

Firefly Trail Expansion and Development Project Report

Partnership with University of Georgia

Ecology 4900S- Environmental Practicum

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Sections Start

Introduction: Overview of Project

The Firefly Trail is a Rail to Trail development project that spans 39.9 miles, connecting Union Point to Athens in one continuous trail. The trail is partially completed for about 10 miles, however most of the trail is undeveloped or under construction. The areas of completed trail are located in Athens, Union Point, and a Model Mile in Maxey's, while much of the area between the towns has not yet been designated for the trail.

Further development of the Firefly Trail will be beneficial for the counties in which it is built. For the residents of these counties, there are benefits for health and social interaction (Scherrer et al. 2020). Environmentally, the addition of the trail to these areas can allow for protection of the environment. The trail will provide connectivity between the counties, which can be beneficial for social and health benefits, ecology, and economies of each of the counties.

For our project, we worked with three mentors, Dr. Douglas Kleiber, John Kissane, and Lisa Baynes. Our mentors provided us with information about the trail and with contacts to further our knowledge of the trail. We broke the trail into 5 sections for our project. For section one, Dr. Douglas Kleiber mentored Chancey Phillips for the Athens- Oglethorpe County Line area. For the middle sections, John Kissane worked with Sarah Sellers, Irene Wright, and Sarah Petrea for section 2,3, and 4 respectively. Finally, Lisa Baynes mentored Karis Mahaffey for section 5 which is the Union Point area.

This project was completed in partnership with the Environmental Practicum (ECOL 4900S) course at the University of Georgia. We worked under the supervision of professors Dr. Alli Injaian and Dr. John Paul Schmidt from the Odum School of Ecology.

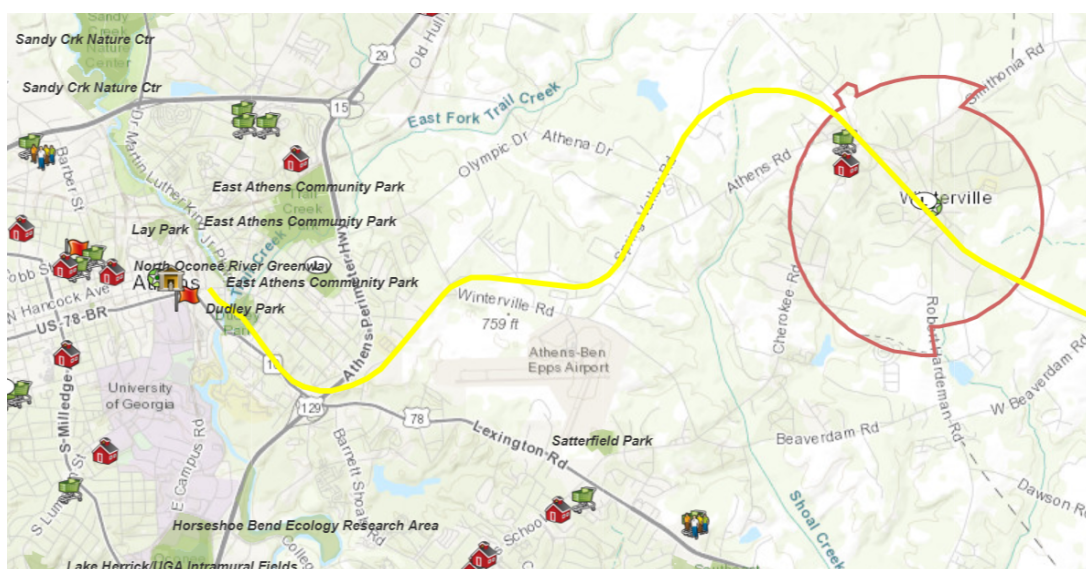
We created this document to share information we learned over the course of our semester and make future suggestions for the trail from an ecological perspective. We hope that this report will help facilitate future development in a way that incorporates both community needs and ecological thinking.

Section 1: Athens to Oglethorpe County Line

Question 1: What are the significant natural environmental characteristics of the section?

This section consists of the trail beginning in Athens near Dudley park, and it goes into Winterville and just past the Oglethorpe County Line (see map). In the Athens section near Dudley Park, there are some warm grasses and small flowers (Image 1) on the trail. An example of a grass similar to low maintenance turfgrass is Pennsylvania Sedge (*Carex pennsylvanica*) (Wade et al. 2017). Next to the trail, approximately ten feet away, there are large trees like White Oak (*Quercus alba*) (Wade et al. 2017). There is a pollinator garden located on the trail which is approximately one fourth of a mile from the trail head! There were a few flowering plants at the pollinator garden including Phlox (Image 3). Beyond the plants, the Oconee River runs under part of the trail, and it can be seen as one walks across the bridge.

As the trail continues through eastside Athens and into Winterville, there is pasture land and multiple residential areas for approximately seven miles. There are areas under construction between Athens and Winterville. A park is planned for this area which will include restrooms and a picnic area. The natural characteristics of this area are mainly large trees, such as, White Ash (*Fraxinus americana*) and Shortleaf Pine (*Pinus echinata*) (Wade et al. 2017). In the City of Winterville there is a train depot next to the trail. In this area, there is also a park with turfgrass, and a few amenities including a bathroom, bike racks, and a large swing (Image 2). This section has trees planted about 10 feet away from the concrete. The trees are spaced proximity 15 feet away from each other in a line.



Map. Shows Section 1 of the Firefly Trail



Image 1. Shows grasses next to the trail.



Image 2. Shows the swing in the Winterville section.



Image 3. Shows Phlox in the pollinator garden in Athens

Question 2: How might the trail be developed in this area to enhance its beauty and appeal and take advantage of the assets identified in #1?

Biodiversity can be maximized along the trail with planting some native plants, and there could be more plants added to the pollinator garden. The addition of red maples (*Acer rubrum*), Black gum (*Nyssa sylvatica*), and Live Oak (*Quercus stellata*) would be beneficial along the section to add some native shade trees (Wade et al. 2017). These trees could be implemented especially in the areas that have not been developed yet. Adding a few shrubs would be beneficial such as Hammock Sweet Azalea (*Rhododendron serrulatum*) and Blackhaw Viburnum (*Viburnum prunifolium*) (Wade et al. 2017). The trail's beauty can be enhanced by adding a few flowers for aesthetics like Crimson eyed Rose Mallow (*Hibiscus moscheutos*) and Meadow Beauty (*Rhexia mariana*) (Wade et al. 2017). There are two bathhouses at the pollinator garden, so we could add more of those across the section to attract bats (Image 4). Adding birdhouses as well would be beneficial to the trail to attract native bird species.



Image 4. Shows bathouses and pollinator garden

Adding signage would be beneficial to this section to provide information about the natural environment to trail-goers. One ideal place for a sign could be at the pollinator garden, and it could include some information about the plants. For example, a sign could say “Phlox flowers come in many colors including Cabot Blue and deep red, but they are most known for being “Hot Pink”” (Wade et al. 2017). Additionally, a sign on the bridge could be included to have information about the river! For example, a sign could say “The North Oconee river is part of the Oconee River Basin. The Robust Redhorse is an endangered fish in this basin” (Oconee River 2019).

Finally, signage for mile markers would be useful on this trail, especially since bikers will be travelling for long distances (Image 5). There is a mile marker on the Train Depot in Winterville, and there are a few other small mile markers across the other sections (Image 6). We suggest one mile marker at each of the trail heads, and then smaller mile markers at every 5 miles of the trail. Beyond mile markers, we suggest making directional signs to point people in the direction of the trail from the road. As the trail is being developed over the next 15 years, we suggest “Coming Soon” signs (Image 7). These signs will inform people about the trail and where it will be. Implementing these signs will facilitate community engagement by providing an avenue for community outreach.



Image 5. Example of what Mile Marker signs can look like



Image 6. Example of mile marker sign on depot



Image 7. Example of “Coming Soon” signage.

Question 3: What are the factors that hinder and facilitate usage and enjoyment of the trail as it is?

The community for the Athens area of the section is a combination of students and Athens locals. There are some bikers in the area who use the trail, and it is used by families for gatherings. With the variety of communities in Athens, we suggest that more outreach be initiated to encourage local neighbors to the trail. Adding an updated pamphlet about the trail to be shared with businesses like Racetrac and churches will be beneficial for engaging with the community. More social media presence will be helpful to get the word out about the trail.

The Firefly Trail can currently be confused for the Athens *Greenway*, since they are located close to each other and even intersect at points. Establishing where the firefly trail is to the community will be helpful, and contact can be made with community members to get their perspectives to see if they like the trail and have any suggestions for it. This will allow for co-creation of the trail, and the community will feel more ownership with the trail.

There is not a clear parking lot for the Firefly Trail near Dudley Park. Although in the Winterville section, there is some parking near the park that trail users can access. Furthermore, there are some issues with access points for people, especially between Dudley Park and Winterville Park. Making a ramp near the Racetrac on Oconee St., halfway back along Little Oak, or near a neighborhood could be useful for some communities. It would be helpful and to have signs near the highway that say “Here is the Firefly Trail” and “Firefly Trail Parking” to make the distinction of these places clearer for people visiting the trail.

Question 4: What are the factors that threaten the environment of the section? How might those threats be mitigated?

The Athens section of the Firefly Trail potentially has runoff from the downtown corridor, since it is directly downhill from there. We suggest including more permeable surfaces or a rain garden. One example of an invasive species on the trail is Kudzu. One way that we suggest to help mitigate issues with invasive species is having invasive species removal days. This would also facilitate community engagement, if students and community members were to work together on these days. Along with invasive species removal days, we suggest having native species planting days, in which students and community members could plant species like Phlox (Image 7). It would be beneficial to get volunteers from the community for maintenance of the trail’s plants, as well.

