Shaker Swamp

A Preliminary Ecological Description

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Compiled by the Hawthorne Valley Farmscape Ecology Program

for the Shaker Swamp Conservancy

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SUMMARY

The Shaker Swamp is a state-regulated freshwater wetland (CA-4) located in the Town of New Lebanon in north-eastern Columbia County, NY. This report is a summary of the field notes compiled by ecologists of the Hawthorne Valley Farmscape Ecology Program during 11 visits to the Swamp since 2007. It presents lists of all the plant and animal species we have so far observed in and around the Swamp, a preliminary habitat map and descriptions of the habitat types found in and around the Swamp, highlights areas of particular conservation interest, introduces the most prevalent invasive plants in the Swamp, and discusses the wild-growing medicinal plants found in the Swamp. It closes with suggestions for future research.

This report documents that Shaker Swamp in New Lebanon is a valuable and unique natural area. It is composed of a variety of habitats, including marsh, wet meadow, hardwood and mixed swamp, upland hardwood, mixed, and conifer forest, upland meadows, upland shrub, and calcareous cliffs/boulders. It forms part of a system of calcareous valleys nestled between the Taconic Hills in the north-eastern corner of Columbia County and is part of the largest wetland complex in this part of the county.

A number of rare and uncommon native plant and animal species occur in the swamp and further studies will likely document additional species of conservation interest. We identified several areas of particular ecological interest, including a rocky forested stream, potentially ancient swamp and upland forest remnants, and calcareous cliffs/boulders. These areas beg further study and deserve special consideration when planning additional trails and increased public access.

We also describe the invasive species that seem to be most prevalent in and around the Swamp and suggest strategies for managing them.

A variety of wild medicinal plants was found growing in and near the Swamp. However, we have not yet located enough historical documents that would allow us to determine the amount (if any) of wild-growing medicinal plants has been harvested directly from the Swamp in order to supply the Shakers and/or Tilden. Information gleaned from an 1852 Tilden & Co. publication indicates that this amount might have been small compared to the amounts of plants bought in from further away or cultivated on site.

The report closes with suggestions for specific directions of further exploration of the current and historical ecology of the Swamp, as well as its economic importance for the local economy through time.

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INTRODUCTION

The Shaker Swamp is a state-regulated freshwater wetland (CA-4) located in the Town of New Lebanon in Columbia County, NY. The area described in this report encompasses the core of the swamp (250 acres) and adjacent upland areas circumscribed by Route 22 (west), Route 20 (north), Old Shaker Road (east), and Cherry Lane (S). The swamp is dissected by two streams: (1) the South Branch of the Wyomanack, which enters at its southern tip near Shaker Mill Inn and flows north along its western border (parallel to Route 22) and (2) the Main Branch of the Wyomanack, which flows east-west along the northern border (parallel to Route 20). The confluence of these two branches lies in the wetland west of Route 22, which is part of Shaker Swamp but not included in this report. The Wyomanack is part of the Kinderhook Watershed and, like most of Columbia County, the swamp eventually drains into the Hudson River. Shaker Swamp is located at 210 meters elevation above sea level and is surrounded by hills rising to 350 meters elevation in the north, to 450 meters in the west and above 600 meters in the east. It is underlain by calcareous (calcium-rich) bedrock and its surface waters tend to be circum-neutral (around or above pH 7).

In 2007, a loosely-knit citizens' initiative facilitated by Ted Timreck and Karen Ross began to explore the ecology, land-use history, and cultural significance of Shaker Swamp. Ted Timreck documented these explorations and the findings in his movie "Medicinal Wetlands – Environmental and Cultural History of Shaker Swamp" (2008). Conrad Vispo and Claudia Knab-Vispo of the Hawthorne Valley Farmscape Ecology Program had been invited to participate in these initial explorations and have since continued to document ecological aspects of the Swamp. This report is a compilation of our (very incomplete!) knowledge to date. It presents lists of all the plant and animal species we have so far observed in and around the Swamp, of a habitat map and descriptions of the habitat types found in and around the Swamp, highlights areas of particular conservation interest, introduces the most prevalent invasive plants in the Swamp, and discusses the wild-growing medicinal plants found in the Swamp. It closes with conclusions and suggestions for future research.

METHODS

Plant and Animal Observations

The lists of plants and animals documented in the Swamp are based on the notes from 11 cursory field visits spread over a five year period (9 May 2007, 20 May 2007, 6 June 2007, 16 Sept 2007, 27 January 2008, 29 July 2010, 20/21 May 2011, 15 August 2011, 7 October 2011, 31 January 2012) covering various, but not all areas of the swamp and adjacent uplands. These lists are not complete inventories and are not based on any standardized sampling regime. They are simply a compilation of whatever we found noteworthy during our explorations. Ben Sandri, a teacher at Darrow School who spends a lot of time observing animals in the Swamp, has kindly added his observations to our animal list.

Habitat Mapping

We remotely distinguished and delineated the ecological habitats represented in the Swamp and surrounding uplands based on the signatures visible in the 2009 orthophoto, the 5m topolines, and our experience in the field. We also consulted 2004 orthophotos, Bing images, and historical aerial photos (1940s), as needed. The resulting habitat map should be interpreted as preliminary. It has not yet been thoroughly verified in the field.

Areas of Particular Conservation Interest

We highlighted some of the areas and habitats that, based on our preliminary observations, are worthy of special attention, because they are unique or might be particularly vulnerable.

RESULTS and DISCUSSION

Plant and Animal Observations

Plant List: Appendix 1 contains the list of plants we have observed to date in and around the Shaker Swamp. It is organized by life form and includes sections on herbaceous plants, graminoids (grasses and sedges), shrubs, trees, vines and ferns. Within sections, the plants are grouped by plant family and listed in alphabetical order by scientific name (as currently in use by the Flora of New York Atlas; for plants well-known by older scientific names, we included these synonyms). Common names are also given. For each species, we indicate the habitat type(s) in which it was observed. Due to the very preliminary stage of our knowledge about the Swamp, we expect many of the species to also occur in habitats where we have not yet observed them. Therefore, an empty cell in the species/habitat matrix should not necessarily be interpreted as "this species never occurs in this habitat". The column "Species Status in Columbia County" represents our current best understanding of the species that are invasive, rare, uncommon, or geographically limited to a certain area in Columbia County. The plant list also indicates the medicinal plants that were recognized by the Shakers (Miller 1998) and those marketed, although not necessarily harvested from the Swamp, by Tilden (Tilden & Co., 1852, 1875). A total of 250 plant species have been noted in Shaker Swamp to date. Of these, 212 are native to our region and 111 are considered rare or uncommon throughout Columbia County. Many of these plants are discussed in more detail in the Habitat Map section on pages 7 to 11. We found 12 invasive plant species and 79 medicinal plants. The latter two categories are discussed briefly on pages 13 to 15.

Animal List: Appendix 2 shows the animals we observed (or have reliable reports on) to date in and around the Shaker Swamp. The animal list is organized by animal groups, including mostly mammals, birds, reptiles, amphibians, fish, and insects (in various subgroups, e.g., butterflies and dragonflies). Within each group, the animals are listed alphabetically by common name and we indicate species considered rare or uncommon in Columbia County. These assessments are based on published information from Kiviat and Stevens (2001) for mammals, birds, amphibians, and reptiles, and on our own experience for dragonflies and butterflies (see

http://hawthornevalleyfarm.org/fep/butterflies/Columbia%20County%20butterfly%20list%20Dec%202010.htm).

These preliminary observations document that many mammals and birds are using the Swamp. Sightings included regionally rare and uncommon species, such as mink, fisher, and bobcat, barred owl, great blue heron, sapsucker, and woodcock. However, for none of these species do we yet know what role the Swamp plays in their lives. We don't know, if they are breeding in the Swamp, visiting to hunt or forage, or just travelling through. Beaver, on the other hand, seem to be year-round residents in the Swamp and are most likely breeding there. For other less mobile vertebrates, such as reptiles and amphibians, we can assume that all species found in the Swamp and surrounding uplands are actually breeding in or near the Swamp. Examples included wood frog and spotted salamander (Photo 46), species that are vulnerable because of their reliance on the combination of good quality upland forest and predator-free water bodies, such as vernal pools or suitable swamps.

We found a number of rare wetland butterflies in the Swamp. Eyed brown and mulberry wing depend on wetland sedges as host plants for their caterpillars. The harvester (Photo 37) is closely associated with alder, a wetland shrub, where their caterpillars actually feed on aphids which in turn suck the juice out of the alder leaves. The only other place in the county where we have so far found the harvester butterfly, was in Drowned Land Swamp in Ancram. It is very likely that all three of these wetland butterflies, as well as most other butterfly species on our list, were actually breeding and potentially spending their entire life in the Swamp. A very special sighting was that of a West Virginia white (Photo 36) along the eastern edge of the Swamp. This rare butterfly (this was the first time it had ever been reported from Columbia County) is imperiled throughout its range and its larvae depend on toothwort (Cardamine spp.), which grows abundantly in the forest adjacent to the Swamp.

The list of dragonflies also includes a number of rare and uncommon species. The most unusual find was that of northern pigmy clubtail (Photo 42 and 43), a species considered rare throughout NY State. It was breeding in a forested, rocky stream flowing through Darrow's forest into the Swamp. Band-winged meadowhawk (Photo 41), shadow darner (Photo 40) and spotted spreadwing (Photo 44) are rare or uncommon throughout Columbia County and specialize in marshy areas.

It was interesting to find that a crawfish photographed during one of our outings into the Swamp, was identified as the native northern clearwater crayfish (*Orconectes propinquus*, Photo 45) by Bob Daniels from the New York State Museum, who informed us that this species seems to be declining throughout NY State because of competition by introduced crayfish species.

Habitat Map

Appendix 3 shows a preliminary habitat map for Shaker Swamp. The following were the habitats we found represented in and around the swamp and some of their characteristics.

Open water: This category includes permanent streams, beaver ponds (Photo 1), and man-made ponds. We mapped the open water based on the 2009 aerial photo, as well as our field observations of new beaver ponds. However, this is probably the most dynamic

habitat in the Swamp. Exact locations of open water within the swamp are constantly changing, as are the size and shape of open water areas. Permanent streams meander and shift their course and beaver ponds continue to increase in area until the dams are abandoned and the pond drains. We noticed submersed and floating aquatic vegetation, e.g., pondweeds, in several of these open water areas, but have not yet conducted a thorough study of the aquatic plants.

We also included in this category the steep, rocky stream bed located in the southern part of the Darrow forest and draining into the Swamp. Based on information kindly shared by Ben Sandri (Darrow School), this stream tends to flow permanently and did not even dry up during the long dry spell in the summer of 2010. We consider this forested, rocky stream bed as an area of particular ecological interest because of the concentration of rare and unusual plant and animal species found there. Please see the more detailed description in the section on Areas of Particular Ecological Interest (pages 11-13).

Intermittent streams and ditches: This category includes ditches in the swamp which were too narrow and variable in their water level to include in the "open water" category. It also includes two steep, rocky stream beds which dry up seasonally. They dissect the Darrow forest and drain into the Swamp. We have not explored the animals and plants living in and along the intermittent streams and ditches.

