Summer 2015

Emily Mickus & Marie Bunker

Natural History Survey - Lillian Anderson Arboretum

Introduction:

The goal of doing a natural history survey of the Lillian Anderson Arboretum (LAA) was to integrate historical data related to the arboretum with its current ecological state. To accomplish this, we performed historical research by utilizing local resources. We also employed various biological research methods to survey flora and fauna diversity in the LAA. Additionally, a GPS unit was used to acquire spatial data. The following document will describe each trail based on the most common attributes. Although these trail-based descriptions do not constitute the full list of species encountered during this project in the LAA, an exhaustive list can be found in the Appendices.

Historical Methods and Results:

The historical research aspect of this project was performed using local resources, online databases, and on site investigation. The Kalamazoo College Archives offered information about the property since it was acquired by the school, including legal documents describing the boundary of the property, agreements regarding the portion of the Arboretum that is designated a conservation easement, and plans for the development of trails and other buildings on the property. There were also lists of known organisms in the Arboretum, such as a database of bird and mammals observed by previous students. While useful information regarding the current state of the property, little could be found about the land use prior to the school’s ownership.

Other local resources included the Western Michigan University Archives, and the Kalamazoo Public Library. Lillian Anderson, the previous owner of the property, had donated a box of documents to the Western Archives prior to her death, with information stretching back to the early 19 century. However, these documents consisted mainly of social and personal family events, such as marriages and death announcement, and had little to do with the farmed land. In addition, microfilm copies of the Kalamazoo Gazette, which were found at the Kalamazoo Public Library, focused mainly on the life of Lillian Anderson and the collection did not include papers that were old enough to reference the functioning Anderson Farm.

The most useful information was found in the online agriculture census records from the National Agricultural Statistics Service (NASS). These surveys contained detailed information regarding the use of farmland in each county in Michigan back to 1945, and less detailed but still useful records stretching even further back from that. It was found the most common crop (and thus most likely to be planted on the Anderson Farm) was corn, followed by various types of plants that were grown for hay. These plants included red clover, which is found in abundance through the Meadow Run trail, but not in other, similar habitats within the LAA, indicating that it was possibly planted there when the farm was operational.

There was also useful information found through the on-site investigation. Evidence of old fences dividing the fields was found, including remains of barbed wire and fence posts, lines of cherry trees (which are an ecological indicator that a fence was present) and certain other artifacts, such as gates, metal gas cans, and farm equipment. The main areas where the fences were most obvious was surround the Meadow Run trail, with an unbroken barbed wire trail running the border of the field as far back as the Not-So-Magnificent-Pines, up to the boundary of the current farm house, and another edge running parallel to M-43 highway. At the corned=r of these two fence lines, there was also evidence of a gate blocking off a road that led into the arboretum. It was along the northern edge of this fence that the most artifacts were found, including what appears to be farm equipment left to rust in the woods. It is also possible that the land north of this fence, near the farmhouse, may have been used to raise small farm animals, as the remains of a barbed wire paddock are visible. There was also a fence line and gate found on the Marsh Woods trail, although the old growth nature of that forest suggest it was used as grazing land for animals rather than crops. Other more common indicators of the farm or the Magnificent Pines and the Not-So-Magnificent Pines, which are the remains of a plantation original grown for the purpose of logging. Similar rows of pines can also be found along Bobayundel Trail.

Ecological Research Methods:

Flowering plants were the focus of our plant surveys, but some non-flowering plants were included in the lists. Plants were marked using the Trimble GPS unit, noting their abundance, flowering and fruiting status, and specific locations. Full trail based list of plants found in Appendix 1. Auditory and visual bird surveys were performed throughout the season. Specific “bird-watching” times were set aside, either in the early morning or near dusk when birds are most actively calling. In addition, birds were identified and noted while conducting other surveys. Full trail based bird lists found in Appendix 2. In an attempt to quantify mammal populations in the LAA, mammal-tracking traps were built and deployed in various areas, as well as a motion sense wildlife camera. Insect populations were measured primarily thorough means of pitfall traps. For further details about pitfalls, see Appendix 3.

GPS Use:

The GPS unit was used to mark man-made objects in the LAA, such as benches, trail markers, trail signs, and maps. It was also used to map recent changes to the LAA, including the newly added Wetland Boardwalk and a re-routed section of Gathje Hill trail. Historical artifacts were marked. Further details can be seen in the Historical Data section. GPS was also used to mark the location of certain trees and flowering plants.

