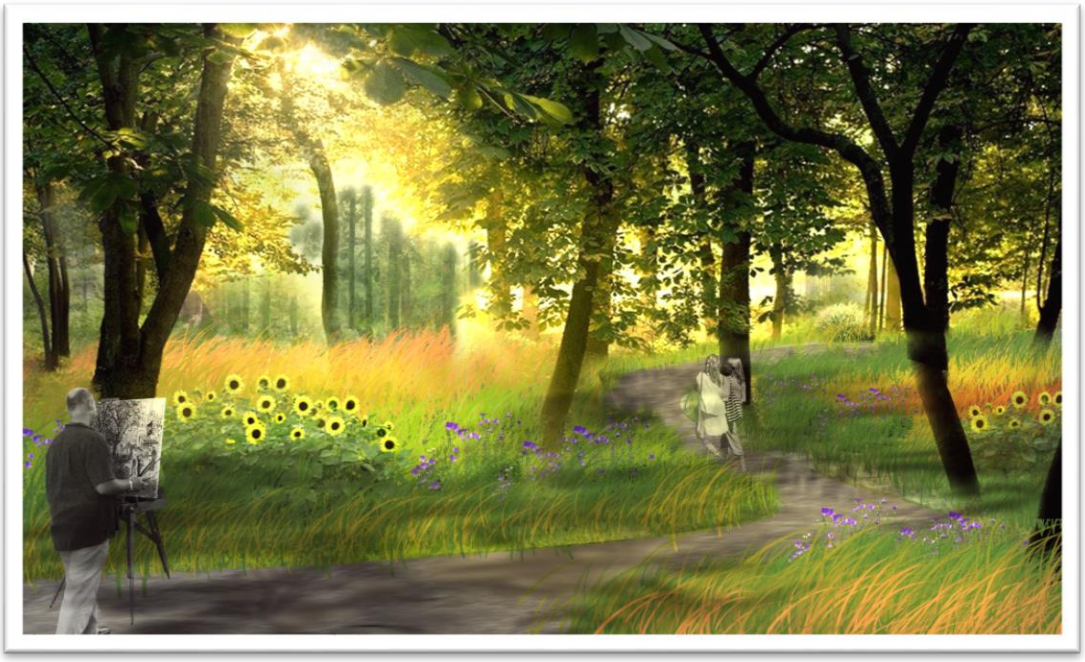

Campus in the Pines

2016 Environmental Protection Agency

Campus RainWorks Challenge

University of Georgia

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Project Abstract

The project concerns the master plan and sustainable development (green print) of East Georgia State College, a small access institution located in Swainsboro, Georgia. Charged with meeting the expectations of stakeholders and reimagining a more resilient institution, our team accepted the 2016 Environmental Protection Agency's Campus Rainworks Challenge to create the first stormwater management and green infrastructure plan for the EGSC campus: "Campus in the Pines." The 249—acre rural campus enjoys a natural landscape of mature Longleaf pine forest, ponds, and creeks, making paramount the need for the design team to address the protection of ecological resources, stormwater, and create a vision for sustainable growth. The vision is broken into three phases to allow for immediate solutions and embolden the institutions commitment to sustainability for decades to come. The team developed a master plan that reinforces an academic environment, creating a walkable landscape that highlights practical green infrastructure practices that mitigate existing and proposed development. Three goals were devised and accomplished through the design: (1) unifying the campus, giving it a distinct sense of place and linking it with the surrounding community (2) creation of an inspiring landscape that enhances the learning, living and working environment of the college, and (3) conserving the campus's unique environmental resources and managing stormwater onsite. Using the EPA's Stormwater Management Model (SWMM) Calculator, a variety of green infrastructure strategies were applied to problem areas to reduce runoff, contaminant discharge and potable water usage. These design solutions center on resiliency in response to stakeholder input and the growing need for sustainable considerations in future development. The framework provided will allow for the campus to transform itself into a sustainable institution, acting as a model of resiliency and smart growth in the region.

