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River Park North

Biodiversity Assessment & Natural Communities Management Recommendations

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River Park North, Greenville, NC

SITE OVERVIEW

River Park North consists of 324 acres of land previously owned by White's Concrete and the A.K. Barrus Construction Company, both of which mined sand for use in construction materials. More recently, 124 acres were donated to the park by the E.R. Lewis Construction Company; this land was also used for construction mining. The total park property includes seven ponds created by sand mining, a powerline right-of-way in which tall vegetation is removed, semi-natural bottomland hardwood areas, and natural wetland areas. These wetland areas include swamp, levee forest, and a mosaic area with patches of swamp, levee forest, and bottomland hardwood. The natural wetland areas are moderate to good examples of their community types. The more altered areas have no true natural analogs, but they do include many native plant species and provide forage and cover for animal species, as do the bottomland hardwood areas. Invasive plants are by far the main problem facing the park. The greatest number of serious invasives are found around the pond edges, but Ligustrum sinense (Chinese privet) is abundant well into the more natural areas. The powerline corridor includes a range of more moderate invasives as well as a few of the highly problematic ones.

Since the park was opened to the public, it has undergone changes from several sources. The vegetation around the ponds is maturing, resulting in greater dominance of woody species. Beavers have dammed portions of Parker Creek and its tributaries, changing the hydrology of the powerline so that it frequently floods after rain. Perhaps most importantly, recreational use of the park has increased, putting more pressure on the resources and wildlife.

Habitat descriptions and management recommendations are given for six areas: ponds and pond edges; cypress-gum swamp; altered bottomland hardwood forest; powerline corridor; mosaic of swamp, bottomland hardwood, levee forest species; and brownwater levee forest. The locations of each area can be found on the map labeled River Park North (Management Zones) on page 24. A list of all observed plant species during the assessment is located on pages 27-32.

COMMUNITY DESCRIPTIONS AND MANAGEMENT RECOMMENDATIONS

Ponds and Pond Edges

About 20% of the park area is taken up by seven ponds and the vegetation surrounding them. Most of this area consists of the ponds themselves, with areas ranging from 1.04 to 34.1 acres. Although the ponds were artificially formed through sand mining, they now provide habitat for frogs and turtles and food for herons and ospreys. Many songbirds find forage and cover in the vegetation, skinks live in the leaf litter, and dragonflies breed in the water. The ponds are used recreationally for fishing (the largest pond on the original property is stocked) and several benches are available for those who wish to relax and appreciate the view.


Aquatic population of *Hydrocotyl*, a native species

River Park North
Pond Acreages


Cephalanthus bushes at water's edge

Liquidambar styracifula (Sweetgum) and *Betula nigra* (River birch) are very abundant around the pond edges. Also common are *Acer rubrum* (Red maple), *Salix nigra* (Black willow), *Platanus occidentalis* (American sycamore), *Quercus phellos* (Willow oak), *Quercus nigra* (Water oak), and other oaks. *Taxodium distichum* (Bald cypress) grows in many of the ponds and along pond edges near to the water. *Albizia julibrissin* (Mimosa) is also quite common and poses a problem, as does *Ligustrum sinense* (Chinese privet): both of these are highly invasive. *Rubus pensylvanicus* (Pennsylvania blackberry) is frequent along the path edges, and *Cephalanthus occidentalis* (Common buttonbush) is common near the water. Vines are abundant, particularly at path edges and canopy gaps. *Ampelopsis arborea* (Peppervine) is very abundant, and *Smilax rotundifolia* (Roundleaf greenbrier) and *S. bona-nox* (Saw greenbrier) are both common, along with *Campsis radicans* (Trumpet creeper) and *Muscadinia rotundifolia* (Muscadine). *Lonicera japonica* (Japanese honeysuckle) is also present and is a highly invasive species. *Lespedeza cuneata* (Chinese Lespedeza), also highly invasive, tends to dominate the herb layer, particularly on the Lewis side. Another highly invasive species, *Alternanthera philoxeroides* (Alligatorweed), gathers in the water along the pond edges and is a significant problem. *Cyperus spp.* (Nutsedges) are also quite common growing near the water, while *Eupatorium capillaris* and somewhat invasive *Verbena brasiliensis* (Brazilian vervain) are present where the soil is a bit drier.


Invasive *Reynoutria* overgrowing a canopy gap

In addition to the invasive species already listed, the highly invasive species *Rosa multiflora* (Multiflora rose), *Wisteria sinensis* (Chinese wisteria), *Microstegium vimineum* (Japanese stiltgrass), and *Reynoutria japonica* (Japanese knotweed) and the invasive species *Morus alba* (White mulberry) and *Clematis terniflora* (Sweet autumn clematis) are present. Because invasive species are the largest problem facing the park, and because many species are found in several management zones, recommendations for prioritizing and executing invasive species control are presented in their own section.

Some erosion was observed at the water's edge in areas where people had repeatedly used particular locations to access the water, whether for fishing or simply for observing. It appears that erosion begins when a gap in pondside vegetation is large enough to permit relatively easy access to the water.


Extensive trampling results in erosion.

As more people take advantage of a gap, existing vegetation is trampled, which leaves exposed soil that is subject to erosion. The open soil also forms a clearer path, encouraging more people to use the site and further decrease the vegetation cover, leading to further erosion. Tree roots at the water's edge help hold the soil in place, slowing erosion, and areas with narrower vegetation gaps appear to erode more slowly than areas with large gaps that are more convenient. Because the ponds are artificial and are relatively isolated from natural systems, erosion along the banks does not pose a serious ecological threat and is not a priority from a biodiversity standpoint. If greater erosion control is desired, possible management options include: building of additional access structures such as piers (O'Toole 2008), adding a more durable substrate such as expanded slate to areas that are already partially eroded, which would also have the effect of reducing soil compaction if the material was tilled into the soil (Kozlowski 1999), or blocking off eroded areas and planting resilient vegetation such as native grasses (Pickering 2010). It is recommended that park staff solicit the input of park users before selecting any of the erosion-control options in order to increase the likelihood that people will cooperate and feel positively about the changes (Golet 2006). For example, fishing piers may be a beneficial option for individuals who primarily want to catch fish, but high piers do not allow close-up observation of plants or animals in the water, which may also be desired. Similarly, revegetation efforts will fail if trampling continues (Roovers 2005). Further erosion can be prevented by retaining as much native vegetation as possible along the pond edges. Such vegetation will also continue to provide food and shelter for wildlife.

The long-term plan for the Lewis property calls for clearing of saplings to improve public access to the pond. It is important that such thinning preserve enough vegetation to prevent erosion and to continue to provide forage and cover for wildlife. The Dan River Basin Association recommends partial clearing for views and paths while maintaining a buffer of woody vegetation to prevent erosion along streambanks; similar principles can be applied to the artificial pond. If clearing is done gradually, the remaining trees will be released to form a canopy, which will provide shade and reduce further woody growth without impeding access to the water. A recommended course of action is to remove no more than half of the trees and saplings the first year, then wait five years for the remaining trees to grow and take advantage of the reduced competition. After those five years, half of the remaining trees can again be removed, with another five years passed without cutting for the effects of competitive release to play out. If necessary, additional trees may be removed after this period, but in smaller numbers – no more than 10-20% while continuing to allow growth periods between cutting years. Where possible, *Quercus* (Oak) species such as *Q. phellos* (Willow oak) and *Q. nigra* (Water oak) should be preserved. These species tend to be found in more mature canopies, and the acorns are an important food source for wildlife. In addition, *Salix* trees are particularly effective at preventing erosion (Edgar 2013). Invasive trees like *Albizia julibrissin* (Mimosa) and *Ligustrum sinense* (Chinese privet) should be targeted for removal, and *Liquidambar styraciflua* (Sweetgum), while native, is characteristic of more disturbed areas, so its removal will cause minimal disruption. Individuals of other species may be removed as needed.

On the northwestern end of the Lewis property, the path runs alongside a junkyard which is adjacent to the park. It may be worth planting additional trees at that spot for more visual screening of the scrap automobiles. Slightly further east and just north of the largest pond is an old stable. This structure may be partially reusable as a picnic shelter.

Two possible trail locations for public access to the Lewis property are indicated in the map labeled River Park North (Recommended Trails) on page 26. The northern one crosses a stream over what appears to be an old beaver dam. To make a usable trail, a path would need to be cleared through some low vines between the road and the stream, and in the long run, a simple bridge might be preferable to the dam. The southern path would simply involve extending a current trail by clearing vegetation and marking the trail corridor. Either or both of these options would allow easy access once the Lewis property is opened to the public.

Cypress-Gum Swamp

Cypress-Gum Swamp (Brownwater Subtype) makes up about 26% of the park area. Most of this is backswamp extending from about 200 m to about 400 m from the Tar River along the east-west length of the park. Smaller patches of swamp, however, can be found adjacent to frequently-saturated areas of the powerline corridor and in the northeastern part of the park, along Parker Creek. The large southern area of the swamp provides shelter for many bird species, particularly prothonotary warblers, which nest in tree cavities, and great blue herons, which have established a rookery in the swamp. Crayfish mounds are also found throughout the swamp. A Natural Heritage Program survey reported the large swamp area as being in good condition and worthy of registry (LeGrand 2013).