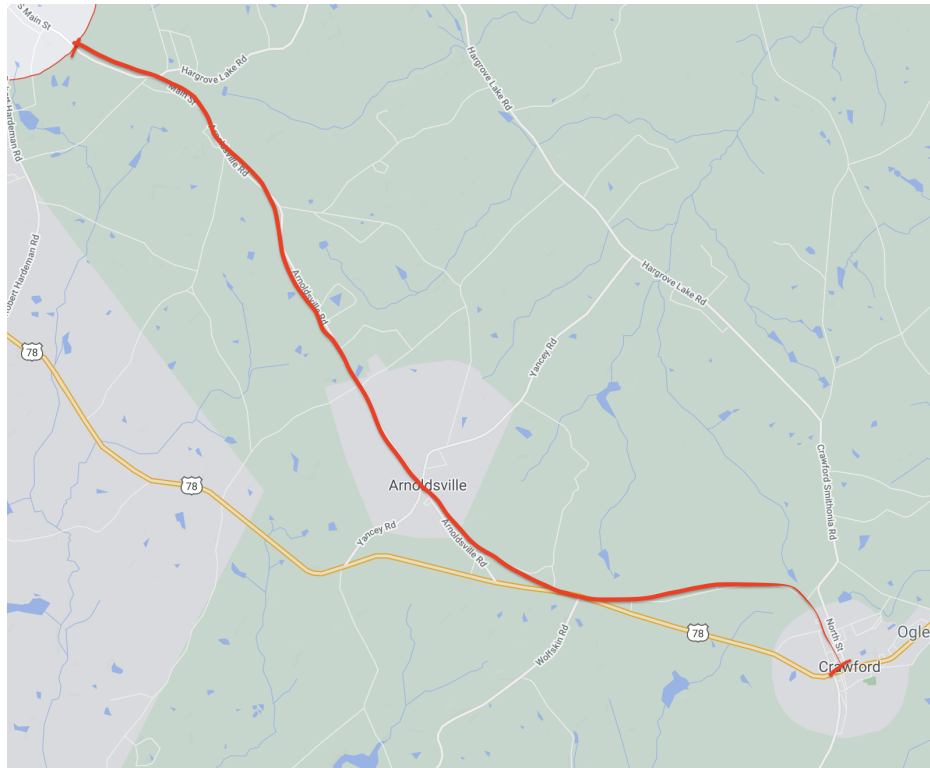


Image 7. Example of Phlox in the pollinator garden.

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Section 2: Oglethorpe County Line, through Arnoldsville to Crawford (Highway 78)

Question 1: What are the significant natural environmental characteristics of the section?



This section starts at the Oglethorpe county line outside of Winterville and goes through Arnoldsville then Crawford where it ends at Highway 78 by the Crawford Commerce building/train depot (Figure 1). It is mainly a rural residential area with lots of open space and few forested areas. In Arnoldsville the main characteristics are the construction that is happening for future neighborhoods and developments (Figure 2). Throughout Arnoldsville there are also aspects of agriculture such as chicken and cow farms (Figure 3). The portion of the potential trail in Crawford will be the most populated area so it will face issues such as runoff and debris build up. Over the majority of the section there is little to no shade from trees. Most plant life is grasses, shrubs, wildflowers, weeds and ornamental plants in areas closest to homes. The few trees that occasionally run along the trail bed are oaks and pines. The most common oaks are White oak, Scarlet oak, Hemlock, and the most common pines are Loblolly, Short Leaf and Eastern White Pine. These trees are mainly scattered and only make up a heavily clustered area in the approach to 78 from Arnoldsville where the rail bed leads away from the road (Figure 4).

Invasive plants that were seen occasionally through the section in areas where there were clusters of trees were Chinese Privet, English Ivy, and Kudzu. These invasive species are known to grow quickly into areas that have recently been cleared so removal may be needed when trail construction begins. Along the roadside in this section there are many wildflowers that bloom in spring such as Blue Toadflax and Dandelions. In a few spots along the road approaching Crawford there are also Wisteria plants which are known to become quite heavy as they grow as vines twisting around buildings or other structures.



Left Figure 1: Crawford Commerce Building



Right Figure 2: Future Development



Left Figure 3a: Chicken Houses (Arnoldsville)



Right Figure 3b: Cow Farm (Arnoldsville)

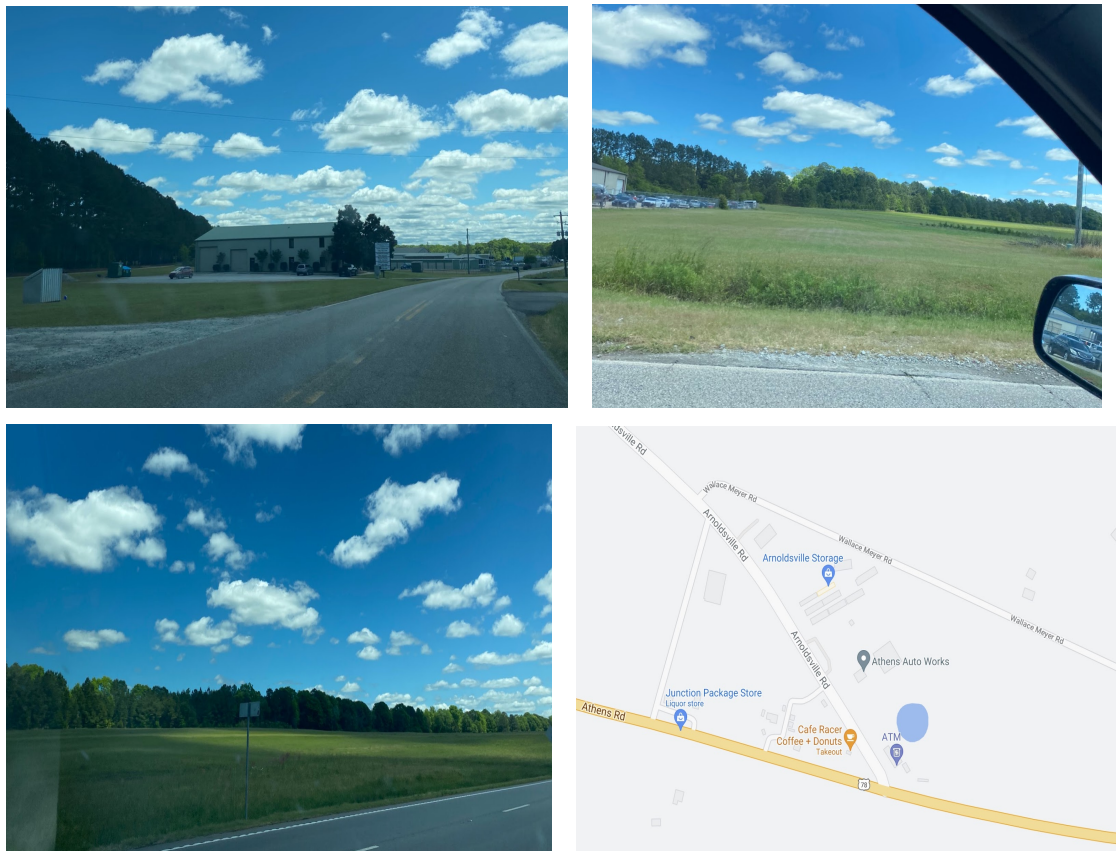


Figure 4: Sequence of photos from Arnoldsville road leading up to Hwy 78





Neighborhoods in Arnoldsville

Question 2: How might the trail be developed in this area to enhance its beauty and appeal and take advantage of the assets identified in #1?

It is important in this section to limit the impact that creating the trail will have on the environment while also making the trail appealing to the community. This area is currently experiencing disturbances due to development and will likely continue to do so making it a priority to encourage community awareness and provide opportunities for wildlife to thrive around the trail.

As this area is more residential, I believe the trail will become popular which leads me to recommend benches and trash cans be placed as frequently as possible so that patrons can take advantage of them. Since there is limited space in this section for immersion into nature most of the suggestions for this section will be additions that provide trail users with access to an experience they otherwise may never have. We believe the main priority for this section will be to provide ways in which the community can learn about the environment they are a part of and experience nature so that they feel a connection to the trail.

1. Native Plants: The top recommendation for this section is for native plants to be placed along the trail. As there are already some wildflowers along the roadside in Arnoldsville this element could be continued throughout the section. Other plants that could be included are Common Yarrow, Opposite-leaf Spot Flower, and Purple Giant Hyssop which all do well in direct sunlight. Wildflowers that do well in shade are White Snakeroot, Wood Anemone, and White Baneberry. All of these wildflower suggestions are perennials meaning they will live longer and bloom more often than others. In areas

where there is a high density of native plants informative signs can be placed with details about the plants and their significance.



Left to right: Common Yarrow, Opposite-leaf Spot Flower, Purple Giant Hyssop



Left to right: White Snakeroot, Wood Anemone, White Baneberry

In areas where there is no shade for a length of approximately 500 feet, I recommend planting trees that can provide shade along the trail (Figure 1). Native trees that provide lots of shade are Red Maple, Sugar Maple, and Yellow Buckeye. In spots such as these benches should be more frequent. Also, if possible, a water station. This will provide a rest area for walkers on hot days.



Figure 1: Example of a space where shade trees could go



Left to right: Red Maple, Sugar Maple, Yellow Buckeye

2. Bat and Bird Houses: In the more forested segment that leads away from the road where Arnoldsville road and 78 meet I recommend placing bird houses and bat houses to attract wildlife. In this area the animals will be able to find shelter and not interfere with residents. Information signs nearby can help educate trail users on the purpose of the boxes and the benefits the wildlife can provide. Bird species that have been spotted often in Oglethorpe county are American Robin, Cedar Waxwing, Canada Goose, Common Grackle, and Black Vulture ([ebird](#)). The birds in this area will likely vary in size and behavior so it is recommended that houses installed are different sizes with variation in hole number. Bird houses should be placed on the edges where fields and wooded areas meet. Bats prefer to feed in clear open spaces which are available to them throughout the section because of pasture areas but because there are fewer trees for roosting the bat

boxes will provide them with a new space. Big Brown Bats are the most common in suburban and farmland areas, so we recommend catering the houses to them. This means the bat houses should be tree mounted with 3-5 cells. One house can house several bats so not many are needed.

3. Rain Gardens: Lower areas where water gathers during rainfall may need rain gardens/bioretention facilities installed to provide drainage and prevent flooding on or near the trail. Storm water runoff will be an issue in this section because it is mainly residential and there are many impervious surfaces that will contribute to the problem (especially as development continues).
4. Pollinator Gardens: Near rain gardens or in other available spaces we recommend pollinator gardens to attract pollinators which will be beneficial to the ecology of the trail environment. Also, in these spots it would be good to have bird feeders, although these require maintenance, but this could be used as community engagement or volunteering opportunities. Pollinator gardens require many plants that bloom throughout the year, limited pesticide use, but native flowers would work well in these spaces.
5. Signage: Wherever any of these additions are made we recommend providing educational signs that provide details on their purpose and how they are important elements to help the ecology of the area.

Question 3: What are the factors that hinder and facilitate usage and enjoyment of the trail as it is?

