A photograph of a dragonfly perched on a reed stem in a pond. The dragonfly is the central focus, with its wings spread and its body clearly visible. The background is a blurred pond with green reeds and a dark log floating in the water. The text is overlaid on the upper half of the image.

Biological Survey Study For Summit Lake and Adjacent Areas

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Hawthorne Valley Farmscape Ecology Program

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Summary

The Hawthorne Valley Farmscape Ecology Program (FEP) documented vascular plant, bird, odonate and butterfly species within the study area (Figure 1) using qualitative surveys. Rather than attempting to describe all animals that use the study area, FEP's researchers focused on these specific animal groups because of their usefulness as indicators of aquatic and botanical conditions (odonates and butterflies, respectively) and appeal to the public. This selection of taxonomic groups had been proposed in the initial *Scope of Work FEP NRI Summit Lake* and had been approved by Philmont Beautification Inc.

The research was coordinated by FEP's Claudia Knab-Vispo (PhD), a botanist with two decades of experience studying plants in Columbia County, NY; Dylan Cipkowski (MSc), biologist, who has surveyed Odonata and Lepidoptera for dozens of research and outreach projects in the Hudson Valley; and Kendrick Fowler (BS), technician and experienced birder who conducted bird surveys and gathered additional relevant bird data from members of the Philmont community and citizen science platforms.

FEP consulted the New York Natural Heritage Program (NYNHP) regarding rare plants, and animals, or natural communities known from within the study area; no such data existed in their records. Additionally, the Columbia County NRI was reviewed to search for existing data related to the study area. Relevant data from the county-wide NRI were incorporated into this biological report as maps created using ArcGIS (Appendices 1-5).

Biological surveys by FEP occurred in and along the shores of Summit Lake, along the lower Agawamuck Creek, in the adjacent shrub swamp, floodplain forest, and open floodplain, as well as the upland forests on public land east of the reservoir (Figure 1). All FEP surveys were conducted in 2020 and early months of 2021 and the survey methods are described in more detail in the respective sections.

Eight species of submerged or floating aquatic plants (and at least three kinds of macroscopic algae) were found in Summit Lake. While the majority of these aquatic plants were native to our region, the aquatic vegetation was dominated by a non-native, invasive species—curly-leaf pondweed (*Potamogeton crispus*).

In the terrestrial and wetland habitats of the site, 315 additional plant species were documented; nearly three quarters of those were native to our region and they included some regionally uncommon and locally rare species (Appendix 6). The flora of the study area also includes 35 invasive plant species.

Bird surveys by FEP documented 68 species of birds within the study area and an additional 25 species have been observed within the area during the last 40 years by members of the Philmont community. The resulting list of 93 bird species (Appendix 7) includes species that are habitat sensitive as well as species of conservation concern both regionally and nationally. Summit Lake appears to be used by at least seven species of waterbirds for breeding. Many bird species documented in the terrestrial habitats are also presumed to breed within the study area.

Finally, insect surveys by FEP found that at least 26 species of odonates (dragonflies and damselflies) use the study area (Table 4). No odonates documented are of conservation concern in NYS. Many, if not all, of the odonate species found are likely using aquatic habitats within the study area as juvenile habitat. Thirteen butterfly species were also found in the study area (Table 5). The documented butterfly fauna was composed of locally common species, none of which are currently of conservation concern in NYS; however, a few of the species are showing signs of regional decline.

Objective

This biological report was created to provide an accessible outreach document to serve the people of the Village of Philmont and Philmont Beautification Inc., familiarizing them with the flora and fauna of Summit Lake and adjacent lands within the study area (Figure 1). Taxa of focus were chosen based on their appeal to the general public, their usefulness as environmental indicators and the expertise of the consultants.

Study Area

This report documents findings from within the study area delineated in Figure 1 by the yellow line. The study area encompasses roughly 85 acres of land and water.

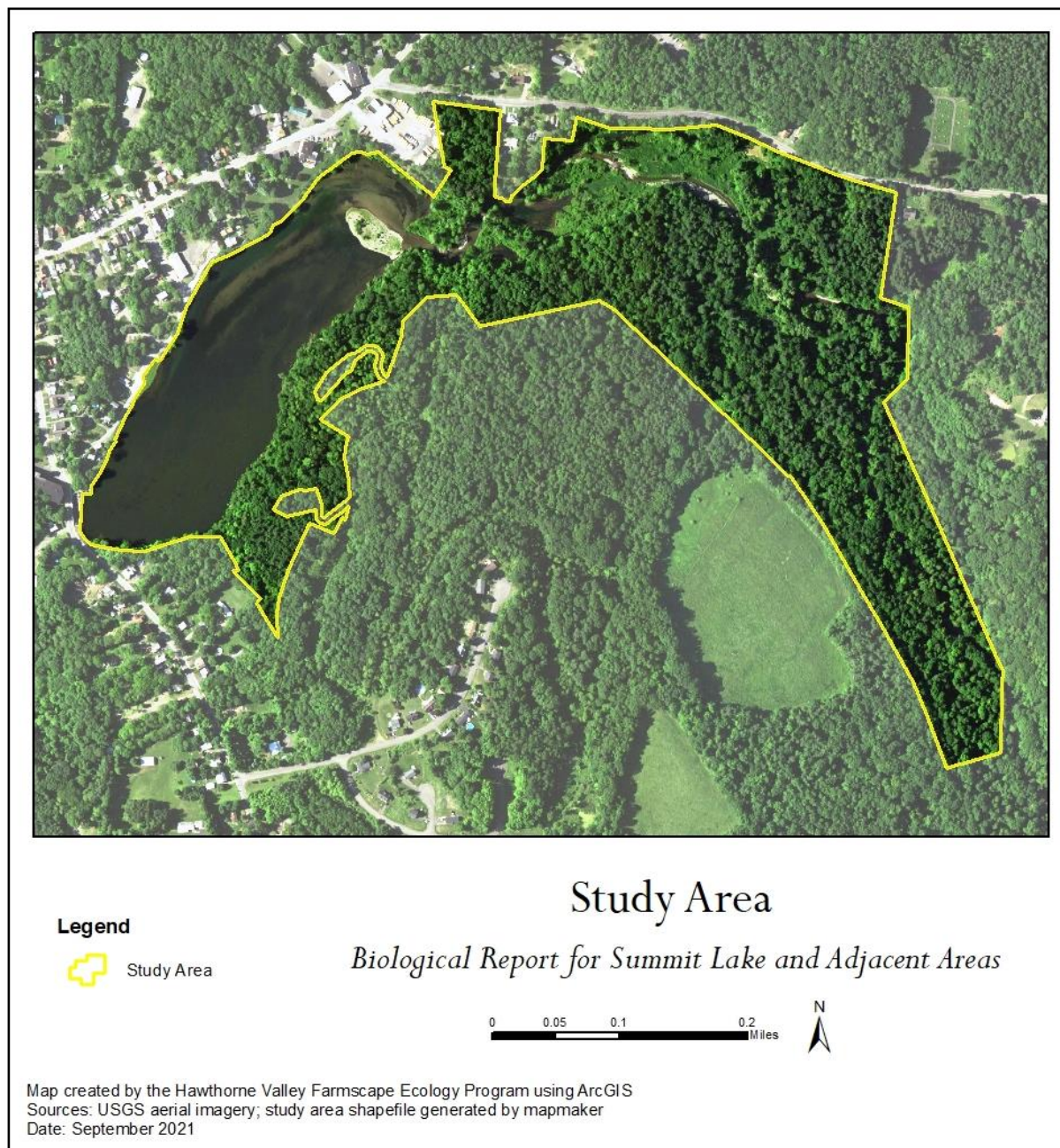


Figure 1. The above map shows the study area for the 2020-2021 biological surveys of Summit Lake and adjacent areas (delineated in yellow).

Habitat Map

Based on vegetation observations in 2020 (see below), a rough habitat map of the study area was created (Figure 2). This map is intended to illustrate and communicate general patterns in the distribution of plants and animals observed during FEP's research. The locations and boundaries between different habitat types are approximate and should be interpreted as such. The vegetation in each of the habitat types is described in the sections on terrestrial and wetland vegetation below.

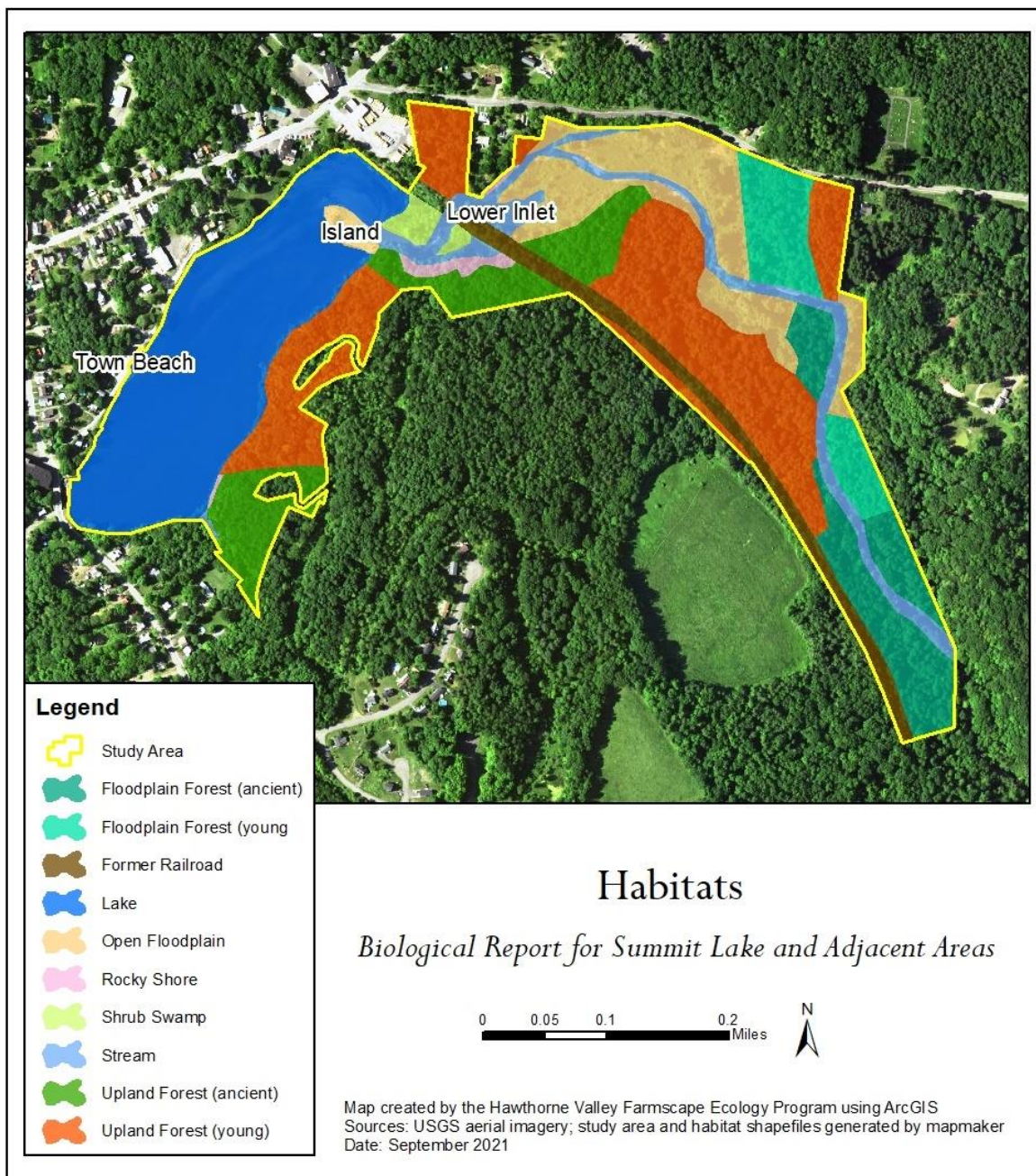


Figure 2. Habitat map of Summit Lake and adjacent areas; FEP distinguished between “ancient” (as defined in the narrative) and young Upland and Floodplain Forests.

Review of Existing Information

FEP reviewed existing biological resource maps, documents, reports, studies, and other forms of technical knowledge regarding the study site. Relatively little data was available. FEP contacted NYNHP regarding existing data of rare plants, animals and/or natural communities at the site (E. White, personal communication, August 2, 2021); there were no such data. The Columbia County NRI (CCNRI) was reviewed for additional information regarding the natural resources of the site. This resource has compiled various natural resource data (e.g., state and national wetland inventory maps) that pertain to Columbia County. Data from the CCNRI regarding wetland type and extent, open habitats, floodplain forests, active river areas and large forests did overlap with the study area of this project and therefore were integrated into this report in the form of ArcGIS maps.

Maps created from existing data offer a useful context regarding the natural resources of the site. So that each of these maps could fill a whole page within this report, they have been placed in the Appendices (Appendices 1-5). Descriptions of the different maps created using existing data are below.

The Large Forests Patches map (Appendix 1) is based on the Hudson Valley Forest Index Patches dataset included in the CCNRI (Columbia County NRI Data Viewer, n.d.). Forest patches were identified by authors of the CCNRI using the 2016 National Land Cover Database developed by Dewitz (2016). The data shows forest patches greater than 100 acres in size, as well as their condition based on metrics related to forest fragmentation, ecological value, environmental stressors, and ecosystem services. According to the dataset, nearly all of the terrestrial habitats of the site are part of a large forest patch. This particular patch falls within the “Stepping Stone” category (patch is 200-1,999 acres in size), one of several types of large forest patches described in this dataset.

The Floodplain Forests map (Appendix 2) was made using the Floodplain Forest dataset included in the CCNRI (Columbia County NRI Data Viewer, n.d.). The map shows remaining ancient floodplain forest patches and recently reforested floodplain forest patches in the study area and nearby surroundings. Here, “ancient floodplain forest” refers to forests that were likely never cleared for agriculture (based on early 20th century aerial images), although logging most likely occurred within them. The authors of this report played an integral role in creating this dataset for the CCNRI.

The Open Habitat map (Appendix 3) was created from the Open Habitats dataset assembled by the CCNRI (Columbia County NRI Data Viewer, n.d.). Authors of the CCNRI created the dataset using open land and shrubland data from the National Land Cover Database (Dewitz, 2016) and the North Atlantic Landscape Conservation Cooperative (NALCC, 2016). The map shows all non-forested habitats, including shrublands, within the study area and nearby surroundings.

The Wetland map (Appendix 4) was derived from the Wetlands NWI (national wetland inventory) dataset included in the Columbia County NRI (Columbia County NRI Data Viewer, n.d.). The map shows the extent, location and type of waterbodies and wetlands within the study area and nearby surroundings, as determined by the USFWS national wetland inventory (USFWS, 2018).

The Active River Areas map (Appendix 5) uses the Active River Areas dataset developed by Smith et al. (2018) of The Nature Conservancy. The data summarizes ecological and physical processes that influence streams, and therefore offers a useful context for conservation efforts related to streams and associated habitats. Three kinds of data are displayed in Appendix 5: 1. “Input Water” includes the streams/ivers and associated waterbodies, which are the core of river systems; 2. “Base Zone”, which

includes wetlands, floodplains, meanders, and terraces near streams and rivers; 3. "Material Contribution Zone", which are areas near the base zone or near headwater streams that contribute organic and inorganic material to the stream and river system.

Aquatic Plants in Summit Lake

METHODS

In order to provide a rapid assessment of the aquatic vegetation in Summit Lake, the presence and identity of submerged and floating aquatic plants and macroscopic algae was documented on June 15, July 28, and September 23, 2020. These qualitative, visual surveys were conducted from a kayak circumnavigating and crossing the reservoir and lower inlet. FEP recorded the species of aquatic plants that were visible and reachable by hand from the boat and took informal notes of their abundance, location, and condition. A more systematic, quantitative survey of the aquatic plants would have been beyond the scope of this study. Emergent aquatic plants were surveyed as part of the terrestrial and wetland vegetation and are reported there.

The manual of *Aquatic and Wetland Plants* by Crow and Hellquist (2000) was consulted for aquatic plant identification as needed. The nomenclature for the aquatic plants in this report and the determination of their native status follows Weldy et al. (2018). Aquatic plants were classified as "invasive" if they were included in the "Capital/Mohawk PRISM Species Priority List" (2017).

RESULTS

FEP found eight different kinds of submerged or floating aquatic plants and at least three kinds of macroscopic algae in Summit Lake (Table 1 and Appendix 6). Some of these aquatic plants and algae were free-floating on the water surface or in the water column without roots. Others were rooted in the sediment and their stems, leaves, and flowers/fruits remained submerged under the water. Finally, some species were rooted in the sediment, but had at least some of their leaves floating on the water surface and could therefore be described as "submerged/floating" (if most of the plant was submerged) or "floating/rooted" (if a large part of the plant was floating).

By far the most abundant aquatic plant species was curly-leaf pondweed (*P. crispus*). This is an invasive species native to Europe and Africa that was first found in North America in the waters around Philadelphia in the early 1840s (NOAA GLANSIS, 2016) and has since spread across the entire continent. Once it arrives at a new waterbody, its unique seasonal growth allows it to quickly dominate the aquatic vegetation to the detriment of native species, including the many native pondweed species.

Table 1: Aquatic plants and macroscopic algae (submerged or floating) documented in Summit Lake (June-Sept. 2020).

