

Witch's Brook

This tributary flows from the north, through the Lewis Woodlands park, and joins the Wawayanda Creek near Forester Avenue. No water quality data for this stream is known either from NYS DEC or OCWA. With wetlands and mature wooded areas, the park is comparatively ecologically intact. Its natural resources including this stream running through it provide important potential linkages, recreational and education opportunities.

Wawayanda Creek Main Stem – Core Study Area

The core study area for this project is the Wawayanda Creek corridor from Memorial Park to Elm Street. Based on the water quality information summarized above, it is clear that water resources in this stream corridor are likely being impacted by a combination of upstream land uses, wastewater discharges, stormwater runoff, and presumably by hydrologic alterations in the past. By the time the Creek reaches the Village, unfortunately, water quality is already significantly impacted. Except for the corridor in Memorial Park, the original riparian buffer for the Creek through most of this area has been developed. There is virtually no remaining intact floodplain or buffer area which would provide more opportunity for water quality to recover naturally from upstream impacts, as well as from localized impacts caused by runoff in the Village and other factors.

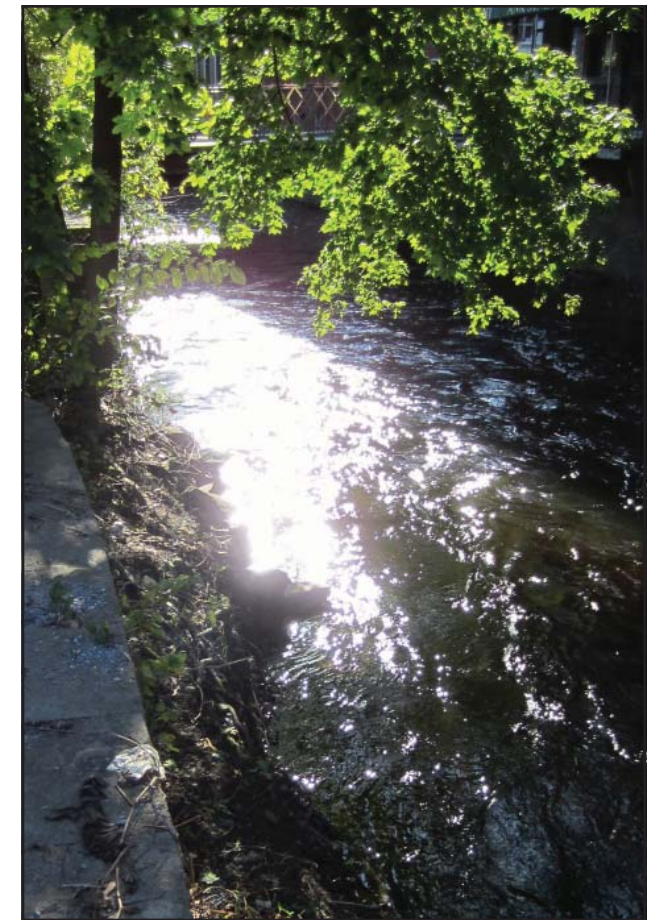


An Eroded Ditchline and Pipe Outfall into the Wawayanda Creek at Memorial Park Lake

Strategies

Over time, it may be possible to realize significant improvement in the Creek's water quality and ecological integrity through collaboration among the Village, Town and other stakeholders. Presently the Village of Warwick is installing a water gauge that will record water levels in the Wawayanda Creek. This and fine tuned water quality monitoring can positively identify sources of water quality degradation as well as rapid stormwater runoff sources. An inventory of pipe outfalls into the stream within the Village would be helpful (and upstream if possible) so that areas can be identified that contribute to rapid rise of the stream; and erosion at pipe outfalls, if it occurs, can be addressed. Stanley Deming Park would especially benefit from an overall park plan that addresses erosion at streambanks with stabilizing plantings, bioengineering, and relocating high foot traffic elements farther from the stream.

Measures to protect and restore water quality in upstream areas could also help mitigate flood risks in the Village in the future. Riparian buffers, erosion control methods, and streambank restoration can contribute to these goals. Use of green infrastructure methods for managing stormwater (and possibly for wastewater as well) can help to restore watershed hydrology, reduce surface runoff, promote groundwater recharge, and have other beneficial effects for water quality as well as for managing streamflow during storm events. Of particular interest is the closure of the Mid-Orange Correctional Facility in the Town of Warwick and opportunities this large tract of land at Wickham Lake might offer to introduce these practices as well as provide space for sustainable flood mitigation for downstream communities.



Although focused on the immediate study area, recommendations, plans and strategies contained in this report strive to improve water quality, reduce erosion, restore biodiversity and create an example for a healthier watershed.

Ecology & Natural History

Ecological Importance of Stream Corridors

Mobility of species is an important consideration, not just for animals, but also for plants and stream corridors afford this opportunity. Flying animals such as birds and insects more easily reach the Village center from all habitats outside the core area. Fish and waterfowl can swim or float up or down the streams, the Wawayanda and its tributaries, and to a lesser degree, ditches, intermittent drainages, runoff and floodwaters.

Wild corridors are safer and less intimidating to land animals, and thus the most likely or perhaps the only path they will use to move in and out of the Village. For historic, aesthetic and clearly many reasons, the best preserved corridors are those along watercourses, putting aerial, aquatic and terrestrial animals on the same paths in and out of town. Maintaining this corridor is a boon and boost for biodiversity, land preservation, public access, and nature-related recreation and research.

Notable Common Species and Communities

Because rare species of plants and animals are largely unfamiliar and require greater effort and considerable expertise to find, more common species and communities are the lifeblood of public appreciation and regional natural history everywhere.



Tree Swallows

Photo by Anita F. Barbour

Here we present a selection of common and uncommon species and communities that occur or could occur within the Wawayanda Creek corridor. This selection is based on diversity, a personal sense of biological interest, observational accessibility, and a hopefully thoughtful but unavoidably biased sense of public interest.

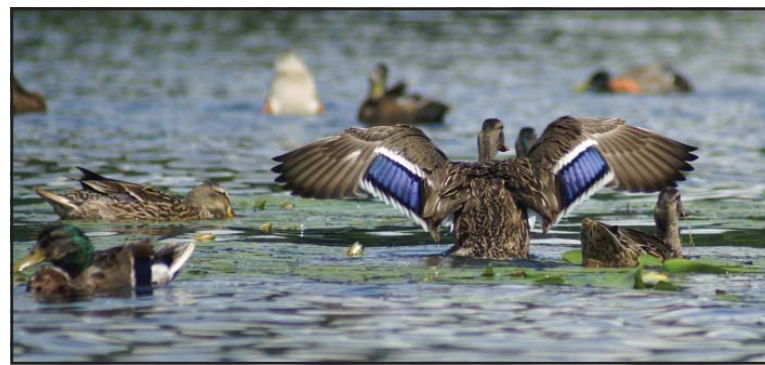
Birds

Certain birds are especially fond of stream corridors for various reasons including adaptation to water, food sources, nesting advantages and other ecological reasons. The birds chosen here reflect such affinities for the stream corridor, and some of them were observed along the Creek in the course of surveys for this project.

Swallows

Swallows often feed on insects over surfaces of lakes, ponds and streams because of ease of flight in unobstructed air space, and an abundance of flying insects over water. Many insects spend their immature stages in water, sometimes emerging in large hatches attracting swallows and other insectivorous birds.

Numbers of swallows have often been observed in the Village Creek corridor swooping and nabbing stream flies and all sorts of other insects at various times of day, especially morning and evening hours. Not surprisingly to knowledgeable birders, swallows are boosted by the urbanized corridor where buildings provide nesting sites for species such as barn swallows (*Hirundo rustica*) and cliff swallows (*Petrochelidon pyrrhonota*). Tree swallows (*Tachycineta bicolor*), which nest in tree hollows and nest boxes, can be seen dipping and hovering to catch insects over the broader, slower stream stretches particularly in Memorial Park.



Mallard Ducks

Photo by Anita F. Barbour

Ducks

The number of duck species passing through the Village center is greater than one might imagine. Virtually any kind of duck that might be found anywhere along the Wawayanda Creek has free passage, and these waterfowl are often uninhibited as they glide beneath the buildings and bridges unnoticed by passersby. When people are observant of the ducks they gain in the delight of wildlife and knowledge of its unexpected diversity. Though mallards (*Anas platyrhynchos*) and domestic ducks are the most common, watch for American black ducks (*Anas rubripes*), wood ducks (*Aix sponsa*) and common mergansers (*Mergus merganser*). During spring and fall migration times, rarer duck species may drop in. Duck nesting sites can include shores, tiny islands, and hollow trees (wood ducks). Nest boxes and platforms increase the chances of seeing duck families on the water and on the shores. Memorial Park would be a good choice for a location to install such nest boxes.

Raptors (Hawks, owls and eagles)

Though highway travelers are long used to red-tailed hawks peering for road kills from trees, cell towers and banks along the Interstates, hawks in cities and villages are a less familiar sight. Accipiters (bird hawks) sometimes come into developed areas to hunt birds such as starlings and English sparrows. It's a shock to see a goshawk or sharp-shinned hawk perch and dive from a power substation or historic building after a starling but it happens more often than you might think.



Barred Owl

Photo by Gordon E. Robertson

Owls, silent night raptors, are more often heard than seen, hooting, howling, whinnying from woods around towns and villages. Barred owl (*Strix varia*) is commonly heard calling from swamps, and great horned owl (*Bubo virginianus*) from upland forests. Screech owls are cosmopolitan. They can be found in town parks and any neighborhood with ample yards and tall trees with holes and hollows for nest sites. In deep winter rural villages and even cities may host one or more visiting snowy owls (*B. scandiacus*). These huge white birds roost by day in church towers and other lofty shelters in the taller buildings, swooping down at night to nab mice and voles from their burrows beneath the snow.

Mammals

What might there be in addition to the urban wildlife we know all too well — deer, squirrels, chipmunks, skunks, mice, rats and raccoons? Any village with a stream through it will probably have a more than an occasional muskrat, maybe even the odd otter. Red foxes (*Vulpes vulpes*) are more common than one might expect in the wilder districts and odd corners of villages and cities, and rarely a coyote (*Canis latrans*) or black bear (*Ursus americanus*) will meander its way into a backyard or village park.



Red Fox

Photo by Ken Billington

Reptiles

Turtles

Of the shelled reptiles, eastern painted turtle (*Chrysemys picta picta*) is such a universal denizen of ponds and lakes that there are inevitably at least several in any town park, basking on shores, logs, and anything protruding from the water. In these same waters lives our largest turtle, the common snapper (*Chelydra serpentina*). Like the painted turtle, the snapping turtle takes to the roads in late spring, to the delight of kids, but to the reptiles' detriment. These turtles are females seeking sandy soils in which to lay their eggs, and they will travel surprising distances from their home waters



Eastern Box Turtle

Photo by Spider Barbour

to nest. A more secretive homebody is the eastern box turtle (*Terrapene carolina*), a territorial turtle (at least the females) whose home turf often includes backyards and public parks with secluded, neglected pockets of wild thickets and woods where turtles feast on berries, mushrooms, snails and earthworms. Wood turtle (*Clemmys insculpta*), listed as a 'special concern' species in New York, spends much of its life in mid-sized streams such as the Wawayanda, but takes to woods and fields in the early growing season. It would not be surprising to see a wood turtle in the outskirts of the Creek corridor. Red-eared slider (*Trachemys scripta elegans*), introduced from the southeast during the baby turtle pet craze of the 50's and 60's, is well-established in New Jersey suburbs, and sometimes found in New York and southern New England.



Eastern Garter Snake

Photo by Spider Barbour

Snakes

Snakes are as fascinating to children as turtles are, and any place with old plywood, sheet metal, tar paper and other "cover objects," as snake fanciers call such shelters, should have its share of garter snakes, and perhaps northern brown snakes, ringneck snakes and milk snakes as well. Northern water snake is to be expected in Village streams, especially the Wawayanda, where cracked and broken walls and other dark nooks provide quick escape paths for these wary serpents. Black racer is a remote possibility in outlying districts nearer to farm country.