At this point the trail is completely undeveloped in this section so it is not in use. It is likely that many community members are not aware of it or the plans for the trail. Linda Parish, Chamber of Commerce member in Oglethorpe County, says the county is in support because of the hope that it will bring business to Crawford and increase foot traffic. There are plans to convert the old commerce building into a rest stop with bathrooms and water which will be an important amenity. There are hopes that catering the local business to cyclists will encourage economic development. Private landowners are less interested because of the potential for cyclists to use their land as rest stops but this can be avoided by providing stops at intervals along the trail with the necessary facilities (especially bathrooms). Also, private property signs should be posted in areas that citizens are concerned about.

Question 4: What are the factors that threaten the environment of the section? How might those threats be mitigated?

As this section is more on the residential side human activity will be the main threat to the environment. In the future as more development happens there will be greater threats to the habitat through disturbance and habitat destruction. One major issue will also be in more populated spots (seen in Crawford area) waste and debris will build up as patrons are unable to dispose of waste properly. In this area there was also evidence of renovations that can cause the spread of debris (Figure 1). So, trash cans will be important in the more populated areas. As more properties develop there will also be an increase in impervious surface cover which can be mitigated by rain gardens to help with runoff. Since this area is closer to homes there is a higher chance of accidentally introduced invasive species from plants that people have on their properties (Figure 2). So, it is important to foster a good relationship with community members whose property will border the trail in the hopes that if any issues arise, they can be easily addressed. Providing signs along the trail about the importance of native species and maintaining a healthy environment will help inform the community. Some of the areas in this section of the trail are also agricultural specifically the chicken and cow farms Arnoldsville. These places may pose a threat to the environment due to runoff that can spread bacteria and antibiotics from the farms which is a risk. It is our recommendation that when the trail is being built that it is constructed to avoid these areas as much as possible.



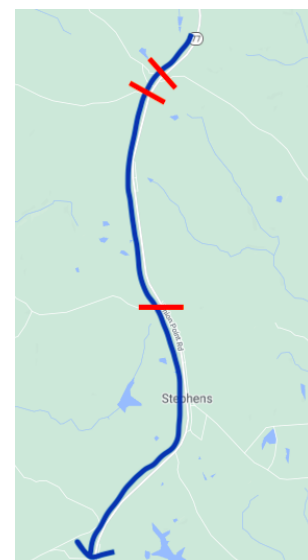
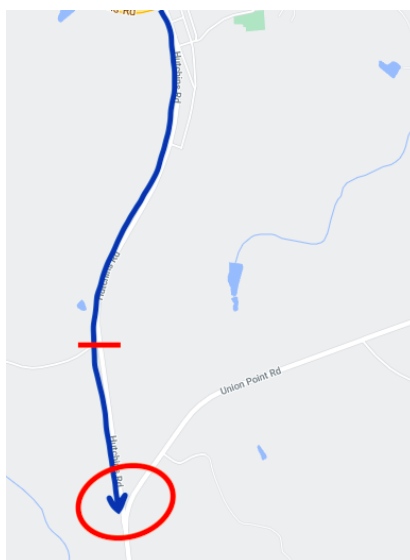
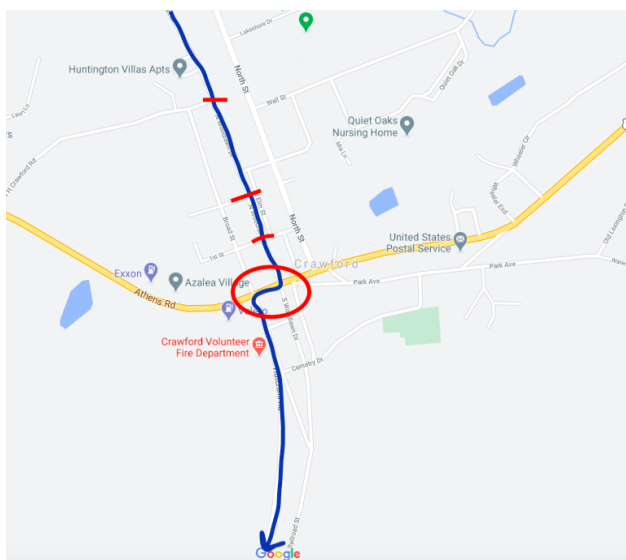
Left: Renovation in Crawford



Right: Ornamental plants in a yard in Crawford

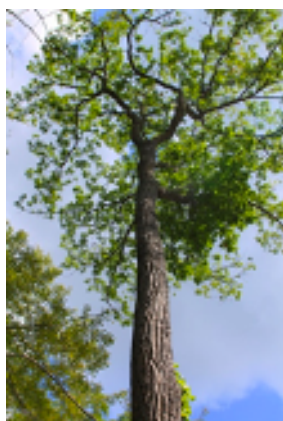
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Section 3: Crawford (Highway 78) to Stephens



Question 1: What are the significant natural environmental characteristics of the section?

Section 3 of the proposed Firefly Trail begins in Crawford, Georgia at the intersection between Georgia Highway 78 and Hutchins Road. The historic railbed follows the East side of Hutchins Road through a residential area on the South side of Crawford. The residential section immediately outside of Crawford extends from Highway 78 to Faust Farm Road with houses scattered amongst the trees. We have classified this portion of Section 3 as woodlands, defined as tree dominated ecological communities that have between 50-80% canopy cover (Gelbart, 2013). In the state of Georgia woodland forests have been declined due to logging and deforestation, but existing woodland forests are dominated by Rock Chestnut Oak(a) and Scarlet Oak(b) trees. They also include tree species such as Northern Red Oak(c), White Oak(d), Pignut Hickory(e), and Hemlock(f) (Gelbart, 2013). Woodland communities also include many native shrub species and grasses which create an understory.



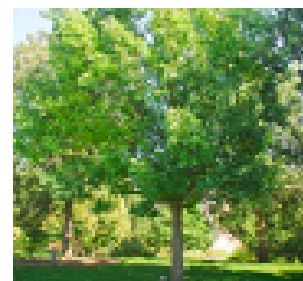
(a)



(b)



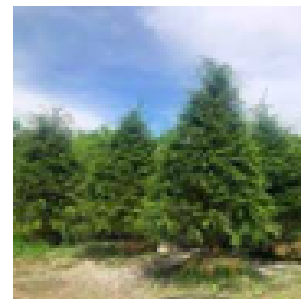
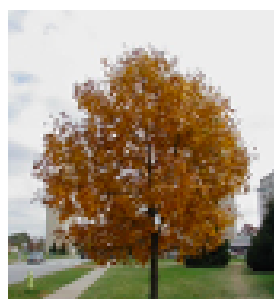
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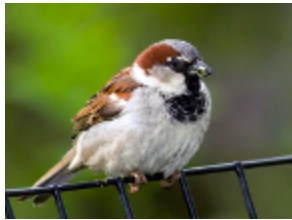
↓(f)



Woodlands are a natural and beautiful part of Georgia's landscape and provide multiple ecosystem [services](#). An ecosystem service is a benefit that people obtain from ecosystems, and in this case woodlands filter air and water, help control flood conditions, prevent erosion, maintain diversity and genetic resources, and provide opportunities for recreation, education, and cultural [enrichment](#). They also provide habitat to multiple species of fauna including coyotes, raccoons, foxes, bats, rattlesnakes, gopher tortoises, and dozens of avian [species](#). Maintaining woodland ecosystems is essential to protecting the natural areas in Georgia.

The second portion of Section 3 begins where Hutchins Road meets Georgia Highway 77, where they merge to become Union Point Road. Here, the railbed crosses Highway 77 to stay on the East side of Union Point Road for the continuation of Section 3 of the proposed trail. A portion of woodlands continues in this section, but soon the trees clear and the railbed enters into an agriculture dominated stretch. This area provides little ecological significance as a natural system, but still interacts with the surrounding environment.

The agricultural portion provides open space for feeding by avian species, either on insects or on other birds. Birding website and smartphone app “eBird” logs hotspots of bird sightings through citizen science. A hotspot has been identified in Section 3 off of William Pope Road, and this location has identified 88 different bird species using Section 3 as a permanent habitat or a stopping point on a greater journey. Species with particularly high sightings include multiple species of Sparrows(g), the Northern Cardinal(h), the Common Grackle(i), and the European Starling(j).



(a)



(b)



(c)



(d)

Section 3 of the Firefly Trail corridor in Oglethorpe County includes two important ecosystems that provide ecosystem services and habitat to flora and fauna. These services should be considered when developing this section of the trail.

Question 2: How might the trail be developed in this area to enhance its beauty and appeal and take advantage of the assets identified in #1?

Section 3 remains mostly untouched and natural. There is a rolling landscape that will provide trail users with a view of rural Georgia. Due to the lack of development, the best way to enhance this section is to leave a small footprint and compensate for the small amount of disturbance the trail will create. As stated by Question 1, the woodland and agricultural environments provide a habitat for many species and providing some resources for these species will help to maintain their presences in this area. Section 3 also has a significant aesthetic value that comes with a region uninterrupted by development or infrastructure. The trail will be considered “development,” but with the intent of enhancing the existing beauty.

With this in mind, we have identified two main goals to enhance the appeal of Section 3 and take advantage of existing assets. First, we aim to provide resources to bird and bat species to mitigate the potential disturbance from the trail through housing, and also aim to educate the public on these species through signage. Second, we aim to create areas where the natural beauty of the region can be appreciated along the trail through designated stopping points and signage.

To best enjoy and enhance the natural beauty of Section 3, we make the following recommendations:

1. Birdhouses: The portion of Section 3 that is predominantly agricultural should be enhanced with the addition of bird houses for native avian species. Increased pedestrian traffic may disturb to the point that they would no longer use Section 3 as a permanent residence area or migratory stop. The addition of birdhouses in this area will provide a safe haven for the birds specified in Question 1 to escape increased human interaction while still maintaining their habitat.

- a. Types of Houses: Since there are both small and medium sized native birds that are present in Section 3, we suggest placing one multi-hole songbird house and one single hole medium sized birdhouse. Sizes and prices will vary, but one of each house should be sufficient to offset the impact from the trail.

- b. Placement Locations (GPS Points): We recommend placing the bird houses on the edges of the two main agricultural fields so there is protection from high winds but still access to the field.

33°46'37.4"N 83°10'27.5"W, 33°50'14.0"N 83°10'07.1"W

2. Bat Houses: Bat species are known to use cleared corridors amongst forested areas for feeding as insects will be more present in these cleared [areas](#). The creation of the trail in Section 3 will have two effects on the bat populations. First, it will create a corridor through the woodlands that will provide a new feeding ground. Second, it will remove trees that are used for roosting to create the trail in the first place. To maintain bat populations in this area, the placement of bat houses will provide roost options along the feeding ground in the woodlands.

