

TOWN OF HILLSBOROUGH



Riverwalk Urban Forest Plan

101 East Orange Street
Hillsborough, NC 27278

June 16, 2015



Written By:
Jennifer Roach,
Assistant District Forester
NC Registered Forest #1498, ISA Certified Arborist #SO-6804A
NC Forest Service
3314 NC Hwy. 86 South
Hillsborough, NC 27278
919-732-8105

NC Forest Service, Orange County Office
Chris Hirni, County Ranger
Justin Bennett, Assistant County Ranger
110 Boone Square, Suite 12
Hillsborough, NC 27278
919-732-8152



Location and Description

The Riverwalk is mostly a paved greenway trail along the Eno River through downtown Hillsborough. This greenway trail provides a place of outdoor recreation for the Town of Hillsborough and the surrounding community. And while the Riverwalk provides access to greenspace for recreation, the Riverwalk provides a huge opportunity for residents to explore and learn more about their environment.

The Riverwalk crosses the Eno River at two different locations along the trail and winds through bottomland hardwood stands adjacent to the river and upland mixed hardwood stands with a few pockets of loblolly, shortleaf, and Virginia pine. The terrain is rolling with slopes of 2-6%.

The trail is also part of the NC Mountains-to-Sea Trail where citizens can walk, run, and cycle across NC.

Objectives for the Riverwalk

The primary objective for the Riverwalk is to enhance the quality of life for the community around Hillsborough by providing outdoor recreation that is accessible for all ages.

Secondary objectives of the Riverwalk include:

- Maintaining a riparian buffer along the Eno River and through downtown Hillsborough that protects water quality and adheres to the Neuse River Buffer Rules.
- Maintaining a healthy forest through downtown Hillsborough that reduces radiant heat and improves air quality.
- To provide access to local restaurants and businesses in downtown Hillsborough that increase foot and bicycle traffic and reduces vehicles.
- To provide educational opportunities where citizens can explore and learn more about their environment.

Summary of Recommendations

➤ **Goal 1- Hazard Tree Assessment**

Immediately remove the trees that will create a hazard for the public. This consists mostly of removing dead and unhealthy trees, trees with large dead limbs that may fall across the path, or large vines hanging that could pose a threat to users of the trail or could create costly damage to the trail or the sewer lines.

In many cases it will be better to remove the entire tree but in other cases dead or unhealthy limbs or forks could be removed without having to remove the entire tree.

Once the initial removal of hazard trees is complete, the trail should be evaluated monthly and following storms that produce high winds, ice, or snow. Mark the trees that will need to be removed either with inexpensive flagging tape or something that is not as visible to the public like small pin flags that could be put at the base of the tree.



➤ **Goal 2-Maintain Aesthetics Along the Trail**

Everyone has a different opinion of what is natural and pretty. Many people prefer the “open park like understory” that is free of undergrowth and dead trees and limbs while others prefer the thick dense forest that shows the life and structure of the forest as well as the decay of dead limbs and trees.

Just always keep in mind that the young tree seedlings and saplings growing in the understory will be a component of the “new forest” in the future. So it is important to maintain the understory along most of the trail. Also, the fallen debris of limbs and whole trees will naturally decay and become part of the soil which is a natural process that the public can learn and understand.

However there may be areas along the trail that debris removal may be needed because it creates a fire hazard or endangers the public. These should be limited to small areas where trees fell apart or snapped and fell into another tree.

To satisfy multiple parties, choose small areas along the trail that are easily accessible where money could be spent to plant more flowering shrubs and plants and maintain a more manicured aesthetic. Maintaining a more manicured understory may also be important where public safety is a concern along a portion of the trail.

➤ **Goal 3-Maintain the Health and Quality of Trees and Forest Stands**

Manage the larger blocks of woodland to maintain a healthy, sustainable forest. This could involve periodic timber stand improvements where trees are removed to help create better growing conditions or it could involve controlling the spread of the invasive species. Each area of the trail has been divided up into stands with the work needed for each stand.

Gold Park

The trails are wider in this area with less trees hanging over or threatening the trail. There is some maintenance needed in this area, but not as much compared to other parts of the trail.

Stand Type	Mixed Bottomland Hardwoods
Species Composition (Common Names)	Yellow poplar, American elm, river birch, hackberry, sycamore, green ash, red maple, sweetgum, loblolly pine.
Understory Species	American beech, sugar maple, red maple, green ash, cherry, muscledwood, persimmon, elm, sweetgum, yellow poplar, Japanese Stilt Grass, Chinese Privet, multi-flora rose, Tree- of- Heaven.
Tree Ages	40-55 years old
Tree Diameters	6-20 inches (diameter at breast height,)
Tree Heights	50-100 feet tall



Concentrate on:

➤ **Goal 1- Hazard Tree Assessment**

Loblolly Pines Growing on River Bank-

The loblolly pines growing on the river bank are quickly becoming a hazard to the public. The river bank is highly erodible and as the bank is lost into the river, the trees become unstable and will fall without warning. You do not have to remove all the loblolly pines growing along the riverbank in Gold Park, but the few trees where the bank has eroded underneath the trees. This was seen along the river, near the footbridge, across from the picnic shelter.

