KENNESAW STATE UNIVERSITY
OFFICE OF SUSTAINABILITY

KSU Sustainability Opportunity Inventory

Summer/Fall 2023

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Executive Summary

Kennesaw State University has experienced two decades of growth and rapid expansion of its campus infrastructure. This study seeks to inventory and map resources and opportunities that will inform the development of sustainable strategies to support the University's continued growth for decades to come. The intention of this study is not to prepare specific recommendations, but to identify gaps and opportunities that may be targeted for future initiatives.

The Sustainability Master Plan, scheduled to kick-off in the Spring of 2024, will identify strategies that will improve KSU's environmental performance and prepare the university to thrive in GA's evolving environmental and economic landscape for the next three decades. The information collected and mapped through this inventory, along with strategies developed as part of the Greenhouse Gas Mitigation Plan completed in 2023, will serve as a resource for working groups tasked with strategy development. By overlaying geographic, economic, and operational data across multiple scales, this study is intended to identify dependencies, areas of impact, and of opportunity. Data was collected from existing national, state, and local sources as well as existing documentation across many of the university's departments.

KSU's Sustainability Opportunity Inventory focused on three primary areas of interest: Climate Resiliency, Economic Conditions, and Research and Curriculum. For each research area, the study provides a summary of relevant contextual findings, a list of existing university assets, and identifies potential gaps or opportunities for growth between these.

Part I - Climate Resiliency: KSU, along with the Southeastern region of the United States, is predicted to experience warmer, wetter weather in the coming century. As a result, extreme weather events, such as storms and tornadoes, are expected to increase in both frequency and strength. Most opportunities identified relating to climate center around mitigation efforts, such as cool or green roofs and surface permeability, adaptive measures such as building upgrades to optimize energy efficiency, and resiliency projects such as regenerative energy and microgrids to allay the most severe impacts.

Part II - Economic Conditions: Lumber and agriculture are historic drivers of the GA economy. Both industries are also susceptible to changing temperatures and precipitation patterns. As the temperature warms and growing seasons extend, farmers are turning to crops previously uncommon in the state. Climate and agricultural research to facilitate, study, document, and assist the transition into new crops and rotations will be an increasingly critical field of study for the coming decades.

Recent investments from Electric Vehicle (EV) manufacturers and their associated suppliers are projected to create thousands of new jobs in GA in the coming years as the state becomes a leading producer of EV's, batteries, and solar panels. This new economic sector creates opportunities for labor force development as well as research in industrial design, electrical engineering, and related fields.

Part III - Research and Curriculum: Driven by growth in the green job industries, as well as by student demand, universities across the country have added sustainable courses and degree programs to their offerings. As KSU continues to develop new courses, it has an opportunity to develop degree and certification programs that leverage the existing interdisciplinary degree structure.

Acknowledgements

This project is the result of a collaboration between María del Mar Ceballos, Director of the Office of Sustainability, Dr. Pegah Zamani of the Research Center for Sustainable Communities, Professors Dr. Allen Roberts, Dr. Jun Tu and Uli Ingram from the Department of Geography and Anthropology, Tyler Reinagel AVP of Economic Development and Assistant Professor of Public Administration, students Sydney McMahon, Betsy McInturff, Chris Delisle, Laia Bevelle, and AJ Sherrell, and Sinobi Guillaume, Construction Project Manager, office of Planning, Design and Construction.

Special thanks to Dr. Jairo Garcia, Executive Director of Urban Climate Nexus and Professor of Planning at Georgia Tech whose earlier project on the *Climate Vulnerabilities: Energy, transportation, heat, floods, public health, food deserts* for Cobb County served as a predecessor and helped inform this study.[1]

Sustainability Opportunity Inventory Summary

Part I: Climate Resiliency

A. Temperature	
Green Infrastructure	
Assets	Opportunities
❖ Existing Tree Canopy	○ KSU Tree Care Plan ○ UHI – Tree Planting Plan ○ Alignment and Partnership with Cobb Trees
❖ Tree Inventory	○ Comprehensive Landscape Inventory
❖ Arboretum	○ Tree Campus USA
❖ KSU Plant List	○ Update KSU Plant List and Standards
❖ American Chestnut	○ Research and breeding
❖ The "Oasis"	○ Campus Native Conservation projects ○ Pink Lady's Slipper orchid conservation/restoration
❖ Pervious/Impervious Surfaces ❖ Cool Roofs	○ Green Roofs ○ Solar Roofs ○ Ground cover design standards/considerations
Energy Efficiency	
❖ High-performance buildings	○ Optimize Energy Efficiency Targets ○
❖ Standardized Energy Efficiency best-practices	○ Additional Standards for Energy Efficiency
❖ Building-level metering	○ Submetering
❖ Energy Audits	○ Prioritized Energy Audits
❖ Renewable Energy • Solar Tables • Existing PV • Rooftop Solar (Proposal)	○ See Extreme Weather events: Renewables and Microgrids
❖ Inflation Reduction Act	○ Identify current and potential projects for funding
B. Precipitation	
❖ High Performance Buildings ❖ Stormwater Management Plan	○ Rainwater Management and reclamation ○ Ground cover design standards/considerations ○ Smart Irrigation ○ Integrated landscape and Stormwater Management Plan ○ Updated KSU Plan List
C. Extreme Weather Events	
❖ Emergency Preparedness Plan ❖ Fire Protection System Freeze Vulnerability Assessment	○ Recurring Facilities Condition Assessments ○ Envelope improvement project priority list.
❖ Batteries, generators	○ Renewables and Microgrids
D. Air Quality/Emissions	
Transportation	
❖ Park-It Once Policy	○ Diversified Parking Passes ○ Georgia Commuter Options
❖ EV Vehicle Infrastructure	○ EV Network Incentives
❖ Public Commuter Networks	○ Optimize Bus and Shuttle Network Connectivity

❖ KSU Big Owl Buses	○ Review and implement recommendations from the Bike Friendly Campus Feedback Report
❖ Cobb County's Growing Trail Network ❖ Bike Infrastructure ❖ Electric Bicycles ❖ Bike Friendly USA ❖ Outdoor Recreation Center and Bike Shop ❖ Bike Rescue Program ❖ Free-standing bike repair stations	○ Prepare a "Complete Streets" or "Bicycle Accommodation" policy ○ Work with city of Marietta and Cobb County to improve network connectivity ○ Upgrade the quality of existing bike parking and adopt bike parking design standards that meet APBP guidelines. ○ Consider developing an occasional Parking Pass option for commuters by offering single-day parking pass options. ○ Develop a comprehensive bicycle education program. ○ Appoint a staff member as official Bicycle Program Manager or create new position ○ Establish annual budget to ensure implementation of bike plan. ○ Conduct regular research on bicycle usage. ○ Improve wayfinding from campus to the off-campus trail network and vice versa. ○ Consider implementing car restrictions or car free zones. ○ Lower the speed limit on campus to 20 mph. ○ Provide traffic calming measures ○ Consider creating bike lanes, buffered bike lanes, or cycle tracks. ○ Consider creating painted bike lanes. ○ Consider incorporating Bike Boxes. ○ Provide covered parking where possible ○ Provide students long-term bike storage options between semesters and through the summer.

Part II: Economics

Economic Conditions	
Assets	Opportunities
❖ Industrial and Engineering Systems Degree & Industrial Engineering Technology ❖ Renewable Energy Minor ❖ Department of Ecology, Evolution and Organismal Biology ❖ KSU Field Station	○ Bachelor's Degrees in Manufacturing Operations and Supply Chains are being cut from the curriculum. Opportunities for Interdisciplinary engineering degrees in Electrical Engineering, Renewable Energy Master's Concentration, and Industrial Design and Manufacturing would be particularly aligned with current industries of growth in Georgia. ○ Renewable Energy Master's Concentration ○ Field Station Optimization ○ Pollinator Support ○ USG Partnerships ○ Commuity Support

Part III: Curriculum and Research

Academic Conditions	
Assets	Opportunities
❖ Sustainability courses	○ General Education Core Requirement ○ Interdisciplinary Degree/Certificate
❖ RCE Greater Atlanta ❖ SDG Futures Fellowship ❖ SDG Community of Practice ❖ Engineering One-Planet	
❖ Living Learning Lab	○ Sustainable Research Inventory ○ Identify Living Learning Lab Opportunities

Summary of Existing KSU Sustainability Initiatives

1. American College and University President Climate Commitment, signed 2007.

In 2007, President Daniel Papp signed the American College & University President Climate Commitment, now known as Second Nature's Carbon Commitment. Through this commitment, KSU expressed its intention to target the reduction of Greenhouse Gas Emissions and achieve Carbon Neutrality. Kennesaw is listed as a Charter Signatory of the program, having been among the first 350 institutions that signed the commitment in its inaugural year.

Second Nature, in partnership with the Environmental Association for Universities and Colleges (EAUC), and with support from the UN Environment Program, now leads the Race to Zero for Universities and Colleges, a part of the United Nation's Race to Zero Campaign. The program is a global effort "to rally leadership and action in the education sector." The program requires universities to commit to zero emissions, as opposed to carbon neutrality and sets a deadline of 2050. The ongoing Greenhouse Gas Mitigation plan will inform KSU's ability to commit to this more ambitious goal.

2. Climate Action Plan

KSU's first Climate Action Plan from 2016 was intended as a guide for developing strategies around areas of priority in Sustainability and for reducing Greenhouse Gas Emissions. The Plan focused on five main areas: (1) Increased Energy Efficiency, (2) Transportation Improvements, (3) Behavioral Changes, (4) Water Use and (5) Renewable Energy and Carbon Credits. The Climate Action Plan was developed under the leadership of then Director of Sustainability, Dr. R.C. Paul and the Climate Commitment Council formed for the purpose of its development. See Appendix 1 for a Summary of Progress on the 2016 Climate Action Plan.

3. Greenhouse Gas Inventory Data

Greenhouse Gas Inventories were prepared for the Kennesaw campus for Fiscal Year's 2008, 2010, 2012 and 2014. Once KSU and Southern Polytechnic (SPSU) were consolidated in 2015, Greenhouse Gas Inventories were collected 2017-2019. The Greenhouse Gas Mitigation plan project launched in summer 2023 prepared the inventory for 2022 and will develop and prioritize mitigation strategies towards achieving carbon neutrality by the middle of the century.

4. Sustainability Advisory Council

The Climate Commitment Council was established for the development of the 2016 Climate Action Plan. The group evolved to become one of six Presidential Commissions and now serves as the Sustainability Advisory Council. The Council is comprised of faculty, staff, and students who serve as advisors to KSU's Office of Sustainability. The Council encourages the growth of Sustainability at KSU by supporting and developing policies and practices that foster social, economic, and environmental sustainability in various aspects of campus life, including operations, facilities planning, academia, student life, and community engagement.

5. The Office of Sustainability

Established in October 2022, the Office of Sustainability is a department under the Office of the Chief Business Officer. Its mission is to empower the KSU community to integrate sustainable principles and practices in everything it does. The Office works across three strategic areas: Sustainable Operations, Academics and Research, and Engagement.