- a. Types of Houses: The most common bat and most likely bat to use a house in this location is the Big Brown Bat (more information in signage section), so appealing to these bats would be the best use of resources. Big Brown Bats prefer tree mounted 3 or 5 cell bat houses. The prices vary based on the material, but the most important part is the size. Dozens of bats can fit inside bat houses and they often prefer cohabitating, so the larger the better.

- b. Placement Location (GPS Point): We recommend placing a single house in the forested area at the connection of Hutchins Road and Union Point Road. Patrons are likely to stop at this intersection and observe the house.

33°51'17.8"N 83°09'31.9"W

3. Educational Signage: With the placement of bird and bat houses, there is an opportunity to educate patrons using the trail on the native species of the area. We suggest adding an education sign at a bat house and at a bird house that includes information about native species and what species trail users might see at these locations. We have included an example paragraph of information for each of these signs, but they would need to be checked and updated closer to the implementation of the signage.

a. Native Birds:

“The state of Georgia is home to over 340 species of birds. Some are permanent residents while others are merely stopping in for a break from their long migration. Due to the complex landscape of Georgia, there are many different niches (or specialized tasks) that birds can occupy as part of the ecosystem. Birds act as seed spreaders, plant pollinators, pest control, and a link in the food chain. In Oglethorpe County, keep an eye out for Blue Jays, mockingbirds, Cedar waxwings, and Loggerhead shrikes. As part of the Firefly Trail, we have added bird houses to provide a safe place for birds to rest, feed, and raise their young.”

b. Native Bats:

“There are 16 different species of bat, many of which are threatened or endangered, that call Georgia home. Bats are one of the few flying mammals, and they act in a similar role as birds as seed dispersers, plant pollinators, and pest control. Did you know a single bat can eat hundreds of mosquitos in a single hour? The majority of bat species are insectivores or frugivores meaning they only eat bugs and fruit. This bat house is likely home to the Big Brown Bat which is the most common in Oglethorpe County and tend to live in forested areas surrounded by farmland. But don’t let the name fool you, the Big Brown Bat is only 2 inches in length and less than three tenths of an ounce in weight.”

4. Groundcover Plants: After the trail has been laid, there will be portions of unearthed dirt on either side of the asphalt trail for the entirety of the section. In order to prevent the introduction of non-native species or species that will expand into the existing environment, we suggest planting non-spreading groundcover plants along the entirety of Section 3. This will allow the disturbed area to be covered with plants and shrubs without expanding into the woodland or agricultural land and will also not inhibit and block the natural beauty of these environments. The University of Georgia has a database of suggested native shrub [species](#), but we suggested 5 species that can grow in shade or anywhere along Section 3, do not spread, are native to this hardiness zone (7b) of Georgia, and may provide a resource to native fauna species. Hardiness Zone refers to the range of temperatures for the region as well as microclimate conditions that allow one to know which plant species will be most [successful](#).

A. Painted Buckeye (*Aesculus sylvatica*):

grows in partial shade, prefers gentle slopes under oak, native to zone 7b, used by hummingbirds during spring migration

B. Devil's Walkingstick (*Aralia spinosa*):

grows in full sun or light shade, prefers fertile woodland soil, native to zone 7b, fruit eaten by migrating birds in the fall

C. Sweetshrub (*Calycanthus floridus*):

grows in full sun or partial shade, prefers woodland environments or as part of a shrub border, native to zone 7b, has very fragrant flowers that attract pollinators

D. Black Titi or Buckwheat Tree (*Cliftonia monophylla*):

grows in full sun or partial shade, prefers soil with organic matter, i.e. woodlands, native to zone 7b, flowers are an important nectar source for honey bees.

E. Georgia Basil (*Clinopodium georgianum*):

grows in almost any environment, native to zone 7b, produces lavender flowers that deer shun due to the aroma.



A-E from left to right and top to bottom.

5. Stopping Points: Section 3 of the Firefly Trail development is a long section of rural trail with large stretches between towns to stop, take a break, and enjoy the environment. This makes it essential to provide spots where trail users can take a break and take in the natural environment as well as look at the bird and bat houses and educational signs. We recommend that at each

stopping location there be a bench for patrons to sit as well as a trashcan to limit the footprint trail users will have on the environment. For Section 3 which is about 6.6 miles long, we recommend breaking the section into three parts and one bench on either side of the middle third. This would mean that the longest stretch between stopping points will be 2.2 miles.

a. Benches: the benches we recommend are only limited by budget and resources. It should fit at least 2 people as many will not bike this section alone, and should be made of weatherproof material, preferably something that has a low environmental impact such as recycled park benches or a combination of metal and treated [wood](#).

b. Trashcans: As part of lessening the impact that the trail will have on the environment, there should be trash cans placed at each of the stopping points. Since this area of Oglethorpe County is home to animals such as squirrels, raccoons, and coyotes, we suggest placing “animal safe” trash cans. This just means that they are built in a way that animals are unable to get inside of them, or tip them over and pull trash out of [them](#). This may not be necessary in the more urban parts of the trail, but is highly recommended for Section 3.

c. Placement Locations (GPS): The location of the benches is subject to change based on the conditions of easements during land acquisition (There will need to be a stipulation that they can be added to the location during the easement process).

33°50'20.5"N 83°10'07.5"W

33°51'22.6"N 83°09'33.9"W

Question 3: What are the factors that hinder and facilitate usage and enjoyment of the trail as it is?

Section 3 is in the earliest stages of development, and therefore the first obstacle to overcome is the process of land acquisition and community support. While businesses and the Chamber of Commerce for Crawford have been incredibly supportive, there are some local landowners that have concerns about the trail. We spoke with a local Crawford official who shared that the major reservation local landowners were having about the trail development was not that the trail would be going through their property, but that bikers have been disrespectful of private property in the past. Particularly in the context of bathroom facilities, landowners are worried that the trail will bring in higher bike and pedestrian traffic despite not having the facilities for them. Creating facilities for trail users will be up to the individual counties involved in the trail development and therefore they fall outside of the realm of the Firefly Trail. That being said, there are ways that Firefly Trail can prevent negative trail user and landowner

interactions through materials and signage. Positive interactions will rally support from private landowners to participate in the Firefly Trail development.

The best way to facilitate positive interactions and build trust with the trail users is to educate the bikers and pedestrians about where there are private boundaries and how to respect private land.

In order to balance the potential obstacles and optimize the use and enjoyment of the trail in Section 3, we make the following recommendations:

1. **Property Signage:** This may be carried over into different sections, but since community concerns vary, we suggest adding a single sign to Section 3 at the intersection between Hutchins Road and Union Point Road as you approach Crawford from the south. The sign should say some variation of “Please stay on the trail.” This sign will then act as a warning to trail users as they enter Crawford that the trail will be moving through a residential area, and they should respect the boundaries of the trail.
2. **Educational Material:** Since Crawford is expected to be used as a significant stopping point between Union Point and Athens, we believe the North and South Oglethorpe County Local Action Committee should work collaboratively to create “good trail stewardship” materials that can be placed at the Crawford Chamber of Commerce and in local businesses that may cater to bikers or trail users. These materials can be applicable to all sections of the trail but focus on the importance of “leave no trace” and respecting the natural environment that the trail occupies, as well as personal property.
3. **Local Action Committees:** Many specific concerns from community members will need to go through local and/or county governments, establishing the need for increased participation from local action committees in Oglethorpe County. It is important for these groups to stay aware of any needs that develop along the trail corridor and share specific concerns with their local officials. There should also be collaboration between LACs from different regions so that the trail can maintain its cohesion.

Question 4: What are the factors that threaten the environment of the section? How might those threats be mitigated?

As is true with any development project, there is inherent change and damage that will be done to the environment through the expansion of the Firefly Trail. Specifically, in Section 3,

woodland forest will need to be cut down in at least a third of the section in order to make way for the trail. This means that there will not only be a loss of woodlands, but there is the potential for invasive species to move into a newly cleared area. Since understories are rarely open for new growth, there is high potential that a highly competitive invasive species could take advantage of the growth opportunity.

In order to keep the trail safe, there will also need to be lighting along the rural portions of Section 3. The introduction of light is an unnatural disturbance to nocturnal species like bats and raccoons but also disrupts some natural processes of [insects](#). Safety should be a top priority of the trail, and therefore other measures must be taken to decrease the impact of light pollution.

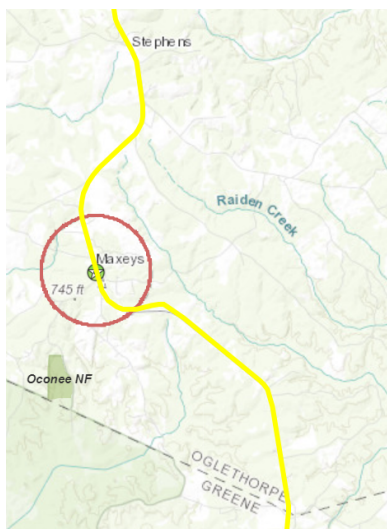
The trail itself will be an impermeable surface, meaning that water doesn't have the ability to move through the material and will move along the surface of the material. This can lead to erosion, pollutants, and soil degradation. This, coupled with the freshly overturned soil along newly built trails, shows the importance for buffer plant species.

To prevent unintentional damage to the natural environment through development of Section 3, we make the following recommendations:

1. Motion Lighting: Since the entire section doesn't need to be lit the entire night, the use of motion sensed outdoor lighting will limit the amount of light pollution caused by the trail. The large sections of rural trail will likely see hours of disuse after sundown and before sunrise, making the need for constant lighting nonexistent. By using motion lighting, the safety is there for the rare occurrence of someone walking or biking along the trail at night without compromising the nocturnal species that use Section 3.
2. Plant Native Species: As previously stated in Question 2, it is important to plant native species in new growth areas to prevent the domination of invasive species. In Question 2, we recommended the use of shade growing native shrub and groundcover species. The same recommendation is made here as a way to prevent invasive species.
3. Plant Directly Along Trail: To prevent erosion and pollution from the impermeable surface of the trail, it is important to plant groundcover species directly next to the trail that will provide a root system to maintain the integrity of the soil and filter pollutants. Since many of the species previously recommended expand a few feet over time, they should be planted a few feet away from the trail and a few feet from each other. This will allow them to grow and fill the space over time and act as natural building blocks and filters of the soil, mitigating the impermeability of the surface.

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Section 4: Stephens (Post office) to Greene County line



Section 4

Question 1: What are the significant natural environmental characteristics of the section?