Common Name	Scientific Name	Origin	Plant Form	Comments on abundance and location in Summit Lake in 2020
Canada waterweed	<i>Elodea canadensis</i>	Native	Submerged	Found occasionally
Common coontail	<i>Ceratophyllum demersum</i>	Native	Submerged	Found occasionally
Common duckmeat	<i>Spirodela polyrhiza</i>	Native	Free-floating	Dense patches in small areas, mostly in quiet bays along the shore
Common duckweed	<i>Lemna minor</i>	Native	Free-floating	Dense patches in small areas, mostly in quiet bays along the shore
Curly-leaf pondweed	<i>Potamogeton crispus</i>	Non-native, invasive	Submerged/floating	Dense, dominant aquatic plant, at peak of season covering approximately ... of southern part of lake
Eutrophic water nymph	<i>Najas minor</i>	Non-native, invasive	Submerged	Found very rarely
Stonewort (alga)	<i>Nitella</i> sp.	Native	Submerged	Found once in shallow water on the north-eastern shore
Unidentified filamentous green algae	unidentified		Free-floating	Common in mid-summer
Water chestnut	<i>Trapa natans</i>	Non-native, invasive	Floating/rooted	Dense patches in several large areas (e.g., in front of town beach and in south-east corner of lake)
Watermeal	<i>Wolffia</i> sp.	Native	Free-floating	Dense patches in small areas, mostly in quiet bays along the shore
Water net (filamentous green algae)	<i>Hydrodictyon</i> sp.		Free-floating	Found once in shallow water on the north-eastern shore

Like other submersed aquatic plants, curly-leaf pondweed (*P. crispus*; Figure 3) is rooted in the sediment and most of the leafy stem remains submerged in the water column. Only the leaves of the upper part of mature plants float loosely on the water surface and the flower spikes often emerge above the water. Its main form of reproduction is by vegetative winter buds, called “turions”, which stay alive through the winter and are able to begin their growth early in the spring, when water temperatures are still low. It has been shown to grow 8- 10 cm a day at a water temperature of only 10°C (NOAA GLANSIS, 2016).



Figure 3. Summit Lake shown in mid-June (facing northeast from the center of the lake); large areas in the southern half of the lake were covered by curly-leaf pondweed (*Potamogeton crispus*). Photo by FEP

This ability for early and rapid growth enables this species to form dense colonies and outcompete other aquatic plants. However, by mid-summer the fully-formed turions sink to the bottom, where they stay green through the winter. The rest of the plant dies back during this time. Nutrients released into the water during its decomposition can lead to mid-summer algae blooms. However, during the early part of the summer, curly-leaf pondweed (*P. crispus*) can provide shelter and feeding habitat for fish, amphibians, and aquatic invertebrates, including the nymphs of dragonflies and damselflies. Ducks are known to feed on the plant’s seeds and turions (NOAA GLANSIS, 2016).

In mid-June, the water surface of much of the southern part of Summit Lake was covered with curly-leaf pondweed (*P. crispus*). FEP found a few other submersed aquatic plants either mixed in with the curly-leaf pondweed (*P. crispus*) or growing as individual plants in shallow water. None of these other species

seemed to occur in significant amounts, and curly-leaf pondweed was clearly the dominant plant in the lake in mid-June. Filamentous green algae were observed only in small colonies suspended in the water at that time.

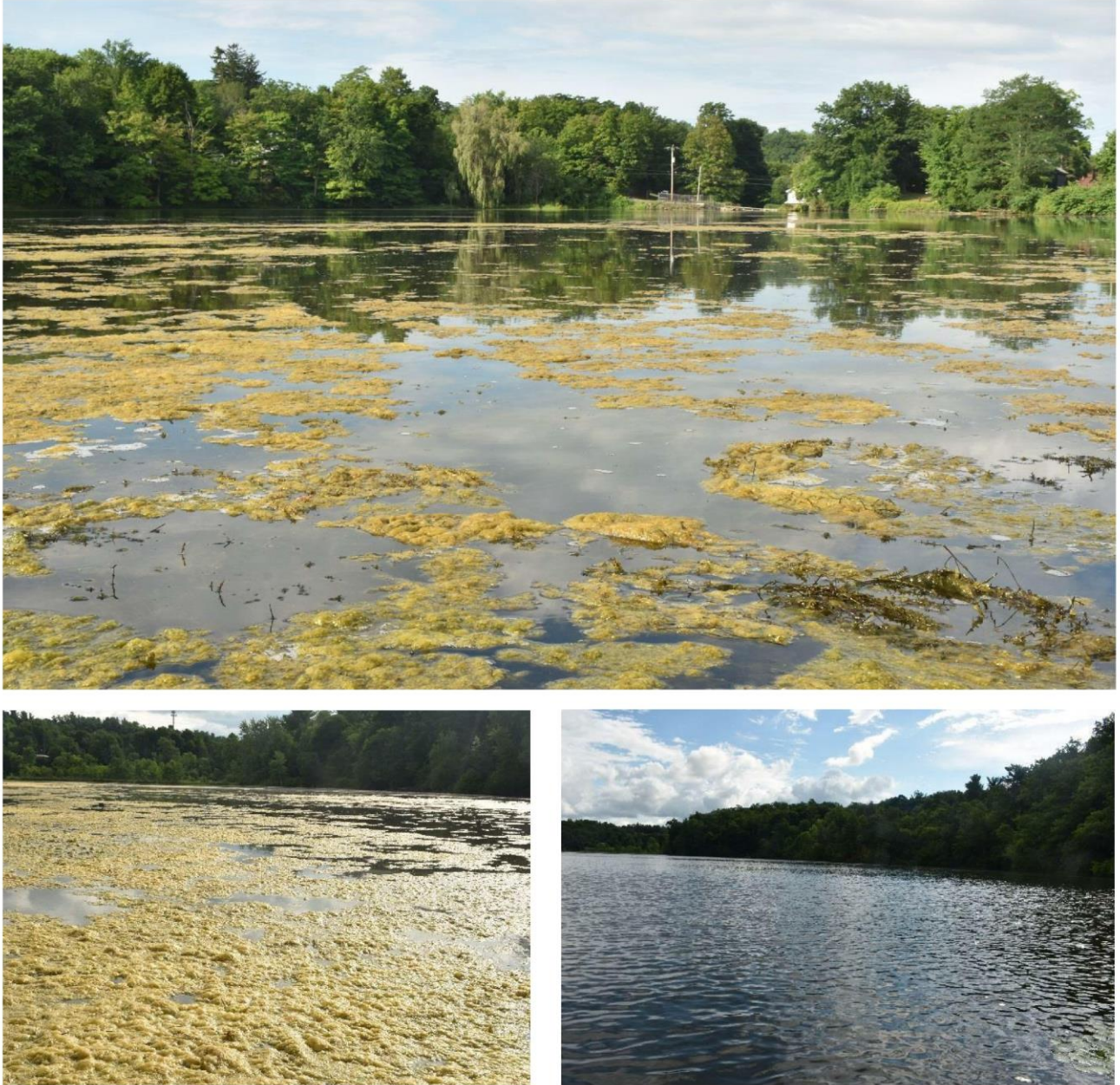


Figure 4. In late July, the southern part of the lake was covered with filamentous green algae. The top image shows these algae from a point near the center of the lake looking south and the bottom left image shows an even denser layer of floating "pond scum" seen from near the town beach on the west shore, looking northeast. However, large areas of the lake were open water in late-July (and at other times of the year) as shown in the bottom right image of the center of the lake looking northeast in late July. Photos by FEP

By late July, the curly-leaf pondweed (*P. crispus*) was decomposing and unidentified free-floating filamentous green algae had become quite abundant in the water column and on the water surface. They formed large, floating, cottony masses also known as “pond scum”, which covered almost half of the lake surface, in the same general areas where curly-leaf pondweed (*P. crispus*) had grown in mid-June. In late September, no traces of curly-leaf pondweed (*P. crispus*) could be seen on the water surface or in the water column. The filamentous algae had largely disappeared and most of the lake surface was open water (Figure 5).

Approximate extent of aquatic plants and macroscopic algae visible on the water surface of Summit Lake in 2020:

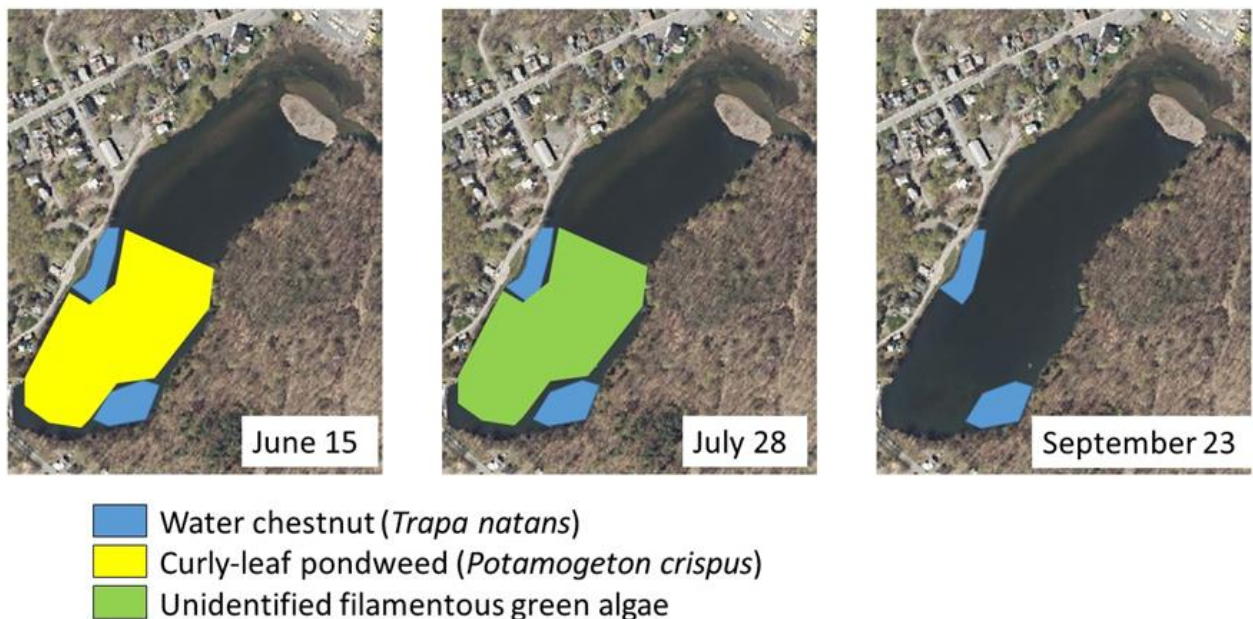


Figure 5: Approximate extent of aquatic plants and macroscopic algae visible on the water surface of Summit Lake in 2020; the outlined areas are based on ballpark visual estimates made from a boat, without any precise measurements.

Throughout the 2020 season, water chestnut (*Trapa natans*; Figures 6 & 7) was also a common aquatic plant in Summit Lake. It was mostly concentrated in front of the town beach on the west shore and in the southeastern corner of Summit Lake (Figure 5).



Figure 6. A patch of water chestnut (*Trapa natans*) was observed in the southeastern corner of the lake in late July. Photo by FEP

Water chestnut (*T. natans*) is also non-native to North America. It was introduced in the late 1800s and by 1900 had spread into the Hudson River and adjacent waters. It is now considered a problematic invasive aquatic plant species in the region, because of its tendency to form dense mats of floating vegetation, which can alter aquatic habitats and cause problems for boaters and swimmers.

Water chestnut (*T. natans*) is rooted in the sediment and has two very different types of leaves (Figure 7). The submerged leaves are finely divided, feather-like. The roughly triangular floating leaves form rosettes of one to several feet diameter.



Figure 7. Water chestnut (*Trapa natans*): an image of the rosette of floating leaves and white flower (top left), the feathery submerged leaves (top right) and the spiny fruit (bottom). Photos by FEP

The inconspicuous, white flowers develop into large fruits with four sharp spines. It should be noted that the term “water chestnut” is applied to several species of aquatic plants with edible seeds or corms (NYIS, 2019); the water chestnuts sold in cans and served in Chinese restaurants are the corms of Chinese water chestnut (*Eleocharis dulcis*), which does not grow in Summit Lake.

Also present on Summit Lake were duckweeds, a group of small, free-floating aquatic plants of the genera *Lemna*, *Wolffia*, and *Spirodela* (Figure 8). These miniscule plants are often mistaken for algae. They are composed of tiny floating leaves with or without little root hairs attached to their bottom.

FEP found at least three species of these duckweeds: common duckmeat (*Spirodela polyrhiza*), common duckweed (*Lemna minor*), and one or several species of watermeal (*Wolffia* spp.). The three types of duckweeds often were observed together and seemed to accumulate mostly in protected areas of quiet water along the shore. While individual duckweed plants were mixed in with the curly-leaf pondweed (*P. crispus*) and water chestnut (*T. natans*), FEP did not observe any continuous mats of duckweeds on the main waterbody.



Figure 8. The image on the left shows a mix of duckweed species in a quiet part of Summit Lake in late June. The cottony mass with gas bubbles in the top left corner of this photo is formed by filamentous green algae (“pond scum”). The image on the right is a close-up view of the duckweeds: common duckmeat (*Spirodela polyrhiza*; large, light green leaves with dark markings), common duckweed (*Lemna minor*; medium-sized, light green leaves) and watermeal (*Wolffia* spp.; smallest, darker leaves). Photos by FEP

Canada waterweed (*Elodea canadensis*) and common coontail (*Ceratophyllum demersum*) are two native submerged aquatic species that were also found in small numbers in Summit Lake. We observed them in small patches in shallow water along the shore, for example near the town beach and on the northeastern shore.



Figure 9. Stonewort (*Nitella* sp.) is shown above. It is a green alga that is rooted in the sediment. Photo by FEP

On the east shore near the island, FEP observed a small colony of a native stonewort species (*Nitella* sp.; Figure 9) growing in very shallow water. Stoneworts are rooted in the sediment and appear like submerged aquatic plants. However, based on their morphology and lack of true flowers, they are classified as algae.

On the east shore near the island, FEP also observed a net-shaped, free-floating green alga, a species of water net (*Hydrodictyon* sp.; Figure 10). It was the first time FEP had ever encountered this organism in Columbia County and little seems to be known about its distribution in our region and its interaction with other organisms.



Figure 10. Waternet (*Hydrodictyon* sp.) is a green alga that forms free-floating, net-like colonies. Photo by FEP

CONCLUSIONS

The aquatic vegetation in Summit Lake was dominated by the non-native, invasive curly-leaf pondweed (*P. crispus*) and seemed typical for a shallow, nutrient-rich, warm waterbody in the region. While this rapid assessment of the aquatic vegetation was designed to document the most abundant plants in Summit Lake, it almost certainly did not result in a complete species list of all aquatic plants present in the lake. Rarer species might well have been present and would require much more effort to be detected.

It is important to note that invasive plants can be transported from one waterbody to the next by recreational boats. Therefore, boats used on Summit Lake should be thoroughly washed before moving them to another waterbody.

Although invasive aquatic plants can impact the ecology of a waterbody, the abundance of dragonflies and damselflies observed at Summit Lake (see below) points to the fact that, even though the aquatic vegetation is largely composed of non-native species, it still functions to provide shelter for invertebrates.

Terrestrial and Wetland Vegetation

METHODS

The qualitative plant surveys of the terrestrial and wetland vegetation were conducted during seven visits to the study area. All the plants observed in the different habitats at the time of the visits were recorded. Habitats and select plants were also documented photographically. On April 7, FEP did a first reconnaissance of the access points on foot, exploring the eastern shore of the reservoir, the island, and the mouth of the Agawamuck. On May 20 and June 8, FEP surveyed the vegetation with a particular focus on spring flowers in the forests on the eastern shore and in the open and forested floodplain along the Agawamuck. On June 15 and July 28, FEP researchers kayaked on the reservoir and lower inlet to record not only the submerged and floating aquatic plants (see above), but also the wetland and terrestrial vegetation along the shore and on the island, including emergent aquatic plants. On August 26, they revisited the open floodplain along the Agawamuck to record the late-season herbaceous plants. On September 23, a final paddle on the reservoir allowed for the documentation of late-season herbaceous plants along the eastern shoreline. Based on botanical field observations, the FEP botanist distinguished ten habitat types in the study area (Figure 2), which are described below.

A plant list for Summit Lake and adjacent areas was compiled, following the taxonomic nomenclature and the determination of the species' native status in Weldy et al. (2018). When plants could not be immediately identified, standard botanical manuals, such as the *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* (Gleason & Cronquist, 1991) and *Flora Novae Angliae* (Haines, 2011) were consulted. The plant list, which is presented in Appendix 6, is organized by life form (aquatic plants, ferns, grasses, forbs, shrubs, trees, vines) and common name. The list also provides scientific names and indicates whether a plant is native or non-native according to Weldy et al. (2018), or invasive in New York State. Plants were classified as "invasive" if they were included in the "Capital/Mohawk PRISM Species Priority List" (2017), or if it is currently spreading aggressively in Columbia County, based on FEP's experience. The list also specifies the rarity of plants at the regional level, according to Kiviat and Stevens (2001) and at the local level, determined by the experience of FEP botanist Claudia Knab-Vispo. No NYS rare plants (Young, 2020) were documented within the study area by FEP and therefore NYS rarity is not specified in Appendix 6. Finally, the list indicates in which habitat(s) each plant species was observed in the study area in 2020.

The plant species richness in the study area was summarized by life form and habitat (Tables 2 & 3). An illustrated narrative was composed to describe the habitat types represented in the study area and some of their characteristic and noteworthy plants.

RESULTS

General Observations on the Flora

In addition to the submerged and floating aquatic plants found in Summit Lake, FEP documented 315 species of plants in the uplands and wetlands of the study area adjacent to the lake. The complete plant list is provided in Appendix 6.

By far, the most diverse group of plants in the study area were herbaceous plants. However, 78 species of trees and woody shrubs were also documented. Overall, 72% of the plant species were native to the region. All of the ferns and a high proportion of grasses and sedges were native. Of the non-native species documented, 35 are currently considered invasive (Table 2).

