AN ANALYSIS OF POLLEN RECOVERED FROM THE GREENHOUSE AT THE WYE HOUSE PLANTATION, EASTON, MARYLAND

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Introduction

The Andrew Fiske Memorial Center for Archaeological Research at the University of Massachusetts Boston conducted a pollen analysis on 19 soil samples that were recovered from the greenhouse on the Wye House Plantation, located in Talbott County, Easton, Maryland. The large, Southern frame plantation house was constructed in the late eighteenth century for Edward Lloyd IV. The plantation featured a terraced landscape and formal garden, slave quarters, work areas and a greenhouse, which is the focus of this study. The greenhouse is a prominent 85-foot brick structure with a two-story central bay and two wings (Hix 1974:82; Pogue 2009:40). The greenhouse included an orangerie, and an eighteenth-century hypocaust system. Soil samples were collected for pollen analysis from within the main room and west wing of the greenhouse and a slave quarter (potting shed) located at the back of the structure. The goal of this study is to use palynology to identify the types of plants that were grown in the greenhouse and ultimately the temperatures needed to support such plants. A second focus is the identification of plants utilized by the slaves inhabiting the shed attached to the greenhouse.

As early as the first century A.D., written records describe the "use of a forcing house" that would protect plants from colder weather enabling them to flower sooner (Hix 1974:9). By the sixteenth century descriptions of wintering sheds, viridariums, or greenhouses that constructed in Holland for example appeared in print and were used to shelter "more delicate species of plants" (Hix 1974:9). The greenhouse at Dyrham Park in Gloucestershire was built in the early 1700s and housed a number of ornamental plants such as "passion flowers, abutilons, solanums and geraniums" (Thomas 1967:25). During the eighteenth century "as exotic plants became all the rage among the well-to-do in America and elsewhere, the wealthy built

function by identifying "task-specific" areas (Cahill et al. 1991:66; Kelso et al. 2006; Pearsall 2000:274).

The pollen recovered from an archaeological site is a mixture of local and regional background pollen rain as well as coming from deliberately used plants. The recovery of pollen from a structure such as a greenhouse or dwelling, "where the composition of the deposited pollen flora and the deposition mode are most deeply influenced by 'non-natural' processes" presumably represents primarily a local signature of what was grown or processed within the structure (Faegri and Iversen 1989:178). Nevertheless most structures are not closed environments because pollen is introduced through open doors and windows. For example, samples taken from in a doorway of a structure would include "a fairly complete representation of pollen rain" while pollen from wind-pollinated taxa may be lacking from contexts situated away from a door (Pearsall 2000:272). Greenhouses, in particular, were not closed structures because when the weather was mild, greenhouse windows were opened on a regular basis to let in fresh air for the well-being of the plants (M'Mahon 1806:158). We can expect the samples from the Wye House greenhouse to have a mixture of local and regional background pollen rain especially from trees and weeds in addition to pollen from plants deliberately grown there.

Historical records indicate that a wide variety of plants were grown in seventeenth-, eighteenth-, and nineteenth-century greenhouses. Greenhouses were used for a variety of purposes, both as a visible display of status and wealth and for the more practical function of growing plants especially for those owners interested in scientific agriculture, popular in the late eighteenth and nineteenth centuries. Greenhouses were used to grow economic crops such as garden vegetables and domestic fruit trees, either to give these plants a head-start in the early spring or to extend their growing seasons, However, warmer-weather exotic plants such as a

dogwood (*Cornus*), holly (*Ilex*), juniper (*Juniperus*), and eastern hop-hornbeam (*Ostrya*) (http://www.nps.gov/plants/pubs/chesapeake/).

A number of vines indigenous to Maryland's Coastal Plain include bittersweet (*Celastrus*) and honeysuckle (*Lonicera*). Pollen from herbaceous plants common to the area such as thoroughworts (*Eupatorium*), sunflowers (*Helianthus*), lilies (*Lilium*), lobelia (*Lobelia*), and goldenrod (*Solidago*) were recovered (http://www.nps.gov/plants/pubs/chesapeake/). Several aquatic species occupy wetland areas of the region such as rose mallow (*Hibiscus*), iris (*Iris*), rush (*Juncus*), yellow water lilies (*Nuphar luteum*) and fragrant water lilies (*Nymphaea odorata*), and arrowhead (*Sagittaria*) (http://www.nps.gov/plants/pubs/chesapeake/). The presence of these plants in the area along with the pollen from modern surface sample allow us to characterize the regional vegetation and background pollen rain and to assist in distinguishing between intentionally used plants and ambient pollen rain.

Methods

Soil samples recovered from the Wye House greenhouse and slave quarter were collected in July 2009 by archaeologists from the University of Maryland with the assistance of Heather Trigg from University of Massachusetts Boston. The samples were recovered from four excavation units, Units 1, 8, and 9 from within the greenhouse and TP 2, a unit from the slave quarter back of the structure (Duensing 2009 Pers. Comm.). Units 1 and 9 were from the center block of the greenhouse and Unit 8 was in the west wing of the greenhouse (Duensing 2009 Pers. Comm.). Pollen was also analyzed from a modern surface sample that was collected from the site for comparative purposes (Pearsall 2000:288). Samples in the test units were taken from each of the distinct stratigraphic levels. Excavations revealed a series of modifications to the

Laboratory Methods and Analytical Protocols

Approximately 30 g of sediment were processed for each sample using standard pollen extraction techniques (see Moore and Webb 1978:22-27; Pearsall 2000:294-296). The samples were treated first with hydrochloric acid to remove carbonates, hydrofluoric acid to remove silicates, and acetolysis to remove organics. Two tablets containing a known number of identifiable exotic *Lycopodium* sp. spores (Batch Number: 483216) were added to each sample to assist in the calculation of pollen grain and spore density and concentration, and assess preservation (Hall 1981; Larsen and MacDonald 1998:819).

Several microscope slides of pollen residue mounted in glycerol were prepared for each sample. The slides were scanned at 400x and 600x magnification. An attempt was made to count 300 pollen grains and spores from each sample, in addition to the *Lycopodium* tracer spores. In order to find rarer taxa, 500 pollen grains and spores were counted for selected samples. Six samples were selected for an extended count because of their content and higher pollen and spore densities (Table 2). For this examination pollen grains classified as "identifiable" and "unidentifiable" were included in the pollen totals, but the added control spike was not.

Pollen grains were identified by comparing them to online images appearing on the web (www.geo.arizona.edu/palynology/polonweb.html; http://striweb.si.edu/roubik/), to a modern reference collection housed at the University of Massachusetts Boston, and to published sources (Erdtman 1943; Kapp 1969, Kapp et al. 2000; McAndrews et al. 1973; Moore and Webb 1978; Moore et al. 1991). Pollen grains too deteriorated, crumpled, torn, or distorted to identify were

1989:13) and, in the case of herbaceous plants, are dispersed near the ground surface where wind velocities are reduced (Kelso 1994a:11; Moore and Webb 1978:111), they are infrequently incorporated in the pollen rain (Pearsall 2000:259). Thus their presence in the pollen spectrum typically signifies local vegetation and environmental conditions (Kelso and Beaudry 1990:65). Many trees such as pine and oak (*Quercus* sp.) and many common weeds such as ragweed (*Ambrosia*) and goosefoot family (Cheno-Ams) are wind-pollinated. They produce large quantities of pollen, and although they are often interpreted as reflecting regional vegetation (Kelso and Beaudry 1990:65; Moore and Webb 1978:109-114; Pearsall 2000:258-260), wind-pollinated weeds and trees may have grown in the immediate area.

Results

In order to reconstruct vegetation patterns, sufficient quantities of pollen are needed. Pollen can be differentially destroyed by taphonomic conditions and this is often reflected in the sedimentological record by low pollen densities. Pollen densities greater than 1000 grains of pollen and spores per gram of sediment are considered satisfactory for environmental reconstruction (Hall 1981). The pollen and spore densities for all 19 samples were calculated (Table 2). Densities were greater than 1,000 grains/g for all but nine samples; two of these samples contained approximately 900 grains/g. Low pollen densities can be the result of two different processes. First, low densities can be the result of a highly weathered pollen assemblage – one in which there is a great deal of destruction of pollen. Because the pollen of various taxa are differentially resistant to decay, a highly weathered assemblage is problematic because taxa are selectively destroyed (Bryant and Hall 1993:280. Alternatively, low pollen densities can result when sediment deposition is rapid.

were present. Although Sample 14 of Unit 9 had a satisfactory pollen and spore density, 21% of the recovered pollen from this sample was unidentifiable due to poor condition of the grains. The poor condition of the pollen in this sample suggests poor preservation environment, not just rapid sedimentation. Sample 15 from Unit 9, dated approximately to pre-circa 1775, had an adequate pollen and spore density and included ornamental taxa more accustomed to tropical conditions such as acacia, citrus, hibiscus (*Hibiscus*), and to the Musaceae family. The presence of tropical taxa such as the Musaceae and Rutaceae families in this pre-1775 layer is problematic and suggests some contamination of the sediments with more recent pollen.

The pollen analysis of soil samples recovered from the Wye House greenhouse and slave quarter revealed 128 distinct taxa in addition to the "identifiable" and "non-identifiable" categories (Table 3). A tally of the recovered pollen for each sample is included (see Appendix A). The pollen data were entered into a computer database (Tilia 2.0) which calculated percentages of the pollen, and we generated pollen percent diagrams included at the end of the report (Figure 1). Samples from Unit 1 and the Slave Quarter Unit were represented in sequence based on depth. A description of the recovered taxa follows.

Table 3

Taxa Identified in the Wye Greenhouse Samples

Scientific Name	Common Name
Arboreal taxa	
Abies	Fir
Acer	Maple
Alnus	Alder
Anacardiaceae, *Rhus*	Sumac
Berberis	Barberry
Betula	Birch
Carpinus	Hornbeam

Scientific Name	Common Name
Ambrosia/Xanthium	Ragweed/ Cocklebur
Apiaceae	Carrot or Parsley Family
Aristolochia	Dutchman's pipe
Asarum	Wild ginger
Asteraceae, Liguliflorae $\geq$ 30 μm	Liguliflorae
Asteraceae, Liguliflorae $\leq$ 30 μm	Liguliflorae
Asteraceae, *Aster*	Aster
Asteraceae, *Carduus*	Musk Thistle
Asteraceae, *Cirsium*	Tall Common Thistle
Asteraceae, *Dahlia*	Dahlia
Asteraceae, *Eupatorium*	Thoroughwort
Asteraceae, *Helianthus*	Sunflower
Asteraceae, *Solidago*	Goldenrod
Brassicaceae	Mustard Family
Campulaceae, *Lobelia*	Lobelia
Carex	Sedge
Caryophyllaceae	Pink Family
Caryophyllaceae, *Dianthus*	Pink
Cheno/Am	Chenopodiaceae/Amaranthaceae
Crocus	Crocus
Daphne	Daphne
Dipsaceae, *Succisa*	Devilsbit
Equisetum	Horsetail
Galium	Bedstraw
Gentiana	Gentian
Geranium	Geranium
Humulus	Hop
Impatiens	Touch-me-not
Iris	Iris Family
Juncus	Rush
Lamiaceae	Mint Family
Lamiaceae, *Mentha*	Mint
Liliaceae	Lily Family
Malvaceae	Mallow Family
Malvaceae, *Hibiscus*	Hibiscus
Marantaceae	Arrowroot Family
Menyanthes	Buckbean
Myrtaceae	Myrtle Family
Nuphar	Pond-lily
Nymphaea	Waterlily
Oxalis	Woodsorrel
Panax	Ginseng
Phlox	Phlox

Description of Recovered Taxa

A description of the taxa identified through pollen analysis for all soil samples that were recovered from the Wye House including the modern samples follows. Data in this section includes the taxon's preferred habitat, possible species, culinary or medicinal uses, as well as the likelihood the taxon represents a deliberate cultivated plant or background pollen rain. Historic records include descriptions of plants that grew in greenhouses among the elite in America during the seventeenth and eighteenth centuries (Hix 1974; M'Mahon 1806; Pogue 2009; Sumner 2005; Weishan 1999; Woudstra 2000). Taxa are discussed in groups based on whether they were trees and shrubs (arboreal), herbs (non-arboreal) or ferns/mosses.