Amphibians

Frogs, Toads and Salamanders

The common and widespread green frog (*Rana clamitans*) is sure to be seen leaping into the water from banks of streams, including the Wawayanda. Slow stretches will have greater numbers of green frogs, and wilder places such as Memorial Park will have bullfrogs (*Rana catesbeiana*), the males' yellow throats swelling as they grunt out their mating calls. Quieter singers include wood frogs (*R. sylvestris*) and spring peepers (*Pseudacris crucifer*) in March and April, northern gray treefrog (*Hyla versicolor*) and pickerel frog (*R. palustris*) a few weeks later. Joining the late spring chorale will be American toad (*Bufo americanus*), more of a landlubber whose tough, warty skin allows it to live in woods, parks and backyards. Our smallest and most abundant salamander, redback salamander (*Plethodon cinereus*), also lives in woody dooryards under wet leaves, deadwood and flat stones. Small permanent streams are home to the stream salamanders. Two-lined salamander (*Eurycea bislineata*) is very common and tolerates



Green Frog

Photo by Anita F. Barbour

slight pollution, while the more sensitive dusky salamander (*Desmognathus fuscus*) is a good indicator of clean water. Mole salamanders, like the redback salamander, live in forested uplands, and may be found in back yards at the edge of wooded areas. The yellow polka-dotted spotted salamander (*Ambystoma maculata*), 5-6 inches long, occasionally makes local headlines when accidentally raked up with autumn leaves or uncovered by a gardener pulling up mulch in the spring. The other mole salamanders -- marbled salamander (*A. opacum*), Jefferson salamander (*A. jeffersonianum*), and blue-spotted salamander (*A. laterale*) are uncommon and mostly restricted to large forest tracts.

Insects and Spiders

Devotion to creatures with exoskeletons and more than two pairs of limbs is a trait some people never outgrow. This affinity is fortunate since arthropods, like plants, are everywhere. Even the biggest and most bizarre or beautiful may show up in the most unlikely places, and some live in places where most people would least expect them to.

Butterflies and Moths

Butterflies, beloved of nature lovers, and their less popular relatives the moths, really do get around. Flight is a powerful means of transport, to anywhere in any direction. But some paths are better than others, and a watercourse is one of the best. Butterflies and moths, along with many other insects and flying animals, use stream courses as flightways. These include female moths and butterflies on egg-laying missions, and males tracking females. Like highways for us, streams offer easy and relatively unobstructed paths to follow, food stops and rewarding destinations.



Tiger Swallowtail on Buttonbush

Photo by Anita F. Barbour

Most adult Lepidoptera (meaning scale-wing, for the “dust” that comes off on your fingers when you handle a moth or butterfly) sip nectar, their energy drink, or one of them (they also like tree sap, puddle water and juice of rotting carrion). This is why flowers attract butterflies. Plants without blossoms attract female butterflies looking for the right plants on which to lay eggs, larval or caterpillar host plants. Both nectar plants and caterpillar food plants are important plantings for keeping butterflies close at hand, and luring them into peopled environments like villages and cities.

Our largest butterflies are the swallowtails, followed by the monarch, the larger brush-foots (Nymphalids) such as the red-spotted purple and the viceroy, and the big fritillaries. Familiar middle sized butterflies include the cabbage white and the orange and yellow sulfurs, the angle-wings and smaller Nymphalids like red admiral, the painted ladies, and the buckeye, a migrant from the south. Small butterflies include the blues, elfins, coppers and hairstreaks (Lycaenids or gossamer-wings). The skippers, stout like moths, and fast-flying, are mostly brown to orange in tone, and consequently underappreciated.



Sphinx Moth

Photo by Anita F. Barbour

Two groups of moths are the most popular. Hawk moths or sphinx moths (Sphingidae) nectar on flowers on summer evenings and one group, the clearwings, feed in full daylight. Our largest moths, big as small birds or bats, are the giant silk moths (Saturniidae), common but seldom seen. Occasionally one gets lured to a light and if seen causes a commotion, but these are probably spent and battered individuals that have literally lost their senses of direction and purpose. Lights have little effect on silk moths in their prime, males tracking pheromone-emitting fresh females, and recently fertile females on egg-laying flights seeking host plants for their coming caterpillars. These caterpillars, when fully grown and as large

as a finger, may be spotted by sharp eyes feeding on shrubs, saplings and low branches of trees along rural roads and sometimes in yards and parks. In winter cocoons may be found attached to these same shrubs and shade trees, others nearby, or for some species, among dead leaves on the ground, having fallen from the trees.



Banded Hairstreak on Common Milkweed

Photo by Spider Barbour

Nectar Plants and Host Plants

Nectar is nectar, but the delivery systems, the flowers themselves, parse butterfly groups mainly by size. Larger butterflies go for larger flowers – more nectar and less competition from smaller butterflies and other insects. Small butterflies feed from small flowers mainly because they can't reach the nectar of larger flowers at all. However, if only small flowers are available, butterflies of all sizes will take to them, with much darting and diving and scrambling. Butterflies, when pressed, get competitive, even aggressive, and the smallest seem to be the spunkiest.

Caterpillar food plants are seldom the same plants as those providing nectar for adult butterflies. Host plants are more diverse and specialized. Having evolved under pressure of leaf-munching insects, plants have adapted by synthesizing toxins deadly or at least distasteful or irritating to caterpillars and other leaf-eating insects. The insects have adapted in two ways, by becoming immune to one or a few plant toxins and eating only those plants, thus avoiding competition with other insects (specialization), or alternatively adapting to a wide variety of leaves and having a broader choice so as to always find something edible (generalization).

For any one planting to bring in butterflies and moths, both adult nectar plants and caterpillar food plants are important; they work together. But choosing butterfly plantings is different from choosing caterpillar plantings. It's a matter of flowers versus foliage. A common principle for both is variety. Nectar plants with large flowers and ones with small flowers serve more sizes and species of butterflies, as do plants of different heights. Plants with a long blooming season or a variety of plants blooming at different seasons attract butterflies that fly at different times of year. Caterpillar food plants are simpler to choose, as these are the plants caterpillars of different species eat. Some are easy to cultivate, some are not. Trees and shrubs are easiest; plant them and care for them. Bang-for-the-buck examples are spicebush for spicebush silk moth and spicebush swallowtail, tuliptree for those two plus tuliptree silk moth and tiger swallowtail. Some plant and butterfly combos, milkweeds and monarchs for instance, satisfy both adult nectar and caterpillar leaf-food criteria.



Tiger Swallowtail Caterpillar on Ash
Photo by Anita F. Barbour

One more consideration is plantings substrates. Butterflies fly but caterpillars that have stopped feeding and are ready to transform need a place to do that. This is no problem for those that stay on the host plant, especially a tree or a shrub. But some caterpillars go down to or a bit beneath the ground, or crawl some distance to find a good anchor to molt into a chrysalis or spin a cocoon. These species are harder to accommodate, and require creative planning to give them a chance to survive. Researchers in Illinois found that *Cecropia* moth caterpillars in suburbs crawled down trunks of their host trees and traveled over 30 feet to find cocoon spinning sites near ground level to avoid woodpecker attacks on cocoons spun on branches of host trees. Nearby small shrubs, especially evergreens like yews and junipers, provide concealment from both birds and mice, persistent predators of nutritious fat-rich moth pupae.



Amberwing Dragonfly

Photo by Anita F. Barbour

Damselflies and Dragonflies

These insects, increasingly popular with binocularians who have gone beyond birds, hatch from and fly over lake, pond and stream waters, and along woodland paths and forest-field edges. The larger, stronger dragonflies are more wide-ranging than the delicate damselflies, which fly low and stay near the water's edge. Female dragonflies can be observed laying eggs on the wing by dipping their abdomens into the water, sometimes followed or embraced by a male. Curiously, in parking lots female dragonflies are sometimes seen laying eggs on car hoods, apparently mistaking them for the reflective surfaces of water bodies.



Oblong-Winged Katydid

Photo by Anita F. Barbour

Other insects that catch the curious eye include various large beetles, mantids, katydids and stick insects. These may appear lost, dazed or confused, or perfectly at home, as some are. Mantids are denizens of weedy waste ground where they find good pickings, particularly grasshoppers, bees and wasps, readily available food even in urban settings. Grasshoppers are abundant in waste areas and even along the sides of buildings with untrimmed weeds. Carpenter bees chew round nesting holes in soffits and braces of wooden buildings. Paper wasps and mud daubers build nests under the eaves of buildings, and on trees and shrubs nearly anywhere.



Filmy Dome Spiders

Photo by Anita F. Barbour

Spiders near human habitation include orb-weavers that build classic spiral-threaded webs of considerable size, and the spiders may be impressively bulky themselves. Mid-sized webs may be seen in numbers on the latticework or between the upright struts of footbridges on early mornings, with dewdrops as bright highlights in the early morning sun. Funnel web weavers and other arachnids, including the notorious black widow, can be common around bridges and buildings.

Warwick Village Rare Species and Related Habitats

The following account of rare species and communities is based upon data for the Town of Warwick (smallest division available) collected by the New York Natural Heritage Program (NHP). Since its founding in 1980, NHP has maintained a database of historic (pre-1980) and recent (post-1980) records of “rare elements.” Each element is a plant or animal species, or an ecological community, that is, a habitat defined by vegetation. For rare elements occurring in New York State NHP has established criteria of rarity (number of occurrences, overall numbers, degree of vulnerability and other factors), and rarity ranks based on these criteria. (See NHP ranks & codes page 39.)

NHP rarity ranks are provided after the species or community name in each heading. These ranks are part of a species’ status for the state, which also includes its currently known presence. Extant species (S1, S2, etc.) are of greater interest for this project than historically known species (SH) or those believed extirpated (SX). Statewide status lists for each type of rare element (plants, animals and communities) are available online at the NHP website.¹⁶

NHP also makes available lists of rare elements for counties and townships in New York (go to the Natural Resource Mapper and New York Nature Explorer tools on the NHP website).¹⁷ These maps and lists are not necessarily complete for each county or town. Reasons may include uncertain status, taxonomic uncertainty of a name, contested validity of a species, or other technical considerations. Information may also be withheld from the public based on potential or demonstrated threats to particular elements or geographic occurrences, or in the case of a species that is highly vulnerable due to high visibility, collecting pressure, or other specifically recognized vulnerabilities.

It is also important to note that knowledge of the occurrences of rare species, and even communities (e.g. small patches of communities that require expertise to recognize), is also incomplete, pointing to the need for more local research. It is our hope that this report and this project will stimulate interest and motivation to engage in such research. We believe that informed amateur enthusiasts can contribute to this body of knowledge.

For the Town of Warwick NHP lists 27 rare elements: 7 animals, 14 plants and 6 ecological communities. The NHP list of rare elements for the Town of Warwick has been edited to focus on rare elements that could occur in

the more limited area of the Village along the Wawayanda Creek corridor and the corridors of the tributaries entering the creek based on habitats in or near the study area

Rare Animals

Kentucky Warbler (*Oporornis formosus*) S2 G5 Protected

Kentucky warbler is a ground-nesting songbird of rich deciduous forests. Southern New York is at the northern limit of its breeding range. This warbler appears to be in decline, probably due to habitat loss in its tropical overwintering grounds. Kentucky warbler, like any songbird, could occur in the study area as a visitor, but without good breeding habitat, not as a resident. Lewis Woods and perhaps also the lower Witch’s Brook corridor at the Wawayanda confluence may have breeding habitat for this lovely songbird.

Longtail Salamander (*Eurycea longicauda*) S2S3 G5 Special Concern

A lungless salamander (breathing through its mouth lining and skin) with a tail nearly three times the length of its body, longtail salamander inhabits caves and springy spots in moist forests. Historically ranging north to Albany, it now appears to be restricted to extreme southeast New York west of the Hudson River. This rare amphibian might occur in the Witch’s Brook corridor.