Table 2: A Summary of the plant species (including a few macroscopic algae) found in and around Summit Lake*

	Total #	% native	# invasive
Aquatic Plants*	11	64%	3
Ferns	9	100%	0
Grasses, Sedges, etc.	39	85%	3
Herbaceous Plants	178	67%	15
Shrubs	42	74%	9
Trees	36	78%	4
Vines	11	64%	2
ALL PLANT SPECIES	326	72%	36

Table 3: Comparison of plant species richness in the various habitats of the study area. For geographic location of habitats, please see Figure 2. For narrative descriptions of the habitats, please see below. The number of unique plant species refers to species that were found only in the respective habitat in the study area, but not in any of the other habitats in the study area.

		ALL Habitats		Lake Water	Lake Shore	Rocky Shores	Island	Lower Inlet	Open Floodplain	Shrub Swamp	Floodplain Forest	Upland Forest
Plant Species	# total	326		11	69	60	97	27	110	52	81	128
	% of total	100%		4%	21%	18%	30%	8%	34%	16%	25%	39%
	# native	236		7	46	53	58	16	65	36	62	99
	% native in habitat	72%		58%	67%	88%	60%	59%	59%	69%	77%	77%
	# unique native	109		4	9	14	19	1	13	2	16	31
# invasive	35		4	13	6	14	6	19	10	13	21	

The largest number of plant species was found in upland forest habitat (Figure 2; see narrative below and Appendix 6) and a high proportion of these species (77%) were native, including 31 unique native species not found in any of the other habitats in the study area. At the same time, upland forests also harbored 21 invasive species (Table 3, Appendix 6). The highest percentage of native plants was found in the rocky shore habitat (Figure 2; see narrative below and Appendix 6), which--in spite of its very small area--was home to 14 unique native species not found in any other habitat in the study area. While the species numbers presented in Table 3 are instructive, they only tell a part of the story. They do not provide any information about the relative abundance of the species found in each habitat.

Vegetation of the Lake Shore

The narrow band of vegetation found along the lake shore is determined by the substrate, incline, and management of the shoreline (Figure 11). Most of the shoreline is steep and covered by upland vegetation. However, wetland vegetation was observed in small areas on muddy sediment in quiet bays, in front of the town beach, and on the shore of the island. It included plants such as the native common arrowhead (*Sagittaria latifolia*), Allegheny monkey flower (*Mimulus ringens*), turtlehead (*Chelone glabra*), swamp milkweed (*Asclepias incarnata*), blue flag iris (*Iris versicolor*), and narrow-leaved cattail

(*Typha angustifolia*), as well as the invasive common reed (*Phragmites australis*). Wetland vegetation could also be found on logs that had fallen into the water and supported little “floating gardens”.



Figure 11. Examples of wetland vegetation found along the shore of Summit Lake are shown in the above images. A quiet bay in the southeastern corner of the lake has common arrowhead (*Sagittaria latifolia*) growing in the mud and several species of duckweeds floating on the water (top left). Common arrowhead (*Sagittaria latifolia*) and water chestnut (*Trapa natans*) form dense vegetation in front of the town beach (top right). A “floating garden” on a log features the sky-blue blossoms of water forget-me-not (*Myosotis scorpioides*; bottom left). A small colony of narrow-leaved cattail (*Typha angustifolia*) was observed in a corner on the northwestern shore of the lake (bottom right). Photos by FEP

A variety of native and non-native shrubs and trees, as well as some escaped ornamental plants were observed on the steep, mostly developed western and northern shore (Figure 12).



Figure 12. Above images show large patches of the invasive Japanese knotweed (*Reynoutria japonica*) on the western shore of Summit Lake (left) and a mix of native and non-native trees and shrubs, including the invasive multiflora rose (*Rosa multiflora*) with white blossoms on the northern shore of Summit Lake (right). Photos by FEP

Trees and shrubs typical of young upland forest (described below) grow along the eastern shore mostly north of the dock. Trees, shrubs, and herbaceous plants of more mature upland forest (also described below) are found along the southeastern shore (Figure 13).



Figure 13. The eastern shore of Summit Lake is undeveloped and the forest vegetation grows right up to the water. The northern part has young upland forest with many invasive trees and shrubs, such as tree-of-heaven (*Ailanthus altissima*) and black locust (*Robinia pseudoacacia*) shown to the left, while the southern part has more mature upland forest mostly composed of native trees as seen in the above image. Photos by FEP

Of particular interest were the small patches of rocky shore in the southeastern corner of Summit Lake and along the lower inlet. They supported a high diversity of native plants and several unique plant species, which were not found in any of the other habitats in the study area.



Figure 14. The Rocky Shore habitat in the southeastern corner of Summit Lake as seen from the water is shown above. Dutchman's breeches (*Dicentra cucullaria*), shown to the right, is a regionally uncommon spring ephemeral, which grows on this rocky shore, but was not seen anywhere else in the study area. Photos by FEP

The rocky shore in the southeastern corner (Figure 14) was the only place in the study area where FEP observed Dutchman's breeches (*Dicentra cucullaria*), fragrant sumac (*Rhus aromatica*), common juniper (*Juniperus communis*), round-leaved violet (*Viola rotundifolia*), Virginia waterleaf (*Hydrophyllum virginianum*), early saxifrage (*Micranthes virginiensis*), and smooth rock cress (*Boechera laevigata*). The rocky shore of the small creek flowing into Summit Lake in the southeastern corner was one of two places in the study area where FEP found long-spurred violets (*Viola rostrata*). A sizable population of the regionally-rare (Kiviat & Stevens, 2001) meadow bottle gentian (*Gentiana clausa*) was observed above the waterline along this steep southeastern rocky shore, as shown in Figure 15. Approximately 80 of these flowering plants were recorded along a stretch of 500 to 600 feet of the shoreline in late September.



Figure 15. Meadow bottle gentian (*Gentiana clausa*) in June (left) and in full bloom in late September (right); the flowers of this gentian never actually open, but strong pollinators, like bumblebees, are able to part the petals and reach the pollen and nectar inside. Photos by FEP

A small area of rocky shore north of the lower inlet was the only place in the study area where FEP observed common lowbush blueberry (*Vaccinium angustifolium*), deerberry (*Vaccinium stamineum*), hairy bush clover (*Lespedeza hirta*; Figure 16), and American pennyroyal (*Hedeoma pulegioides*).



Figure 16. Hairy bush clover (*Lespedeza hirta*) is an unusual native clover which was found in a single location within the study area. Photo by FEP

Vegetation of the Island

A gravelly Island is located in the delta of the Agawamuck in the northern part of Summit Lake (Figures 2 & 17). Its vegetation was composed of approximately 100 different species of plants, both native and non-native. Most of the island supported terrestrial vegetation typical of disturbed ground. However, in a narrow band along the island's shore, many of the wetland plants typical of the open floodplain along the Agawamuck (described below) were also observed.

The small trees growing on the island were mostly the invasive black locust (*Robinia pseudoacacia*) and the native sycamore (*Platanus occidentalis*).



Figure 17. The above image shows the island as seen from the lake facing northwest. Photo by FEP

The dominant herbaceous plant on the island was the invasive spotted knapweed (*Centaurea stoebe*), but it was accompanied by a variety of native and non-native species that are often found along roadsides and in vacant lots. Native plants observed only on the island and not elsewhere in the study area included: slender agalinis (*Agalinis tenuifolia*), false pimpernel (*Lindernia dubia*), spotted St. John's-wort (*Hypericum punctatum*), and rough-leaved goldenrod (*Solidago rugosa*).

Vegetation of the Lower Inlet

The lower inlet is an area of shallow, slow-flowing water at the mouth of the Agawamuck Creek (Figures 18 & 19). The bottom of the lower inlet is fine-textured (muddy) in the areas of still or slowest-flowing water, but gravelly along the main course of the creek. When the water is low, there are exposed mud flats and gravel bars/beaches in the lower inlet. Most of the shoreline of the inlet is flat ground, covered by a mix of wetland and upland plants typical of the open floodplain (described below).



Figure 18. The lower inlet is an area of still and shallow water near the mouth of the Agawamuck Creek. Photo by FEP



Figure 19. Much of the vegetation on the shores of the lower inlet is typical of the vegetation of the open floodplain, described below. Photo by FEP

FEP observed only four submerged or floating aquatic plant species in the shallow water (less than one foot deep) of the lower inlet: Canada waterweed (*E. canadensis*), common coontail (*C. demersum*), curly-leaf pondweed (*P. crispus*), and water chestnut (*T. natans*). All of these species, which were also present in Summit Lake, were observed only in small numbers in the inlet. Similarly, common arrowhead (*Sagittaria latifolia*), which formed dense (if small) colonies along the shore of Summit Lake, was growing as widely-spaced plants along the shore of the inlet. A native plant observed only in this part of the study area was clammy hedge hyssop (*Gratiola neglecta*; Figure 20), which grew profusely on the gravel bar downriver from the railroad bridge.

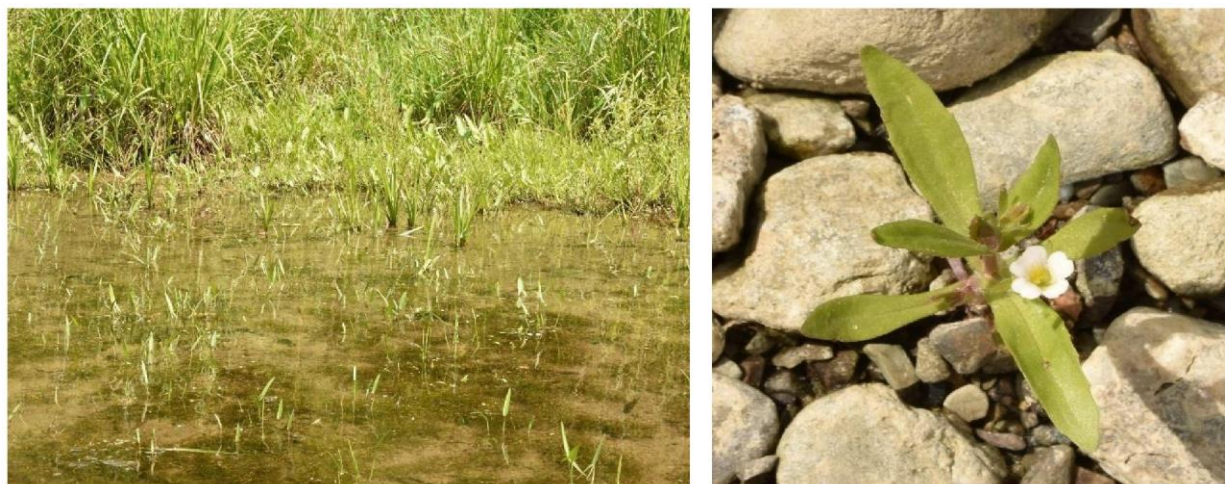


Figure 20. The shallow water of the lower inlet had few submerged aquatic plants and sparse emergent vegetation, composed of widely-spaced common arrowhead plants (*Sagittaria latifolia*; image on left). Clammy hedge hyssop (*Gratiola neglecta*; image on right) is an inconspicuous native plant of open wetlands. It was observed on a gravel bar downriver from the railroad bridge. Photos by FEP

Vegetation of the Open Floodplain

The open floodplain habitat in the study area is defined as the unforested, flat terrain along the lower Agawamuck Creek which is subject to occasional flooding by the creek (Figures 2 & 21). The open floodplain included gravel bars, meadows, shrublands, and savannah-like areas with widely-space trees. According to the *Columbia County Soil Survey* (1989), the soil underlying this habitat (which is classified as Fluvaquents-Udifluvents complex) ranges from “very poorly drained to excessively drained”. As such, it was not surprising that the resulting mosaic of micro-habitats supported a large number of plant species (Table 3). Although the entire area corresponding to the open floodplain has been mapped as a wetland (wetland map, Appendix 4), typical upland and typical wetland plant species were growing often side-by-side in this habitat. Most of its soils were well-drained and easily accessible by foot during the 2020 season.

The open floodplain was also home to a large number of invasive plants (Table 3, Figure 22).



Figure 21. This image pictures the Agawamuck Creek near its mouth (just before spreading out into the "lower inlet"), with open floodplain vegetation on both banks. Photo by FEP



*Figure 22. The open floodplain includes gravel bars and islands in the Agawamuck Creek. Note a small colony of invasive common reed (*Phragmites australis*) on the far shore. Photo by FEP*

The most common native tree observed in the open floodplain was sycamore (*P. occidentalis*; Figure 23). Other trees present included American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), and trembling aspen (*Populus tremuloides*). Occasionally, a non-native boxelder (*Acer negundo*) or an invasive black locust (*R. pseudoacacia*) tree was observed in this habitat. Shrubs were abundant and diverse in the open floodplain. Several species of native willows (*Salix* spp.) were joined by other native species, such as nannyberry (*Viburnum lentago*), smooth arrowwood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), dotted hawthorn (*Crataegus punctata*), and alders (*Alnus* spp.). Invasive Eurasian shrub honeysuckle (*Lonicera morrowii* and/or *L. x bella*) and multiflora rose (*Rosa multiflora*) were also present in higher elevations of the floodplain.



Figure 23. In spring, the widely-spaced, still leafless sycamore (*Platanus occidentalis*) trees in the open floodplain were easily identified by their white bark on the upper trunk and limbs. Photo by FEP

FEP observed extensive patches of the tall-growing, invasive Japanese knotweed (*Reynoutria japonica*; Figure 24) in the Open Floodplain.



Figure 24. In August, the invasive Japanese knotweed (*Reynoutria japonica*) was covered by thousands of small white flowers. Photos by FEP

Some meadows in the open floodplain were visually dominated by native ostrich fern (*Matteuccia struthiopteris*) and sensitive fern (*Onoclea sensibilis*), which were often mixed with the invasive dame's rocket (*Hesperis matronalis*) and garlic mustard (*Alliaria petiolata*; Figure 25).



Figure 26. Large areas of the open floodplain were dominated by the invasive reed canary grass (*Phalaris arundinacea*; above). The invasive mugwort (*Artemisia vulgaris*) was observed on gravel banks. It sometimes hosted the parasitic common dodder (*Cuscuta gronovii*), whose leafless twining stalks look like orange spaghetti and produce numerous small white flowers (right). Photos by FEP

Along the muddy edges of still water areas in the open floodplain, FEP observed American water plantain (*Alisma subcordatum*), a species of bur-reed (*Sparganium* sp.), water purslane (*Ludwigia palustris*), which are all native, as well as the non-native water forget-me-not (*Myosotis scorpioides*).

Other native plants typical of wet meadows were scattered throughout the meadows, shrublands, and along the shores of the open floodplain. These included common boneset (*Eupatorium perfoliatum*), blue vervain (*Verbena hastata*), purple-stemmed aster (*Symphotrichum puniceum*), spotted Joe-Pye weed (*Eutrochium maculatum*), smooth goldenrod (*Solidago gigantea*), and spotted jewelweed (*Impatiens capensis*; Figure 27). In addition, native plants typical of floodplain forest, such as false mermaid weed (*Floerkea proserpinacoides*), wood nettle (*Laportea canadensis*), and American stinging nettle (*Urtica gracilis*), were also observed throughout the open floodplain.



Figure 27. A mix of wetland plants grow along a shore in the open floodplain. In this image, the native common boneset (*Eupatorium perfoliatum*; white flowers), smooth goldenrod (*Solidago gigantea*; yellow flowers), and spotted Joe-Pye weed (*Eutrochium maculatum*; pink flowers) are joined by the invasive purple loosestrife (*Lythrum salicaria*; purple flowers). Photo by FEP

Vegetation of Shrub Swamp

A shrub swamp is an area of permanently saturated soil with low-growing, woody vegetation. A small shrub swamp is located on the northeastern shore of Summit Lake (Figure 2). Widely-spaced trees of the same species that were found in the open floodplain emerged above the shrubs in this habitat. The shrubs themselves were a mix of native alder species (*Alnus* spp.) and silky dogwood (*Cornus amomum*; Figure 28) with the invasive Eurasian shrub honeysuckle (*Lonicera morrowii* and/or *L. x bella*), multiflora rose (*Rosa multiflora*), and autumn olive (*Elaeagnus umbellata*). The invasive Japanese stiltgrass (*Microstegium vimineum*) and purple loosestrife (*Lythrum salicaria*) were mixed in with native and non-native herbaceous plants similar to those found in the open floodplain. The only unique native plant found in the shrub swamp habitat and nowhere else in the study area was marsh pennywort (*Hydrocotyle americana*).



Figure 28. In late summer, silky dogwood (*Cornus amomum*) is easily recognized by its metallic blue fruits. Photo by FEP

Vegetation of Floodplain Forest

According to the *Ecological Communities of New York State* (Edinger et al., 2014), floodplain forest is typically a hardwood forest that occurs on mineral soils on low terraces of river floodplains and river deltas. Although Edinger et al. (2014) state that “the composition of floodplain forests in New York State has not been studied in sufficient detail to characterize compositional variations...”, based on their studies of Columbia and Dutchess County floodplain forests (Knab-Vispo & Vispo, 2009; Knab-Vispo & Vispo, 2010) FEP proposes to distinguish at least between “ancient” and young floodplain forest.

The extent of ancient forests (floodplain forest as well as upland forest, see below) can be gleaned by comparing the forests visible in a recent and a historical aerial photo of the study area (Figure 29). Based on FEP’s experience in Columbia County, most extant forests that are also visible on the 1940s aerials, have not been cleared for agriculture for more than 150 years, if ever, and might be considered ancient. These ancient forests in our region are not necessarily composed of old trees and usually have been selectively logged, grazed, and otherwise used. Thus, they are definitely not “primary” or “virgin”

forests. However, ancient forests might be growing on soils that have never been homogenized by the plow and they seem to have less invasive plants and harbor more uncommon native plant species than young forests growing on former agricultural fields.