Figure 1: Proposed student center

Project Context

Our team accepted the 2016 Environmental Protection Agency's (EPA) Campus Rainworks Challenge to create the first stormwater management and green infrastructure plan for the EGSC: "Campus in the Pines." The team undertook the Rainworks challenge as part of a long-term project. The project will continue with the next phase during the spring 2017 semester, January to March.

The Project is defined in five phases: initiation, green infrastructure, physical master plan, implementation, and closing.

1. *Initiation Phase (April-October 2016)*
   Establish the design team and advisors. Site visit to meet with community and campus stakeholders to define the project purpose, scope and goals. Become familiar with the history of the institution and campus grounds.
2. *Green Infrastructure Plan (October - December 2016)*
   Collect data on campus drainage, soil infiltration, topography, canopy cover, land use and ecological resources. Modeling of EGSC campus was performed using EPA SWMM for both existing and proposed site. Model outputs were used to determine runoff volume reduction. The Georgia Stormwater Management Manual (GSMM) was also used to employ better site development (BSD) principles and propose green infrastructure (GI) strategies.
3. *Physical Master Plan (January – March 2017)*
   Conduct site inventory and analysis on building and land use, circulation, and programming requirements. Use case studies, collected data, and stakeholder input to design a phased physical master plan.
4. *Implementation Phase (2017-2032)*
   Integrate "Campus in the Pines" into the proposed 15-year campus plan. At the end of this phase, the team aims to have all green infrastructure implemented on campus and all planning guidelines and metrics adopted by campus management.
5. *Closing Phase (2032 and on)*
   Utilize proposed GI as a learning experience for classes, research and the Swainsboro community. The closing phase marks the end of the proposed 15-year master plan at which point the campus will have completed its transformation into the "Campus in the Pines."

Site Selection, Inventory, and Analysis

The region is characterized by low college attendee and graduation rates. As the most affordable institution within the state university system, East Georgia State College (EGSC) is primarily an access institution. As more students expect to go to college and learn about EGSC as a viable option, the number of students expected to enroll and the size of campus will grow.

The design team met with EGSC's president, professors, and stakeholders within the Swainsboro community to review the campus master plan and determine what future development was desired and likely to be implemented.

Campus Context

Currently, East Georgia State College (EGSC) is a 249–acre rural campus just east of Swainsboro, GA. The campus houses 11 buildings, a single main lawn, two ponds, and Longleaf Pine habitat for the gopher tortoise and threatened indigo snake. The total impervious area accounts for roughly 8.22% of the study site, resulting in approximately 453.9 acres of permeable surfaces. EGSC Swainsboro currently enrolls approximately 1,100 students with 388 of those living in the recently built dorms, the "Bobcat Villas," and the other 65% commuting from the surrounding area, no more than 50 miles away.

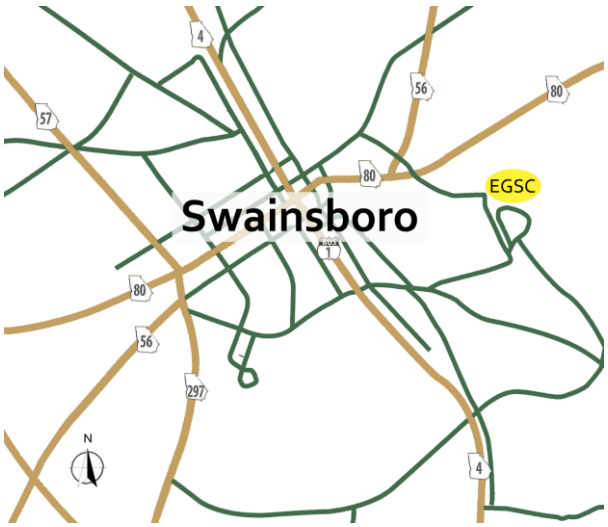

Figure 2: Campus Context

Just recently the campus was gifted 137 acres adjacent to a technology park that borders the campus. The technology park (approximately 120 acres) is owned by the county and gave 11.7 acres to EGSC in 2014; the remaining 110 acres are likely to be given once the college's master plan demonstrates how EGSC intends to use the site. Therefore our design site considers these generous donations (495 acres) and examines their suitability as areas for campus expansion that could house students in newly developed residences or create new academic centers as the college grows. Future development should contribute to a 24/7 learning community that enhances the campus and its relationship to Swainsboro residents.