Before removing the trees, the Town must consult with the Division of Water Resources to be sure this will be allowed under the Neuse River Buffer Rules. Trees like this are normally not allowed to be removed since they are healthy trees. But there is no doubt the trees are a hazard and a huge safety concern for the public using the trail and must be removed. Hopefully the trees will fall directly into the river before falling back towards the trail, but this is a safety concern and not something the Town should linger over.

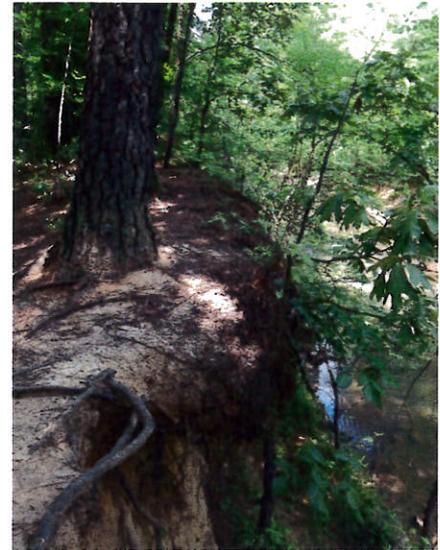


Figure 1-Pine standing on Eroded Bank

Remove the Hazard Trees- Continue to monitor the trail and remove those hazard trees that can fall on the trail or sewer lines. This may consist of removing dead or unhealthy trees, trees that lean over the trail that may have damage at the base and make the tree susceptible to fall, or removing large limbs or forks from a tree that may fall onto the trail. This includes looking out from the trail and monitoring the older, larger trees that may be 50+ feet off the trail but could fall and threaten the trail. Keep in mind that though a tree may be dead or unhealthy does not mean it is a hazard tree and has to be removed. Focus on those trees that can fall or threaten a structure along the trail. If the tree falls or breaks apart in the woods, the tree is not considered a hazard.

➤ **Goal 3-Improve the Health and Quality of Trees and Forest Stands**

Young pockets of trees growing up along the trail- As new trees start grow along the trail, in particular, pine trees, the trees may form small dense areas where the trees are growing too close together. As the trees grow, the trees will compete for space and nutrients and eventually the losers will die off, creating a hazard tree for the public. We recommend while the trees are young (at least 3-5 years of age), choose one or two dominant and healthy trees to keep and remove the other seedlings and saplings that are growing. Try to create a spacing of at least 10-12 feet between trees. Doing this when the trees are small will make the work much easier.



Figure 2-Small pockets of trees along trail



Area underneath the Powerline-



Mow underneath the powerlines at least every two years so that trees do not become established. Trees are a hazard to powerlines and would only create maintenance issues in the future. Leaving these small areas to grow creates early succession habitat which consists of grasses and weeds where an array of birds and small mammals can forage and take refuge. It also seems to keep foot traffic down.

To add a little more color to the area, the Town could disk the area every few years and plant a mix of wildflowers that will attract an array of bird species. This would only be appropriate in the drier areas along the powerline and not in the wetland areas.

Overall Tree Health- Overall, the forest stands in Gold Park are healthy and growing well. Overtime, in another 10-12 years, there may be a need for some improvement cutting in the forest. The purpose would be to open up the stands and create more growing space for the trees and to allow more sunlight to reach the forest floor that will encourage the growth of new seedlings and shrubs. This would consist of not only removing the dead, un-healthy, or suppressed trees but removal of large individual trees that would create small openings in the canopy.

When the time comes to do some improvement cutting, there are trees that should be favored over others. Try and choose to keep the oaks, hickories, blackgum, cherries, and persimmon trees for a food source for wildlife, while keeping some maples, river birch, and elm for fall color. The pines are short-lived and the sycamore tend to break apart fairly easily but maintaining a few of these trees provide diversity and structure to the forest.

The wetland areas in Gold Park should be left to grow with little impact or disturbance. Any management should be limited to only removal of hazard trees when necessary.



Manage the Invasive Species-There is a plethora of invasive species growing like the Bamboo, Chinese Privet, Tree of Heaven, Japanese Stilt Grass, Honeysuckle, and multi-flora rose. Eradication of the invasive plants in this area will be almost impossible if herbicide use is not desired. However, controlling the spread of some of the species is achievable.

The spread of the Bamboo could be controlled by digging a ditch or trench that is deeper than the rhizomes, typically 2 feet deep, completely around the area of Bamboo that will prevent new rhizomes from growing.