Previous Awards and Recognition

The Princeton Review	*Green Colleges List*
USG Board of Regents	*2012 Sustainability Awarded for Energy Performance*
Carnegie Foundation	*Engaged Citizenship*
Kaiser Permanente	*KSU Community Clinic funding*
Georgia General Assembly	*KSU's Academic for Inclusive Learning & Social Growth*
National Restaurant Association	*Operator Innovations Award for Sustainability Innovator*
Newsweek	*Top 25 Colleges for Food (*2011)
National Association for College and University Food Services	*Residential Dining Concepts Silver Award (2013) & Bronze Award for Education and Outreach*
National Renewable Energy Laboratory	*Technical Assistance*
US Department of Education	*Green Ribbon School*
The Coca-Cola Co./Keep America Beautiful	*Public Space Recycling Infrastructure Grant*
League of American Bicyclists	*Bicycle Friendly University - Bronze*

Part I. Climate Resilience

A. Temperature

A.1: Conditions

Historic

Georgia's hot subtropical climate is generally characterized by long, hot, humid summers and short mild winters. Over the past century, Cobb County and the state of Georgia's average annual temperature has increased at an average rate of 0.1°F per decade since record keeping began in 1895, resulting in an average temperature increase of 1.28°. The average annual temperature increase in the United States by contrast has been increasing at a higher average rate of .16°F for a total average increase of just over 2°F. [2]

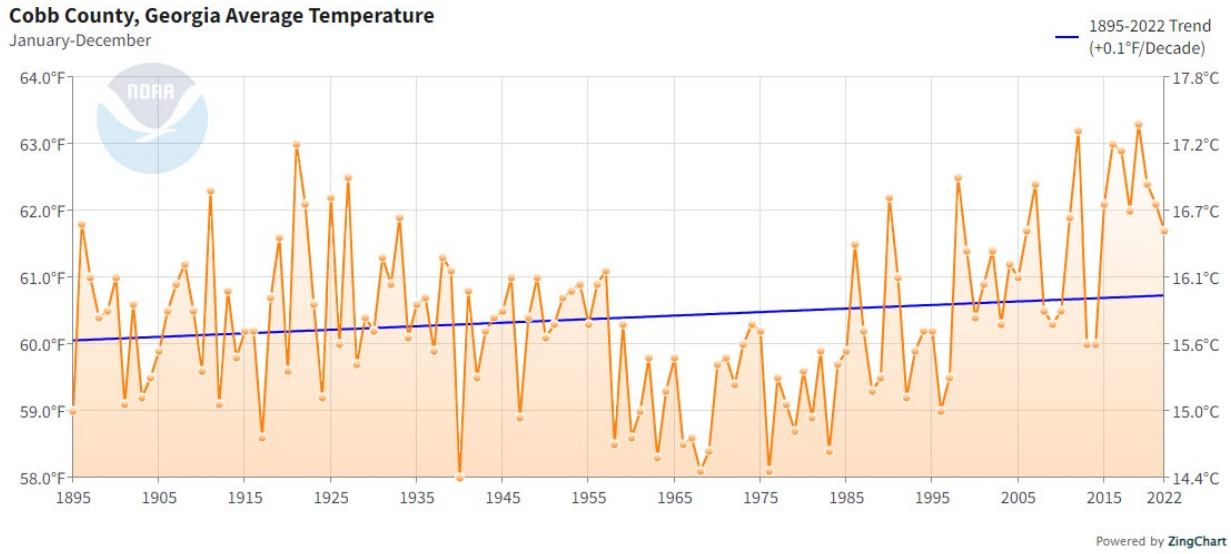


Figure 1: Cobb County Average Temperature 1895-2023, National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate at A Glance.

The minimum and maximum average temperatures in Cobb County have also shown a consistent increase, with the average minimum temperature rising more quickly of the two. It should be noted, in both cases, these represent a minimum and maximum average temperatures, which include, but do not represent, the absolute minimum and maximum temperatures for each year.

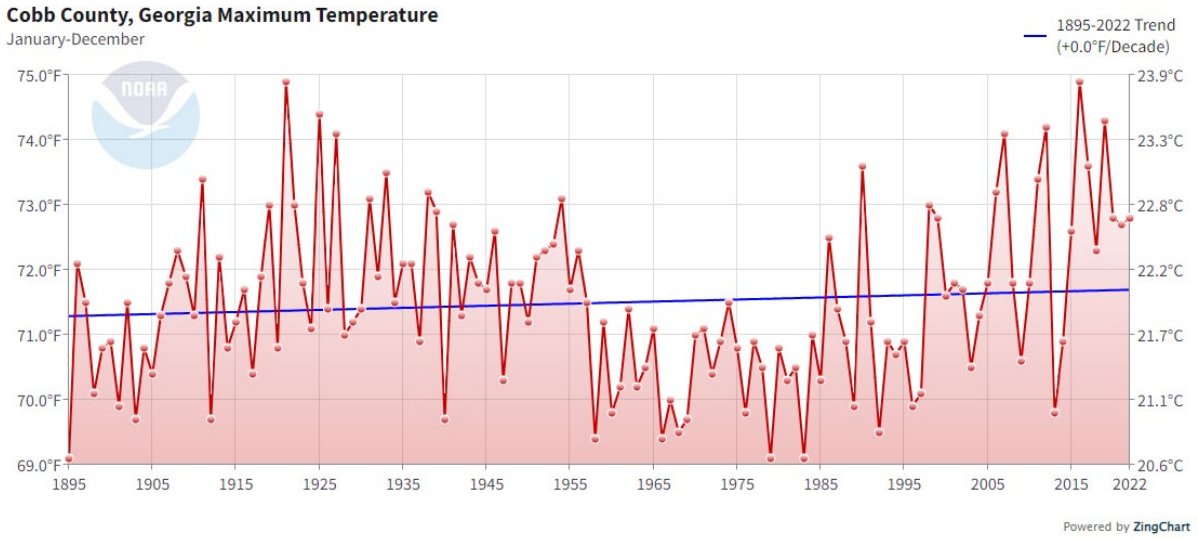


Figure 2: Cobb County Average Maximum Temperature 1895-2023, National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate at A Glance.

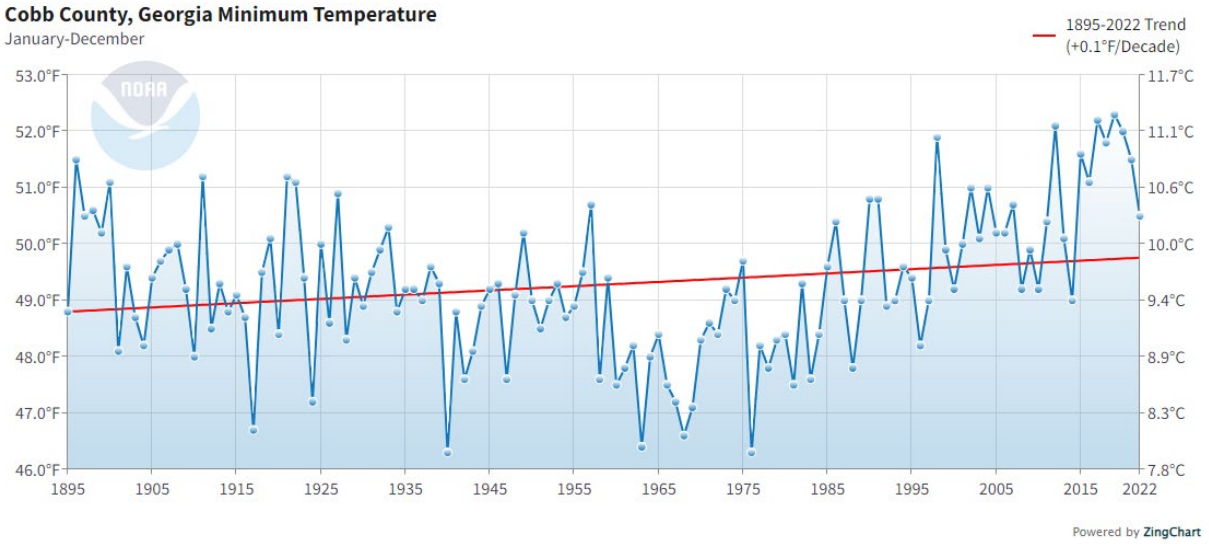


Figure 3: Cobb County Average Minimum Temperature 1895-2023, National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate at A Glance.

In addition to county-wide average warming temperatures, Kennesaw and Marietta, and our KSU campuses in particular, are likely to experience the impacts of densification and development in the form of Urban Heat Island (UHI) effect. The Environmental Protection Agency defines Urban Heat Islands as "urbanized areas that experience higher temperatures than outlying areas." Impervious surfaces such as buildings, roads, sidewalks absorb and re-emit solar radiation, warming the environment (and people) around them. Dense, urban areas that are heavily developed and largely paved over experience a concentrated UHI effect. Per the EPA heat islands areas can experience temperatures 1-7° higher than surrounding, less populated areas during the day, and 2-5° higher at night[3].

As a result of the warmer average temperatures and the exacerbating effects of UHI effect, a 2010 research study by Georgia Tech's Urban Climate Lab determined that while the average American city experienced 10 extreme heat days a year in the 1950's, that number had more than doubled by the mid-2000's[4]. A separate study by the lab also found that these extreme weather events (EHE's) were most acute in sprawling cities – including Atlanta (Figure 4). The study estimates an increase of over 0.3 days of EHE per year for the metropolitan area. As both Marietta and Kennesaw are becoming increasingly dense sprawling cities of their own, UHI is likely to have similar effects on our campuses.