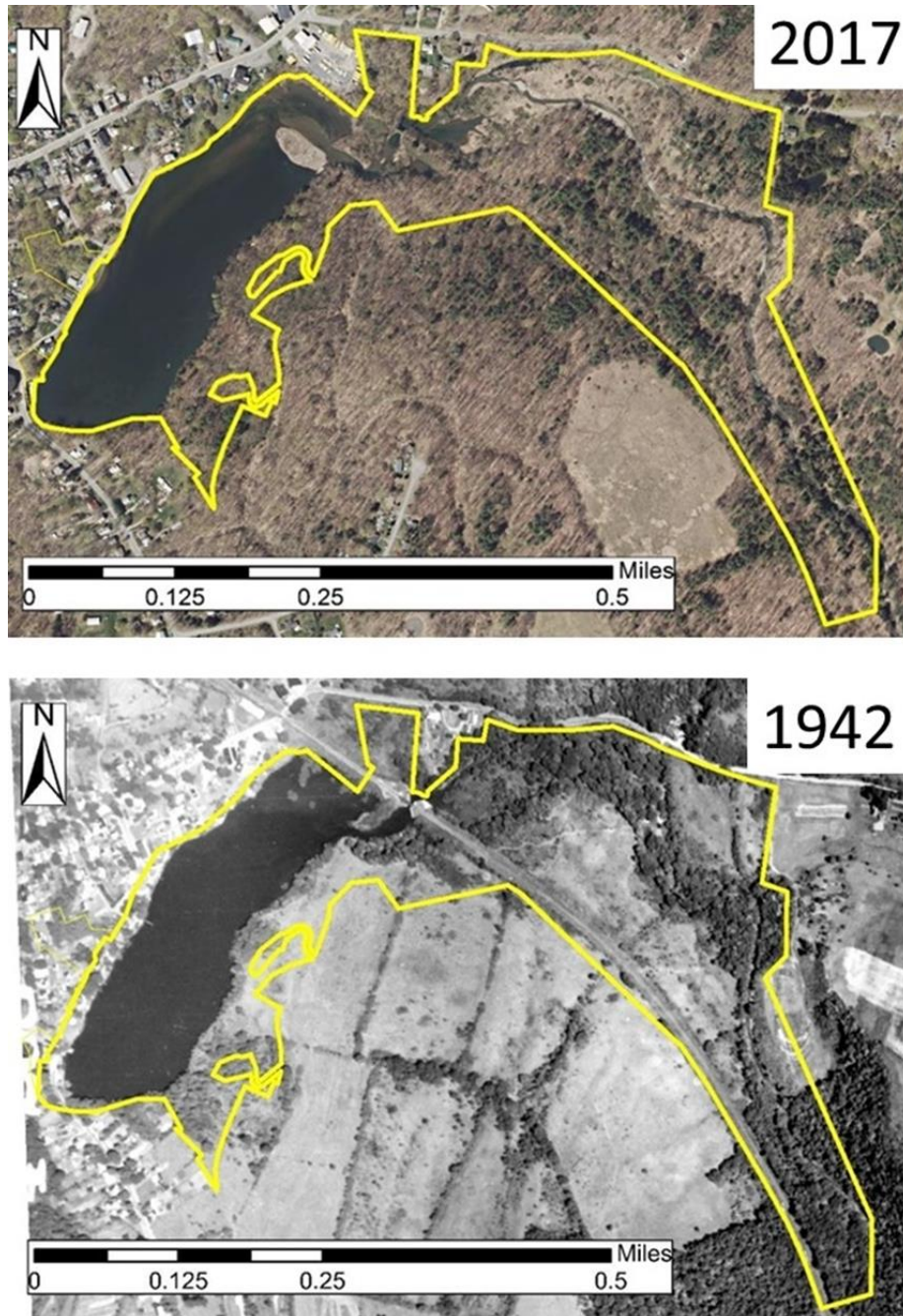


Figure 29. The study area is outlined on aerial images from 2017 (above) and 1942 (below). Fields appear in these images as homogeneous pink (above in 2017) or light grey (below in 1942) areas. In the 2017 image (above) taken during the season when deciduous trees had no leaves, the evergreen trees appear as dark green dots, while the trunks of deciduous trees create a diagonal pattern. In the black & white 1942 image (below), the woody vegetation (trees and shrubs with their leaves) appear dark-colored and show the texture of the canopy. Aerial imagery from NYS Clearing House and Soil and Water Conservation.

The ancient floodplain forest stands are colored dark bluegreen in the habitat map (Figure 2). One of these ancient floodplain forest stands in the study area was located in the southeastern corner of the study area on the high southern banks of the Agawamuck Creek. It appeared to get flooded only very infrequently (due to its elevation above the creek bed) and was noteworthy by its presence of hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*) trees (Figure 30). In Columbia County, FEP considers the presence of mature hemlock (*Tsuga canadensis*) and/or American beech (*Fagus grandifolia*) trees as a good indicator of ancient forests. This floodplain forest stand also had the most species-rich and visually most abundant native spring flowers of all habitats in the study area. The species observed included red trillium (*Trillium erectum*), partridge berry (*Mitchella repens*), two-leaved miterwort (*Mitella diphylla*), foamflower (*Tiarella cordifolia*), blue cohosh (*Caulophyllum thalictroides*), cut-leaved toothwort (*Cardamine concatenata*), broad-leaved toothwort (*Cardamine diphylla*), wild leek (*Allium tricoccum*; Figure 30), bloodroot (*Sanguinaria canadensis*), trout lily (*Erythronium americanum*), long-spurred violet (*Viola rostrata*; Figure 30), American dog violet (*Viola labradorica*), yellow wood violet (*Viola pubescens*), Canada mayflower (*Maianthemum canadense*), rue anemone (*Thalictrum thalictroides*), and wood anemone (*Anemone quinquefolia*). Typical floodplain forest indicator species (ref), such as ostrich fern (*Matteuccia struthiopteris*) and false mermaid weed (*Floerkea proserpinacoides*) were also present.

Another ancient Floodplain Forest stand, located on a somewhat lower elevation in the floodplain also on the southern bank of the Agawamuck Creek, was characterized by a canopy of sugar maple (*Acer saccharum*) trees, but had few shrubs, ferns, and spring flowers (Figure 31).



Figure 30. The image on the left shows an ancient floodplain forest stand with American beech (*Fagus grandifolia*) and hemlock (*Tsuga canadensis*) trees. This habitat also harbored wild leek (aka ramps; *Allium tricoccum*), whose fruits are pictured above, and long-spurred violet (*Viola rostrata*; below). Photos by FEP



Figure 31. This is another example of an ancient floodplain forest stand. It is characterized by a canopy of sugar maple (*Acer saccharum*) trees and a relatively open understory. Photo by FEP

Young stands of floodplain forest are colored light bluegreen in the habitat map (Figure 2). They were found in locations that were still farmed in 1942 (Figure 29), and possibly several decades later. These young floodplain forest stands (Figure 32) were composed of small trees of species which are able to colonize bare ground, such as black locust (*R. pseudoacacia*), bigtooth aspen (*Populus grandidentata*), red maple (*Acer rubrum*), and black birch (*Betula lenta*). In the understory, FEP observed a subset of the native plants seen in the ancient floodplain forest, and there were more invasive shrubs and herbaceous plants, especially garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis*) compared to the ancient floodplain forest.

However, some native plants, such as false hellebore (*Veratrum viride*) and common golden Alexanders (*Zizia aurea*), were observed only in these young stands of floodplain forest and nowhere else in the study area.



Figure 32: Young floodplain forest had smaller trees of different species than the ancient floodplain forest and more invasive herbaceous plants and shrubs. Photos by FEP

Vegetation of Upland Forest

Most of the upland forest (located outside the floodplain of the Agawamuck) is relatively young forest, which established itself within the last 80 years on former farmland or other completely cleared ground in the study area (Figures 2 & 29). By comparing the 1942 and 2017 aerial photos in Figure 29, one can locate some ancient upland forest stands, which likely have been in continuous tree cover since before the 1940s—and probably much longer—because their steepness or rocky soil made them unsuitable for agriculture. These areas are colored green in the habitat map (Figure 2). As explained above, it is important to note that although these *forest* stands might be ancient, the individual *trees* are not necessarily very old. The younger upland forests, which have colonized former agricultural land within the last 80 years, are colored orange in the habitat map (Figure 2).

FEP observed a larger number of plant species in the upland forest (young and ancient combined) than in any of the other habitat types in the study area (Table 3), and most of the species found were native species. However, many non-native invasive species were also present in this habitat, especially in the younger forest stands, where they appeared to be much more common than in the ancient forest stands.

The native trees observed in the upland forest were mainly sugar maple (*A. saccharum*), red maple (*A. rubrum*), white ash (*Fraxinus americana*), American elm (*U. americana*), red oak (*Quercus rubra*), shagbark hickory (*Carya ovata*), hop-hornbeam (*Ostrya virginiana*), black cherry (*Prunus serotina*) and white pine (*Pinus strobus*). However, while the ancient upland forest stands were mostly composed of these native trees, all the young upland forest stands also had many invasive black locust (*R. pseudoacacia*) trees and some stands also had a lot of invasive tree-of-heaven (*Ailanthus altissima*). The native black cherry (*Prunus serotina*) and white pine (*Pinus strobus*) also appeared to be more common in the young upland forest stands.

The immediately obvious difference between ancient and young upland forest stands was the density of shrubs and vines. The young upland forest was at times almost impenetrable with its thick growth of invasive Eurasian shrub honeysuckle (*Lonicera morowii* and/or *L. x bella*; Figure 33), which was accompanied by a smattering of other invasive shrubs, such as multiflora rose (*Rosa multiflora*), privet (*Ligustrum* sp.), common buckthorn (*Rhamnus cathartica*), autumn olive (*Elaeagnus umbellata*), winged burningbush (*Euonymus alatus*), and Japanese barberry (*Berberis thunbergii*). Some native shrubs, such as gray dogwood (*Cornus racemosa*), silky dogwood (*Cornus amomum*), red and black raspberries (*Rubus idaeus* and *R. occidentalis*), Allegheny blackberry (*Rubus allegheniensis*), and highbush blueberry (*Vaccinium corymbosum*) also had been able to colonize the young upland forest stands in small numbers.

The vines in the young upland forest stands were a mix of native species, such as grapes (*Vitis* sp.), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*) and the invasive Oriental bittersweet (*Celastrus orbiculatus*). The ground flora in the young upland forest stands was dense and rich in species, both non-native and native. For example, the native Jack-in-the-pulpit (*Arisaema triphyllum*) was not uncommon in this habitat. Particularly common was the invasive garlic mustard (*Alliaria petiolata*). A lesser-known, but quickly spreading invasive, bushy bittercress (*Cardamine impatiens*; Figure 34), was also seen in several places in the young upland forest.

In contrast, the ancient upland forest stands had very few invasive trees, hardly any vines, and an open understory that was easy to walk through. Some of these stands had large lawns of Pennsylvania sedge (*Carex pensylvanica*; Figures 35, 36, & 37). While invasive plants were not completely absent, they seemed much less abundant in the ancient than in the young upland forest stands.



Figure 33. Examples of young upland forest stands in the study area. White pine (*Pinus strobus*) dominates the stand pictured on the left and black locust (*Robinia pseudoacacia*) and tree-of-heaven (*Ailanthus altissima*) are dominant in the stand pictured on the right. Both of these young upland forest stands have a dense understory of Eurasian shrub honeysuckle (*Lonicera morrowii* and/or *L. x bella*) and other shrubs. Photos by FEP



Figure 34. Bushy bittercress (*Cardamine impatiens*), an invasive species, was observed in several young upland forest stands in the study area. Photo by FEP



*Figure 35. This image shows a stand of ancient upland forest with small trees, but few invasives and an extensive lawn of Pennsylvania sedge (*Carex pensylvanica*). The stone wall separates this potentially ancient forest from the young, post-agricultural forest from which the photo was taken. Photo by FEP*



Figure 36. This image shows another area of ancient upland forest on steep, rocky ground. While the trees are not large, the lack of invasive species is a sign that this forest has not recently been opened. Photo by FEP



Figure 37. This stand of potentially ancient upland forest has a canopy of sugar maple (*Acer saccharum*) trees, a lawn of Pennsylvania sedge (*Carex pensylvanica*) and very few invasive plants. Photo by FEP

Vegetation of the Former Railroad

An abandoned railroad traverses the study area (Figure 2). In 2020 it was recognizable as a narrow band of mostly herbaceous and shrubby vegetation within the forest matrix. This sunny habitat harbored a mix of native and non-native plants characteristic of meadows, forest edges, and interior forest, including some young trees colonizing it from the adjacent forest. It also supported several invasive species that were present in most habitats of the study area, as well as some, including autumn olive (*Eleagnus umbellata*), black swallowwort (*Vincetoxicum nigrum*), and bushy bittercress (*Cardamine impatiens*), which seemed to be more abundant here than in other, more shaded habitats.

CONCLUSIONS

The vegetation of the uplands and wetlands in the study area was composed of native and non-native plants and included a large number (and in some places high densities) of invasive plant species. This is not surprising, given the vicinity of residential areas and the long history of human activity on most of the land. Significant portions of the current upland and floodplain forest used to be open fields. The young forests that have grown up on former fields within the last 80 years structurally tended to have more shrubs and vines than neighboring ancient forest remnants. Invasive plant species were also more prominent in the young forest stands. The former railroad which traverses the study area might serve as a corridor for invasive plant species to move into the study area and to colonize the adjacent forest.

That said, the botanical surveys did locate small patches of noteworthy plant communities that were largely composed of native plants and harbored species not found anywhere else in the study area. Some of these species are considered rare throughout the Hudson Valley or at least in Columbia County. These noteworthy plant communities were all located in ancient forest remnants. They occurred along sections of rocky shore (both of Summit Lake and the lower inlet of Agawamuck Creek) and in a small stand of ancient floodplain forest in the southeastern corner of the study area.

Birds

METHODS

Qualitative bird surveys in the study area were conducted on May 14, May 15, June 17, June 18, October 27, November 10, and December 10, 2020, and February 26, 2021. These particular dates were chosen so that FEP could detect bird species during songbird migration (April–May), the breeding season for summer migrants (May–July), the autumn waterfowl migration (September–December) and winter.

In terrestrial habitats, surveys entailed a single observer proficient at identifying birds to species by sight and sound (FEP field technician Kendrick Fowler) walking a path through the different units of the study area (Figure 2) and documenting bird species present within each unit. To detect birds on, over or beside the lake, the observer surveyed from a fixed vantage point overlooking the lake. These were not systematic surveys like point counts; however, results from these surveys still offer insight into the bird community of the study area and its units (Appendix 7).

Incidental observations on bird activity throughout the year while performing fieldwork for other components of the study were also used to describe the bird community within the study area. Additionally, FEP examined lists of birds reported from the study area on eBird and contacted birders in the community to request information about bird activity they had observed around the lake. Information gathered from those community sources yielded records of a number of bird species not detected during FEP's fieldwork. Those community sourced data are shown in Appendix 7. While eBird is driven by community science data, every record obtained by eBird passes through a vigorous evaluation process and therefore offers accurate data (Horns et al., 2018).

The national conservation status of bird species documented at the site was determined using 2016 State of the Birds Watch List, 2016 Partners in Flight Watch List, and 2016 USFWS Birds of Conservation Concern list. NYS conservation status was described using NYNHP (2017) and other NYS government resources (see Appendix 7).

RESULTS

Sixty-eight bird species were documented by FEP within the study area (Appendix 7). An additional 25 species not detected during FEP surveys were reported to eBird or reported to FEP by birders in the community, bringing the total number of species recorded in the study area to 93. Prior to FEP's surveys, a total of 60 bird species were listed from Summit Lake on eBird, so work by FEP increased the number of species reported from the site by 55%.



Figure 38. Gray catbird (*Dumetella carolinensis*) is a common species at the study area. Usually found skulking among shrubbery, this species is often heard before it is seen. Its distinctive call resembles a cat's meow. Photo by FEP

Seven of the bird species documented at Summit Lake showed signs of breeding activity: Canada goose (*Branta canadensis*), wood duck (*Aix sponsa*), gray catbird (*Dumetella carolinensis*), wood thrush (*Hylocichla mustelina*), eastern towhee (*Pipilo erythrophthalmus*), Louisiana waterthrush (*Parkesia motacilla*), and northern cardinal (*Cardinalis cardinalis*). We also located what may have been the nest of a broad-winged hawk (*Buteo platypterus*) near the extreme southwestern corner of the study area, but we were not able to confirm that suspicion with certainty. (We noticed whitewash at the base of a large tree that had a nest-like structure in its branches, and an agitated broad-winged hawk appeared when we approached the tree to inspect it more closely.) Based on the behavior of the Canada goose (*B. canadensis*) pair, we believe that they nested on the island. The eastern towhee (*Pipilo erythrophthalmus*) nested along the side of the rail trail in a relatively open area of the upland forest. Breeding was confirmed in the other species when we observed adult birds carrying food and/or

accompanying immatures that had left the nest. One of the birds in which we confirmed breeding, the wood thrush (*H. mustelina*), is a species of conservation concern both nationally and regionally (see Appendix 7).

Of the habitat types present around Summit Lake, we detected the greatest number of bird species in the upland forests. That finding is not surprising, as upland forest covers a large proportion of the study area and, correspondingly, FEP spent more time surveying that habitat type than any of the others; it is a well-established fact that the number of species detected during biodiversity inventories tends to increase with both the size of the area surveyed and with search effort. However, another reason for this finding: many bird species in the region require, or are associated with, woodland habitats, including some of our most colorful species, such as orioles (*Icterus* spp.), new world warblers (Parulidae), and members of the cardinal family (Cardinalidae), as well as some threatened species such as the aforementioned wood thrush (*H. mustelina*) and the American woodcock (*Scolopax minor*).