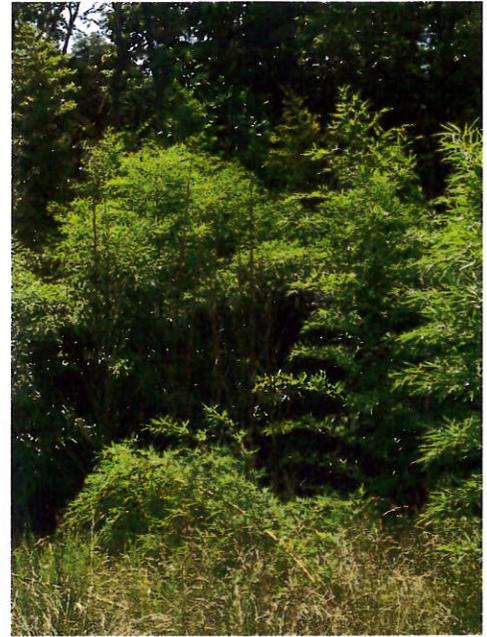


Figure 3-Bamboo in Gold Park



Figure 4-Tree of Heaven Along Trail

The multi-flora rose, honeysuckle, and Tree-of-Heaven could be cut out or removed by hand if herbicide use is not desired. Re-sprouting can be assured, however. The Japanese Stilt grass and Chinese Privet are much harder to control since they have such a hold already on the area. (I have included several attachments on controlling some of the invasive species). If the Town truly wants to become aggressive in controlling the spread of the invasive species, we recommend you contact a herbicide contractor to learn more about some of the options of herbicide. Keep in mind invasive plants are not only found throughout the Riverwalk trail, but are also starting to spread onto the adjacent neighboring properties.

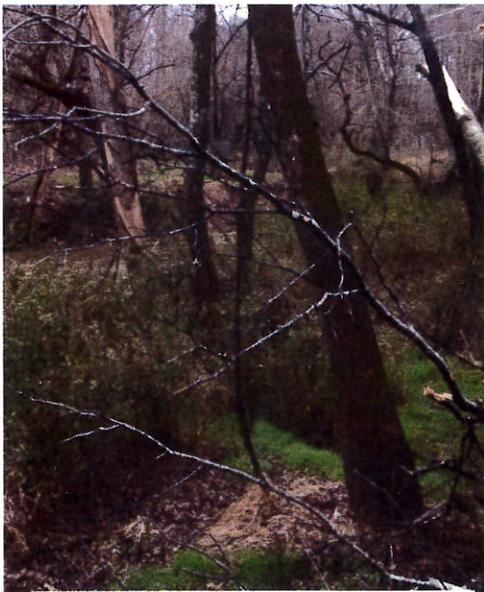


Figure 6-Privet Growing in Understory



Figure 5-Understory of Japanese Stilt Grass



Middle Riverwalk

This is the large middle section of the trail also referred to as Phase II.

Stand Type	Mixed Bottomland Hardwoods
Species Composition (Common Names)	Yellow poplar, American elm, river birch, hackberry, sycamore, green ash, red maple, sweetgum, black walnut, shortleaf pine, loblolly pine.
Understory Species	American beech, sugar maple, red maple, green ash, cherry, musclewood, persimmon, elm, sweetgum, yellow poplar, Japanese Stilt Grass, Chinese Privet, multi-flora rose, Tree- of- Heaven.
Tree Ages	40-55 years old
Tree Diameters	6-20 inches (diameter at breast height,)
Tree Heights	50-100 feet tall

Concentrate on:

➤ **Goal 1- Hazard Tree Assessment**

Continue to Remove the Hazard Trees- Continue to monitor the trail and remove those hazard trees that can fall on the trail or sewer lines. This may consist of removing dead or unhealthy trees, trees that lean over the trail that may have damage at the base and make the tree susceptible to fall, or removing large limbs or forks from a tree that may fall onto the trail. This includes looking out from the trail and monitoring the older, larger trees that may be 50+ feet off the trail but could fall and threaten the trail. Keep in mind that though a tree may be dead or unhealthy does not mean it is a hazard tree and has to be removed. Focus on those trees that can fall or threaten a structure along the trail. If the tree falls or breaks apart in the woods, the tree is not considered a hazard.

Past Storm Damage in Virginia Pines- The Virginia pine stand growing in this area has been snapped off, pushed over, topped, or broken by other trees during the last ice storm. There are a few trees growing along the edge of the trail that are a danger to the public, however the entire stand does not present an immediate danger to the public, unless they venture off the trail. Furthermore, during the dry fall months when the Japanese Stilt grass has died back, this area would be considered a fire hazard.

There are 3 options recommended for this area. No matter what option you choose, this would be an opportunity to inform users of the trail about this area.

Option 1-Do nothing but remove hazard trees that threaten the trail. This is a low cost option that is risky.

Option 2- Remove all the pines in this area, leaving scattered hardwoods to grow. Remove all the snapped, broken, topped Virginia pine trees, as well as those few trees that remain standing. Virginia pine is a short-lived tree with a very shallow root system that when opened-up from a dense stand to a more open grown tree, the trees are very likely to fall over. This option removes the broken up debris while leaving a scattered overstory of hardwoods.

Option 3-Remove all the trees in this small area, leaving nothing standing. This would create an open area from the powerline down the trail for about 50 feet. This would allow the Town to clean up the storm damage and allow for a new forest to grow. This option would create early successional



habitat which is drastically different than the rest of the trail and over the next few years you may start to see new grasses, weeds, and trees start to grow. The disadvantage, however, is the Japanese Stilt grass will also grow even more. It will spread further and create thick, dense carpets that may prevent the growth of native vegetation in this area. If all the trees are removed, it would be a good time to try and control the stilt grass. You may also have to use volunteers to find new hardwood sprouts amongst the grass and try and control the grass around them until the seedlings are above the stilt grass. Also, the Virginia pines that grow back should be cut down once the trees reach heights of 3-5 feet. We do not recommend keeping the Virginia pines along the trail.