Description of Recovered Taxa

Arboreal

Abies: Pollen grains of this genus appeared in six samples. Balsam fir (*Abies balsamea*) for example grows naturally in Canada and the northern United States (Harlow 1957:68). Firs inhabit boreal regions, but also grow in mountainous areas (Britton and Brown 1896:56), and are located besides streams and in swamps (Harlow 1957:68). Since this genus is wind-pollinated and can be transported great distances, it is probable that the presence of fir pollen in this study denotes regional vegetation.

Acer: Small amounts of maple pollen were recovered from three samples. Several species of maple are found throughout the eastern United States (http://plants.usda.gov) and generally favor moist soils (Harlow 1957:239-248). This genus is wind-pollinated and probably represents regional pollen rain.

forests" and inhabits wet soils beside stream banks (Harlow 1957:133). American hornbeam (*Carpinus caroliniana*) is native to the subject area (http://plants.usda.gov) and its presence in the pollen spectrum probably represents background pollen rain.

Carya: Hickory pollen was recovered in the majority of samples and in all samples that were satisfactory for environmental reconstruction including the slave quarter samples. This genus is native to eastern North America (Britton and Brown 1896:484). Although hickory is wind-pollinated, its pollen is heavy and tends to fall closer to its originating source perhaps indicating local vegetation. Hickory trees probably grew in close proximity to the Wye House greenhouse. Interestingly, hickory pollen comprised almost 10% of the total counted pollen for Level A of Unit 1.

Castanea dentata: Small amounts of chestnut pollen were recovered in a few samples; however, chestnut pollen appeared in two slave quarter samples. A few types of chestnut are native to the subject area (Britton and Brown 1896: 514-515).

Cornus: Several species of dogwood are found throughout the eastern United States (http://plants.usda.gov). Dogwood is predominantly an understory tree that thrives in moist soils (Harlow 1957:262). Since dogwood is insect-pollinated, pollen grains from this genus generally denote local vegetation. A small quantity of dogwood pollen appeared in Level C of greenhouse Unit 1.

Elaeagnaceae: Shrubs and small trees are members of the Oleaster Family. Pollen identified to this family only appeared in Levels A through C of Unit 1. Russian olive (*Elaeagnus angustifolia*) belongs to this family.

Walnut and other nut trees were cultivated (M'Mahon 1806), but the pollen recovered from these samples probably reflects background pollen rain.

Juniperus: Taxa belonging to this genus are evergreen trees or shrubs. Small quantities of juniper pollen appeared in Level B of Unit 1, Sample 15 of Unit 9, and in two of the slave quarter samples. Red cedar (*Juniperus virginiana*) grows in the area (Britton and Brown 1896:60); however, it was used as an outdoor ornamental (Leighton 1986:440) and as an analgesic and emetic among Native Americans (Moerman 1998:291). Junipers generate large amounts of pollen and thus the grains recovered here probably reflect background pollen rain from the surrounding vegetation although it is possible it was collected by slaves for its medicinal properties.

Kalmia: Kalmia prefers moist soils and several species of this genus are native to the area (Britton and Brown 1897:563-564). Small quantities of kalmia pollen were recovered in a couple of samples from Unit 1 and in Level C of the slave quarter. Kalmia was grown intentionally for its aesthetic qualities; however, the small quantities of this pollen suggest that it was not intentionally grown in the immediate area.

Lonicera: A small quantity of honeysuckle pollen was recovered only in the modern sample. Honeysuckle is native to the subject area (Britton and Brown 1897:605), and probably represents background pollen rain.

Mimosoideae, *Acacia* and *Albizia*: Pollen identified to these taxa appeared in almost all sampled contexts (Britton and Brown 1897:254). Both acacia and silk tree were introduced to the area although acacia grows naturally in the southern portion of the United States (Britton and Brown, Vol. I 1896:254; Wodehouse 1965:431). Acacias and silk trees were used as ornamentals

Nyssa: A small quantity of black gum pollen was recovered in the modern sample and Level A of Unit 1. Water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), and black gum (*Nyssa sylvatica*) are indigenous to the subject area (http://plants.usda.gov) and the presence of pollen identified to this genus perhaps indicates moist soil conditions in the area. The pollen from this taxon is likely background pollen rain.

Oleaceae, *Forsythia*: Forsythia is not indigenous to the area, but has escaped cultivation and is present throughout the region (http://plants.usda.gov). A small quantity of forsythia pollen was identified in the modern sample only.

Ostrya: Hophornbeam is native to the area (Britton and Brown 1896:507). A small quantity of hophornbeam pollen was identified only in Level A of Unit 1.

Palmae or Arecaceae: The members of the Palm Family are mostly tropical and subtropical plants. Pollen identified to this family was recovered from Level A of Unit 1, Level A of the Slave Quarter Unit, and Sample 13 of Unit 8. Palm pollen was not recovered in the modern sample perhaps indicating that taxa belonging to this species grew in the greenhouse. Historical records indicate that several types of palm trees such as date palms (*Phoenix dactylifera*), Sago palms (*Cycas revoluta*), and cabbage palmetto (*Sabal palmetto*) were included in plant nursery catalogues and grown in greenhouses (Adams 2004:87-89; M'Mahon 1806:611, 613, 628-629, 633). Interestingly approximately 6% of the total pollen counted for the modern levels of the Slave Quarter Unit (Level A) was composed of Palmae pollen.

Philadelphus: There are several species of mock orange native to the area (Britton and Brown 1897:185-186), but mock orange was used as an ornamental (Leighton 1986:464). This genus only appeared in Level A of Unit 1 and in the modern pollen sample, perhaps indicating that this

Quercus: Oak was present in the majority of samples examined. Several species are native to the area (Kapp 2000:126), and its presence in the pollen spectrum probably denotes background pollen rain.

Ribes: A small quantity of currant pollen was recovered in Level C of Unit 1. Currants are insect-pollinated and their pollen reflects local vegetation. Historical documentation indicates that currants were cultivated (Leighton 1986:147); however, several species are indigenous to the area (http://plants.usda.gov).

Rutaceae, *Citrus*: Oranges, lemons, limes, citrons, and shaddocks belong to this genus. Citrus pollen was recovered in Greenhouse Unit 1 - Levels A, B, and C and Sample 15 of Unit 9. Citrus trees no doubt grew in the Wye House greenhouse. Historical records indicate that citrus trees were commonly cultivated in greenhouses and in homes (M'Mahon 1806; Woudstra 2000:194).

Salix: A small quantity of willow pollen was identified in Unit 1 and Level B of the Slave Quarter Unit. Since willow is both wind and insect-pollinated, it is difficult to say whether the recovered willow pollen is from local or regional vegetation. Several species of willow are native to the region and inhabit wetland areas such as marshes and along the margins of streams and lakes (Britton and Brown 1896:494-505; Harlow 1957: 81). In addition to being valued for their ornamental quality, willow was used in basketry (Sumner 2004:279).

Thuja: Arborvitae, a small tree or shrub, prefers wet soils and grow in the eastern United States (Britton and Brown 1896:58). Small quantities of arborvitae pollen were identified in Unit 1, Sample 15 in Unit 9, and every level of the slave quarter.

(Britton and Brown, 1897:575-580). Its presence in the slave quarters may reflect its culinary uses.

Viburnum: Pollen identified as viburnum was only recovered in Level A of Unit 1. Several species of viburnum grow in the subject area (http://plants.usda.gov); however, viburnum was also used as ornamental shrubbery (Sumner 2004:318).

Arboreal and Non-Arboreal Vegetation

Trees, shrubs, and herbs belong to the Celastraceae, Fabaceae and Rosaceae families. For this examination, pollen identified to these family levels were not grouped in either arboreal or non-arboreal categories.

Celastraceae: Several species belonging to the Bittersweet family are native to the area (Britton and Brown 1897:393-396). A small quantity of pollen identified to this family was identified in Level B of the greenhouse.

Fabaceae: Besides trees, such as honey locust (*Gleditsia*), black locust (*Robinia*), Kentucky coffee-tree (*Gymnocladus*), and redbuds, economic and weedy taxa also belong to the Bean Family. Small amounts of pollen identified to this family were recovered in most samples.

Rosaceae: Pollen identified to the Rose Family was recovered in the majority of samples. This family comprises roughly 1200 species (Britton and Brown 1897:194-254). Because many Rose Family taxa are insect-pollinated and their pollen is poorly dispersed, their presence in the pollen spectrum may indicate that these species grew in the area. Burnet (*Sanguisorba*) and strawberries (*Fragaria*) belong to the Rose Family as well as peaches (*Prunus persica*) and of course roses (*Rosa*). Pollen identified as burnet was recovered in Level B of Unit 1, while pollen

disturbed, open, regional landscape in the area. Interestingly, ragweed and cocklebur pollen comprised approximately 10% of the total counted pollen for the modern sample perhaps depicting a more settled landscape. For samples from the slave quarter, ragweed and cocklebur pollen only made up roughly 4% of the total counted pollen for samples from Levels A and C, which had suitable densities for environmental reconstruction, perhaps indicating that these samples were better sheltered from the pollen rain.

Apiaceae: Weedy and economic taxa such as wild parsnip (*Pastinaca*), Queen Anne's lace (*Daucus carota*) and carrots (*Daucus*) are included in the Carrot Family. Pollen identified to this family was recovered in all samples with pollen and spore densities suitable for environmental reconstruction and in Level B of the Slave Quarter Unit. Many species identified to this family are insect-pollinated and indicate local vegetation, but it is common for a few pollen grains identified to this family to appear in pollen profiles because the plants are generally pervasive (http://www.geo.arizona.edu/palynology/pid00043.html).

Aristolochia: A small amount of pollen identified to this genus was recovered in Sample 15 of Unit 9. Dutchman's pipes (*Aristolochia macrophylla*) and Virginia snakeroot (*Aristolochia serpentaria*) are a few taxa belonging to this genus. These taxa grow naturally in Maryland.

Asarum: Pollen grains identified as wild ginger were recovered from one sample, Level C of the Slave Quarter Unit. Canadian wild ginger (*Asarum canadense*) is indigenous to the area (http://plants.usda.gov) and insect-pollinated. The recovery of wild ginger pollen from this sample is more than incidental especially since not a great amount of pollen introduced by pollen rain was identified in any of the slave quarter samples, therefore, it is probable that ginger was

appeared in five samples. Numerous species belonging to the genus *Aster* are native perennials and grow in a variety of habitats (Britton and Brown 1898:356-382; Page and Weaver 1974:164). Although some asters are considered weeds (Leighton 1986:396), several species are attractive enough to be grown in gardens, but this practice was more common in England than it was in the United States (Page and Weaver 1974:164).

Brassicaceae: The Mustard Family comprises many weedy and economic taxa (Britton and Brown 1897:118) such as pepperweed (*Lepidium*), a naturally occurring weed in North America (Britton and Brown 1897:110-112) and broccoli (*Brassica*). Since many mustard Family species are insect-pollinated, their presence in the pollen spectrum probably indicates local vegetation. Pollen grains identified to this family were recovered in the majority of samples with more than an incidental quantity recovered from Level C of the Slave Quarter Unit. Since only a small quantity of mustard family pollen was recovered in the modern sample, it is likely that the elevated amount of mustard family pollen in Level C reflects deliberate use.

Campulaceae, *Lobelia*: Several species of lobelia are indigenous to the area and prefer moist soils (Britton and Brown 1898:257-261). A small quantity of pollen identified to this genus was recovered in Level A of the Slave Quarter Unit dated to the 20th/21st century. Lobelia has medicinal uses.

Carex: Many species of sedge are commonly found in swamps, bogs, marshes, ponds, streams, wet woods, and along shores; however, some species prefer woody areas, thickets, and dry soils (Britton and Brown 1896:248-256, 292- 360). A small quantity of sedge pollen was identified in one sample, Level C of Unit 1.

were identified in seven samples; however, more than an incidental amount of this pollen was recovered in Level C of the Quarter Unit.