The habitats with the second and third greatest number of bird species were the floodplain forest and open floodplain, respectively, for reasons similar to those discussed for the upland forest: they cover relatively large portions of the study area, and forests are generally good habitats for various bird species in this region. Almost all of the species we encountered in those two habitats also occurred in the upland forest, but we detected one of the birds in which we confirmed breeding activity, the Louisiana waterthrush (*P. motacilla*), only in the floodplain forest. As its name implies, the Louisiana waterthrush (*P. motacilla*) prefers to live near water—specifically, near streams in forests—so the floodplain forest represents the best habitat for that species in the area around Summit Lake. Because of its unique habitat requirements, the presence of Louisiana waterthrush (*P. motacilla*) might indicate good quality stream habitat.

Summit Lake itself attracted a number of species of waterfowl, wading birds, and other birds that associate with water. In addition to the aforementioned Canada geese (*B. canadensis*) and wood ducks (*A. sponsa*), the assemblage of waterfowl we observed using the lake included mallard (*Anas platyrhynchos*), common merganser (*Mergus merganser*), and hooded merganser (*Lophodytes cucullatus*). We found relatively few species of waterfowl during the autumn migration, but observed large numbers of Canada geese (*B. canadensis*) (at least 269 individuals) roosting on the lake during an FEP survey on December 10.



Figure 39. Many birds in the new world warbler family, such as this black-throated blue warbler (*Setophaga caerulescens*), can only be found in forest habitats. Photo by FEP

Reports on eBird suggest that the greatest levels of waterfowl diversity at the site might occur during late winter or early spring (February– April), but we did not conduct thorough surveys at that time of year. Wading birds using the lake included solitary sandpiper (*Tringa solitaria*), spotted sandpiper (*Actitis macularius*), and great blue heron (*Ardea herodias*). The former species occurs only during migration. Two other waders that visit our area, but do not breed here, the greater yellowlegs (*Tringa melanoleuca*) and great egret (*Ardea alba*), have been reported from the lake by community members, but are not commonly seen and may not appear every year. The region’s two fish-hunting raptors, osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*), were both occasional visitors at the lake, as was (according to community reports) the red-shouldered hawk (*Buteo lineatus*)—a species that, although not a piscivore, often hunts near aquatic habitats and incorporates aquatic prey such as frogs and crayfish into its broad diet (Audubon, n.d.). Another fish-hunting bird, the belted kingfisher (*Megasceryle alcyon*), was seen regularly throughout the spring, summer, and autumn.

CONCLUSIONS

Summit Lake and its surrounding areas provide habitat for a variety of both transient and breeding birds, including species that are habitat-sensitive or of conservation concern. FEP surveys substantially increased the number of bird species known from the lake and its surrounding areas. While a total of 93 species is somewhat lower than that reported at popular birding sites in Columbia County (many of which boast lists of more than 120 species according to eBird), the number of species detected (68) during FEP surveys is normal in our region given the level of search effort dedicated during this study, based on the experience of the researcher heading FEP's bird surveys. More species could probably be found if the site were frequented by birders or if more resources were committed to surveying its birds. Many bird species that are known from similar locations in Columbia County, but not from Summit Lake probably occur at the site as transients—species that visit only temporarily, such as during migration or while foraging. Detecting such species is simply a matter of vigilance: someone needs to be looking for birds when they happen to appear. Perhaps this study will encourage more birders to visit Summit Lake and report their findings publicly, building the body of knowledge about the site's bird fauna over time.

The completion of the Harlem Valley Rail Trail could also make Summit Lake more attractive to birders, as the trail is planned to pass through parts of the site that provide good opportunities for viewing birds but are unfriendly to access in their current state of development. However, both the construction of the rail trail and the human and pet traffic that it will bring could alter the way birds utilize the site.



Figure 40. Bald eagle (Haliaeetus leucocephalus) is an occasional visitor at Summit Lake year-round. Photo by FEP

Insects: Dragonflies, Damselflies and Butterflies

METHODS

Field visits were made by FEP staff on June 17 and 23, July 10 and 31, and August 18 to conduct qualitative surveys for dragonflies and damselflies (Odonata) and butterflies (non-moth Lepidoptera) within the study area. Surveys occurred on the lake, along its shores, along the Agawamuck Creek and in the open floodplain habitat within the study area. All butterflies, dragonflies and damselflies encountered were identified to species, genus, or broader taxonomic level by sight, or by catching them with an insect net for closer viewing/photographing. When necessary, we consulted, *A Field Guide to the Dragonflies and Damselflies of Massachusetts* (Nikula et al., 2007) and *Kaufman Field Guide to Butterflies of North America* (Brock & Kaufman, 2006) for to aid in species identification.

NYS conservation status of insect species documented was determined by consulting NYNHP Rare Animal Status List (2017). Regional population trends of butterfly species documented by FEP were described based on various sources, including inspection of regional historical literature; recent trends were derived largely from Stichter (2015) and *We Butterfly* (We Butterfly, n.d.). Remarks in this report regarding odonate ecology and usefulness as indicators were largely based on Nikula et al. (2007) and Paulson (2012). Moreover, FEP drew upon their staff's experience with these insect groups in writing this report; the organization has been conducting butterfly and odonate surveys in Columbia County since 2005 (Vispo, 2018; HVFEP, 2019).

RESULTS

Dragonflies and Damselflies

Dragonflies and damselflies can be useful environmental indicators. In their juvenile (nymph) form, odonates are aquatic, and the different species require a variety of aquatic conditions (Nikula et al., 2007). The odonate community composition is influenced by such factors as the amount of water flow, aquatic vegetation, sedimentation, and fish predation (Nikula et al., 2007). The adult community of dragonflies and damselflies (which are generally far more conspicuous than their nymphs) can therefore reflect the aquatic environments of a site.



Figure 31. A variable dancer (*Argia fumipennis*) from the study area; the species is a damselfly—a group of small and slender cousins of the dragonflies. The males of this species, shown here, are colored a distinctive purple. Photo by FEP

FEP documented 26 species of dragonflies and damselflies within the study area (Table 4). All species documented are native to the region. Odonate abundance was highest over/beside the lake, along the Agawamuck Creek and in the open floodplains, based on surveys by FEP. Adult odonates generally feed on other insects, and so aquatic habitats offer not only nurseries for the aquatic nymphs but also, given their frequent abundance of flying insects, good adult foraging grounds. Mating also usually occurs near the same waters where the eggs will be deposited. None of the odonates documented appear on the NYNHP's list of rare animals (2017). However, several of the species documented are considered by FEP to be rare in Columbia County, NY (see Table 4).

Nineteen species of odonates found in the study area are dragonflies; a majority of them are members of the skimmer family (Libellulidae). Skimmers are a diverse group of more than 1,000 species worldwide and about 50 species in the region. They use a variety of waters as nymph habitat, and so are often considered generalists. Nonetheless, many skimmer species seem to prefer weedy ponds and lakes, such as Summit Lake. At regional wetlands, they are often the most abundant kind of dragonfly (Nikula et al., 2007). The common whitetail (*Plathemis lydia*), a skimmer, was one of the most abundant dragonfly species at the site during surveys. The males of this species stand out with their bright white abdomens and dark wing markings. Another skimmer species documented was the autumn meadowhawk (*Sympetrum vicinum*; Figure 42); the red colored dragonfly with light legs uses well-vegetated waters as nymph habitat and is considered rare in Columbia County by FEP.



Figure 42. A perched autumn meadowhawk (*Sympetrum vicinum*) at the study area; the species is associated with well vegetated waters. Photo by FEP

Emeralds (Corduliidae), darners (Aeshnidae), and clubtails (Gomphidae) are other dragonfly families documented at the site. Some species in these families are more specialized in terms of their nymph habitat requirements than skimmers tend to be. Compared to the skimmers, a higher proportion of each of these families' species are of conservation concern in our region (NYNHP, 2017). Clubtails documented included the lily pad clubtail (*Arigomorphus furcifer*, fig. 43) and the unicorn clubtail (*A. villosipes*), two species that we only occasionally see in Columbia County. The former favors well-vegetated still or slow waters, while the latter can occur in a range of pristine and impacted ponds and lakes.

The most notable darter found, the fawn darter (*Boyeria vinosa*; Figure 44), is a distinctive brownish dragonfly that uses wooded streams. Unlike most of our other dragonflies, this species seems to prefer shaded areas and is often active relatively early and late in the day when males can be seen patrolling shaded streams and females ovipositing (egg laying) into submerged decaying wood or aquatic plants (Nikula et al., 2007). The eyes of adults are especially large for seeing in their relatively low-light habitat (Munroe, 2013). A single adult fawn darter was documented along a forested section of the Agawamuck Creek upstream from Summit Lake.



Figure 43. A lily pad clubtail (*Arigomorphus furcifer*) at the study area; the species' rusty-color tipped abdomen and turquoise eyes are fairly distinctive. Photo by FEP

Table 4. Dragonfly and damselfly species documented in the study area, including their family, scientific and common name, nymph habitat, and apparent abundance in Columbia County, NY (based on HVFEP, 2021).

	Family	Common Name	Scientific Name	Nymph Habitat	Abundance
Dragonflies	Aeshnidae	Black-tipped darner	<i>Aeshna tuberculifera</i>	Weedy ponds, bogs	Uncommon
	Aeshnidae	Common green darner	<i>Anax junius</i>	Still water, various	Common
	Aeshnidae	Fawn darner	<i>Boyeria vinosa</i>	Forested streams	Uncommon
	Corduliidae	Common baskettail	<i>Epitheca cynosura</i>	Still water, various	Common
	Corduliidae	Prince baskettail	<i>Epitheca princeps</i>	Ponds, lakes, slow streams	Uncommon
	Gomphidae	Lancet clubtail	<i>Phanogomphus exilis</i>	Ponds, lakes	Uncommon
	Gomphidae	Lilypad clubtail	<i>Arigomphus furcifer</i>	Weedy ponds, lakes	Uncommon
	Gomphidae	Unicorn clubtail	<i>Arigomphus villosipes</i>	Muddy ponds/lakes/streams	Rare
	Libellulidae	Black saddlebags	<i>Tramea lacerata</i>	Ponds, pools	Common
	Libellulidae	Blue dasher	<i>Pachydiplax longipennis</i>	Still water, various	Common
	Libellulidae	Calico Pennant	<i>Celithemis elisa</i>	Weedy ponds, lakes	Uncommon
	Libellulidae	Common whitetail	<i>Plathemis lydia</i>	Various	Common
	Libellulidae	Eastern amberwing	<i>Perithemis tenera</i>	Ponds, lakes	Common
	Libellulidae	Eastern pondhawk	<i>Erythemis simplicicollis</i>	Ponds, lakes	Common
	Libellulidae	Halloween pennant	<i>Celithemis eponina</i>	Still water, various	Common
	Libellulidae	Autumn meadowhawk	<i>Sympetrum vicinum</i>	Well-vegetated still-water near forest	Rare
	Libellulidae	Slatey skimmer	<i>Libellula incesta</i>	Ponds, slow streams	Common
	Libellulidae	Twelve-spotted skimmer	<i>Libellula pulchella</i>	Ponds, lakes	Common
Libellulidae	Widow skimmer	<i>Libellula luctuosa</i>	Ponds, lakes	Common	
Damselflies	Calopterygidae	Ebony jewelwing	<i>Calopteryx maculata</i>	Forested streams	Common
	Coenagrionidae	Eastern forktail	<i>Ischnura verticalis</i>	Weedy ponds, wetlands	Common
	Coenagrionidae	Fragile forktail	<i>Ischnura posita</i>	Weedy ponds, wetlands	Common
	Coenagrionidae	Orange bluet	<i>Enallagma signatum</i>	Still water, various	Common
	Coenagrionidae	Skimming bluet	<i>Enallagma geminatum</i>	Weedy ponds, slow streams	Uncommon
	Coenagrionidae	Variable dancer	<i>Argia fumipennis</i>	Weedy ponds/streams	Common
	Lestidae	Amber-winged spreadwing	<i>Lestes eurinus</i>	Still water, various	Uncommon



Figure 44. A fawn darner (*Boyeria vinosa*) from the study area; the brown dragonfly sticks to the shadows near wooded streams and tends to only fly in the late afternoon. Photo by FEP

Seven damselfly species from three families were documented at the site. Damselflies are cousins of dragonflies that are more slender-bodied and tend to be smaller overall. Most damselflies tend to hold their wings together behind their back when at rest. While both dragonflies and damselflies belong to the order Odonata, damselflies are in the suborder Zygoptera while dragonflies belong to suborder Anisoptera.

Most damselfly species documented were narrow-winged damselflies (Coenagrionidae), which generally are dwellers of well-vegetated ponds and wetlands (Nikula et al., 2007). Spread-winged damselflies (Lestidae) documented at the site included the amber-winged spreadwing (*Lestes eurinus*; Figure 45); the species is associated with ponds and bogs that are fishless (Nikula et al., 2007). One broad-winged damselfly (Calopterygidae) species found at the site was the ebony jewelwing (*Calopteryx maculate*; Figure 45). The ebony jewelwing (*C. maculate*) can be relatively common along shady streams with intermittent rapids, and it's distinctive given its all-dark wings and iridescent green bodies. Unlike the other damselflies of the site that use still water, the habitat of the ebony jewelwing is centered around streams and rivers, especially small forested streams having intermittent rapids—like the Agawamuck Creek.



Figure 45. An ebony jewelwing (*Calopteryx maculata*; left) and amber-winged spreadwing (*Lestes eurinus*; right) from the study area; the two damsel fly species belong to different families and have different habitat: the ebony Jewelwing (*C. maculata*) uses forested streams while the amber-winged Spreadwing (*L. eurinus*) uses still water, especially those without fish. Photos by FEP

Butterflies

Butterflies are one of the most familiar insect groups. The monarch (*Danaus plexippus*), with its epic migration and incredible conservation challenges, has captured the attention of many, from researchers to the general public. Other butterfly species in the region have their own interesting life stories and conservation challenges. In addition to sometimes being pollinators, butterflies can be useful indicators of the botanical community of a place. This is because the feeding behavior of a species' caterpillar is often limited to one or a few plant species.

Thirteen species from five families of butterflies were documented in the study area (Table 5). All but one species documented are native to the region, and none are of conservation concern in NYS (NYNHP, 2017). Of the species observed, the viceroy (*Limenitis archippus*) may be experiencing regional declines (Stichter, 2015; We Butterfly, n.d.); however, we still see them regularly in Columbia County.

The open floodplains, with their abundant wildflowers, were commonly used by butterflies in the study area. Goldenrods (*Solidago* spp.), spotted joe-pye weed (*E. maculatum*) and other flowers within this floodplain offer food for various adult butterflies and, in some cases, for caterpillars, such as the aster-feeding larvae of the pearl crescent (*Phyciodes tharos*).

Like many other animal groups, butterfly habitats are often formed from a mosaic of landcover types. For example, the caterpillars of eastern tiger swallowtail (*Papilio glaucus*; Figure 48) feed on various forest hardwoods, but then its adults spend much of their lives in more open spaces where its preferred flowers can be found for nectaring. The existing patchwork of floodplain, field and forest is thus likely to be important for maintaining the site's butterfly populations.



Figure 46. A viceroy (*Limenitis archippus*) from the site; the yellow arrow points to the black bar that is absent on the monarch (*D. plexippus*). Photo by FEP

The viceroy (*Limenitis archippus*), is a mimic of the monarch (*D. plexippus*). The species is associated with wetlands, where its caterpillar food plant, willows (*Salix* spp.), can be found. While visually very similar to the monarch (*D. plexippus*), the viceroy (*Limenitis archippus*) has a distinctive black bar on its hind wings (see arrow in Figure 46). Additionally, the viceroy (*L. archippus*) is often smaller and a little quicker in flight than the monarch (*D. plexippus*). It is non-migratory, overwintering in the area as a caterpillar.

The silver spotted skipper (*Epargyreus clarus*; Figure 47) was one of the most common species at the site. Skippers (family Hesperiiidae) are often stocky and fast-flying; they tend to hold their forewings together behind their backs and are generally small butterflies. The silver-spotted skipper (*E. clarus*), however, is fairly large (wingspan up to 6.5cm). The species' caterpillar feeds on black locust (*Robinia pseudoacacia*) and other legumes. Not only does it stand apart from other regional skipper species in size, the species also has distinctive white and orange wing markings when seen from below (as in Figure 47).

A second, smaller skipper, Peck's skipper (*Polites peckius*; Figure 47), was also documented. Its caterpillars feed on grasses, and adults can be common in pastures and other open areas where grasses are present. They can be remarkably fast, making them difficult to follow with the eye. The Peck's skipper (*P. peckius*) is one of many similar looking, quick flying skipper species in the region. However, the light colored 'key hole' on its hindwing (when seen from below, as in Figure 47) is distinctive.

The most abundant butterfly species observed at the site was the cabbage white (*Pieris rapae*; Figure 47). This non-native species is abundant in much of our region during summer months and can be especially numerous on farms. Their caterpillars feed on wild and cultivated plants in the mustard family (Brassicaceae), and is sometimes considered a pest on regional farms. However, children and adults alike (especially non-farmers) probably enjoy the company of the white butterfly as it visits flowers for nectar feeding (the caterpillars feed on mustards; the adults eat only nectar). The cabbage white (*P. rapae*) was accidentally introduced to North America in the 1860s and has since expanded its range across much of the continent (Cech & Tudor, 2007).



Figure 47. A Peck's skipper (*Polites peckius*) perched on grass in the open floodplain (top right); a silver-spotted skipper (*Epagyreus clarus*) on native spotted joe-pye weed (*Eutrochium maculatum*; bottom right); and a cabbage white (*Pieris rapae*), a non-native and the site's most abundant butterfly, feeding on non-native and invasive purple loosestrife (*Lythrum salicaria*, left). Photos by FEP



Figure 48. An eastern tiger swallowtail (*Papilio glaucus*) in the open floodplain. Photo by FEP

Table 5: Butterflies documented around Summit Lake in 2020; an Asterisk indicates the species is non-native. Regional population trend was described using Stitcher (2015) and We Butterfly (n.d.).