Nyssa aquatica in standing swamp water

As is typical for a brownwater cypress-gum swamp, the swamp areas at River Park North are strongly dominated by *Nyssa aquatica* (Water tupelo) and to a lesser extent *Taxodium distichum* (Bald cypress). *Acer rubrum* (Red maple), *Fraxinus caroliniana* (Swamp ash), *and F. produnda* (Pumpkin ash) are also common. Tidal marsh and pocosin species, though also associated with saturated soils, are absent from this community type (Schafale 2012). In less saturated areas, and particularly along ecotones with other vegetation types, *Platanus occidentalis* (American sycamore), *Liquidambar styraciflua* (Sweetgum), *Betula nigra* (River birch), *Carpinus caroliniana* (American hornbeam), *and Ilex decidua* (Swamp Holly) can be found, along with *Quercus laurifolia* (Laurel oak) and other oaks. *Ligustrum sinense* (Chinese privet) is a problem in the drier areas, again particularly where other vegetation types are nearby. Vines are abundant in canopy gaps and edges. *Campsis radicans* (Trumpet creeper) and *Smilax rotundifolia* (Roundleaf greenbrier) are common, and *Gonolobus suberosus* (Anglepod), *Toxicodendron radicans* (Poison ivy), *Ampelopsis arborea* (Peppervine), and *Muscadinia rotundifolia* (Muscadine) are also present. *Tillandsia usneoides* (Spanish moss) hangs from some of the trees. *Lonicera japonica* (Japanese honeysuckle), a serious

invasive, is present near the power line corridor edge. *Saururus cernuus* (Lizard's tail) and *Boehmeria cylindrica* (Smallspike false nettle) are the dominant herbs in the saturated areas, but *Chasmanthium latifolium* (Inland sea oats), *Commelina virginica* (Virginia dayflower), and *Persicaria virginiana* (Virginia knotweed) grow along the road that runs through the swamp. *Arundinara tecta* (Switchcane) is frequent in areas where the swamp meets the powerline corridor or the bottomland hardwood forests. *Alternanthera philoxeroides* (Alligatorweed) is a problem on the border between the swamp and the powerline corridor as well.

Although the swamp areas have the lowest density of invasive species in the park, *Albizia julibrissin* (Mimosa), *Morus alba* (White mulberry), and *Rosa multiflora* (Multiflora rose) are found along the road adjacent to the swamp or on the swamp-powerline ecotone, in addition to the invasive species mentioned above. Control of invasive species is the most important management strategy for supporting the biodiversity of the park.

One of the proposed locations for a Tar River pedestrian bridge would connect to the park on the Lewis property. If this location is chosen, it may necessitate a trail through the swamp to provide access to the rest of the park. A path across the powerline and into the swamp area leads into an apparently artificial raised area, perhaps an old road bed. Adapting this previously built infrastructure would be less disruptive than building a whole new trail, though some features, such as bridges, may need to be rebuilt to withstand rain. The map below indicates possibilities for trails leading from the proposed bridge location to the rest of the park. The north-south trail follows the old roadbed in the swamp, continues through relatively dry regions of mosaic and levee forest, and is finished by following the less wet signatures on the 2012 aerial photography of the area. Two east-west possibilities are shown, both also following the less wet photography signatures. The northern possibility goes through the levee forest interior, while the southern one travels along the Tar River. Both possible trails connect to the current trails on the publicly accessible property. In order to avoid forest fragmentation, however, it is recommended that only one east-west trail be built across the Lewis property.

Registry or dedication with the North Carolina Natural Heritage Program (NCHNP) is recommended as a way to formalize protection of the natural swamp community. By signing a registry agreement, the City of Greenville would go on record as agreeing to preserve the community in its natural condition, to refrain from destructive or extractive practices, and to consult with NCNHP about management and development actions. A dedication would make the agreement binding in perpetuity, ensuring that protection would continue through future administrations. Either registry or dedication would offer the park staff access to NCNHP expertise on maintaining biodiversity while resolving any management concerns that may develop in the future. NCNHP staff can be contacted for more information on both of these programs.


Lobelia cardinalis, a native species

Altered Bottomland Hardwood Forest

About 3% of the park property consists of wooded land that, while not as clearly impacted as the ponds or the powerline

corridor, has been heavily altered. These areas include the northern campsites and some of the larger areas between the ponds and the powerline corridor. Based on their location (in the floodplain and away from the riverbank) and their canopy composition (oaks, hickories, and sweetgum), these areas were likely brownwater bottomland hardwood forests in their original state (Schafale 2012). They have been heavily altered by fragmentation and industrial activity so that they are no longer truly representations of a natural community type, but they do still include many native plant species and provide habitat for wildlife and recreational hiking opportunities for human use.


Bottomland area with well-developed herb layer

The canopy is dominated by *Liquidambar styracifula* (Sweetgum) and a variety of oaks, particularly Quercus laurifolia (Laurel oak). *Carya cordiformis* (Bitternut Hickory), *Acer rubrum* (Red maple), and *Taxodium distichum* (Bald cypress) are also common, and *Betula nigra* (River birch), *Carpinus caroliniana* (American hornbeam), and *Platanus occidentalis* (American sycamore) are present. As elsewhere, Ligustrum sinense (Chinese privet) is a problem. Vines are abundant, particularly *Smilax rotundifolia* (Roundleaf greenbrier), but also *Toxicodendron radicans* (Poison ivy), *Campsis radicans* (Trumpet creeper), and *Ampelopsis arborea* (Peppervine). *Lonicera japonica* (Japanese honeysuckle) is frequent – another invasive problem. The herb layer is fairly sparse with no clear dominants, but there are several large patches of *Microstegium vimineum* (Japanese stiltgrass) that need to be controlled.

Also seriously invasive are *Alternanthera philoxeroides* (Alligatorweed) and *Murdannia keisak* (Marsh dayflower) in the wetter areas of the northeastern end of the park. *Clematis terniflora* (Sweet autumn clematis) is also overgrowing the native vegetation in a few patches. The major management recommendation, as for the rest of the park, is to develop and carry out a plan for controlling invasive species.


Hibiscus in flower

The bottomland area has a large amount of waste material present, including trash in the open area of the park and old tires and other large scrap items in the Lewis property. Regular volunteer clean-ups would help make the area more attractive as well as improving its ecology.

Powerline Corridor

About 5% of the park property is in a powerline right-of-way in which the vegetation is kept short to accommodate the power lines. Due partly to beaver activity, the powerline corridor frequently

floods after rainfall. Several runoff channels run through the corridor, and frogs use the semi-permanent pools for breeding. Crayfish have also been observed in the wetter areas of the corridor, as have turtles sunning themselves on logs. The shells of mollusks have been found in piles near the creek, most likely left by a raccoon that fed upon them. Several rare mollusk species are known to occur in the Tar River (LeGrand 2013), though it is not known whether they are found in the stretch adjacent to the park. In the shrubby areas towards the center of the corridor and at the forest edge, *Rubus pensylvanicus* (Pennsylvania blackberry), *Ampelopsis arborea* (Peppervine), and *Smilax rotundifolia* (Roundleaf greenbrier) form viney tangles. Small *Taxodium distichum* (Bald cypress) saplings establish closer to the swamp edges, but still well into the powerline corridor. *Alternanthera philoxeroides* (Alligatorweed) is common and a serious problem anywhere the ground stays saturated. *Hibiscus moscheutos* (Rosemallow), *Diodia virginiana* (Virginia buttonweed), *Carex spp* (Sedges), *Eupatorium semiserratum* (Smallflower thoroughwort), and the somewhat invasive *Heliotropum indicum* (Indian heliotrope) and *Verbena brasiliensis* (Brazilian vervain) are all patch dominants. Also common are *Boehmeria cylindrica* (Smallspike false nettle), *Commelina virginica* (Virginia dayflower), *Cyperus spp* (Nutsedges), *Eleocharis obtusa* (Blunt spikerush), *Leersia virginica* (White grass), *Persicaria spp.* (Smart weed), *Saururus cernuus* (Lizard's tail), *Scirpus cyperinus* (Woolgrass), *Clematis crispa* (Swamp leatherflower), *Coleataenia rigidula* (Panic grass), *Dichanthelium scoparium* (Velvet panicum), and *Sagittaria latifolia* (Broadleaf arrowhead). The highly invasive *Lespedeza cuneata* (Chinese Lespedeza) is also present in patches.


Temporary pool in powerline

Aside from *Alternanthera philoxeroides* (Alligatorweed) the powerline corridor has relatively few seriously invasive species. There are several exotic species that are less destructive or less widespread invasives (see complete plant list). Park staff should weigh the advantages of controlling these lesser invasives against the cost of doing so, the potential damage to native vegetation, and the effect of herbicides on the environment. Many serious invasives, however, do thrive in open, sunny spaces. The powerline should be regularly monitored for invasives to be sure that it does not become a source of invasive species for the rest of the park.

Although there is no ecological need to mow the powerline corridor, the practical need to keep vegetation short will necessitate mowing. While clearing woody areas to create early successional habitat is not recommended, this area would support biodiversity more as early successional habitat than as a uniform region of short-mowed grass. Because the powerline corridor is frequently flooded, mowing is likely a better technique than disking: the soil disturbed by disking may be eroded away in the next rainstorm. While mowing can produce thatch that hinders movement for small animals (Harper 2007), that material also attracts aquatic invertebrates in areas that flood (Havens), so it would support the crayfish populations and other species that form part of the base of the food web. According to the North Carolina Wildlife Resources Commission, it's best to mow outside the nesting season of April 15 and September 15 to prevent harm to nests and young animals. Rather than mowing the whole area every year, it should be segmented, with each segment mowed on a 3-5 year rotation; that way some forage and cover is always available to wildlife. Each segment should be at least half an

acre in area and 100 feet wide on every side to ensure adequate cover for wildlife. Driving heavy equipment across saturated ground will result in muddy gouges, so mowing should be carried out during drier periods.

Mosaic of Swamp, Bottomland Hardwood, and Levee Forest Species

Within the southern portion of the park is a strip of land that is lower than the levee forest but not as uniformly wet as the swamp. LeGrand (2013) included it as part of the swamp in his site report but mentioned that there were patches of hardwoods as well. Here it is mapped as a patchy mosaic of communities, which takes up about 18% of the park area. As with the swamp, this mixed-community region provides habitat for animals from birds and reptiles to crayfish and dragonflies.