Dipsaceae, *Succisa*: Devilsbit is not indigenous to the United States (http://plants.usda.gov). A small amount of pollen identified to this genus was recovered in Level A of the Slave Quarter Unit which dates to the 20th/21st century.

Equisetum: Small quantities of spores identified to this genus were recovered four samples, two of the Quarter Unit samples and Levels C and F of Unit 1. Field horsetail (*Equisetum arvense*), for example, grows in sandy soils (Britton and Brown 1896:36). Scouring-rush (*Equisetum hymale*) grows in wet environments along the shores of rivers and lakes (Britton and Brown 1896:38). The rough stems of scouring-rush (*Equisetum hymale*) were used to scour pots and to line floors (Britton and Brown 1896:38; Sumner 2004:298).

Galium: A small quantity of bedstraw pollen was recovered in only one sample, the modern pollen sample. Several types of bedstraw are indigenous to the subject area (Britton and Brown 1898:218-225).

Gentiana: Several species of gentian are native to the area (Britton and Brown 1897:612-618) and were considered medicinal (Leighton 1986:423). Pollen identified to this genus was recovered in the modern pollen sample and in Levels A and B of Unit 1. Its presence in the modern samples suggests its occurrence as the background pollen rain in other samples.

Geranium: Several species of geranium are indigenous to Maryland (Britton and Brown 1897:340-342); however, other species were valued for their ornamental qualities (Leighton 1986:423) and grew in greenhouses (M'Mahon 1806:160). A small qunantity of geranium

396) and was introduced into the greenhouse if ground water was used to water plants. However, rushes are also used as matting and floor coverings.

Lamiaceae and *Mentha*: Pollen identified to the Mint Family was recovered in Levels B and C of Unit 1. Many taxa belonging to this family are insect-pollinated and their presence in the samples indicates local vegetation. Both weedy and economic species are included in this family. Generally in the United States, mint was grown in greenhouses in October in order to have a supply of this herb during the winter months (M'Mahon 1806:509).

Liliaceae: Several species of lily are native to the area and inhabit dry woods as well as meadows and marshes (Britton and Brown 1896:416-418). Insect-pollinated, vegetable and flower species are included in this family. Lilies were cultivated and a popular eighteenth-century ornamental gracing gardens throughout North America (Sumner 2004:445-447). In the 1800s there were over 68 types of lilies available in seed catalogues (Adams 2004:254-260). Several more sensitive types of lily were grown in greenhouses (M'Mahon 1806). Lily Family pollen was recovered in 11 samples including the modern pollen sample. More than an incidental quantity of lily pollen was recovered in Level A of the Quarter Unit and Level F of the greenhouse, perhaps indicating the intentional cultivation of these plants.

Malvaceae: Many herbs and shrubs belong to the Mallow Family and include ornamental taxa such as hibiscus (*Hibiscus*) and economic species such as cotton (*Gossypium*). Several species of sida (*Sida*), for example, are indigenous to the area and grow in waste places and along rivers (Britton and Brown 1897:421-422). Pollen grains identified to this family were recovered in ten samples. Several greenhouse samples from Unit 1 and Sample 15, Unit 9 contained Mallow pollen grains that measured over 100 μm which are the same size as hibiscus and rose of Sharon

species is mentioned by M'Mahon in 1806. Pollen from these taxa could have also been introduced into the greenhouse through watering activities if ground water was used to irrigate the plants.

Oxalis: Woodsorrel prefers woods and fields and is present in the subject area (Britton and Brown 1897:344-347). Wood sorrel pollen was only recovered in the modern pollen sample.

Panax: Ginseng is native to the subject area and prefers moist woods or thickets (Britton and Brown 1897:507). A small quantity of ginseng pollen was recovered in Level B of Unit 1. Ginseng was valued for its medicinal properties in the seventeenth and eighteenth centuries (Sumner 2004:242).

Phlox: Phlox is indigenous to Maryland and grows in moist woods, along streams, and in thickets (Britton and Brown 1898:32-37). Small quantities of phlox pollen were recovered from Levels A, B, and C of the Slave Quarter Unit, Units 8 and 9, and Level F of Unit 1. In the eighteenth century, several types of phlox were collected and cultivated for their flowers (M'Mahon 1806:461; Sumner 2004:323) and used for their medicinal properties (Moerman 1998:392).

Plantago: Plantain is associated with paths and roadways (Page and Weaver 1974:212), and "undisturbed" grassed surfaces (Behre 1981:229). Plantain pollen was identified in 14 samples including the modern surface sample. Levels A and C of the Slave Quarter Unit had the highest percentages of this pollen type. Plantain pollen comprised approximately 7% of the total counted pollen for Level A, while it made up roughly 5% of the total counted pollen for Level C.

McAndrews and Turton 2007:14). It is probable that maize grew nearby and was consumed by the occupants of the property.

Polemonium: Jacob's-ladder grows in swamps and along streams in Maryland (Britton and Brown 1898:41), but it was also used as an ornamental (Leighton 1986:467). A small amount of pollen identified to this taxon was recovered in Level E.

Polygalaceae: There are approximately ten genera and 750 species in the Milkwort family that are distributed throughout temperate and tropical regions (Britton and Brown 1897:355). Pollen identified to this family appeared in Levels C, E, F, and G of Unit 1, Level C of the Quarter Unit, and Levels 8 and 12 of Unit 9. Some species belonging to this family, Seneca snakeroot (*Polygala senega*) for example, were used as a cure-all in the eighteenth century (Leighton 1986:467; Weishan 1999:253); while others may have been cultivated for the aesthetic quality of their flowers (M'Mahon 1806:444).

Polygonum: Pollen grains identified as knotweed were recovered from 13 samples, seven of which were satisfactory for environmental reconstruction. Both naturalized and indigenous herbs are included in this genus with some species preferring wet soils, while others flourish within waste places (Britton and Brown 1896:554-567; Wodehouse 1965:404). Several species of knotweed grow naturally in the subject area (Britton and Brown 1896:555 - 567) with one in particular, arsmart (*Polygonum sagittatum*) used by Thomas Jefferson for its medicinal value (Leighton 1986:468). *Polygonum* pollen appeared in all Slave Quarter Unit levels; however, it was also identified in the pre-historic level as well strongly suggesting that it was part of the natural pollen spectrum.

Table 5

Number of Tree Taxa

Context	Number of Arboreal Taxa
Modern Surface	21
Greenhouse Unit 1, Level A	29
Greenhouse Unit 1, Level B	23
Greenhouse Unit 1, Level C	22
Greenhouse Unit 1, Level F	14
Greenhouse Unit 1, Level G	14
Greenhouse Unit 9, Sample 15	21
Slave Quarter, Level A	11
Slave Quarter, Level C	15

This trend is also reflected in the weedy taxa. Wind-pollinated weedy taxa constituted a greater proportion of the pollen assemblage in the greenhouse samples than they were in the slave quarter samples and the modern surface sample (see Table 6). The relatively low proportion of these taxa in the modern surface sample could be the result of a more managed modern landscape. Since ragweed (*Ambrosia*) is s an invader species one that easily colonizes disturbed environments, perhaps the spike in ragweed pollen depicted in Levels B, C, and F of the greenhouse probably indicates an ongoing disturbance to the environment perhaps as a result of intense land use (Figure 1). Similarly the high proportions of Cheno/Am pollen in Level G of Unit 1 and Sample 15 of Unit 9 reflect the disturbance to the surrounding landscape because many Cheno/Ams are aggressive weeds (Kricher and Morrison 1988:102; Page and Weaver 1974:209).

A variety of taxa identified in the Wye House greenhouse pollen analysis are indigenous to the area but were also grown as ornamentals. It is probable that some of the identified taxa were grown or at least started in the greenhouse; however, it is difficult to say with certainty whether these taxa were used as ornamentals unless a large quantity of their pollen was recovered. Also the difficulty in identifying pollen grains to cultivated species or, in some cases subspecies, limits the interpretation we can give (see Table 7). The discussion that follows focuses on the pollen recovered from 3 time periods: circa 1775, 1785-1790 when the hypocaust was installed, and the 19th through mid-20th centuries. We give our best interpretation for those taxa which might have been deliberately grown in the greenhouse, but we must caution that these results should not be over-interpreted. In the table below, taxa in bold are thought to be particularly significant either because they do not naturally grow in the area or because they are known to have been grown in historic greenhouses.

The earliest layer associated with the construction of the greenhouse (1775), pollen from possible ornamental plants recovered in the circa 1775 levels are identified as Daphne, *Iris*, members of the Liliaceae and Malvaceae, Musaceae, Myrtaceae, Rosaceae, *Citrus*, and *Saxifraga*. Pollen identified to most of these taxa were only recovered in Unit 9, Level XII (Sample 15). The pollen assemblage for this sample appears strikingly similar to the modern assemblage identified in Unit 1, Level A. We wonder if this sample (PS 15) was contaminated with soils from upper levels possibly due to a construction episode, and we discard the results of this sample as likely contaminated and not reflective of the 1775 use of the structure. From this earliest level, therefore, we suggest taxa indentified in this analysis that are most likely reflect possible use in the greenhouse are Rosaceae and possible *Nymphaea* if a water garden was installed.

Phlox, *Saxifraga*, and Rosaceae. *Nuphar* might have been cultivated in a water garden, if one was created in the greenhouse.

From the 19th to mid 20th century (Unit 1 Levels B, C, and D) samples, pollen identified to the Caryophyllaceae, Lilaceae, Musaceae, and Rosaceae families, *Crocus*, *Daphne*, *Geranium*, *Iris,* and *Citrus* may reflect deliberately cultivated plants. Certainly the Caryophyllaceae, Liliaceae, Malvaceae, Musaceae, and Rosaceae families and *Crocus*, *Geranium*, *Iris*, and *Citrus* have species that were grown in greenhouses or cultivated in gardens. M'Mahon (1806:573) specifically states that crocus and iris flowers can be forced by bringing them inside the greenhouse. Level A in Unit 1 is thought to be modern and therefore we do not discuss the pollen here although the taxa recovered are listed in Table 7.

In general, all of the plants listed for the greenhouse except those identified as Musaceae and *Citrus* have wild species that could have grown naturally on or near the estate. Pollen identified as daphne and saxifrage and to the Malvaceae and Rosaceae families were recovered in a pre-historic level associated with the slave quarter perhaps indicating that pollen from these taxa were part of the natural pollen spectrum for the area. However, daphne and saxifrages were listed as plants commonly grown in greenhouses (M'Mahon 1806:562) and the pollen grains recovered from these samples may indicate they were grown at Wye. Members of the Lily family may also have been deliberately grown in the greenhouse. In Level F, Unit 1 Lily family pollen represents 1.34% of the total while only representing .33% of the total for the modern sample. Historical accounts indicate that a vast variety of lilies were raised, including tropical lilies from South Africa (Adams 2004; Leighton 1986; M'Mahon 1806; Sumner 2004). Pollen grains from the Caryophyllaceae or Pink Family and specifically pinks (*Dianthus*) were

Table 8

Significant Taxa Recovered in the Slave Quarter Unit

Time Period c.	Unit and Location	Significant Taxa
Pre-historic	Quarter Unit 3/Level D	*Daphne*, Malvaceae, *Polygonum*, Rosaceae, *Sagittaria*, *Saxifraga*
1775-1790	Quarter Unit 3/Level C	***Asarum*, Brassicaceae**, *Daphne*, *Menyanthes*, Musaceae, *Nymphaea*, *Phlox*, **Poaceae-Euro cereal**, **Rosaceae**, *Sagittaria*, **Solanaceae-*Physalis*, *Vaccinium***, *Yucca*
1785-1865	Quarter Unit 3/Level B	Caryophyllaceae-*Dianthus*, *Daphne*, **Liliaceae,** Musaceae, *Sagittaria*
20th/21st century	Quarter Unit 3/Level A	Apiaceae, Brassicaceae, Campulaceae-*Lobelia*, Caryophyllaceae-*Dianthus*, Liliaceae, Marantaceae, Musaceae, *Nymphaea*, Palmae, *Phlox*, Poaceae-*Zea mays, Sagittaria*

From the 1775-1790 layer (Level C), significant taxa include *Asarum* (wild ginger), Brassicaceae (mustard family including broccoli, mustard and other greens),), possibly Musaceae (banana family), European-introduced cereals, Rosaceae, *Physalis* (ground cherry), and *Vaccinium* (blueberry). Each of these plants has culinary or medicinal uses. Small quantities of European cereal pollen were recovered in the Slave Quarter Unit and might indicate their presence in the slaves' diet. However, pollen from this taxon was also recovered in all three greenhouse units probably indicating that they grew in close proximity to the greenhouse and were merely ambient pollen rain. The Rosaceae pollen is problematic to interpret because it may

background pollen rain (weedy and arboreal taxa) in the greenhouse relative to the slave quarter suggests that opening windows and doors was used to regulate temperatures in the Wye greenhouse.