Results:

Wetland Boardwalk:

The most recent addition to the LAA, the Wetland Boardwalk trail can be characterized as a wetland or marsh ecosystem. It has a high plant diversity and is home to many unique plant species. Few tall trees are seen on the Boardwalk, but woody shrubs and herbaceous plants are abundant. Due to the high diversity of the Boardwalk, a single dominant species doesn’t stand out. However, some of the most common flowering plants seen are Boneset, Joe-Pye Weed, Buttonbush, and several types of Skullcaps. Common non-flowering plants include Common Cattail as well as several fern species. It’s also noteworthy that the harmful Poison Sumac is found near the Boardwalk trail, and should be avoided. When on the Boardwalk, it’s likely to hear the Common Yellowthroat. Keep an eye out for some of the more rare birds, like the Ruby-Throated Hummingbird, various woodpecker species, or the Red-Tailed Hawk. Although specific insect surveys were not performed on this trail, it was common to spot dragonflies, butterflies, and other flying insects on sunny days.

Powerline:

The Powerline trail spans the length of the LAA. Because this trail is managed by the power company, it is characterized by shorter woody shrubs and herbaceous plants, with few tall trees that could interfere with the power line. The most common shrubs are members of the Rubus genus, which includes black raspberries, and blackberries, as well as other thorny shrubs with edible berries. Other common shrubs found along this trail are buttonbush and buckthorn. There is also a large abundance and diversity of flowering plants (listed in Appendix 1). Historical research shows that this trail likely went through several different farmed fields; this could account for the high plant diversity, which changes throughout discreet regions across the trail. Again, specific bug surveys were not done on Powerline, but similar to other fields in the Arboretum, aerial insects are frequently seen along the trail on sunny days, including dragonflies and damselflies, along with butterflies and moths. As the trail runs close to Bonnie Castle marsh for a large portion, water nesting birds can be heard, such as pied billed grebes, red winged blackbirds, herons and cranes. On the sections of the trail that are near forested areas, woodthrush, woodpeckers and other forest birds can be heard. The open nature of the trail also allows sighting of the Red Tailed Hawk. The Powerline trail forms an edge ecosystem to many of the other micro habitats, which affords the opportunity for a lot of diversity in its flora and fauna.

Meadow Run:

Meadow Run trail forms a distinct ecological unit, partially because it was part of a single farmed field when the LAA was still Anderson Farm. This is indicated by the lack of forest encroachment into it’s two open fields (Monarch Waystation and Weather Station), as well as evidence of a fence that runs around various parts of the trail (as described in the historical results section). Monarch Waystation is maintained as an ideal habitat for Monarch butterflies, and thus contains plants that are attractive to various species of butterflies, specifically Monarchs. These include milkweed, butterfly weed, various clovers and other flowering plants. The presence of Red Clover in this field and Weather Station, when it is not common elsewhere is the LAA, indicates that perhaps red clover was planted here to be harvested for hay, as this was common in Kalamazoo County when the Anderson Farm was in operation. The Weather Station field is slightly more overgrown, and contains additional flowering plants such as Horse Nettle and several varieties of Nightshade and Sumac. In addition to the common field-dwelling aerial insects that were described on the previous trails, pitfall traps were set in these two fields to determine the diversity and abundance of ground insects, the detailed results of which can be found in Appendix 3. Birds common to this trail were the Grey Catbird, the Eastern Towhee and the Red Eyed Vireo.

Old Field:

The Old Field trail extends along the outside of Old Field, a prairie ecosystem consisting primarily of grasses and wildflowers. The trail includes woody growth along with various herbaceous plant species. It’s common to see Enchanter’s Nightshade, Naked-flowered Tick Trefoil, Woodland Agrimony, and other wildflowers along the trail. Old Field itself has remained an open prairie except for several oak trees scattered throughout the field.

Both benches in Old Field are suitable areas to hear or see birds such as the Eastern Towhee, Grey Catbird, and Eastern Wood-Pewee. It’s also common to hear the distinct call of the Wood Thrush, a species whose habitat has declined greatly in recent years.

Wood Frog:

The Wood Frog trail extends along Batts Pond, an ecosystem that is considerably isolated from human development. Buttonbush is the dominant plant species in the pond, but many unique wetland plants, including Monkey Flower, Mild Water Pepper, and Yellow Pond Lily, also grow here. The top layer of Batts Pond is mostly covered in algae. The southern-most section of Wood Frog has many fallen pine trees from severe thunderstorm damage. The remainder of Wood Frog trail is characterized as a deciduous forest. Along the southern end of the trail there is a distinct gully that separates the pine forest from the deciduous forest.

Standing on Batts Pond bridge, you’ll likely hear the Wood Thrush, Pewee, Towhee, and various woodpecker species. Through the use of mammal tracking traps, we determined that raccoons, squirrels, chipmunks, and other rodents are present in the Wood Frog area.