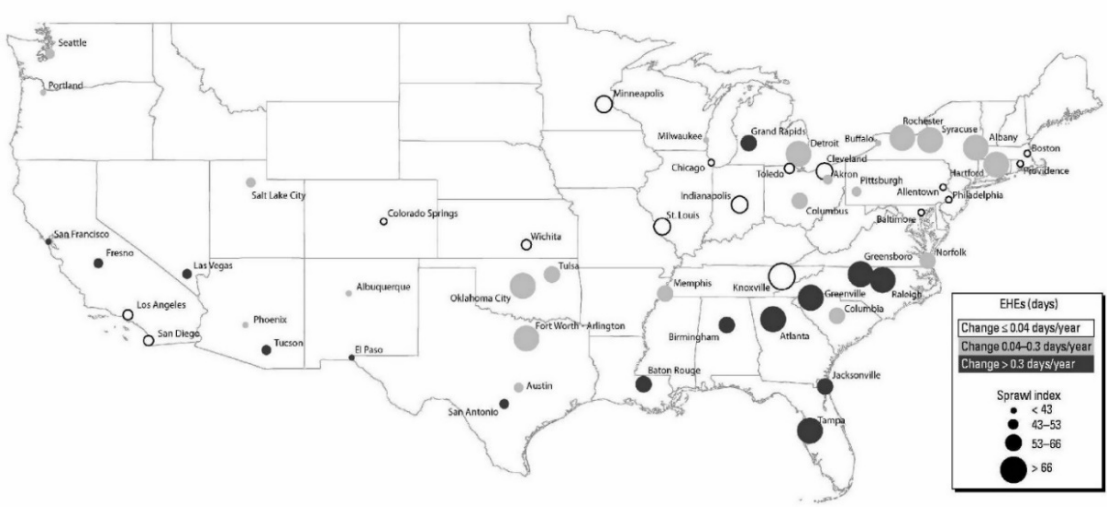
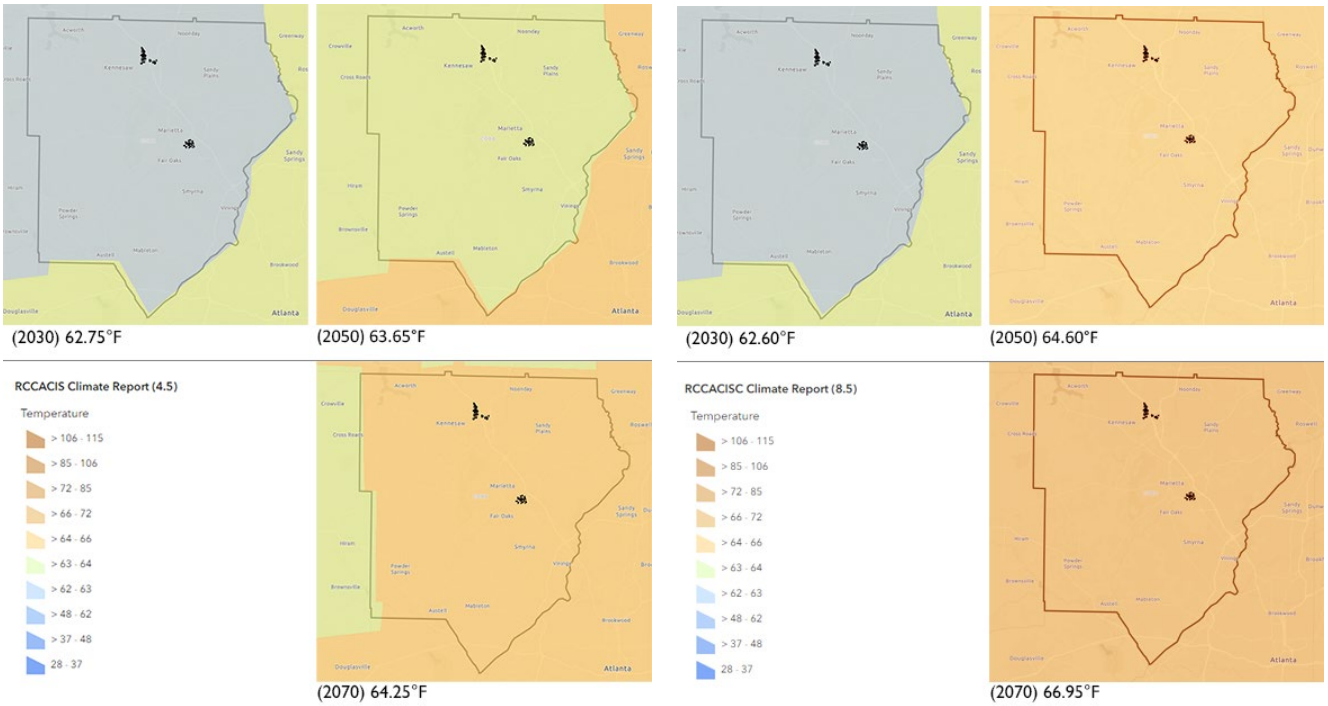


Figure 4: Sprawl ranking and mean annual change in frequency of Extreme Heat Events by metropolitan statistical area.

Projections

In its Fifth Assessment Report in 2014, the IPCC[5] adopted a series of pathways that describe future potential climate scenarios using different assumptions about future emissions of greenhouse gases. The Representative Concentration Pathways (RCP) range from RCP 2.6 to RCP 8.5, each of them identified by the predicted solar radiance value ranging from 2.6 W/m^2 to 8.5 W/m^2 respectively. For this study, we used data provided by the RCC-ACIS based on pathways RCP4.5, generally considered the "Lower Emissions" pathway and RCP 8.5, the "Higher Emissions" pathway.

Per the RCC-ACIS model, the historic average temperature in GA in the late half of the 20th century was estimated to be 59.50°F. In 2022, the average temperature was 61.7°F. Per the RCP 4.5 "Lower Emissions" model, the average temperature is predicted to rise to 62.75°F, 63.65°F and 64.25°F by the years 2030, 2050, and 2070 respectively. The RCP 8.5 "Higher Emissions" pathway predicts the average temperatures as 62.60°F, 64.60°F and 66.95°F for the same years. Comparing the two, the models show a roughly 1° difference between them by 2050, and a 2° difference by 2070.



RCCACIS 4.5 RCCACIS 8.5

Figure 5: Cobb County Average Minimum Temperature 1961 - 2023 from RCC-AIS models (4.5) and (8.5) data. GIS model by project team.

The Risk Factor tool developed by the First Street Foundation Research Lab[6] identifies four areas of risk by which to measure a property's environmental risks. For buildings on both campuses, the tool assigns a "Major Risk Heat Factor" between 5 (Marietta) and 6 (Kennesaw) out of 10, indicating a significant risk of elevated temperatures. A breakdown of the factors contributing to the major qualification emphasizes the growing risk of heat waves and high temperature days.

	Marietta			**Kennesaw**		
	1990's	2020's	2050's	1990's	2020's	2050's
Likelihood of "Heat wave" 103°F +	13%	53%	87%	14%	53%	87%
"Dangerous Days" 100°F +		14	29		16	32
"Health Risk Days" 90°F +		71	95		75	98
Days above 80°F +		148	163		150	163

Figure 6: Extreme weather projected data. Source: The Risk Factor reports for Marietta and Kennesaw campus address.

Separate modeling by the *Climate Mapping for Resilience* toolkit[7], developed by a Federal inter-agency initiative and managed by National Oceanic and Atmospheric Association (NOAA), shows the peak temperature in Cobb County using the same *lower emissions* and *higher emissions* models as before. While the lower emissions model caps the maximum temperature model just below 106°F, the higher emissions predict possible temperatures around 115°F by the last quarter of the century.

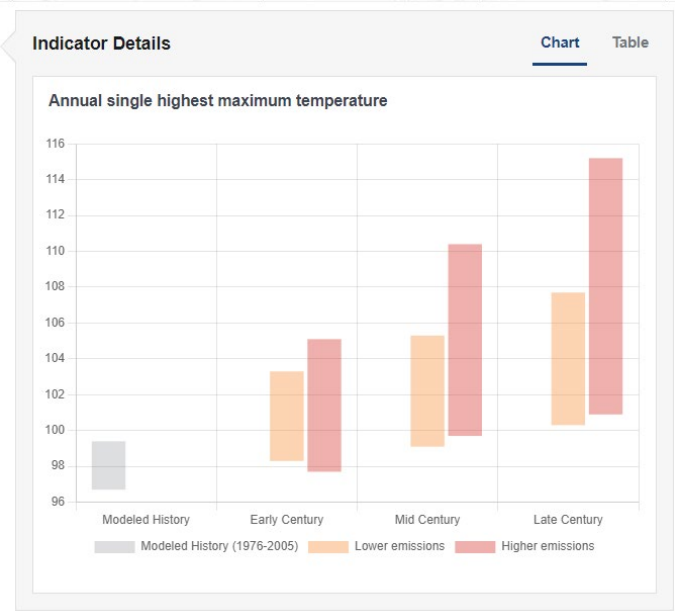


Figure 7: Modeled History, Lower and Higher emissions projected annual highest maximum temperature. Source: NOAA Climate Mapping for Resilience Adoption toolkit.[8]

A.2 Local Impact

Impact on energy consumption in the built environment

In the South, warmer weather increases the number of cooling days and requires mechanical systems to run longer. Among the reasons to consider the different predictive model variations is in calculating the return on investment (ROI) of energy efficiency projects. For the RCP 4.5 model, the *Climate Impact Lab* [9] predicts an increase in energy expenditure for Cobb County and is expected to rise 4% between 2012 and the 2040-2059 average. It can be assumed that the change in energy expenditure for the RCP 8.5 model would be proportionally greater.

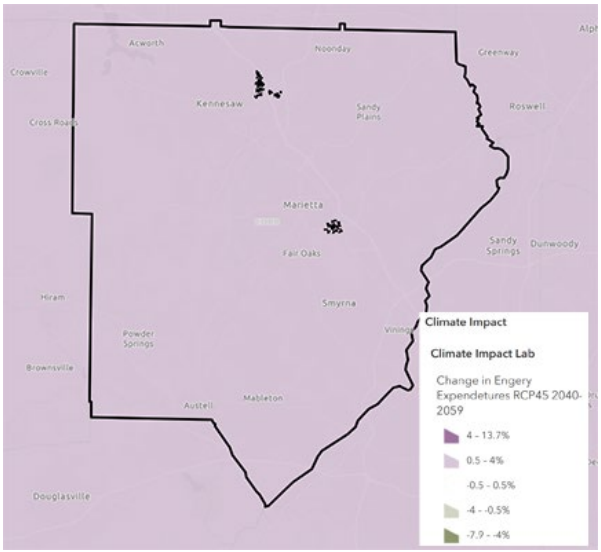


Figure 8: Cobb County Change in Energy Expenditure from 2012 to the average for 2040-2059 as modeled per RCP 4.5 by the Climate Impact Lab. GIS model by the project team.

Electric Grid Burden

As individual energy consumption increases, so does the burden on the electric grid serving our campuses. As illustrated by the 2003 Great North American blackout which left 24,000 sq miles from Chicago to NYC and north to Ontario in the dark, heat waves represent a risk to the integrity of electric grids. As temperatures rise and HVAC systems are run consistently, stresses to the infrastructure can cause large, interconnected areas to collapse. Data collected by GT's Climate Lab indicated that national electric grid failures were becoming more common between 1990 and 2010 (Figure 9). In 2022 Georgia Power prepared an updated Integrated Resource Plan which included a series of strategies to improve existing infrastructure, build resiliency and added distributed energy initiatives including the *Distributed Energy Resource (DER) Customer Program* and the *Income-Qualified Community Solar.*

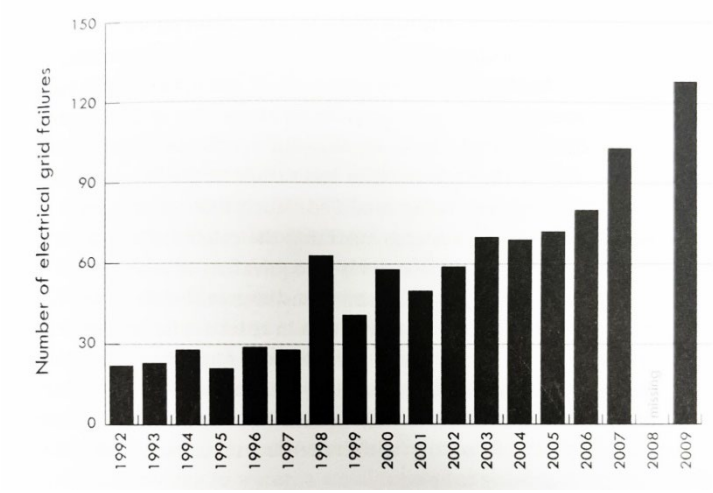


Figure 9: Annual Electric Grid Failures USA 1992-2009 from Stone (2012). Source: North American Electric Reliability Corporation.[10]

Plant Hardiness and Landscaping

As a result of largely warming temperatures, in November 2023, the US Department of Agriculture issued a new "plant hardiness zone map"[11] to reflect which plants are most adapted to current conditions. This is the first update to the map in over a decade and accounts for 2.5° warmer temperatures across the contiguous US. The new map moves Cobb County from Zone 7b, as it was mapped in 2012[12] (Figure 10), to zone 8a (Figure 11).