Arrowhead Spiketail

Photo by Alan Wells

Arrowhead Spiketail (*Cordulegaster obliqua*) S2S3 G4

Arrowhead spiketail is a large dragonfly that breeds in forests, the females dropping their eggs in small, slow streams or spring pools. A striking insect, with a long, yellow-and-black-marked abdomen, individuals can be

seen in May resting on stems along secluded wooded edges such as trails and utility corridors. Local in distribution and seldom seen, arrowhead spiketail is threatened by stream pollution and development of wild, wooded areas. This is a highly local insect, and could occur in suitable habitat in stream corridors in the outskirts of the Wawayanda Creek.



Blue-Tipped Dancer

Photo by Alan Wells

Blue-tipped Dancer (*Argia tibialis*) S2 G5

Blue-tipped dancer is a damselfly known from only ten streams in two major watersheds of NY. It is a southern species that appears to have recently expanded its range into our state. In Ohio it is common and occurs in many streams, including slow waters. It could occur in the Wawayanda Creek, for example, in Memorial Park.

Mottled Darner (*Aeshna clepsydra*) S2S3 G4

A large dragonfly of small lakes and bays or larger lakes with marshy or boggy edges, mottled darner is widespread but recorded from just ten localities in the state. Adults can be found perching on tree trunks. Males are often observed patrolling shorelines. Habitat restoration at Memorial Park might increase the marshy edge habitat that supports mottled darner, and generally increase diversity of dragonflies and damselflies in the Creek corridor.

Rare Plants

Carey's Smartweed (*Persicaria careyi*) S1S2 G4 Threatened

This species' drooping pink flowers and glandular-hairy red stems are characteristic. The only seven extant NY populations are either small or threatened by human disturbance or invasive species. Intermittently wet pond shores, roadsides, utility rights-of-way and talus slopes are typical habitats. Carey's smartweed tends to appear and disappear, making it hard to track. Likely this species has a large seed bank, and may be more common than it seems. I believe this plant could appear in the study area, as it actually prefers common, even disturbed habitats. Its potential presents a challenge to connoisseurs of rare native plants that could show up in strange everyday places.

Davis' Sedge (*Carex davisii*) S2 G4 Threatened

This charming sedge of river floodplains has drooping flowers and fruit (called spikes). It is fairly common along the Hudson River and is also known from the Wallkill River floodplain in Orange and Ulster Counties. It may occur along the Wawayanda, and should be searched for in summer at Memorial Park. Davis' sedge would be a good choice for planting there if stock is available.



Michaux's Blue-eyed Grass
Photo by David Werier

Michaux's Blue-eyed-grass (*Sisyrinchium mucronatum*) S1 G5 Endangered

Habitats of this wiry little blue-flowered relative of irises include meadows, hayfields, successional old fields, path edges and rural roadsides. There are only 7 known extant populations left out of about 20-25 historical

New York populations. At the northern edge of its range this species may compete poorly with more common relatives and non-native invasive plants. Documented threats from humans include horseback riding, fire suppression, natural succession to shrubland or forest, and mowing. This blue-eyed grass is so similar to its relatives that it may be more common than reported. It should be looked for in the restoration area. Abandonment of mowed areas to wild growth might improve its chances of natural establishment.

Purple Meadow-parsnip (*Thaspium trifoliatum* var. *flavum*) SX G5T5

Meadow parsnip, a branched, upright member of the parsnip family with small yellow flowers and ridged stems, closely resembles the more common golden alexanders (*Zizia aptera*). Habitats include dry fields, rocky open woods, thickets and stream banks. Though there is a historic record from Warwick, this species is believed to be extirpated in New York. Since stream banks are listed among its habitats, this species could occur in the Village Creek corridor. It might be a good planting choice for the Memorial Park restoration plan.



Purple Milkweed

Photo by David Werier

Purple Milkweed (*Asclepias purpurascens*) S2S3 G5

Purple milkweed resembles common milkweed, but the flower heads are not as spherical, and the flower color is a more intense magenta. Otherwise, the difference lies in small structural details. In Orange County a little north of the Town of Warwick boasts the largest population in the United States, with over 1000 plants. Most populations are small, with fewer than one hundred plants, and located in areas that are being rapidly developed. There could be small stands or isolated individuals in wet meadows and wood edges if restored at Memorial Park.

Rattlebox (*Crotalaria sagittalis*) S1 G5 Endangered

This weedy species was found from New Hampshire throughout the eastern and southern states to as far west as Arizona on the southern and Minnesota on the northern edges of its range. Within this range it is extirpated in both New Hampshire and West Virginia; Michigan populations are considered to be introduced rather than native. In New York this species is found in the Lower Hudson Valley and Long Island, ranging as far north as Orange County. Rattlebox could occur in the Creek corridor area in dry, grainy, circumneutral soils. These are likely to be waste areas with fill soils. None were found during our surveys.

Swamp Lousewort (*Pedicularis lanceolata*) S2 G5 Threatened

With about 20 extant New York populations, half in good condition with hundreds of plants, swamp lousewort occurs in a variety of open wetland habitats, including rich fens, freshwater tidal marshes and swamps, and along the edges of ponds or shrub swamps. It has an affinity for calcium-rich soils, so is not found in acidic wetlands in mountainous terrain. Loss of habitat is probably the greatest threat to swamp lousewort in southeast New York. Swamp lousewort habitat is likely in floodplain swamps along the creek, and could occur in the swamp at Memorial Park. If available as a planting or seed, it would be an attractive and interesting introduction.

Terrestrial Starwort (*Callitriche terrestris*) S2S3 G5 Threatened

This tiny native annual has been found in New York on wet logging roads, in a soggy horse corral, and other disturbed muddy places. State Botanist Emeritus Richard Mitchell surmised that terrestrial starwort grew historically in the wallows of extinct mammals like mastodons, and that it recently has adapted to human disturbance. Ten populations have been documented in New York, mostly in the southeast part of the state. It so resembles a moss that it is likely overlooked, and may be more common than its rarity status suggests. Terrestrial starwort could occur in the Creek corridor on wet compacted soils, but competing plants and unsuitable soil chemistry may prevent its establishment. Nearly nothing is known of how such factors affect this species.

Thicket Sedge (*Carex abscondita*) S1 G4G5

This sedge has often been confused with the common woodland sedge (*C. digitalis*) due to a mistake in many sedge keys. Its occurrence north of Long Island is in question, since many specimens determined as thicket sedge have been re-examined and determined to be common woodland sedge. Further surveys of areas with suitable habitat (shrublands, moist young and mature forests, and floodplains) for thicket sedge might

reveal the species in unexpected locations in southeast New York. Issues of identification make it difficult to say whether thicket sedge might occur in the Wawayanda Creek corridor. Certainly it cannot be ruled out, since its described habitats are commonplace. Brushy edges within the study area especially Witch's Brook and Memorial Park are the most promising habitats.

Virginia Snakeroot (*Endodeca serpentaria*) S2 G4

This southern species occurs on south to southeast-facing oak-hickory slopes, often with other uncommon to rare forest herbs such as black-edge sedge (*Carex nigromarginata*), Wildenow's sedge (*Carex wildenowii*), Bosc's panic grass (*Dichanthelium bosci*) and small-flowered crowfoot (*Ranunculus micranthus*). Snakeroot, named for its use as a cure rattlesnake bites, has an affinity for seasonal runoff channels, where numbers of plants may be found. Because this species resembles some other small herbs and tree seedlings, there may be undiscovered populations, including in the Village. No suitable habitat has been found in the core Creek area, but there may be forest slopes up side corridors where Virginia snakeroot does occur. These may be sources of seeds and water-borne plants that might be washed into the main Wawayanda Creek channel as pioneers. Witch's Brook corridor is the most likely area for this plant to occur.



Virginia Snakeroot

Photo by David Werier

Woodland Agrimony (*Agrimonia rostellata*) S2 G5

Woodland agrimony, with lacy leaves and tiny yellow flowers, grows on forested slopes with calcareous soils, where it is likely to be found with other rare herbs such as Virginia snakeroot and small-flowered crowfoot. Though it is the smallest member of its genus, most of the 17 New York

populations have fewer than 100 plants. One though, has more than 10,000. Development of wooded slopes is a major threat to this plant and its woodland companions. Woodland agrimony should be looked for in the study area along tributary streams and runoff channels of wooded slopes. Witch's Brook corridor is a good possibility for this woodland wildflower.

Habitats (Natural Communities)

Habitats are divided into terrestrial or upland types, and wetland types, including ponds and streams (the latter treated separately under the NHP scheme). Like species, the communities listed here are those listed by NHP for the Town of Warwick. Though no rare communities were found in the Wawayanda Creek corridor during our surveys, those described below are characteristic habitats that could potentially occur. Much of the Creek corridor study area is disturbed or fragmented but contain pieces of these habitats. The most intact areas of habitat are in Memorial Park and Lewis Woodlands.

Red Maple-Hardwood Swamp S4 G5

This type of swamp occurs on poorly drained inorganic soils. Red maple may be the only dominant tree, or may be codominant with ashes, elms, yellow birch or swamp white oak. The shrub layer may be quite dense, with winterberry, spicebush, alders, viburnums, highbush blueberry, common elderberry and shrubby dogwoods. The herbaceous layer may be dominated by ferns, skunk cabbage or sedges, with jewelweed, false nettle, arrow arum, or tall meadow rue. The largest area of red maple-hardwood swamp in the study area is along the Wawayanda Creek at Memorial Park.

Red Cedar Successional Shrubland S4 G4

This type of shrubland occurs on sites that have been cleared (mostly for farming). As natural vegetation takes over there is a succession of growth stages usually from meadow to forest, with a shrubby stage along the way. Characteristic shrubs include eastern red cedar, gray dogwood, raspberries, wild cherries, sumacs and multiflora rose. Successional shrublands are good nesting sites for songbirds, including brown thrasher, blue-winged warbler, golden-winged warbler, chestnut-sided warbler, yellow-breasted chat, eastern towhee, field sparrow, song sparrow, and indigo bunting.

Appalachian Oak-Hickory Forest S4 G4G5

This is a common forest community of rocky uplands, typically found on middle slopes and terraces, less frequently on low summits. Soils are often somewhat to very calcareous based on the rock substrate. In Warwick there are limestones and dolomites in the northwest portion of the town, but not

in the southeast part where the rocks tend to be metamorphic and at least somewhat acidic. Oak-hickory woods in these more rugged mountains, including Bellevalle Mountain, are supported on more exotic geologies (e.g. plagioclase, coarser granites, amphibolite, pegmatite). Although this is not an especially rare community, high biodiversity and rare herbaceous species are frequent features of these mountain slope forests. Small patches of this forest type could occur, for example in the upper Witch's Brook corridor.

Rich Mesophytic Forest S2S3 G4

This is a mixed hardwood forest that resembles those of the unglaciated Allegheny Plateau but is less diverse. It occurs on rich, fine-textured, well-drained soils that are favorable for the dominance of a wide variety of tree species. The description of the forest of Lewis Woodlands in the upper Witch's Brook Corridor suggests that it is probably a rich mesophytic forest.

(For additional information regarding the ecology of the Creek corridor see *Ecologist's Survey, Appendix C.*)

NHP Ranks & Codes

NYS RANK

- S1: Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.
- S2: Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.
- S3: Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.
- S4: Apparently secure in New York State.
- S5: Demonstrably secure in New York State.
- SH: Historically known from New York State, but not seen in the past 15 years.
- SX: Apparently extirpated from New York State.
- SZ: Present in New York State only as a transient migrant.
- SxB and SxN, where Sx is one of the codes above, are used for migratory animals, and refer to the rarity within New York State of the breeding (B) populations and the non-breeding populations (N), respectively, of the species.

GLOBAL RANK

- G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.
- G2: Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.
- G3: Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.
- G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- GH: Historically known, with the expectation that it might be rediscovered.
- GX: Species believed to be extinct.