Magnificent Pines:

The Magnificent Pines trail gets its name from the striking rows of pine trees lining the trail. Originally planted for logging, these pines now dominate the ecosystem and don’t allow for much undergrowth. Still, keep an eye out for Herb Robert with its small pink flowers and the invasive, thorny Multiflora Rose.

At the north end of the trail sits the Nella Langeland bench, named after the woman who previously owned the farmhouse. This provides a useful spot to listen for birds, particularly the Wood Thrush and Scarlet Tanager. At night, flying squirrels and owls are active in this area. Insect data were collected by means of pitfall traps (see Appendix 3).

Not-So-Magnificent Pines:

Similar to the Magnificent Pines, the Not-So-Magnificent Pines were clearly planted for the purpose of logging. What distinguishes this trail from the Magnificent Pines is that there is more undergrowth and encroachment of deciduous tree species. Herbaceous plants on this trail include Enchanter’s Nightshade, Herb Robert, and Nipplewort.

Gathje Hill:

Gathje Hill goes through an old growth forest, including Oaks, Maples, and American Beech trees, as well as others. The trail runs next to a subdivision for part of it’s length, and ends where it connects to Marsh Woods. Evidence of barbed wire fences and old gates from the time the area was farmed, as well as the age of the forest, indicate that this land was used as pasture for animals and was most likely not cleared for crops. Near the Powerline end of the trail there is a large patch of Spotted –Touch-Me-Nots, and Indian Pipe, Naked Flowered Tick Trefoil, and Wild Hog Peanut can also be found the length of this trail. This type of forest is home to Woodpeckers, Scarlet Tanagers, and Woodthrush.

Bobayundel:

Bobayundel trail forms half of the loop with Gathje Hill, connecting to Powerline in two different places, and also for the most part travels through old growth, mixed deciduous forest. The exception to this is the area of the trail that was clearly planted as a pine plantation, with organized rows of pines similar to those in the Magnificent and Not-So-Magnificent Pines. This trail is one of the few places in the Arboretum that Spotted Wintergreen or Sweet Scented Bedstraw can be found, and also has patches Indian Pipe. Birds that can be found here include the White Breasted Nuthatch and the Scarlet Tanager.

Marsh Woods:

The Marsh Woods trail shares a three-way intersection with Bobayundel and Gathje Hill, then continues to run adjacent to the Bonnie Castle Marsh. This trail contains patches of Mayapple between the two benches overlooking the marsh, and has Enchanters Nightshade and Indian Pipe. There is also opportunity to see some interesting mushrooms growing near the marsh. On those benches which overlook the marsh, keep an eye out for Herons, Sandhill Cranes and Red Winged Blackbirds. In addition, forest birds such as the Pileated Woodpecker, Trees Swallows, and Red Eyed Vireos can be found.

Stump Dump:

This area of the LAA is the most accessible from the outside, as there is a short road leading up to the clearing. As the name suggests, it is used as a dumping ground by facilities management from Kalamazoo college. This area could be classified as a waste area or a clearing, and as such offers a diversity of flowering plants that are not seen anywhere else in the Arboretum. Some of the more rare and interesting plants that were found here were the Asiatic Dayflower, Moth Mullein, Musk Mallow or Pale Touch-Me-Nots (opposed to thee Spotted Touch-Me-Nots, which are more common in the Arboretum). This area is also infested with the highly invasive Japanese Knotweed, and is currently under management by the Arboretum crew to control its spread. Birds that can be heard here include the American Crow, Grey Catbird, or the Tufted Titmouse. This is the site of a future construction project being done by the school, and the habitat of the Stump Dump will likely undergo drastic changes in the near future.

Bonnie Castle:

The marsh that surrounds Bonnie Castle Lake is partially on the Arboretum property, and can be viewed from benches along Marsh Woods trail, as well as Bernie’s Landing and Chestnut Point. The marsh is accessible by canoe, but difficult to navigate once on the water due to the large amount of buttonbush growing on the water, as well as the fact that the marsh rarely gets deeper than one or two feet. In addition to buttonbush, the marsh hosts two different types of lily, several types of smartweed and swamp loosestrife. Along the adjacent trails and on the water, large water birds such as herons and sandhill cranes can be seen, in addition to Red Winged Black Birds and mallards. There are several species of Dragonfly and Damselfly living in the marsh, and it has dense population of green frogs.