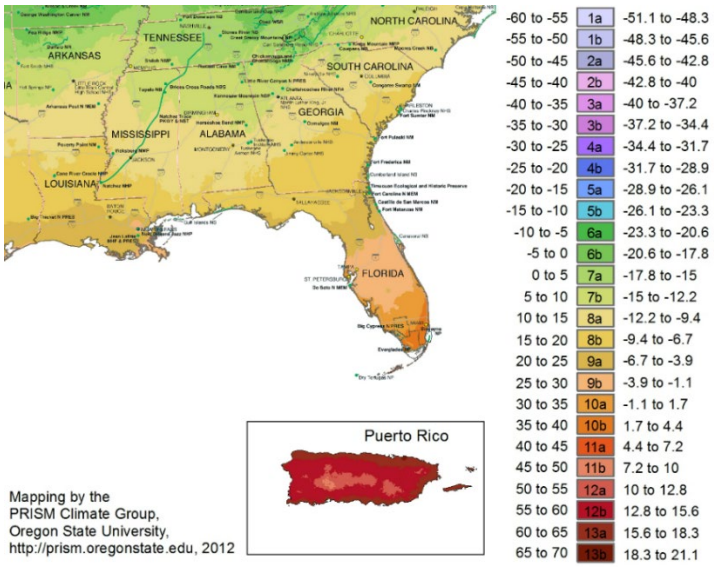


Figure 10 USDA's Plant Hardiness Map, 2012, depicting Southeastern region of the US. In this issue of the map, counties NW of Atlanta were identified as being in zone 7b.[1]

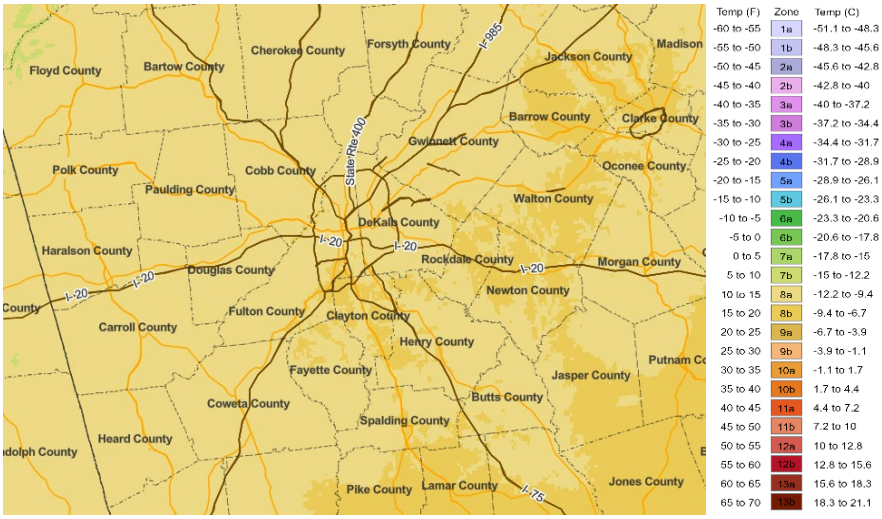


Figure 11 USDA 2023 plant hardiness regional county map, Cobb County zone 8a

Human Comfort

Most vulnerable to the impacts of heat waves, extended periods of health risk, and dangerously hot days; are children, the elderly, and more frequently in the case of KSU's population, those required to spend a considerable amount of time outside, including athletes, staff, and individuals looking to use alternate modes of transportation. Human activity is particularly vulnerable to UHI effect and benefits most directly from smaller, local-scale urban heat island mitigation measures.

A.3 Assets & Opportunities

Green Infrastructure

Trees and other vegetation help to mitigate the impact of the Urban Heat Island effect in two major ways: shading and evapotranspiration.

Shading: The leaves and branches of trees decrease the amount of solar radiation that is allowed to reach the surfaces beneath them. Different trees provide different levels of protection. Per the EPA, "generally 10-30% of the sun's energy reaches the surfaces below a tree. In areas impacted by winter weather where deciduous trees lose their leaves, as much as 80% of the solar energy is allowed through, warming the surface during the colder weather days.[13] Several tests conducted by the EPA measured surface temperature reductions in shaded building walls ranging from 11-25°.

Evapotranspiration: Is the combination of two plant processes. "Transpiration" occurs as plants absorb moisture through the roots and emit it through the leaves. "Evaporation" occurs as trees and plants capture precipitation on their leaves and allow it to evaporate into the air. The combination of the two is called evapotranspiration and produces a cooling effect in the area immediately around the vegetation.

- Existing Tree Canopy

An estimated canopy inventory of the campus was prepared using historic and current satellite images from the Google Earth archive and CAD drawing software. It must be noted, that given the limited quality of the satellite images, and the variation in the time of year of the available images, there is a significant margin of error. The estimate does appear to show that the average square footage of tree coverage on both campuses has remained consistent throughout the last 20 years, showing perhaps even some net increase as the existing trees have matured and the circumference of their canopy increased. (Figure 12) Additional calculations were done using the *i-Tree Canopy* tool[14]. The tool estimated a 32% Tree canopy cover for the Marietta campus and 22% for the Kennesaw campus.

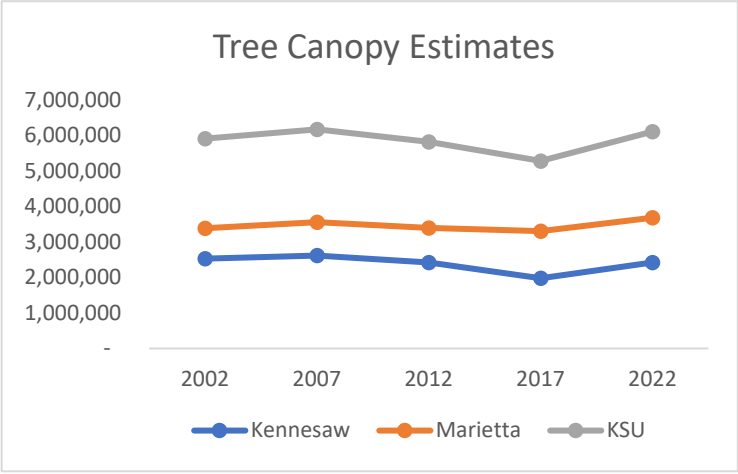


Figure 12: Historic tree canopy estimated sqft coverage by campus. Area take-offs by project team from archival Google Earth imagery for the corresponding years.

The tree canopy is currently protected by Cobb County's modest tree ordinance. The ordinance requires that all existing tree replacements must produce a total of no less than 15 density units per acre.[15] The City of Marietta has a stricter requirement of 17 density units per acre and a comprehensive list of allowed species. The Marietta campus is required to comply with this stricter requirement.

KSU Tree Care Plan

KSU faculty and staff developed a Tree Care plan in 2018 that includes a detailed tree replacement chart intended to be used alongside Cobb and Marietta jurisdiction requirements. The plan also stipulates the requirement for green space design during the design of new buildings and renovations. It further includes provisions for compensation for trees required to be removed for the construction of a new project, and the requirement that KSU develop a tree Inventory. The KSU Tree Care plan has not yet been adopted by Campus Operations or Campus Planning, Design and Construction, and offers an opportunity to evaluate, update and adopt a revised Tree Care Plan.

UHI – Tree Planting Plan

Develop strategy and policy prioritizing tree plantings in areas that support alternate community and transportation including along major pedestrian and bicycle circulation arteries and key connection points with Cobb Country transportation systems and trails.

Alignment and Partnership with Cobb Trees

Keep Cobb Beautiful's Cobb Trees program has a mission of "*Planting a greener Cobb*". The program works closely with the Georgia Forestry Commission, Cobb County Public Service Agency, the Department of Transportation, Community Development, and Property Management. The county has also developed the Cobb Tree Fund to provide trees to be planted in lower income neighborhoods, schools etc. Aligning with Cobb County's mission and master plan might help inform the types of trees we chose to plant, and help identify priority areas for conservation, increased planting density, and placement – particularly in areas critical to circulation and public transportation access.

- Tree Inventory

The Office of Sustainability has initiated the preparation of a campus inventory in GIS with an expected completion date of March 2024. The inventory will include the quantity, species, and caliper of all trees on both campuses.

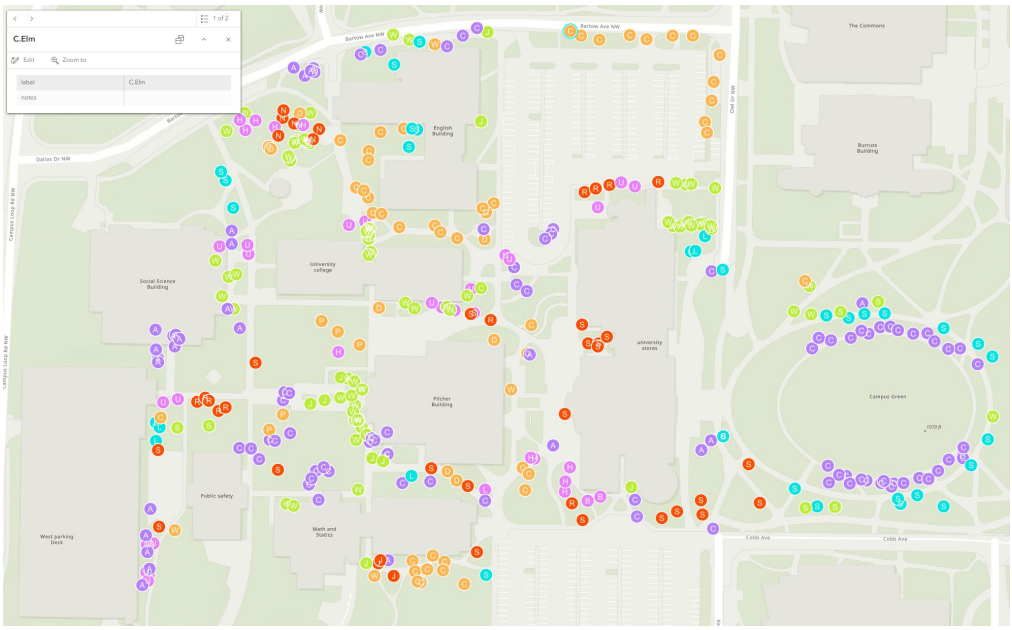


Figure 13: Office of Sustainability Tree Inventory currently in progress, completion date of March 2024.

Comprehensive Landscape Inventory

Current Canopy mapping and Tree inventory efforts only account for campus trees and do not address other campus plants or groundcover, both of which also contribute to the mitigation of heat Island effect. Consider creating comprehensive inventory to capture other plant species.