From the Stephens post office to Maxeys, Section 4 is dominated by hardwood trees. These trees are the remains of oak-hickory forests and were probably selectively spared for aesthetic purposes or allowed to re-grow after agricultural practices (refer to Section 3 for a comprehensive overview of this type of woodland). These trees offer aesthetic benefits and provide a well shaded corridor for the trail. The historic railbed is level and weaves between the greenery throughout this portion. Before reaching Maxeys, the hardwoods become less frequent and new-growth pines, Loblolly Pines (a), replace them.

The Model Mile in Maxeys starts at the Cabaniss Dairy farm as an open vista. Here, there is beautiful pasture land (b). This continues into Maxeys, where the trail is bordered by decorative hardwood trees, such as Crepe Myrtles (c). Some other native shade and flowering trees in the area are Southern Magnolia, Flowering Dogwood, Yoshino Cherry, American Sweet Gum, and multiple species of Oak (refer to Section 5 for more information). These can be found primarily around Maxeys or residential lawns. Common bird species in Maxeys and throughout this section are the European Starling, Red-Winged Blackbird, Tree Swallow, American Robin, American Crow, American Goldfinch, Northern Cardinal, Carolina Wren, and House Finch (refer to Section 5 for more information).

After the already developed model mile in Maxeys, the railbed travels through a tunnel of trees, creating a natural transition out of the quaint city. Disruptions in elevation of the land and

“tree cuts” may interfere with trail development South of Maxeys; the historic rail bed becomes difficult to determine in certain areas. Tree cuts, as they are referred to in this section, are sections of the trail where land has been set aside on either side of the historic railbed, creating a scenic corridor. As the landscape levels out, land in various stages of succession (d) from clear-cut logging and residential properties dominate the area up to the Green County Line. Loblolly pines are the most common species here.

This section of the trail has a diverse array of natural environmental characteristics. Development of the trail throughout this section will impact the surrounding ecosystem in different ways.



a.



b.



c.

d.



Question 2: How might the trail be developed in this area to enhance its beauty and appeal and take advantage of the assets identified in #1?

Section 4 of the proposed Firefly Trail extension spans from the Stephens post office to the Green County line. There are residential land owners and corporate owned property holders throughout this section. There is a high level opportunity for community engagement in this section; Maxeys has submitted nomination materials to Georgia's State Historic Preservation Office to have most of the town established as a historic district listed on the National Register of Historic Places (administered by the National Park Service). Because of this, amenities are especially important for full enjoyment of the history and historic resources in this section. Most of the terrain following the historic railbed is flat, but, South of Maxeys, there are some fluctuations in elevation and deep rail cuts. This section is made up of diverse land cover ranging from agricultural fields to late-successional woodland. All of this needs to be taken into account when determining how best to highlight this section of the trail not only naturally, but also recreationally.

To best enjoy and enhance the natural beauty of Section 3, we make the following recommendations:

1. Functional Signage:

Wayfinding Signs: In order to maximize community engagement, we suggest including wayfinding signs or banners along the trail that emphasize points of interest throughout this section. Wayfinding signs provide trail users with navigational information and bring them a sense of ease in an otherwise unfamiliar environment (Gibson 2009). Aiding trail users in navigation on or off the trail may decrease the likelihood of pedestrians straying from the path in unwanted areas. Wayfinding signs may also encourage trail users to walk and/or bicycle more often (Keliikoa et al. 2018). This could further boost trail use. We recommend that the points on the wayfinding maps be decided on by the South Oglethorpe Local Action Committee in conjunction with Firefly Trail, Inc. and that permission be granted by any establishment not connected with the trail. The wayfinding

sign should be consistent with the design of existing wayfinding signs on the Maxeys Model Mile. There are currently 4 wayfinding signs on the Maxeys Model Mile. We recommend putting signs at sections of the trail that cross the road, but the final positions should be assessed closer to installment.

a. Examples of locations to include on wayfinding signs:

Community Center & Veterans Park & Playground
 Maxeys Cemetery
 Maxeys Christian Church & Harmonia Baptist Church
 Maxeys Town Hall, Post Office & Volunteer Fire Dept.
 Peace Garden
 Durham Apothecary
 Cabaniss Dairy Farm
 Still Crazy Goat Farm
 Gillen House Bed and Breakfast
 Maxeys Model Mile TrailHead Park
 Picnic areas
 Bathrooms

b. Example of current wayfinding sign on the Maxeys Model Mile:



Information Benches: Informational benches can be utilized as a rest stop and a source of information. There are currently 3 informational benches on the Maxeys Model Mile. We recommend putting additional benches at the city limits or any areas of this section where people might be resting or getting onto the trail (picnic areas, parks, trailheads, parking areas, etc.). Ideally, we recommend that these benches contain a map of the trail and surrounding area. We also recommend that educational material (defined in Section 3, Question 3, Recommendation 2) be placed here in order to facilitate good trail stewardship. Other options for materials include educational pamphlets about native plants or animals, the Firefly Trail, or navigation. An alternative to printed material could be education signage; instead of taking a physical copy, trail users could take a picture with their smartphones. This way, additional waste will not be created by single-using and discarding paper materials.

c. Example of existing information bench:



2. Educational Signage:

Because there are ample opportunities to not only showcase the environment, but also the history of many places along the trail, we suggest developing a unified approach to historic and natural signage all along the trail corridor from section 1 to section 5.

Historic: Because Maxeys is in the process of becoming a historically designated town, there is an opportunity to educate the public via signage and make the trail more interactive. This could include information on historical land use or agriculture (specifically, cotton), history of local buildings, or history of the railroad itself. At minimum, we recommend a small amount of text and at least one picture on the sign, but there are many other ways to create [effective signage](#).

a. Example of historical signage at Dudley Park:



i.

Natural: Educational signs identifying and teaching about plant or animal species can facilitate not only engagement with the Firefly Trail, but also foster a deeper appreciation for the environment and trail stewardship in trail users. We recommend adding natural educational signage at birdhouses and bat houses, near pollinator plants, and/or around native trees and plants.

a. Some Natural Signage Ideas:

- i. Explain the role pollinators have in the ecosystem.
- ii. Identify native plants and include a fun fact or how they function in the ecosystem.
- iii. Identify common animals in the area and include a fun fact or how they function in the ecosystem.

3. Waste Management:

Trash and Recycling: We recommend that trash and recycling bins be installed 2 per mile in order to reduce waste from trail users. Presence of trash and recycling bins will reduce the likelihood that trail users will litter, thus keeping the trail aesthetically appealing and offsetting the harmful effects of littering such as water, soil, and air pollution (Schultz et al. 2011). We recommend that trash cans be animal-safe, so that animals are not able to access any trash inside them.

- a. Example of existing trash and recycling cans:



Dog Waste Stations: We recommend installing 2 pet waste stations per mile in more urban areas of this section and 1 per mile in more rural areas. Pet waste can have detrimental effects on the environment: harmful bacteria and nutrients from pet waste can contaminate local bodies of water and impact water quality. By installing dog waste stations, those effects can be mitigated. The dog waste stations should include a sign (either explaining the benefits of waste disposal and/or a call for courtesy of neighbors), a trash can, and portable bag dispensers to function effectively (Typhina and Yan 2014).

- a. Example of existing dog waste station:



Bathrooms: As part of keeping the trail clean and reducing impact of waste on the ecosystem, we recommend installing bathrooms or portable toilets. Installation of bathrooms or portable toilets will also prevent or deter trail users from using the bathroom on private property. This may be up to individual counties and governments rather than Firefly Trail, Inc..

4. Bird & Bat Houses:

Refer to Section 3 & 5 for more information on species and recommendations. The development of the trail will result in increased pedestrian traffic and minor loss of habitat from tree removal. This could disturb many bird and bat species in the area. The addition of birdhouses and bat houses in this section will provide a safe haven for these species to escape the increased human interaction and offset the loss of habitat.

- a. Types of Houses: We suggest placing one multi-hole songbird house and one single hole medium sized birdhouse. We suggest using websites such as eBird and NestWatch to understand and identify bird species before addition of birdhouses. We also suggest tree mounted 3-5 cell bat houses. There are 6 main species of bats in the Piedmont in the South, so building bat houses that cater to these species would be the most effective (Menzel et al. 2003).
- b. Because of the land acquisition issues involving the logging companies and other land owners, placement of bird houses and bat houses should be assessed closer to installment in this section. Researching the species we have already identified in this report and utilizing other identification resources will aid in final placement.
 - i. Because bats use corridors such as trail cuts and cleared portions of woodlands to navigate and hunt, so we suggest putting bat houses near the trail cuts and tree tunnels located south of the Maxeys Model Mile.

5. Artwork:

The South Oglethorpe County Local Action Committee has expressed interest in art installations along the Model Mile in Maxeys. We recommend asking local artists or the Women's Art Guild of Oglethorpe County about their interest in donating their artwork to the Firefly Trail. This addition to the trail could enhance this section as an area of interest and encourage use of the trail. Artwork could possibly highlight the history of Maxeys or illuminate native species, plants, etc. in order to make it educational and encourage trail users to be good stewards of nature. We recommend any artwork be safe for [outdoor display](#).

6. Trailhead Park:

The installation of Trailhead Park in Maxeys could act as a formal welcome to the Firefly Trail. We recommend including a parking area and picnic tables to fully enhance the appeal of this section.

- a. Trailhead Park Location:



i.

7. Benches:

Benches allow trail users to rest and take in their environment. They are essential to trail enjoyment. The precedent set by the Maxeys Model Mile should be followed throughout the more urban parts of this section: 8 benches per mile. South of Maxeys, where the trail becomes less residential, 2-4 benches are recommended per mile.

a. Example of existing bench in Maxeys:



i.

8. Aesthetic Plants:

Flowers: We recommend flowers or other decorative plants at each street crossing on either side of the trail. This will serve to beautify and delineate between the road and the trail. We suggest that the Maxeys Garden Club be involved with the planting and upkeep of the flowers due to their experience with the Peace Garden.

a. We highly recommend native plants.

i. The Complete Guide to Native Plants for Georgia can be used as a resource for identifying suitable species (Wade et al. 2017).

Trees: In order to further compliment the natural environment and enhance the trail, we suggest planting trees along sections of the trail where there is more of an open vista as opposed to secluded tree cover. This will beautify the area and provide shade.

a. It is best to plant trees that are low maintenance. For this reason, we recommend native trees.