Chestnut Point:

Chestnut Point is a short trail in the western corner of the LAA. It is characterized by mixed deciduous forest, containing mostly oaks and maples. Chestnut Point borders the Bonnie Castle marsh, and sources indicate that it was never farmed due to its swampy land, which could account for the large, old growth oaks present here. Importantly, Chestnut Point is also home to the majority of the few American Chestnut trees in the Arboretum, a species who’s population was decimated in the early 1900’s, with few live trees remaining in North America. There is a short boardwalk on Chestnut Point that extends into the marsh, where swamp plant species and birds can be observed. This is a good place to look for the Red Tailed Hawk or the Sandhill Crane, as well as American Goldfinches, Woodpeckers, and various types of sparrows. Detailed insect data was collected on Chestnut Point through the use of pitfall traps, which can be found in Appendix 3.

Entrance Trail/Parking Lot/Roadside:

These three ecosystems can all be described as “disturbed” field areas, and showed similar plant species and diversity, which is why they are grouped together. While the stump dump is technically a similar ecosystem, most of the flowering plants found there were not in any other areas of the LAA, so it was kept separate from these three areas. Although they are disturbed, the parking lot, roadside and entrance trail contain many plants commonly found in prairie habitats such as Queen Ann’s Lace, Yarrow, Goldenrod, or Fleabane, amongst others.

Possible Research Questions/Future Directions:

* Measure DBH and take tree-coring samples of Black Cherry trees – associated with existing fence lines?
* Flowering phenology – compared to previous years? Climate change?
* Stump Dump pre and post construction – plants, birds
* Mag Pines pre and post tree clearing – pitfall data
* Lack of tree encroachment into Old Field, Monarch Waystation, Weather Station
* Compare roadside plants with parking lot/Powerline
* Further investigation of mammals
* Wading in Bonnie Castle – measure depth?
* Further investigation into bird populations/ranges – use bird index and our bird data
* Small frogs – do they vary by location?
* Wildlife camera
* Wetland Boardwalk – aerial nets to catch insects, compare to Powerline/old field insects

Appendix 1:

**Flowering plants:**

**Powerline:**

Black-eyed Susan (*Rudbeckia serotima*)

Buckthorn (*Rhamnus* spp.)

Butterfly Weed (*Asclepias tuberosa*)

Common Milkweed (*Asclepias syriaca*)

Common Mullein (*Verbascum thapsus*)

Common Evening Primrose (*Oenothera biennis*)

Creeping Bush Clover (*Lespedeza repens*)

Deptford Pink (*Dianthus armeria*)

Elderberry (*Sambucus nigra*)

Flowering Spurge (*Euphorbia corollata*)

Gray Dogwood (*Cornus racemosa*)

Hawthorne (*Crataegus* spp.)

Hyssop Hedge Nettle (*Stachys hyssopifolia*)

Indian Pipe (*Monotropa uniflora)*

Indian Tobacco (*Lobelia inflata*)

Lance-leaved Goldenrod (*Euthamia graminifolia*)

Narrow-Leaved Meadowsweet (*Spiraea alba*)

Prairie Fleabane (*Erigeron strigosus*)

Pokeberry (*Phytolacca americana*)

Queen Anne’s Lace (*Daucus carota*)

Rubus—various species

Selfheal (*Prunella* spp.)

Small White Aster (*Symphyotrichum ericoides*)

Spiderwort (*Tradescantia* spp.)

Spotted Knapweed (*Centaurea maculosa*)

Spotted St. Johnswort (*Hypericum punctatum*)

Spotted Touch-Me-Not (*Impatiens capensis*)

White False Indigo (*Baptisia alba*)

Whorled Loosestrife (*Lysimachia quadrifolia*)

Yarrow/Milfoil (*Achillea millefolium*)

Yellow Wood Sorrel (*Oxalis europaea*)

**Wetland Boardwalk:**

Bittersweet Nightshade (*Solanum dulcamara*)

Blue Vervain (*Verbena hastata)*

Boneset (*Eupatorium perfoliatum*)

Bristly Crowfoot (*Ranunculus pensylvanicus*)

Buckthorn *(Rhamnus cathartica*)

Buttonbush (*Cephalanthus occidentalis)*

Curly Dock (*Rumex crispus)*

Eastern Skunk Cabbage (*Symplocarpus foetidus)*

Flat-topped White Aster (*Aster umbellatus*)

Great Blue Lobelia (*Lobelia siphilitica)*

Horsetail (*Equisetum*)

Joe-Pye Weed (*Eutrochium purpureum*)

Mad-Dog Skullcap (*Scutellaria lateriflora)*

Marsh Marigold (*Caltha palustris)*

Marsh Skullcap (*Scutellaria epilobiifolia*)

Mock Bishop’s Weed (*Ptilimnium capillaceum*)

Monkey Flower (*Mimulus* spp.)