- Arboretum

The Arboretum on the west side of the Kennesaw campus covers about 6 acres of land behind the Science and Mathematics building. The area was outlined and dedicated in 1976 and has helped to support countless academic programs since its foundation. The arboretum has been measured and recorded in at least three separate instances since 2008, most recently in 2014. The survey shows a wide variety of mostly native trees and their relative size at the time.[16]

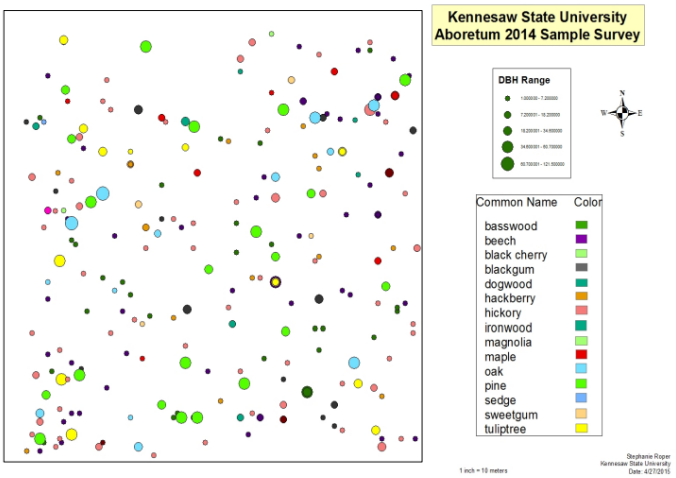


Figure 14: from "Structure and Composition of The Kennesaw State University Arboretum: Past and Present", Roper, Stephanie. and Nancy Pullen, PhD. Department of Geography and Anthropology, Kennesaw State University.

Tree Campus USA

Local peer institutions UGA and Georgia Tech are both recognized as Tree Campus USA schools having met a series of criteria that include the development of a Green Infrastructure or Landscape Master Plan. The Inventory currently under development by the Office of Sustainability, as well as the Tree Care plan, if implemented, would put KSU on the path to certification. The certification also requires the creation of dedicated annual expenditures for tree maintenance and growth which would in turn provide resources to implement the designed care plan. Other Tree Campus USA requirements include the observance of *Arbor Day* and student-learning opportunities which would both fall under the purview of the Office of Sustainability and its campus partners.

- KSU Plant list

KSU's Facilities Planning and Design Guidelines include a curated plant list that considers maintenance requirements. The list currently consists primarily of native species.

Update KSU Plant list & Standards

Following the publishing of the plant hardiness map, KSU should consider reviewing the plant list and making adjustments that reflect new conditions. The list should also consider increasing the number of pollinator plants and others that support biodiversity. Consider the revision of its current published plant list to reflect the recommendation changes of the USDA.

- American Chestnut

KSU made the surprising discovery of two American Chestnuts in the surviving forest at the Field Station. American Chestnuts were once abundant in the US, estimated to number around 4 billion at their peak – before being threatened with extinction during the 20th century caused by a fungal disease. These two surviving specimens protect the forest from further development.

American Chestnut: Research and breeding

Prof. Kyle Gabriel and Michael Blackwell received a grant from The American Chestnut Foundation to research the breeding and maintenance of these trees from the samples on site. Additional breeding and proliferation projects may be considered in partnership between the Office of Research and Campus Operations.

- The Oasis

The Oasis is a hands-on outdoor classroom and one of the most unique and innovative laboratory spaces on campus enabling biology students to study native Georgia plant life. The Oasis was built in the unused courtyard space between the Science Building and the Science Laboratory building in the Clendenin building. The initiative, which includes a water basin containing and surrounded by a diverse array of plant species, was funded by a generous donor, Dr. Joseph Cook, and named "The Oasis" by the College of Science and Mathematics students in the CSM Courtyard naming contest.

"Pink Lady's Slipper conservation/restoration"

KSU's Kennesaw Campus used to be home to a large population of native Pink Lady's Slipper orchids, *Cypripedium Acaule*. These showy wildflowers typically only grow in undisturbed areas as they depend on interactions with mycorrhizal fungi. Georgia is the furthest south that these flowers will naturally grow and are protected by law on all Federal land. The Pink Lady's Slipper orchid's population lived in the space now between the Science lab addition and The Summit residence hall. These plants were removed during the site preparation and construction process and, to our knowledge, no longer exist on KSU's campus. KSU may look for opportunities to support assisting in the re-establishment of the species in areas identified for conservation on campus, and creating a policy to review their removal if any are found.

- Pervious/Impervious Surfaces

Mapping of impervious surfaces in both campuses and calculations using the *i-Tree Canopy* tool calculations estimate 58% impervious surface cover in the Kennesaw campus as shown in Figures 15a and 15b and 53% of the Marietta campus are covered with impervious surfaces as shown in Figures 16a and 16b. Primarily made up of parking lots and garages, buildings and roads, these impervious surfaces absorb solar radiation and drive the UHI effect on campus.

Figure 15a: Kennesaw Campus, Impervious surface map. GIS map by project team.

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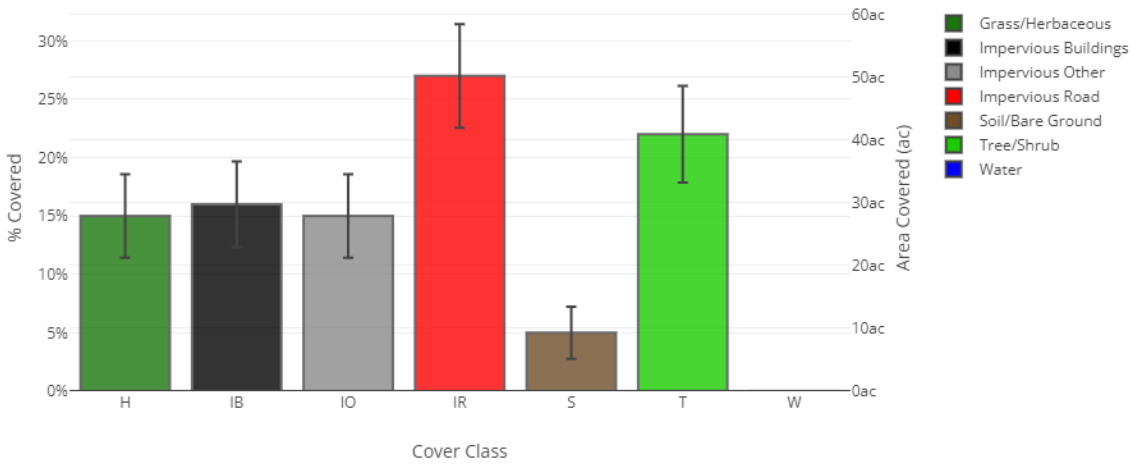


Figure 15b: Kennesaw Campus ground cover percentages. Created using iTree by project team.

Figure 16a: Marietta Campus, Impervious surface map. GIS map by project team.

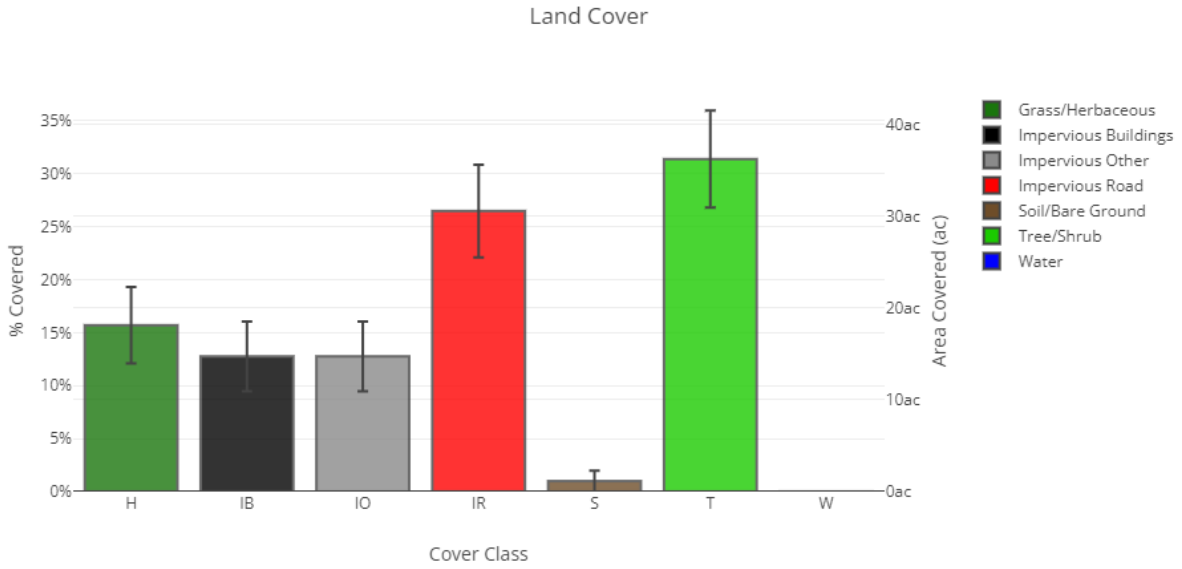


Figure 16b: Marietta Campus ground cover percentages. Created using iTree by project team.

- Cool Roofs

While some of the older buildings in each campus still retain their older roof systems, most new construction since the early 2000's has been limited to the use of "cool roofs", largely driven by increasingly stringent code requirements as well as KSU's own design guidelines. The *Facilities Service Planning, Design, & Construction Services Architectural & Engineering Design Criteria* require roofing materials with a solar reflectance index (SRI) of greater than 78 for low-sloped roofs and 29 for high-sloped roofs.[17] As older roofs continue to be replaced, KSU has an opportunity to continue to install high reflectance roofs, which reduce heat absorption and improve building performance and efficiency.

Green Roofs

In addition to cool roofs, green or landscaped roofs are also considered potential UHI mitigators. Much like the vegetation on ground level, the vegetated roof insulates the roof slab from direct solar radiation, keeping the building's interior cooler and reducing heat load to mechanical systems. To date, green roofs have been considered on several projects, most recently, the forthcoming STEM building in the Marietta campus. In all cases construction of the green roof has been value-engineered from projects due to budget constraints.

Solar Roofs

Roof-mounted solar panels offer modest insulation from solar heat gain compared to green roofs but can help contribute to UHI mitigation. A study by the University of California, San Diego, used infrared images to measure heat absorption of the roof in the case of PV panel installations and found a 5% decrease in the roof's heat load.[18]

Ground cover design standards/considerations

Along with new design projects, including master plan and stormwater management plans, there is an opportunity to re-establish priorities for selecting ground cover including: optimizing the width of walkways, minimizing the impact on previously undeveloped property and selecting materials with higher albedo that reduce heat absorption.

Energy Efficiency

As the average temperatures increase driving up energy consumption, the ROI on the higher performing buildings becomes increasingly valuable. Higher performance, energy efficient buildings optimize their mechanical systems as well as the building envelope and decrease internal consumption and heat loads.

The recent Greenhouse Gas Inventory prepared in partnership with consultants Glumac and Bluestrike, showed a considerable reduction in energy consumption in FY 2022 compared to pre-pandemic years. Energy efficiency improvements can be attributed to (1) LED and other lighting improvement projects, (2) major

renovations of existing buildings that include envelope and mechanical system improvements, and (3) increased remote work and teaching.