As elsewhere in the park, highly invasive *Ligustrum sinense* (Chinese privet) abundant in the shrub layer, sometimes reaching tree height. Also common are *Liquidambar styraciflua* (Sweetgum), *Acer negundo* (Box elder), *Fraxinus spp* (Ash), *Quercus spp* (Oak), *Carpinus caroliniana* (American hornbeam), *Taxodium distichum* (Bald cypress), and *Ulmus americana* (American elm). Vines, including *Campsis radicans* (Trumpet creeper), *Gonolobus suberosus* (Anglepod), *Smilax rotundifolia* (Roundleaf greenbrier), *Toxicodendron radicans* (Poison ivy), *Ampelopsis arborea* (Peppervine), and *Muscadinia rotundifolia* (Muscadine), are abundant in canopy gaps. *Carex spp* (Sedges) are abundant in the herb layer, as are *Boehmeria cylindrica* (Smallspike false nettle) and *Saururus cernuus* (Lizard's tail). *Symphyotrichum pilosum* (Hairy aster) and *Viola sororia* (Common blue violet) are also present. In addition to the *Ligustrum*, there are several patches of *Microstegium vimineum (Japanese stiltgrass)* and a few invasive *Nandina domestica* (Heavenly bamboo) shrubs. Controlling the invasive species is the most important biodiversity management action for this area, as indeed it is for the whole park.


Canopy gap in the mosaic area

One of the likely locations for a Tar River pedestrian bridge would necessitate a trail through the mosaic area. Such a trail should be constructed with as little disruption as possible to the native vegetation. The best trail location is probably a continuation of the old roadbed that passes through the swamp. The exact location of the trail corridor may be determined by clearing invasive species within an acceptable range of the proposed trail location and adjusting the final path to follow those already-cleared areas. Culverts have been built under the roads in several locations throughout the park to allow stormwater to drain without eroding the roadbed. These wet communities are not harmed by the water, but the force of water flow may be creating a channel from one of the culverts. An experienced engineer may be able to tell if ecologically significant changes are likely to result, and if so, how to correct the situation.

This mosaic community is overall in good natural condition and would be worth protecting through NCNHP registry or dedication along with the swamp.

Brownwater Levee Forest

About 20% of the park land is a Brownwater Levee Forest (Medium Levee Subtype) in good to fair condition, as mapped by LeGrand in his 2013 site report. As the name implies, this subtype refers to the forests found on medium height levees, which lack the richer flora of higher levees and also have lower abundance of the wet species characteristic of lower levees (Schafale 2012). The levee forest forms part of the continuous natural area used by wildlife and also provides human recreational opportunities for camping and hiking along the Tar River.


View from Parker Creek bridge

Ligustrum sinense (Chinese privet) is a significant problem in the levee forest; there are large areas where it is the dominant woody plant. In less affected parts of the forest, the canopy is dominated by *Quercus spp* (Oaks), especially *Quercus lyrata* (Overcup oak), as well as some *Taxodium distichum* (Bald cypress) in the wetter areas. *Fraxinus pennsylvanica* (Swamp ash), *Acer negundo* (Box elder), *Acer rubrum* (Red maple), *Carpinus caroliniana* (American hornbeam), *Liquidambar styraciflua* (Sweetgum), *Populus heterophylla* (Swamp cottonwood), *Carya cordiformis* (Bitternut Hickory), *Celtis laevigata* (Sugarberry), and *Platanus occidentalis* (American sycamore) are also common. *Ilex cornuta* (Chinese holly), a non-native species, is frequent in the shrub layer. *Smilax rotundifolia* (Roundleaf greenbrier) and *Toxicodendron radicans* (Poison ivy) are abundant, especially in areas dominated by *Ligustrum*. *Chasmanthium latifolium* (Inland sea oats) is very abundant in the herb layer, and *Boehmeria cylindrica* (Smallspike false nettle), *Saururus cernuus* (Lizard's tail), *Carex spp* (Sedges), and *Ipomoea pandurata* (Man of the earth) are also common.


Canopy gap overgrown with *Ligustrum*

In addition to the *Ligustrum*, the levee forest includes areas invaded by *Microstegium vimineum* (Japanese stiltgrass), *Lonicera japonica* (Japanese honeysuckle), and *Rosa multiflora* (Multiflora rose) as well as a few invasive *Morus alba* (White mulberry) trees. Control of the invasive species, particularly the *Ligustrum*, is the most important management action to benefit biodiversity in the park. Although clearing native vegetation to increase visibility of the Tar River is not recommended, clearing invasive plants would open up additional viewsheds and may open sufficient area for additional riverside trail-building.

Clearing invasive plants to open trail space is also recommended in order to build a trail from one of the likely locations of the Tar River pedestrian bridge to the rest of the park. Doing so would efficiently use labor for invasive control and trail-building at the same time and would minimize trail construction impacts to native vegetation. In the meantime, additional maintenance would improve existing trails. The Howard Loop trail often floods, and the corridor of the trail is difficult to find in places, even with the trail blazes. In the long run, a raised boardwalk-style trail might provide better access to natural areas that are often saturated, but re-marking the trail corridor would make the trail more usable in the meantime. The map labeled River Park North (Recommended Trails) on page 26 shows a traveled path approximating the trail that was relatively dry a few days after a rain. Other trails would also benefit from maintenance, including the primitive campsite trail, which has a log fallen across it.

As with the swamp community and the mosaic area, the levee forest community is eligible for registry to dedication with the NCNHP. Such an agreement is recommended to ensure long-term protection of the natural communities.

RECOMMENDATIONS FOR CONTROL OF INVASIVE PLANT SPECIES

The most important actions that can be taken to support biodiversity at River Park North are those that reduce or eliminate invasive plant species populations. Although budget constraints may not allow immediate implementation of all recommendations, an invasive control program can be started with whatever resources are available. Major populations of the most significant invasive species are shown on the map labeled River Park North (Invasive Species) on page 23.

Management recommendations are given below for the ten highly invasive species found in River Park North. Species are prioritized for control based on their prevalence in the park, the severity of their ecological effects, and their rate of spread. Most recommendations are adapted from Miller's 2013 *USDA Management Guide for Invasive Plants in Southern Forests,* with herbicides chosen to minimize damage to native vegetation and have the smallest number of different products. Alternatives from the literature are also included where relevant.

Although the species below are listed from highest to lowest priority for control, reduction of any of the invasive populations will be beneficial. Herbicides are recommended for the most effective control, but volunteers who have learned to identify the target plant can be of significant assistance using only mechanical removal. Total removal of the root system has the greatest long-term effect, but simply cutting down woody stems and pulling up weeds will still reduce the competition faced by native species.

In all activities of invasive species control, care must be taken to avoid introducing the species to a new area. Management actions should be conducted when the plants are not in fruit or seed. As long as the vegetative material of most plants can be dried in a bare, sunny area and then composted, but plants that aggressively spread through vegetative means, such as *Alternanthera philoxeroides* (Alligatorweed) and *Reynoutria japonica* (Japanese knotweed), should not be removed manually, instead herbicide should be applied close to flowering.

Ligustrum sinense (Chinese privet)

Ligustrum sinense (Chinese privet) is probably the most abundant invasive plant species in River Park North. It reproduces both sexually through fruit production and vegetatively through basal shoots.

Ligustrum decreases the availability of light and nutrients to other species and may alter the forest hydrology (Hart 2013). The plant itself is shade-tolerant, so its own offspring are not harmed by its shading effect. Although birds will use it for cover, it is unlikely that eliminating *Ligustrum sinense* (Chinese privet) would reduce songbird populations (Wilcox 2007).

Where the leaves are low enough to reach, a 3% solution of glyphosate with a surfactant is recommended; it will probably be most effective if the herbicide is not applied in the summer. For taller stems, a basal spray of the Pathfinder II herbicide can be used, or stems may be cut and the stump top and sides treated with a 20% solution of Garlon 3A. Large stems can also be injected with Garlon 3A using an EZ-Ject tree injector. (Miller 2013).

Another approach would be to hand-cut the *Ligustrum* stems in the less dense areas and either use a mulching machine or also hand-cut the more dense areas in October or November and then spray any sprouts with 2% glyphosate and 0.5% surfactant in early winter the following year. (Hanula 2009).

***Microstegium vimineum* (Japanese stiltgrass)**

Although *Microstegium vimineum* (Japanese stiltgrass) is currently found in relatively small patches in the park, its capacity for rapid spread means that controlling it sooner will prevent an even harder task later. *Microstegium* grows in large clumps, smothering the seedlings of other species. The changes brought about by *Microstegium* invasion can reduce the abundance and diversity of arthropod species and change the proportions of herbivorous to carnivorous arthropods (Simao 2010).

To control *Microstegium,* hand-pulling in the early summer is recommended, with an application of Fusilade DX one month later (Miller 2013). Kleczewski (2011) recommends grass-specific herbicides, including sethoxydim. According to their respective material safety datasheets, sethoxydim is less toxic than Fluazifop-P-butyl, the active ingredient in Fusilade DX. In any case, several years of hand-pulling and herbicide application will be needed to exhaust the seed bank. Care should be taken to avoid carrying *Microstegium* seeds out of the invaded area on shoes, clothing, or equipment.

***Wisteria sinensis* (Chinese wisteria)**

Wisteria sinensis (Chinese wisteria) is found in relatively few locations in the park. Treating it earlier would increase the chances of eradicating it before it begins to negatively impact the native vegetation. An annual foliar application of 4% Garlon 4 is recommended between July and September to control this species (Miller 2013).