Northern Willow Herb *(Epilobium ciliatum)*

Purplestem Aster (*Symphyotrichum puniceum*)

Small Water Plantain *(Alisma subcordatum)*

Spotted St. Johnswort (*Hypericum punctatum*)

Swamp Goldenrod (*Solidago patula*)

Swamp Rose (*Rosa palustris*)

Wild Mint (*Mentha arvensis*)

Yellow Avens (*Geum aleppicum*)

**Entrance Trail:**

Dame’s Rocket (*Hesperis matronalis*)

Enchanters Nightshade (*Circaea quadrisulcata*)

Harebell (*Campanula rotundifolia*)

Nipplewort (*Lapsana communis*)

Prairie Fleabane (*Erigeron strigosus*)

Rough Avens (*Geum laciniatum*)

White Vervain (*Verbena urticifolia*)

Wild Black Raspberry (*Rubus occidentalis)*

**Parking Lot/Roadside:**

Blue Vervain (*Verbena hastata)*

Chicory (*Cichorium intybus)*

Common Evening Primrose (*Oenothera biennis*)

Curly Dock *(Rumex crispus)*

Goldenrod (spp.?) *(Solidago*)

Horse Nettle (*Solanum carolinense)*

Prairie Fleabane (*Erigeron strigosus*)

Queen Anne’s Lace (*Daucus carota*)

Spotted Knapweed (*Centaurea maculosa*)

Yarrow (*Achillea millefolium)*

**Meadow Run:**

Bittersweet Nightshade (*Solanum dulcamara*)

Butterfly Weed (*Asclepias tuberosa)*

Bull Thistle (*Cirsium vulgare)*

Common Mullein (*Verbascum thapsus)*

Common Nightshade (*Solanaceae nigrum)*

Cow Vetch (*Vicia cracca)*

Deptford Pink (*Dianthus armeria*)

Enchanter’s Nightshade (*Circaea quadrisulcata)*

Flowering Spurge (*Euphorbia corollata*)

Horse Nettle (*Solanum carolinense)*

Prairie Fleabane (*Erigeron strigosus)*

Queen Anne’s Lace (*Daucus carota*)

Red Clover (*Trifolium pretense)*

Showy-Flowered Tick Trefoil (*Desmodium canadense)*

Sweet Cicely (*Osmorhiza claytoni)*

Spiny-leaved Sow Thistle (*Sonchus asper)*

Wild Bergamot (*Monarda fistulosa)*

Yarrow (*Achillea millefolium)*

**Old Field:**

Bladder Campion (*Silene cucubalus)*

Bloodroot (*Sanguinaria canadensis)*

Enchanter’s Nightshade *(Circaea quadrisulcata)*

Naked-flowered Tick Trefoil *(Desmodium nudiflorum)*

Phlox (spp.?)

Poison Ivy (*Toxicodendron radicans)*

Smartweed (*Polygonum)*

Spotted St. Johnswort (*Hypericum punctatum*)

Spotted Touch-Me-Not (*Impatiens capensis*)

Staghorn Sumac (*Rhus typhina)*

Sweet Goldenrod (*Solidago odora)*

Wild Black Raspberry (*Rubus occidentalis)*

Woodland Agrimony (*Agrimonia rostellata)*

**Wood Frog:**

Mayapple (*Podophyllum)*

Naked-Flowered Tick Trefoil *(Desmodium nudiflorum)*

Woodland Agrimony (*Agrimonia rostellata)*

**Magnificent-Pines:**

Herb Robert (*Geranium robertianum)*

Multiflora Rose (Rosa multiflora)

**Not-So-Magnificent-Pines:**

Enchanter’s Nightshade (*Circaea quadrisulcata)*

Herb Robert (Geranium robertianum)

Nipplewort (*Lapsana communis*)

Solomon’s Seal (*Polygonatum)*

Staghorn Sumac (*Rhus typhina)*

**Gathje Hill:**

Indian Pipe (*Monotropa uniflora)*

Jumpseed (*Persicaria virginiana)*

Multiflora Rose (*Rosa multiflora)*

Naked-flowered Tick Trefoil (*Desmodium nudiflorum)*

Wild Hog Peanut (*Amphicarpaea bracteata)*

**Bobayundel:**

Creeping Wood Sorrel (*Oxalis corniculata)*

Indian Pipe (*Monotropa uniflora)*

Naked Flowered Tick Trefoil (*Desmodium nudiflorum)*

Spotted Wintergreen (*Chimaphila maculata*)