In December, for example, M'Mahon (1806:573-574) recommends heating the greenhouse to around 40◦F or 45◦F, but not higher; while for the hot-house, he advises to heat it higher than 52◦F, but not warmer than 62◦F to protect the plants from frost, but to keep them cool enough so they would not flower. Specific instructions on what temperatures citrus trees prefer appeared in garden instruction books and manuals. During the winter months such as January, greenhouses were not kept above 40◦ to 45◦ F to prevent citrus trees from flowering (M'Mahon 1806:159). For the month of February, M'Mahon (1806:168) states that the temperature for pineapples and other cold-sensitive plants should be kept around 55◦F during the night and no higher than 62◦F by fire heat during the day, "but in no case, nor under any circumstances, let the heat of the house fall below 52◦F, if possible" (M'Mahon 1806:168). He (M'Mahon 1806:170) does acknowledge that some plants require "a somewhat greater degree of heat than the Pine-apple, and others not quite so much," and he indicates that separate rooms within the hot-house that could be kept at different temperatures thus accommodating all types of tropical plants. While no pineapple pollen was identified in the Wye samples, M'Mahon's guidelines provide suggestions for the temperatures at which tropical plants, such as those that were identified through this analysis, required.

Conclusion

The pollen analysis of samples that were recovered from the Wye House greenhouse and Slave Quarter Unit touches upon what vegetation types existed in the regional and local

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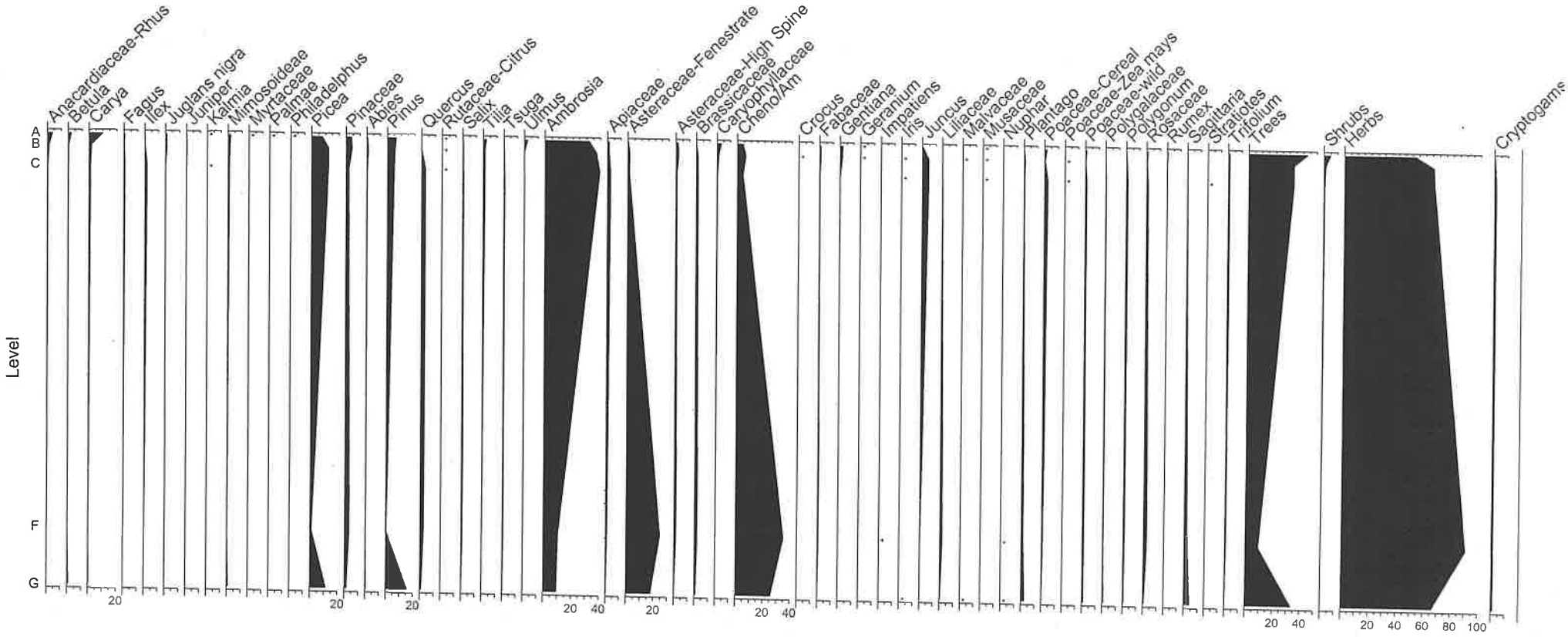
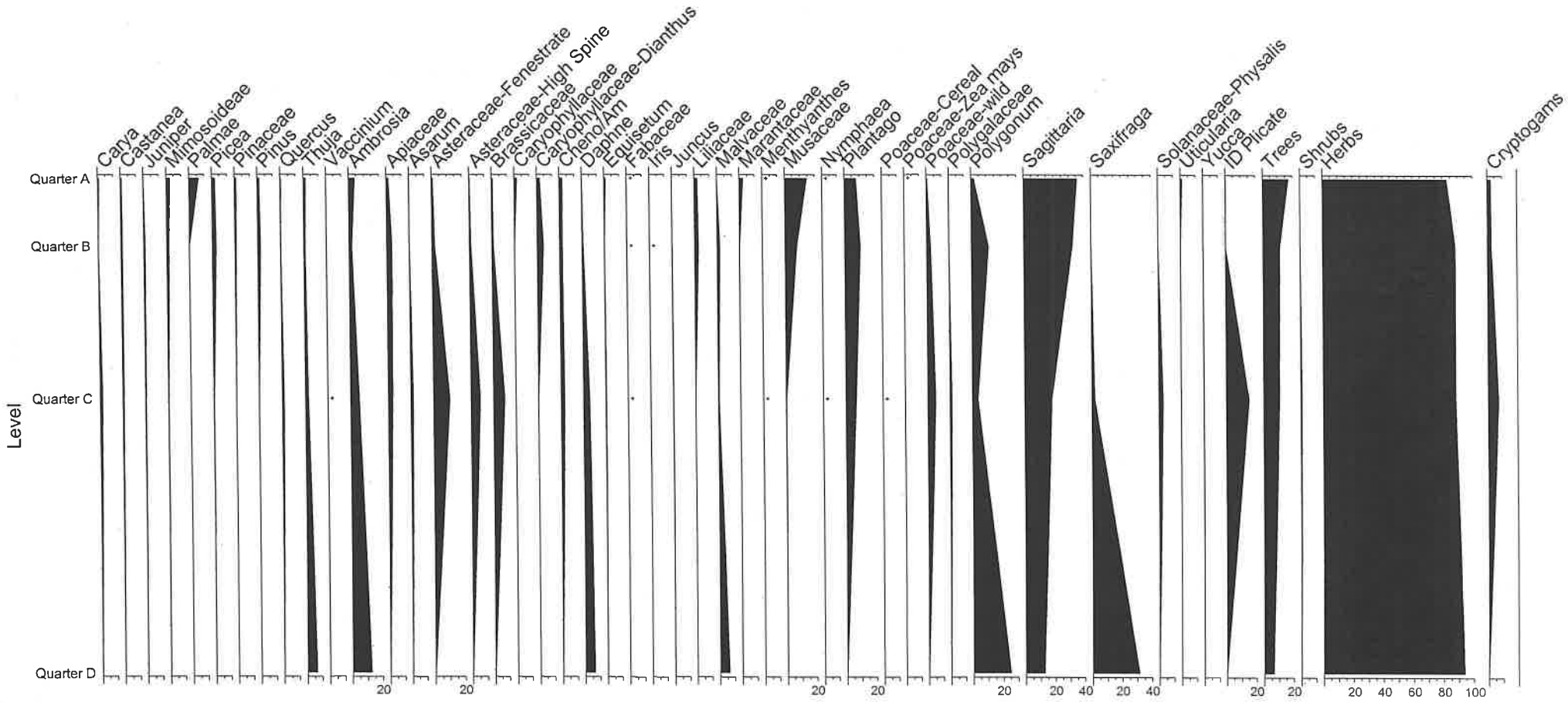
Figure 1: Pollen Diagrams of the Wye House Greenhouse Unit 1 and Slave Quarter Unit 3

Unit 1 of the Greenhouse



Quarter Unit 3



Appendix A: Pollen and Spore Total Counts by Sample and Level

Greenhouse Unit 1

Taxon	TP1-1 Level A	TP1-2 Level B	TP1-3 Level C	TP1-4 Level D	TP1-5 Level E	TP1-6 Level E	TP1-7 Level F	TP1-8 Level G	TP1-9 Level G	TP1-11- Level H
Acer	0	1	1	0	0	0	0	0	0	0
Alnus	3	0	3	0	0	0	1	0	0	0
Anacardiaceae, *Rhus*	18	7	2	0	0	0	0	0	0	0
Berberis	0	0	0	0	0	0	0	1	0	0
Betula	10	2	1	0	0	0	3	0	0	0
Carpinus	3	3	0	0	0	0	0	0	0	0
Carya	48	10	5	0	1	0	1	1	0	0
Castanea	0	0	4	0	0	0	1	0	0	0
Cornus	0	0	2	0	0	0	0	0	0	0
Elaeagnaceae	5	4	2	0	0	0	0	0	0	0
Fagus	2	1	3	0	0	0	0	0	0	0
Fraxinus	3	0	1	0	0	0	0	0	0	0
Ilex	0	1	8	0	0	0	0	0	1	0
Juglans cinerea	1	0	0	0	0	0	0	0	0	0
Juglans nigra	4	5	0	0	0	0	0	0	0	0
Juniper	0	2	0	0	0	0	0	0	0	0
Kalmia	1	0	1	0	0	0	0	1	0	0
Mimosoideae	0	1	0	0	0	0	0	0	1	0
Mimosoideae, *Acacia*	4	6	4	0	0	0	3	3	0	0
Mimosoideae, *Albizia*	4	0	0	0	0	0	0	0	0	1
Myrtaceae, *Myrceugenia*	1	0	0	0	0	0	0	0	0	0
Nyssa	1	0	0	0	0	0	0	0	0	0
Oleaceae	0	0	0	0	0	0	1	0	0	0
Ostrya	3	0	0	0	0	0	0	0	0	0
Palmae	4	0	0	0	0	0	0	0	0	0
Philadelphus	1	0	0	0	0	0	0	0	0	0
Picea	36	69	58	0	0	4	40	31	6	0
Pinaceae	18	24	9	0	0	0	16	5	0	0
Pinaceae, *Abies*	2	6	2	0	0	0	0	2	0	0
Pinus	30	31	24	0	0	1	55	18	3	0
Ptelea	0	3	0	0	0	0	0	0	0	0
Quercus	12	3	8	0	1	1	16	5	1	0
Rutaceae, *Citrus*	1	4	4	0	0	0	0	0	0	0
Salix	1	3	3	0	0	0	4	0	0	0