Family	Common Name	Scientific Name	Host Plant	Regional Population Trend
Hesperiidae	Least skipper	<i>Ancyloxypha numitor</i>	Grasses	Stable
Hesperiidae	Peck's skipper	<i>Polites peckius</i>	Grasses	Possible slight decline
Hesperiidae	Silver-spotted skipper	<i>Epargyreus clarus</i>	Legumes	Stable
Lycaenidae	Gray hairstreak	<i>Strymon melinus</i>	Various	Stable
Nymphalidae	Common ringlet	<i>Coenonympha tullia</i>	Grasses	Stable
Nymphalidae	Eastern comma	<i>Polygonia comma</i>	Nettles, Elms, Hops	Increase
Nymphalidae	Great spangled fritillary	<i>Speyeria cybele</i>	Violets	Stable
Nymphalidae	Monarch	<i>Danaus plexippus</i>	Milkweeds	Stable
Nymphalidae	Pearl crescent	<i>Phyciodes tharos</i>	Asters	Stable
Nymphalidae	Viceroy	<i>Limenitis archippus</i>	Willow, Poplar, Cottonwood	Apparent decline
Papilionidae	Eastern tiger swallowtail	<i>Papilio glaucus</i>	Cherry, Tuliptree, others	Stable
Pieridae	Cabbage white*	<i>Pieris rapae</i> *	Mustards	Stable
Pieridae	Clouded sulphur	<i>Colias philodice</i>	Legumes	Stable

CONCLUSIONS

Butterflies and odonates are conspicuous and beautiful insects that also have value as environmental indicators. With their ability to catch the interest of the general public, these taxa also help introduce people to the beauty and complexity of regional insect life.

The various aquatic environments of the site offer important habitat for local populations of dragonflies and damselflies. It is likely that any change in the site's aquatic habitats might cause changes in the odonate community. For example, aquatic vegetation eradication would likely have a large and negative impact on several of the odonate species observed. Conversely, efforts to reduce sedimentation and other contamination in the Agawamuck might favor the arrival of additional, as-yet-undetected, stream-favoring dragonflies.

For butterflies, while no particularly unusual species were documented, the site offers a beautiful variety of species. Like dragonflies, butterflies may require different kinds of habitats during their lives. The mosaic of natural areas created by Summit Lake and surrounding meadows, wetlands, and forests support the complex habitat needs of different local butterfly populations. The open floodplain, with its abundance and variety of floral resources, offers great foraging opportunities to different butterflies—the place was teeming with butterfly life during summer surveys. Meanwhile, the forested parts of the site may have helped maintain several species whose caterpillars feed on woody plants. The preservation of this combination of habitats may help maintain local butterfly populations into the future.

Acknowledgements

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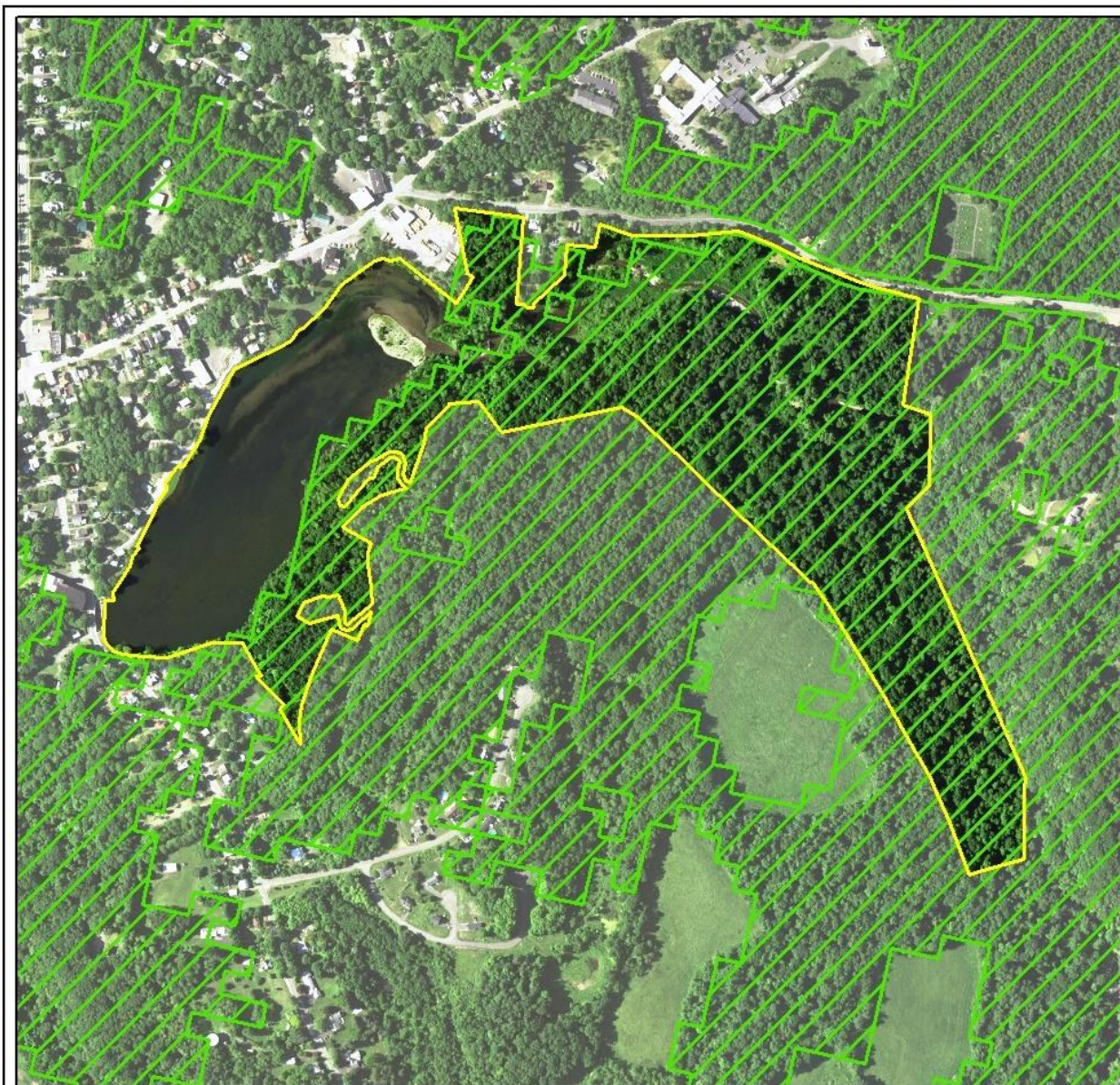
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Appendices

Appendix 1



Legend

-  Study Area
-  Large Forests (>100 ac)

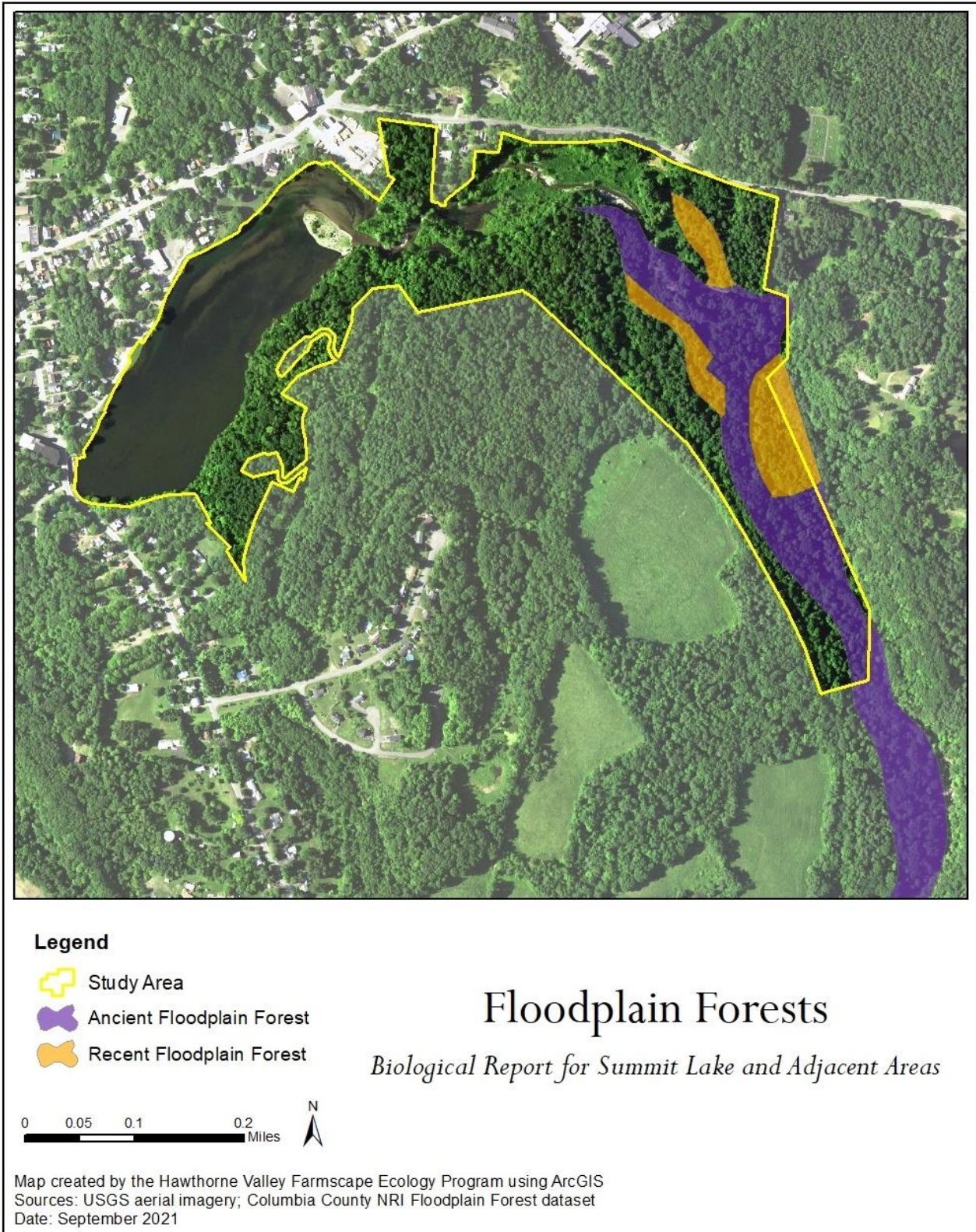
Large Forest Patches

Biological Report for Summit Lake and Adjacent Areas

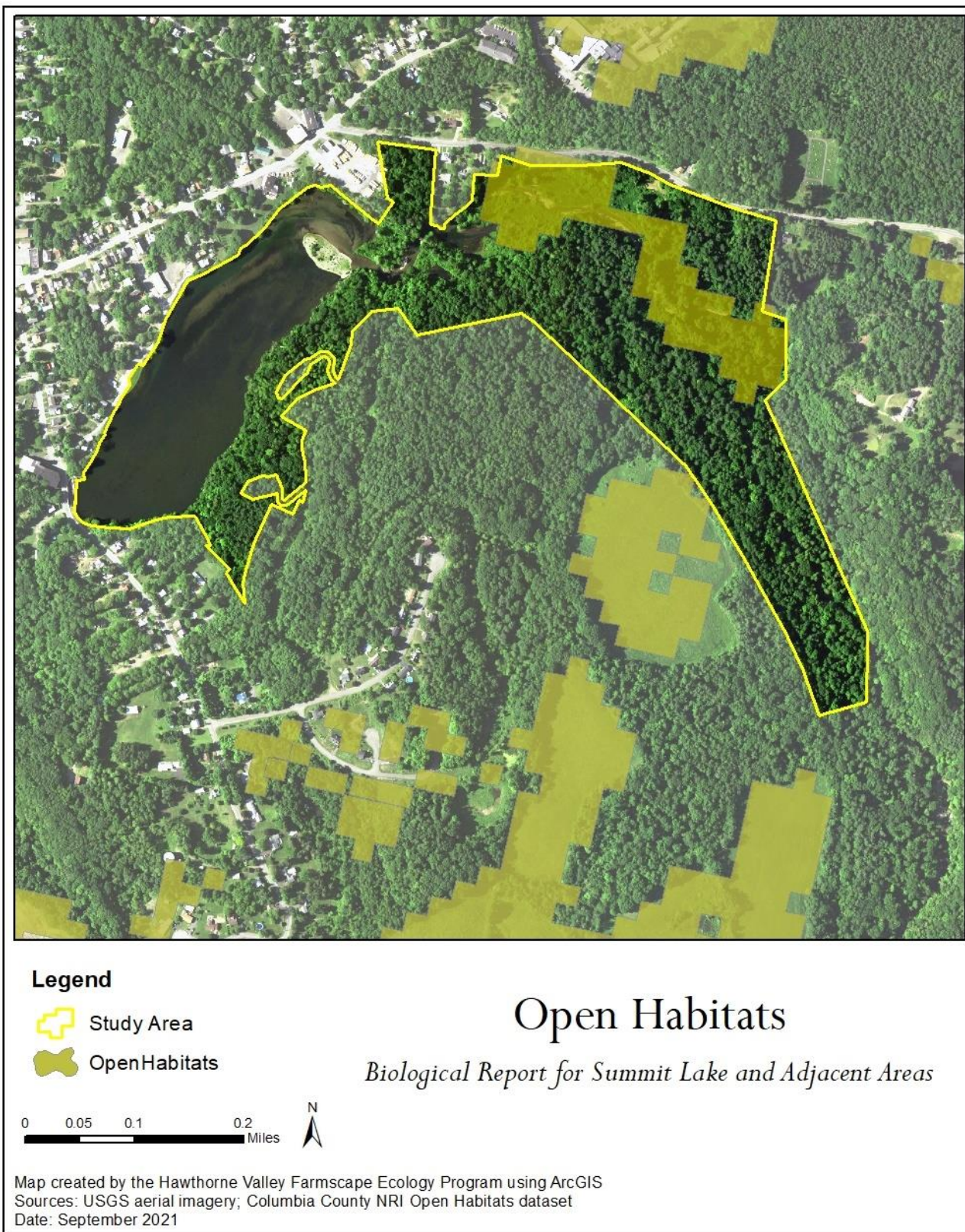


Map created by the Hawthorne Valley Farmscape Ecology Program using ArcGIS
Sources: USGS aerial imagery; Columbia County NRI Hudson Valley Forest Index Patches dataset
Date: September 2021