***Reynoutria japonica* (Japanese knotweed)**

Reynoutria japonica (Japanese knotweed) is currently present in only a few patches in the pond edge management zone. It is, however, a particularly noxious invasive. *Reynoutria* crowds out native plants and also affects nutrient cycling in the environment and produces allelopathic chemicals (Michigan DNR 2012). A long-lived plant, it can produce offspring for years. Because the plant is still uncommon in North Carolina (Weakley 2012), removing it may help slow its spread throughout the state.

Because the *Reynoutria* is found near the pond edges, application of the aquatic herbicides Renovate in a 1% solution and Rodeo in a 2% solution is recommended in spring and fall (Miller 2013). If simple herbicide application is unsuccessful, a more complex program of cutting, applying herbicides, and planting natives may be tried. This program is based on the work of Bashtanova (2009), Delbart

(2012), and Skinner (2012), and combines the most successful treatments from each researcher's work; the combined program has not been tested.

The steps in the two-year combined program are as follows. Year 1: May – cut down *Reynoutria* plants (Skinner 2012). June – spray with glyphosate at 450 g/L concentration with 1300 L/ha of water for the rate of application (Delbart 2012). July – spray with imazapyr according to manufacturer directions (Bashtanova 2009). September – reapply imazapyr. Year 2: Repeat May and June cutting and herbicide treatments. July – inject imazapyr into stems of larger plants (Bashtanova 2009) and plant native species in the area to compete with the *Reynoutria* (Skinner 2012). September – repeat imazapyr injection.

Skinner listed the native plant species used in his work, but not all of the species are native to the Coastal Plain of North Carolina. The following is a list of plants on the original list (regular type) or close relatives that are native to the North Carolina Coastal Plain (bold type) that are also commercially available: *Andropogon gerardii* (Big bluestem), ***Baptisia tinctoria*** **(Horseflyweed),** ***Cornus florida*** **(Flowering dogwood),** ***Rhus copallanium*** **(Winged sumac),** ***Sambucus canadensis*** **(American elderberry),** *Schizachyrium scoparium* (Little bluestem), *Sorghastrum nutans* (Indiangrass), *Vernonia gigantea* (Giant ironweed), and *Viburnum dentatum* (Southern arrowwood). Skinner noted that not all of the species established in each of his experimental plots and that one species accounted for most of the native growth, but that a species mix increases the chance that at least one native species will establish.

Alternanthera philoxeroides (Alligatorweed)

Alternanthera philoxeroides (Alligatorweed) is the second-most common invasive in the park, growing at the pond edges and also the wet areas of the powerline. It outcompetes native plants, reducing their access to resources and altering the ecosystem. Although it does produce flowers, it primarily reproduces through vegetative growth: even a small fragment of a plant is enough to start a new colony.

Recommended treatment is a foliar spray of 2% Renovate 3 or Rodeo and later, in the spring, a 1% solution of Clearcast applied at 100 gal/acre (Miller 2013). An alternative possibility is to use triclopyr (the active ingredient n Renovate 3) at 44.4 g/L and 3 L/ha for three applications in early winter, midwinter, and early spring (Schooler 2008). If triclopyr is used, an amine salt formulation such as Renovate 3 is preferable because the material safety datasheet indicates that an amine salt formulation is less toxic than an ester formulation.

Lonicera japonica (Japanese honeysuckle)

Lonicera japonica (Japanese honeysuckle) is a highly adaptable vine that reduces biodiversity by outcompeting native species.
Although it is common in the park, it has not yet expanded to the point of forming dense thickets, as it does elsewhere. It should be controlled as soon as feasible, and mechanical removal is an excellent activity for volunteer groups, but the other species listed so far pose more serious threats.

When controlling *Lonicera* with herbicide, a 2% glyphosate solution or a 3-5% solution of Garlon 3A or Garlon 4, plus a surfactant, is recommended for application from July through October (Miller 2013).

***Albizia julibrissin* (Mimosa)**

Albizia julibrissin (Mimosa) has a long-lasting seed bank and reduces availability of resources to native species, but because it mainly colonizes disturbed areas, spread through the park is not a major concern. Nonetheless, it is already present in the more altered areas of the park, and the native species would benefit from its absence.

Large trees may be killed by stem injections of Garlon 3A, though this treatment should not be carried out in March or April. Trees may also be cut and the stumps treated with Garlon 3A. Saplings can be targeted with a basal spray of Pathfinder II, and seedlings and resprouts can be treated with a 4% solution of Garlon 3A plus surfactant on all leaves (Miller 2013). Miller (2013) recommends that the seedling treatment be carried out between July and September; based on field observations in River Park North, August treatment is recommended so that *Chamaecrista* plants, which resemble *Albizia* seedlings, are not mistakenly targeted. An alternative treatment is to use aminocyclopyrachlora at 70 g/ha, plus methylated soybean oil at 0.5% by volume (Koepke-Hill 2012).

***Lespedeza cuneata* (Chinese Lespedeza)**

On the Lewis property in particular, *Lespedeza cuneata* (Chinese Lespedeza) is a major component of the herb layer and was likely seeded for erosion control. Its lower priority for control is entirely due to the severity of the other invasive species problems. Recommended treatment is a 2% solution of Garlon 4 with 0.25-0.5% surfactant applied on all leaves between mid-June and late July, with mowing one to three months before herbicide application (Miller 2013). Farris (2009) also found triclopyr, the active ingredient in Garlon 4, to be the most effective herbicide against *Lespedeza cuneata* (Chinese Lespedeza).

***Rosa multiflora* (Multiflora rose)**

Although *Rosa multiflora* (Multiflora rose) is a serious invasive statewide and is abundant in the park, it has not yet formed dense colonies. Nonetheless, treatment would be worthwhile when resources allow. Most of the shrubs are small enough to be treated with foliar applications of 4% glyphosate, which is best applied repeatedly between May and October. Taller stems can be treated with a basal spray of Pathfinder II in January or February, or between May and October.

***Murdannia keisak* (Marsh dayflower)**

Murdannia keisak (Marsh dayflower) forms monoculture vegetation mats which exclude native species. Although it was observed in only one location in the park, it is known for its ability to spread. The Tennessee Exotic Pest Plant Council recommends treatment with a 2% solution of either glyphosate or triclopyr, plus 0.5% surfactant. Of the two, triclopyr is a more narrow-spectrum herbicide. When carrying out management activities in an area infested with *Murdannia*, care must be taken not to move any plant parts to unaffected areas on shoes, clothing, or equipment, as the plant can form new colonies from small fragments.

CONCLUSION

River Park North provides recreational opportunities for Greenville residents and visitors and also contains high-quality natural communities and habitat for wildlife. The primary threat to biodiversity is competition with invasive plant species, so a good management plan will put a high priority on invasive control. The southern side of the park, from the levee forest, though the swamp, is in good natural condition. Registry or dedication would help ensure its protection for years to come. In order to best serve as wildlife habitat, the powerline corridor should not be fully mowed every year, but instead should have segments mowed on a three to five year rotation in order to control woody vegetation.

As the Lewis property is opened to the public and recreational use of the Tar River increases, demand for improvements will likely also increase. Several current trails could be improved without harming the surrounding natural area, and additional trails can be built to provide access to the Lewis property and to connect the proposed Tar River pedestrian bridge with the rest of the park. Volunteers can be encouraged to invest their time in caring through the park by cleaning up trash or cutting and pulling invasive plants. Careful choices and well-informed management will allow River Park North to continue as a refuge for both people and wildlife.

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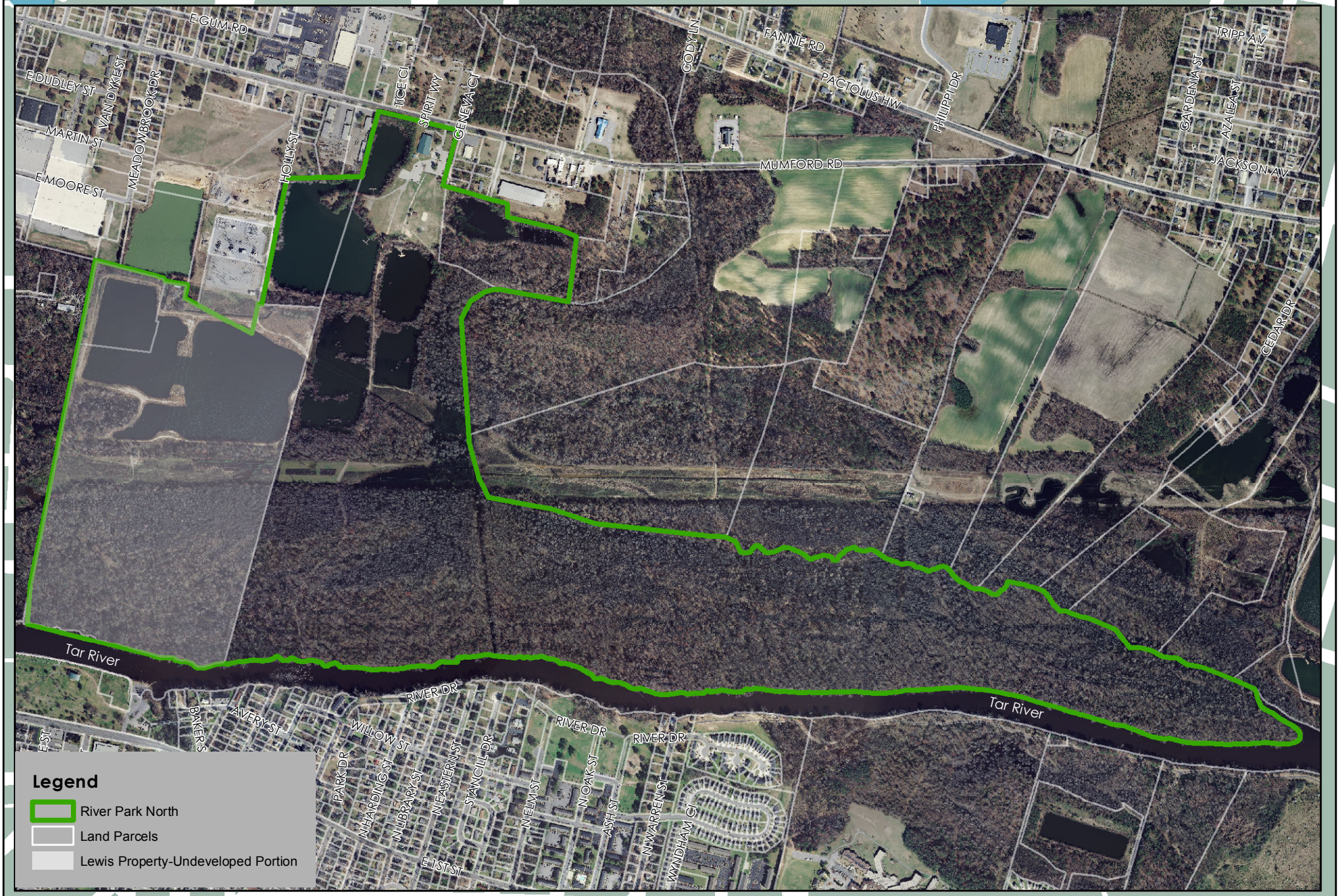
River Park North (2012 Aerials)