➤ **Goal 2-Maintain Aesthetics Along the Trail**

I believe the Town already has plans to clean up the understory near one of the trailheads near Weaver Street Market. This would be a good place to concentrate on removing the woody debris in the understory and planting more flowering shrubs and creating a more manicured appearance.

The open areas underneath the powerline and adjacent small fields in this area would be a good place to plant a mix of wildflowers. As long as this area only contains overhead powerlines and not underground utilities, the soil could be lightly disked every few years and wildflower seed could be sown. This would provide a little more color and interest along these areas as well as create a haven for bird species. Wildflower seed is a little expensive but a mix of sunflowers, black-eyed susans, partridge pea, butterfly weed, daisy fleabane, coreopsis, mixed with native grasses like little blue stem and Indian grass could create a nice wildlife viewing area.

➤ **Goal 3-Improve the Health and Quality of Trees and Forest Stands**

Overall the trees are growing well in this area. However, in another 10-12 years, just as in the Gold Park area, improvement cuts may be needed in the interior of the forest stands. This type of harvest is meant to create a more open stand while encouraging the growth of a new future forest stand in the understory. An improvement cut would simply try and open up the hardwood stands to provide more growing space and less competition for nutrients that should remove some of the stress on the trees and reduce mortality in the stand. This type of cut would maintain a mature overstory while creating conditions for new seedlings to grow. Basal areas of 60-80 square feet per acre should be left.

When Improvement cuts are performed, maintain the oak, hickory, blackgum, cherry, persimmon, and other mast producing trees for a food source for wildlife. Also try and maintain at least 4-5 large, mature trees along the river for nesting sites for birds and other predators. As well as maintain a few snags, or standing dead trees, as long as the trees don't present a hazard to the public or the sewer lines, for cavity dweller species like woodpeckers and owls.

When improvements cut are performed, consider removing any tree larger than 20 inches in diameter. Remove most of the pine trees, though the Town may decide to maintain a few shortleaf pine trees as legacy trees since they are a long-lived tree. Remove unhealthy trees with a lot of dieback in the canopy, trees with scars, past damage, or rot in the main bole of the tree.

The Town can perform these improvement cuts at one time up and down the trail, but it may be more beneficial and provide a better aesthetic along the trail by doing this in small areas along the trail over



several years. Performing small, periodic cuts in this area and in Gold Park over several years instead of at one time will diversify the trail even more as well as limit the amount of debris that would be created.

Manage the Invasive Species-Just like along the rest of the trail, this area has its fair share of many invasive species.

East End of the Trail-

Along this portion of the trail, there were multiple hazards that needed to be removed and many trees with rot in the base.

Concentrate On:

➤ **Goal 1- Hazard Tree Assessment**

Focus on removing those trees that create a hazard to the public. Trees with dieback in the crown that lean over or towards the trail, trees with rot in the bottom of the main bole, or dead trees that may break apart and fall on the trail.

Since this part of the trail may have to be re-paved every 8-10 years, caution should be taken so that trees are not damaged during the pavement operation by equipment. If a new trail needs to be installed, it could damage the roots of some trees so the area would need to be monitored for several years following the installation to make sure that damage has not been done. If a tree starts to show dieback during the spring and summer following the installation of a new trail, the tree should be removed.

➤ **Goal 2-Maintain Aesthetics Along the Trail**

This part of the trail is narrow and the understory is fairly dense with invasive species. You may consider creating a more manicured look along the trailhead at Cameron Street to make this area more inviting for a larger group of people. With all the vines hanging from the trees and a dense understory it may steer people away from this part of the trail.



Figure 7-Grapevines along trail

➤ **Goal 3-Improve the Health and Quality of Trees and Forest Stands**

Manage the Invasive Species- Just like along the rest of the Riverwalk

Otherwise, this area should be left to grow. Periodic maintenance of hazard trees will be all this area really needs.



When Maintenance Along the Trail is Performed, What Could Be Done with the Woody Debris?

- A tree service could chip the trees that are removed and the chips could be carried away, spread out along the trail, used to improve other parts of the trail, or used around town.
- A small, portable sawmill could be set up onsite in an open area (like the small field in the Middle) that could mill the large pine trees that are removed. The lumber could be used to build benches and signs along the trail by local volunteer groups. The boards would need to be dried for several months and treated in order to withstand the elements, however. Even then, benches made from pine and not pressured treated pine may only last a few years. This would be best utilized when the Town has a lot of trees to remove, particularly large pine.
- Hardwood trees could be offered to local woodworking artisans. This would require some organization, maybe by the tree board or local volunteer, so the artisans could immediately take the trees after the trees were cut to limit the amount of “debris” along the trail.
- Whole trees could be used to block off parts of the trail to keep foot traffic down.
- Trees could be cut up into small lengths and put along parts of the trail where foot traffic has created an erosion issue. The small bolts of trees could create “steps” that the public could walk on while the trees help push water to one side of the trail, instead of downhill.
- Trees could be used to create a fitness area along the trail. A volunteer group willing to cut trees into small sections could create a small obstacle course along trail. The disadvantage, however, is the trees, though they could be treated with a polyurethane, would eventually decay and may need to be re-cut every 5-8 years.
- An outdoor classroom could be setup in the Gold Park area using the large trees as seats. Once again, this would last for several years, but would have to be re-cut fairly often.