Sweet-Scented Bedstraw

*(Galium triflorum)*

**Stump Dump:**

Asiatic Dayflower (*Commelina communis)*

Bird’s Foot Trefoil (*Lotus corniculatus)*

Bull Thistle (*Cirsium vulgare)*

Celandine (*Chelidonium majus)*

Chicory (*Cichorium intybus)*

Corn Speedwell (*Veronica arvensis)*

Cow Vetch (*Vicia cracca)*

Crown Vetch (*Securigera varia*)

Dame’s Rocket (*Hesperis matronalis*)

Enchanter’s Nightshade (*Circaea quadrisulcata)*

Fleabane (spp.?) (*Erigeron)*

Hedge Bindweed (*Calystegia sepium)*

Japanese Knotweed (*Fallopia japonica)*

Moth Mullein (*Verbascum blattaria)*

Motherwort (*Leonurus cardiac*)

Musk Mallow (*Malva moschata)*

Naked-Flowered Tick Trefoil (*Desmodium nudiflorum)*

Nipplewort (*Lapsana communis*)

Pale Touch-Me-Not (*Impatiens* *pallida)*

Pink Knotweed (*Persicaria capitata)*

Pokeberry (*Phytolacca americana*)

Red Clover (*Trifolium pretense)*

Rough Avens (*Geum laciniatum)*

Selfheal (*Prunella* spp.)

Virginia Knotweed (*Persicaria virginiana)*

White Campion (*Silene latifolia)*

White Sweet Clover (*Melilotus albus)*

White Vervain (*Verbena urticifolia*)

Woodland Agrimony (*Agrimonia rostellata*)

Yarrow (*Achillea millefolium)*

Yellow Wood Sorrel (*Oxalis europaea*)

**Bonnie Castle:**

Bittersweet Nightshade (*Solanum dulcamara*)

Bladderwort (*Utricularia* spp.*)*

Buttonbush (*Cephalanthus occidentalis*)

Fragrant Water Lily (*Nymphea odorata*)

Mild Water Pepper (*Polygonum hydropiperoides)*

Swamp Loosestrife *(Decodon verticillatus*)

Swamp Smartweed (*Polygonum* *hydropiperoides)*

Yellow Pond Lily (*Nuphar lutea)*

**Batts Pond:**

Buttonbush (*Cephalanthus occidentalis*)

Monkey Flower (*Mimulus* spp.)

Mild Water Pepper (*Polygonum hydropiperoides*)

Sedge (spp.?)

Spotted Touch-Me-Not (*Impatiens capensis*)

Wild Mint (*Mentha arvensis*)

Woodland Agrimony (*Agrimonia rostellata*)

Yellow Pond Lily (*Nuphar lutea*)

**Bernie’s Landing:**

False Solomon’s Seal

Partridge Berry

King Fern (*Ptisana salicina*)

Partridge Berry (*Mitchella repens*)

**Marsh Woods:**

Enchanter’s Nightshade *(Circaea quadrisulcata)*

Indian Pipe (*Monotropa uniflora)*

Mayapple (*Podophyllum)*

**Non-Flowering Plants:**

American Elder (*Sambucus canadensis*)

Bracken Fern (*Pteridium* spp.)

Common Cattail (*Typha latifolia)*

Common Duckweed (*Lemna minor)*

Crab Apple (*Malus* spp.)

Grape (*Vitis* spp.)

Ostrich Fern (*Matteuccia struthiopteris)*

Poison Sumac (*Toxicodendron vernix)*

Partridge Berry (*Mitchella repens*)

Sassafras (non-flowering, *Sassafras albidum*)

Sedge (spp.?)

Sensitive Fern (*Onoclea sensibilis)*

Sphagnum Moss (*Sphagnum* spp.)

Appendix 2:

**Birds (assume heard if not otherwise noted):**

Chestnut Point:

American Goldfinch (seen)

Blue Jay

Virginia Rail

Yellowthroat

Red Winged Black Bird (seen)

Downy woodpecker

White breasted Nuthatch

Cardinal

Song Sparrow

Red Tailed Hawk (Seen)

Sandhill Crane

Mallard

Pied Billed Grebe

Black Capped Chickadee

Robin

Grey Catbird

Yellow Warbler

Powerline:

Red-Winged Blackbird

Yellow Warbler

Pied-billed Grebe

Song Sparrow

Field Sparrow

American goldfinch

Northern Cardinal

Downy Woodpecker

Bonnie Castle Lake:

Eastern Wood Pewee

Mallard

Sandhill Crane

American Goldfinch

Red-Winged Blackbird

Boardwalk:

American Crow

Black-capped chickadee

Blue Jay

Common Yellowthroat

Ruby Throated Hummingbird (seen)

Downy Woodpecker

Eastern Towhee

Red Tailed Hawk (seen)

Grey Catbird

Red-winged blackbird

Song sparrow

Flycatcher (type?)