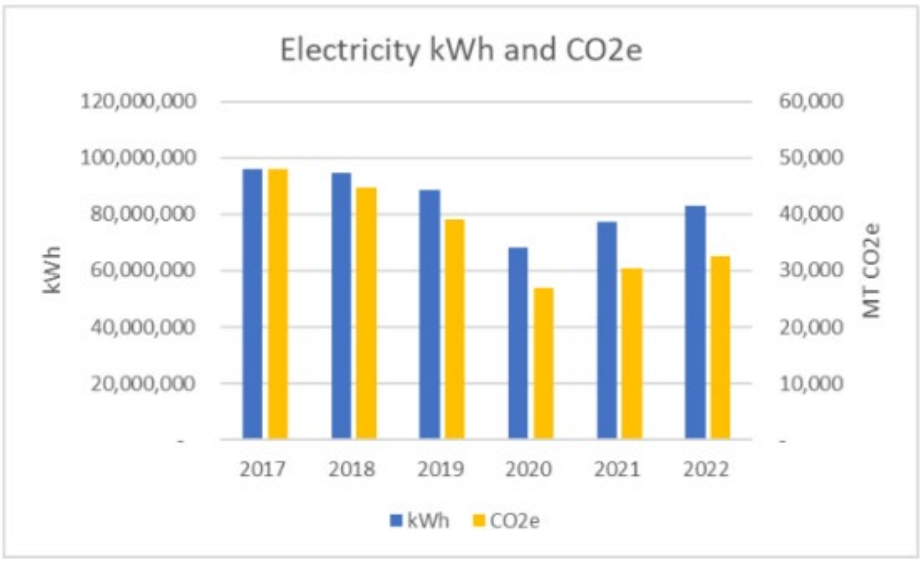


Figure 17: KSU Energy consumption 2017-2022. Greenhouse gas Inventory prepared by Glumac 2023.

In addition to the increased energy efficiency, the CO2e reduction shown in the graph is also due to the cleaner energy mix of two of KSU's energy providers: Georgia Power and Cobb EMC. (Marietta Power has not yet provided its historic energy mix). Significant in KSU's projected emissions from power is Georgia Power's increasing capacity for generating nuclear power with the expansion of Plant Vogtle, which is expected to be fully operational in 2024. While reducing carbon emissions is within the scope of KSU's Sustainability Opportunities, they are not directly included in this project's scope, while the Greenhouse Gas Mitigation plan remains ongoing.

- High Performance Buildings

Building certifications such as LEED have long encouraged energy efficiency. In recent years, building codes throughout the country have increased performance requirements, in some cases even surpassing green building certification pre-requisite standards. KSU's older building stock presents both a disadvantage and opportunity for improvement. Many of KSU's buildings were built even before the 1994 Universal Code which first established consistent requirements throughout the state. Only a handful of buildings have been constructed since Georgia's adoption of the 2018 ICC, which establishes energy requirements like those in LEED's prerequisites. The current International Energy Conservation Code (IECC) 2015 referred to be the ICC and currently adopted in Georgia refers to ASHRAE 90.1-2013, which built on the 2010 version requiring 30% lower energy consumption than earlier versions. This higher State standard means that even non-certified buildings are required to exceed the performance requirements of their predecessors. Georgia code, however, has not kept up with certification

requirements which, for the current LEED V4.1, require meeting ASHRAE 90.1-2016. KSU's own requirements refer to ASHRAE 189.1-2014 which was designed to exceed the code requirement but does not yet meet LEED's current pre-requisite.

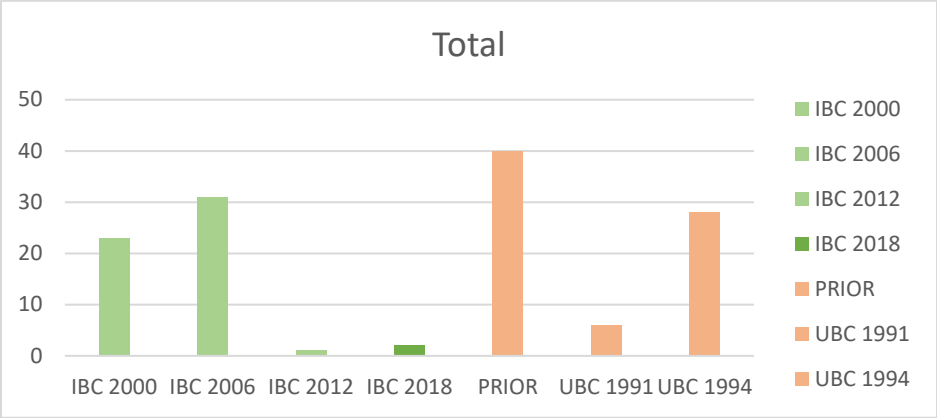


Figure 18: Count of KSU building stock by applicable code summary.

Between 2010 and 2016, KSU and SPSU buildings achieved LEED certification on 18 new construction projects. Fourteen achieved "Silver" Certification, while The Commons, Prillaman Health Sciences and the Science Laboratory achieved Gold. In the past, KSU's 17 LEED certified buildings only pursued about 25% of the available energy credits. (See Appendix 2: LEED Credit summary for a list of credits pursued for all certified projects.)

Most recently, the Academic Learning Center earned two "Peaches" from the Georgia Peach program. Although detailed point calculations were not available, the 2 out of 5 peach awards it received would indicate that the energy efficiency contributions were similar to the previous LEED projects.

Certification	Building	Year	Certification Level
LEED			
V2.2	Marietta - (SPSU ETC)Engineering Technology	2012	Silver
V2.2	Marietta- Design Building II	2012	Silver
V2.2	Marietta - SPSU Student Housing Phase III	2011	Silver
V3 Homes	Marietta - SPSU Special Interest Housing #1-9	2011	Silver
V2.2	Kennesaw - The Commons (The New Dining Hall)	2010	Gold
V2.2	Kennesaw - Prillman Health Sciences	2012	Gold
2009 NC	Kennesaw - Science Laboratory	2016	Gold
2009 NC	Kennesaw - Siegel Students Recreation and Activities Center	2016	Silver
2009 NC	Kenesaw - Education Building	2016	Silver
GA Peach			
	Academic Learning Center	2022	2 Peaches

Figure 19a: List of certified Higher Performance Buildings

Optimize Energy Efficiency Targets

Whether KSU chooses to pursue LEED certification in the future or not, it should seek to maximize energy efficiency measures as described by both the LEED and the Georgia Peach certification programs.

Pursuing LEED: In 2015, Georgia passed the Georgia State Bill HB255, which included language prohibiting state agencies from pursuing green building certifications that required FSC certification for lumber, which disadvantaged GA lumber growers. At the time, the language in LEED disqualified USG institutions from pursuing the certification. LEED V4.1 changed the language of the materials credit so that HB255 no longer applies. This change provided new paths that recognize SFI- and ATFS-certified forest products. These adjustments make the LEED rating systems available for Georgia state-funded projects again (Blackwelder, 2021). The Georgia Forestry Association supported the change, and Governor Kemp supported the pursuit of LEED in state buildings. GT has registered (though not yet certified) 11 new projects as of December 2023, as well as incorporated LEED Platinum as a benchmark requirement in their Design guidelines for all new construction and capital renovation projects.

- Standardized Energy Efficient Best Practices

KSU has created energy efficiency standard best practices including the use of Energy Star Appliances and the installation of LED light fixtures on all new construction projects.

Additional Standards for Energy Efficiency

* Create a requirement for replacing all existing fixtures with LED as replacements are required.
* Establish a standard for occupancy/motion sensors for all capital new/renovation projects.
* Establish a policy against the use of space heaters in private offices.

- Building -Level Metering

To better understand the energy consumption and usage patterns of our existing buildings, building-level meters were installed in 26 buildings prior to 2020. Visibility to these meters was given to Campus Operations through an internal dashboard and to the student and faculty through an external dashboard. Persistent connectivity issues have plagued both dashboards and meters since their installation, limiting the usefulness of the data collected. A project is currently underway (November 2023) to correct installation issues. It was also discovered that floating IP addresses in a small percentage of the meters had left several of them untraceable from the dashboard. All issues are expected to be corrected by the end of the calendar year.

Figure 19b below shows relative building energy use intensity, with buildings in green being the lower energy/soft consumers and in red the highest. The project team believes these figures will need to be revised once the meter installation is complete and newer, more reliable data can be collected and verified against inventoried billing data.

A separate effort is underway to complete the installation of building-level metering, by installing meters in the buildings that are yet to have one. That project is also expected to be completed by the end of 2023. The *Energy and Water Dashboards* are intended to be made available to the public once again when the meter connections have been finalized. The additional transparency and improved quality of the data received will allow Campus Operations to detect problems and inefficiencies much more readily and allow the Office of Sustainability to collect data on building usage and occupant behavior that may lead to education and engagement opportunities.

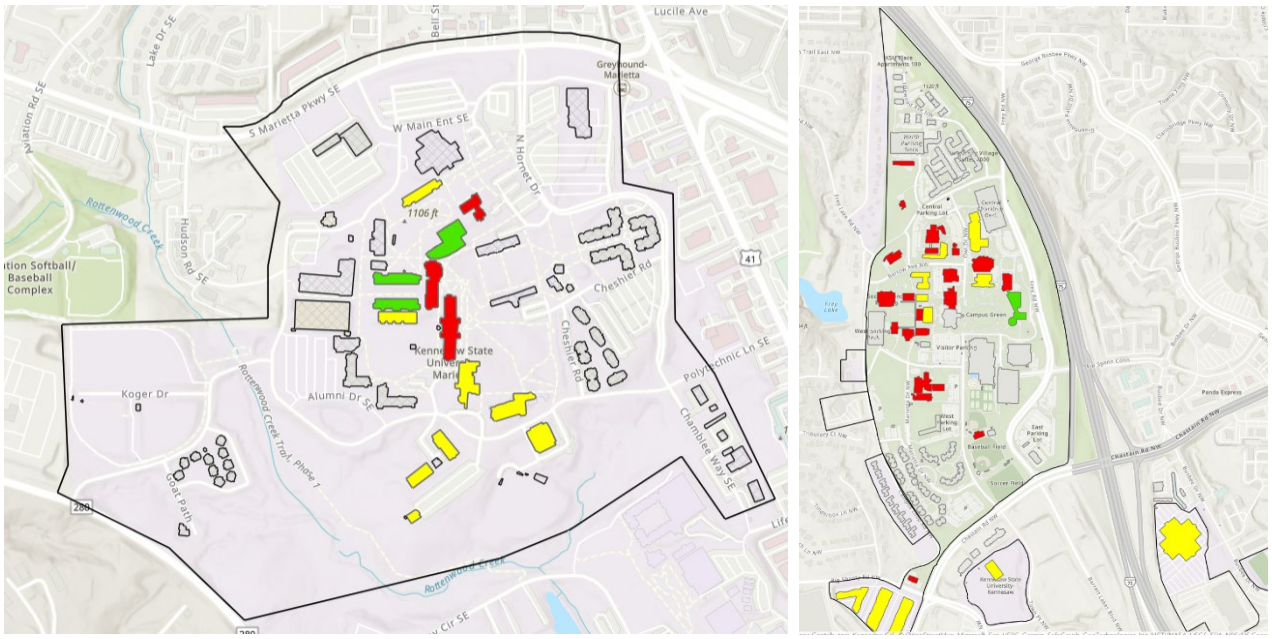


Figure 19b: Current Energy Use Intensity maps for building-level metered buildings by campus. GIS map created by project team; data collected from existing Delta dashboard.