Site Soils, Hydrology, Tree Cover, and Habitat

Emanuel County, Georgia is located in the Southern Coastal Plain Major Land Resource Area. The USDA's Natural Resources Conservation Services (NRCS) Soil Survey reveals the site predominantly consists of upland, well-drained sand to sandy loam soils typically found on the Coastal Plains. The county consists of well-developed streams over gravelly, clayey sand. The areas on either side of the existing streams on the site consist of moderate to frequently flooded wetlands of the Kinston, Bibb, and Pelham series.

EGSC's campus has two ponds, Ezra and Pa's Pond, and four main tributaries, acting as the only "stormwater management" systems on campus being a catch-all for surface water runoff and sediment, which is distributed to larger streams offsite. Site surfaces (walkways, parking lots, roof tops) equal 8.22% impervious cover totaling 40.6 acres of the 495-acre site. On the main campus, site run-off flows directly into Paws Pond and the surrounding wetland and stream systems with little infiltration due to heavily compacted soils.

Existing site canopy consists of roughly 83% (410.5 acres) of the site while the majority is established and emerging Longleaf pine (*Pinus palustris*) and Slash pine (*Pinus elliottii*) forest – the habitat of the at risk Gopher Tortoise, Indigo Snake, and Red Cockaded Woodpecker.

Analysis: Stormwater Modeling

The EPA's Stormwater Management Model (SWMM) Calculator was used to measure stormwater run-off from the study site. Looking at the pre-settlement conditions of the site, the SWMM measured 2% stormwater runoff under forested conditions (0.72"/yr.) **(Table 1)**. This provides a historical context of the original landscape, therefore framing our vision for the site moving forward. The existing site conditions (83% forest) measure 9% stormwater runoff (3.95"/yr.) **(Table 1)**. With no stormwater controls on the developed portion of the site, if the campus expands further into its currently undeveloped Longleaf pine habitat without control measures, the rate of runoff will increase significantly. Results in the following sections show the proposed master plan with and without low impact design (LID) controls in place **(Table 5).**

EPA Calculator Statistic	Pre-settlement Scenario	Existing Scenario
Study Site (494.6 acres)	**(0% Impervious)**	**(8.22% Impervious)**
Average Annual Rainfall (in.)	44.17	44.17
Average Annual Runoff (in.)	0.72	3.95
Days per Year with Rainfall	82.71	82.71
Days per Year with Runoff	1.3	16.66
Percent of Wet Days Retained	98.43	60.6
Smallest Rainfall w/Runoff (in.)	0.29	0.38
Largest Rainfall w/o Runoff (in.)	4.7	0.49
Max. Rainfall Retained (in.)	4.7	4.32