- i. The Complete Guide to Native Plants for Georgia can be used as a resource for identifying suitable species (Wade et al. 2017).
- ii. There are many crepe myrtles lining this section of the Firefly Trail. While beautiful and low maintenance, these trees are not native. An alternative to crepe myrtle could be native hollies such as winterberry (*Ilex verticillata*) (a) and possumhaw (*Ilex decidua*) (b). Refer to The Complete Guide to Native Plants for Georgia for other options.



a. Winterberry



b. Possumhaw

- 9. Other amenities, trail policies, and materials should follow precedents set by the Maxeys Model Mile, Firefly Trail, Inc., and the South Oglethorpe County Local Action Committee.

Question 3: What are the factors that hinder and facilitate usage and enjoyment of the trail as it is?

Because this section is partially developed, many community members are already involved with this extension of the Firefly Trail. That being said, some residents have been opposed to a trail running through their property for two reasons: worry that trail users may not adhere to good trail stewardship and concern that the trail may raise crime rates in this area. While security and crime are concerns, research suggests that trail development actually decreases crime rates in the areas surrounding the trail (Harris et al. 2017). As for trail stewardship, we have made some recommendations below. The other major hindrance to usage of the trail in this section is acquisition of land from corporations (for example, logging companies) that own land South of Maxeys. Lastly, trail upkeep, especially overgrowth of plants, has been identified as a concern in this section due to the increased amount of potential and recommended amenities, aesthetic additions, and plantings.

In order to balance the potential obstacles and optimize the use and enjoyment of the trail in Section 3, we make the following recommendations:

1. Signage:

“Stay on the Trail” signage and wayfinding signs may act to caution trail users against deviating from the trail. This reduces the likelihood of trail users straying into private property and reduces threats to wildlife and personal safety.

2. Bathrooms or Portable Toilets:

Access to bathrooms may aid in keeping the trail clean and steer trail users off private property. As stated in Question 2, the Firefly Trail may not be responsible for the addition of bathrooms. We recommend asking for permission from local county officials.

3. Local Action Committees, Guilds, and Clubs:

Although local and county governments are generally responsible for trail maintenance (such as collection of trash and recycling), we suggest coordination between local action committees and local governments to address upkeep tasks. The expansion and promotion of various community groups may encourage delegation of the maintenance of the trail. Along with expanding the existing trail upkeep, community groups can be active members of their community by tending to trees, trimming back plants, and invasive species removal. This will prevent overgrowth and encourage community involvement. Additional groups may be needed to keep potential art installations or signage in good condition.

4. Land Ownership:

The first step in assessing how to acquire land is figuring out who owns it. The Oglethorpe County tax assessor website, <https://www.qpublic.net/ga/oglethorpe/>, can be used as a resource.

Question 4: What are the factors that threaten the environment of the section? How might those threats be mitigated?

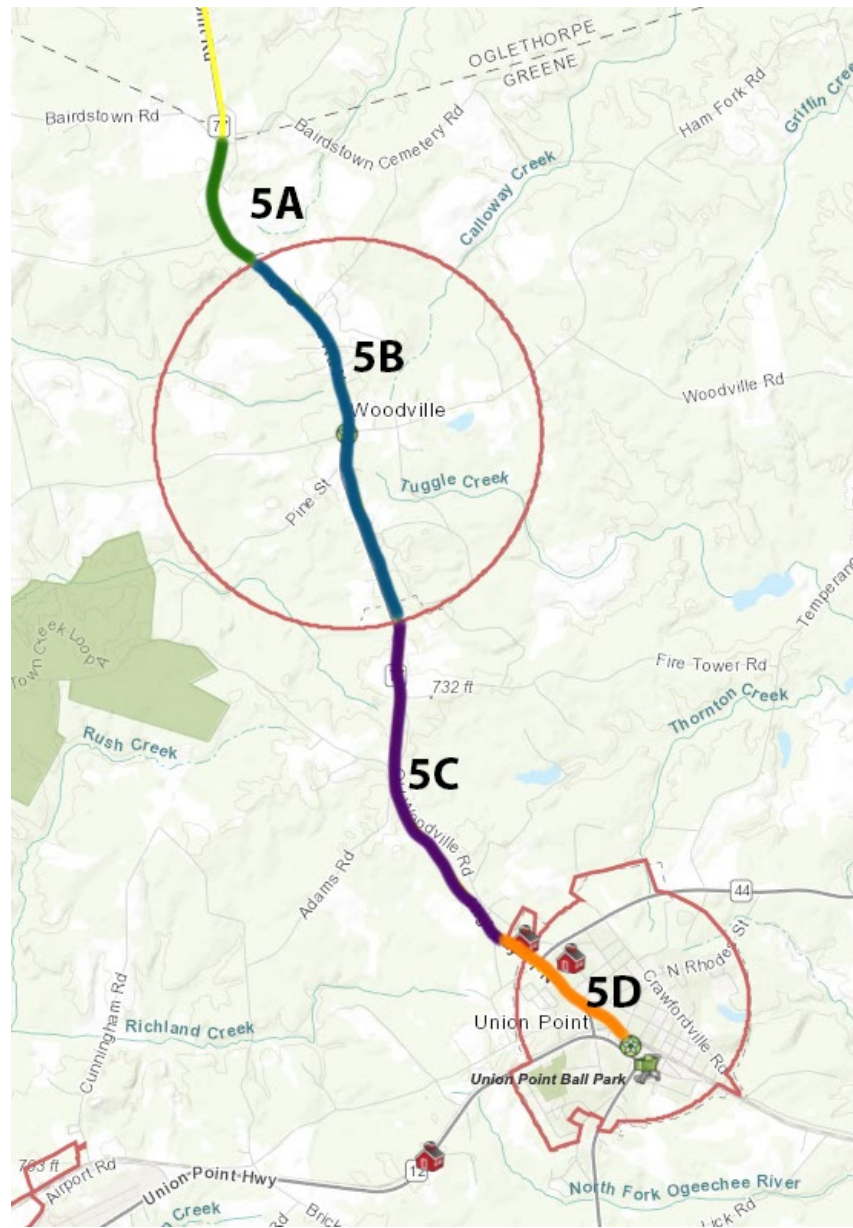
As stated, Section 4 of the Firefly Trail has a variety of environments in the immediate vicinity of the potential trail. There are residential areas, agricultural land, woodlands, and logging land. With these different settings come varying challenges. In the more residential and urban areas, light pollution, waste management, and increased human contact are the primary threats to the environment. Across woodlands and dense tree cover, habitat degradation is a concern. As for land formerly used for logging, the trail may actually benefit the environment by allowing it to recover and the habitat to be restored surrounding the trail. However, invasive species can take advantage of these spaces if not monitored.

To prevent unintentional damage to the natural environment through development of Section 3, we make the following recommendations:

1. No Lights:
The South Oglethorpe County Local Action Committee has decided not to include lights in this section of the trail. This will avoid the negative impacts of light pollution, cost, and visual distraction from nature.
2. Proper Waste Management:
The addition of trash and recycling bins, dog waste stations, and bathrooms to new sections of the trail should prevent alien waste from entering the surrounding environment
3. Plant Native, Beneficial Species:
Planting native and beneficial species can offset the issues associated with habitat loss as a result of the development of the trail. Native species also have a wide variety of [benefits](#) over non-natives. A key concern associated with this section of the trail is maintenance; native plants often require less attention than non-natives. Planting near the trail can also offset erosion and other water-related issues.
4. Signage:
We suggest that informational signage about nature and trail stewardship can encourage trail users to be respectful of the surrounding ecosystem. Additionally, signs that encourage trail users to remain on the trail will prevent unwanted contact with wildlife or further disturbance of the surrounding environment.
 - a. Many signs can be made using recycled materials to further reduce environmental impact.
5. Birdhouses and bat houses:
Construction of bird and bat houses may reduce effects of loss and disturbance of habitat either during construction of the trail or due to increased human traffic and contact.
6. Invasive Species Removal:
Common invasive plants in Section 4 are Chinese Privet, English Ivy, and other thorns and vines. These species are likely to take advantage of newly cleared, unmonitored land. There are two ways that the role of invasive species monitoring and removal could be delegated.
 - a. A committee or community group takes responsibility and trains its members on invasive species removal.
 - b. Invasive species removal events regularly occur. These would require training and recruiting volunteers.

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Section 5: Greene County Line to Union Point



The image above shows Section 5 of the Firefly Trail, which spans from the Greene and Oglethorpe County line to the City of Union Point. Section 5A, shown in green is from the county line to the city line of Woodville. The City of Woodville is section 5B, shown in blue. 5C in purple shows the space between Woodville and Union Point. 5D is in orange, and shows the section composed of the city of Union Point. Although many recommendations will be the same throughout section 5, there will be some variation due to difference in land use.

Question 1: What are the significant natural environmental characteristics of the section?

True to the [Piedmont](#) region of Georgia, much of Section 5 located in Greene County is a mix of forest and cleared land used for pasture or farming. Loblolly pine covers much of the area, but there is quite a variety of other native trees. Native shade and flowering trees observed are Southern Magnolia (a), Flowering Dogwood (b), Yoshino Cherry (c), American Sweet Gum (d), and multiple species of Oak.



A-D from left to right

Section 5A, which starts at the Greene and Oglethorpe county line, consists mostly of Loblolly pines along the proposed trail, with a few native flowering trees within the surrounding forest. Woodville has a good number of shade trees (Bradford Pears) along one section of the proposed trail, but ultimately there is not much shade throughout Woodville. Many homeowners within this section have lawns with landscaping and flowering plants. The section in between Woodville and Union Point, 5C, transitions from more forested areas into pasture and farmland. Section 5D, Union Point, is extensively landscaped throughout the areas where the proposed trail will be. Azaleas, Rose bushes, Irises, and Crepe myrtles are planted along downtown Union Point near the water town where the proposed terminus of the trail will be. A diversity of large shade trees cover much of area 5D, except along the finished portion of the trail, which is mostly Loblolly pine. Common invasive plants seen along Section 5 are Chinese Privet, English Ivy, and a variety of thorns and vines. Quite a few small creeks (Hurricane Creek, McWhorter Creek, and Tuggle Creek) lie within Greene County, but are not especially close to the trail. In Union Point (5D) there is a small stream that passes under the retired railway through a historic culvert that feeds into the Ogeechee River.

The ecosystems found within Section 5 (forest, pasture, and small towns) result in a variety of wildlife such as insects, birds, small mammals, coyotes, raccoons, and reptiles. The birding website and smartphone app “eBird”, along with website and smartphone app

“iNaturalist” are citizen science initiatives that allow people to log sightings of wildlife, which can aid in research and protection of species and their habitats. There are minimal sightings logged within Section 5, but on eBird there are [177 sightings](#) within Maxey’s, which is similar and close enough to Union Point to gather data about native bird species. Some of the most commonly observed species in this area are: European Starling, Red-Winged Blackbird, Tree Swallow, American Robin, and American Crow. Although observed at a lesser rate, other common well-known species are the American Goldfinch (e), Northern Cardinal (f), Carolina Wren (g), and House Finch (h).