Opportunities to Engage Local Volunteer groups and Service Organizations

Opportunities for volunteer groups are endless along the trail. There are so many ways that people could get involved and help maintain and improve the trail. And when the local community feels connected to the Trail, the community will help keep the trash picked up, help identify hazard trees that are leaning or falling over the greenway, and help maintain public safety along trail.



- Form a Greenway Volunteer group (ex: Friends of the Greenway) that could assist with clean-up activities, assist other volunteer groups along the trail, and help organize small events along the trail. This groups purpose should be limited however, and the Public Works Dept. and Tree Board should have the final authority on management activities.
- Volunteer groups could build benches along the trail
- Volunteer groups could build signs along the trail noting the trailhead entrances, mileage along the trail, etc.
- Volunteers could create an educational walk for children and adults alike. Tree identification trails could be setup, the different forest stands and different types of habitat the forest provides could be established along the trail.
- Volunteers could create an obstacle course along the trail for runners, children, etc.
- School groups from individual classrooms to organized clubs like 4H, Future Farmers of America, and Envirothon groups could disk and plant wildflower fields and help establish tree id trails.



- Master Gardeners could assist with the planting and manicuring of certain areas along the trail.
- Birding groups could assist with identification of the local bird species and produce a few signs along the trail.

Signs and Symptoms of Stressed or Un-Healthy Trees

The best time to truly determine how healthy a tree is, is during the spring and summer months. Hardwoods may appear to have some dieback during the late summer and may appear to be dead during the winter. But the tree should be monitored during the spring to see how well the tree “flushes” out or produces leaves in the spring.

For Pine trees, they tend to “Flag” out meaning that their crown may turn reddish or yellowish in color.

If you notice any of the following signs, the tree could be stressed due to an insect attack, disease, or damage and should be monitored.

- If the tree is a pine, do the branches look reddish or yellowish in color?
- Is there “popcorn” up and down the main bole of the tree?
- Is there “sawdust” laying at the bottom of the tree?
- Is there dieback, or loss of leaves, on some of the limbs?
- Is the tree defoliated?
- Is there open holes or the appearance of rot in the bottom of the tree?
- Is there mushroom like structures growing on the bole of the tree or around the base of the tree?
- Are there any galls or fruiting bodies growing on the side of the tree or limbs?
- Is the bark pulling away from or falling off of the tree?



Urban and Community Forestry Grant

The NC Forest Service Urban and Community Forestry Program maintains a grant program that is available for local governments. The goal of the grant program is to provide monetary assistance to local government programs that enhance the benefits and sustainability of their urban forests. Monies can be used to manage the urban and community forests and improve public understanding of the benefits of maintaining existing tree cover in our communities. The Town would simply need to have a specific project in mind and apply for the grant providing specific details of the project, projects costs, and the benefits to the community of Hillsborough. There is more information available on our website and our urban staff in our Raleigh office would be more than happy to talk with you further about this program. www.ncforestsservice.gov

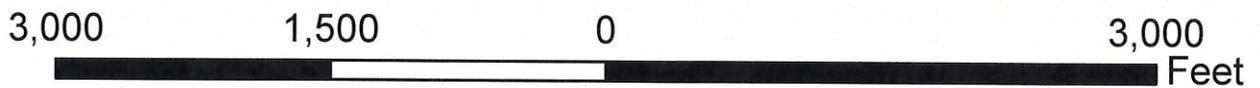
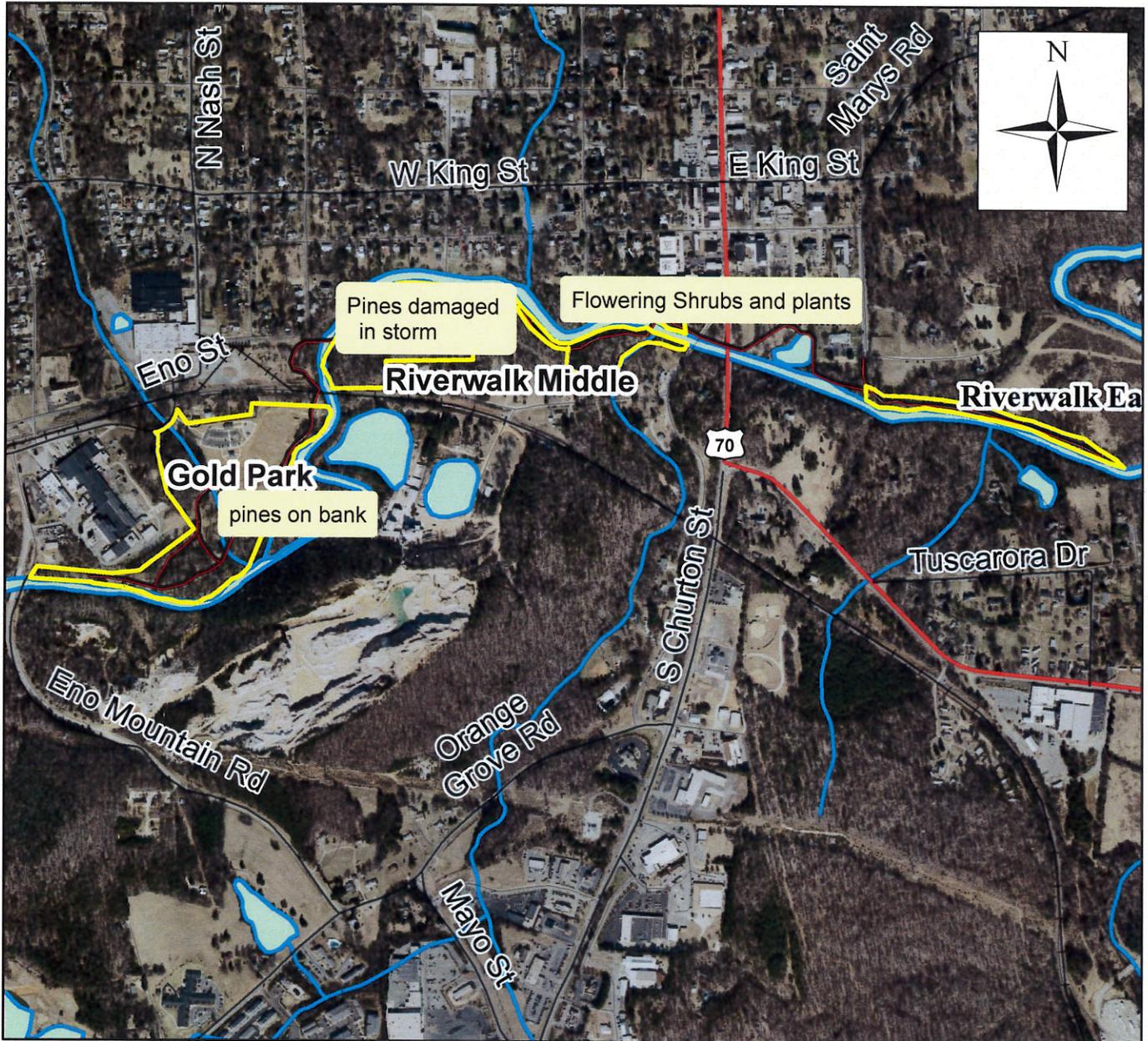