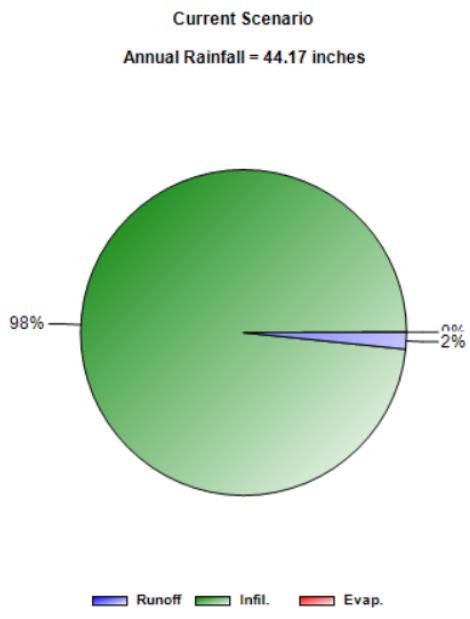

Diagram 1A: Pre-settlement scenario

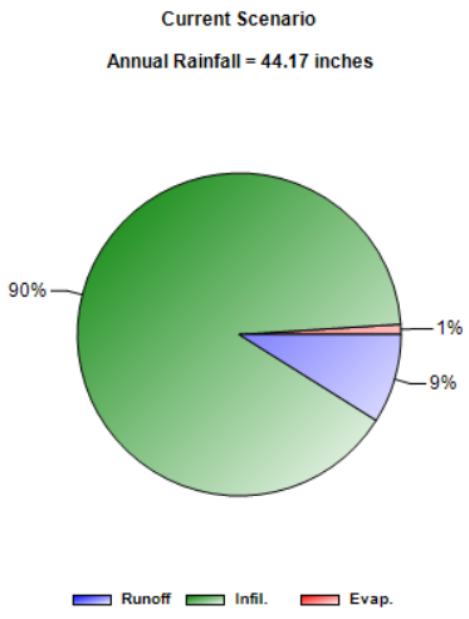

Diagram 1B: Existing scenario

Opportunities

Because East Georgia State College currently has very little in the way of stormwater management and no green infrastructure strategies in place, the potential for the design to have a marked effect on the campus is high. The team's thorough analysis of the site made apparent the strengths and weaknesses of the campus grounds and therefore guided the design process to protect and conserve natural amenities, restore and enhance existing conditions, and create a framework for the future. By phasing the design implementation, the framework allows immediate action to be taken and smart growth to continue in the future.

Resilient Campus Approach

Recognizing the need to address climate change and create a functional, inspiring landscape for campus and community members, the overall design concept transforms the campus through employed better site development (BSD) principles and proposed green infrastructure (GI) strategies. In accordance with the Georgia Stormwater Management Manual, the team has designed a master plan that incorporates a series of solutions in relation to the existing hydraulic systems and flows on campus.

ZONES
Building Development
Existing and proposed building development sites including the building footprint and its associated parking and walking paths.
Class A-2 occupancy for *college/student union*: avg. building size 44,400 sq.ft. | avg. 15 sq.ft./person
Class B occupancy for *college, classroom, & administration*: avg. building size 50,000 sq.ft. | avg. 15 sq.ft./person
Interactive Conservation
The southern portion of the forest that currently divides the main campus from the technology park. Serves as a natural education and passive recreation area as well as habitat for native flora and fauna.
Preservation
Forest that occupies the north, the southwest corner, and the far eastern portion of the property meant to remain untouched to maintain sensitive habitats and enhance the ecological functionality of the entire site.
Circulation
Arterial roadways that create the flow of traffic throughout the campus grounds.
Eco-commons
Open green space that creates the central axis of the campus and reinforces a walkable, pedestrian dominated space with visible green infrastructure practices.

Table 2: Proposed land use zones

Zoning Criteria & Guidelines

Once the vision and goals were established, the team defined five zones **(Table 2)** and established a consistent suite of performance criteria and thresholds for each. These metrics were looked at through the lens of four categories (land use, vegetation, stormwater, and soil) that correlated to suitability studies.

Land Use: Assigned the applicability of specific land uses (Academic, Residential, Active & Passive Recreation)

Vegetation: Established the percent tree cover and appropriate landscape plants

Hydrology: Set thresholds for percent of impervious surface and performance metrics for the reduction of water pollutants. Used the EPA SWMM Calculator to determine the performance criteria for stormwater runoff reduction. By looking at the pre-settlement conditions of the forested site, we determined that the daily rainfall for the 85th percentile is approximately 1.2" runoff, the 95th is 1.8", and the 99th is about 3". These were used in setting the targets for each zone's ability to capture runoff.