Marsh: This category defines seasonally flooded areas with emergent vegetation that is dominated by non-woody plants growing in more or less permanently saturated soil (Photos 3, 5 – 8). We found it difficult on the aerial images to distinguish between emergent marsh and wet meadow or sedge meadow (defined below), and in the field, we saw these categories often intermingle in small patches. Furthermore, due to the dynamics in water levels, these categories are likely continuously grading into each other over time throughout the swamp. Therefore, we decided to categorize as "marsh" all areas dominated by non-woody vegetation around beaver ponds and along the streams in the core of the swamp. Typically, these marsh areas were dominated either by native plants, such as cattails (broad-leaved, *Typha latifolia*, and narrow-leaved, T. *angustifolia*) or lake-bank sedge (*Carex lacustris*), or by the introduced (and invasive) common reed (*Phragmites australis*, Photos 5 and 6)), reed canary grass (*Phalaris arundinaceae*, Photo 3), or purple loosestrife (*Lythrum salicaria*, Photo 4). However, we also found a number of uncommon native plants in this habitat, including great angelica (*Angelica atropurpurea*, Photo 47), American sweetflag (*Acorus americanus*), swamp loosestrife (*Lysimachia terrestris*), water loosestrife (*Lysimachia thyrsiflora*), hooded skullcap (*Scutellaria galericulata*), blue-joint reedgrass (*Calamagrostis canadensis*), and water horsetail (*Equisetum fluviatile*). The sedges in this habitat can serve as food plants for rare wetland butterflies.

Wet meadow: This category defines meadows that are occasionally flooded and have wetland indicator plants, but soils that are not permanently saturated. A few meadows at the southern end and along Old Shaker Road were classified as wet meadows. They were composed of a diverse mix of upland and wetland plants, including uncommon species, such as ditch-stonecrop (*Penthorum sedoides*), halberd-leaved tearthumb (*Persicaria arifolia*), rattlesnake grass (*Glyceria canadensis*), as well as blue vervain (*Verbena hastata*) and steeplebush/hardhack (*Spiraea tomentosa*). The sedges in these wet meadows can serve as food plants for rare wetland butterflies.

Hardwood swamp: This category represents wetlands dominated by broad-leaved woody plants. From the aerial photos, it was not possible to consistently differentiate between shrub swamp and swamp forest, so both of these habitats were combined in the category of hardwood swamp. However, we noticed that shrub swamp (Photo 10) seemed to be most prevalent in areas that had been cleared of woody vegetation in the 1940s and have since re-grown with woody plants. Shrub swamp tended to be dominated by grey-twig (Photo 12), silky (Photo 11), and red osier dogwood (*Cornus racemosa*, C. *amomum*, and C. *sericea*), alders (*Alnus incana* and A. *serrulata*), and willows (e.g., *Salix discolor*, S. *bebbiana*, and S. *sericea*), with occasional small red maples (*Acer rubrum*). The invasive buckthorn (*Rhamnus cathartica*) and multiflora rose (*Rosa multiflora*) were often present, but we also observed uncommon native species, such as winterberry (*Ilex verticillata*), highbush cranberry (*Viburnum opulus*, Photo 33), and shrubby cinquefoil (*Dasiphora fruticosa*, Photo 35) in shrub swamp. The alders in this habitat serve as food plants for the rare harvester butterfly (Photo 37). The shrubby structure can provide breeding habitat for shrubland birds.

On the contrary, possibly ancient hardwood swamp areas (those likely never completely cleared of their woody growth, but at least forested since the 1940s, Photos 15 and 16) were characterized by trees, mostly red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), and American elm (*Ulmus americanus*), with an occasional hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*). We consider these possibly ancient hardwood swamp forests (together with the possibly ancient mixed hardwood/conifer swamp forests) as areas of particular ecological interest in the Swamp. Please see the more detailed description in the section on Areas of Particular Ecological Interest (pages 11-13).

A variety of uncommon herbaceous plants was found in both types of hardwood swamps. They included skunk cabbage (*Symplocarpus foetidus*, Photo 49), golden ragwort (*Packera aurea*), and rough-leaved goldenrod (*Solidago patula*, Photo 35).

Mixed hardwood/conifer swamp: This category includes wetlands dominated by woody vegetation containing a significant amount of conifers (between 25-75%, Photos 13 and 14). The conifers occurring in the Shaker Swamp were hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and tamarack (*Larix laricina*). All three conifers were observed as components of ancient mixed swamp forests, the latter two were also seen growing as scattered trees within a matrix of shrub swamp. From our preliminary observations, the herbaceous vegetation tends to be similar to that found in hardwood swamp.

Upland deciduous forest: This category encompasses upland forest patches where conifers contribute less than 25% of the canopy cover (Photo 21). We did not conduct systematic inventories of trees in any of the forests, so we don't yet know which trees were dominant in this habitat. However, from our field notes, we know at least the following trees to be present in this forest: Oaks (at least *Quercus rubra*, most likely other oaks, as well), sugar, red, and Norway maple (*Acer saccharum*, A. *rubrum*, and A. *platanoides*), sweet birch (*Betula lenta*), American beech (*Fagus grandifolia*), shagbark, pignut, and bitternut hickory (*Carya ovata*, C. *glabra*, and C. *cordiformis*), white ash (*Fraxinus americana*), black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), witch-hazel (*Hamamelis virginiana*), American hornbeam (*Carpinus caroliniana*) and

hop hornbeam (*Ostrya virginiana*). The herbaceous and shrub species present in this forest (as well as the upland mixed forest described below) depend largely on two factors: the geology/soil of a particular forest patch (there are a number of calcium-loving species that only occur in the vicinity of calcium-rich rocks, Photos 22 - 28) and its land use history (there were two "islands" of potentially ancient upland forest surrounded by wetland areas). We consider calcareous (=calcium-rich) cliffs and boulders and their vicinity as areas of particular ecological interest because of the large number of herbaceous plants that exclusively occur in this habitat. We also have evidence to believe that the ancient upland forests harbor a unique set of understory plants not found in other habitats in or around the Swamp and should therefore be considered areas of particular ecological interest, as well. Please see the more detailed descriptions in the section on Areas of Particular Ecological Interest (pages 11-13).

Upland mixed forest: This category defines upland forest patches where conifers contribute between 25-75% of the canopy cover (Photos 17 - 19). As mentioned above, we did not conduct systematic inventories in this habitat, but (except for the increased density of hemlock and/or white pine) the species composition seemed not obviously different from the upland deciduous forest. With one marked exception: yellow birch (*Betula alleghaniensis*, Photo 18), a species of northern affinity, was only seen in the potentially ancient mixed upland forests (as well as adjacent potentially ancient swamp forest), but not in upland hardwood forest. It is our impression, that the understory flora in this habitat is basically composed of the same set of species as that of the upland deciduous forest. However, as the density of conifers in the canopy, and therefore shading on the forest floor, increase, the understory tends to become sparser. As mentioned above, the geology/soil and land use history of a particular forest spot seems to be very important in determining the exact species composition of the understory flora.

Upland conifer forest: This category encompasses upland forest patches with more than 75% conifers in the canopy (Photo 20). These conifer forests were either dominated by hemlock or white pine. Under dense conifer canopy, the understory tended to be sparse. Conifer forests can serve as breeding and winter roosting habitat for owls and hawks, hemlock stands tend to attract porcupines during the winter (Yamasaki et al. 2000), and there is a group of song birds that tend to associate with conifer forests (Kiviat and Stevens 2001, supplement).

Upland shrub: This category describes habitat dominated by low woody vegetation on well-drained soil. We did not take notes on the plant composition or the wildlife in this habitat. Generally, upland shrub can be an important habitat for shrubland birds. However, we don't expect the patch of upland shrub at the north end of Shaker Swamp to offer any habitat value to these birds above and beyond that of the extensive hardwood shrub swamp.

Upland meadow: This category includes hay meadows on well-drained soil. In the vicinity of Shaker Swamp, these were mostly the hay meadows at Darrow. They were dominated by introduced grassland species, but had some native plants of conservation interest, such as common milkweed (*Asclepias syriaca*), the host plant for monarch butterflies. Notable was the discovery of a NY State endangered plant, spring avens (*Geum vernum*) right on the mowed footpath of one of these hay meadows. This species had not before been reported from Columbia County and is considered rare and

endangered throughout NY State. We saw at least one male bobolink in a Darrow meadow. This species of grassland-breeding bird requires large meadows and a late mowing regime to nest successfully. Some of the Darrow meadows seem to be cut not before July and seem to be suitable habitat for this declining bird.

Lawn/garden: This category defines intensively managed yards, with or without trees, as well as ball fields and orchards at Darrow. We did not survey any of these areas for their biodiversity. In a landscape with extensive natural areas, this habitat usually is not crucial for native plants or animals.

Dense development: This category encompasses areas with a high density of buildings and other impervious surfaces. We also did not survey any of these areas for their biodiversity and generally we do not expect them to be significant habitats for native plants or animals.

Areas of Particular Ecological Interest

The map in Appendix 4 highlights areas of particular ecological interest. It indicates the locations where we found state-wide rare plants or animals, delineates areas with high concentrations of plants and animals we consider rare or unusual within Columbia County, and habitats of exceptional quality in other respects, e.g., exceptionally large trees, notable lack of invasive species.

State-wide rare species:

We found a patch of NY State endangered (S2S3) spring avens (*Geum vernum*) on a mowed path in one of Darrow's hay meadows (#1 on map).

In the southern rocky stream, we documented a dragonfly, the northern pigmy clubtail (*Lanthus parvulus*), which is considered uncommon (S3) throughout NY State (#2 on map). This species, which breeds only in rocky, forested streams, was actually breeding in this stream, as we observed the nymph emerge from the water and go through the transformation to adult.

At the mouth of the same stream, we documented a butterfly, the West Virginia white (*Pieris virginiensis*), which is considered imperiled throughout its range (G3) (#3 on map). The caterpillars of this butterfly feed on the native toothworts (*Cardamine diphylla* and C. *concatenata*), which occur in patches throughout Darrow's forest.

To our knowledge, all three of these state-wide rare species have never before been reported from Columbia County.

Rocky stream:

The southern rocky stream did not only harbor a breeding population of a state-wide uncommon dragonfly. Several plants that are rare or uncommon throughout Columbia County were found growing along its shores. These included plantain-leaved sedge (*Carex plantaginea*), may-apple (*Podophyllum peltatum*, Photo 50), two-leaf miterwort (*Mitella diphylla*), wood nettle (*Laportea canadensis*), mountain maple (*Acer spicatum*) and leatherwood (*Dirca palustris*).

Calcareous cliffs and boulders:

A band of calcium-rich cliffs and boulders extends along the lower/mid slope of the forests east of Shaker Swamp. On and around these calcium-rich rocks, we found a number of ferns and other herbaceous species that don't occur anywhere else in the Swamp or its vicinity and we consider rare or uncommon throughout Columbia County. Examples are walking-fern spleenwort (*Asplenium rhizophyllum*, Photo 24), maidenhair-fern (*Adiantum pedatum*), bulblet and fragile fern (*Cystopteris bulbifera,* Photo 23, and C. *fragilis*), wild ginger (*Asarum canadense*, Photo 25), dutchman's breeches (*Dicentra cucullaria*), ramp (*Allium tricoccum*), giant solomon's seal (*Polygonatum biflorum*), black-fruited mountain-ricegrass (*Piptatherum racemosum*), sharp-lobed hepatica (*Hepatica nobilis* var. *acuta*), and Canada violet (*Viola canadensis,* Photo 26).

Potentially ancient upland forest (deciduous and mixed deciduous/conifer):

Two "islands" of upland areas completely surrounded by wetlands are located on the east side of the Swamp (Photos 17 – 19). We did not see any evidence of past forest removal, such as stone walls, on these forested islands. Some of their trees are of exceptional size (Photo 19) and we think it likely that these forested island represent rare patches of upland forest that have never been completely cleared for agriculture, although individual trees might have been removed for timber and livestock might have had access to these forests. Thus they should **not** be considered "old growth" forests.