NY LEGAL STATUS - Animals:

- Categories of Endangered and Threatened species are defined in New York State Environmental Conservation Law section 11-0535. Endangered, Threatened, and Special Concern species are listed in regulation 6NYCRR 182.5.
- E - Endangered Species: any species which meet one of the following criteria: Any native species in imminent danger of extirpation or extinction in New York. Any species listed as endangered by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.
- T - Threatened Species: any species which meet one of the following criteria: Any native species likely to become an endangered species within the foreseeable future in NY. Any species listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of the Federal Regulations 50 CFR 17.11.
- SC - Special Concern Species: those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York.
- P - Protected Wildlife (defined in Environmental Conservation Law section 11-0103): wild game, protected wild birds, and endangered species of wildlife.
- U - Unprotected (defined in Environmental Conservation Law section 11-0103): the species may be taken at any time without limit; however a license to take may be required.
- G - Game (defined in Environmental Conservation Law section 11-0103): any of a variety of big game or small game species as stated in the Environmental Conservation Law; many normally have an open season for at least part of the year, and are protected at other times.

NY LEGAL STATUS - Plants:

- The following categories are defined in regulation 6NYCRR part 193.3 and apply to NYS Environmental Conservation Law section 9- 1503.
- E - Endangered Species: listed species are those with: 5 or fewer extant sites, or fewer than 1,000 individuals, or restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or species listed as endangered by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.
- T - Threatened: listed species are those with: 6 to fewer than 20 extant sites, or 1,000 to fewer than 3,000 individuals, or restricted to not less than 4 or more than 7 U.S.G.S. 7 and ½ minute topographical maps, or listed as threatened by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.
- R - Rare: listed species have: 20 to 35 extant sites, or 3,000 to 5,000 individuals statewide.
- V - Exploitably Vulnerable: listed species are likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.
- U - Unprotected: no state status.

Strategies: Landscape Improvements for Key Locations

One of the primary goals of this Strategic Plan is to present attractive landscape design solutions for key areas along the Creek corridor. These shown here involve Village parkland but other areas along the Wawayanda Creek corridor could also benefit from plantings that are designed for beauty as well as functionality. Well designed installations can have seasonal interest, hold banks and prevent erosion, decrease stormwater runoff and add to biodiversity. For instance, the railroad right-of-way, if seeded with deep rooted native grasses and wildflowers could provide an attractive cover that resists erosion and is easy to maintain. Mitchel Mall as described previously has great potential for having an attractive landscape that integrates the shopping area with its generous Creek frontage.

Linear Park at the South Street Parking Area

This open space is the central Village connecting node as described in 'Areas of Interest'. Linear Park is a highly visible location at the urbanized edge of the Creek and a favored parking area that serves nearby shopping and dining. A retaining wall separates the Creek from the parking lot, formerly its floodplain. The channelized streambanks are narrow, eroded and steep, offering little space to introduce significant ornamental plantings.

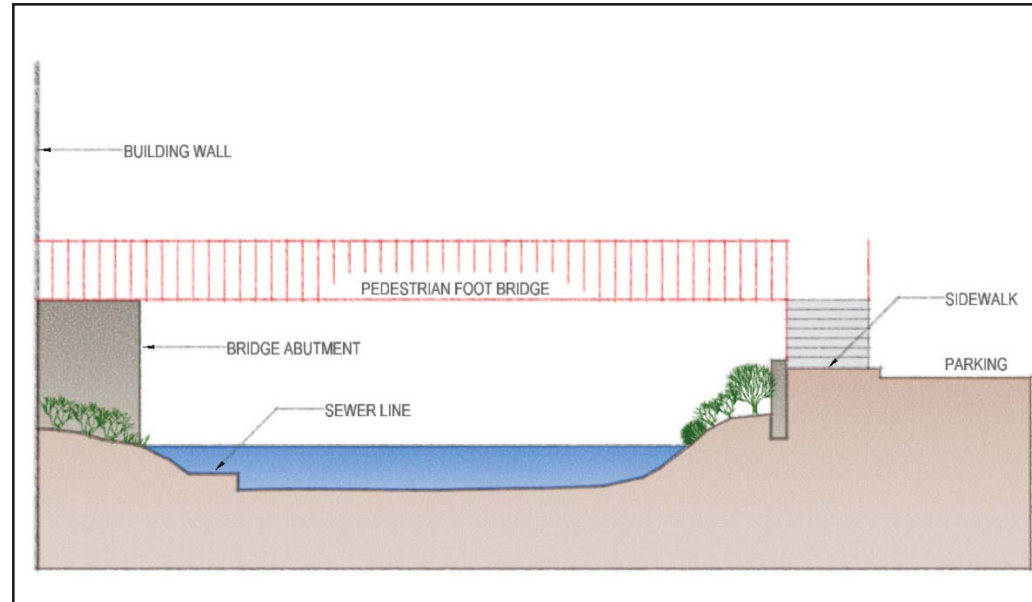
The Planting Plan proposed for Linear Park in this report (the full construction drawings are submitted under separate cover) uses a method called bioengineering that employs plants and non-structural methods to stabilize streambanks instead of armoring them with rock or concrete. Coir logs made of coconut hulls are staked at the toe of the slope and



Beebalm (*Monarda didyma*)

flood tolerant native shrubs such as red-twig dogwood and buttonbush are planted above or driven into the coir logs as 'live stakes' to root into the soil and provide further stability. At the top of the bank a band of colorful native perennials, shrubs and grasses are specified to grow just below the wall in sight of pedestrians on the nearby bridge or sidewalk.

Weedy volunteer vegetation grows rampantly and must be removed before new plants are installed thus leaving soil vulnerable to flooding. Erosion control fabric is used throughout the project to hold soil in place while plant roots develop. The planting plan is proposed to be implemented in phases to reduce loss if severe flooding damages a new installation. This is a particularly difficult area to install any type of planting but its importance as a highly visible public space warrants the effort. The Landscape Architect (Restaino) has consulted with the Orange County Soil and Water Conservation District Manager, Kevin Sumner, who offered to assist with permitting and technical soils and erosion control practices.



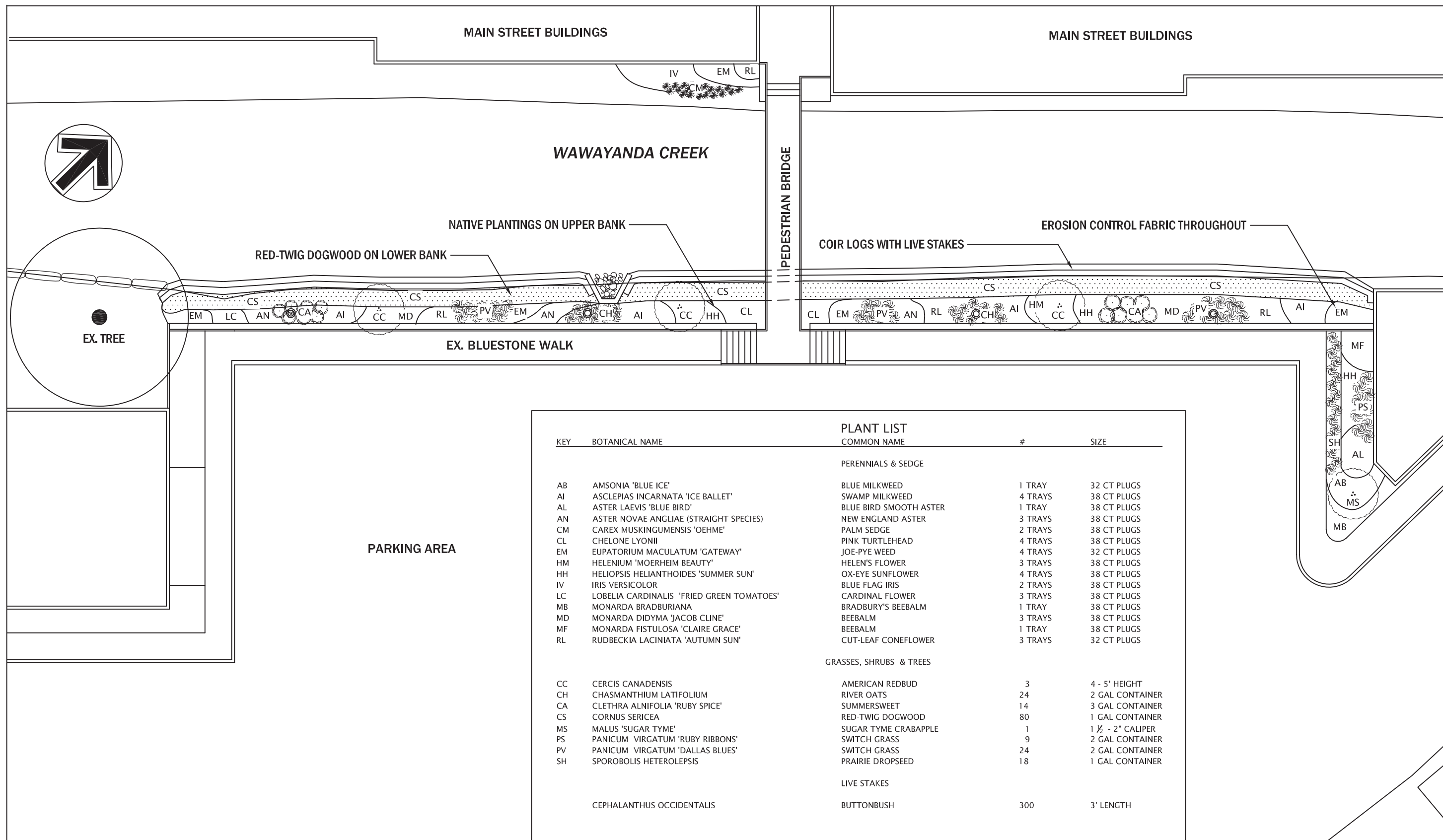
Cross Section of Wawayanda Creek at Linear Park South Street Parking Area



American Redbud (*Cercis canadensis*)



Wild Bergamot (*Monarda fistulosa*)

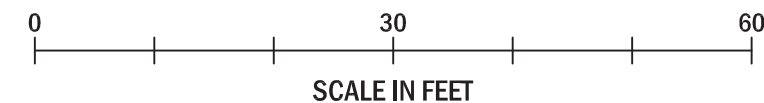


KEY	BOTANICAL NAME	COMMON NAME	#	SIZE
PERENNIALS & SEDGE				
AB	AMSONIA 'BLUE ICE'	BLUE MILKWEED	1 TRAY	32 CT PLUGS
AI	ASCLEPIAS INCARNATA 'ICE BALLET'	SWAMP MILKWEED	4 TRAYS	38 CT PLUGS
AL	ASTER LAEVIS 'BLUE BIRD'	BLUE BIRD SMOOTH ASTER	1 TRAY	38 CT PLUGS
AN	ASTER NOVAE-ANGLIAE (STRAIGHT SPECIES)	NEW ENGLAND ASTER	3 TRAYS	38 CT PLUGS
CM	CAREX MUSKINGUMENSIS 'OEHME'	PALM SEDGE	2 TRAYS	38 CT PLUGS
CL	CHELONE LYONII	PINK TURTLEHEAD	4 TRAYS	38 CT PLUGS
EM	EUPATORIUM MACULATUM 'GATEWAY'	JOE-PYE WEED	4 TRAYS	32 CT PLUGS
HM	HELIENIUM 'MOERHEIM BEAUTY'	HELEN'S FLOWER	3 TRAYS	38 CT PLUGS
HH	HELIOPSIS HELIANTHOIDES 'SUMMER SUN'	OX-EYE SUNFLOWER	4 TRAYS	38 CT PLUGS
IV	IRIS VERSICOLOR	BLUE FLAG IRIS	2 TRAYS	38 CT PLUGS
LC	LOBELIA CARDINALIS 'FRIED GREEN TOMATOES'	CARDINAL FLOWER	3 TRAYS	38 CT PLUGS
MB	MONARDA BRADBURIANA	BRADBURY'S BEEBALM	1 TRAY	38 CT PLUGS
MD	MONARDA DIDYMA 'JACOB CLINE'	BEEBALM	3 TRAYS	38 CT PLUGS
MF	MONARDA FISTULOSA 'CLAIRE GRACE'	BEEBALM	1 TRAY	38 CT PLUGS
RL	RUDBECKIA LACINIATA 'AUTUMN SUN'	CUT-LEAF CONEFLOWER	3 TRAYS	32 CT PLUGS
GRASSES, SHRUBS & TREES				
CC	CERCIS CANADENSIS	AMERICAN REDBUD	3	4 - 5' HEIGHT
CH	CHASMANTHIUM LATIFOLIUM	RIVER OATS	24	2 GAL CONTAINER
CA	CLETHRA ALNIFOLIA 'RUBY SPICE'	SUMMERSWEET	14	3 GAL CONTAINER
CS	CORNUS SERICEA	RED-TWIG DOGWOOD	80	1 GAL CONTAINER
MS	MALUS 'SUGAR TYME'	SUGAR TYME CRABAPPLE	1	1 1/2 - 2" CALIPER
PS	PANICUM VIRGATUM 'RUBY RIBBONS'	SWITCH GRASS	9	2 GAL CONTAINER
PV	PANICUM VIRGATUM 'DALLAS BLUES'	SWITCH GRASS	24	2 GAL CONTAINER
SH	SPOROBOLIS HETEROLEPSIS	PRAIRIE DROPSEED	18	1 GAL CONTAINER
LIVE STAKES				
	CEPHALANTHUS OCCIDENTALIS	BUTTONBUSH	300	3' LENGTH