Soil: Determined the percent of soil area to be protected and restored.

Suitability Mapping

After performance criteria and thresholds were set, the above categories were further broken down to establish suitability guidelines for future development. Following the McHargian Suitability Analysis model, we classified the existing land use, slope, vegetation, hydrology, soil, and habitat conditions in terms of low, medium, or high suitability for each future zone.

SD Principles & GI Strategies

BETTER SITE DESIGN PRINCIPLES	
PRINCIPLE	**PLANNING CONSIDERATIONS**
Community Planning, Infill, and Redevelopment	Developing on urbanized areas or previously developed land that is currently underutilized. A new parking garage and two new academic buildings are proposed on the previously graded parking lot and recreation area in the northeast part of the campus.
Natural Resource Inventory	Involves identifying natural features and resources prior to designing site development layout. Gopher tortoise and indigo snake habitats were thoughtfully considered. Ponds and creeks were protected and enhanced where possible.
Conservation of Natural Resources	Strategies that can be used by local governments to enforce or provide incentives for conservation of natural features. The western plot of land, expected to become EGSC property, will be developed responsibly and sparingly with incentives for protection of forest and wildlife.
Tree Conservation + Tree Canopy	The preservation of trees and native plant cover during and post-construction. Tree removal in only absolutely necessary contruction situations. Offset by new tree plantings. Majority of the existing forest was left untouched.
Management of Open Space, Sustainable Landscaping	Manage open space and vegetation effectively. Functional, sustainable open landscapes prioritized and increased. The central lawns of the campus serve as an eco-commons, highlighting visible, sustainable practices while creating a more functional campus atmosphere.
Reducing Roadway + Right-of-Way Width and Length	Strategies to reduce impervious cover by addressing roads. Superfluous roads removed and replaced with open green space to create a more functional campus flow.
Reducing Paved Parking + Walking Areas	Reducing the footprint of paved parking lots and sidewalks to reduce imperviousness. Parking garage proposed and all proposed sidewalks and additional parking will be pervious.

Table 3: Better Site Design principles employed in new master plan

GREEN INFRASTRUCTURE STRATEGIES	
SITE APPLICATION	**BENEFITS**
Bioswales + Raingardens	
Rain water from academic buildings, residences, and impervious surfaces, namely parking lots and roads, will be intercepted by strategically designed and placed rain gardens and bioswales. 100% of runoff from the surfaces will be mitigated by this strategy.	Reduction of runoff and problems arising from runoff including erosion and flooding. Contributes to a visible culture of sustainability on campus.
Green Walls	
Vertical gardens placed thoughtfully on the sides of select proposed developments	Reduces the urban heat island effect, improves air quality, improved energy efficiency and improved structure protection.
Cistern	
Roof water management through collection of water from the three proposed developments on the eastern portion of the campus. Underground system installation.	Usable stormwater runoff management, water conservation, and potable water use and costs.
Pervious Materials	
All proposed walkways and parking lots will be pervious.	Runoff reduction, increased infiltration, decreases run-off volume and peak flow, and improves water quality.
Soil Amendment	
Disturbed soils surrounding new development will be restored such that the soil is able to infiltrate and store rainwater. External soil hauling for landscape development will be eliminated. Utilize inorganic and organic materials in soil redevelopment.	Decreased runoff, erosion, and improved water quality.
Habitat Restoration	
Identification and amendment of gopher tortoise and indigo snake habitat. Identification and management of old growth forest.	Creation of habitat corridors for at risk species. Native plantings enhancement.

Table 4: Proposed GI strategies for stormwater management

Implementation

Phase I (2017-2022): Green Campus Initiative

The initial phase will prioritize campus cohesion and atmosphere using Better Site Design Principles as a guiding force behind accomplishing a more sustainable and resilient core campus. Encompassed in Phase 1, the removal of roads and parking lots that disrupt the campus and ecological environment. Prioritized stormwater mitigation and green infrastructure practices will expose sustainable benefits and solidify a culture of campus resiliency. A linear flow from the southern point of the campus to the residence halls in the north will be reinforced with new academic developments including a student center and open lawn where a large parking lot once dominated. The first phase will provide an authentic campus environment with green infrastructure practices amending the effects of the new developments and enhancing the existing.