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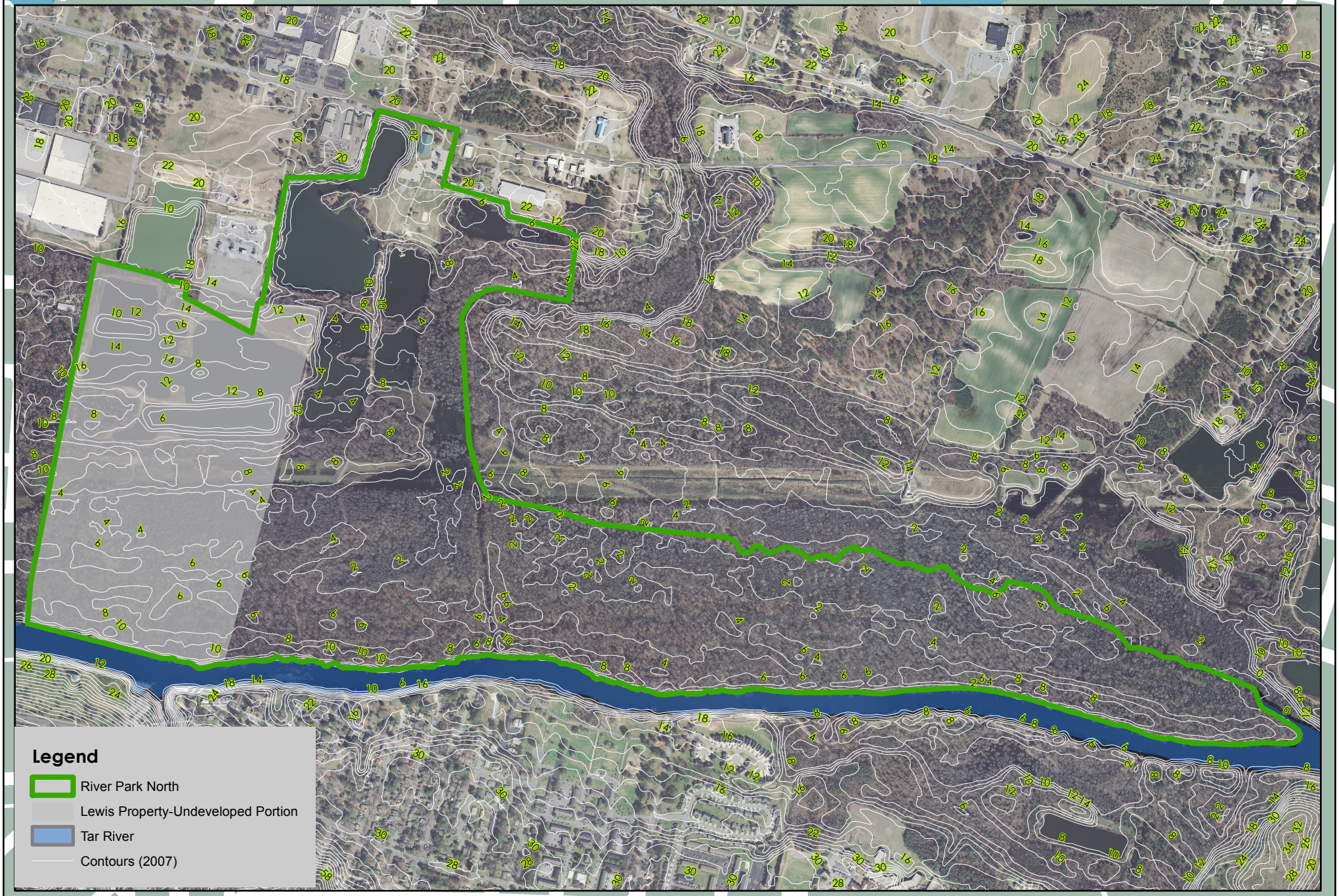
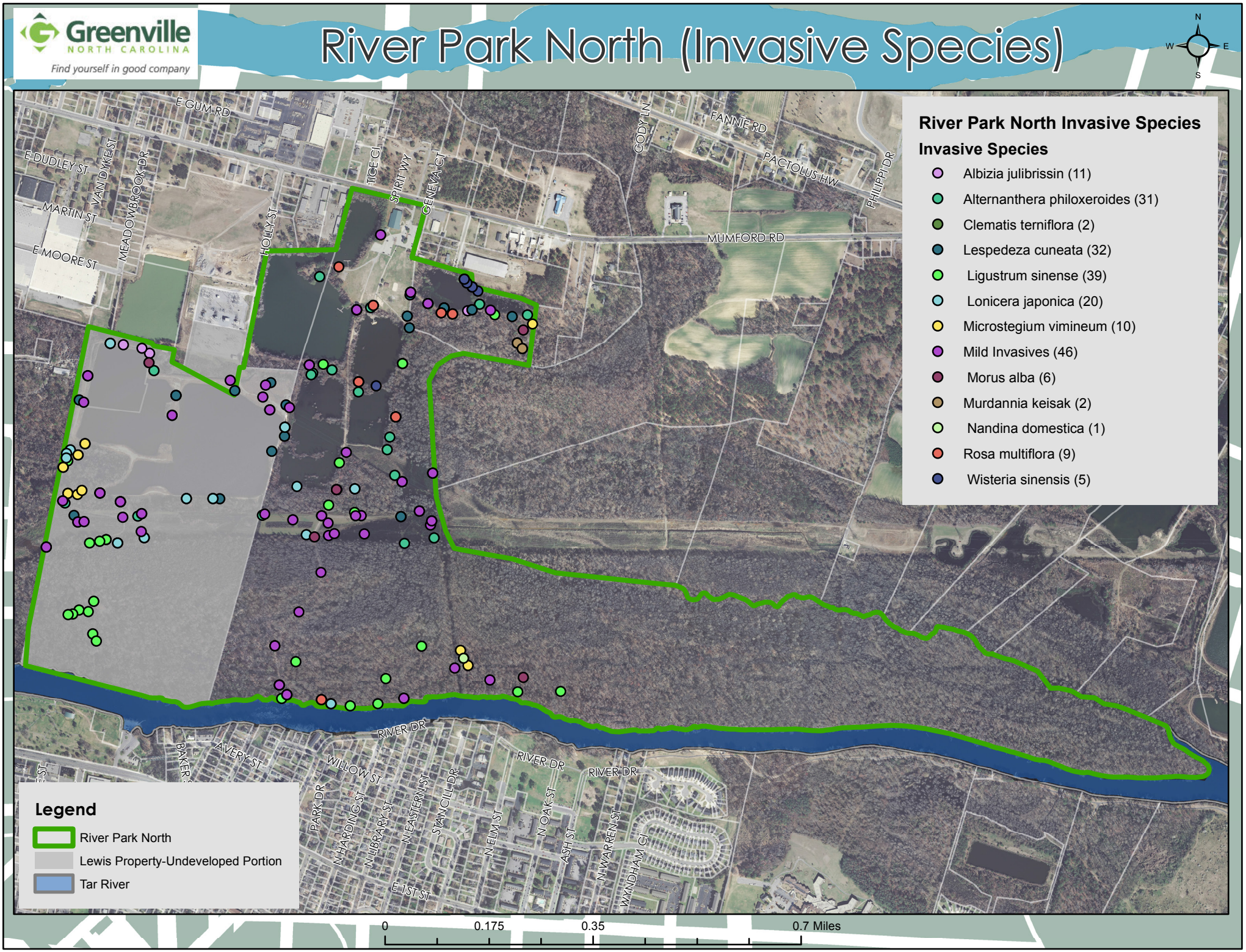
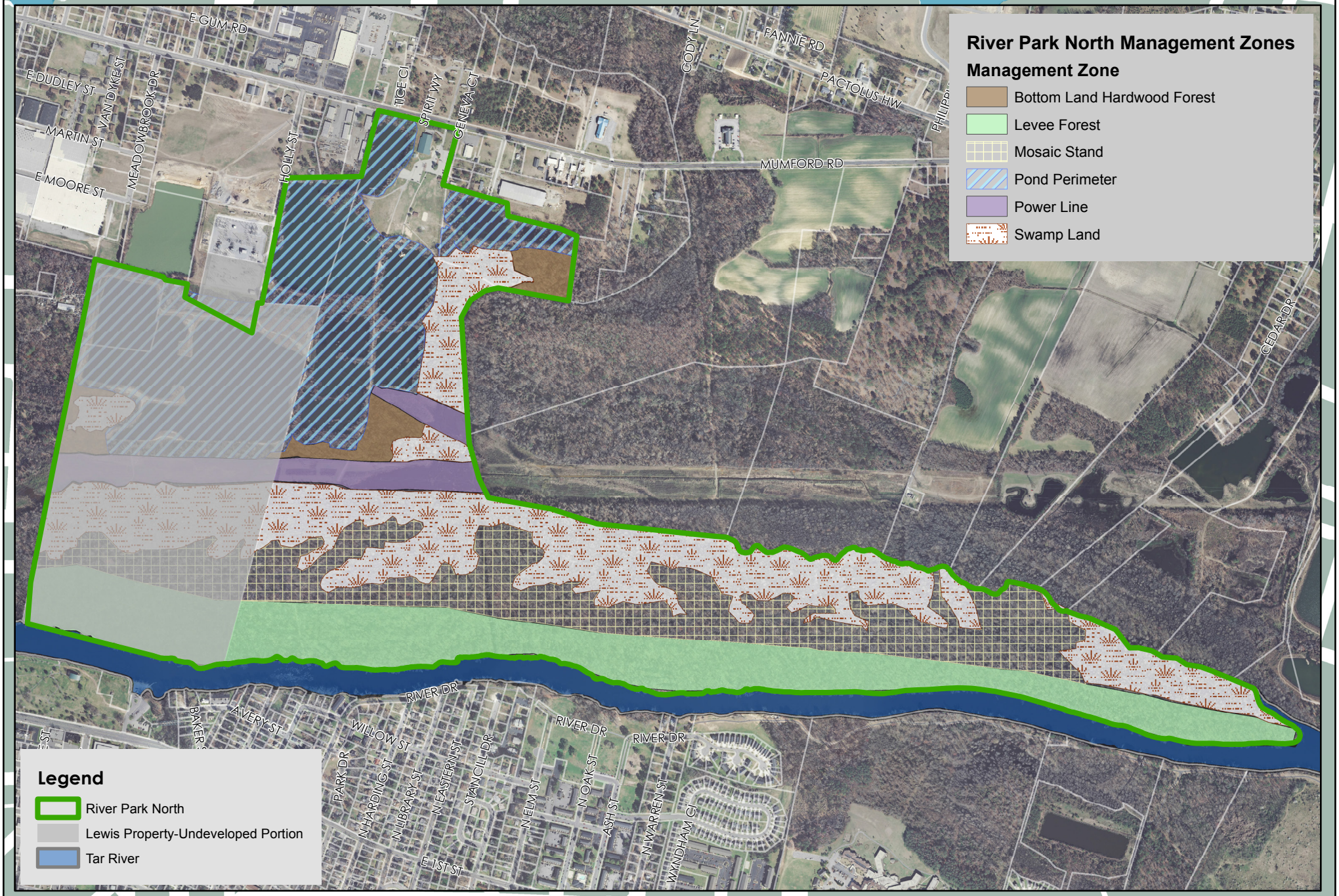
River Park North (Contours)