Our preliminary observations indicate that there might be a few plant species in these potentially ancient upland forests that do not occur in the other forests near Shaker Swamp. One example is hobblebush (*Viburnum lantanoides*) which occurs in our county only in a few places, usually at higher elevations in the eastern part, and often in cool microclimates. Canada mayflowers (*Maianthemum canadense*), spring beauty (*Claytonia caroliniana*), eastern tree club-moss (*Dendrolycopodium obscurum*), fan club-moss (*Diphasiastrum digitatum*), and cutleaf grape-fern (*Botrychium dissectum*) were during this study exclusively observed in potentially ancient forests. Yellow birch (*Betula alleghaniensis*, Photo 18) occurred only on these potentially ancient upland forest islands as well as in adjacent ancient swamp forest. In order to determine just how ecologically unique these islands are, we recommend a more systematic study of their vegetation. Further research into the land use history by the Shakers might also shed new light on the historical ecology of these islands.

Potentially ancient swamp forest (hardwood and mixed hardwood/conifer):

The swamp forest located between the islands just described is a fine example of a red maple – black ash swamp forest. It might well be the place with the highest density of black ash (*Fraxinus nigra*, Photo 29) we have yet seen in Columbia County. Black ash used to be an important source of materials for basket-weaving and is still considered a prime resource by the few people who master this craft, today. As mentioned above, it is also one of the few places where we found yellow birch (*Betula alleghaniensis,* Photo 18) in and around the Swamp. On the 1940s aerial photograph, most of the current area of the swamp forest seems to have been forested as well, which supports our hypothesis that it might represent an ancient swamp forest. This part of the Swamp harbors seemingly healthy populations of rare and uncommon wetland plants who are either known to be associated with calcium-rich water, such as rough-leaved goldenrod (*Solidago patula*,

Photos 31 and 32), great blue lobelia (*Lobelia siphilitica*, Photo 30), and water avens (*Geum rivale*), or tend to be of more northern affinity, such as goldthread (*Coptis groenlandica*), heart-leaved foam-flower (*Tiarella cordifolia*), and sweet white violet (*Viola blanda*).

Invasive Plants

We have observed 12 species of invasive plants in the Swamp and adjacent areas. The invasive reed canary grass (*Phalaris arundinacea*, Photo 3), purple loosestrife (*Lythrum salicaria*, Photo 4), and common reed (*Phragmites australis*, Photos 5 and 6) already dominate certain areas of the marsh. Multiflora rose (*Rosa multiflora*), buckthorn (*Rhamnus cathartica*), and morrow's honeysuckle (*Lonicera morrowii*) were particularly common in shrub swamp. Creeping Jennie (*Lysimachia nummularia*) covered some ground in potentially ancient swamp forest, which also harbored some of the same woody invasives observed in shrub swamp. Japanese barberry (*Berberis thunbergii*) occurred in both upland and swamp areas. Garlic mustard (*Alliaria petiolata*), oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry, and winged burning bush (*Euonymus alatus*) were present in the upland forests and, if unchecked, have the potential to significantly impact the ecological integrity the forest. Where garlic mustard occurs in high densities, it is suspected to crowd out native spring ephemerals. It might also be one of the culprits for the decline of the rare butterfly West Virginia white, which we found on the edge of the Swamp. The caterpillars of this butterfly depend on native species of the mustard family, such as toothworts (*Cardamine* spp.), to successfully reach the point of metamorphosis. Garlic mustard also belongs to the mustard family and exudes the same chemical attractant (sinigrin) as the toothworts, which entices the butterflies to lay their eggs. However, West Virginia white caterpillars have a reduced survival rate if they feed on garlic mustard. This makes the presence of garlic mustard a potential population sink for the West Virginia White (Finnell & Lehn, 2007). Japanese barberry and winged burning bush can become very dominant in the forest understory, and seem to be especially invasive on calcium-rich soils. The woody vine oriental bittersweet, which also seems to be most invasive on calcium-rich soils, has the capacity to strangle its host trees and can initiate a vicious cycle where its damage to the trees opens up the canopy, which allows more light to reach the forest floor, which encourages other invasive plants and represses regeneration of the forest trees even further.

Medicinal Plants

In and around Shaker Swamp, we have observed 79 wild-growing species of medicinal plants which were listed either in Miller (1998) or in Tilden & Co. (1852, 1875). These medicinal plants are annotated in the plant list (App. 1). Thirteen of these species are not native, but have naturalized and maintain wild-growing populations. Some of these species might have originally been brought into this country precisely for their medicinal purposes, but most of them are very common and wide-spread species and they were probably introduced to this continent long before the Shakers made their home on Mount Lebanon. However, February daphne (*Daphne mezerum*) is a rare introduced plant that we have seen growing wild only twice in Columbia County. It might have originally

escaped into the Swamp from cultivation as a medicinal plant by the Shakers, but it might also have escaped from an ornamental garden.

Of the 79 species still found wild-growing in the area and which formed part of the Shaker pharmacopeia (according to Miller, 1998), Tilden marketed only 35 in 1852 and 39 in 1875. Tilden did not market any native wild plants that had not also been listed as Shaker medicinal plants, but obviously was more selective and marketed only about half of the locally wild-growing species recognized for their medicinal value by the Shakers. The fact that wild-growing medicinal plants were marketed by the Shakers and Tilden & Co., does not automatically mean that all these medicinal plants were collected from wild populations in or around the Swamp. In fact, as the following excerpts from Tilden & Co. (1852) illustrate, only few of the wild-growing plants we find in the Swamp today seemed to have been processed at a volume worth mentioning in this early publication.

> *The Messrs. Tilden informed us that they have about forty acres cultivated under their immediate superintendence, somewhat in the following arrangement:—10 acres in Taraxacum, 2 in Conium, 3 in Hyoscyamus, 3 in Belladona, 3 in Lettuce, 3 in Sage, 2 Summer Savory, 2 Stramonium, 2 Burdock and Dock, 1 Marjoram, 2 Digitalis, 2 Parsley, Poppies, and Horehound, 1 Aconite and Balm. The remainder are occupied with Basil, Button Snake root, Blessed Thistle, Borage, Coriander, Feverfew, Hollyhock, Hyssop, Larkspur, Lovage, Marshmallow, Marygold, Mugwort, Mountain Mint, Southern Wood, Tansey, &c.*

Only one of these cultivated medicinal plants, mountain mint, might have been a native plant. Mountain mint (*Pycnanthemum* spp.) is now an uncommon plant of dry open areas and we have not documented it in the Swamp nor is there any evidence that it has ever occurred there.

> *… Conium maculatum grows spontaneously in all that region of country, having become naturalized. It is seen along the roads, and in fields that have been abandoned for a time, attaining often the height of six feet, and presenting a striking object to the eye, by reason of its subdivided foliage. For this reason, the Messrs. Tilden do not cultivate this plant very extensively, but depend largely on that of spontaneous growth, which they gather from the country many miles around, as far as the Vermont line, and in Massachusetts. It is probable that the Conium obtained in this way is really more active, weight for weight, than the cultivated, being less succulent.*

Poison hemlock (*Conium maculatum*) is a European plant that has no relationship with our native hemlock trees. It is the very poisonous plant that killed Socrates. We have not yet found this plant growing anywhere in Columbia County. According to the NY State Flora Atlas, there are no vouchers of historical or recent collections of this plant from our county, but vouchers exist from nearby Rensselaer, Washington and Ulster counties, as well as a number of counties in western New York. It seems as if there has been an early boom of this species in our area, but by now it has all but disappeared, again.

> *... Besides the varieties cultivated, large quantities of indigenous plants are purchased from collectors in the West and South, which are required in their business.*

Obviously, for the wild growing, native medicinal plants, Tilden did not rely exclusively (if at all) on materials sourced from the Swamp.

> *... Besides these, a considerable amount of extracts are made from dry materials, both foreign and indigenous, as Gentian, Rhubarb, Chamomile, Mayapple, Horehound, Cohosh, &c.*

Only two of these species are native to this continent. Mayapple (*Podophyllum peltatum*, Photo 50) is an uncommon species that we found in small patches growing along the eastern edge of the Swamp. Cohosh is an ambiguous term, because it is used as the common name for at least four different medicinal plant species: blue cohosh (*Caulophyllum thalictroides*, Photos 22 and 28), red cohosh (*Actaea rubra*), white cohosh (*Actaea pachypoda*), and black cohosh (*Cimicifuga racemosa*). All but the latter still grow in the rich forests along the eastern edge of the Swamp. The habitat in these forests also seems suitable for black cohosh, but this species has become very rare throughout the county and it was no surprise that we didn't find it near the Swamp.

Other than these brief comments gleaned from Tilden & Co. (1852), we don't yet have any quantitative information about the amounts of cultivated and wild-crafted medicinal plants marketed by the Shaker community on Mount Lebanon or by Tilden & Co. We also do not know which amount (if any) of wild-growing medicinal plants has been harvested directly from the Swamp in order to supply the Shakers and/or Tilden.

Evidence of Past Land Use

Extensive stone walls (Photos 51-52) are found throughout most of the forested areas in the vicinity of the swamp, pointing to the fact that most of the now forested land had been cleared and used at least for pasture, if not plowed for field crops. The 1940's aerial photos show that large areas of what is now shrubby hardwood swamp, had been cleared and were at least mowed regularly. On Mount Lebanon, the Shakers had an elaborate system of canals and dams to distribute water throughout the village and to harness its power for mills (see Mount Lebanon Shaker Village Waterworks Tour in Google Earth, National Park Service 2011). At least one dam remains within the reforested area along a rocky forested creek of particular ecological interest (Photo 54). The 1940's aerial photos also show an extensive system of ditches throughout the Swamp. At the very edge of the Swamp, we stumbled upon the ruins of what seems to have been a large barn with a wooden floor elevated above the ground by a series of 3 foot concrete pillars (Photo 55). It is possible that this building was used by the Shakers to store hay cut from the marshes and wet meadows in the Swamp. Archaeologist Steve Oberon informed us that the type of concrete used in these pillars dates approximately to the turn of the 19th century. Throughout the Darrow forest, one can find remnants of log cabins (Photo 56), which we were told by Darrow teachers, used to be built by Darrow students up to the 1960s. The now forested slope east of the Swamp also shows remnants of a ski lift Darrow used to operate, but has not been functional for several decades.

CONCLUSIONS and SUGGESTIONS

Our preliminary results document that Shaker Swamp in New Lebanon is a valuable and unique natural area composed of a variety of habitats, including marsh, wet meadow, hardwood and mixed swamp, upland hardwood, mixed, and conifer forest, upland meadows, upland shrub, and calcareous cliffs/boulders. It forms part of a system of calcareous valleys nestled between the Taconic Hills in the north-eastern corner of Columbia County and is part of the largest wetland complex in this part of the county.

A number of rare and uncommon native plant and animal species occur in the swamp and further studies will likely document additional species of conservation interest. We identified several areas of particular ecological interest, including a rocky forested stream, potentially ancient swamp and upland forest remnants, and calcareous cliffs/boulders. These areas beg further study and deserve special consideration when planning additional trails and increased public access.

We also describe the invasive species that seem to be most prevalent in and around the Swamp and suggest strategies for managing them.