E-H from left to right

Section 5 of the Firefly Trail in Greene County contains multiple ecosystems which are home to a variety of native flora and fauna. These species and habitats provide valuable [ecosystem services](#) such as pollination, water filtration, nutrient cycling, and access to a natural environment which can be beneficial both mentally and physically. These services should be considered when developing this section of the trail.

Question 2: How might the trail be developed in this area to enhance its beauty and appeal and take advantage of the assets identified in #1?

Although section 5 is quite rural and passes through the variety of ecosystems listed above, it also passes through two small towns, Woodville and Union Point. Historically these towns were major stopping points along the rail line spanning from Augusta to Athens. Not only does this section provide a beautiful view of the countryside, it also provides the historical appeal of small southern towns. Section 5 is one of the more developed sections of the trail, and the entirety of the trail in Greene County should be complete within the next four years. Because of the stage of development in Section 5, we recommend focusing on two main goals. The first goal is to focus on developing the trail in the most ecological way possible, both by limiting the impact created in the first place, and by adding additional features to benefit the surrounding

ecosystems. The second goal is to focus on fostering community engagement and support of the trail, so that as the trail is developed it will be done so with the local community in mind.

Recommendations for ways to enhance the beauty and appeal of the assets identified in question 1 are as follows:

1. Birdhouses: Section 5 offers a variety of habitats for avian species, and the recommendations vary within the section. Section 5A is dominated by pines, and any birdhouses should focus on species found within forests. In sections 5B and 5D, focus on species that are more commonly found in urban or landscaped environments. In Section 5C, focus on attracting species that are found in pastures and open fields. An interactive website called [NestWatch](#) can provide additional species recommendations based on habitat, as well as information on constructing birdhouses. An example for each section is as follows:
 - a. Forest: The [Tufted Titmouse](#) can be found in forests and parks with mature trees. They prefer nest boxes placed on poles 5 to 15 feet high, with an entrance hole of 1 ¼ in wide.
 - b. Town: The [Carolina Chickadee](#) would be a great bird to focus on in Woodville and Union Point, as the population is currently declining. They can be found in towns with forest and open woodland, and prefer nest boxes on poles or trees. The box should be 4 to 15 feet high, with an entrance hole 1 ⅛ in wide.
 - c. Open Field: [Barn owls](#) are an important avian species that can help control small animal populations such as rodents which is important ecologically, but it is also helpful to humans as these small animal populations may damage crops. Barn owls prefer open habitats with nest boxes attached to trees or poles 8 to 25 feet high. The entrance of the hole should be around 4 ½ inches wide.
2. Bat Houses: Bats provide valuable ecosystem services by pollinating and controlling insect populations. Although there are quite a few bat species that are native to Georgia, not all of them use bat houses. The most common species in this area is the [Big Brown Bat](#). In addition to providing bat boxes, bat gardens can be planted as well.
 - a. Locations: We suggest adding bat boxes in sections 5A and 5C. Big Brown Bats are generalists and will live in both woodland corridors and open fields, and consume both crop and forest pests.
 - b. Types of Houses: Bat houses should be mounted on poles or trees at least 12-20 feet above the ground, and should be at least 24 inches high and 16 inches wide. Bat boxes can be purchased or constructed; examples of designs can be found at [Bat Conservation International](#).

3. Planting Native Species: [Native plant species](#) are beneficial because they often require less maintenance than non-native; they are adapted to the local environment, need less water, are often more hardy, and provide a number of services to the larger habitats they belong to. Local wildlife such as insects, birds, and pollinators have evolved with these food sources and benefit from the habitat created. In addition to planting native, we recommend clearing out invasive species such as Chinese Privet and English Ivy.
 - a. [Trees](#) and Shrubs: In some areas the forested area will need to be cleared to make way for the trail. One of the main areas this will occur is Section 5A. We suggest adding shade trees and flowering trees already found within the nearby woods, such as Eastern Redbuds, Flowering Dogwoods and a variety of Oaks. In Woodville, some areas already have Bradford pears along the sidewalk. We suggest adding more flowering plants such as American Holly and Winged Sumac, which both grow well in sunny roadside areas and provide food sources for birds.
 - b. [Groundcover](#): Section 5C requires greater care in choosing what plants to add, as the area is used as pasture and farmland. If permitted, a barrier of groundcover plants are suggested between the trail and fence line. Wildflowers and native grasses should be used. Examples of wildflowers are Robin's Plantain and Dwarf Crested Iris.
 - c. [Pollinator Gardens](#): In addition to the pollinator garden in Union Point, additional pollinator gardens can be added in Woodville near CJ's BBQ or Magnolia Street (i), as well as near Elm Street (j). Some common plants used in pollinator gardens are Spice Bush, Purple Cone Flower, Dill and Fennel.

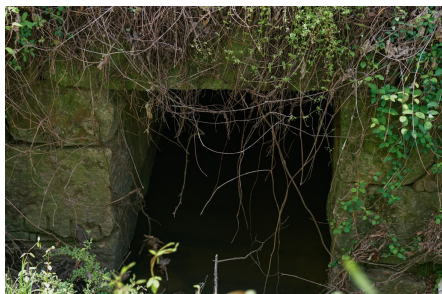


I-J from left to right

4. Educational Signage: Signage in recreational areas and parks has been shown to be beneficial in a number of ways, allowing trail-users to more fully understand and engage with the environment. Detailed signs can designate pathways along the trail to mitigate human encroachment on natural spaces, while still providing access to natural spaces for the general public (Marschall, et al, 2017). Therefore, we suggest providing signage along the Firefly Trail that conveys information about the town or county, historical use

of the land and the railroad, environmental aspects of the trail (i.e. native flora and fauna), or information about the benefits of a nearby feature (i.e. rain garden or bioswale) to display how aspects of the trail are noteworthy.

- a. Native Flora and Fauna: A section of the Butterfly Garden was recently planted in front of Union Point Elementary school, and will provide the students with educational opportunities. Signage about the plants added, why choosing native plants are important, and the kinds of pollinators attracted to a specific species would be great signs to add at the Butterfly Garden in Union Point, as well as in the possible Butterfly Garden in Woodville. Additional signage on any native species planted following construction, or those which make up a majority of a section can be added as well. Signage about the bird species attracted to the birdhouses installed and the benefit of bats near the bat boxes can increase the awareness of trail-users to species they might find in their backyard.
- b. Environmental features: Adding signage about the natural or added environmental features will increase engagement with and understanding of the ecosystem. Should they be constructed, signage about the purpose of a bioswale and a rain garden could be added to inform visitors of the importance of stormwater management and how impermeable surfaces and urbanization affect the hydrology of an ecosystem.
- c. Historical Signage: The city of Woodville and Union Point are rich with history, and bringing attention to these places can increase the appeal of the trail and local community engagement. We propose adding historical signage on the city of Woodville at the intersection of Birch and Dogwood near Elm Street. This would be near a kiosk with maps and benches. In Union Point, there are multiple places for historical signage. We propose adding signage near the culvert which feeds the Ocmulgee (k), near the water tower (l) and stairs which lead to downtown Union Point, and the Terrace Hotel Inn (now privately owned). Although not currently part of the Firefly Trail plans, the “Rat Hole” (m) across from the old Chipman Hosiery Mill would also be an excellent place for historical signage.



K-M from left to right

5. Local Action Committees: Certain aspects of the trail will need to go through local and/or county governments, and various concerns community members may have can be

addressed through increased participation with the LAC in Greene County. The LAC can serve multiple purposes; it can inform the development of the trail in a way that includes community members' perspectives, which can increase the appeal of the trail for locals and give them a sense of ownership. It can also serve to inform potential volunteers and trail-users of best management practices established along the Firefly Trail and create an Ambassador Program to maintain the trail.

Question 3: What are the factors that hinder and facilitate usage and enjoyment of the trail as it is?

Although the majority of the Firefly Trail is in the early planning stages, much of Section 5 will be completed within the next 4 years thanks to a few recently awarded grants. The [Georgia Outdoor Stewardship Grant](#) from the Department of Natural Resources will allow 6.78 miles of construction up to the Greene and Oglethorpe county line. This grant will also allow the construction of the bridge over N. Rhodes Street in Union Point and painted trail markers into downtown Union Point. The National Association of Realtors Placemaking Grant will provide an interactive mural on the water tower, a kiosk bench, and additional landscaping. This being said, the only portion of the trail currently built in Section 5 is within Union Point, and although support is high for the trail, much more of the community should be informed about the potential benefits of the trail. Most community members do not know what a rail to trail conversion is, and a few have reservations about privacy issues.

Community support in Section 5 is much higher than that found in the middle sections, possibly due to the large biking community within Union Point. Hart Farm Mountain Biking Trails are not far from the end of the proposed trail near downtown Union Point, and multiple biking groups from Athens and Union Point organize events and ride through this area on a regular basis. In addition, community members have had access to a little over a mile of completed trail and can see the benefits the completed trail will bring. Many residents of Union Point are extremely enthusiastic about the trail and potential to interact with wildlife and the local ecosystem. In particular, they have shown an interest in getting involved with planting pollinator gardens and focusing on planting native.

Downtown Union Point has a lot of history and potential. In 2001 the Chipman Union Hosiery Mill shut down, leaving many residents without a job, and resulting in the closing of a few local businesses. The City Council of Union Point is extremely supportive of the Firefly Trail, as the increased visitors can help bring business back to the town. There are a number of potential businesses in downtown Union Point, such as a distillery, brewery, or live music venue.

The City Council in Woodville is also supportive of the trail, but as of right now there are no Local Action Committee members from the Woodville Community. There are many opportunities within Woodville for stopping points and signage, and a few local businesses such

as CJ's BBQ that could benefit from increased traffic. Union Point and Woodville have a number of amenities already in place, such as bike racks, benches, and trash cans, but there needs to be a focus on providing these amenities along the undeveloped and less urban portions of the trail that can provide a sense of safety for users while minimizing impact on the local environment and wildlife. Additional safety issues will need to be addressed, such as adding safety crossing walks across multiple roads the trail will cross. In Union Point, part of the proposed trail is quite close to the active railroad.