Flicker

American Goldfinch (seen)

Marsh Woods:

Red Winged Black Bird (seen)

Sandhill Crane (seen)

Green Heron

Mallard

Tree Swallows

Red Eyed Vireo

Downy Woodpecker

Pileated Woodpecker

Scarlet Tanager

Grey Catbird

Bobayundel:

White Breasted Nuthatch

Scarlet Tanager

Bernie’s Landing:

Song Sparrow

Yellowthroat

Eastern Wood-Pewee

Batts Pond:

Wood Thrush

Pileated Woodpecker

Eastern Towhee

Eastern Wood-Pewee

Red Eyed Vireo

Wood Frog:

Eastern Towhee

Downy Woodpecker (seen)

Pileated woodpecker

Wood thrush

Old Field:

American Goldfinch (seen)

Rose-Breasted Grosbeak

House Wren

American Robin

Eastern Wood Pewee

Wood Thrush

Eastern Towhee (seen)

Grey Catbird

American Crow

American Robin (seen)

Black Capped Chickadee (Seen)

Common Yellowthroat

Fern Oak:

Red Eyed Vireo

Stump Dump: (pre-construction, 7/28/15)

Red Eyed Vireo

Grey Catbird

Blue Jay

Eastern Wood Pewee

Tufted Titmouse

Meadow Run:

Grey Catbird

Red Eyed Vireo (seen)

Tufted Titmouse

Various sparrows

Flicker

Magnificent Pines:

Wood Thrush (many)

Scarlet Tanager

Appendix 3:

**Pitfall Traps:**

**Chestnut Point**

Pitfall traps were set in a random direction from each marker 1-8 and one additional trap halfway down the landing, and a random number generator was used to determine the distance (0-10 meters), away from the trail. Marker nine was not used because it was more accurately part of the Powerline ecosystem. Pitfall traps were left for about 48 hours, filled ¼ full with soapy water and covered with a net to prevent catching small animals. Traps were collected, and captured organisms were separated by general species (i.e. spiders, beetles, etc.), and then stored in glass vials with 70% ethanol. Species will be identified at a later date. Results in the following table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Sp | Btl | Ant | Fly | B/W | Cr | MP | SPT | PB | slug | Other | total |
| 1a | 1 | - | 3 | 2 | - | - | - | - | 4 | - | 2 mosq. | 12 |
| 2a | 1 | 1 | 3 | 7 | - | - | - | 1 |  | - | - | 13 |
| 3a | - | 2 | 15 | - | - | 1 | 1 | 2 | 2 | - | 1 worm | 24 |
| 4a | 2 | - | 3 | 2 | - | - | - | 7 | - | 2 | 1 worm | 17 |
| 5a | - | - | 3 | 3 | - | - | - | 13 | 3 | 3 | - | 25 |
| 6a | 2 | 1 | 2 | - | - | - | 2 | - | - | - | 1 worm | 8 |
| 7a | 4 | 1 | 3 | 3 | - | 1 | - | 6 | 2 | - | 1 worm | 21 |
| 8a | 1 | - | 3 | 1 |  |  |  | 12 | 2 |  | 3 worms  1 shrimp bug | 23 |
| La | - | 1 | - | 1 | - | - | - | 5 | - | - | 2 worms  1 snail | 10 |
| 1b | 4 | 3 | 1 | - | 2 | - | - | 57 | 1 | 5 | 1 worm | 74 |
| 2b | 2 | 8 | - | 2 | 1 | - | - | 18 | - | - | - | 31 |
| 3b | - | 1 | - | 2 | - | 2 | - | 37 | - | - | --- | 42 |
| 4b | 1 | 8 | 8 | - | - | 1 | - | 11 | 2 | - | - | 31 |
| 5b | - | 8 | 4 | - | - | 1 | - | 15 | - | - | 2 frogs | 30 |
| 6b | - | 5 | - | 1 | - | 1 | - | 8 | - | - | - | 15 |
| 7b | 2 | 1 | 1 | - | - | - | - | 10 | - | - | - | 14 |
| 8b | 1 | 4 | 2 | 1 | 2 | - | 1 | 17 | - | - | - | 28 |
| Lb | 4 | 2 | - | 2 | - | -- |  | >60 | 2 | 2 | 1 frog | 73 |
| Total (a) | 11 | 6 | 35 | 19 | 0 | 2 | 3 | 46 | 13 | 5 | 13 | 153 |
| Total (b) | 14 | 40 | 16 | 8 | 5 | 5 | 1 | 233 | 5 | 7 | 4 | 338 |
| Total | 25 | 46 | 51 | 27 | 5 | 7 | 4 | 279 | 18 | 12 | 17 | 516 |