NOT A CONSTRUCTION DOCUMENT

RESTAINO DESIGN LANDSCAPE ARCHITECTURE, PC
 GRAHAMSVILLE, NY 12740
 FEBRUARY 28, 2012

PLANTING PLAN
SOUTH STREET PARKING AREA
VILLAGE OF WARWICK, NEW YORK



Memorial Park Lake

Memorial Park Lake is in essence a widened area of the Wawayanda Creek with gentle banks of mowed turf to the water's edge. Here the Creek is connected to its floodplain and can slowly rise during floods, inundating lower areas and taking pressure off flooding elsewhere. The planting plan here features flood tolerant riparian plants and is proposed to discourage geese that congregate along the lake shore making this area unappealing. Geese prefer mowed lawns with tender new grass and avoid areas where predators might hide. Tall native grasses, shrubs and perennials are proposed here for color, interest and educational value. The planting is not meant to be strictly a restoration but a demonstration planting of natives to attract a wide variety of birds, butterflies and other wildlife. A boardwalk is proposed so that visitors can have access to the waterfront without getting overly wet feet. It would also provide a good vantage point for viewing plants, insects, birds and other animals as well as fishing. The lake is teeming with dragonflies in the summer months and with binoculars all kinds are evident darting over the water.



Boardwalk on the nearby Appalachian Trail

'Trees for Tribs' Site behind the Skate Park

In the fall of 2011, the Village was awarded 300 trees and shrubs from the NYS DEC 'Trees for Tribs' program to plant behind the skate park in Memorial Park. During that time unprecedented bad weather, hurricane Irene, Lee and a severe ice storm, transpired and rendered site preparation impossible. Volunteers braved the muddy conditions and 'heeled in' plants for spring planting in 2012. Although the varieties of trees and shrubs were selected and furnished by the program, the Landscape Architect drew up a diagram as a planting guide (*see page 44*). The plants noted here are good selections for riparian planting but might need to be supplemented with showier native perennials, grasses and woody plants for more visible areas.



Shadbush, Serviceberry (*Amelanchier laevis*)



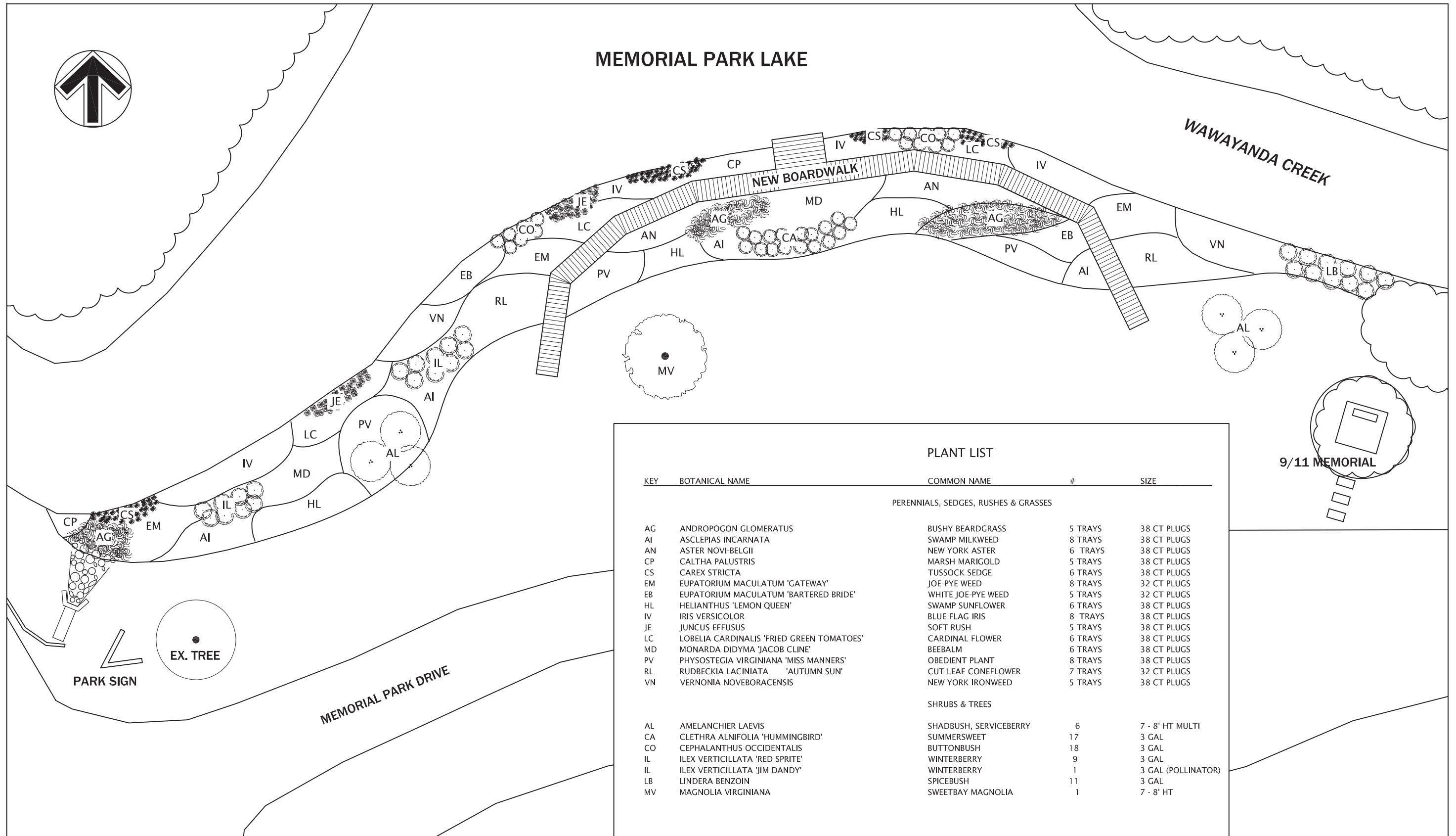
Blue Flag Iris (*Iris versicolor*)



Orange Sunflower (*Heliopsis helianthoides*)



New York Ironweed (*Vernonia noveboracensis*)



PLANT LIST			
KEY	BOTANICAL NAME	COMMON NAME	SIZE
PERENNIALS, SEDGES, RUSHES & GRASSES			
AG	ANDROPOGON GLOMERATUS	BUSHY BEARDGRASS	5 TRAYS 38 CT PLUGS
AI	ASCLEPIAS INCARNATA	SWAMP MILKWEED	8 TRAYS 38 CT PLUGS
AN	ASTER NOVI-BELGII	NEW YORK ASTER	6 TRAYS 38 CT PLUGS
CP	CALTHA PALUSTRIS	MARSH MARIGOLD	5 TRAYS 38 CT PLUGS
CS	CAREX STRICTA	TUSsock SEDGE	6 TRAYS 38 CT PLUGS
EM	EUPATORIUM MACULATUM 'GATEWAY'	JOE-PYE WEED	8 TRAYS 32 CT PLUGS
EB	EUPATORIUM MACULATUM 'BARTERED BRIDE'	WHITE JOE-PYE WEED	5 TRAYS 32 CT PLUGS
HL	HELIANTHUS 'LEMON QUEEN'	SWAMP SUNFLOWER	6 TRAYS 38 CT PLUGS
IV	IRIS VERSICOLOR	BLUE FLAG IRIS	8 TRAYS 38 CT PLUGS
JE	JUNCUS EFFUSUS	SOFT RUSH	5 TRAYS 38 CT PLUGS
LC	LOBELIA CARDINALIS 'FRIED GREEN TOMATOES'	CARDINAL FLOWER	6 TRAYS 38 CT PLUGS
MD	MONARDA DIDYMA 'JACOB CLINE'	BEEBALM	6 TRAYS 38 CT PLUGS
PV	PHYSOSTEGIA VIRGINIANA 'MISS MANNERS'	OBEDIENT PLANT	8 TRAYS 38 CT PLUGS
RL	RUDBECKIA LACINIATA 'AUTUMN SUN'	CUT-LEAF CONEFLOWER	7 TRAYS 32 CT PLUGS
VN	VERNONIA NOVEBORACENSIS	NEW YORK IRONWEED	5 TRAYS 38 CT PLUGS
SHRUBS & TREES			
AL	AMELANCHIER LAEVIS	SHADBUSH, SERVICEBERRY	6 7 - 8' HT MULTI
CA	CLETHRA ALNIFOLIA 'HUMMINGBIRD'	SUMMERSWEET	17 3 GAL
CO	CEPHALANTHUS OCCIDENTALIS	BUTTONBUSH	18 3 GAL
IL	ILEX VERTICILLATA 'RED SPRITE'	WINTERBERRY	9 3 GAL
IL	ILEX VERTICILLATA 'JIM DANDY'	WINTERBERRY	1 3 GAL (POLLINATOR)
LB	LINDERA BENZOIN	SPICEBUSH	11 3 GAL
MV	MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	1 7 - 8' HT

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RESTAINO DESIGN LANDSCAPE ARCHITECTURE, PC
 GRAHAMSVILLE, NY 12740
 FEBRUARY 28, 2012

MEMORIAL PARK LAKE PLANTING PLAN

VILLAGE OF WARWICK, NEW YORK



Strategies: Landscape Maintenance

General

The initial critical step to take for maintaining the Wawayanda Creek landscape applies to the corridor as a whole. The Wawayanda Creek needs periodic, minimally yearly, stream clean-up for removing debris and refuse within the stream bed in the study corridor and, even more advantageously, its length within the Village. The Village of Warwick Department of Public Works with its access to equipment and machinery is the most obvious and capable group able to tackle this first stage of clean-up since there are heavy or dangerous items in the stream such as railroad ties, tires and corrugated metal pieces. If an open dialogue with the railroad owners and its lessee can be established, their assistance with railroad tie removal and other railroad debris that is in the stream corridor is called for. During the floods of the fall of 2011 loose railroad ties made their way into the streambed and are now much more difficult to remove.

Thereafter, an organized citizens group or Creek advocacy group such as a 'Friends of the Wawayanda Creek' including community young people where conditions are safe, could carry on a cooperative yearly stream clean-up in concert with the Village Department of Public Works. In addition to debris in the stream, invasive plants such as Japanese Knotweed and Norway Maple intrude upon the Creek banks pushing out native plants and trees. A trained individual can do positive identification and help in an effort to remove these landscape nuisances and replace them with native plants.

