few roots |
| | 127-158 | B3/C | N3.5 With 10YR 5/4 | Dark gray to medium dark gray firm clayey sand with moderate yellowish brown iron accumulations; a few small gravel throughout |

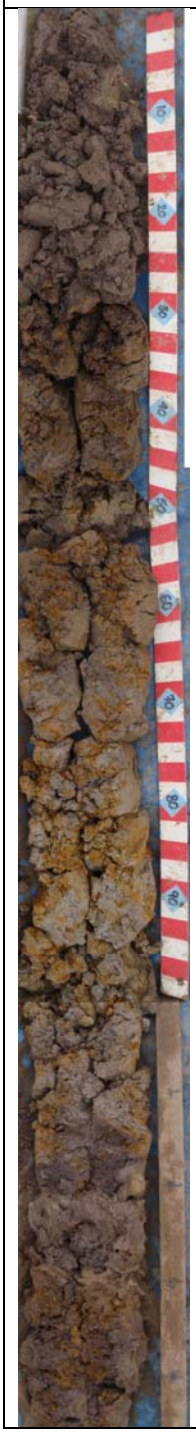
Site: Low Management #3 Total length – 140 cm Date collected – 3/31/11
Notes: 3 m from nearest tree (oak); no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-28 | A | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 28-63 | B1 | N4 Grading to N5 With 10YR 6/6 | Medium dark gray grading to medium gray clay loam with dark yellowish orange iron accumulations; some roots |
| | 63-92 | B2 | N5 Grading to N5.5 With 10YR 6/6 | Medium gray grading to medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; a few roots; lumpy |
| | 92-115 | B3 | N4 with 10YR 5/4 | Medium dark gray slightly sandy clay with many moderate yellowish brown iron accumulations |
| | 115-140 | C | N4 with 10YR 5/4 | Medium dark gray silty sand with gravel mixed with moderate yellowish brown |

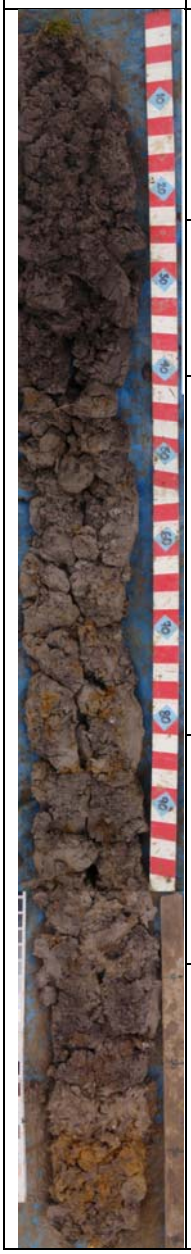
Site: Low Management #4 Total length – 145 cm Date collected – 3/31/11
Notes: 2.5 m from tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-25 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 25-55 | B1 | 5Y 4/1 Grading to N4 With 10YR 6/6 | Olive gray grading to medium dark gray clay loam with dark yellowish orange iron accumulations; some roots throughout |
| | 55-112 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure; a few roots |
| | 112-145 | C | N4 With 10YR 5/4 | Medium dark gray silty sand with gravel with moderate yellowish brown iron accumulations |

Site: Low Management #5 Total length – 132 cm Date collected – 3/31/11
Notes: 0.5m from hardwood tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 26-60 | B1 | N4.5 With 10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; some roots throughout; blocky structure |
| | 60-113 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; blocky structure; a few roots |
| | 113-132 | C | N5 With 10YR 5/4 | Medium gray silty sand with very little gravel; moderate yellowish brown iron accumulations |

Site: Low Management #6 Total length – 140 cm Date collected – 3/31/11
Notes: 20 cm from nearest tree (pine); 1.5 m from hardwood; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-24 | A | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 24-41 | A2/E | 5Y 2/1 | Olive black silt; very many roots |
| | 41-82 | B1 | 5Y 4/1 Grading to N5 With 10YR 6/6 | Olive gray grading to medium gray clay loam with dark yellowish orange iron accumulations; a few roots |
| | 82-108 | B2 | N4 with 10YR 6/6 | Medium dark gray clay loam with fewer dark yellowish orange iron accumulations than above |
| | 108-140 | C | N3.5 with 10YR 6/6 | Dark gray to medium dark gray clayey, gravelly sand with dark yellowish orange iron accumulations; very wet |