Phase II (2022-2027): Campus for the Future

The second phase will address a growing campus by creating new academic buildings and a parking deck to alleviate increased traffic. This expansion will take place on the current site of

the tennis courts and parking lot located on the eastern part of campus. A new pedestrian corridor will thoughtfully meander through the pine forest by the baseball fields to initiate a connection to Phase 3 developments. The community center found at the southern tip of the property will be expanded, encouraging an improved town and gown relationship.

Phase III (2027-2032): A Campus in the Pines

The final phase will see development realized along the technology corridor in the eastern section of the property. By taking advantage of the fully outfitted area, the campus can successfully expand while maintaining a cohesive flow and minimal environmental impacts.

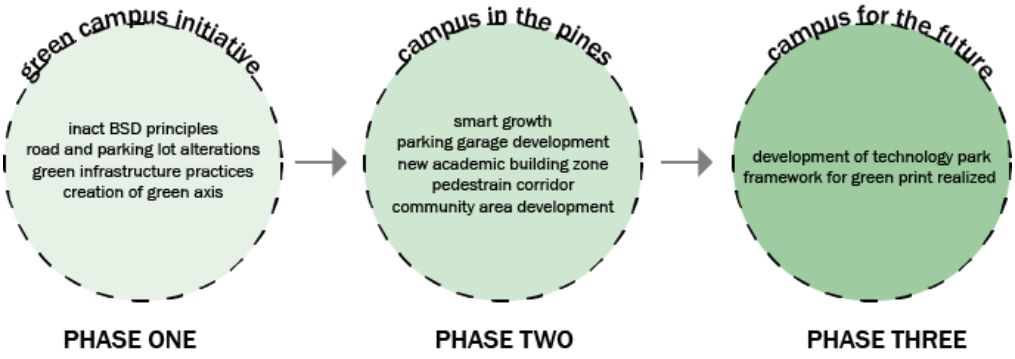

Figure 3: Master plan implementation phasing

Analysis Results

Results were calculated using the EPA Stormwater Calculator during a 1.2" storm event. Compared to the existing site, the new master plan implements green infrastructure in order to offset a larger impervious footprint due to campus expansion. Infiltration basins, raingardens, street planters, a rain cistern, and pervious paving were sized to have a capture ratio of 100%. **Table 5** and **Design Board 2** reflect results. Even after campus development, the proposed master plan with LID controls results in a decrease in average annual stormwater runoff by 1.38"/yr.

EPA Calculator Statistic	Proposed Scenario w/o GI's	Proposed Scenario w/ GI's
Study Site (494.6 acres)	**(16.92% Impervious)**	**(16.92% Impervious)**
Average Annual Rainfall (in.)	44.17	44.17
Average Annual Runoff (in.)	7.33	2.57
Days per Year with Rainfall	82.71	83.75
Days per Year with Runoff	24.78	5.03
Percent of Wet Days Retained	41.37	88.15
Smallest Rainfall w/Runoff (in.)	0.22	0.96
Largest Rainfall w/o Runoff (in.)	0.3	1.1
Max. Rainfall Retained (in.)	3.91	4.25