Key: sp-spider, Btl- beetle, B/W—bees/wasps, Cr- cricket, MP-millipedes,

SPT-springtails, PB- pill bugs,

**Meadow Run**

Pit fall traps were set on both weather station and Monarch Waystation field. Within Monarch Way Station pitfalls were set in the south west third of the trail (divided by two paths, including the bench). Traps were placed in the rough center of the field (denoted as “MW center”), halfway between the center and the forest edge denoted as “MW middle”), on the forest edge (denoted as “MW edge”), and adjacent to the east to west trail (denoted as “MW trail”). Similarly, in the Weather Station Field, a rough center point was chosen (denoted as “WS center”), a second was placed at a point between center and the north forest edge (denoted as “WS middle”), and one was placed at the north forest edge (denoted as “WS edge”). The final was placed on the trail, near a green post trail marker (denoted as “WS trail”). Pitfalls were left in place from 8/6 to 8/8. When they were retrieved, WS center, WS edge, and MW Trail had been removed and disturbed and did not contain any specimens. Traps were collected, and captured organisms were separated by general species (i.e. spiders, beetles, etc.), and then stored in glass vials with 70% ethanol. Species will be identified at a later date. Results in the following table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Sp | Btl | Ant | Fly | B/W | Cr | MP | SPT | PB | Slug | Other | Totals |
| MW Center | - | 30 | 3 | 3 | 1 | - | 2 | 9 | - | 1 | 1 Worm | 50 |
| MW Middle | - | 9 | 13 | 5 | - | 1 | 4 | - | - | - | - | 32 |
| MW Edge | - | 83 | 8 | 6 | 6 | - | 17 | 4 | 2 | - | - | 126 |
| WS Trail | 1 | 22 | 7 | 10 | 34 | - | 12 | - | 1 | 2 | 1 leafbug | 90 |
| WS Middle | - | 20 | 19 | - | 1 | 5 | 57 | - | - | - | 1 Caterpillar | 103 |
| Total MW | 0 | 122 | 24 | 14 | 7 | 1 | 23 | 13 | 2 | 1 | 1 | 208 |
| Total WS | 1 | 42 | 26 | 10 | 35 | 5 | 69 | 0 | 1 | 2 | 2 | 193 |
| Total | 1 | 164 | 50 | 24 | 42 | 6 | 92 | 13 | 3 | 3 | 3 | 401 |

Key: sp-spider, Btl- beetle, B/W—bees/wasps, Cr- cricket, MP-millipedes,

SPT-springtails, PB- pill bugs,

**Magnificent Pines**

Traps were set at the location where tree clearing is planned. An arbitrary starting point was chosen, and three rows were created from that starting point. Pitfalls in each row were placed 10 meters apart, and rows were made with roughly 4 tree rows between each. Cups were numbered from 1-10 beginning with the most north east point. Cups were left from 8/13 to 8/17. When cups were picked up, numbers 2, 8, and 9 had been removed and disturbed and contained no organisms. Traps were collected, and captured organisms were separated by general species (i.e. spiders, beetles, etc.), and then stored in glass vials with 70% ethanol. Species will be identified at a later date. Results in the following table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Sp | Btl | Ant | Fly | B/W | Cr | MP | SPT | PB | Slug | Other | Totals |
| 1 | - | - | - | 1 | - | - | 2 | - | 1 | 6 | - | 10 |
| 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | - | 4 | 5 | - | 18 |
| 4 | - | 8 | - | - | - | - | 2 | - | - | 4 | - | 14 |
| 5 | 3 | 8 | - | 4 | 1 | - | 3 | 1 | 1 | 1 | - | 22 |
| 6 | 2 | 7 | 2 | 1 | 1 | - | 10 | - | 1 | 3 | - | 27 |
| 7 | - | 2 | - | - | - | - | 4 | - | 2 | 25 | - | 33 |
| 10 | 1 | 2 | 1 | - | - | 1 | 10 | - | 1 | 66 | - | 82 |
| Total | 7 | 27 | 5 | 7 | 3 | 2 | 33 | 1 | 10 | 110 | 0 | 206 |

Key: sp-spider, Btl- beetle, B/W—bees/wasps, Cr- cricket, MP-millipedes,

SPT-springtails, PB- pill bugs,