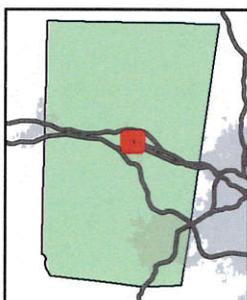
North Carolina Forest Service Woodland Management Map



Boundaries and Acreages are Approximate



Vicinity Map



Woodland Management Map

Landowner: Town of Hillsborough
County: Orange
Latitude: 36° 4.26
Longitude: -79° 6.54
Drawn By: JJ Roach
Date: 6/12/15
RiverBasin: Neuse
2013 Photography

Legend

- Stand_Boundary
- Streams
- Trails

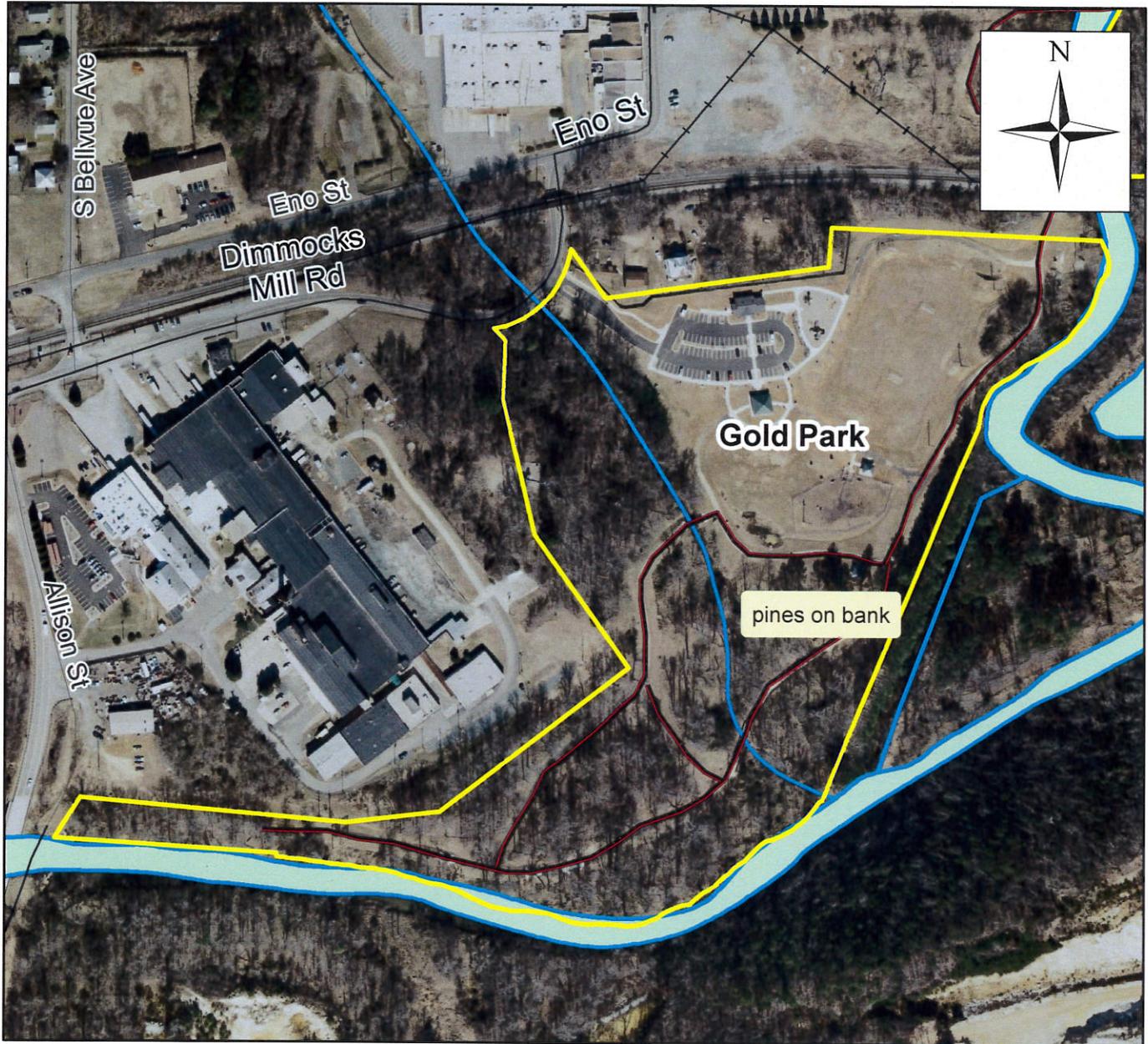


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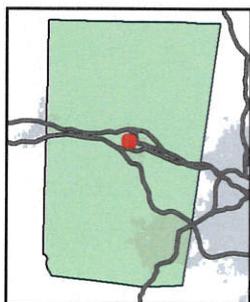
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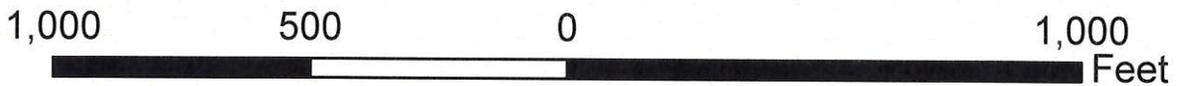
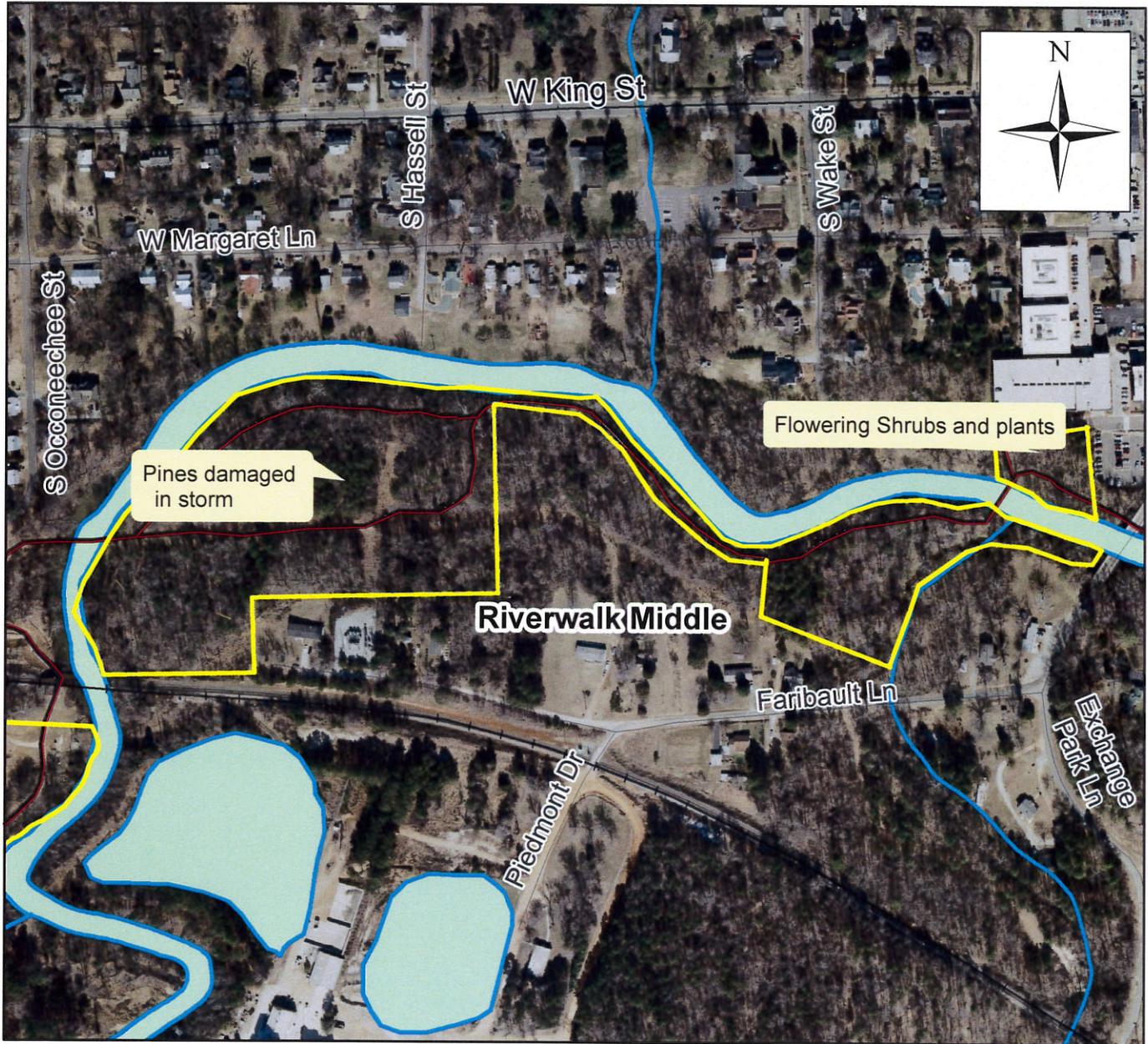