Site: Low Management #7 Total length – 130 cm Date collected – 3/31/11
Notes: 2 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 26-54 | B1 | N4 With 10YR 6/6 | Medium dark gray clay loam with dark yellowish orange iron accumulations; blocky structure; some roots |
| | 54-92 | B2 | N5.5 With 10YR 6/6 | Medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; a few roots |
| | 92-108 | B3 | N3.5 with 10YR 6/6 | Dark gray to medium dark gray slightly sandy clay loam with fewer dark yellowish orange iron accumulations than above |
| | 108-130 | C | N6 With 10YR 5/4 | Medium light gray with moderate yellowish brown gravelly silty sand |

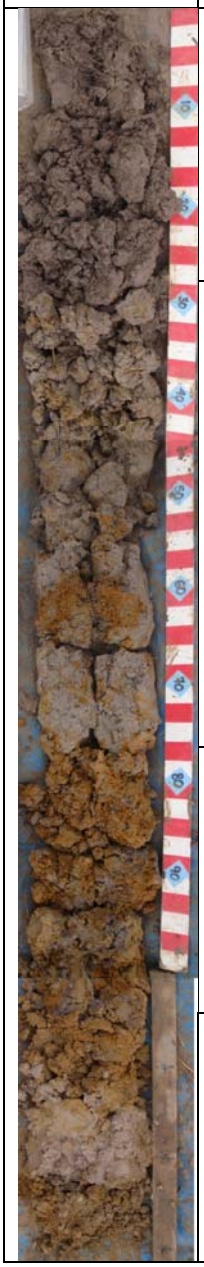
Site: Low Management #8 Total length – 146 cm Date collected – 3/31/11
Notes: 0.25 m from nearest tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-26 | A1 | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 26-46 | A2 | 5Y 3/1 | Olive black to olive gray silty clay loam; some roots throughout |
| | 46-70 | B1 | 5Y 3/1 Grading to N4 With 10YR 6/6 | Olive black to olive gray clay loam grading to medium dark gray with dark yellowish orange iron accumulations; blocky structure; a few roots |
| | 70-101 | B2 | N5 With 10YR 6/6 | Medium clay loam with very many dark yellowish orange iron accumulations; a few roots |
| | 101-132 | B3 | N5.5 with 10YR 6/6 | Medium dark gray to medium gray slightly sandy clay loam with fewer dark yellowish orange iron accumulations than above |
| | 132-146 | C | N4 With 10YR 5/4 | Medium dark gray with moderate yellowish brown gravelly silty sand with gravel |

Site: Low Management #9 Total length – 148 cm Date collected – 3/31/11
Notes: 2 m from nearest tree (hardwood); no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-22 | A | 5Y 4/1 | Olive gray silt loam; very many medium and fine roots throughout |
| | 22-62 | B1 | N4 Grading to N4.5 With 10YR 6/6 | Medium dark gray clay loam grading to medium dark gray to medium gray with dark yellowish orange iron accumulations; some roots |
| | 62-96 | B2 | N5 Grading to N5.5 With 10YR 6/6 | Medium gray grading to medium gray to medium light gray clay loam with dark yellowish orange iron accumulations; a few roots; dense laminate of organics at 72 cm |
| | 96-116 | B3 | N4 with 10YR 5/4 | Medium dark gray slightly sandy clay with moderate yellowish brown iron accumulations |
| | 116-148 | C | N4.5 With 10YR 5/4 | Moderate dark gray to medium gray with moderate yellowish brown silty sand with gravel; a lot of pea gravel below 132 cm |

Site: Low Management #10 Total length – 128 cm Date collected – 3/31/11
Notes: 1 m from very small hardwood tree; no surface water

| Photograph | Interval (cm) | Soil Horizon/ Subsample ID | Color (Munsell Color Standard, GSA, 1991) | Description |
|---|---|---|---|---|
|  | 0-28 | A | 5Y 4/1 | Olive gray silt loam with very many medium and fine roots |
| | 28-76 | B1 | N4.5<br>With<br>10YR 6/6 | Medium dark gray to medium gray clay loam with dark yellowish orange iron accumulations; some roots throughout; large iron accumulation from 60-65 cm |
| | 76-103 | B2 | 10YR 6/6<br>With<br>N4 | Dark yellowish orange slightly sandy clay with medium dark gray iron depletions |
| | 103-128 | C | 10YR 5/4<br>N4<br>N6.5 | Mixed moderate yellowish brown, medium dark gray, and medium light gray to light gray sandy gravel; very wet |