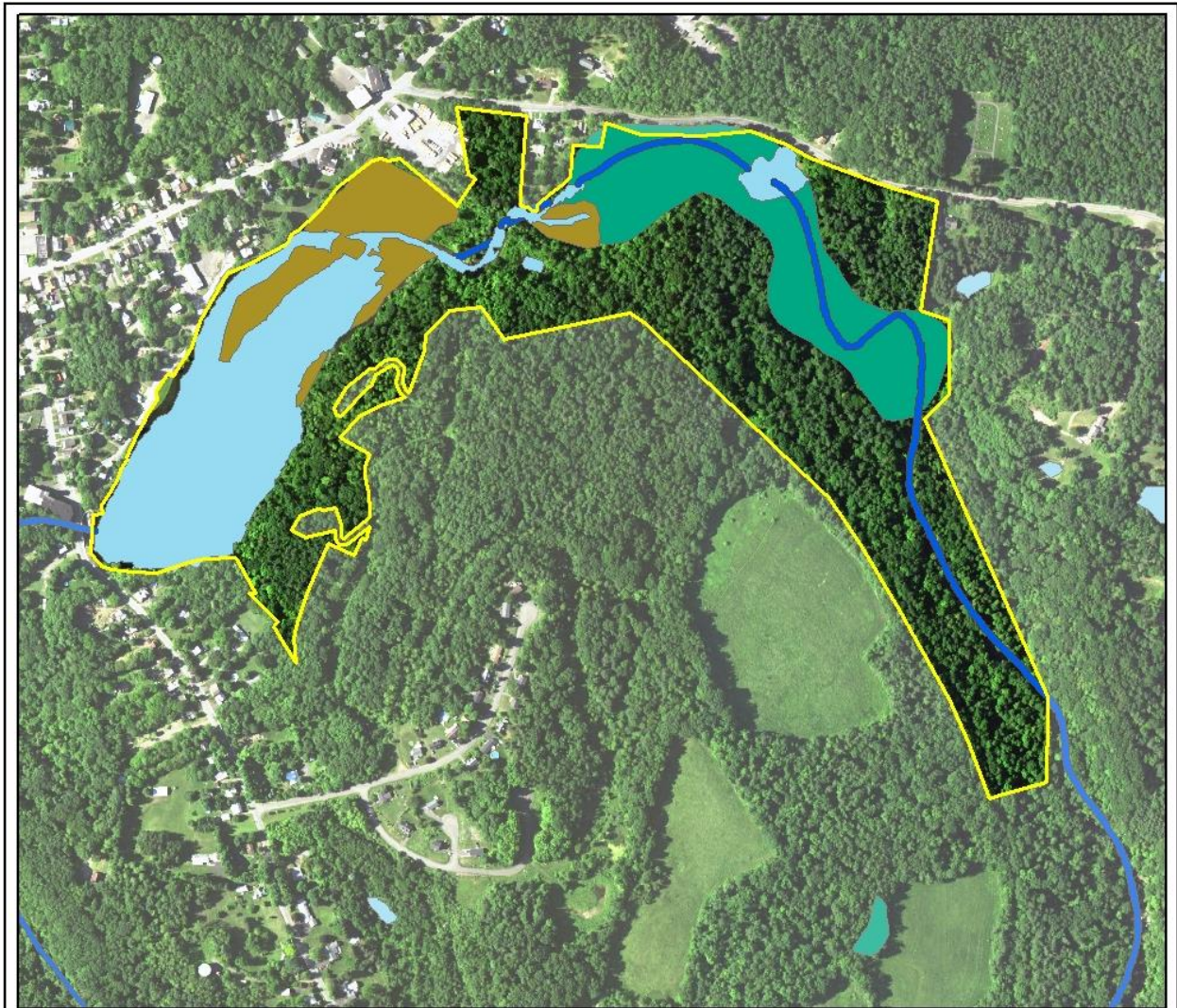
Appendix 2








Appendix 3



Appendix 4



Legend

-  Study Area
-  Emergent Wetland
-  Forested/Shrub Wetland
-  Pond
-  Riverine

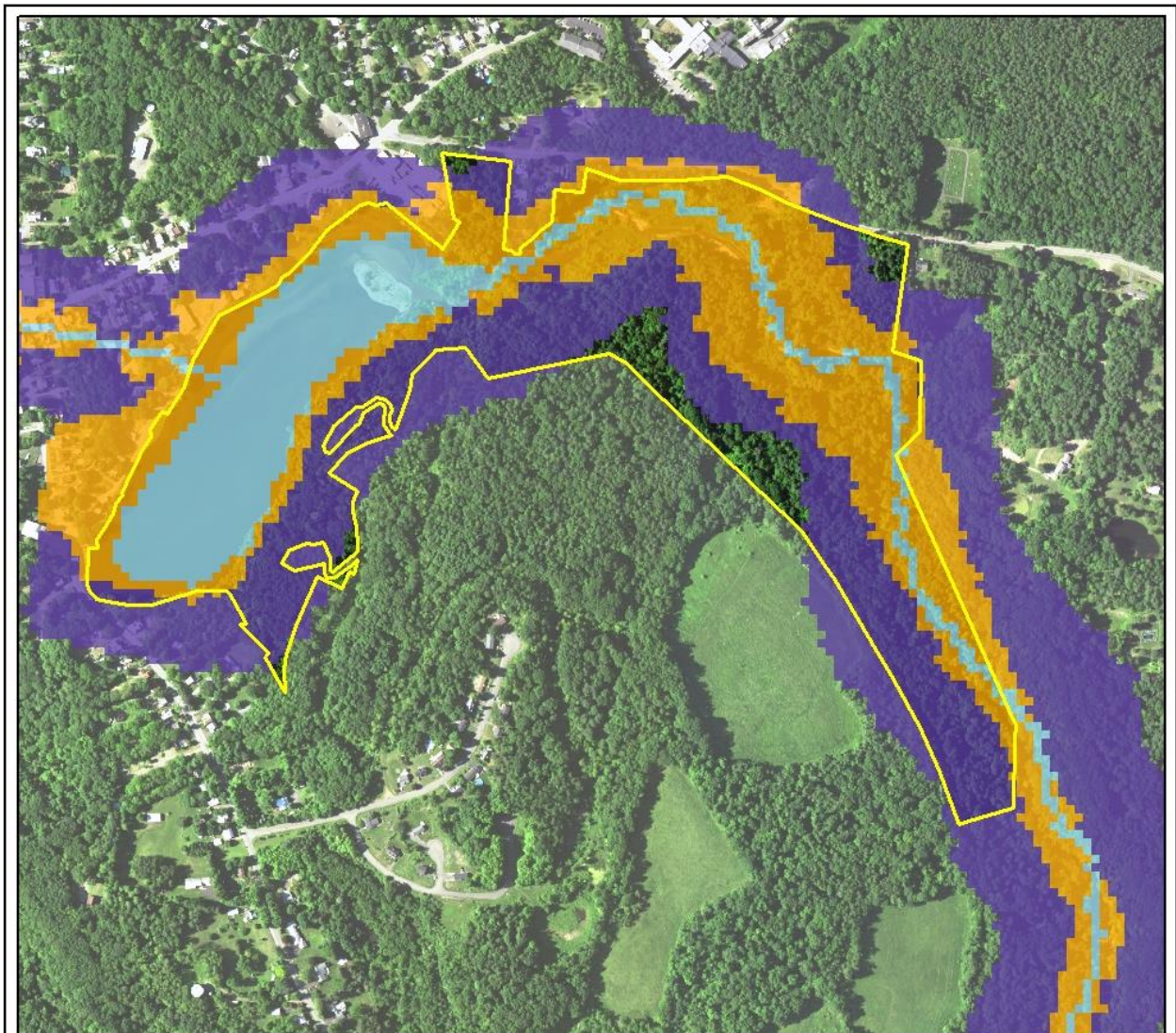
Wetlands

Biological Report for Summit Lake and Adjacent Areas







Map created by the Hawthorne Valley Farmscape Ecology Program using ArcGIS
Sources: USGS aerial imagery; USFWS National Wetlands Inventory
Date: September 2021

Appendix 5



Legend

-  Study Area
-  Base Zone
-  Input Water
-  Material Contribution Zone

Active River Areas

Biological Report for Summit Lake and Adjacent Areas



Map created by the Hawthorne Valley Farmscape Ecology Program using ArcGIS
Sources: USGS aerial imagery; The Nature Conservancy Active River Areas dataset
Date: September 2021

Appendix 6

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
<u>Aquatic Plants/Algae</u>												
Canada waterweed	<i>Elodea canadensis</i>	Y				x	x	x				
common coontail	<i>Ceratophyllum demersum</i>	Y				x	x					
common duckmeal	<i>Spirodela polyrhiza</i>	Y				x						
common duckweed	<i>Lemna minor</i>	Y				x						
curly-leaf pondweed	<i>Potamogeton crispus</i>	N-Inv.				x	x					
eutrophic water nymph pondweed	<i>Najas minor</i> <i>Potamogeton sp.</i>	N-Inv. Y				x		x		x		
stonewort	<i>Nitella sp.</i>	Y				x						
water chestnut	<i>Trapa natans</i>	N-Inv.				x	x					
watermeal	<i>Wolffia sp.</i>	Y				x						
waternet	<i>Hydrodictyon sp.</i>					x						
<u>Ferns</u>												
Christmas fern	<i>Polystichum acrostichoides</i>	Y		x								x
evergreen wood fern	<i>Dryopteris intermedia</i>	Y		x								x
hay-scented fern	<i>Dennstaedtia punctilobula</i>	Y		x								
lady fern	<i>Athyrium angustum</i>	Y		x					x			x
marginal wood fern	<i>Dryopteris marginalis</i>	Y								x	x	x
ostrich fern	<i>Matteuccia struthiopteris</i>	Y		x				x				
rock polypody	<i>Polypodium virginianum</i>	Y								x	x	
sensitive fern	<i>Onoclea sensibilis</i>	Y		x			x	x	x	x	x	x
spinulose wood fern	<i>Dryopteris carthusiana</i>	Y										x
wood fern	<i>Dryopteris sp.</i>	Y		x								x
<u>Grasses, Sedges, etc.</u>												
Appalachian sedge	<i>Carex appalachica</i>	Y										x
blunt spikerush	<i>Eleocharis obtusa</i>	Y			x							
bottlebrush grass	<i>Elymus hystrix</i>	Y								x	x	x
bristly sedge	<i>Carex comosa</i>	Y			x					x		
broad-leaved sedge	<i>Carex platyphylla</i>	Y										x
bulrush	<i>Scirpus sp.</i>	Y			x			x	x			
common reed	<i>Phragmites australis</i>	N-Inv.			x			x		x		
common spikerush	<i>Eleocharis palustris</i>	Y			x							
common velvet grass	<i>Holcus lanatus</i>	N							x			
common wood rush	<i>Luzula multiflora</i>	Y										x
drooping sedge	<i>Carex prasina</i>	Y		x								
false yellow nut sedge	<i>Cyperus strigosus</i>	Y			x			x				
fowl blue grass	<i>Poa palustris</i>	Y						x	x			
fowl manna grass	<i>Glyceria striata</i>	Y						x	x			
fox sedge	<i>Carex vulpinoidea</i>	Y			x				x			

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Grasses, Sedges, etc. (cont.)												
fringed sedge	<i>Carex crinit</i>	Y					x	x	x	x	x	
graceful sedge	<i>Carex gracillima</i>	Y										x
grove blue grass	<i>Poa alsodes</i>	Y						x		x		
hard-stemmed bulrush	<i>Schoenoplectus acutus</i>	Y	CC		x		x					
hop sedge	<i>Carex lupulina</i>	Y			x							
Japanese stilt grass	<i>Microstegium vimineum</i>	N-Inv.		x	x		x	x	x	x	x	x
long-stalked sedge	<i>Carex pedunculat</i>	Y										x
nodding fescue	<i>Festuca subverticillata</i>	Y										x
path rush	<i>Juncus tenuis</i>	Y			x							
Pennsylvania sedge	<i>Carex pensylvanica</i>	Y								x	x	x
pointed broom sedge	<i>Carex scoparia</i>	Y			x							
pubescent sedge	<i>Carex hirtifolia</i>	Y										x
reed canary grass	<i>Phalaris arundinacea</i>	N-Inv.						x	x	x		
sallow sedge	<i>Carex lurida</i>	Y			x		x		x	x	x	
sharp-fruited rush	<i>Juncus acuminatus</i>	Y			x							
smooth brome	<i>Bromus inermis</i>	N						x				
soft rush	<i>Juncus effusus</i>	Y			x		x	x				
sweet vernal grass	<i>Anthoxanthum odoratum</i>	N										x
three-way sedge	<i>Dulichium arundinaceum</i>	Y						x				
twisted sedge	<i>Carex torta</i>	Y	CC					x				
white cut grass	<i>Leersia virginica</i>	Y										x
wild rye	<i>Elymus sp.</i>	Y		x				x				
woolgrass	<i>Scirpus cyperinus</i>	Y			x		x	x				
Herbaceous Plants												
Allegheny monkey flower	<i>Mimulus ringens</i>	Y				x		x		x		
alsike clover	<i>Trifolium hybridum</i>	N										x
American bugleweed	<i>Lycopus americanus</i>	Y			x							
American dog violet	<i>Viola labradorica</i>	Y		x								x
American pennyroyal	<i>Hedeoma pulegioides</i>	Y								x	x	
American stinging nettle	<i>Urtica gracilis</i>	Y		x	x			x	x			x
American water-plantain	<i>Alisma subcordatum</i>	Y			x			x				
American wild mint	<i>Mentha canadensis</i>	Y					x	x				
arrow-leaved tearthumb	<i>Persicaria sagittata</i>	Y			x			x				
awl aster	<i>Symphotrichum pilosum</i>	Y			x							
bedstraw	<i>Galium sp.</i>							x				
bidens	<i>Bidens sp.</i>							x		x	x	

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Herbaceous Plants (cont.)												
bird's foot trefoil	<i>Lotus corniculatus</i>	N			x			x		x		
bitter-sweet nightshade	<i>Solanum dulcamara</i>	N-Inv.								x		
bladder campion	<i>Silene vulgaris</i>	N			x							
bloodroot	<i>Sanguinaria canadensis</i>	Y		x								x
blue cohosh	<i>Caulophyllum thalictroides</i>	Y	HV	x								
blue flag	<i>Iris versicolor</i>	Y							x	x		
blue vervain	<i>Verbena hastata</i>	Y			x			x		x		
blue-stemmed goldenrod	<i>Solidago caesia</i>	Y							x	x	x	x
bouncing bet	<i>Saponaria officinalis</i>	N		x	x			x				
broad-leaved dock	<i>Rumex obtusifolius</i>	N			x		x	x	x			
broad-leaved toothwort	<i>Cardamine diphylla</i>	Y		x								
bulb-bearing water-hemlock	<i>Cicuta bulbifera</i>	Y					x	x		x		
burdock	<i>Arctium sp.</i>	N						x				
bur-reed	<i>Sparganium sp.</i>	Y					x	x				
bushy bittercress	<i>Cardamine impatiens</i>	N-Inv.						x				x
butter-and-eggs	<i>Linaria vulgaris</i>	N			x							
calico aster	<i>Symphotrichum lateriflorum</i>	Y			x					x	x	
Canada mayflower	<i>Maianthemum canadense</i>	Y		x								x
Canada onion	<i>Allium canadense</i>	Y						x	x			
Canada thistle	<i>Cirsium arvense</i>	N-Inv.						x				
cardinal flower	<i>Lobelia cardinalis</i>	Y										x
clammy hedge hyssop	<i>Gratiola neglecta</i>	Y	HV				x					
clearweed	<i>Pilea sp.</i>	Y										x
cleavers	<i>Galium aparine</i>	Y		x	x			x				x
coltsfoot	<i>Tussilago farfara</i>	N		x				x				
common arrowhead	<i>Sagittaria latifolia</i>	Y			x		x		x	x		
common blue violet	<i>Viola sororia</i>	Y			x							x
common boneset	<i>Eupatorium perfoliatum</i>	Y			x			x				
common chickweed	<i>Stellaria media</i>	N			x			x				
common cinquefoil	<i>Potentilla simplex</i>	Y			x							x
common dandelion	<i>Taraxacum officinale</i>	N							x			x
common evening primrose	<i>Oenothera biennis</i>	Y			x							
common golden Alexanders	<i>Zizia aurea</i>	Y		x								
common hemp nettle	<i>Galeopsis tetrahit</i>	N						x				
common milkweed	<i>Asclepias syriaca</i>	Y			x			x				
common mullein	<i>Verbascum thapsus</i>	N			x							
common plantain	<i>Plantago major</i>	N							x			

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Herbaceous Plants (cont.)												
common ragweed	<i>Ambrosia artemisiifolia</i>	Y						x				
common shinleaf	<i>Pyrola elliptica</i>	Y										x
common speedwell	<i>Veronica officinalis</i>	N										x
common St. John's wort	<i>Hypericum perforatum</i>	N			x							
common tansy	<i>Tanacetum vulgare</i>	N		x	x			x				
common yarrow	<i>Achillea millefolium</i>	Y			x							x
common yellow wood sorrel	<i>Oxalis stricta</i>	Y			x							
crown vetch	<i>Securigera (Coronilla) varia</i>	N-Inv.			x			x		x	x	
curly dock	<i>Rumex crispus</i>	N		x								
cut-leaved toothwort	<i>Cardamine concatenata</i>	Y		x								
daisy fleabane	<i>Erigeron annuus</i>	Y			x							
dame's rocket	<i>Hesperis matronalis</i>	N-Inv.		x				x				x
Deptford pink	<i>Dianthus armeria</i>	N			x							
ditch stonecrop	<i>Penthorum sedoides</i>	Y							x	x		
Dutchman's breeches	<i>Dicentra cucullaria</i>	Y	HV							x	x	
early goldenrod	<i>Solidago juncea</i>	Y			x					x	x	
early meadow-rue	<i>Thalictrum dioicum</i>	Y		x						x	x	x
early saxifrage	<i>Micranthes (Saxifraga) virginensis</i>	Y								x	x	
eastern willowherb	<i>Epilobium coloratum</i>	Y						x				
Eurasian heal-all	<i>Prunella vulgaris ssp. vulgaris</i>	N			x			x				
false hellebore	<i>Veratrum viride</i>	Y		x								
false mermaid weed	<i>Floerkea proserpinacoides</i>	Y	HV	x				x				
false nettle	<i>Boehmeria cylindrica</i>	Y			x				x	x	x	
false pimpinell	<i>Lindernia dubia</i>	Y			x							
false Solomon's-seal	<i>Maianthemum racemosum</i>	Y		x						x	x	x
field garlic	<i>Allium vineale</i>	N-Inv.										x
field mint	<i>Mentha arvensis</i>	N			x					x		
field pepperweed	<i>Lepidium campestre</i>	N						x				
flat-topped goldenrod	<i>Euthamia graminifolia</i>	Y			x			x				
foamflower	<i>Tiarella cordifolia</i>	Y		x								
fringed loosestrife	<i>Lysimachia ciliata</i>	Y			x							
garlic mustard	<i>Alliaria petiolata</i>	N-Inv.		x	x			x	x			x
germander	<i>Teucrium canadense</i>	Y					x	x		x		
giant chickweed	<i>Myosoton aquaticum</i>	N						x				

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Herbaceous Plants (cont.)												
golden ragwort	<i>Packera aurea</i>	Y										x
gray goldenrod	<i>Solidago nemoralis</i>	Y								x	x	
greater celandine	<i>Chelidonium majus</i>	N-Inv.										x
hairy bush clover	<i>Lespedeza hirta</i>	Y	CC							x	x	
hairy goldenrod	<i>Solidago hispida</i>	Y	CC									x
hairy Solomon's seal	<i>Polygonatum pubescens</i>	Y		x						x		x
honewort	<i>Cryptotaenia canadensis</i>	Y						x				
hooked buttercup	<i>Ranunculus recurvatus</i>	Y										x
Indian tobacco	<i>Lobelia inflata</i>	Y			x							
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>	Y		x				x	x			x
Japanese knotweed	<i>Reynoutria japonica</i>	N-Inv.		x				x		x		x
Jerusalem artichoke	<i>Helianthus tuberosus</i>	N						x				
jumpseed	<i>Persicaria virginiana</i>	Y										x
kidney-leaved buttercup	<i>Ranunculus abortivus</i>	Y								x	x	x
lady's thumb	<i>Persicaria maculosa</i>	N			x							
lance-leaved aster	<i>Symphotrichum lanceolatum</i>	Y										x
lettuce	<i>Lactuca sp.</i>			x								
long-spurred violet	<i>Viola rostrata</i>	Y		x						x	x	
low hop clover	<i>Trifolium campestre</i>	N			x							
mad dog skullcap	<i>Scutellaria lateriflora</i>	Y			x			x		x		
marsh hedge nettle	<i>Stachys palustris</i>	N		x	x			x				
marsh pennywort	<i>Hydrocotyle americana</i>	Y							x			
meadow bottle gentian	<i>Gentiana clausa</i>	Y	HV							x		
moneywort	<i>Lysimachia nummularia</i>	N-Inv.		x	x			x				
mouse-eared chickweed	<i>Cerastium fontanum ssp. vulgare</i>	N			x							
mugwort	<i>Artemisia vulgaris</i>	N-Inv.		x	x		x	x	x	x	x	x
narrow-leaved cattail	<i>Typha angustifolia</i>	Y								x		
nipplewort	<i>Lapsana communis</i>	N			x							
nodding beggar-ticks	<i>Bidens cernua</i>	Y						x		x		
northern St. John's wort	<i>Hypericum boreale</i>	Y			x					x		
northern swamp buttercup	<i>Ranunculus caricetorum</i>	Y		x				x	x			
oxeye daisy	<i>Leucanthemum vulgare</i>	N			x					x		
partridge berry	<i>Mitchella repens</i>	Y		x								
Pennsylvania smartweed	<i>Persicaria pennsylvanica</i>	Y						x				