In order to increase community support and facilitate usage and enjoyment of the Firefly Trail in Section 5, we make the following recommendations:

1. **Address Safety Concerns:** Barriers such as shrubs or tall grasses can be planted in between the trail and Highway 77 to keep trail-users from encroaching on the road. Signage and fences are proposed near the active railroad in Union Point. In areas where the trail will cross a road, we suggest adding flashing crossing signals. In Union Point, the Georgia Department of Transportation took over creating the crosswalk across Highway 44, and they assumed all legal liability. It is best to keep it this way rather than have the cities of Union Point or Woodville attempt to create a safer crosswalk. Instead, community members should be urged to make complaints to GDOT to increase the safety of these crossings.
2. **Property Signage and Privacy:** To address community concern over privacy issues, we propose adding 'No Trespassing Signs' or 'Please Stay on the Trail' signs throughout Section 5. While this certainly won't be necessary for all land owners, in the event a land owner is not in support of the trail, all efforts should be taken to increase the privacy between the trail and their land. Barriers such as fencing or privacy hedges can be planted along the trail in these areas.
3. **Provide Facilities and Amenities:** Section 5, although more developed than other sections, is still quite rural with few places to rest along the 6.78 miles of trail. We propose four stopping points within this section; one at the start of Woodville near Elm Street (N), one near the intersection of Dogwood and Peachtree Street near CJ's (O), one in the middle of section 5C (P-not in this exact location, but shows view of what you might see in this area), and a final stopping point at the planned bench and kiosk near the water tower in downtown Union Point (Q). Stopping points should have the facilities listed below.



N-O left to right



P-Q left to right

- a. Benches: The benches provided in section 5A and 5C should allow for 2 people to sit, as most will not be traveling alone but it will not be a heavily trafficked area. For sections 5B and 5D, in addition to two-person benches, we propose adding picnic tables or larger seating areas, as trail users may like to stop and enjoy the amenities and restaurants available in Woodville and Union Point.
- b. Trash cans: Trash cans should be provided at each of the four stopping points within Section 5. There are already many within Union Point and Woodville, but ensuring that there are trash receptacles nearby seating areas will minimize any impact trail users may have. It is suggested that only the one trash can be provided in sections 5A and 5C, as people will mostly be passing through and trash pick up will not be as regular as it will be within city limits. In addition to trash cans, dog waste stations should be provided at each of the four stopping points.
- c. Amenities: Bathrooms, water fountains, and bike repair station will increase the appeal and use of the trail. To minimize the impact of development and maintain the rural aesthetic of this section, we propose only adding these amenities at the stopping points within section 5B and 5D. In section 5B, there is already a pavilion with picnic tables and a bathroom behind CJ's BBQ. If possible, incorporating this space into the Firefly Trail would eliminate the need to add additional amenities in this area. In Union Point, a bike repair station and water

fountain can be provided at the water tower. If possible, local business owners in Union Point may be willing to offer their restroom facilities.

- d. **Parking and Access to Trail:** The current parking lot and access in Union Point is hard to find, but once the trail is completed it should be more obvious how to access the trail. We propose adding a larger parking lot at the current end of the trail in Union Point (near N. Rhodes Street) in addition to signage that indicates Firefly Trail Parking in downtown Union Point. A smaller lot can also be created in either Woodville near CJ's and Magnolia Street, or near Elm Street, as usage of the trail increases.
4. **Foster Community Relationships:** We recommend creating pamphlets or material for the local businesses within Union Point and Woodville. Gathering support from business owners and showing them the benefits the trail could be a huge step in getting the rest of the community involved. Using examples such as the Butterfly Garden and the benefits it will bring to students can show community members ways that the trail may benefit them in ways they had not thought of.
5. **Educational Material:** While the community is quite involved in this section, we recommend creating a guide for best serving the Firefly Trail in the most ecological way possible. This would include information about native pollinators and native plants and why they are important. Additionally, recommended birdhouses or bat box designs could be included in this information.

Question 4: What are the factors that threaten the environment of the section? How might those threats be mitigated?

Much of Section 5 will run parallel to Highway 77, and will face similar environmental threats due to its proximity to the highway, and the construction of the trail. Being so close to the highway increases the amount of litter and road water runoff that can accumulate in the surrounding environment of the trail. Adding the trail, which will be an impermeable surface, can affect the current hydrology of the area. In section 5C, construction and development should take into consideration the surrounding pasture and livestock on nearby land. A few of the areas (5A and 5C) have steep ditches which will need to be addressed during construction to make sure the waterways are maintained. Due to the area being quite rural, there are not many light sources outside of the City of Woodville (5B) and the City of Union Point (5D). Adding lighting can increase trail safety, but could do so at a detriment to surrounding wildlife.

To minimize the impact on the natural environment throughout section 5, we make the following recommendations:

1. Work with Greene County and Local Action Committees to form [Trail Ambassador](#) programs similar to those in Athens. These programs can help with litter clean up and invasive species removal. As the trail is further along in development in this section, community members can also assist in planting native plants and maintaining pollinator gardens.
2. Consult with hydrology engineers during construction, as a few areas along section 5 (notably 5A and 5C) have steep ditches that will need to be traversed during the construction of the trail. These ditches help maintain the runoff from the road, and adding additional impermeable surfaces can interfere with their efficiency. Ensuring that roadside ditch efficiency is maintained during construction will prevent unwanted problems down the road such as the creation of gullies, standing water, or erosion.
3. Bioswales or rain gardens may be used in situations that permit. Bioswales are a great [Low Impact Development](#) approach suggested by the NRCS in alternative to more traditional approaches such as storm drains. Bioswales use native plants to increase filtration, decrease erosion, slow down storm water, and in some cases move the water towards a rain garden where the water can filter into the ground. Not only would these features address hydrology concerns, but they will also provide habitats for insects, birds, and other small animals.
4. Motion lighting: Although Union Point and Woodville already have some lighting, most of Section 5 is quite rural and does not have much lighting. Not only is light pollution a nuisance to common nocturnal animals, such as bats, foxes, and racoons, it can also affect a number of [species of birds](#), particularly those that migrate or hunt at night. Light pollution can even affect the behavior of [zooplankton](#) in bodies of water, resulting in a negative effect on that ecosystem's food web. To limit light pollution while still providing safety for those that may be using the trail after dark, we suggest adding motion lighting.
5. Focus on Native Species: Some areas of Section 5 will need to be cleared to create the trail, and it is important to mitigate as much damage to the natural environment as possible. To prevent the spread of invasive species, we recommend planting native trees, shrubs, and groundcover following construction. Benefits of planting native species can be found in question 2.

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Final Recommended Priorities:

In order to balance the goals of preserving the valuable ecosystems found along the Firefly Trail, while still providing a recreational area for community members to engage with the natural environment, we suggest the following overall recommendations. These recommendations have been made with the consideration of their potential cost, ease of implementation, and the timeline for implementation due to the progress of different sections in their development. These recommendations are generally applicable to the entire trail, but sections do differ and we suggest referring to specific sections for further assessment. For example, while facilities are necessary throughout the trail, the extent to which they are needed will differ based on section and how urban or rural it is. We have divided our trail wide suggestions into environmental and community categories.

1. A main goal of the Firefly Trail is to maintain the natural beauty and ecosystem of this region of Georgia. In order to achieve this goal, making sustainable and eco-centric choices is essential throughout the development process. We encourage developing the trail with the smallest footprint as possible, mitigating any damage caused by trail development. We also recommend providing additional environmental features to enhance the natural beauty and support native wildlife in all sections. With this in mind, we recommend these environmental considerations for all sections:
 - a. Plant along border of trail: As specified in previous sections, the addition of the trail to native areas will place an impermeable surface in a previously permeable area. This can lead to runoff and erosion along the trail in all sections. To mitigate this, plant species that will fill the space between the trail and the existing environment. They will provide structure to the soil that will filter pollutants and prevent erosion along the trail.
 - b. Provide Bird and Bat houses: the development of the trail through wooded areas in multiple sections has the potential to displace bird and bat species, or interfere with their natural processes and feeding in these areas. Therefore, to mitigate this problem, provide bird and bat houses along the entire trail to provide established space for these species. Types of houses will vary along the trail by the species present.
 - c. Plant Native Species: In order to prevent long-term problems with the trail after development, it is important to begin the project initially by planting native species. Decorative species are often invasive, and can provide aesthetic value, but in the long-term they will take over species that occupy the space of the trail creating more work in the future to remove them. By planting native species initially, the overall upkeep of the trail will be reduced to trimming and generally maintenance, and the surrounding environment will not be overrun by invasives.

- d. **Provide Facilities As Soon As Possible:** A major concern for the central part of the trail is the intrusion of bikers and pedestrians into private property. Part of getting landowners on board is the promise that facilities will be provided for trail users. It is essential that this happens with the development of the trail in a timely manner to ensure there is no environmental degradation along the trail due to trash or waste, or human intrusion as trail users walk off the trail to use the facilities. It is also important in order to maintain a positive landowner/trail user relationship.
2. **Community Engagement and Education:** In all areas of the trail, provide outreach material and educational opportunities for local communities. Because there are ample opportunities to not only showcase the environment, but also the history of many places along the trail, we suggest developing a unified approach throughout the entire trail. This will keep the design of any engagement material cohesive. These items include but are not limited to:
 - a. Add appropriate signage along the trail according to recommendations listed in each Section as the areas of the trail are developed. Signs that take precedence are wayfinding signs and information about any installed features such as birdhouses or bat boxes.
 - b. Create pamphlets and take-away materials and provide to local businesses that cater to trail-users. Additional materials for land-owners or potentially affected community members can be created as well.
 - c. Increase social media presence in areas without; use Section 1 and Section 5 as examples, and use to garner support and volunteers for various events as the Trail develops.
 - d. Build upon Local Action Committees and increase opportunities for potential volunteers in areas where support is low or the community is unaware of the trail. The LAC's will be an essential component of the Firefly Trail, as members and volunteers will likely perform a majority of the softscaping and maintenance of the trail. LAC's can also be an important aspect in working with local and county governments, acting as a mediator between the community and their representatives.

Final Conclusions:

Rail to Trail conversions provide a unique opportunity to preserve historic rail lines, provide alternative transportation, access to recreational areas, connect communities, and promote the conservation of ecosystems and wildlife. The Firefly Trail has the potential to conserve a large stretch of land within the Piedmont region of Georgia, which consists of multiple vulnerable ecosystems and species. It will also connect multiple communities within Clarke, Oglethorpe, and Greene Counties, allowing them to experience nature in a way they may have not had access to otherwise. Due to the nature of long-term projects, the recommendations listed in this document may need to be reassessed as the trail continues to develop. We have suggested different recommendations for each section, as well as overall recommendations. Over the next 15 years as the trail is developed, the Firefly Trail, LAC's, and local governments will need to work together to create a cohesive trail.

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