Submetering

Submetering within buildings can provide additional, detailed information about energy use and can facilitate the early identification of failing systems. Examples of metered equipment can include groups of plug loads, individual boilers, chillers, etc. Submetering can also be provided for gas and water metering.

- Energy Audits

Several no-cost energy audits were performed through Grants to Green which resulted in energy efficiency improvements projects as part of building renovations. The list of audited buildings was not identified as a part of this project.

Prioritized Energy Audits Policy

(1) Comprehensive Energy Audits are recommended to be required to be conducted *prior* to the budgeting or programming phase of any capital renovation project being considered. 2- Energy Audits should be integral and concurrent to all Facility Condition Assessments (FCA) 3- Older, high energy consuming buildings should be prioritized for Energy Audits.

- GA Power Energy Audits

GA Power offers rebates on eligible energy efficiency projects. Several recent projects have been submitted for Georgia Power Energy rebates by project managers, housing administration and by Campus Operations. While not reducing the initial cost of installation, they do represent an opportunity to improve on the ROI of renovation projects, or fund additional projects.

Recurring Facilities Condition Assessments

Currently there is no standard for maintaining current Facility Condition Assessments for all campus buildings. Establishing a 5-10 year cycle for recurring FCAs that incorporate Energy Audits would support the maintenance of a prioritized renovation and maintenance project list.

Envelope Improvement Project Priority List

Mechanical system efficiency, and therefore energy efficiency, is often driven by air and moisture infiltration and leakage through the building envelope (insulation, windows, roof, etc). A prioritized list of envelope improvements as identified by the FCA's would support energy efficiency efforts.

- Renewable Energy

Solar Tables

There are several solar-powered tables throughout both campuses. The tables provide convenient locations for the KSU community to charge devices during the day while sitting to work, eat, or rest. While a full inventory of the tables was not conducted as a part of this study, the team did note concerns that several of them were not currently collecting a charge.

Current Solar PV Installations

There are currently two solar installations on the Marietta campus, neither of which connects to a building system or grid and were originally intended primarily for research. There is currently a 5kW rooftop system on the ETC Building and a 10KW ground-mounted at the greenhouse nearby. Campus Operations does not access the data to or maintain either array. In the past, KSU has made efforts to introduce renewable energy on campus.

Proposals for Rooftop Solar

In 2021, KSU was provided with a proposal from a third-party vendor to install a 1,500kW system, with a potential of energy offset of about 5%. The proposal included installation of flat PV arrays on the roofs of the buildings listed in Figure 20. At the time, the proposal included only buildings in the Kennesaw campus where power is provided by either EMC or Georgia Power. Marietta Power's fee structure did not make the installation of PV's on that campus an economically viable option for the vendor. In this model, the panels would be installed and owned by the vendor who would cover the cost of installation and maintenance and sell the power back to KSU at a lower cost than the utility. The project estimated a benefit of $1.88 million to 2.45 million over a 20-year period. At the time, the proposal required a 20-year contract, which exceeds the contract limitations allowed by the USG.

Building	Estimated kW capacity of roof array (2021)
Bookstore	123 kW
Education Building	109 kW
English Building	126 kW
SRAC	757 kW
The Commons	84 kW
WellStar CHHS	264 kW

Figure 20: PV array capacity for Kennesaw Campus buildings as proposed by third party vendor in 2021.

Peer Institution Energy Efficiency and Resiliency Projects

Several of our USG peer Institutions have begun to incorporate PV arrays on a variety of campus projects. In 2012, UGA installed an 18kW array on the roof of the Jackson Street Building, which aptly houses programs in the College of Environment & Design. Later, in 2015, UGA partnered with Georgia Power on the installation of a 1-megawatt solar array in an underutilized agricultural field near the University's Sports complex. As a Living Learning Lab project, the array includes several different types of sun tracking technologies which support engineering research. Georgia Tech has also installed several rooftop arrays. The earlier installation on top of the Recreation Center was recently decommissioned. By contrast, the array on the Carbon Neutral Energy Solutions Laboratory Building remains active and produces an average of 396,000 kW hours per year. The installation in that case includes both rooftop and carport installed PVs. GT's largest installation to date is the 330kW array on the roof of the Kendeda Building. The array consistently produces twice the energy consumed by the building. In an effort to reduce the need for battery storage and to the support the University's grid during peak hours, the Kendeda does not store the vast majority of the energy it produces (storage capacity is limited to enough for emergency power for 48hrs), instead it feeds the power to the grid immediately – during the daytime hours when the neighboring lab and academic buildings are most likely to be consuming their peak loads. The most recent installation at GT is of a modest array on top of its Teck Reck garage which houses the University's mascot vehicle.

❖ Inflation Reduction Act

The Inflation Reduction Act creates the opportunity for non-profit and tax-exempt governmental institutions to benefit and apply for rebates on energy optimization, renewable energy, commercial clean vehicles and EV infrastructure projects among others.

Identify Current and upcoming projects for funding

Current EV charging infrastructure improvement projects, mechanical retrofits, energy optimization and fleet purchases may be eligible for the IRA. Current projects should be reviewed and processes and staffing put in place to support the application process.

B. Precipitation

B.1 Conditions

Historic

Along with increased temperature, Cobb County has seen and is projected to see an increase in precipitation. Since 1895, Cobb has experienced an average of 0.26" increase in precipitation per decade – including periods of extreme drought and extreme rainfall.[19]

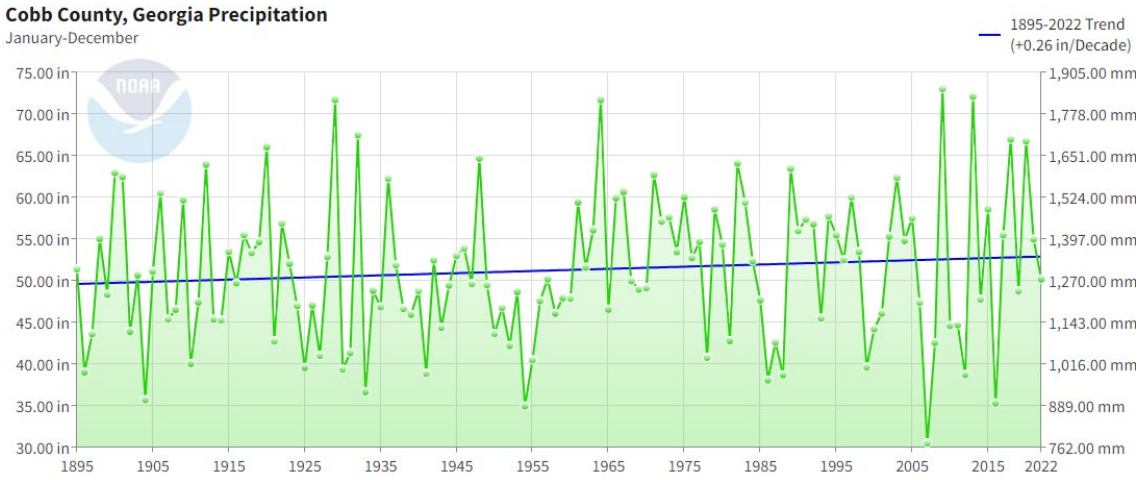


Figure 21: Cobb County Average Precipitation 1895-2023, National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate at A Glance.

Despite the general trend towards increased rainfall, it is important to note significant periods of decreased precipitation and drought which can have a significant impact on campus operation practices as well as the state economy more broadly. In the 128-year period analyzed, the minimum rainfall occurred rather recently in 2006. The graph below from NOAA similarly depicts the significant deviation from average rainfall for the same time period.[20]

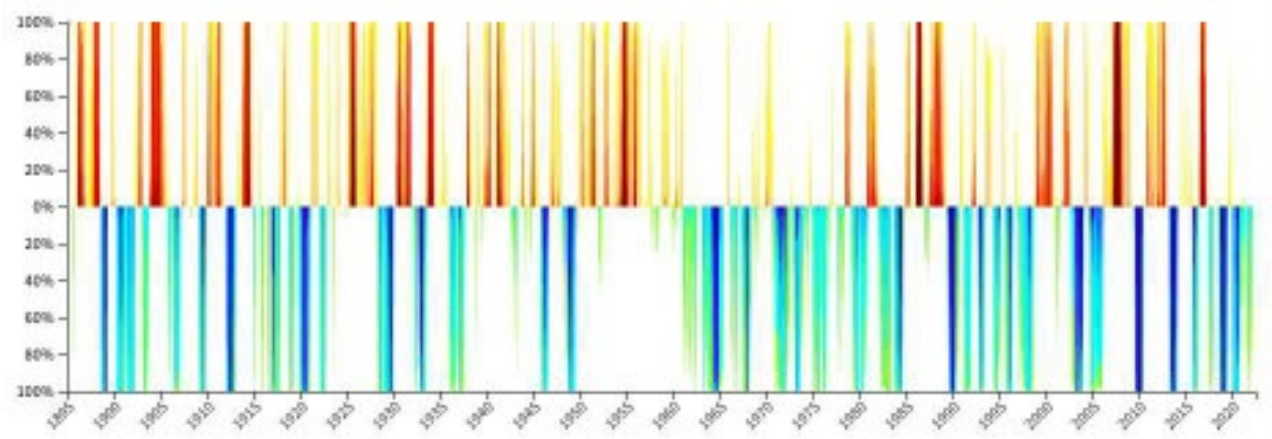


Figure 22: Droughts and Precipitation as Deviations from the average in Cobb County. Top bars indicate drought, and the bottom precipitation. The darker colors indicate a larger deviation from average. Source: National Oceanic and Atmospheric Association's Climate at a Glance Historical Data (2022) in (Garcia, 2022).

Projections

The Climate Mapping for Resilience and Adaptation models per the RCP *lower* and *higher* emissions scenarios also point to both an increased likelihood of periods of extreme heavy or decreased rainfall, signaling that while Cobb's average annual rainfall is likely to increase, the likelihood of flooding and drought events is also projected to increase. The predicted increased variability suggests the importance of stormwater management and storage strategies that leverage high precipitation events to optimize a consistent water supply.