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Herbaceous Plants (cont.)												
pilewort	<i>Erechtites hieraciifolium</i>	Y										x
poison-hemlock	<i>Conium maculatum</i>	N			x		x		x	x		
pokeweed	<i>Phytolacca americana</i>	Y						x				
purple loosestrife	<i>Lythrum salicaria</i>	N-Inv.			x	x	x	x	x	x	x	
purple-stemmed aster	<i>Symphotrichum puniceum</i>	Y						x				
pussytoes	<i>Antennaria sp.</i>	Y								x	x	x
ragged robin	<i>Lychnis flos-cuculi</i>	N						x				
rattlesnake root	<i>Nabalus sp.</i>	Y		x								x
red trillium	<i>Trillium erectum</i>	Y		x								
rough bedstraw	<i>Galium asprellum</i>	Y							x	x		
rough-leaved goldenrod	<i>Solidago patula</i>	Y			x							
round-leaved violet	<i>Viola rotundifolia</i>	Y	HV							x	x	
rue anemone	<i>Thalictrum thalictroides</i>	Y		x						x	x	
sessile-leaved bellwort	<i>Uvularia sessilifolia</i>	Y		x						x	x	
silver rod	<i>Solidago bicolor</i>	Y								x	x	
slender agalinis	<i>Agalinis tenuifolia</i>	Y	HV		x							
smaller forget-me-not	<i>Myosotis laxa</i>	Y	CC							x		
smooth goldenrod	<i>Solidago gigantea</i>	Y			x			x	x			x
smooth forked chickweed	<i>Paronychia canadensis</i>	Y								x	x	
smooth rock cress	<i>Borodinia (Boecheera) laevigata</i>	Y								x	x	
spotted jewelweed	<i>Impatiens capensis</i>	Y		x	x			x	x	x		x
spotted Joe-Pye weed	<i>Eutrochium maculatum</i>	Y			x		x	x				
spotted knapweed	<i>Centaurea stoebe ssp. micranthos</i>	N-Inv.			x			x		x	x	
spotted St. John's wort	<i>Hypericum punctatum</i>	Y			x							
starflower	<i>Lysimachia (Trientalis) borealis</i>	Y		x								x
swamp milkweed	<i>Asclepias incarnata</i>	Y								x		
sweet white violet	<i>Viola blanda</i>	Y										x
sweet-scented bedstraw	<i>Galium triflorum</i>	Y										x
tall goldenrod	<i>Solidago altissima</i>	Y			x							
tall meadow rue	<i>Thalictrum pubescens</i>	Y								x	x	
tower mustard	<i>Arabis glabra</i>	N										x
trout lily	<i>Erythronium americanum</i>	Y		x						x	x	x
turtlehead	<i>Chelone glabra</i>	Y						x	x	x	x	x
two-leaved mitrewort	<i>Mitella diphylla</i>	Y		x								
verbena	<i>Verbena sp.</i>	Y						x		x		

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Herbaceous Plants (cont.)												
Virginia bugleweed	<i>Lycopus virginicus</i>	Y			x					x	x	
Virginia marsh St. John's wort	<i>Hypericum (Triadenum) virginicum</i>	Y					x			x	x	
Virginia stickseed	<i>Hackelia virginiana</i>	Y							x			x
Virginia waterleaf	<i>Hydrophyllum virginianum</i>	Y								x	x	
water forget-me-not	<i>Myosotis scorpioides</i>	N			x			x	x	x		
water purslane	<i>Ludwigia palustris</i>	Y						x				
water speedwell	<i>Veronica anagallis-aquatica</i>	N			x		x	x				
white avens	<i>Geum canadense</i>	Y										x
white baneberry	<i>Actaea pachypoda</i>	Y		x								x
white clover	<i>Trifolium repens</i>	N			x							
white snakeroot	<i>Ageratina altissima</i>	Y		x								x
white sweetclover	<i>Mellilotus albus</i>	N						x				
white vervain	<i>Verbena urticifolia</i>	Y										x
white wood aster	<i>Eurybia divaricata</i>	Y		x						x	x	x
wild carrot	<i>Daucus carota</i>	N			x							
wild geranium	<i>Geranium maculatum</i>	Y		x						x	x	x
wild leek	<i>Allium tricoccum</i>	Y		x								x
wild sarsaparilla	<i>Aralia nudicaulis</i>	Y		x								
winter cress	<i>Barbarea vulgaris</i>	N			x		x	x				
wood anemone	<i>Anemone quinquefolia</i>	Y		x						x	x	x
wood nettle	<i>Laportea canadensis</i>	Y		x				x		x		
wormseed mustard	<i>Erysimum cheiranthoides</i>	N						x				
wrinkle-leaved goldenrod	<i>Solidago rugosa</i>	Y								x	x	x
yellow iris	<i>Iris pseudacorus</i>	N-Inv.							x			
yellow wood violet	<i>Viola pubescens</i>	Y		x								x
zig-zag goldenrod	<i>Solidago flexicaulis</i>	Y		x								
Shrubs/Small Trees												
alder	<i>Alnus sp.</i>	Y			x			x	x			x
Allegheny blackberry	<i>Rubus allegheniensis</i>	Y										x
alternate-leaved dogwood	<i>Cornus alternifolia</i>	Y	HV							x		
American red raspberry	<i>Rubus idaeus ssp. strigosus</i>	Y										x
autumn olive	<i>Elaeagnus umbellata</i>	N-Inv.			x			x	x	x	x	x
black raspberry	<i>Rubus occidentalis</i>	Y			x							x
broad-leaved meadowsweet	<i>Spiraea alba var. latifolia</i>	Y			x					x	x	

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Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Shrubs/Small Trees (cont.)												
choke cherry	<i>Prunus virginiana</i>	Y										x
common barberry	<i>Berberis vulgaris</i>	N-Inv.		x								
common buckthorn	<i>Rhamnus cathartica</i>	N-Inv.										x
common elder	<i>Sambucus nigra ssp. canadensis</i>	Y								x		
common juniper	<i>Juniperus communis var. depressa</i>	Y	CC							x	x	
common lowbush blueberry	<i>Vaccinium angustifolium</i>	Y								x	x	
crimson weigelia	<i>Weigelia floribunda</i>	N								x		
deerberry	<i>Vaccinium stamineum</i>	Y								x	x	
dotted hawthorn	<i>Crataegus punctata</i>	Y						x				
Eurasian shrub honeysuckle	<i>Lonicera morrowii/L. x bella</i>	N-Inv.		x	x			x	x	x		x
fragrant sumac	<i>Rhus aromatica</i>	Y	HV							x	x	
gray dogwood	<i>Cornus racemosa</i>	Y			x				x			x
hawthorn	<i>Crataegus sp.</i>	Y										x
highbush blueberry	<i>Vaccinium corymbosum</i>	Y										x
Japanese barberry	<i>Berberis thunbergii</i>	N-Inv.		x								x
maple-leaved viburnum	<i>Viburnum acerifolium</i>	Y		x								x
multiflora rose	<i>Rosa multiflora</i>	N-Inv.		x	x		x	x	x	x		x
musclewood	<i>Carpinus caroliniana</i>	Y		x				x				x
nannyberry	<i>Viburnum lentago</i>	Y						x				x
narrowleaf willow	<i>Salix exugia</i>	Y						x				
northern dewberry	<i>Rubus flagellaris</i>	Y										x
pasture rose	<i>Rosa carolin</i>	Y								x	x	x
privet	<i>Ligustrum sp.</i>	N-Inv.		x								x
red osier dogwood	<i>Cornus sericea</i>	Y							x			
round-leaved dogwood	<i>Cornus rugosa</i>	Y	HV							x		
shadbush	<i>Amelanchier sp.</i>	Y								x	x	x
silky dogwood	<i>Cornus amomum</i>	Y						x	x	x	x	x
silky willow	<i>Salix sericea</i>	Y						x				
smooth arrowwood	<i>Viburnum dentatum var. lucidum</i>	Y						x		x	x	
steeplebush	<i>Spiraea tomentosa</i>	Y								x	x	
swamp rose	<i>Rosa palustris</i>	Y								x		
Toringo crab apple	<i>Malus toringo</i>	N-Inv.			x							
willow	<i>Salix sp.</i>				x		x	x				
winged burningbush	<i>Euonymus alatus</i>	N-Inv.		x								x
witch-hazel	<i>Hamamelis virginiana</i>	Y		x								
Trees												
American beech	<i>Fagus grandifolia</i>	Y		x								
American elm	<i>Ulmus americana</i>	Y			x			x	x			x

1) and 2) please see references in the footnotes on the last page of Appendix 6.

Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Trees (cont.)												
basswood	<i>Tilia americana</i>	Y		x				x		x	x	x
bigtooth aspen	<i>Populus grandidentata</i>	Y		x								x
black birch	<i>Betula lenta</i>	Y		x								x
black cherry	<i>Prunus serotina</i>	Y							x			x
black locust	<i>Robinia pseudoacacia</i>	N-Inv.		x	x			x	x			x
black walnut	<i>Juglans nigra</i>	Y										x
black willow	<i>Salix nigra</i>	Y		x					x			
box elder	<i>Acer negundo</i>	N						x	x	x		
catalpa	<i>Catalpa sp.</i>	N						x				
common pear	<i>Pyrus communis</i>	N										x
cottonwood	<i>Populus deltoides</i>	Y		x								
domestic cherry	<i>Prunus sp.</i>	N										x
gray birch	<i>Betula populifolia</i>	Y							x			x
hemlock	<i>Tsuga canadensis</i>	Y		x				x				
hop-hornbeam	<i>Ostrya virginiana</i>	Y								x	x	x
Norway maple	<i>Acer platanoides</i>	N-Inv.										x
Norway spruce	<i>Picea abies</i>	N								x		x
red cedar	<i>Juniperus virginiana</i>	Y										x
red maple	<i>Acer rubrum</i>	Y		x					x			x
red oak	<i>Quercus rubra</i>	Y		x						x		x
shagbark hickory	<i>Carya ovata</i>	Y								x	x	x
silver maple	<i>Acer saccharinum</i>	Y								x		x
slippery elm	<i>Ulmus rubra</i>	Y										x
staghorn sumac	<i>Rhus typhina</i>	Y								x		
sugar maple	<i>Acer saccharum</i>	Y		x								x
swamp white oak	<i>Quercus bicolor</i>	Y								x		
sycamore	<i>Platanus occidentalis</i>	Y			x			x	x			
tree-of-heaven	<i>Ailanthus altissima</i>	N-Inv.								x		x
trembling aspen	<i>Populus tremuloides</i>	Y						x				
white ash	<i>Fraxinus americana</i>	Y		x	x							x
white birch	<i>Betula papyrifera</i>	Y										x
white mulberry	<i>Morus alba</i>	N-Inv.										x
white oak	<i>Quercus alba</i>	Y										x
white pine	<i>Pinus strobus</i>	Y		x						x	x	x
Vines												
black swallowwort	<i>Vincetoxicum nigrum</i>	N-Inv.						x				x
climbing false buckwheat	<i>Fallopia scandens</i>	Y			x							
common dodder	<i>Cuscuta gronovii</i>	Y			x			x				
grape	<i>Vitis sp.</i>	Y							x	x		x
hedge false bindweed	<i>Calystegia sepium</i>	N						x				
oriental bittersweet	<i>Celastrus orbiculatus</i>	N-Inv.			x			x				x

1) and 2) please see references in the footnotes on the last page of Appendix 6.

Appendix 6 (cont.)

Plant List for Summit Lake and Adjacent Areas (Hawthorne Valley Farmscape Ecology Program 2021)

Common Name	Scientific Name	native ¹⁾	rare ²⁾	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline	Rocky Shore	Upland Forest
Vines (cont.)												
poison ivy	<i>Toxicodendron radicans</i>	Y		x	x					x	x	x
river grape	<i>Vitis riparia</i>	Y						x		x		x
Virginia creeper	<i>Parthenocissus quinquefolia</i>	Y						x	x	x	x	x
virgin's bower	<i>Clematis virginiana</i>	Y						x				x
wisteria	<i>Wisteria sp.</i>	N								x		
<p>1) Plants considered native (Y) or non-native (N) to NYS by Weldy et al. 2018; plants considered invasive (N-Inv.) in the Capital/Mohawk Region (Capital/Mohawk PRISM, 2017) or in Columbia County by the authors.</p> <p>2) Plants considered rare or scarce in the Hudson Valley (Kiviat & Stevens, 2001) or in Columbia County by the authors.</p>												

Appendix 7 (cont.)

Common Name	Scientific Name	Status *	Floodplain Forest	Island	Lake	Lower Inlet	Open Floodplain	Shrub Swamp	Shoreline (at water)	Shoreline (vegetation)	Upland Forest
Chickadees & Titmice			Paridae								
Black-capped Chickadee	<i>Poecile atricapillus</i>		X				X			X	X
Tufted Titmouse	<i>Baeolophus bicolor</i>		X				X			X	X
Swallows			Hirundinidae								
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>				X						
Tree Swallow	<i>Tachycineta bicolor</i>				X						
Bank Swallow	<i>Riparia riparia</i>				X						
Barn Swallow	<i>Hirundo rustica</i>				X						
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>				X						
Kinglets			Regulidae								
Ruby-crowned Kinglet	<i>Regulus calendula</i>									X	X
Nuthatches			Sittidae								
White-breasted Nuthatch	<i>Sitta carolinensis</i>		X							X	X
Creepers			Certhiidae								
Brown Creeper	<i>Certhia americana</i>										X
Wrens			Troglodytidae								
House Wren	<i>Troglodytes aedon</i>	e									
Carolina Wren	<i>Thryothorus ludovicianus</i>										X
Starlings			Sturnidae								
European Starling	<i>Sturnus vulgaris</i>	c, INV			X						
Mockingbirds & Thrashers			Mimidae								
Gray Catbird	<i>Dumetella carolinensis</i>		X	X			X	X		X	X
Thrushes			Turdidae								
Eastern Bluebird	<i>Sialia sialis</i>	e									
Veery	<i>Catharus fuscescens</i>		X				X				X
Wood Thrush	<i>Hylocichla mustelina</i>	US, NY	X								X
American Robin	<i>Turdus migratorius</i>			X				X		X	X
Waxwings			Bombycillidae								
Cedar Waxwing	<i>Bombycilla cedrorum</i>						X			X	
Old World Sparrows			Passeridae								
House Sparrow	<i>Passer domesticus</i>	INV								X	
Finches			Fringillidae								
House Finch	<i>Haemorhous mexicanus</i>	e									
American Goldfinch	<i>Spinus tristis</i>		X				X			X	X
New World Sparrows			Passerellidae								
Chipping Sparrow	<i>Spizella passerina</i>	e									
White-throated Sparrow	<i>Zonotrichia albicollis</i>										X
Savannah Sparrow	<i>Passerculus sandwichensis</i>	e									
Song Sparrow	<i>Melospiza melodia</i>		X	X			X	X		X	X
Eastern Towhee	<i>Pipilo erythrophthalmus</i>										X
Blackbirds & Orioles			Icteridae								
Baltimore Oriole	<i>Icterus galbula</i>							X			X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>			X			X				X
Brown-headed Cowbird	<i>Molothrus ater</i>										X
Common Grackle	<i>Quiscalus quiscula</i>			X	X		X	X	X	X	X
New World Warblers			Parulidae								
Ovenbird	<i>Seiurus aurocapillus</i>		X				X				X
Louisiana Waterthrush	<i>Parkesia motacilla</i>	NY	X								
Black-and-white Warbler	<i>Mniotilta varia</i>		X								X
Nashville Warbler	<i>Leiothlypis ruficapilla</i>										X
Common Yellowthroat	<i>Geothlypis trichas</i>		X				X	X		X	
American Redstart	<i>Setophaga ruticilla</i>		X								X
Magnolia Warbler	<i>Setophaga magnolia</i>										X
Yellow Warbler	<i>Setophaga petechia</i>						X	X			X
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	NY									X
Yellow-rumped Warbler	<i>Setophaga coronata</i>							X			X
Black-throated Green Warbler	<i>Setophaga virens</i>										X
Cardinals, Grosbeaks, & Tanagers			Cardinalidae								
Scarlet Tanager	<i>Piranga olivacea</i>	e, NY									
Northern Cardinal	<i>Cardinalis cardinalis</i>		X				X	X			X

*Key

c Not detected during fieldwork by FEP, but reported from Summit Lake by community members.

e Not detected during fieldwork by FEP, but reported from Summit Lake on eBird.

US Threatened nationally: included on the 2016 State of the Birds Watch List, 2016 Partners in Flight Watch List, and/or 2016 USFWS Birds of Conservation Concern.

NY Threatened in New York State: designated as Endangered, Threatened, or Special Concern by the NYS DEC, listed as a NYS Species of Greatest Conservation Need, or designated as

INV Non-native invasive species.