Attractive plantings by active gardening organizations contribute to the Village of Warwick's visual appeal and are a draw for businesses as well as an enhancement to Village identity. Special plantings and methods called bioengineering furthermore can help with erosion control, as shown in the 'Linear Park Planting Plan'. Planted stormwater management installations also known as green infrastructure are cost effective and attractive and may be used more frequently in the future instead of hard pipe solutions. For these reasons it is recommended that the Village train or hire an individual within the Department of Public Works who is trained in horticulture and has hands-on experience with plants so that planting installations, trees and park areas can be maintained in an efficient and effective way. The active gardening organizations, Warwick Valley Gardeners and Warwick in Bloom maintain several lovely floral and commemorative plantings as well as planters and any needed coordination could be done through this specially trained individual. (See Appendix B: Maintenance Recommendations.)



'Trees for Tribs' Planting Diagram

Strategies: Community Connections

Wayfinding & Interpretive Signage

Two types of signage are recommended for the Wawayanda Creek corridor: wayfinding and interpretive. These are shown placed in key locations on the 'Areas of Interest Maps' (see pages 16-27). Wayfinding signage is directional in nature and helps visitors follow a particular path for a determined route; interpretive signage provides notable facts or interesting information about a locale from a variety of viewpoints such as historical, natural, educational, architectural, etc. Key nodes such as Mitchel Mall, Railroad Green, South Street Linear Park and Memorial Park can be linked with wayfinding signage if some of the important physical connections can be made. Successful wayfinding signage is judiciously placed, simple to read, easily recognizable and consistent in color and design.

Interpretive signage does not depend upon an established route but is best located in places where visitors or Village residents can have easy access or congregate such as next to Linear Park or by the Caboose (The Warwick Merchant's Guild information location by the bank parking area). An emerging opportunity called podcasts uses a variety of digital tools and technologies to enable access to educational information. Audio podcasts can be developed to provide short narrations about specific sites and resources. The Village and the Warwick Historical Society are already working on this approach for a limited set of locations. Interpretive podcasts for the Wawayanda Creek corridor could be coordinated with this effort and could feature narrations on Creek mills, the railroad, natural history, ecology or community events that involve the Wawayanda Creek.

Railroad Right-of-Way

Issues and Opportunities

The railroad had a key role in the development of Warwick's economy and in shaping the Village's physical layout as we experience it today. The railroad's ownership of land along and near the Wawayanda Creek creates significant constraints on what is possible in terms of physical improvements, pedestrian access, and other steps that the Village might wish to pursue, including some recommendations in this Strategic Plan. This section outlines key issues and challenges for the Wawayanda Creek corridor and then describes a potential approach for next steps that may help overcome certain obstacles.

The active rail line through the Village, known as the Hudson Secondary line, is owned by the Norfolk Southern Railroad and is currently leased and operated by the Middletown & New Jersey Railroad. It is used for freight, including some cargo that originates from businesses in Warwick, and plans are being discussed for some improvements that can potentially increase the use of this line for shipping local agricultural products. For a number of elements proposed within this Plan, including some of the steps discussed in this section, the railroad has a dominant role in the community as a landowner and operator of this active line through the Village.

Apart from the conceptual potential for collaborating with the railroad operators to explore some of the educational opportunities described below, the railroad's operations have a major impact on Village life in certain ways. Some of the aesthetic and environmental issues and opportunities discussed elsewhere in this Strategic Plan are directly related to the current and future operations of the railroad, including the fact that the rail corridor currently houses significant accumulations of trash, much of which is clearly from the railroad itself, e.g. old railroad ties left lying near the tracks. Management of vegetation along the tracks is another area where changes can benefit the Village's environment and appearance. Improved management practices in the railroad right-of-way especially where it is directly adjacent to the Creek banks can potentially eliminate herbicides, help reduce erosion over time, reduce the risk of damage during floods, and may help protect other adjacent private property from erosion and flood damage.

In addition to the issues listed above, another key question is whether there is any potential for working with the railroad to develop a more direct pedestrian connection from South Street to Forester Avenue that could utilize part of their right-of-way. Visual observations and interviews with local residents, clearly indicate that pedestrians often use the railroad right-of-way between Elm Street to Oakland Avenue, and South Street to Forester Avenue, rather than taking the longer routes through Village streets.

There is potential to locate a pedestrian path separated from the tracks by a fence, along the south side of the railroad tracks in the South Street to Forester Avenue section providing that the north edge of the Kiuken lumber yard parking lot could be made part of the pedestrian access (See *Area of Interest D*, page 23) Initial outreach to a representative of the Middletown & New Jersey Railroad resulted in a negative response regarding their willingness to consider this approach. Other communities have pursued pedestrian and bicycle trails that are within and run parallel to an existing

active railroad track with success such as in the Hamlet of Wassaic in the Town of Amenia, New York where a tall fence separates a popular pedestrian and bike trail safely from nearby Metro-North railroad tracks.



Eastbound Train Leaving Warwick Station, 1936

Photographer Unknown

Railroad Heritage Corridor

Communications with a representative from the Middletown & New Jersey railroad line with Mayor Newhard and the Environmental Planner (Gruber) as of the writing of this report resulted in the representative agreeing to consider some of the most salient items such as removal of leaning telegraph poles and strewn railroad ties. The herbicide spraying of the entire leased rail line is contracted out and the railroad was reluctant to change these practices at the present time.

We recommend that the Village continue trying to engage the railroad's operators to explore the potential for access, clean-up of debris in the right-of-way, repairs and maintenance that respect the Village of Warwick's visual quality such as that at Railroad Green, and improvements to their current vegetation management practices. Addressing some of these issues is a priority in order to maximize the potential value and feasibility of other ideas described in this Plan. Working with both companies (Norfolk Southern and Middletown-New Jersey) to begin compiling historical and educational information relevant to development of a "Railroad Heritage Corridor" may provide an important starting point for dialogue and collaboration on other issues including right-of-way maintenance and

possible pedestrian access issues. This “Railroad Heritage Corridor” would fit in well with the historic district that includes Railroad Avenue and the architecturally notable railroad station. The railroad’s past role and its continued presence also present major opportunities for interpretive education projects and a tourism draw for railroad enthusiasts. In addition, the ownership, lease holder and use of the railroad right-of-way may change over time resulting in more opportunities for improvements that would benefit the Wawayanda Creek corridor as well as the Village of Warwick.

Resources related to planning and design of walking trails along active railroad lines are available from several sources and include the Federal Highway Administration’s Report, *Rails with Trails – Lessons Learned* (2002), which provides a detailed overview of relevant issues from the perspective of both railroads and trail advocates. This report includes material about the benefits available to railroads from cooperating in the development of trails along rail lines, as well as a good introduction to the challenges and obstacles railroads face for many of these proposed projects.¹⁸

According to the New York State Department of Transportation, projects that involve walking paths along active rail lines have been implemented in New York State (personal communication with Lisa Mondello, March 12, 2012) and this agency is one source of information. The *Rails-To-Trails Conservancy*, a nonprofit group working nationally on related issues, is another good source and has a number of resources on rails with trails along active rail lines.¹⁹

Assembling Pedestrian Connections

If impediments prove insurmountable for assembling certain key Creek access points and routes, our recommendations include following an incremental strategy for developing these pedestrian connections. As specific properties undergo change in use and ownership, the Village can potentially develop easements or legal arrangements with individual owners to allow a public walking route that can be relatively close to the Creek, depending upon site constraints, existing buildings and land use. This approach can be adopted by the Village, and as decisions are made about specific properties and sites by the Planning Board and Village Board in future years, sections of this pedestrian corridor can be pieced together until complete walking connections from Elm Street to Forester Avenue are developed within as close proximity to the Creek as possible. The ownership, topography and layout of existing buildings and

other improvements along this corridor are challenging, but this process could be expedited through outreach to property owners and by securing voluntary agreements and developing alternative by-pass routes as the corridor takes shape.

Bridges and Village Style

Bridges

The Village of Warwick is unique for its careful attention to historic resources, visual appearance and attractive plantings. As mentioned previously, bridges are important visual features throughout the stream corridor and provide an especially fine vantage point for viewing the Creek as well as a pleasing rhythm. These could be focal points for area artists to draw attention to the Creek and a place for sculpture or interpretive signage. Pursuing action to save the historic bridge at Bank Street is important. A preservation organization, the Historic Bridge Foundation, publishes a list of actions that communities can take to save historic bridges, including placing the bridge on the National Register.²⁰

Unifying Village Style

Village style is a phrase that has been referred to in previous sections. The existing historic architecture within the Village and the new elements that have been thoughtfully chosen for lighting, street furnishing, and paving in the Village historic district and along Railroad Green provide good examples to follow for a unifying style within the Creek corridor. Rather than start a new design vocabulary, we recommend continuing the existing style as a unifying design approach with high quality street furnishings and attractive planters. Screening backyards and dumpsters along the back of Main Street shops and adding lighting and paving to areas such as Mitchel Mall can be adapted from the design ideas that are already in use.

Community Advocacy

The creation of a community advocacy group that champions the Wawayanda Creek would be a powerful tool for restoration and bringing the Creek back as an amenity and into the fabric of the community. Participation would cut across many interests, talents, ages, businesses and professions represented in the Village and the larger Warwick community. A Wawayanda Creek advocacy group could spearhead initiatives that were supported or coordinated with the Village, sharing responsibility for carrying out some of the recommendations that are contained in this Strategic Plan.



Attractive Fencing and Landscaping Reflects Village Style



Existing Design Vocabulary Can be Used throughout Creek Corridor



Artist's Rendering of Enhanced Pedestrian Space at South Street Linear Park

Executive Summary

Toward the completion of this Strategic Plan and as part of our outreach efforts, we drew up a short questionnaire that was distributed by the Village to businesses located along the Creek corridor. It asked basic questions such as “what features of the Wawayanda Creek are most appealing” and “what features detract the most” and similar questions concerning the Wawayanda’s place in the community. The responses that have come in (more may come in as of this writing) show that the Creek was indeed in their vision and considered important. Most respondents viewed the Creek favorably: as a source of soothing sounds, the place of the Duck Derby, providing shade and coolness, providing views of water flowing under the bridges, among others. They also expressed reservations about the Creek because of flooding (a topic which is beyond the scope of this report) and problems similar to the ones we have cited such as debris in the stream and unattractive volunteer vegetation on the streambanks. A few respondents were concerned about how the central business district in the Village would grow in the future, attract new businesses and maintain its vitality since the Creek and the Village core are intimately related.

Our outreach to the various sectors of the community revealed a variety of needs and expectations focused on the Creek. For instance, our meeting with the Warwick Valley School District gave us an idea of creek oriented activities that school children might engage in. Some of these were fishing, nature study and creative arts or writing projects inspired by the Creek’s attributes or its problems. Our recommendations seek to address multiple needs, but at the same time focus on core strategies for the Village to embark upon as a pro-active path toward the Creek’s revitalization.