Taxon	TP1-1 Level A	TP1-2 Level B	TP1-3 Level C	TP1-4 Level D	TP1-5 Level E	TP1-6 Level E	TP1-7 Level F	TP1-8 Level G	TP1-9 Level G	TP1-11- Level H
Lamiaceae, *Mentha*	0	2	1	0	0	0	0	0	0	0
Liliaceae	0	1	1	0	0	1	8	1	0	0
Malvaceae	0	1	0	0	1	1	0	2	0	0
Menthyanthes	0	0	0	0	0	0	1	0	0	0
Musaceae	1	2	1	0	0	0	0	0	0	0
Myrtaceae, *Myrceugenia*	1	0	0	0	0	0	0	0	0	0
Nuphar	0	0	0	0	0	0	2	1	0	0
Nuymphaea	0	0	0	0	0	0	0	0	1	0
Panax	0	2	0	0	0	0	0	0	0	0
Phlox	0	0	0	0	0	0	3	0	0	0
Plantago	0	5	2	0	1	1	7	9	0	0
Poaceae, Euro-Cereal	8	2	12	0	3	0	3	0	0	0
Poaceae, *Zea mays*	0	3	4	0	0	0	0	0	0	0
Poaceae, Wild Grasses	4	1	5	0	1	0	5	3	1	0
Polemonium	0	0	0	0	1	0	0	0	0	0
Polygalaceae	0	0	2	0	6	5	1	3	0	0
Polygonum	0	3	6	0	0	5	4	2	2	0
Portulacaceae	0	0	0	0	0	0	1	0	0	0
Primulaceae, *Lysimachia*	1	0	0	0	0	0	1	1	0	0
Ranunculus	1	0	0	0	0	0	0	0	0	0
Ribes	0	0	1	0	0	0	0	0	0	0
Rumex	0	3	0	0	0	0	0	0	0	0
Sagittaria	1	0	1	0	3	3	10	14	1	1
Sanguisorba	0	1	0	0	0	0	0	0	0	0
Saxifraga	0	0	0	0	0	0	1	0	0	0
Solanaceae, *Physalis*	2	3	0	0	0	0	1	0	0	0
Spergula	0	3	0	0	0	0	0	0	0	0
Stratiotes	0	0	1	0	0	0	0	0	0	0
Succisa	0	0	0	0	0	0	0	0	0	0
Thalictrum	0	1	0	0	0	0	0	0	0	0
Tribulus	0	0	0	0	0	0	1	0	0	0
Trifolium	5	6	5	0	0	0	3	0	0	0
Uticularia	0	0	0	0	0	0	2	4	0	0
Verbenaceae, *Phyla*	1	0	0	0	0	0	0	0	0	0
Totals	**245**	**365**	**310**	**0**	**24**	**31**	**405**	**230**	**26**	**1**
Didymodon	0	0	0	0	1	0	0	0	0	0
Dryopteris	0	5	4	0	0	0	0	2	1	0

Greenhouse – Units 8 and 9

Taxon	Surface	8VI,South Wall	8VI,North Wall	9VIII,West Wall	9XII,West Wall
Alnus	63	0	0	0	0
Anacardiaceae, *Rhus*	7	0	0	0	3
Betula	14	0	1	1	3
Carpinus	1	0	0	0	0
Carya	15	1	0	2	7
Castanea	0	0	0	0	1
Fagus	2	0	0	0	3
Fraxinus	11	0	0	0	1
Juglans nigra	8	0	0	0	2
Juniper	0	0	0	0	1
Kalmia	2	0	0	0	0
Lonicera	1	0	0	0	0
Mimosoideae	0	0	0	0	1
Mimosoideae, *Acacia*	1	0	1	1	11
Myrtaceae, *Myrceugenia*	0	0	0	0	1
Nyssa	4	0	0	0	0
Oleaceae, *Forsythia*	1	0	0	0	0
Palmae	0	0	1	0	0
Philadelphus	2	0	0	0	0
Picea	15	0	0	5	23
Pinaceae	3	0	1	1	13
Pinaceae, *Abies*	0	0	0	0	1
Pinus	2	0	0	1	19
Quercus	14	0	1	0	4
Rutaceae, *Citrus*	0	0	0	0	1
Thuja	0	0	0	0	3
Tilia	7	0	0	0	8
Tsuga	2	1	1	0	1
Ulmus	10	0	0	0	4
Vaccinium	0	0	0	0	0
Viburnum	0	0	0	0	0
Totals	**178**	**2**	**6**	**11**	**109**
Celastraceae	0	0	0	0	0
Fabaceae	1	0	1	1	5
Rosaceae	11	1	0	0	2
Totals	**12**	**1**	**1**	**1**	**7**
Ambrosia	29	1	0	8	67

Taxon	Surface	8VI,South Wall	8VI,North Wall	9VIII,West Wall	9XII,West Wall
Rumex	1	0	0	0	0
Sagittaria	0	2	5	15	104
Saxifraga	0	0	0	0	8
Solanaceae, *Physalis*	2	0	0	0	2
Succisa	1	0	0	0	0
Tribulus	0	0	1	1	0
Trifolium	7	0	0	0	10
Uticularia	1	1	1	0	0
Yucca	0	0	0	0	0
Totals	**74**	**15**	**30**	**38**	**348**
Dryopteris	18	0	0	0	0
Huperzia	0	0	0	0	0
Lycopodium	1	0	2	0	5
Orthotrichaceae	0	0	0	0	1
Osmunda	0	0	1	0	0
Polypodium	4	0	0	0	0
Sphagnum	2	0	0	1	0
Totals	**25**	**0**	**3**	**1**	**6**
ID Plicate	0	2	1	4	6
ID	0	0	0	0	0
UnID	13	9	11	7	25
Totals	**13**	**11**	**12**	**11**	**31**
Spike	19	66	111	60	284
Totals	**302**	**29**	**52**	**62**	**500**

Taxon	Surface PS 16	Level A TP2-1	Level B TP2-2	Level C TP2-3	Level D TP2-3
Rosaceae	11	0	0	4	1
Totals	**12**	**2**	**1**	**6**	**1**
Ambrosia	29	19	2	14	2
Apiaceae	2	6	4	7	0
Asarum	0	0	0	4	0
Asteraceae, Fenestrate > 30 μm	0	2	1	15	0
Asteraceae, Fenestrate < 30 μm	1	1	1	11	0
Asteraceae, *Aster*	1	0	1	0	0
Asteraceae, *Carduus*	0	0	0	1	0
Asteraceae, *Eupatorium*	0	0	0	3	0
Asteraceae, *Helianthus*	0	1	0	4	0
Asteraceae, *Solidago*	0	0	0	7	0
Brassicaceae	1	3	1	18	0
Campulaceae, *Lobelia*	0	1	0	0	0
Caryophyllaceae	0	9	0	0	0
Caryophyllaceae, *Dianthus*	0	9	5	0	0
Cheno/Am	5	10	2	6	0
Daphne	0	0	1	10	1
Dipsaceae, *Succisa*	0	1	0	0	0
Equisetum	0	4	0	1	0
Galium	1	0	0	0	0
Gentiana	3	0	0	0	0
Iris	1	0	1	0	0
Juncus	1	0	0	1	0
Liliaceae	1	9	3	0	0
Malvaceae	0	0	2	1	1
Marantaceae	0	11	0	0	0
Menthyanthes	0	2	0	1	0
Musaceae	0	69	9	1	0
Nymphaea	0	2	0	2	0
Oxalis	1	0	0	0	0
Phlox	0	2	1	2	0
Plantago	2	36	12	17	0
Poaceae, Euro-Cereal	1	0	0	2	0
Poaceae, *Zea mays*	0	3	0	0	0
Poaceae, Wild Grasses	1	2	3	13	0
Polygalaceae	0	0	0	3	0
Polygonum	0	8	13	0	4

Appendix B: Correspondence

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Wed, 17 Jun 2009 15:54:41 -0400
To: <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, John Blair <jblair@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, Steven Archer <SArcher@CWF.org>, Stephanie Duensing <stephanie.duensing@gmail.com>
Subject: Paleobotanical work at Wye House

Dear Dr. Trigg,

Although we have not met, Steve Archer of CW recommends that I approach you and Dr. Popper for advice.

The Greenhouse, or Orangery, at Wye House is pretty well known and my team in Archaeology in Annapolis has been excavating there. We have not excavated yet in the main room of the greenhouse which is a large, south facing, 18th-century space. I want to collect paleobotanical remains and need to work with somebody who can be sure that we collect the samples properly, and then analyze them.

If you do this kind of work and are interested in offering guidance, and a rate sheet, I would be interested in having your sense of things.

The material would be used in a dissertation here at the University of Maryland and so we would be publishing all the results.

We will be starting this work next month on July 13, 2009 and would like your advice and guidance beforehand.

Please let me know if either you or Virginia is interested.

Many thanks,

Mark Leone

Mark P. Leone
Professor
Department of Anthropology
1108 Woods Hall
College Park, MD 20742-7415
(301) 405-8767 (office)
(301) 314-8305 (fax)

I do not know what the scope of our analysis should be and I cannot predict until I know whether or not anything exists.

I like the idea of your coming down around the 6th of July and staying overnight at a hotel in nearby Easton. I assume you know the area because of your family in Annapolis.

Let's keep this conversation going.

Thanks,

Mark

Mark P. Leone

>>> Heather Trigg <heather.trigg@umb.edu> 6/30/2009 1:58 PM >>>
Hi Mark,
I'm looking into flights to Maryland. It looks like I have a couple of choices (all about the same price), and perhaps you could advise me which choice is better for your work. I could fly in on Monday July 6 morning (getting to BWI around 8 AM) and drive to your site that day and leave the next morning. Or I could fly in on Monday evening, arrive at the site first thing on Tuesday morning and then fly out of BWI at 8:45 Tuesday night. I want to make sure I have adequate time to get from the airport to the site (or vice versa) and complete the work you need done. I thought I would spend the overnight with my sister in Annapolis. Is either schedule better?

Regards,
Heather

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Tue, 30 Jun 2009 14:58:16 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, John Blair <jblair119@gmail.com>, Stephanie Duensing <stephanie.duensing@gmail.com>
Subject: Re: Botanical sampling

Heather,

Either way sounds okay to me. Annapolis is about an hour from Wye House and the driving instructions from Route 50 are attached here.

Although your email does not suggest it, you may want to visit twice to fix any mistakes that occur to you after your first visit.

You are right that it is a long way to BWI from Annapolis or from Easton.
The trip is much easier from BWI since the highway is very well marked for the airport and it probably takes less than one hour, although you will be going in rush hour.

It probably will not rain while you are here, but it could be extremely hot next week. If you were to stay overnight in Easton, you could have an afternoon with us and then visit in the early morning.

Now that I think about it, I think if you worked throughout one day you could leave and not need to return.

Despite my being indecisive here, either of your plans will do.

Mark

Dear Dr. Trigg,

My name is Stephanie Duensing and I am working with Dr. Leone on the archaeology and sample collection from the Greenhouse at Wye House. I have been copied on your correspondence and wanted to touch base with you to work out any scheduling for our time together. It is wonderful that you can come and assist us at such short notice and we want to do our best to be prepared to get the most out of your expertise. I am including the other members of our team on this email to try to get the most out of our communication.

My colleague, John Blair and I definitely want to make ourselves available to you for any portion of your time here which you are willing to contribute. We can stick around at Wye House on Monday if you would like to come out after your flight but it seems that you would not be arriving until 7pm or so and I would imagine you would be quite hungry. If there is any preparatory aspects that do not require being in the field, we can meet you in Annapolis for a drink or food. Really, we are quite flexible and willing to accommodate anything which will facilitate the learning process.

John and I have successfully established that there is stratigraphic integrity within the Greenhouse itself. This was expected, but good news none the less. I wanted to make sure that we had everything prepared for your visit. We have acid free plastic bags, a set of six 200mm diameter brass soil sieves (mesh sizes 12.5mm down to 250microns), a float tub (if necessary), and access to water. We just want to know if there were any other items that we should make sure to have ready for your visit? Please let me know if there is anything that you recommend to be able to successfully gather these samples.

We look forward to your visit and hope to learn all we can from your time here. Please do not hesitate in contacting me for any reason in the next few days. This is my best contact email and my phone number is 918.407.6859. Feel free to contact me for any reason by whichever works best for you.