A variety of wild medicinal plants was found growing in and near the Swamp. However, we have not yet located enough historical documents that would allow us to determine the amount (if any) of wild-growing medicinal plants has been harvested directly from the Swamp in order to supply the Shakers and/or Tilden. Information gleaned from an 1852 Tilden & Co. publication indicates that this amount might have been small compared to the amounts of plants bought in from further away or cultivated on site.

Future exploration of the current and historical ecology of the Swamp, as well as its economic importance for the local economy through time might include the following:

- Explore Tilden and Shaker archival material in order to get better idea of:
  - Amount of different plants used
  - Source of plant materials
  - Location of and crops in cultivation
  - Any additional information on Swamp management
- Interview older residents who remember historical uses of the Swamp
- Focal work on ‘ancient forests’, both swamp and upland
  - Tree cores
  - standardized herbaceous plant and invert surveys (comparing the potentially ancient forest remnants to nearby secondary forest)
- A systematic bird survey of the Swamp to get better year-around picture of bird populations
- Explore the forested rocky creeks (both the one already identified as an area of particular ecological interest, but also the one paralleling Old Shaker Road) in more detail looking for
  - Salamanders
  - Dragonflies

- Survey more broadly for the West Virginia White; how widely dispersed is this rare species?
- Survey aquatic plants
- Survey fish (snorkeling)
- More intensive surveys for dragonflies as charismatic creatures that might include additional rare species in the Swamp
- Acoustic surveys for bats as illustration of importance of swamp to this declining group of vertebrates
- Continue work on soil cores as one of the only ways of getting direct evidence of past vegetation
- Interview any trappers/hunters who regularly visit the Swamp to tap their knowledge of Swamp wildlife (and to begin building a non-confrontational relationship)
- Continue to refine the preliminary habitat map

ACKNOWLEDGEMENTS:

Our gratitude goes to Karen Ross for her tireless efforts on behalf of Shaker Swamp, to the Shaker Swamp Conservancy for entrusting us with the task to compile this first ecological report, and to the Berkshire Taconic Community Foundation for partial funding of our efforts. Thanks also to the landowners who graciously gave access to their parcels in and near the Swamp. Much credit goes to Ted Timreck, whose beautiful movie "Medicinal Wetlands" brought the Swamp and its inhabitants to the attention of a wide audience and opened new doors for collaboration in its exploration.

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Appendix 1: Plant List of Shaker Swamp (FEP, preliminary report, March 2012)

				Habitat																medicinal		
Family	***Scientific Name***	***Synonyms***	**Common Name**	**upland deciduous forest**	**upland mixed forest**	**upland conifer forest**	**on or around calc. outcrops**	**near rocky creek**	**upland meadow**	**wet meadow**	**marsh**	**shrub swamp (hardwood or mixed)**	**swamp forest (hardwood or mixed)**	**open water**	**sand bar**	**beaver dam**	Species Status Columbia County[5)]	Native	Shakers	Tilden (1852)	Tilden (1875)
Herbaceous																					
Alismataceae	*Sagittaria sp.*		arrowhead											x				Y			
Apiaceae	*Angelica atropurpurea*		great angelica							x	x	x	x				CCu	Y	x	x	x
Apiaceae	*Cicuta bulbifera*		bulb-bearing water-hemlock							x	x	x						Y			
Apiaceae	*Cicuta maculata var. maculata*		spotted water hemlock, poison hemlock, beaver-poison, musquash-root, spotted cowbane							x	x	x					CCg	Y			
Apiaceae	*Osmorhiza claytonii*		Clayton's sweetroot, sweet cicely		x		x										CCu	Y			
Apiaceae	*Osmorhiza longistylis*		longstyle sweetroot, aniseroot				x										CCu	Y	x		
Apiaceae	*Sanicula sp.*		snake-root, sanicle	x	x													Y			
Apiaceae	*Zizia aurea*		common golden Alexanders							x	x	x						Y			
Araceae	*Acorus americanus*	*Acorus calamus*	American sweetflag								x	x					CCg	Y	x	x	x
Araceae	*Arisaema triphyllum ssp. triphyllum*		common jack-in-the-pulpit	x	x		x											Y	x		x
Araceae	*Symplocarpus foetidus*		skunk cabbage							x		x	x				CCg	Y	x	x	x
Araliaceae	*Aralia nudicaulis*		wild sarsaparilla		x													Y	x	x	x
Aristolochiaceae	*Asarum canadense*		wild ginger, asarabacca				x										CCu	Y	x	x	
Asclepiadaceae	*Asclepias incarnata ssp. incarnata*		swamp milkweed								x							Y	x		x
Asclepiadaceae	*Asclepias syriaca*		common milkweed						x									Y	x		
Asteraceae	*Ageratina altissima var. altissima*	*Eupatorium rugosum*	white snakeroot				x											Y			
Asteraceae	*Bidens cernua*		nodding beggar-ticks								x					x		Y			
Asteraceae	*Bidens connata*		purple-stem swamp beggar-ticks							x		x						Y	x		
Asteraceae	*Bidens tripartita*	*Bidens comosa*	three-lobe beggar-ticks								x	x					CCu	Y			
Asteraceae	*Erigeron philadelphicus var. philadelphicus*		Philadelphia fleabane						x								CCu?	Y			x
Asteraceae	*Eupatorium perfoliatum*		common boneset							x								Y	x	x	x
Asteraceae	*Euthamia graminifolia*	*Solidago graminifolia*	flat-top fragrant goldenrod, grass-leaved goldenrod							x								Y			
Asteraceae	*Eutrochium maculatum var. maculatum*	*Eupatorium maculatum*	spotted Joe-Pye weed							x	x	x						Y			
Asteraceae	*Packera aurea*	*Senecio aureus*	golden ragwort									x	x				CCu	Y	x	x	x
Asteraceae	*Rudbeckia laciniata var. laciniata*		cutleaf coneflower							x							CCu	Y	x		
Asteraceae	*Solidago altissima*		Canada goldenrod							x								Y			
Asteraceae	*Solidago gigantea*		giant goldenrod, smooth goldenrod							x								Y			
Asteraceae	*Solidago patula ssp. patula*		rough-leaved goldenrod							x		x	x				CCu	Y			
Asteraceae	*Symphyotrichum lanceolatum var. lanceolatum*	*Aster lanceolatus*	white panicle aster							x								Y			
Asteraceae	*Symphyotrichum lateriflorum*	*Aster lateriflorus*	calico aster, small white aster								x							Y			
Asteraceae	*Symphyotrichum puniceum var. puniceum*	*Aster puniceus*	purple-stemmed aster								x							Y			
Asteraceae	*Taraxacum officinale*		common dandelion						x	x								N	x	x	x
Asteraceae	*Tussilago farfara*		colt's foot												x			N	x		x
Balsaminaceae	*Impatiens capensis*		spotted jewelweed, touch-me-not, snapweed	x									x					Y			
Balsaminaceae	*Impatiens pallida*		pale jewel-weed	x									x				CCu	Y	x		
Berberidaceae	*Caulophyllum thalictroides*		blue cohosh, squaw-root, papoose-root	x	x		x										CCu	Y	x	x	x
Berberidaceae	*Podophyllum peltatum*		May-apple, Indian-apple, wild-mandrake	?	?			x									CCu	Y	x	x	x

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Family	***Scientific Name***	***Synonyms***	**Common Name**	**upland deciduous forest**	**upland mixed forest**	**upland conifer forest**	**on or around calc. outcrops**	**near rocky creek**	**upland meadow**	**wet meadow**	**marsh**	**shrub swamp (hardwood or mixed)**	**swamp forest (hardwood or mixed)**	**open water**	**sand bar**	**beaver dam**	Species Status Columbia County[5)]	Native	Shakers	Tilden (1852)	Tilden (1875)
Boraginaceae	*Hackelia virginiana*		beggarslice, stickseed				x										CCg	Y			
Boraginaceae	*Myosotis scorpioides*		true forget-me-not							x	x	x						N			
Brassicaceae	*Alliaria petiolata*		garlic mustard	x	x												INVASIVE	N			
Brassicaceae	*Cardamine concatenata*	*Dentaria laciniata*	cutleaf toothwort	x	x		x										CCu	Y			
Brassicaceae	*Cardamine diphylla*	*Dentaria diphylla*	two-leaf toothwort	x	x		x										CCu	Y			
Brassicaceae	*Hesperis matronalis*		dame's-rocket, mother-of-the-evening, dame's-violet										x				INVASIVE	N			
Campanulaceae	*Lobelia siphilitica*		great blue lobelia					x					x				CCu	Y	x		
Cannabaceae	*Humulus japonicus*		Japanese hops									x						N			
Clusiaceae	*Hypericum perforatum*		common St. John's-wort							x								N	x		x
Crassulaceae	*Hylotelephium telephium*	*Sedum purpureum*	garden stonecrop		?													N			
Crassulaceae	*Penthorum sedoides*		ditch-stonecrop							x							CCu	Y			
Fumariaceae	*Dicentra cucullaria*		Dutchman's breeches				x										CCu	Y			
Geraniaceae	*Geranium maculatum*		wild crane's-bill	x						x								Y	x	x	x
Geraniaceae	*Geranium robertianum*		herb-Robert, Robert's geranium	x	x		x										CCu	Y			
Iridaceae	*Iris versicolor*		blueflag								x							Y	x	x	x
Lamiaceae	*Agastache scrophulariifolia*		purple giant hyssop												x		CCr	Y			
Lamiaceae	*Collinsonia canadensis*		Canada horse-balm	x	x												CCu	Y	x		x
Lamiaceae	*Glechoma hederacea*	*Nepeta hederacea*	ground ivy		x													N	x		
Lamiaceae	*Lycopus americanus*		American bugleweed							x	x	x						Y	x		
Lamiaceae	*Mentha arvensis*	*Mentha arvensis ssp. haplocalyx*	wild mint							x								N			
Lamiaceae	*Scutellaria galericulata*	*Scutellaria epilobiifolia*	hooded skullcap								x	x					CCu	Y			
Liliaceae	*Allium tricoccum var. tricoccum*		small white leek, ramp				x										CCu	Y			
Liliaceae	*Erythronium americanum ssp. americanum*		yellow trout-lily	x														Y			
Liliaceae	*Maianthemum canadense*		Canada May-flower, Canadian May-lily, wild lily-of-the-valley, false lily-of-the-valley, two-leaved SolomonÆs-seal		x[1)]												CCg	Y			
Liliaceae	*Maianthemum racemosum ssp. racemosum*	*Smilacina racemosa*	false SolomonÆs-seal, false spikenard, SolomonÆs-plume	x	x		x											Y	x		
Liliaceae	*Polygonatum biflorum*	*Polygonatum canaliculatum*	common Solomon's-seal, giant SolomonÆs seal				x										CCr	Y	x	x	x
Liliaceae	*Polygonatum pubescens*		downy Solomon's-seal, hairy SolomonÆs seal	x	x		x											Y			
Liliaceae	*Trillium erectum*		wake robin, red trillium, stinking Benjamin, stinking Willie, birthwort, ill-scent trillium	x			x										CCu	Y	x	x	
Liliaceae	*Veratrum viride*		American false-hellebore									x					CCg	Y	x	x	x
Lythraceae	*Lythrum salicaria*		purple loosestrife, spiked loosestrife							x	x	x					INVASIVE	N	x		
Onagraceae	*Epilobium coloratum*		eastern willow-herb								x	x				x		Y			
Onagraceae	*Epilobium hirsutum*		codlins and cream, willow-herb, fireweed									x						N			
Onagraceae	*Epilobium strictum*		downy willow-herb													x	CCu	Y			
Onagraceae	*Ludwigia palustris*		marsh seedbox								x	x						Y			
Orchidaceae	*Epipactis helleborine*		eastern helleborine, broad-leaved helleborine	x	x		x											N			
Papaveraceae	*Chelidonium majus*		greater celandine	x														N	x		x
Papaveraceae	*Sanguinaria canadensis*		bloodroot	x	x		x										CCu	Y	x	x	x