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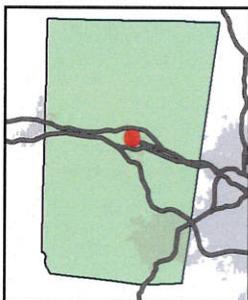
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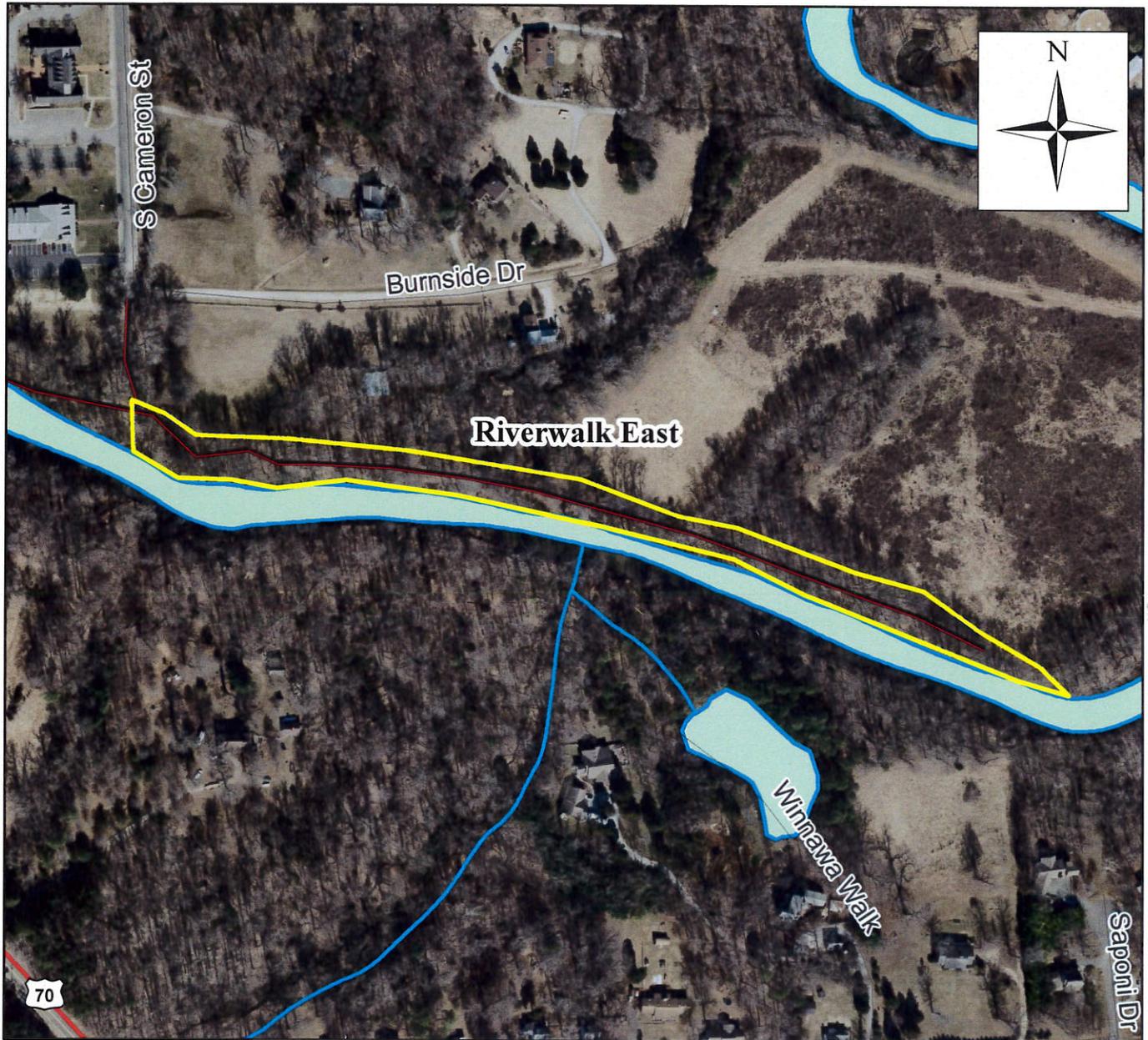
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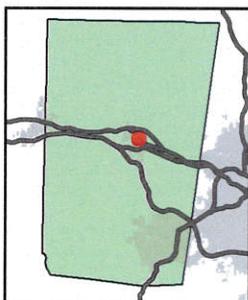
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