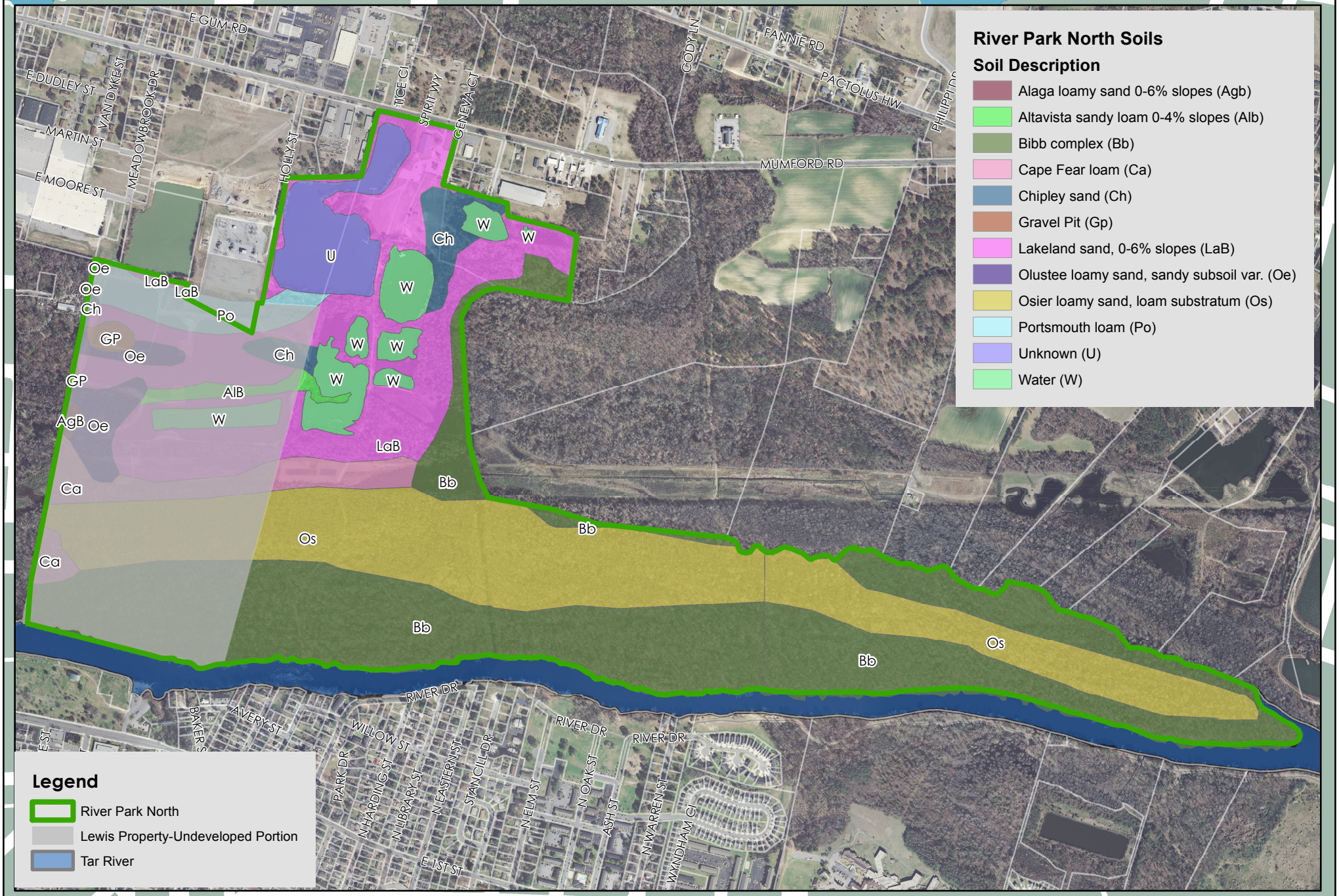
River Park North (Invasive Species)



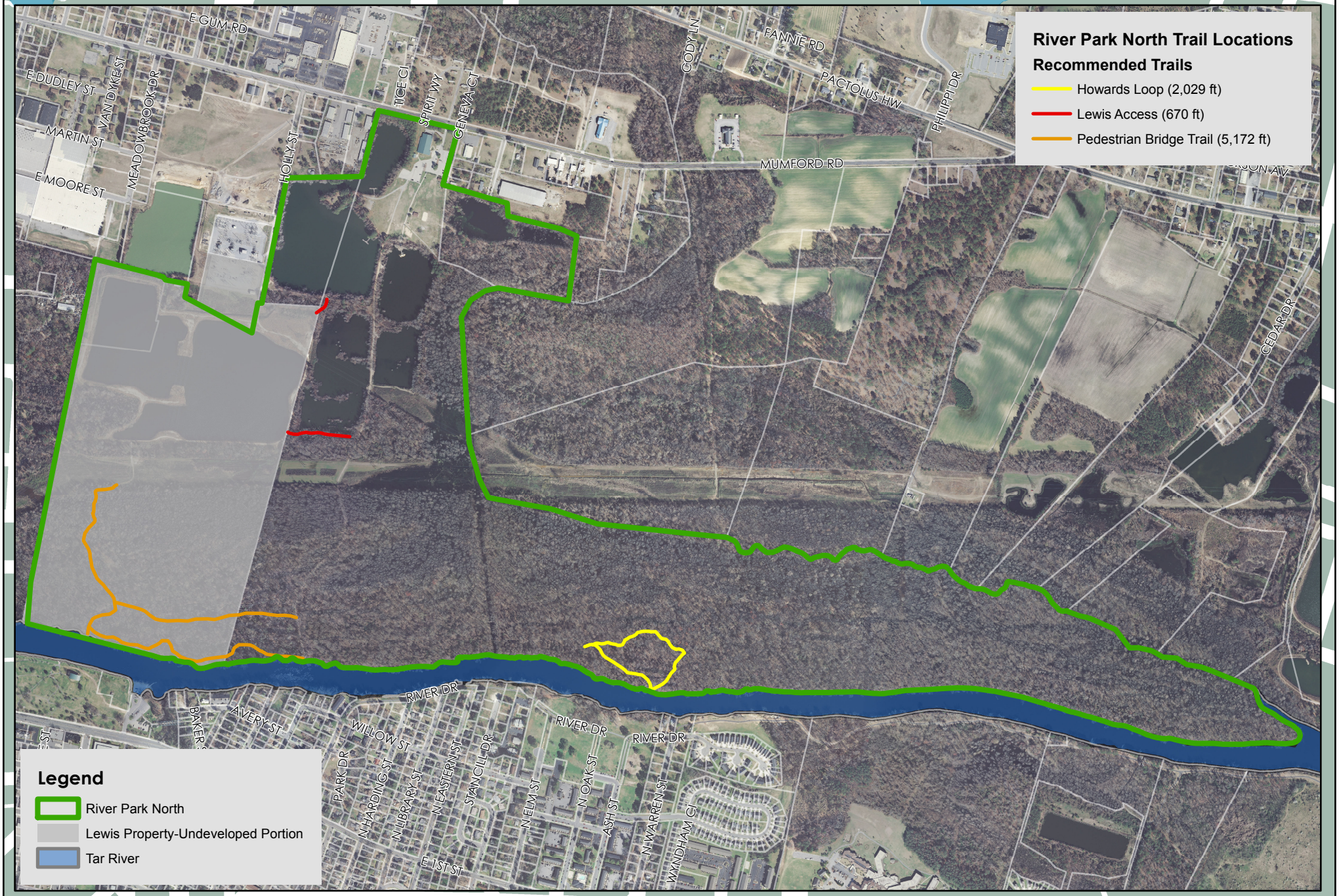
River Park North (Management Zones)



River Park North (Soils)



River Park North (Recommended Trails)



The following is a list of all vascular plants observed in the park, identified as accurately as possible. Although every attempt was made to be thorough, it was not possible in the available time to visit every acre of the park, so there will be some unintentional omissions. Also included are plants from LeGrand's 2013 report; those which were not also observed in the field work specific to the biodiversity assessment are indicated. Scientific names follow Weakley (2012), and common names follow the USDA PLANTS database.