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Polygonaceae	*Persicaria arifolia*	*Polygonum arifolium*	halberd-leaf tearthumb, tear-thumb								x						CCu	Y			
Polygonaceae	*Persicaria lapathifolia*	*Polygonum lapathifolium*	dock-leaf smartweed, pale smartweed													x		N			
Polygonaceae	*Persicaria sagittata*	*Polygonum sagittatum*	arrow-leaf tearthumb, arrow-vine, scratch-grass							x								Y			
Polygonaceae	*Persicaria virginiana*	*Polygonum virginianum*	jumpseed	x	x												CCu	Y			
Polygonaceae	*Rumex britannica*	*Rumex orbiculatus*	water dock, greater water dock, British dock								x						CCu	Y	?		
Polygonaceae	*Rumex crispus*		curly dock, yellow dock, sour dock							x								N	x	x	x
Polygonaceae	*Rumex obtusifolius*		broad-leaf dock, broadleaf dock, bitter dock						x									N	x		
Portulacaceae	*Claytonia caroliniana*		Carolina spring-beauty		x[1)]												CCr	Y			
Potamogetaceae	*Potamogeton sp.*		pond weed											x				Y			
Primulaceae	*Lysimachia ciliata*		fringed loosestrife							x								Y			
Primulaceae	*Lysimachia nummularia*		creeping Jennie									x	x				INVASIVE	N			
Primulaceae	*Lysimachia quadrifolia*		whorled loosestrife							x		x						Y			
Primulaceae	*Lysimachia terrestris*		swamp loosestrife							x	x						CCu	Y			
Primulaceae	*Lysimachia thyrsiflora*		water loosestrife								x						CCu	Y			
Ranunculaceae	*Actaea pachypoda*	*Actaea alba*	white baneberry, doll's-eyes	x	x												CCu	Y	x	x	
Ranunculaceae	*Actaea rubra*		red baneberry		x												CCu	Y	x		
Ranunculaceae	*Caltha palustris*		marsh marigold									x	x					Y			
Ranunculaceae	*Coptis trifolia*	*Coptis groenlandica*	goldthread, goldenroot, yellow snakeroot										x				CCu	Y	x		x
Ranunculaceae	*Hepatica nobilis var. acuta*	*Hepatica acutiloba*	sharp-lobed hepatica				x										CCg	Y	x	x	x
Ranunculaceae	*Hepatica nobilis var. obtusa*	*Hepatica americana*	round-leaved liverleaf		x												CCu	Y	x	x	x
Ranunculaceae	*Ranunculus abortivus*		kidney-leaved crowfoot, littleleaf buttercup	x	x		x											Y			
Ranunculaceae	*Ranunculus hispidus var. caricetorum*	*Ranunculus septentrionalis*	bristly buttercup									x	x				CCu	Y			
Ranunculaceae	*Ranunculus recurvatus var. recurvatus*		hooked crowfoot	x	x												CCu	Y			
Ranunculaceae	*Thalictrum dioicum*		early meadow-rue, quicksilver-weed	x	x		x										CCu	Y			
Ranunculaceae	*Thalictrum pubescens*	*Thalictrum polygamum*	tall meadow-rue, late meadow-rue, meadow-weed, muskrat-weed, king-of-the-meadow							x	x	x					CCu	Y			
Rosaceae	*Fragaria virginiana*		wild strawberry, Virginia strawberry							x								Y	x		
Rosaceae	*Geum aleppicum*		yellow avens							x			x					Y			
Rosaceae	*Geum canadense*		white avens	x														Y			
Rosaceae	*Geum rivale*		purple avens										x				CCu	Y	x	x	x
Rosaceae	*Geum vernum*		spring avens						x								NYS-endangered	Y			
Rosaceae	*Potentilla simplex*		old-field cinquefoil							x								Y			
Rubiaceae	*Galium circaezans var. circaezans*		licorice bedstraw		x[1)]													Y			
Rubiaceae	*Galium lanceolatum*		Torrey's wild licorice		x[1)]													Y			
Rubiaceae	*Galium mollugo*		white bedstraw							x								N			
Rubiaceae	*Galium tinctorium*		stiff marsh bedstraw	x	x												CCg	Y			
Rubiaceae	*Mitchella repens*		partridgeberry		x													Y			
Saxifragaceae	*Mitella diphylla*		twoleaf miterwort , coolwort				x	x									CCu	Y	x		
Saxifragaceae	*Tiarella cordifolia*		heart-leaved foam-flower										x				CCu	Y			

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Scrophulariaceae	*Chelone glabra*		white turtlehead							x		x						Y	x	x	x
Scrophulariaceae	*Mimulus ringens*		square-stemmed monkey-flower, Allegheny monkey-flower							x								Y			
Scrophulariaceae	*Scrophularia marilandica*		carpenter's square		x												CCu	Y	x		
Scrophulariaceae	*Verbascum thapsus*		great mullein				x											N	x	x	
Scrophulariaceae	*Veronica americana*		American speedwell									x					CCu	Y			
Scrophulariaceae	*Veronica serpyllifolia ssp. serpyllifolia*		thymeleaf speedwell						x									N			
Solanaceae	*Solanum dulcamara var. dulcamara*		climbing nightshade, trailing nightshade, bittersweet									x	x					N	x	x	x
Sparganiaceae	*Sparganium americanum*		American bur-reed							x	x							Y			
Typhaceae	*Typha angustifolia*		narrow-leaved cattail								x						CCu?	Y			
Typhaceae	*Typha latifolia*		broad-leaf cattail							x	x							Y			
Urticaceae	*Laportea canadensis*		wood nettle				x	x									CCu	Y			
Verbenaceae	*Phryma leptostachya*		lopseed		x		x										CCu	Y			
Verbenaceae	*Verbena hastata var. hastata*		blue vervain, swamp verbena, simpler's-joy							x							CCu	Y	x		x
Verbenaceae	*Verbena urticifolia var. urticifolia*		white vervain							x								Y			
Violaceae	*Viola blanda*	*Viola icognita*	sweet white violet										x				CCu	Y			
Violaceae	*Viola canadensis var. canadensis*		Canada violet, Canadian white violet				x										CCu	Y			
Violaceae	*Viola labradorica*	*Viola conspersa*	alpine violet, American dog violet	x													CCu?	Y			
Violaceae	*Viola pubescens var. pubescens*		downy yellow violet	x	x													Y			
Violaceae	*Viola rostrata*		long-spur violet	x	x		x										CCu	Y	x		
Violaceae	*Viola sororia*	*incl. Viola papilionaceae*	common violet	x	x													Y			
Graminoids																					
Cyperaceae	*Carex albursina*		white bear sedge	x													CCg	Y			
Cyperaceae	*Carex appalachica*		Appalachian sedge	x													CCu	Y			
Cyperaceae	*Carex bromoides ssp. bromoides*		bromelike sedge										x				CCu	Y			
Cyperaceae	*Carex comosa*		bristly sedge							x	x							Y			
Cyperaceae	*Carex gracillima*		graceful sedge		x[1)]								x[1)]					Y			
Cyperaceae	*Carex hirtifolia*		pubescent sedge		x[1)]								x[1)]					Y			
Cyperaceae	*Carex lacustris*		lake-bank sedge								x	x	x				CCg	Y			
Cyperaceae	*Carex lurida*		shallow sedge							x	x	x						Y			
Cyperaceae	*Carex pensylvanica*		Pennsylvania sedge	x	x												CCg	Y			
Cyperaceae	*Carex plantaginea*		plantain-leaved sedge				x	x									CCr	Y			
Cyperaceae	*Carex platyphylla*		broad-leaved sedge	x			x										CCu	Y			
Cyperaceae	*Carex stricta*		tussock sedge									x						Y			
Cyperaceae	*Scirpus cyperinus*		common woolgrass							x	x	x						Y			
Cyperaceae	*Scirpus sp.*		bullrush							x		x						Y			
Juncaceae	*Juncus effusus var. solutus*		common rush							x								Y			
Juncaceae	*Luzula acuminata var. acuminata*	*Luzula acuminata (L. carolinae)*	hairy woodrush	x	x												CCu	Y			
Poaceae	*Calamagrostis canadensis var. canadensis*		blue-joint reedgrass								x						CCu	Y			
Poaceae	*Glyceria canadensis*		Canada manna grass, Rattlesnake grass							x							CCu	Y			
Poaceae	*Glyceria melicaria*		slender manna grass								x	x					CCu	Y			
Poaceae	*Glyceria striata*		fowl manna grass								x	x						Y			
Poaceae	*Leersia virginica*		Virginia cutgrass	x	x													Y			

Appendix 1: Plant List of Shaker Swamp (FEP, preliminary report, March 2012)