Thank you again,

Stephanie

Stephanie Duensing
Associate Field Director
Archaeology in Annapolis
918.407.6859
stephanie.duensing@gmail.com

On Fri, Jul 3, 2009 at 8:14 PM, Heather Trigg <heather.trigg@umb.edu> wrote:
Dear Stephanie,
Thanks for your email. I'm looking forward to meeting you and seeing the site. Can you tell me a little more about what you'd like to get out of my visit? I'm happy to demonstrate (and help take) pollen samples and float samples. I can demonstrate floating if you want. We could also discuss some places that might be useful for botanical sampling.

I have a few (9) whirl-paks for collecting pollen. This would probably be enough for a bit of demonstration, but perhaps not enough to completely sample a profile. If you don't have whirl-paks or small sized plastic bags (about 4-6 oz) and want to do extensive sampling, please let me know. I won't be able to bring a trowel on the plane, so

Galway Bay is an Irish Restaurant and Pub on Maryland Ave and City Dock is a coffee shop next door. It should not take long, but I think it is best to make sure everything is in order.

Also, we can meet you in Annapolis Tuesday morning if you would like to follow us out to Wye. The driving directions are very reliable so whichever is most convenient for you is fine with us.

I hope this helps answer the questions sufficiently. If there is anything I neglected or need to address more clearly please let me know.

Have a safe and happy 4th of July and we look forward to meeting you next week!

Best Wishes,

Stephanie

Stephanie Duensing

On Sun, Jul 5, 2009 at 2:51 PM, Heather Trigg<heather.trigg@umb.edu> wrote:
Hi Stephanie,
This all looks good. Should we try to meet sometime between 6 and 6:30? I'd be more definite, but I'm not sure what the traffic will be like from BWI to Annapolis at that time of day. Either the pub or coffee shop is fine with me. I don't think either place will be hard to find.

Best wishes,

Heather

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Sun, 5 Jul 2009 15:14:52 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Mark Leone <mleone@anth.umd.edu>, John Blair <jblair.trustno1@gmail.com>
Subject: Re: Sample collection at Wye House Greenhouse

Dear Heather,

Between 6-6:30 is perfect. If traffic is bad that is fine, I will have plenty to do to keep busy. I will send you the link to Galaway Bay <http://www.galway2006.com/> and here are driving directions <http://www.mapquest.com/maps?1qn=Baltimore-Washington+International+Airport+%28BWI%29&1c=Baltimore&1s=MD&1z=21240&1y=US&1l=39.18275&1g=-76.67331&1v=ADDRESS&1id=2685325&2c=Annapolis&2s=MD&2a=63+Maryland+Ave&2> from BWI to the pub. It is fairly straight forward. If there are any problems finding it, please call me on my cell: 918.407.6859. My colleague, John Blair, may be joining us depending on his schedule.

I look forward to seeing you tomorrow afternoon and safe travels!

Best,
Stephanie

From: Heather Trigg <heather.trigg@umb.edu>
Date: Tue, 14 Jul 2009 17:25:36 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, John Blair <jblair119@gmail.com>, Stephanie Duensing <stephanie.duensing@gmail.com>
Conversation: Dear Heather,
Subject: Re: Dear Heather,

Dear Mark et al.,
Sue has processed and begun to look at the pollen from the Greenhouse. While I try to get her just to count pollen without doing ids - just to get the preservation assessment, she's been doing them anyway. She looked at level F (I believe that's the earliest layer of the Greenhouse); she's counted 200 grains - usually we do 300 so she'd not done looking yet. The preservation for this layer is quite good, just under 10,000 grains/gram. We usually want at least 1,000 grains/gram and many garden samples I've seen have been in the 400-500 grains/gram range. This is good news.

Now for the not so good news - the taxa she's found are generally weedy taxa
- cheno/am, pine, ragweed, plantago,oak, willow, alder, Asteraceae family to name a few. 1 each of clover and a European-introduced cereal. There are some interesting finds - Nuphar - water lily, impatiens (1 grain each), Rose family (could be roses, cherries, plums, wild cherries, raspberry or weedy plants such as cinquefoil), several from the lily family (lilies, daffodils, tulips, onions, and some non-domesticated plants). No citrus, at least yet.

Sue started examining the slave quarter pollen. The preservation there is not as good as the greenhouse, but still not bad.

As far as any interpretation of this - I think that is premature because of all the difficulties in interpreting single grains of anything - but preservation does look good.

Best wishes to all,
Heather

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Wed, 15 Jul 2009 14:12:42 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, John Blair <jblair119@gmail.com>, Stephanie Duensing <stephanie.duensing@gmail.com>
Subject: Re: Dear Heather,

Dear Heather,

It was great to speak with you this morning. Thank you very much for this email. I could follow some of your explanation about what these results mean statistically, but not everything. When you find some boiler plate that you use in your reports to say what a few pollen grains mean, please send it along.

I introduced you to the paleobotanical remains from Fleet and Cornhill Streets, particularly the water logged remains from the log road that may date as early as 1684 and that certainly was there by 1720. I would be very happy to have you and a future graduate student at U Mass Boston collaborate with us on an analysis of these remains.

With these remains I am introducing you once again to Jocelyn Knauf who will be using the archeological materials from these houses in the heart of Annapolis for her dissertation from our department. Jocelyn will be willing to explore with you shipping you these remains when you are ready.

She will also be available if you think the next move to understand these remains and their potential is another trip down here when you return from Iceland.

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Wed, 29 Jul 2009 10:08:07 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Mark Leone <mleone@anth.umd.edu>, John Blair <jblair.trustno1@gmail.com>, Amanda Tang <amanda.tang5@gmail.com>, Jocelyn Knauf <jocelyn.knauf@gmail.com>
Subject: Re: Float samples from Wye Greenhouse

Oh wow, that sounds intense. We have the opposite here: It is 95 with 100% humidity!

As far as the float samples are concerned, that is very good news. We will go ahead and just plan on sending the entire sample to be processed then. Jocelyn Knauf has offered to drive the samples up to Boston toward the middle or end of August on her way up to New England. Will this be alright? Are there any helpful instructions or advice to give to her?

I would also like to run our preliminary plan by you and see how you feel about it. We are thinking of processing 5 more pollen samples (4 of which we will be mailing you - 3 from the other units we excavated and the control sample - and 1 which you took back with you already) and then analyzing 10 total of the macroremain samples. That would give us a total of 7 from the Greenhouse and Quarter. We would gather one from both strata we think were surfaces (one which was already processed and the other which you took back already), the quarter sample, the builder's trench found in the unit we placed against the wall, a level from within a strange feature found within the unit placed in the west wing, and a sample from a layer in the west wing that looks to be redeposited surface material from the original Greenhouse surface used to grade that side during the building's redesign. Your thoughts and guidance on this plan would be wonderfully received and greatly appreciated.

Thanks so much,

Stephanie

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Wed, 12 Aug 2009 09:43:27 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Mark Leone <mleone@anth.umd.edu>, John Blair <jblair.trustno1@gmail.com>, Amanda Tang <amanda.tang5@gmail.com>, Jocelyn Knauf <jocelyn.knauf@gmail.com>
Subject: Re: Float samples from Wye Greenhouse

Dear Dr. Trigg,

Hope all is well up North! We are attempting to make arrangements to drop these soil samples off at the Fiske Center and have been informed that we must make arrangements with you first. In our last correspondence I inquired about this, but I am sure you have been extremely busy and have not had time to think about this in the least! I am hopeful this will reach you in time as Jocelyn Knauf was going to be driving them up tomorrow. I realize at this point it is rather short notice, so even if there is nothing that can be worked out by tomorrow, please do let me know. I would hate if we were to make Jocelynn tow 200-300lbs of dirt up to Maine for her vacation!
Thanks so much and hope you keep finding amazing things!
All the Best, Stephanie Duensing

From: Heather Trigg <heather.trigg@umb.edu>
Date: Wed, Oct 28, 2009 at 9:57 AM
Subject: Re: Sample collection at Wye House Greenhouse
To: John Blair <jblair119@gmail.com>

Hi John,
I'm trying to develop a sampling strategy for the Wye House floats and pollen samples, and I'm hoping you can help me with a little information. I have float samples from Units, 1, 8, and 9.
1). Are all of these units in the Greenhouse? Are any of these units in the slave quarters in the Greenhouse or the furnace room?
2). Could you tell me a little about the features you identified (Feature 2, Feature 19a, c, Feature 20a, b, Feature 23)?
3). I have samples from level H from each of the units. Are these in sterile?
4). Are any of the levels in any units particularly interesting or promising?

I'd like to analyze a reasonable number of samples – don't want to charge for samples that are not helpful for the questions you/Dr. Leone are interested in so any information you could give will be helpful.

Thanks so much for your help.

Best wishes for your graduate studies,
Heather

On Mon, Nov 2, 2009 at 2:21 PM, Heather Trigg <heather.trigg@umb.edu> wrote:

Hi Stephanie,
I hope things are going well in your program. Sorry to bother you with Wye stuff, but could you tell me more about the samples that you discussed below? Which ones are these? What are their proveniences? Feature #? Sample# Now that I have all the samples, I'm trying to put together a reasonable sampling strategy and what you proposed below sounds good.

Any information on the samples would be helpful.

Thanks,
Heather

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Wed, 4 Nov 2009 11:28:13 -0600
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Mark Leone <mleone@anth.umd.edu>, John Blair <jblair.trustno1@gmail.com>, Jocelyn Knauf <jocelyn.knauf@gmail.com>, Amanda Tang <amanda.tang5@gmail.com>
Subject: Re: Float samples from Wye Greenhouse

Dear Dr. Trigg,

Sorry for the delay on getting back to you, I am at grad school in England and am trying to get to everything. I will

Yes, Level H is our sterile sub soil in all the units, but in Unit 8 it had some mottling and was at a different elevation which leads us to believe it may have been tampered with during the alteration of the structure.

4) Are any of the levels in any units particularly interesting or promising?

Now, this is where I get a little uncertain with how to proceed and would really appreciate feedback. Initially, we had planned on only having 7 pollen samples processed. I emailed you a preliminary plan for what we were wanting to be tested on July 29, in one of our correspondences while you were in Iceland. This was not very well articulated about which samples to process and I apologize. As I understand it now, there have been 7 samples processed so far, five that came from the test unit 1 and two from unit 3 in the slave quarter, and all of which you took back with you when you came to teach us how to collect pollen samples.

We had originally wanted to have pollen tests on the samples from feature 20(I can't remember if it was a or b, but we only took/sent a pollen sample from the one we wanted), feature 19-c from unit 8 and level H from unit 8. The other levels (levels B and F) from test unit 1 were also wanted, but I am certain you have already processed those. Additionally, there was just the slave quarter surface level (which you have already done as well) and the control sample.

At this time, if you could advise us on where the most advantageous area to focus our resources on would be, that would be invaluable. I know we had planned on getting 10 flotations processed, but if you feel that doing a couple more pollen samples from the other units would be a wiser investment of resources, please let us know. Our main objective is to get the best coverage.

My impulse is to do 6 floats and another pollen sample from each of the other units so we at least have some idea as to whether there is any variation within the main room based on length of use. Particularly, I would like the sample from feature 19-C in unit 8 processed.

As far as a schedule for the flotations we wanted processed, I never heard for sure if you had been given one. I put together a list of which levels have priority and will include it below. If you have a different list, could you please send it to me and I will compare them and get back to you. Again, we may not do all of these if we decide to do a couple more pollen samples, but I wanted to make sure you had the basic provenience information. I apologize that I do not have bag numbers. I can attempt to get those for you if you would like.

If you have any further questions please don't hesitate to ask.

Thanks so much,

Stephanie Duenisng

FLOAT SAMPLE Choices (number indicates priority)

(1) Unit 9-Level C
(2) Unit 9-Level F
(3) Unit 9-Level G
(4) Unit 8-F.19c
(5) Unit 8-Level H
(6) Unit 8-Level D

Quarter Unit and Sample 15 of Unit 9. Several species of arrowhead grow in shallow water (Britton and Brown 1896:88-92) and may have been introduced into the Wye House pollen profile through watering activities; however, arrowhead produces an edible root that was consumed by Native Americans who also used the plants leaves for medicinal purposes such as an anagelsic and as a gastrointestinal aid (Moerman 1998:500).