Table 5: EPA SWMM Statistics, proposed

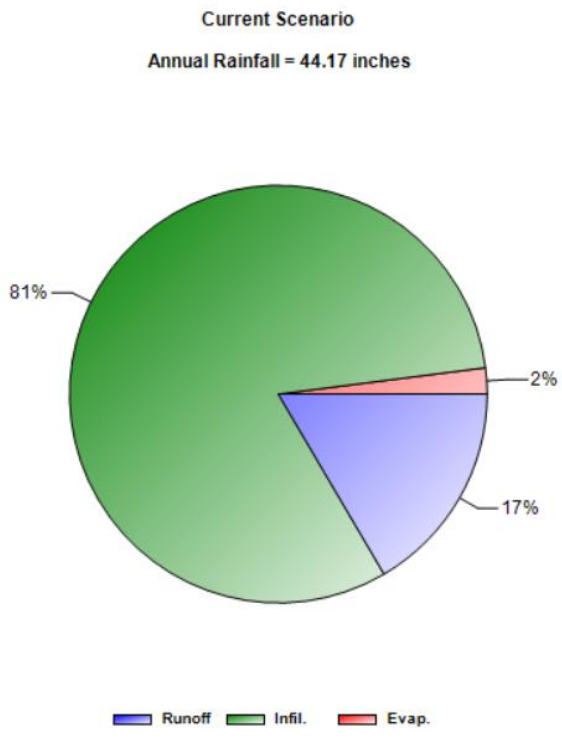

Diagram 2A: Proposed development plan without GI controls

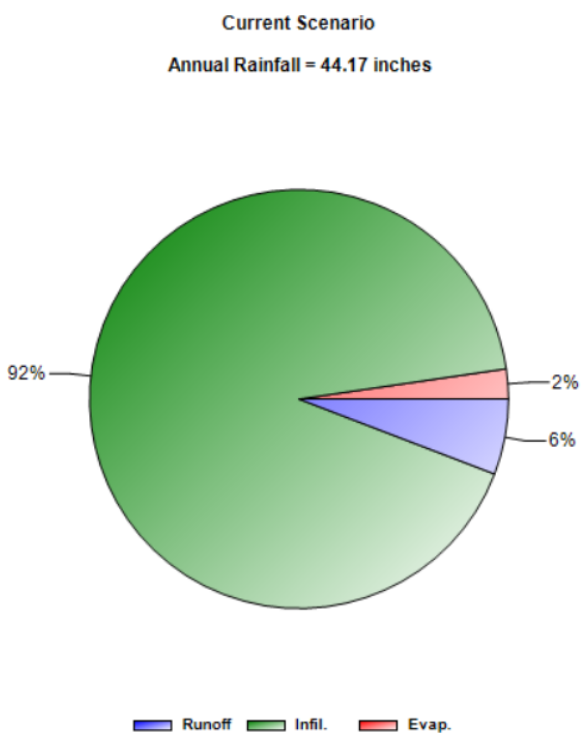

Diagram 2B: Proposed development plan with GI controls

Expected Outcomes

- Reduce runoff by 1.38”/yr.
- Increase in infiltration 2%, Decrease in run-off 3%
- Expand campus while protecting 88% of existing forest
- Area of protected streambank soils, 100%
- New parking planters to sequester CO^2 and capture runoff
- Implement green wall and cistern with new parking deck
- Add native/adapted plants in rain gardens and new landscaping
- Protect and restore habitat for at risk Gopher Tortoise, Indigo Snake, and Red Cockaded Woodpecker
- Replace large parking lot with new student center and eco-commons
- Unify the campus along an axis of green space

Conclusion

Reimagining East Georgia State College as a “Campus in the Pines,” highlighting its pine forests and abundant natural amenities, runs congruent with aligning the campus culture and values to that of a sustainable, resilient institution. Through diligent research involving stakeholder meetings, historical analysis, site inventory, and data collection, the proposed project represents thoughtful, practical considerations for extending a sustainable vision to the campus and its surrounding lands. These considerations address immediate solutions, creating a vibrant academic culture while enhancing the grounds with overarching mater plan design

improvements that remove superfluous roads and parking lots to form a central green axis. This green axis is reinforced through the implementation of bioswales and rain gardens that are visible, effective means to mitigating runoff in the central campus. The proposed vision extends into the periphery of the property creating guidelines for expected growth such that the campus can continue its commitment to sustainability for decades to come.

Figure 4: Green Axis Concept

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