				Habitat																medicinal		
Family	***Scientific Name***	***Synonyms***	**Common Name**	**upland deciduous forest**	**upland mixed forest**	**upland conifer forest**	**on or around calc. outcrops**	**near rocky creek**	**upland meadow**	**wet meadow**	**marsh**	**shrub swamp (hardwood or mixed)**	**swamp forest (hardwood or mixed)**	**open water**	**sand bar**	**beaver dam**	Species Status Columbia County[5)]	Native	Shakers	Tilden (1852)	Tilden (1875)
Poaceae	*Phalaris arundinaceae*		reed canary grass							x	x						INVASIVE	N			
Poaceae	*Phragmites australis*	*Phragmites communis*	European common reed							x	x	x	x					N			
Poaceae	*Piptatherum racemosum*	*Oryzopsis racemosa*	black-fruited mountain-ricegrass		x		x										CCu	Y			
Poaceae	*Schedonorus pratensis*	*Festuca pratensis or elatior*	meadow fescue							x								N			
Shrubs																					
Aquifoliaceae	*Ilex verticillata*		common winterberry, black holly									x	x				CCu	Y	x	x	x
Berberidaceae	*Berberis thunbergii*		Japanese barberry	x	x		x						x				INVASIVE	N			
Betulaceae	*Alnus incana ssp. rugosa*	*Alnus rugosa*	speckled alder, tag alder, swamp alder							x		x						Y	x	x	x
Betulaceae	*Alnus serrulata*		brook-side alder, smooth alder, hazel alder							x		x					CCu	Y			
Caprifoliaceae	*Lonicera dioica var. dioica*		limber honeysuckle		x												CCu	Y			
Caprifoliaceae	*Lonicera morrowii*		Morrow's honeysuckle									x					INVASIVE	N			
Caprifoliaceae	*Lonicera sp.*		honeysuckkle				x									x		N			
Caprifoliaceae	*Viburnum acerifolium*		mapleleaf viburnum	x	x													Y			
Caprifoliaceae	*Viburnum dentatum var. lucidum*	*Viburnum recognitum*	northern arrowwood							x		x	x					Y			
Caprifoliaceae	*Viburnum lantanoides*	*Viburnum alnifolium*	hobblebush, alderleaf viburnum	x[1)]													CCu	Y			
Caprifoliaceae	*Viburnum lentago*		nannyberry									x						Y	x		
Caprifoliaceae	*Viburnum opulus var. americanum*	*Viburnum opulus*	highbush cranberry									x					CCu	Y	x		x
Celastraceae	*Euonymus alatus*		winged burning bush	x													INVASIVE	N			
Cornaceae	*Cornus alternifolia*		alternate-leaf dogwood				x										CCu	Y	x		
Cornaceae	*Cornus amomum ssp. amomum*		silky dogwood							x		x	x			x		Y			
Cornaceae	*Cornus racemosa*		gray dogwood									x	x			x		Y			
Cornaceae	*Cornus sericea ssp. sericea*		red osier dogwood							x		x	x			x	CCu	Y	x		
Ericaceae	*Lyonia ligustrina*		maleberry							x		x					CCg	Y			
Grossulariaceae	*Ribes americanum*		wild black currant									x					CCg	Y			
Grossulariaceae	*Ribes cynosbati*		prickly gooseberry	x	x													Y			
Grossulariaceae	*Ribes hirtellum*		smooth gooseberry									x					CCu	Y			
Lauraceae	*Lindera benzoin*		spicebush, benzoin-bush, Benjamin-bush, fever-bush, wild allspice										x					Y	x		x
Rhamnaceae	*Rhamnus cathartica*		buckthorn										x				INVASIVE	N	x		x
Rosaceae	*Dasiphora fruticosa ssp. floribunda*	*Potentilla fructicosa*	shrubby cinquefoil									x					CCu	Y			
Rosaceae	*Rosa multiflora*		multiflora rose, rambler rose							x	x	x	x				INVASIVE	N			
Rosaceae	*Rosa palustris*		swamp rose									x						Y			
Rosaceae	*Rubus pubescens var. pubescens*		dwarf red blackberry, plumboy										x				CCu	Y			
Rosaceae	*Spiraea alba var. latifolia*	*Spiraea latifolia*	northern meadow-sweet							x		x						Y			
Rosaceae	*Spiraea tomentosa var. tomentosa*		hardhack spiraea							x							CCg	Y	x	x	x
Salicaceae	*Salix bebbiana*		Bebb's willow							x		x					CCu	Y			
Salicaceae	*Salix discolor*		pussy willow							x		x						Y	x		
Salicaceae	*Salix sericea*		silky willow									x						Y			
Thymeliaceae	*Daphne mezereum*		February daphne		x[3)]													N	x		
Thymeliaceae	*Dirca palustris*		eastern leatherwood					x									CCu	Y	x		
Trees																					
Aceraceae	*Acer pensylvanicum*		striped maple, moosewood, green-striped maple, whistlewood, Pennsylvania maple				x										CCg	Y	x		

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				Habitat																medicinal		
Family	***Scientific Name***	***Synonyms***	**Common Name**	**upland deciduous forest**	**upland mixed forest**	**upland conifer forest**	**on or around calc. outcrops**	**near rocky creek**	**upland meadow**	**wet meadow**	**marsh**	**shrub swamp (hardwood or mixed)**	**swamp forest (hardwood or mixed)**	**open water**	**sand bar**	**beaver dam**	Species Status Columbia County[5)]	Native	Shakers	Tilden (1852)	Tilden (1875)
Aceraceae	*Acer platanoides*		Norway maple	x													INVASIVE	N			
Aceraceae	*Acer rubrum var. rubrum*		red maple	x									x					Y	x		
Aceraceae	*Acer saccharum var. saccharum*		sugar maple	x														Y			
Aceraceae	*Acer spicatum*		mountain maple					x									CCg	Y			
Betulaceae	*Betula alleghaniensis*		yellow birch		x[1)]								x[1)]				CCg	Y			
Betulaceae	*Betula lenta*		sweet birch, cherry birch	x														Y	x	x	
Betulaceae	*Carpinus caroliniana ssp. virginiana*		American hornbeam, blue beech, musclewood, ironwood	x									x					Y			
Betulaceae	*Ostrya virginiana*		hop hornbeam, ironwood	x	x													Y			
Fabaceae	*Robinia pseudoacacia*		black locust, false acacia						x[4)]									N			
Fagaceae	*Fagus grandifolia*		American beech	x	x		x											Y	x		
Fagaceae	*Quercus spp.*		oaks, incl. red oak	x	x													Y			
Hamamelidaceae	*Hamamelis virginiana*		American witch-hazel	x	x													Y	x	x	x
Juglandaceae	*Carya cordiformis*		bitternut hickory	x													CCg	Y			
Juglandaceae	*Carya glabra*		pignut hickory, sweet pignut	x														Y			
Juglandaceae	*Carya ovata*		shagbark hickory, shellbark hickory	x														Y			
Juglandaceae	*Juglans nigra*		black walnut	x													CCr	Y	x		
Oleaceae	*Fraxinus americana*		white ash	x														Y	x		
Oleaceae	*Fraxinus nigra*		black ash					x					s				CCu	Y			
Pinaceae	*Larix laricina*		tamarack, American larch		x[2)]								x				CCu	Y	x	x	
Pinaceae	*Pinus resinosa*		red pine			x											CCr	Y			
Pinaceae	*Pinus strobus*		eastern white pine		x	x							x					Y			
Pinaceae	*Tsuga canadensis*		eastern hemlock		x	x							x					Y	?	x	x
Rosaceae	*Crataegus sp.*		hawthorn									x						?			
Rosaceae	*Prunus serotina*		wild black cherry	x	x							x						Y	x	x	
Salicaceae	*Populus deltoides*		eastern cottonwood										x					Y			
Salicaceae	*Populus tremuloides*		quaking aspen										x					Y	x	x	x
Salicaceae	*Salix alba*		white willow							x								N	x	x	x
Tiliaceae	*Tilia americana var. americana*		American basswood				x											Y	x		
Ulmaceae	*Ulmus americana*		American elm										x					Y			
Ulmaceae	*Ulmus rubra*		slippery elm						x[4)]								CCg	Y	x	x	
Vines																					
Anacardiaceae	*Toxicodendron radicans ssp. radicans*		eastern poison ivy	x	x								x					Y	x		
Apocynaceae	*Vinca minor*		periwinkle	x														N			
Celastraceae	*Celastrus orbiculatus*		Oriental bittersweet	x	x												INVASIVE	N			
Fabaceae	*Amphicarpaea bracteata*		American hogpeanut	x								x						Y			
Ranunculaceae	*Clematis virginiana*		Virginia virgin-bower							x		x						Y	x		
Vitaceae	*Parthenocissus quinquefolia*		Virginia creeper				x											Y			
Ferns																					
Aspleniaceae	*Asplenium rhizophyllum*	*Camptosorus rhizophyllum*	walking-fern spleenwort				x										CCu	Y			
Dennstaedtiaceae	*Pteridium aquilinum var. latiusculum*	*Pteridium latiusculum*	eastern bracken, bracken fern		x													Y			
Dryopteridaceae	*Dryopteris clintoniana*		Clinton's wood fern									x					CCu	Y			
Dryopteridaceae	*Dryopteris intermedia ssp. intermedia*	*Dryopteris spinulosa var. intermed*	evergreen woodfern	x	x		x										CCg	Y			

Appendix 1: Plant List of Shaker Swamp (FEP, preliminary report, March 2012)

				Habitat																	medicinal		
Family	***Scientific Name***	***Synonyms***	**Common Name**	**upland deciduous forest**	**upland mixed forest**	**upland conifer forest**	**on or around calc. outcrops**	**near rocky creek**	**upland meadow**	**wet meadow**	**marsh**	**shrub swamp (hardwood or mixed)**	**swamp forest (hardwood or mixed)**	**open water**	**sand bar**	**beaver dam**	Species Status Columbia County[5)]	Native	Shakers	Tilden (1852)	Tilden (1875)
Dryopteridaceae	*Dryopteris marginalis*		marginal wood fern				x											Y			
Dryopteridaceae	*Polystichum acrostichoides*		Christmas fern	x	x		x											Y			
Equisetaceae	*Equisetum arvense*		field horsetail, common horsetail									x						Y			
Equisetaceae	*Equisetum fluviatile*		water horsetail, river horsetail								x						CCu	Y			
Equisetaceae	*Equisetum sylvaticum*		woodland horsetail									x					CCu	Y			
Lycopodiaceae	*Dendrolycopodium obscurum*	*Lycopodium obscurum*	ground pine, eastern tree clubmoss	x[1)]													CCg	Y			
Lycopodiaceae	*Diphasiastrum digitatum*	*Lycopodium complanatum*	fan club-moss		x[1)]												CCg	Y			
Onocleaceae	*Matteuccia struthiopteris*		ostrich fern				x					x					CCu	Y			
Onocleaceae	*Onoclea sensibilis*		sensitive fern							x	x	x	x					Y			
Ophioglossaceae	*Botrychium dissectum*		cutleaf grape-fern		x[1)]													Y			
Osmundaceae	*Osmunda cinnamomea*		cinnamon fern								x	x						Y			
Osmundaceae	*Osmunda claytoniana*		interrupted fern										x				CCg	Y			
Osmundaceae	*Osmunda regalis var. spectabilis*		royal fern										x				CCu	Y	x		
Pteridaceae	*Adiantum pedatum*		northern maidenhair-fern				x										CCu	Y	x		
Thelypteridaceae	*Thelypteris palustris var. pubescens*	*Dryopteris thelypteris*	marsh fern							x	x							Y			
Woodsiaceae	*Athyrium filix-femina ssp. angustum*	*Athyrium angustum*	lady fern		x													Y			
Woodsiaceae	*Cystopteris bulbifera*		bulblet fern				x										CCu	Y			
Woodsiaceae	*Cystopteris fragilis*		fragile fern				x										CCu	Y			
[1)] in ancient swamp or upland forest	[2)] along edge of swamp	[3)] along Route 22	[4)] in hedgerow																		
[5)] CCr: rare in Columbia County; CCu: uncommon in Columbia County; CCg: geographically limited to certain area of Columbia County (based on current assessment by the Farmscape Ecology Program)																					

Appendix 2: Animal List of Shaker Swamp (FEP, preliminary report, March 2012)

Mammals		
beaver		lots of sign seen
black bear	regionally scarce[1)]	dropping seen
bobcat	regionally vulnerable[1)]	tracks seen
coyote		reported by Ben Sandri
deer		tracks seen
eastern cottontail		reported by Ben Sandri
fisher	regionally scarce[1)]	tracks seen
fox, probably red fox		tracks seen
grey squirrel		reported by Ben Sandri
mink	regionally scarce[1)]	tracks seen
mouse (white-footed or deer mouse)		reported by Ben Sandri
red squirrel		reported by Ben Sandri
Birds		
Baltimore oriole		seen
barred owl	regionally scarce breeder[1)]	reported by Ben Sandri
black&white warbler		heard
bobolink	NYState-protected, regionally vulnerable	seen
catbird		heard
common yellowthroat		heard
American crow		seen
grackle		seen
great blue heron	regionally scarce breeder[1)]	found dead (photo)
kingbird		photo
mourning dove		photo
northern harrier	NYState-threatened	seen
pileated woodpecker		seen
raven		seen
red-bellied woodpecker		seen
red-winged blackbird		heard/seen?
rose-breasted grossbeak		heard/seen?
sapsucker	regionally scarce breeder[1)]	photo
swamp sparrow		seen
tree swallow		seen
wild turkey		reported by Ben Sandri
woodcock	regionally declining[1)]	flew up
yellow warbler		heard/seen?
yellow-rumped warbler		heard/seen?
Reptiles		
northern water snake		reported by Ben Sandri
snapping turtle		photo
Amphibians		
american toad		heard
green frog		seen
pickerel frog		caught
woodfrog	regionally vulnerable[1)]	seen
Amphibians (cont.)		
red-backed salamander		photo
spotted salamander	regionally vulnerable[1)]	photo