Saxifraga: Many species of this genus prefer to inhabit rocky, dry soils, while others grow in wet environments (Britton and Brown 1897:170-176). Saxifrage pollen was identified in samples Level F of Unit 1, Levels C and D of the Slave Quarter Unit and Sample 15 of Unit 9. Saxifrages were collected from the wild and considered to be "beautiful flowering plants" (M'Mahon 1806:461), but Native Americans utilized the edible leaves of this taxon as greens and as a drug for urinary issues and as a poultice (Moerman 1998:521). Since this taxa was recovered in a pre-historic level it is probable that it grew naturally in the immediate vicinity.

Scrophuliaceae, *Pedicularis*: Several species of lousewort are indigenous to the area and grow in wet soils and swamps while others prefer dry woods and thickets (Britton and Brown 1898:184-187). A small quantity of lousewort pollen was recovered in Level A of the Slave Quarter Unit dated to the 20th/21st century. This probably reflects background pollen.

Solanaceae, *Physalis*: Species belonging to the Nightshade Family are predominantly insect-pollinated. A small quantity of ground cherry pollen was recovered in six samples, including the modern surface sample. A variety of taxa native to North and South America are included in this family (Britton and Brown 1898:137). Ground cherry (*Physalis virginiana*) grows wild and was consumed as food and used as a medicinal remedy both by Native Americans and American colonists (Heiser 1969:108-109; Moerman 1998:395-396). Many other edible and economic

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Thu, 10 Dec 2009 12:50:01 -0500
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, Michael Roller <mroller@anth.umd.edu>, John Blair <jblair119@gmail.com>, Stephanie Duensing <stephanie.duensing@gmail.com>
Subject: Update needed, please.

Heather,

Please give me an update on the pollen and seed work, if you can. I left a lengthy message right after the Thanksgiving weekend on your work mail, but haven't heard back from you.

Please let me know that everything is fine or that you are being held up for some reason.

Thanks,

Mark

Mark P. Leone

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Fri, 11 Dec 2009 12:37:33 +0000
To: Heather Trigg <heather.trigg@umb.edu>
Subject: Re: Float samples from Wye Greenhouse

Dear Dr. Trigg,

I hope you have been having a good semester. I am sorry for the delay in my response. I have been very busy with the end of my first term approaching.

Yes, the pollen is what I would like to focus our budget on since, as you pointed out, the floats were fairly unproductive when we were looking at them at Wye. Our budget was set at $1500 for float samples and $1750 for pollen. I believe that works out to be 10 floats and 7 pollen based on the prices we were quoted of $150 per float and $250 per pollen sample. However, we are not married to the number of floats/pollen. We can rearrange the numbers to process whichever samples you feel would be the most productive.

I do have an interested in the slave quarter and the features for my research. Any information that can be used to help understand the differences in the use of the spaces and how they have changed through the different periods of use will be beneficial to the ultimate interpretation of the site.

I will be happy to continue to work with you on any other things should they arise, but I apologize in advance if there is a lag in my response time. Take care and hope you enjoy the holiday season.

Best,

Stephanie Duensing

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Wed, 03 Feb 2010 16:07:20 -0500
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, Michael Roller <mroller@anth.umd.edu>, John Blair <jblair119@gmail.com>, Stephanie Duensing <stephanie.duensing@gmail.com>
Subject: Any news?

Heather,

I am hoping by now you have more results. Do you have any news from our pollen samples?

Please let me know how you are proceeding.

Mark

Mark P. Leone
Professor

On 3/1/10 12:00 PM, "Mark Leone" <MLEONE@anth.umd.edu> wrote:

Heather,

Do we have any news on pollen samples from the greenhouse at Wye from your lab? I am beginning to plan the summer and some news reports and would like to include something from your work for us. Plus, you probably are anxious to get paid for what you have done so far and I want to accommodate you. I feel the need for an update and will call you soon. Please write back and let me know the best time of day for a phone call.

Many thanks,

Mark

Mark P. Leone

From: Heather Trigg <heather.trigg@umb.edu>
Date: Mon, 01 Mar 2010 15:26:10 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Conversation: Any news?
Subject: Re: Any news?

Hi Mark,
We've been working on your samples. I've asked my technician to put together a brief overview of the results. I'll try to get this to you sometime tomorrow. Wednesdays and Fridays are the best days to talk - late morning or early afternoon would be good.

Regards,
Heather

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Thu, 08 Apr 2010 11:53:41 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Cc: Amanda Tang <atang@anth.umd.edu>, Jocelyn Knauf <jknauf@anth.umd.edu>, Michael Roller <mroller@anth.umd.edu>
Subject: update needed

Heather,

I am getting pretty concerned about finishing up our work. I have called your number many times in the last few days and have begun to realize that you are away. If it is on work, I hope it is productive and successful.

As you know, the last report contained data which I could not understand the value of. It came to us uninterpreted. I have two requests.

The first is that you give me an update that is fully contextualized with an understanding of the Greenhouse at Wye and what the pollen and seeds tell us about this unique environment, if they tell us anything.

Second, when do you think you will finish?

It is getting pretty frustrating right now not to be able to find you by phone, which I hope you will understand because the Wye Greenhouse is quite special, indeed unique. The Tilghman family has put a lot of trust in me and my students and I need to return that relationship with something from this analysis that tells us that floral analysis is productive and more should be commissioned, or that it is not productive and they can treat the interior land more casually.

Many thanks,

Mark

Mark P. Leone

On 4/19/10 11:47 AM, "Mark Leone" <MLEONE@anth.umd.edu> wrote:

Heather,

Last week's email seems like the right approach to me, as long as you stay heavily involved by directing the course of the research and analysis. Only you have the experience of having seen Wye House, and the greenhouse. Further, only you can distinguish how to filter out ambient pollen rain from seeds and pollen who would tell us something about the use of the structure.

I think it is just fine to have students do the counting, but not the analysis. This is particularly true for students who pay more attention to pre-historic remains. Wye, is an extremely well known environment with plenty of documentation. Under your command we have to determine whether or not any paleobotanical analysis tells us something new. Counts alone cannot do that job.

I look forward to seeing your final thoughts in the report.

Thanks,

Mark

Mark P. Leone

From: Heather Trigg <heather.trigg@umb.edu>
Date: Wed, 19 May 2010 20:46:03 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Conversation: Any news?
Subject: Re: Any news?

Hi Mark,
We are finishing up the report now and hope to have it to you on Monday so you'll have our best interpretation then. I'd be happy to discuss the findings more if the report generates additional questions.

Heather

From: Heather Trigg <heather.trigg@umb.edu>
Date: Mon, 24 May 2010 15:46:39 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Cc: Stephanie Duensing <stephanie.duensing@gmail.com>
Conversation: Wye pollen
Subject: Wye pollen

Dear Mark,

Attached is a draft of the pollen analysis we did on the Wye materials. We tried to make it as complete as possible, but we wanted to get it to you today and we anticipate that you may have additional questions or issues that you would like us to address. We'd be happy to do this. I plan to be in my office tomorrow and Wednesday if you'd like to talk about the results.

Regards,
Heather

Heather Trigg

From: Stephanie Duensing <stephanie.duensing@gmail.com>
Date: Mon, 24 May 2010 22:56:20 +0100
To: Heather Trigg <heather.trigg@umb.edu>
Subject: Re: Wye pollen

Dear Dr. Trigg,

Thank you for including me on the final results. I have read through it and I am certain Mark will be thrilled with your findings. Thank you so much again for coming and taking the time to show John and I how to collect the samples. It was an honor to work with you. Best of luck with your projects in Iceland, especially now with all the crazy volcano business. I hope I will have an opportunity to work with you again at some point in the future.

All the Best,

Stephanie Duensing

I concluded that the greenhouse was not an orangerie until well into the 19th century and that it remained one through today. However, it was not built to hold citrus because there is no citrus pollen at all in the lower levels of TU1. Do you agree with this?

Further, the greenhouse contained a mixture of flowering shrubs, flowering plants, and medicinal herbs in the 18th and first half of the 19th centuries. This is when it was a greenhouse with a considerable variety of plants in it. For certain, in the 18th century, which is to say the lower levels of TU1 there was pollen for:

viburnum
geranium
iris
hibiscus: mallow
arrow root
pond lillies
phlox
snakeroot (cureall)
saxifrange
water soldiers
palm
impatiens
buckbean(antiemitic)

I realize that your Figure 1 should allow plant varieties to segregate by era, but it is too hard to use.

I cannot tell from your report whether the initial use of the greenhouse, which is the lower levels of TU1, have:

acacia
mint
ginseng
croacus
dianthus
daphne
banana

I would appreciate it if you could help me sort out what plants were in the slave quarter when it actually was a slave quarter, which is the period from
1775 to about 1820.

This is a remarkable report which I appreciate very much. I will be spending a lot more time on it and will give a copy, this coming Friday, to the Tilghman family for them to read. You were great to send this report in time for me to digest it so that I can give a public talk in the greenhouse this coming Friday evening.

Many thanks,

Mark

Mark P. Leone

Please let me take you up on the offer to make tables using the plant list in your report and the levels, each of which now has a date attached. Please begin with the earliest dates and then come toward the present. Feel free to eliminate what you and Heather are sure is wind-born pollen, or pollen that is so improbable it represents a plant that would not have been there.

I realize that this work will take time, although, I hope you will be able to sort the material automatically. If this does take a lot of time, please let me know and I will find a way to add to our payment to you.

See if this suggestion works and please let me know.

Mark

On 6/9/10 12:11 PM, "Mark Leone" <MLEONE@anth.umd.edu> wrote:

Susan,

This morning I paid a lot of attention to the large format print out that I got from you yesterday with the pollen diagrams from Wye House. My sense is that the diagrams are much less refined than the species by species description that forms the core of your report. Given this, I would prefer tables of plants grown by dated level, at least of the earliest levels and into the 19th century.

Thanks,

Mark

Mark P. Leone

Sent by Susan Jacobucci on June 9, 2010 at 1:38 PM
Dear Mark,

Heather and I will put a table together for you and will send it along. Thank you for the information.

Kind Regards,

Susan

Susan A. Jacobucci

Sent by Heather Trigg June 10, 2010 at 8:08 AM
Dear Mark,
I'm in the field this week, but Sue and I have been talking about the charts vs. the pollen diagrams. As she noted, we will put a chart together for you along with a bit of description on the interpretation of the charts.
Because some samples were counted to 500-grains and some to 300, the counts in the charts cannot be used to reflect relative abundance. So we need to be a bit careful about the interpretation.

We'll try to get this to you on Monday.

Best wishes,
Heather

From: Heather Trigg <heather.trigg@umb.edu>
Date: Wed, 16 Jun 2010 14:28:00 -0400

From: Mark Leone [mailto:MLEONE@anth.umd.edu]
Sent: Tuesday, June 29, 2010 3:54 PM
To: Susan Jacobucci
Subject: Re: Edited Wye House Pollen Report

Susan,

Could you check the material you sent because the pdf looks blank. I don't know how it could be, but it seems to be.

Mark

Mark P. Leone

"Susan Jacobucci" <Susan.Jacobucci@umb.edu> 6/29/2010 5:02 PM >>>
Dear Mark,

I have attached the edited Wye House Pollen Report pdf. Please let me know if this copy is legible.

Thanks,

Susan

Sent by Mark P. Leone on July 1, 2010 at 2:09 PM
Susan,

By the time you sent the most recent pdf, I was headed out the door. I have just printed it out and want to thank you for it.

Because you mentioned looking at page 45 and afterwards, I just did that. The material is easy to understand and I want to thank you for your work.

You will remember bananas and plantains. I don't remember the Latin name, but are they still there on your lists?

Thanks,

Mark

Mark P. Leone

Sent by Susan Jacobucci on July 1, 2010 at 4:05 PM
Hi Mark,

Please let me know how many copies of the report you would like to have as well as where we should send them. Bananas and plantains belong to the Musaceae Family and we could only identify pollen to this family level and not to specific species. Musaceae pollen was recovered in the modern levels, levels dated to the 19th to mid 20th century and in Unit 9, Level XII.