A list of grants and grant strategies is appended (*Appendix A*) so that the Village can pursue potential funding for carrying out some of the recommendations contained here. Many of these grants now emphasize synergies among various aspects of community development. Since the Creek is significant in that it cuts across many boundaries as well as threads the community together, several related proposals that involve the Creek corridor might fulfill these grant requirements. The following recommendations are described in more detail in the body of this Plan:

1. Initiate a major Creek clean-up effort by the Village Department of Public Works before engaging volunteers for regular or yearly stream clean-up days perhaps before the Duck Derby.
2. As a first phase, implement the planting and erosion control project described in the Plan for the Creek banks at Linear Park with assistance from the Orange County Soil & Water Conservation District.
3. Hire or train a Department of Public Works individual in horticulture to maintain Village plant installations, street trees and park lands; coordinate with Warwick Valley Gardeners and Warwick in Bloom projects. Yearly stream clean-up and care of erosion control installations can also be coordinated with the DPW and this individual.
4. Institute a parking study for the core business district, especially at South Street and the bank drive-thru parking areas to better organize parking throughout the core business district. This study should consider Creek buffers so that vehicles are not located up against streambanks and comfortable room is left for pedestrian passage. As a second phase include a modest pedestrian ‘buffer’ area along Linear Park sidewalk.
5. Create a small ‘pocket park’ at the confluence of the Mistucky and Wawayanda Creeks as described in the Plan.
6. Work with the Warwick Historical Society to list the Bank Street Bridge on the register of historic places. Contact the Historic Bridge Foundation regarding the preservation of this important bridge.
7. Follow-up on the initial discussions with the railroad owner and lessee (Norfolk Southern and Middletown-New Jersey) for cleaning-up the debris in the railroad right-of-way, making repairs that are compatible with the Village’s visual quality, and changing the current maintenance practice of herbicide spraying along the Creek corridor. Continue to pursue a “Heritage Railroad Corridor” as described in this report.
8. Assemble pedestrian connections incrementally throughout the Creek corridor as they become available by means of easements or agreements as properties change ownership or as they come before the Village Boards for changes in use.
9. Implement landscape maintenance recommendations for new Village plantings. Install plantings at Memorial Park Lake with a boardwalk (as shown in this report) to discourage geese and provide an area for easy access for education, fishing and nature study.
10. Initiate a park landscape plan for Stanley Deming Park to address erosion along the Mistucky Creek, stabilize banks with plantings, and relocate park elements that cause excessive foot traffic; make connections with the Park Avenue Elementary School.
11. Develop interpretive themes and signage at notable locations within the Creek corridor as shown on the ‘Areas of Interest’ maps; coordinate podcasts with the Warwick Historical Society where appropriate. Institute wayfinding (directional) signage when Creek accessibility is improved and partial or complete walking routes are pieced together.
12. Encourage clean-up, screening of dumpsters, and modest landscape improvements of backyards along the Creek corridor. Promote adoption of the ‘Village Style’ as noted in this report for lighting, street furnishings, screening, planters and paving.
13. Work with the owners of Mitchel Mall and Burger King to incorporate a walkway to Elm Street and to provide outdoor amenities and creekside eating opportunities at Mitchel Mall as described. If the opportunity arises, initiate a site plan for Mitchel Mall that features the ‘Village Style’ and connects the Mall to the rest of the Village business district.
14. Monitor water quality and quantity of the Wawayanda Creek as recommended; inventory and repair pipe outfalls entering the Creek; introduce bioengineering, erosion control and green infrastructure methods where possible. Work with upstream municipalities and stakeholders to improve water quality and quantity control.
15. Initiate the formation of a *Friends of the Wawayanda Creek* or *Wawayanda Creek Watershed Alliance*. The goals of a citizens’ volunteer group would complement and strengthen those of the Village concerning the Creek corridor and might include:
 - Increasing the Creek’s visibility within the Village of Warwick
 - Promoting and restoring its environmental quality
 - Conducting water quality, fish and invertebrate monitoring
 - Conducting events such as organizing regular stream clean-up days and coordinating with the Village Department of Public Works
 - Organizing an arts festival centering on the Creek or Village bridges as a theme
 - Celebrating the Creek’s history and railroad past
 - Promoting pride in the properties bordering the Creek corridor
 - Sponsoring opportunities for recreation and engaging trails, scouting and youth group involvement
 - Working with the Warwick Valley Central School District to develop Creek natural history education
 - Caring for landscape installations along the Creek corridor and coordinating with area beautification groups
 - Removing invasive plants and installing native plants along the Creek corridor
 - Acting as a vehicle for fund raising and projects that benefit the Creek, its watershed and the Warwick community

The recommendations and designs in this Plan include specific ideas, and broader linkages relevant to a variety of resources, issues and topics. Funding sources, technical assistance and other resources that can potentially support implementation of specific projects, therefore, may be available in a number of programs and contexts. In general, the availability of funding from many government programs has declined in recent years, and some other recent trends should also be considered when deciding how best to invest resources in seeking funding. First, creative packaging of different project elements into coordinated proposals will potentially open up funding and technical assistance sources that might not otherwise be available. One trend evident in some government grant programs is sometimes expressed as: “No more single purpose funding.” This captures the growing practice to use available resources to meet as many needs as possible. Project proposals that include more than one element, therefore, can be more competitive and may also access funding from more sources. For example, planting trees can support downtown revitalization, help reduce stormwater runoff, and depending upon their location, can provide energy efficiency benefits by shading buildings or parked vehicles. A trail project along a stream could combine a health and fitness focus with an ecological education and restoration component.

On this note, this Plan discusses many themes and topics and the Village’s existing initiatives touch on still others, including gardening and beautification, history, education, stream ecology and water resources, agriculture, recreation (which is closely related to health and fitness, which may be important links for finding funding), arts and culture, and green technology. We recommend that the Village work with other local organizations to periodically review the status of the many initiatives underway and consult with its grant writer to identify creative connections between projects that can potentially provide leverage for obtaining funding and other resources. This research should also include a careful review of the Strategic Plan for the Mid-Hudson Region described below, which is in part a very strong focus on economic development and jobs that has emerged as an underlying priority for many state programs. Another trend apparent in many grant programs in recent years is a growing emphasis on environmental justice, a set of priorities aimed at redressing historical inequities involving the disproportionate location of polluting activities and sites, undesirable projects and infrastructure (like landfills or other waste management sites), and other environmental burdens in low-income neighborhoods and communities. State and Federal agencies are increasingly looking to fund projects that benefit environmental justice communities, designated based on several criteria. The Environmental Justice office at the NYS DEC is a key source for information about these policies.²¹

Another key development for many New York State funding programs, implemented in 2011, is a new consolidated funding application (CFA) form and process. This online application process is designed to guide users through one application form that is used for dozens of different state grant programs, and in the process the state’s system identifies which grant programs are relevant for specific projects. The whole CFA application process is, in turn, linked to a new regional economic development planning framework that was also initiated for the first time in 2011 for New York State. The Mid-Hudson Regional Economic Development Council was appointed by Governor Cuomo in 2011 (along with other Councils for other state regions) and was responsible for developing the Mid-Hudson Regional Economic Development Strategic Plan. As conveyed in the title, this agency and the state’s related programs are at the forefront of a major focus on jobs and economic development that is currently driving many state programs including grants. Beginning in 2011, the state’s grant review and approval process for many programs includes ranking projects based on whether and how they support the priorities in the regional economic development plans, so clearly identifying relationships of a proposed project to this plan’s goals is critical for developing competitive grant proposals. (See endnotes for The Mid-Hudson Regional Economic Development Plan link.)²² A variety of other informational materials about this process is found at the Mid-Hudson Regional Economic Development Council main page.²³

As of this writing (March 17, 2012), the state has not announced when the new CFA forms and background information will be available in 2012. It is also important to note that some New York State funding programs are administered separately and not through this CFA process.

Other resources for grant research and development include the Foundation Center, a non-profit organization based in New York City that provides a range of education, training and other resources for researching non-governmental grant sources including foundations. In addition to resources offered at their offices, the Foundation Center maintains a comprehensive online database on foundations and grants that is available for a fee, with a tiered rate structure allowing access to various levels of information depending on the monthly fee.

A detailed review of specific grant programs relevant to implementation of all the elements of this Plan was beyond the scope of the project, but several were identified in the course of related research.

1. Parks & Trails New York, a non-profit organization based in Albany, provides detailed technical assistance for developing trails that have a health-related component, through the Healthy Trails Healthy People program. The annual competitive application deadline is in the fall, and while this program does not provide direct funding, it supports research and consultations with this organization’s technical staff to implement detailed studies and planning steps for trail projects. Applications for projects serving lower income neighborhoods get a higher ranking so linking a proposal to serving these neighborhoods in the Village would be a priority if possible.
2. The Community Foundation of Orange and Sullivan²⁴ and the Community Foundations of the Hudson Valley²⁵ are local organizations donors and for those seeking grants that both serve Orange County. One of these organizations may be a good fit for establishing and managing a dedicated fund that could be designed specifically to support projects to benefit the Wawayanda Creek and its tributaries.
3. The NYS DEC Hudson River Estuary Program’s ‘Trees for Tribes’ program provides trees and other resources at no cost for plantings near streams. The Village is already working with this program for a project at Memorial Park in 2012 and it could be used in the future to support plantings at other locations (this, and some other state programs, have a separate application process and are not currently administered through the Consolidated Funding Application described above.)
4. For technical assistance, educational resources and information about certain funding opportunities related to water quality, streams, habitat conservation and restoration, open space protection, and volunteer/citizen science monitoring projects, the NYS DEC Hudson River Estuary Program’s website is a good starting point.²⁶ A related resource is the Hudson River Watershed Alliance, a non-profit educational organization that provides a bi-weekly e-mail Digest with upcoming events, announcements, etc. including grants information. (See website to sign up for the Digest.)²⁷
5. As noted above, given a current strong focus on jobs economic development and economic revitalization in New York State, we recommend that any initiatives for seeking grants and other assistance be linked to these priorities when possible to maximize the potential for funding. This Plan’s focus on the Wawayanda Creek corridor in the heart of the Village’s business district provides a clear linkage to the community’s economy, so there are definitely many opportunities to expand upon this connection.

Appendix B - Maintenance Recommendations

South Street Linear Park and Memorial Park Lake Plantings

Maintenance during Period of Establishment First Two Seasons of Growth:

1. Refrain from stepping into newly planted beds and keep barriers intact.
2. Water during dry periods only when less than 1" of rain falls per week and soil dries out and plants are visibly stressed. Riparian soils should retain more moisture than other soils but monitoring is important. Soil moisture gauges can be used as well as the expertise of a trained individual to recognize conditions.
3. Check goose netting daily (Memorial Park Lake) the first season since geese can destroy a planting in one day. Remove goose netting when plants are firmly rooted and cannot be pulled out.
4. In case of severe flooding reset any plants, erosion control fabric, netting, stakes or coir logs according to the Landscape Construction Plans (under separate cover).
5. Monitor for weeds weekly and reset any newspaper sheet mulch. Plant identification skill is needed for this task. Step in new beds a little as possible. Do not enter beds if saturated.
6. Remove weeds identified. If newspaper sheet mulch is adequate and undisturbed few weeds should be present and only at planting pit sites. A ladder can be used against the bank to weed streambanks if necessary. Disturb soil as little as possible.
7. Do not let mower clippings shoot into beds. Face mulching mowers away from beds.

Routine Maintenance for Established Beds (2+ Years)

Spring before Plant Growth Begins (April):

1. Make sure that any work done is on a day that soil is not wet to prevent opening soil for weed seeds and damaging plantings.
2. Cut ornamental grasses back with hand tool. Do not use weed eater or cut into crown.
3. Remove last year's dead perennial stalks by hand only if still standing. Do not use weed eater or leaf blower.
4. Clean established beds of any trash or debris.
5. If newspaper and coir fabric has rotted out cover perennials with thin (1 – 2") layer of partially decomposed woodchips from compost supplies. Cover shrub and tree areas with 2 – 3" mulch.
6. Cut back red-twig dogwood only if overgrown (At least 3+ years). Will produce redder twigs.

During Growing Season (May – September)

1. Identify and weed out any 'volunteer' plants. If flooding has occurred incidence of weeds will increase.
2. Do not let mower clippings shoot into beds. Face mulching mowers away from beds.
3. Keep 3" deep mulch rings around trees outside of planting beds to prevent mechanical injury from mowers.
4. Coir logs will last for several years and will provide additional slope protection at South St. Linear Park. Keep intact and reset stakes where necessary.
5. Plantings should be established and not need watering unless prolonged drought.
6. Riparian soils have good fertility and fertilizer should not be necessary.
7. Repair mulch should there be flooding or when it rots out.

During End of Season (Fall - Winter)

Leave grasses and spent perennials intact for winter food for birds and winter interest. Do not use leaf blowers. Leave beds in natural state until spring except for flood damage repair should that occur.