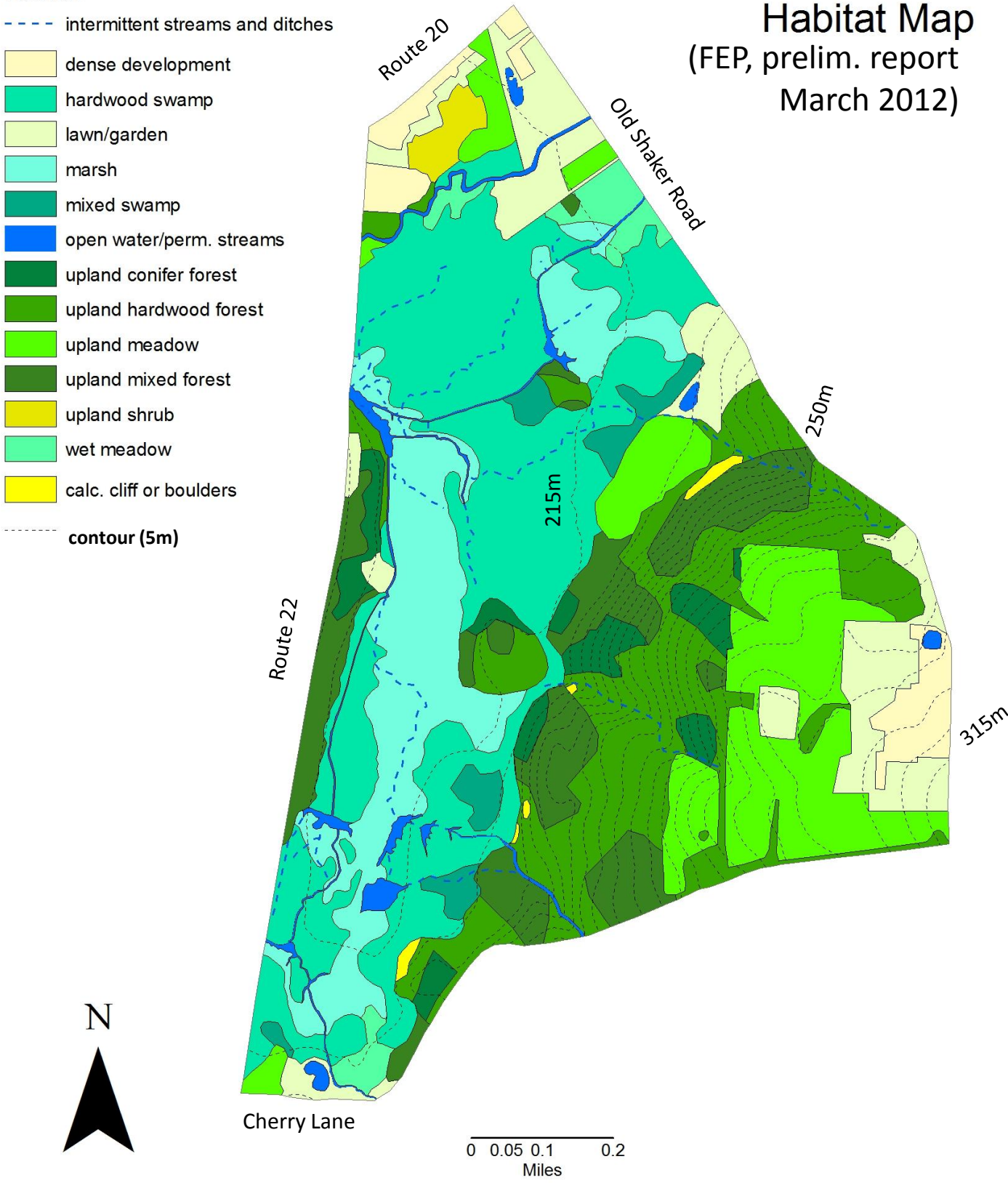
two-lined salamander		seen
Fish		
eastern black-nosed dace		seen
Insects - bees		
bumblebee (*Bombus vagans*)		photo
sweat bee (*Augochlora pura*)		photo
Insects - beetles		
gold-necked carrion beetle (*Nicophorus tomentosus*)		photo
ground beetle (*Sphaeroderus stenostomus*)		seen
ground beetle (*Gastrellarius honestus*)		seen
ground beetle (*Platynus decens*)		seen
ground beetle (*Agonum affine*)		seen
ground beetle (*Agonum corvus*)		seen
ground beetle (*Carabus nemoralis*)		seen
ground beetle (*Amphasia interstitialis*)		seen
Insects - butterflies		
Appalachian brown	occasional in Coumbia County[2)]	photo
baltimore checkerspot		photo
banded hairstreak	occasional in Coumbia County[2)]	photo
cabbage white		seen
clouded sulphur		seen
eyed brown	rare in Coumbia County[2)]	seen
harvester	rare in Coumbia County[2)]	photo
least skipper		seen
monarch		seen
mourning cloak		seen
mulberry wing	rare in Coumbia County[2)]	seen
pearl crescent		photo
questionmark	occasional in Coumbia County[2)]	photo
red admiral	occasional in Coumbia County[2)]	photo
red-spotted purple	occasional in Coumbia County[2)]	seen
silver-spotted skipper		seen
spring azure		seen
summer azure		photos
viceroy		seen
West Virginia white	imperiled throughout its range (G3), first sighting in Columbia County!	photo
Insects - moths		
green cloverworm moth (*Hypera scabra*)		photo
Insects - dragonflies		

band-winged meadowhawk	rare in Columbia County[3)]	photo
common spreadwing		photo
northern pigmy clubtail	local or uncommon in NY State (S3)	photo
shadow darner	rare in Columbia County[3)]	photo
spotted spreadwing	unusual in Columbia County[3)]	photo
white-faced meadowhawk		photo
widow skimmer		seen
Insects - other groups		
giant water bug		reported by Ben Sandri
Ichneumon wasps (various species)		reported by Ben Sandri
Arachnidae		
deer tick		reported by Ben Sandri
Crustaceans		
northern clearwater crayfish (*Orconectes propinquus*)	declining[4)]	photo
Annelids		
earthworms (at least two different *Lumbricus spp.*)		photo
leech		photo

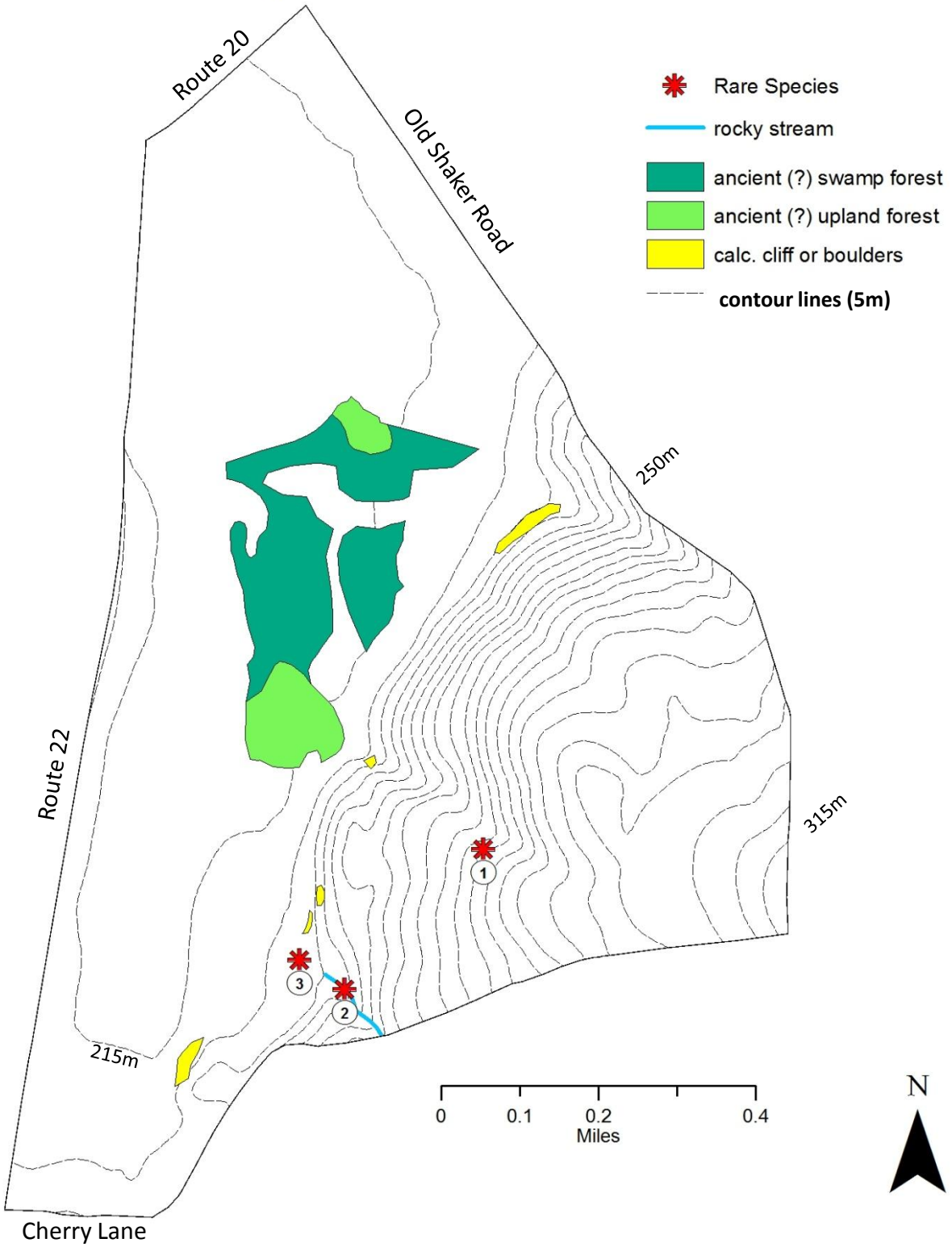
1) Kiviat and Stevens. 2001. Biodiversity Assessment Manual. Hudsonia Ltd.
2) Vispo, unpublished list of butterflies of Columbia County
3) Vispo, unpublished list of dragonflies of Columbia County
4) pers. comm. Bob Daniels, NY State Museum

Appendix 3: Shaker Swamp Habitat Map

(FEP, prelim. report March 2012)



Appendix 4:
Areas of Particular Ecological Interest in Shaker Swamp (FEP, prelim. report March 2012)



App. 5.1: Photos of Shaker Swamp Habitats - Marsh and Open Water

Photo 1: Open water in beaver pond (north-east part of Swamp)

Photo 2: Cattails, dock-leaved smartweed and bur marigold on beaver dam

Photo 3: Northern part of marsh looking south-east; dominated by reed canary grass

Photo 4: Intermittent stream in central part of marsh; the plants in this picture are lake-side sedge, purple loosestrife, and Joe-Pye-weed

Photo 5: Marsh with a band of common reed

Photo 6: Cattails and common reed in marsh

App. 5.2: Photos of Shaker Swamp Habitats and Plants – Marsh and Swamp

Photo 7: Marsh in north-western part of Swamp looking north

Photo 8: Marsh in north-western part of Swamp looking south-east

Photo 9: Hardwood swamp near eastern edge of Swamp: Joe-Pye-weed and willow trees

Photo 10: Shrub swamp in northern part of Swamp

Photo 11: Silky dogwood, one of the common shrub species in shrub swamp

Photo 12: Grey-twig dogwood, another very common shrub in shrub swamp

App. 5.3: Photos of Shaker Swamp Habitats – Ancient Swamp Forest

Photo 13: Ancient mixed hardwood/conifer swamp forest; a magical place with red maple, elm, black ash, and hemlock trees growing out of mossy hummocks. The shallow water can serve as breeding habitat for vernal pool amphibians.