Non-native plants are categorized according to their invasiveness as follows:
highly invasive – NC Native Plant Society Invasive Exotic Species List Rank 1, Severe Threat
invasive – NC Native Plant Society Invasive Exotic Species List Rank 2, Significant Threat
moderately invasive – NC Native Plant Society Invasive Exotic Species List Rank 3, Lesser Threat
potentially invasive – NC Native Plant Society Invasive Exotic Species Watch List A, plants that may become a problem in the future
invasive in neighboring states – NC Native Plant Society Invasive Exotic Species Watch List B, plants that cause problems in adjacent states but have not been reported to do so in North Carolina
somewhat invasive – not listed by NC Native Plant Society but identified as invasive in the CABI Invasive Species Compendium
exotic – non-native, but not identified as invasive in any of the above sources.

Management recommendations are given for the highly invasive species, and areas of dense populations are mapped in shapefiles for each species. These should not be interpreted as the only park locations for any given species, but they will provide a starting point for management operations. Individual shapefiles are also provided for the rank 2 invasive species, and a single shapefile is provided for all the lesser invasive species collectively. Species details for the collective shapefile can be found in its attribute table.

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Shrub	Adoxaceae	Sambucus	candadensis	common elderberry		
Forb	Alismataceae	Sagittaria	latifolia	broadleaf arrowhead		
Tree	Altingiaceae	Liquidambar	styraciflua	sweetgum		
Forb	Amaranthaceae	Alternanthera	philoxeroides	alligatorweed	highly invasive	
Shrub	Anacardiaceae	Rhus	copallinum	winged sumac		
Vine	Anacardiaceae	Toxicodendron	radicans	posion ivy		
Forb	Apiaceae	Sanicula	canadensis	Canadian blacksnakeroot		
Vine	Apocynaceae	Gonolobus	suberosus	eastern anglepod		
Shrub	Aquifoliaceae	Ilex	cornuta	Chinese holly	exotic	
Shrub	Aquifoliaceae	Ilex	decidua	possumhaw		
Shrub	Aquifoliaceae	Ilex	glabra	inkberry		
Tree	Aquifoliaceae	Ilex	opaca	American holly		
Shrub	Aquifoliaceae	Ilex	vomitoria	yaupon		
Forb	Araliaceae	Hydrocotyle	ranunculoides	floating marshpennywort		
Fern	Aspleniaceae	Asplenium	platyneuron	ebony spleenwort		
Forb	Asteraceae	Ambrosia	artemisiifolia	annual ragweed		
Forb	Asteraceae	Antennaria	plantaginifolia	woman's tobacco		
Shrub	Asteraceae	Baccharis	halimifolia	eastern baccharis		

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Forb	Asteraceae	Conoclinium	coelestinum	blue mistflower		
Forb	Asteraceae	Conyza	canadensis	Canadian horseweed		
Forb	Asteraceae	Coreopsis	verticillata	threadleaf coreopsis		
Forb	Asteraceae	Eclipta	prostrata	false daisy		
Forb	Asteraceae	Erigeron	sp.	daisy fleabane		
Forb	Asteraceae	Eupatorium	capillifolium	dogfennel		
Forb	Asteraceae	Eupatorium	semiserratum	smallflower thoroughwort		
Forb	Asteraceae	Eupatorium	serotinum	late eupatorium		
Forb	Asteraceae	Krigia	sp.	cynthia		
Forb	Asteraceae	Lactuca	candadensis	Canada lettuce		
Vine	Asteraceae	Mikania	scandens	climbing hempvine		
Forb	Asteraceae	Pluchea	camphorata	camphor pluchea		
Forb	Asteraceae	Pseudognaphalium	obtusifolium	fragrant rabbit tobacco		
Forb	Asteraceae	Senecio	vulgaris	Old-man-in-the-Spring	moderately invasive	from LeGrand's report
Forb	Asteraceae	Solidago	altissima	Canada goldenrod		
Forb	Asteraceae	Symphyotrichum	pilosum	hairy white oldfield aster		
Shrub	Berberidaceae	Nandina	domestica	sacred bamboo	invasive	
Tree	Betulaceae	Betula	nigra	river birch		
Tree	Betulaceae	Carpinus	carolinana	American hornbeam		
Vine	Bignoniaceae	Bignonia	capreolata	crossvine		
Vine	Bignoniaceae	Campsis	radicans	trumpet creeper		
Fern	Blechnaceae	Woodwardia	aerolata	netted chainfern		
Forb	Boraginaceae	Heliotropium	indicum	Indian heliotrope	somewhat invasive	
Forb	Brassicaceae	Lepidium	virginicum	poor man's pepper		
Epiphyte	Bromeliaceae	Tillandsia	usneoides	Spanish moss		
Forb	Campanulaceae	Lobelia	cardinalis	cardinalflower		
Forb	Campanulaceae	Wahlenbergia	marginata	southern rockbell	exotic	
Tree	Cannabaceae	Celtis	laevigata	sugarberry		
Vine	Caprifoliaceae	Lonicera	japonica	Japanese honeysuckle	highly invasive	
Forb	Commelinaceae	Commelina	virginica	Virginia dayflower		
Forb	Commelinaceae	Murdannia	keisak	wartremoving herb	highly invasive	
Vine	Convolvulaceae	Ipomoea	hederacea	ivyleaf morning-glory		
Vine	Convolvulaceae	Ipomoea	lacunosa	whitestar		
Vine	Convolvulaceae	Ipomoea	pandurata	man of the earth		
Tree	Cornaceae	Cornus	florida	flowering dogwood		
Tree	Cupressaceae	Juniperus	virginiana	eastern redcedar		
Tree	Cupressaceae	Taxodium	distichum	bald cypress		
Graminoid	Cyperaceae	Bulbostylis	capillaris	densetuft hairsedge		
Graminoid	Cyperaceae	Carex	albolutescens	greenwhite sedge		
Graminoid	Cyperaceae	Carex	joorii	cypress swamp sedge		

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Graminoid	Cyperaceae	Carex	lupulina	hop sedge		
Graminoid	Cyperaceae	Cyperus	difformis	variable flatsedge	somewhat invasive	
Graminoid	Cyperaceae	Cyperus	esculentus	yellow nutsedge		
Graminoid	Cyperaceae	Eleocharis	obtusa	blunt spikerush		
Graminoid	Cyperaceae	Rhynchospora	corniculata	shortbristle horned beaksedge		
Graminoid	Cyperaceae	Scirpus	cyperiunus	woolgrass		
Shrub	Cyrillaceae	Cyrilla	racemiflora	swamp titi		
Forb	Dioscoreaceae	Dioscorea	villosa	wild yam		
Tree	Ebenaceae	Diospyros	virginiana	persimmon		
Shrub	Ericaceae	Chimaphila	maculata	striped prince's pine		
Shrub	Ericaceae	Vaccinium	elliottii	Elliott's blueberry		
Shrub	Ericaceae	Vaccinium	fuscatum	black highbush blueberry		
Tree	Fabaceae	Albizia	julibrissin	silktree	highly invasive	
Vine	Fabaceae	Apios	americana	groundnut		
Forb	Fabaceae	Chamaecrista	fasciculata	partridge pea		
Forb	Fabaceae	Chamaecrista	nictitans	sensitive partridge pea		
Forb	Fabaceae	Desmodium	paniculatum	panicledleaf ticktrefoil		
Forb	Fabaceae	Kummerowia	striata	Japanese clover	moderately invasive	
Forb	Fabaceae	Lespedeza	cuneata	sericea lespedeza	highly invasive	
Forb	Fabaceae	Lespedeza	sp.	lespedeza		
Tree	Fabaceae	Quercus	pagoda	cherrybark oak		
Forb	Fabaceae	Senna	obtusifolia	java bean	somewhat invasive	
Vine	Fabaceae	Wisteria	sinensis	Chinese wisteria	highly invasive	
Tree	Fagaceae	Fagus	grandifolia	American beech		
Tree	Fagaceae	Quercus	falcata	southern red oak		
Tree	Fagaceae	Quercus	geminata	sand live oak		
Tree	Fagaceae	Quercus	laurifolia	laurel oak		
Tree	Fagaceae	Quercus	lyrata	overcup oak		
Tree	Fagaceae	Quercus	michauxii	swamp chestnut oak		
Tree	Fagaceae	Quercus	nigra	water oak		
Tree	Fagaceae	Quercus	phellos	willow oak		
Tree	Fagaceae	Quercus	velutina	black oak		
Tree	Fagaceae	Quercus	virginiana	live oak		
Vine	Gelsemiaceae	Gelsemium	sempervirens	Carolina jessamine		
Forb	Hydrophyllaceae	Hydrolea	quadrivalvis	waterpod		
Forb	Hypericaceae	Hypericum	gentianoides	orangegrass		
Shrub	Hypericaceae	Hypericum	hypericoides	St. Andrew's cross		
Forb	Hypericaceae	Hypericum	mutilum	dwarf St. Johnswort		
Forb	Hypericaceae	Hypericum	punctatum	spotted St. Johnswort		
Forb	Hypericaceae	Hypericum	walteri	greater marsh St. Johnswort		