Thank you,
Susan

Please help me get this material completely straight before you print the final copies. We are making real progress with this analysis and I can already see the need for more pollen samples and more analysis, but I have to know how to understand and write from your tables before we can do more.

Many thanks for helping to educated me on how to read your work.
Mark Leone

Mark P. Leone

From: Heather Trigg <heather.trigg@umb.edu>
Date: Wed, 07 Jul 2010 16:21:40 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Conversation: Response & Response Needed Back
Subject: Re: Response & Response Needed Back

Dear Mark,
Just to let you know, Sue and I have been discussing your questions and will need to talk about them a bit more. We will try to have answers to all tomorrow.
Heather

On 7/8/10 2:24 PM, "Mark Leone" <MLEONE@anth.umd.edu> wrote:

Dear Heather,

Please take your time. I am still working on the report myself. I need to read it thoroughly once more with lists of which plants grew where and with what likelihood. I am preparing a press release for the New York Times on all of our work in the Greenhouse, including your and Susan's pollen work. In my first draft of the press release I have already mentioned the Fisk Center and your name.

Normally, I would not be so fussy with regard to a set of scientific data, but if I am going to discuss the greenhouse in the Times, I have to get it right. I also can't waffle.

So, take a few more days if you need to, and respond next week. I will probably write again in the meantime once I make a final effort at assembling the actual differences by archaeological phase of the greenhouse and the slave quarter. By the way, I like the use of bold. I am ignoring all the plants that aren't in bold on Table 7 and 8.

In case, you are holding up the bill until all this work is finished, don't bother to do that. Submit the bill and we'll pay it. If you need to add more later, that's fine.

Thanks for your hard work.

Mark

Mark P. Leone

From: Heather Trigg <heather.trigg@umb.edu>
Date: Thu, 15 Jul 2010 21:06:10 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Conversation: Response & Response Needed Back
Subject: Re: Response & Response Needed Back

Dear Mark,

Sue and I are still thrashing through the Musaceae issue - we've had lots of discussion about this and we are still working on it. I did want to respond and start getting you information. I've tried to address your questions (except about the Musaceae). We will get back to you about this and your most recent questions.

Here's my response to your other questions.

Heather

When you get ready, I want to request 7 copies total and you can send everything to me, Department of Anthropology, 1111 Woods Hall, University of Maryland, College Park, MD 20742. It would be really useful if you could send me a digital copy, as well.

Will do – 7 hard copies, plus an electronic pdf to you.

I think it would be a good idea to include our entire email correspondence as an appendix so that people will be reminded what the questions were that motivated the pollen analysis. In particular, we need to include the email correspondence that eliminated the possibility of an analysis of seeds. This correspondence should include everything from me, Heather, and Stephanie Duensing insofar as any of this has been saved. If you don't have it, I will forward mine.

We'll get this together.

Before you go to print, I would like one more exchange with you both by email so that I can be absolutely clear about what I can say in public, reliably.

I have read really carefully Tables 7 and 8 of the June 2010 draft. Please check on me by looking at what I say below.

In the first version of the building which was probably not heated by a hypocoust, there were roses. We really need to be very careful here. The pollen was identified to the Rosaceae family. This botanical family includes wild plants such as cinquefoil which might have just grown in the immediate area – just outside the greenhouse for example. It also includes food plants such as strawberries, raspberries, cherries, peaches, almonds, plums, and plants used as herbal remedies such as alchemilla (lady's mantle). The Rosaceae family is one of the largest botanical families – many, many taxa, and from the pollen, we really can't tell which genus, let alone which species. If you have other data to indicate roses were being grown in the greenhouse, then I would say that the pollen supports this. But without this sort of confirmation, it would be pushing the interpretation beyond the data to say that roses were being grown in the greenhouse.

Rosaceae is not in your dictionary of plants any longer, insofar as I can tell. We won't count anything from PS 15. Therefore, Daphne and Nymphaea are questionable. Only roses are certain for the first version of this building. Is this a proper reading? Again, I can't tell you roses because of the limitation of palynological identification. Is it also the case that we need many more samples, like four or five from the lowest level? More samples might help although preservation in the lowest levels is poor; additional samples may not yield much data. In order to understand the first phase of what later became a greenhouse.

We have a lot of data from 1785-1790. This is when the building became a greenhouse. There were lilies in water, phlox, iris, roses, and Saxifrange. Should we say there is no citrus? We didn't find any citrus pollen in the intact

1785-1790 when the hypocaust was put in – please let me know if this is wrong) had much better preservation and more pollen could be counted. This still had more taxa, but not many. To me the biggest change comes in Level C identified as 19th-mid 20th century when not only the number of taxa increase (which could just be preservation). but more importantly the nature of the plants seems to change, specifically the citrus plants, oranges, lemons, or the like Not much else.

The phase from 1785-1790 had a consistent heat source and somewhere between 10 and 15 kinds of flowering plants, including lilies in water. No citrus. No bananas. Yet, at the same period there may have been bananas in the slave quarter. No? We are working on this a bit more.

The greenhouse turns into an orangerie after 1850, but not before. Do you agree? I think we talked about this before. I think this may be pushing the pollen data a bit far, but it is certainly consistent with what we found and tells a nice story.

Please help me get this material completely straight before you print the final copies. We are making real progress with this analysis and I can already see the need for more pollen samples and more analysis, but I have to know how to understand and write from your tables before we can do more.

From: Mark Leone <MLEONE@anth.umd.edu>
Date: Fri, 16 Jul 2010 11:34:08 -0400
To: Heather Trigg <heather.trigg@umb.edu>
Subject: Re: Response & Response Needed Back

Heather,

Thanks for working so hard on all of this. I will read your email carefully over the weekend. For now, we will both need to keep in mind that it would be good to summerize the results of the pollen analysis in one or two sentences whose meaning includes that it was worthwhile to do your work.

More Monday,

Mark

Mark P. Leone

From: Heather Trigg <heather.trigg@umb.edu>
Date: Fri, 30 Jul 2010 10:33:20 -0400
To: Mark Leone <MLEONE@anth.umd.edu>
Conversation: Wye report
Subject: Wye report

Dear Mark,

We have taken a good deal of time and effort, because we know of the importance of this work, to try to track down the Musaceae (banana family) pollen identification. We checked as many published resources as we can find and we have tried to get 'a second opinion' submitting photographs online to various palynological groups and other researchers, but cannot find anyone to provide an identification at this time. Here is what we know with certainty. The pollen grains identified as Musaceae family are not bananas or plantains (Musa sp.) the overwhelming majority are too small to be members of this genus; for levels B and C in the slave quarter they are all too small to be bananas/plantains. We have not been able to securely identify these pollen grains to species that is, we aren't

-iris

I understand that all of these plants have members that can be found locally. I also understand that some forms of lily must have extra heat and therefore may require a greenhouse.

With less certainty these below may have been grown in the greenhouse, but the later two may also be from wild pollen.

-daphne
-naphur
-nymphaea

My question is: what can you be certain was grown in the greenhouse? The answer appears to be only some kinds of lilies. The answer may also be the possibility of daphne and pond lilies.

What I am getting at here is whether or not we can say anything about the greenhouse as a consequence of pollen analysis. If you had only been allowed to sample the surrounding environment for the later 18th century, would you have found exactly the same things? Does pollen analysis for the greenhouse tell us anything for the later 18th century that an analysis of the contemporary surrounding environment wouldn't also tell us? Did the greenhouse contain anything that couldn't be found in surrounding nature? Is the answer: lilies and possibly water lilies? If this isn't the answer, should we say that the pollen did not isolate anything that required greenhouse protection?

Because of our stratigraphic work, the 19th and early 20th centuries form a much longer block of time. We can be certain that pinks, or carnations, crocus, geraniums, and citrus grew in the greenhouse. Do you agree?

As I come to understand your analyses, some of your caution stems from the morphology of the pollen grains themselves. However, some of your caution comes because the samples we took and sent you have turned out to be quite small. Do you have any sense of how many more samples, particularly from the 18th century, would add to your certainty?

Many thanks for all your hard work,
Mark

Mark P. Leone

Heather Trigg <heather.trigg@umb.edu> 8/6/2010 3:13 PM >>>
Dear Mark,

To address your question about what we can say with the pollen analysis, we feel that the pollen analysis gives you one line of evidence that can be substantially strengthened with other archaeological data. Pollen analysis usually gives possibilities (family level identifications) rather than specific (species) identifications because of the limitations of this science. Most pollen analysis cannot give species-level identifications, and most palynologists are suspicious of such specific identifications. This is why we suggest that documents (or in some instances macrobotanical analyses) might help narrow down the possibilities or suggest specific plants. While we would love to give you exact names of plants grown, the state of the art does not allow for it. We hope that this analysis, while it may not be a statement on exactly what was grown, will give some possibilities (some suggestions) that can lead to further analysis or substantiate some of your hypotheses and complement other archaeological work.

Your list from the earliest phase of the green house sounds right. We understand the need to give common names so that others (non-botanists) will know what you're talking about. You can say Rose family and list some possibilities such as roses, strawberries, and some wild plants such as cinquefoil. It is perfectly valid to suggest some members without specifying exact species. (Just a detail - the plant is saxifrage, not saxifrange). Some forms of lily might require extra heat, but we were not able to distinguish those that might from those that would not.

I feel confident in saying that in the late 18th and early 19th centuries the Greenhouse had a range of flowering plants and shrubs, and some herbs. Anything in the Greenhouse was going to be in a pot or trough of some sort and these would have been in tiers or placed on risers. The result would have been an array of plants. These groups might have been organized by the need for heat and cool. Further, they were probably kept in groups which was the preferred technique in gardening manuals at the time. This information comes from my reading of Mark Laird's The Romantic Landscape.

The purpose of the plants was more decorative than scientific, but there may have been some experimental efforts to grow rare plants. Because some of the pollen is from plants that have medicinal uses, there may have been an element of herb culture.

For the initial phases of the Greenhouse (1785-1820), there were lilies earlier, and there is some possibility of pond lilies grown in tubs. There were citrus by 1820 because Douglass saw them. There is citrus pollen by the mid 19th century.

How does this seem as a summary?

Thanks,
Mark

Mark P. Leone

Sent by Heather Trigg on August 17, 2010 at 3:13 PM

Dear Mark,
This sounds good to me. The pollen work suggests some families for plants that may have been grown and you could mention them as possibilities.
Another book that might be useful to you for background would be The American Gardener's Calendar by M'Mahon (1806). We cite this work a good deal.

We will send you a final copy of the report shortly.

Regards,
Heather

grasses and forage plants, which included red clover (*Trifolium pretense*) (Romani 1996:33). Clover was commonly used as green manure and part of a crop rotation system (Nelson 2007). Red clover, for example, was commonly grown for fodder (Britton and Brown 1897:276) and no doubt was incorporated in the pollen rain at the Wye House.

Utricularia: A small quantity of bladderwort pollen was recovered in the modern sample, Levels F and G of Unit 1, Level A of the Slave Quarter Unit, and the north and south walls from Level 6 of Unit 8. Several species in this genus are indigenous to the area (http://plants.usda.gov).

Verbenaceae, *Phyla*: A small quantity of pollen identified as fogfruit was recovered in Level A of Unit 1.

Yucca: A small quantity of yucca pollen was recovered Level C of the Slave Quarter Unit. Yucca was used as an ornamental in colonial gardens (Adams 2004:206).

Mosses and Ferns

Several types of mosses and ferns were identified in the samples. Some of the ferns prefer moist environments and grow in swamps and marshes as well as grassy woods and meadows. A variety of moss and fern spores were identified in this examination; however, mosses and ferns did not represent a majority of the total spores counted for any one sample. In samples suitable for environmental reconstruction, mosses and ferns represented approximately lower than 1% for the greenhouse samples, while registering from 2.20% to 5.23% for the Slave Quarter Unit samples, and roughly 8% for the modern pollen sample.

Discussion

Environmental Reconstruction