Photo 14: Uncommon herbaceous plants, such as foamflower, grow on the hummocks in ancient swamp forest.

Photo 15: Intermittent stream in ancient swamp forest. The individual trees in an ancient forest don't have to be big – as long as the canopy has never been entirely removed, it can be considered an ancient forest.

Photo 16: This part of the ancient swamp forest has a "lawn" of brome-like sedge, interspersed with other uncommon native plants.

App. 5.4: Photos of Shaker Swamp Habitats – Ancient Upland Forest

Photo 17: One of the islands s of possibly ancient upland forest in the Swamp. Hemlock trees are mixed with beech and other hardwoods. In the understory, we found the rare hobblebush, a species of northern affinity which thrives only in a few locations in our County.

Photo 18: Yellow birch on an island of possibly ancient upland forest in the Swamp.

Photo 19: An exceptionally large oak tree on one of the islands of possibly ancient upland forest in the Swamp.

Photo 20: Upland conifer forest on the eastern shore of the Swamp. This steep slope is dominated by hemlock trees and has most likely never been completely cleared for agriculture. It might also represent a patch of ancient upland forest.

App. 5.5: Photos of Shaker Swamp Habitats and Plants – Upland Forest and Calcareous Cliffs/Boulders

Photo 21: Much of the upland forest east of the Swamp looks somewhat like this image.

Photo 22: Rich mesic upland forest near calcareous cliffs/boulders. In this forest patch, the herbaceous layer is dominated by the uncommon medicinal plant blue cohosh.

Photo 23: Calcareous cliffs have a unique community of otherwise rare native plants, including bulblet fern (yellow-green fronds growing on top of cliff) and wild ginger (heart-leaved plant growing at the bottom of cliff).

Photo 24: The rare walking fern spleenwort is another native plants that only occurs on calcareous cliffs or boulders.

App. 5.6: Photos of Shaker Swamp Habitats – Uncommon Plants near Calcareous Cliffs/Boulders

Photo 25: The native wild ginger is not related to the commercial ginger, which is the root of a tropical plant. However, its root has a similar taste and has been valued by the Shakers and by Tilden for its medicinal properties. In our County, it is only found on and around calcium-rich rocks. Note the unique, three-parted flower near the ground. Its color and smell of carrion attract flies who serve as pollinators.

Photo 26: Canada violet is another uncommon plant which in our County only occurs on and around calcareous rocks.

Photo 27: Long-spurred violets are uncommon throughout the County, but quite common around the calcareous outcrops just east of Shaker Swamp.
(We apologize for the errors in the captions of photos 27 and 28 in the first version of this report.)

Photo 28: Blue cohosh occurs on deep, fertile soil and is often found near calcareous outcrops.

App. 5.7: Photos of Shaker Swamp - Uncommon Plants of Swamp Forest

Photo 29: Black ash occurs in the ancient swamp forest of Shaker Swamp at a high density. It can be distinguished from other ash species by its corky bark and sessile leaflets.

Photo 30: Great blue lobelia occurs mainly in calcareous (calcium-rich) wetlands. It was considered a medicinal plant by the Shakers.

Photos31 and 32: Rough-leaved goldenrod is also a plant that is confined to calcareous (calcium-rich) wetlands.

App. 5.8: Photos of Shaker Swamp - Uncommon Plants of Shrub Swamp

Photo 33: The rare highbush cranberry, which is not related to true cranberries, but so called because of its puckery, cranberry-like fruit.

Photo 34: The wild black currant tends to occur mostly in the western part of the County, but can also be found in Shaker Swamp. It often grows side by side with the closely related smooth gooseberry (not pictured).
(We apologize for the error in the first version of this report, which identified the pictured plant as smooth gooseberry.)

Photo 35: Shrubby cinquefoil is another shrub that only occurs in calcareous (calcium-rich) wetlands. It is considered an indicator species for the rare calcareous fen habitat in the Harlem Valley, but also was found in two locations along the eastern edge of Shaker Swamp.

App. 5.9: Photos of Shaker Swamp - Rare or Uncommon Butterflies

Photo 36: West Virginia white is a very rare butterfly which is considered imperiled throughout its range. Shaker Swamp is the only location within the County where it has so far been found.
(We apologize for the error in the first version of this report which showed the picture of an azure butterfly instead of the West Virginia white.)

Photo 37: The harvester is a rare wetland butterfly in Columbia County which has so far only been found in Shaker Swamp and Drowned Lands Swamp. Its caterpillars are unique in their feeding habits, because instead of eating leaves, like all other butterfly caterpillars, they prey on aphids, specifically those which suck the juices of alder bushes.

Photo 38 : Appalachian brown, a native wetland butterfly whose caterpillars feed on sedges. It is only occasionally seen in the County.

Photo 39: Banded hairstreak, another native butterfly only occasionally seen in the County. Its caterpillars feed on leaves of oak, hickory, and walnut trees.

App. 5.10: Photos of Shaker Swamp - Rare or Uncommon Dragonflies

Photo 40: Shadow darner is a rare dragonfly in Columbia County.

Photo 41: The band-winged meadowhawk is also a rare dragonfly in Columbia County.

Photos 42 and 43 : The northern pigmy clubtail, a dragonfly considered rare throughout New York State, which breeds in rocky, forested streams. Above, a freshly emerged adult.

Photo 44: The spotted spreadwing is an unusual dragonfly in Columbia County.

Photo 43: The aquatic larvae of a northern pigmy clubtail just before its transformation.

App. 5.11: Photos of Shaker Swamp - Other Rare or Uncommon Animals

Photo 45: The northern clearwater crayfish was found in a rocky forested stream flowing into the Swamp from the east. According to state ichthyologist Bob Daniels, this native crayfish seems to be declining in New York State due to competition from introduced crayfish species.

Photo 46: This spotted salamander was found under a rock in a forested area of calcareous boulders east of the Swamp. This uncommon salamander spends most of its life hidden from sight in upland forests and every spring seeks out vernal pools to breed and lay its eggs. The aquatic larvae develop quickly to emerge from the pool before it dries out during the summer and continue their life in nearby upland forest. Because there are no vernal pools near the place where we found this salamander, we suspect that these salamanders also breed in the shallow water of swamp forest in Shaker Swamp.

App. 5.12: Photos of Shaker Swamp – Examples of Native Medicinal Plants Used by the Shakers and by Tilden

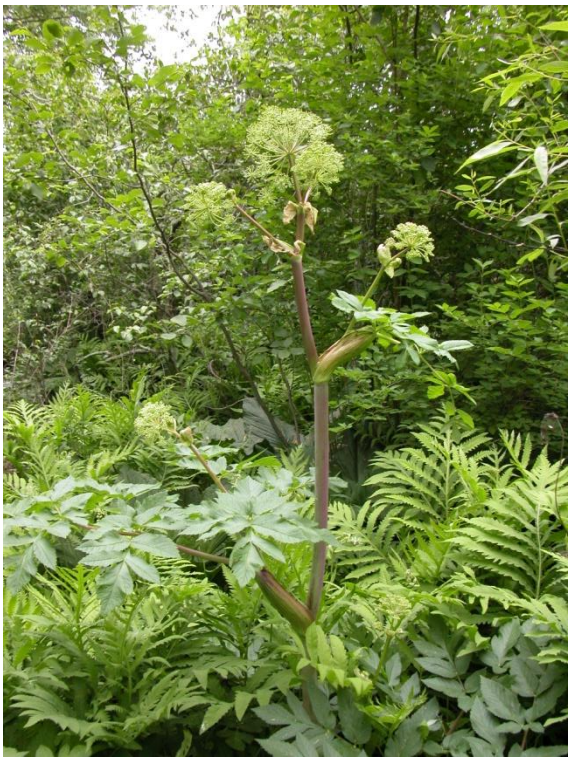


Photo 47: Great angelica

Photo 48: American false-hellebore

Photo 49: Skunk cabbage

Photo 50: May-apple

App. 5.13: Photos of Shaker Swamp – Remnants of Land Use History

Photos 51 - 53: Examples of stone walls, most likely built by the Shakers to delineate fields and cattle lanes.

Photo 52: Example of a very large stone wall.

Photo 53: Examples of more moderate-sized stone walls.

Photo 54: Dam on rocky stream, probably a mill dam.

Photo 55: Cement pillars at the edge of the Swamp. Most likely, they were erected to raise the wooden floor of a hay barn above the periodically wet ground.

Photo 56: Log cabin built by Darrow students, most likely in the first half of the 20th century.

App. 5.14: Photos of Shaker Swamp – Sampling of Swamp Sediment for Clues to its Ecological History

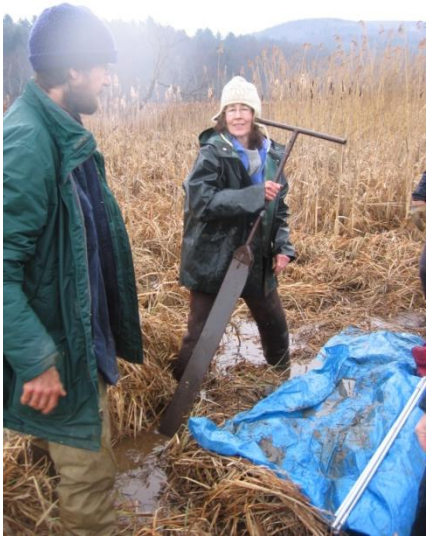


Photo 57: Dorothy Peteet of Lamont Earth Observatory with core sampler assisted by Conrad Vispo.

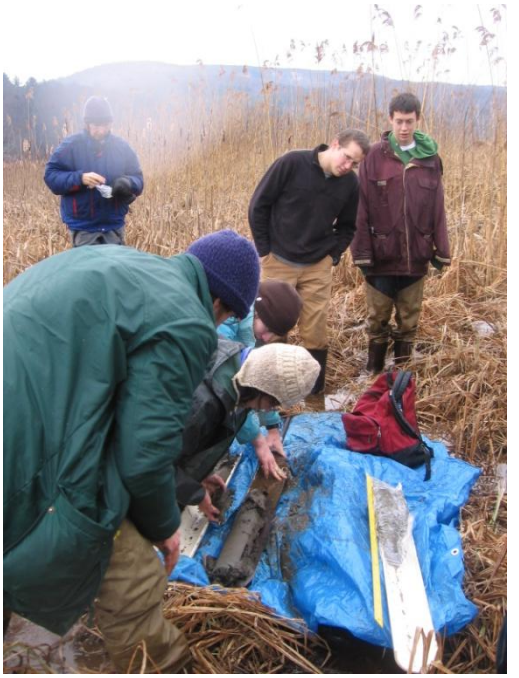


Photo 58: Preparing a column of swamp sediment for transport to the laboratory. Darrow teachers and students observe the process.

Photo 59: Craig Westcott (Darrow School) and Dorothy Peteet measure the depth of sediment while Darrow students look on.

Photo 60: Preserving segments of sediment core in the laboratory at Darrow.

Photo 61: Training session on how to screen sediment core segments for buried seeds that could give clues to the vegetation history of the Swamp.