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Forb	Iridaceae	Iris	virginica	Virginia iris		
Forb	Iridaceae	Sisyrinchium	sp.	blue-eyed grass		
Tree	Juglandaceae	Carya	aquatica	water hickory		
Tree	Juglandaceae	Carya	cordiformis	bitternut hickory		
Tree	Juglandaceae	Carya	glabra	pignut hickory		
Tree	Juglandaceae	Carya	pallida	sand hickory		
Tree	Juglandaceae	Carya	tomentosa	mockernut hickory		
Tree	Juglandaceae	Juglans	nigra	black walnut		from LeGrand's report
Graminoid	Juncaceae	Juncus	effusus	common rush		
Graminoid	Juncaceae	Juncus	tenuis	poverty rush		
Shrub	Lamiaceae	Callicarpa	americana	beautyberry		
Forb	Lamiaceae	Perilla	frutescens	beefsteakplant	moderately invasive	
Forb	Lamiaceae	Stachys	tenuifolia	smooth hedgenettle		
Tree	Lauraceae	Sassafras	albidum	sassafras		
Forb	Lythraceae	Cuphea	carthagenensis	Colombian waxweed	somewhat invasive	
Tree	Magnoliaceae	Liriodendron	tulipifera	tuliptree		
Tree	Magnoliaceae	Magnolia	grandiflora	southern magnolia		
Forb	Malvaceae	Hibiscus	moscheutos	eastern rose mallow		
Forb	Malvaceae	Sida	rhombifolia	Cuban jute	exotic	
Forb	Malvaceae	Sida	spinosa	prickly fanpetals	exotic	
Forb	Melastomataceae	Rhexia	mariana	Maryland meadowbeauty		
Tree	Meliaceae	Melia	azedarach	chinaberrytree	invasive in neighboring states	
Tree	Moraceae	Morus	alba	white mulberry	invasive	
Tree	Moraceae	Morus	rubra	red mullberry		
Shrub	Myrticaceae	Morella	cerifera	wax myrtle		
Tree	Nyssaceae	Nyssa	aquatica	water tupelo		
Tree	Nyssaceae	Nyssa	biflora	swamp tupelo		
Shrub	Oleaceae	Elaeagnus	pungens	thorny olive	potentially invasive	from LeGrand's report
Tree	Oleaceae	Fraxinus	carolinana	Carolina ash		
Tree	Oleaceae	Fraxinus	pennsylvanica	green ash		
Tree	Oleaceae	Fraxinus	profunda	pumpkin ash		from LeGrand's report
Shrub	Oleaceae	Ligustrum	sinense	Chinese privet	highly invasive	
Forb	Onagracae	Ludwigia	alternifolia	seedbox		
Forb	Onagracae	Ludwigia	decurrens	wingleaf primrose-willow		
Forb	Onagracae	Ludwigia	leptocarpa	anglestem primrose-willow		
Fern	Osmundaceae	Osmunda	regalis	royal fern		
Forb	Oxalidaceae	Oxalis	sp	wood sorrel		
Vine	Passifloraceae	Passiflora	incarnata	purple passionflower		
Vine	Passifloraceae	Passiflora	lutea	yellow passionflower		
Forb	Phytolaccaceae	Phytolacca	americana	American pokeweed		

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Tree	Pinaceae	Pinus	taeda	loblolly pine		
Tree	Platanaceae	Platanus	occidentalis	American sycamore		
Graminoid	Poaceae	Andropogon	sp.	broomsedge		
Graminoid	Poaceae	Arundinaria	tecta	switchcane		
Graminoid	Poaceae	Chasmanthium	latifolium	Indian woodoats		
Graminoid	Poaceae	Coleataenia	rigidula	redtop panicgrass		
Graminoid	Poaceae	Dichanthelium	commutatum	variable panicgrass		
Graminoid	Poaceae	Dichanthelium	dichotomum	cypress panicgrass		
Graminoid	Poaceae	Dichanthelium	scoparium	velvet panicum		
Graminoid	Poaceae	Echinochloa	muricata	rough barnyardgrass		
Graminoid	Poaceae	Echinochloa	walteri	coast cockspur grass		
Graminoid	Poaceae	Elymus	virginicus	Virginia wildrye		
Graminoid	Poaceae	Leersia	virginica	whitegrass		
Graminoid	Poaceae	Microstegium	vimineum	Nepalese browntop	highly invasive	
Graminoid	Poaceae	Paspalum	notatum	bahiagrass	somewhat invasive	
Graminoid	Poaceae	Paspalum	urvillei	Vasey's grass	somewhat invasive	
Graminoid	Poaceae	Saccharum	alopecuroides	silver plumegrass		
Graminoid	Poaceae	Setaria	pumila	yellow foxtail	exotic	
Graminoid	Poaceae	Tripsacum	dactyloides	eastern gamagrass		
Forb	Polygonaceae	Persicaria	hydropiper	marshpepper knotweed	somewhat invasive	
Forb	Polygonaceae	Persicaria	lapathifolia	curltytop knotweed		
Forb	Polygonaceae	Persicaria	pensylvanica	Pennsylvania smartweed		
Forb	Polygonaceae	Persicaria	virginianum	jumpseed		
Shrub	Polygonaceae	Reynoutria	japonica	Japanese knotweed	highly invasive	
Forb	Polygonaceae	Rumex	sp.	dock		
Fern	Polypodiaceae	Pleopeltis	polypodioides	resurrection fern		
Forb	Portulacaceae	Portulaca	pilosa	kiss me quick		
Forb	Ranunculaceae	Clematis	crispa	swamp leather flower		
Vine	Ranunculaceae	Clematis	terniflora	sweet autumn virginsbower	invasive	
Forb	Ranunculaceae	Ranunculus	abortivis	littleleaf buttercup		from LeGrand's report
Vine	Rhamnaceae	Berchemia	scandens	Alabama supplejack		
Tree	Rosaceae	Crataegus	marshallii	parsley hawthorn		
Tree	Rosaceae	Crataegus	viridis	green hawthorn		
Forb	Rosaceae	Fragaria	virginiana	Virginia strawberry		
Forb	Rosaceae	Potentilla	canadensis	dwarf cinquefoil		
Forb	Rosaceae	Potentilla	indica	Indian strawberry	exotic	from LeGrand's report
Shrub	Rosaceae	Rosa	multiflora	multiflora rose	highly invasive	
Shrub	Rosaceae	Rubus	pensilvanicus	Pennsylvania blackberry		
Shrub	Rubiaceae	Cephalanthus	occidentalis	common buttonbush		
Forb	Rubiaceae	Diodia	teres	poorjoe		

Growth Form	Family	Genus	Species	Common Name	Invasive Status	Observation Source
Forb	Rubiaceae	Diodia	virginiana	Virginia buttonweed		
Forb	Rubiaceae	Galium	triflorum	fragrant bedstraw		
Forb	Rubiaceae	Mitchella	repens	partridgeberry		
Forb	Rubiaceae	Richardia	scabra	rough Mexican clover	exotic	
Forb	Ruscaceae	Liriope	muscari	big blue lilyturf	moderately invasive	
Tree	Salicaceae	Populus	heterophylla	swamp cottonwood		
Tree	Salicaceae	Salix	nigra	black willow		
Tree	Sapindaceae	Acer	negundo	boxelder		
Tree	Sapindaceae	Acer	rubrum	red maple		
Tree	Sapindaceae	Aesculus	pavia	red buckeye		
Forb	Saururaceae	Saururus	cernuus	lizard's tail		
Forb	Scrophulariaceae	Gratiola	virginiana	roundfruit hedgehyssop		from LeGrand's report
Forb	Scrophulariaceae	Mazus	pumilis	Japanese mazus	exotic	from LeGrand's report
Forb	Scrophulariaceae	Mimulus	alatus	sharpwing monkeyflower		
Vine	Smilacaceae	Smilax	Bona-nox	saw greenbrier		
Vine	Smilacaceae	Smilax	glauca	cat greenbrier		
Vine	Smilacaceae	Smilax	rotundifolia	roundleaf greenbrier		
Forb	Solanaceae	Solanum	carolinense	Carolina horsenettle		
Tree	Ulmaceare	Ulmus	alata	winged elm		
Tree	Ulmaceare	Ulmus	americana	American elm		
Forb	Urticaceae	Boehmeria	cylincrica	smallspike false nettle		
Forb	Verbenaceae	Verbena	brasiliensis	Brazilian vervane	somewhat invasive	
Forb	Violaceae	Viola	affinis	sand violet		
Forb	Violaceae	Viola	sororia	common blue violet		
Parasite	Viscaceae	Phoradendron	leucarpum	oak mistletoe		from LeGrand's report
Vine	Vitaceae	Ampelopsis	arborea	peppervine		
Vine	Vitaceae	Muscadinia	rotundifolia	muscadine		
Vine	Vitaceae	Parthenocissus	quinquefolia	Virginia creeper		
Vine	Vitaceae	Vitis	cinerea	graybark grape		