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VILLAGE OF WARWICK WAWAYANDA CREEK CORRIDOR

Survey of Restoration Project Area - 22 April 2011

Report to:

Barbara Z. Restaino, ASLA, LEED AP
Restaino Design Landscape Architects, PC
290 Main St., PO Box 778
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6 June 2011

Introduction

On 22 April 2011, Barbara Restaino (affil) , Simon Gruber (affil) and Sven Hoeger (Creative Habitat Corp) and I walked to length of the Wawayanda Creek in the Village of Warwick to make observations and gather information on the stream corridor ecosystem in the early growing season. We had made similar inspections of the corridor in the late fall and early winter of 2010 as part of a restoration planning and feasibility study.

The bulk of the present report is an illustrated assessment of the restoration potential of specific portions of the restoration area, from Elm Street east to Veterans Memorial Park east of Forester Avenue.

This introduction presents general findings and recommendations for initial restoration efforts in specific locations along the restoration area of the corridor and to some extent, areas beyond.

Restoration opportunities are limited, suggested and facilitated by activities, land uses and present conditions within the restoration area. As an ecologist I recognize structural, economic and ecological constraints that must influence the prioritizing, timing and selection of restoration opportunities to pursue. Additionally there are necessary and potential contacts, agreements and partnerships to be explored and developed in these efforts.

This report focuses on ecological factors pertaining to restoration opportunities that revealed themselves as having good potential on the basis of the day's tour. The following pages are organized from west to east beginning at Elm Street and ending at Veterans Memorial Park. I describe features of each segment in terms of ecological constraints, value and potential, assess opportunities for restoration, and suggest steps and actions for restoration in relation to land use, public benefits, and ecological values.

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Village West

WC-Wawayanda Creek
ML-mowed lawn
RB-railroad berm
WB-wooded bank
TW-tall willows

RESTORATION POTENTIAL

East of Elm Street, the west boundary of the restoration area parking, the stream corridor lies against a railroad right-of-way on its north and the elevated lawn of a row of shops (a "mini-mall") on its south. In the last 1-3 years the railroad eliminated vegetation between the tracks and the stream using herbicide and mechanical clear-cutting. Only a sparse growth of herbaceous plants has come back. South of the creek there is a strip of lawn between the mini-mall parking lot and the descending stream bank, which is lightly forested with a good diversity of trees including sugar maple, Norway maple (invasive) and white ash. At the base of the bank near the center of this section of the corridor are two large willow trees growing in the stream.

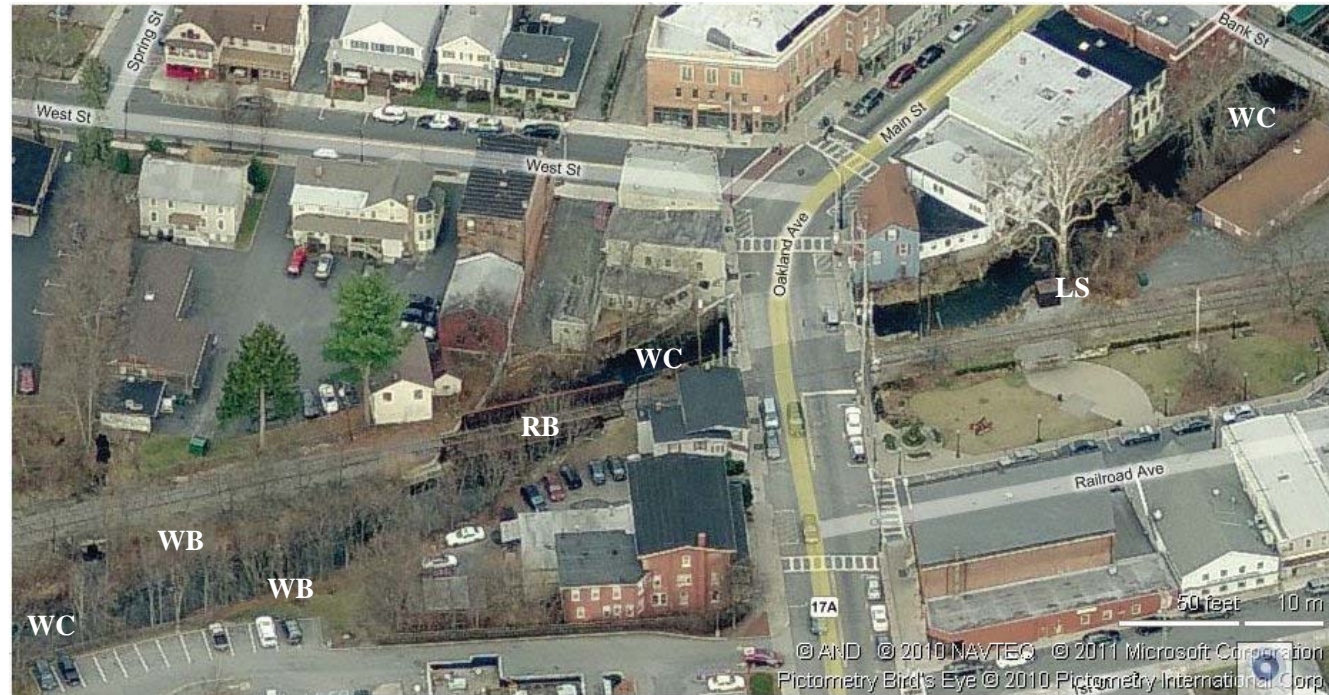
An opportunity exists here to enhance public use by creating a more park-like setting relating to the shops in the mini-mall. A casual path now used for stream access to the willows area could be improved for safety and greater stability through step-making and stabilizing plantings. Weeds could be cleared from the edge of the lawn and native wildflowers and shrubs planted in their place. These improvements could be tailored to the uses of birds and butterflies for the education and enjoyment of patrons of the mall's food outlets sitting at tables on the lawn. Such enhanced connections to natural habitats should improve business by greater integration of commercial and natural areas in the Village.

It may be worth seeking the cooperation of the railroad in restoring vegetation along the north stream shore if only to stabilize the banks, which are collapsing, a threat to the railroad as well as to the Village ecosystem and the stream itself.

Appendix C - continued

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Village Center 1

RESTORATION POTENTIAL

WC-Wawayanda Creek
LS-large sycamore tree
RB-railroad bridge
WB-wooded bank

The stream corridor from Oakland Avenue to Bank Street in the center of the Village of Warwick is highly constrained, and subject to flash flooding and erosion. Stream banks are steep, consisting of vertical built walls (stone, concrete, bridge abutments, gabions) and steep slopes of poor soils with weedy vegetation and adventive trees and shrubs. Built walls vary from unvegetated to sparsely vegetated. Plants are rooted in cracks or eroded, softened spaces in walls, or in adjacent soil but scaling walls as vines or woody plants supported by walls. Some of these plants are decorative, or provide shelter for birds and other small wildlife. Trees and shrubs along stream walls bordering parking lots are cut back to their bases frequently.

Restoration opportunities are limited here, but small improvements could have great benefits. Banks with soil could be planted with indigenous stream bank shrubs such as silky dogwood, winterberry or buttonbush, and soil stabilizing streamside herbs such as sedges and grasses. Existing native trees should be monitored and protected, and replaced with new plantings if lost.

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Village Center 2

RESTORATION POTENTIAL

WC-Wawayanda Creek
LS-large sycamore tree
FB-foot bridge
OB-overpass building

From Bank Street eastward south of Smith Street in the Village of Warwick the Wawayanda Creek corridor is narrow, with vertical constructed walls and steep soil slopes. Vegetation is sparse to absent, consisting of common weeds and a few trees and shrubs. Buildings abut the creek, including one under which the Creek passes.

Restoration opportunities are basically the same as in the section of the corridor west of this one, but even more limited here. Views from the two foot bridges might be enhanced with limited plantings, and the views of these and other worthy sights be kept clear.

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Village East

- WC**-Wawayanda Creek
- FC**-flood channel
- RS**-red maple swamp
- WB**-wooded bank

RESTORATION POTENTIAL

East of the central village parking lot vertical constructed walls give way to soil banks along the creek, with increased vegetation including more native, and fewer non-native, plant species. Though less constrained, the stream corridor is similar in configuration. Banks are steep, but there are low, narrow margins of herbaceous alluvium at the base of wooded slopes. Much of the north slope is forested. The south bank has trees also, toward the east approaching Forester Ave. South of the railroad is a disturbed red maple swamp that might be brought to a healthier state with little effort and expense.

Restoration opportunities here should be viewed as light-handed, consisting of cleaning up debris and dead material to allow more vegetation to spread into areas freed of clutter and obstructions. The railroad right-of-way is a popular walking path, an alternative to the streets, and continues east to Forester Ave. but small improvements could have great benefits. The hydrology of the wetland has been altered at intervals over many decades. However, simply cleaning up trash and debris in the area could allow vegetation to regenerate in short order.

Cooperation of the railroad should be sought in order to improve the existing walking path in casual public use .

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Memorial Park West

- WC**-Wawayanda Creek
- RS**-red maple swamp
- SS**-shrub swamp
- TS**-tributary stream
- WL**-wetland lawn

RESTORATION POTENTIAL

East of Forester Avenue Wawayanda Creek has extensive undisturbed land running north to the railroad and beyond, and maintained grounds of Veterans Memorial Park to its south.

The wild area north of the creek is red maple swamp with patches of shrub swamp and herbaceous marsh along the creek, and upland forest on the slope descending from the railroad berm. The high-quality, largely undisturbed swamp has some very large red maples, swamp white oaks, basswood and willows, and few non-native plant species.

Memorial Park has wetlands, including tree swamp, shrub swamp, herbaceous marsh and wet meadow along the south side of the creek. Herbaceous wetland areas are mowed regularly along with drier lawn areas on higher ground. Even in April we observed wetland-indicator species such as water purslane and skunk cabbage in mowed areas. Steeper stream banks east of the lake were undercut by groundwater flow here and there, the cause difficult to ascertain.

Restoration of banks would require determination of the causes of erosion and collapse. Without this understanding landscaping and planting efforts might fail from those same causes. Herbaceous wetlands would be better left unmowed, or mowed just once per year. This would provide a more natural transition to the streamside wetland, as well as the interest of more wildlife activity for visitors to enjoy and learn from.

Appendix C - continued

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Memorial Park Center

RESTORATION POTENTIAL

WC-Wawayanda Creek
RS-red maple swamp
WL-wetland lawn
WG-waste ground

Farther east in Memorial Park the same habitats continue in the same positions relative to Wawayanda Creek. The area of wetland lawn is larger here, patches of standing water observable in the photograph above. North of the fenced recreation court is a large area of waste ground that abuts the stream on its east.

For restoration purposes the mowed wetland areas should be delineated, marked and thenceforth left unmowed for most of the growing season. Times of mowing to eliminate woody plants should be decided upon plant reproductive cycles and breeding seasons of significant animal species.

The waste ground area might be restored as a community garden or as habitat of a type not presently found in the park or village restoration area, but found elsewhere in the Wawayanda Creek corridor or watershed.

VILLAGE OF WARWICK, WAWAYANDA CREEK CORRIDOR

Restoration Project Area - Survey of 22 April 2011—J.G. Barbour, Ecological Consultant



Memorial Park East

RESTORATION POTENTIAL

WC-Wawayanda Creek
FC-flood channel
FM-floodplain marsh
RS-red maple swamp
WL-wetland lawn
WG-waste ground

The east end of Memorial Park is an extension of the same habitat complex found along Wawayanda Creek in the western portion of the park. This ecosystem appears to be a natural, relatively undisturbed low-lying landscape of long duration and therefore worthy of preservation.

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Illustrations

- Fig. 1 Young, James P. and J. Heron. *Geological and Mineralogical Map of a Part of Orange Co. N. York*. Map. *Albert Wisner Public Library - Warwick Valley History*. Web. Source: <<http://www.albertwisnerlibrary.org/Factsandhistory/History/Maps.htm>>
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- Fig. 3 "1903 Village of Warwick Map"
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