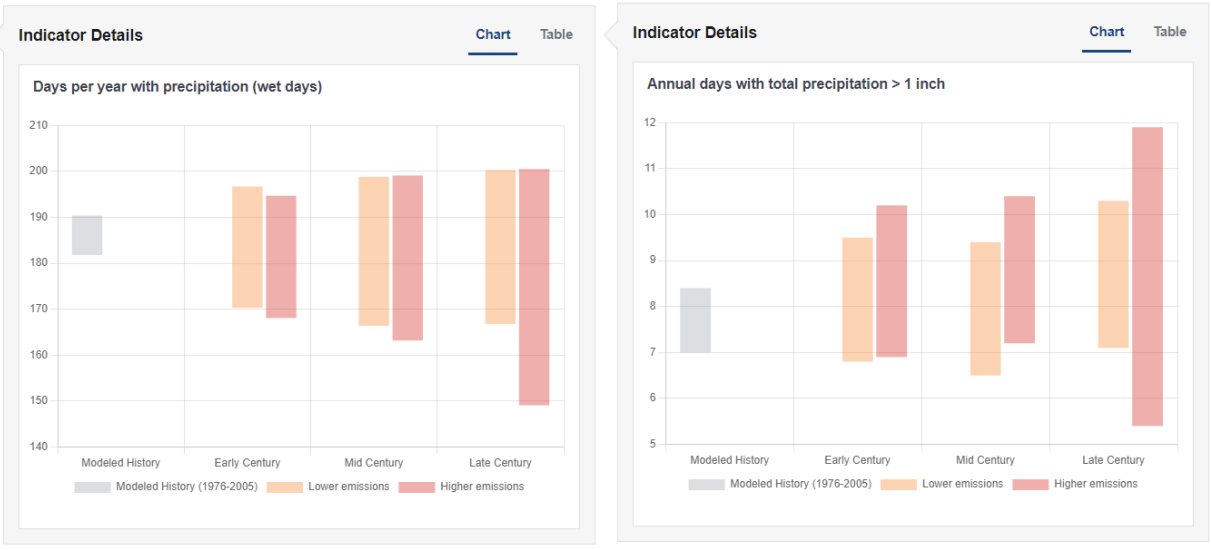


Figure 23: Modeled History and lower and higher emissions projected annual wt days and days with precipitation over 1". Source: NOAA Climate Mapping for Resilience Adoption toolkit.

Studies[21] have found a correlation between UHI attributed to large urban areas to increased precipitation down-wind from large, and sprawling cities. Jordan McLeod and Marshall Shepherd's (UGA) study of patterns of rainfall around Atlanta, leveraged emerging radar and gauge-based precipitation data to map and examine rainfall in and around Atlanta. It concludes that the "pattern of rainfall anomalies is most evident in the early evening hours of the day, after the skin or surface temperature UHI is able to force deep convective lift" and found the greatest impact in areas to the northeast of the city, in the direction of the predominant winds. From this and similar studies, it can be inferred that as Kennesaw, Marietta, and neighboring communities densify, it is likely that our campuses will be impacted by increased precipitation and well as temperatures driven by the UHI effect.

B.2 Impact

Flooding

While The Risk Factor[22] assigns Cobb County a "Moderate" Risk Factor for flooding, it assigns a minimal risk factor for both KSU properties. In both campuses, most buildings are outside of the FEMA-identified flood zones. In the Kennesaw campus, only the houses on the west side of the Campus Loop are within the "moderate" level of threat. The athletic field spanning between Big Shanty Road and George Busbee Pkwy NW are significantly impacted by the "moderate" level flood zone. Any design in either of these areas should consider the potential for increased flooding risk as projected in the RCP 4.5 and 8.5 models as follow below.

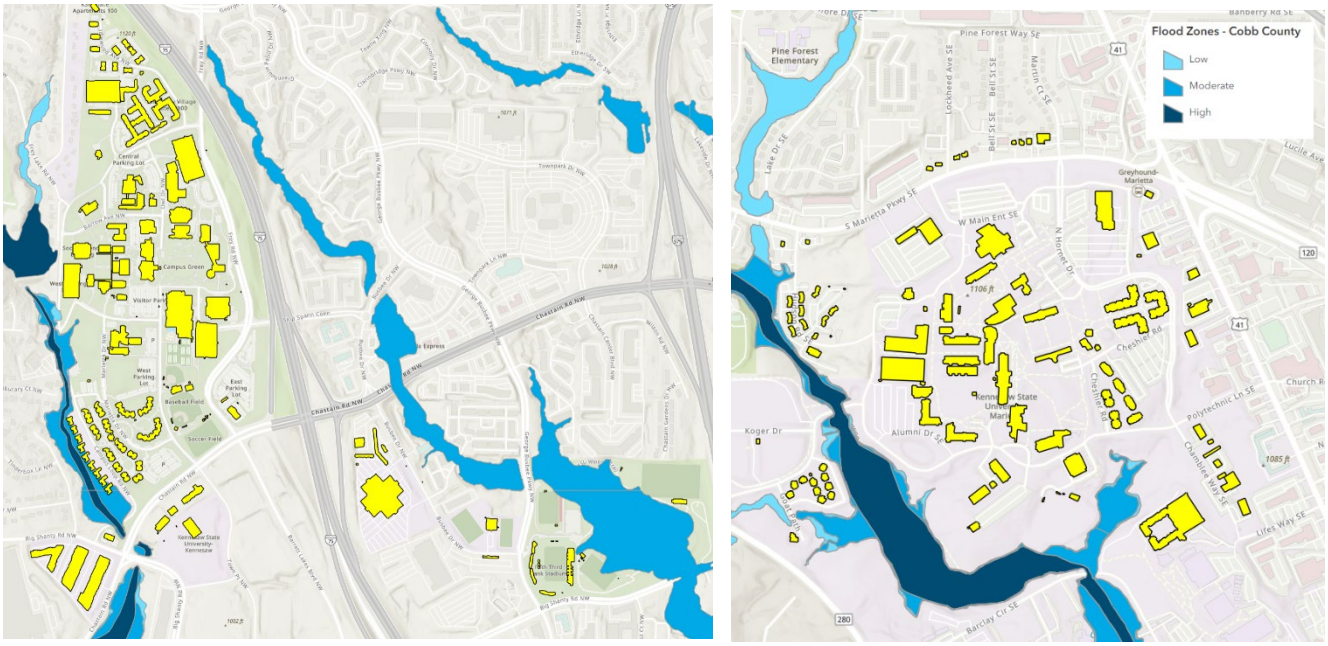


Figure 24: KSU campus Flood Zones. Generated from GIS map prepared by project team. Original data from Rochester database.

B.3 Assets &Opportunities

- High Performance Building – Water Use Reduction

LEED scores show that KSU has consistently pursued about 80% of water credits available, focusing primarily on water use reduction measures. KSU's design guidelines incorporate highly efficient water fixtures, which have helped it continuously hit that target. KSU has so far not pursued water innovation technology credits that consider cisterns, graywater reuse from chiller for irrigation, or otherwise reusing existing systems that allow it to reduce its clean water consumption.

Peer Institution Water Use and Resiliency Projects

Several LEED projects at Georgia Tech pursue the water innovation credit by installing underground cisterns to collect water from roofs to be used for irrigation. Building on the earlier cistern model installed for the Klaus Building, the Clough Undergraduate Learning Commons uses water from an underground cistern under Tech Green to flush its toilets. Emory University made its biggest investment in water efficiency and reclamation with the installation of its Water Hub. Installed in 2015, the WaterHub is capable of recycling 400,000 gallons of water each day cleaning water for future non-potable uses like flushing toilets and irrigation. GT's Kendeda building by contrast collects rainwater which is then processed by a treatment plant in the basement and used as potable water throughout the building, providing 100% of the building's water. Smaller interventions use condensate from building mechanical systems for irrigation etc.

- Stormwater Management Plan

The increasing variability in precipitation highlights the importance of strategic and resilient irrigation and stormwater management planning. The recent stormwater management plan focused on the prevention of stormwater contamination, and while it provides maps identifying existing stormwater infrastructure, it does not include strategies for future efficiency projects or priorities.

Rainwater Management and Storage

In the past, KSU has successfully pursued a large percent of the Water Use Reduction credits available through LEED and similar targets through the Georgia Peach program but has yet to pursue innovation credits that introduce measures beyond fixture and irrigation efficiency. Innovation credits may include rainwater and gray water collection harvesting, reclamation, and the use of gray water for irrigation. Such projects can reduce the impact of high precipitation events while providing long-term resiliency.

Ground surface design standards/considerations

Local flooding is likely to develop because of surface runoff during major rain events. Any increase in impermeable surfaces is likely to exacerbate water runoff. Along with new design projects, master plan and stormwater management projects, there is an opportunity to re-establish priorities for selecting ground cover including the heat gain consideration mitigation measures mentioned earlier as well as selecting pervious pavers and similar products for walking and driving surfaces that allow for water infiltration back into the soil to be managed naturally on site.

Integrated Landscape and Stormwater Master Plan

A comprehensive landscape and stormwater master plan would give KSU an opportunity to develop integrated strategies to optimize UHI mitigation, water reduction, stormwater management and transportation strategies. The plan would be expected to also facilitate the development of other opportunities such as enhanced landscape care plan, material selection design standards etc.

Smart Irrigation

Smart irrigation leverages weather and moisture data to determine real-time irrigation needs of a landscape. As IoT technology becomes more ubiquitous, customized solutions that reduce maintenance needs as well as water consumption are likely to become increasingly affordable and practical.

Update KSU Plant list

Non-native species and lawns are likely to require a greater amount of irrigation and maintenance. Creating a standardized and updated list of native plant communities, which limit all planting on campus and reduce the emphasis on manicured laws would help conserve water and minimize the impact of periods of low precipitation. With the additional potential benefit of supporting local wildlife and pollinators.

C. Extreme Weather

C.1 Conditions

In addition to increasingly variable temperatures and rainfall, Cobb County is vulnerable to a variety of extreme weather events including hurricanes, fire, and tornados. KSU's Emergency Preparedness Plan includes all necessary information on emergency processes policies and specifies safe evacuation areas for campus. Citing 197 recorded wind events since 1984 and the risk of tornadoes and hurricanes, The Risk Factor assigns Cobb County a Wind Factor of 4, or moderate to both campuses. The most severe recorded wind event cited was a category F4 tornado near the Kennesaw Campus.

Hurricanes

Unlike the coastal cities in Georgia, Cobb County, and both campuses, are unlikely to feel the most extreme effects of a hurricane – but are not entirely immune to their effects. GIS modeled hurricane paths from the past 65 years show a clear increase, not only in the number of hurricanes making landfall in the southeast, but that an increasing number of them are finding their way inland as hurricanes before being downgraded to storms. Currently the Risk Factor estimates that maximum hurricane sustained winds are 52 mph for Marietta and 49mph in Kennesaw and 67 mph and 63 mph gusts respectively, but projects each of those could increase by around 6mph each in the next 30 years. While there is very little data about damage specifically attributed to hurricanes in Cobb County, it can be deferred that wind damage to trees, power infrastructure and small structures shall be expected to increase. At the time of this study, Cobb County was not known to have any specific wind load requirements beyond those prescribed in the state approved code.

Tornadoes

While not as frequent in Georgia as to our western neighboring states, tornadoes do represent a threat to Cobb County. Since 1950, there have been over 120 tornadoes, averaging about 2 occurrences a year. The GIS modeled map of tornado tracks over the past 65 years, once again shows a significant intensification in the frequency of tornado events including along Georgia's west border (Figure 26). Predictions of warming and wetter climate conditions often associated with tornadoes, suggest these events may increase in both frequency and intensity.

Following the tornado that cut across downtown Atlanta in 2008, Dr. Marshall Shepherd of UGA and Dr. Dev Niyogi of Purdue leveraged historic rain gauge and satellite data to model the relationship between drought years preceding active tornado seasons. While the study acknowledges the limitations of the highly focused project, it does find sufficient statistical data to support "that, on a seasonal scale, antecedent fall-winter drought is correlated with a reduction in tornado days the following spring"[23]. From this study, it can be deduced that increasing number of wet days are likely to have a parallel impact on potential EHE and tornado days and should be tracked and observed

1961-1980

1981-2000

2001-2020

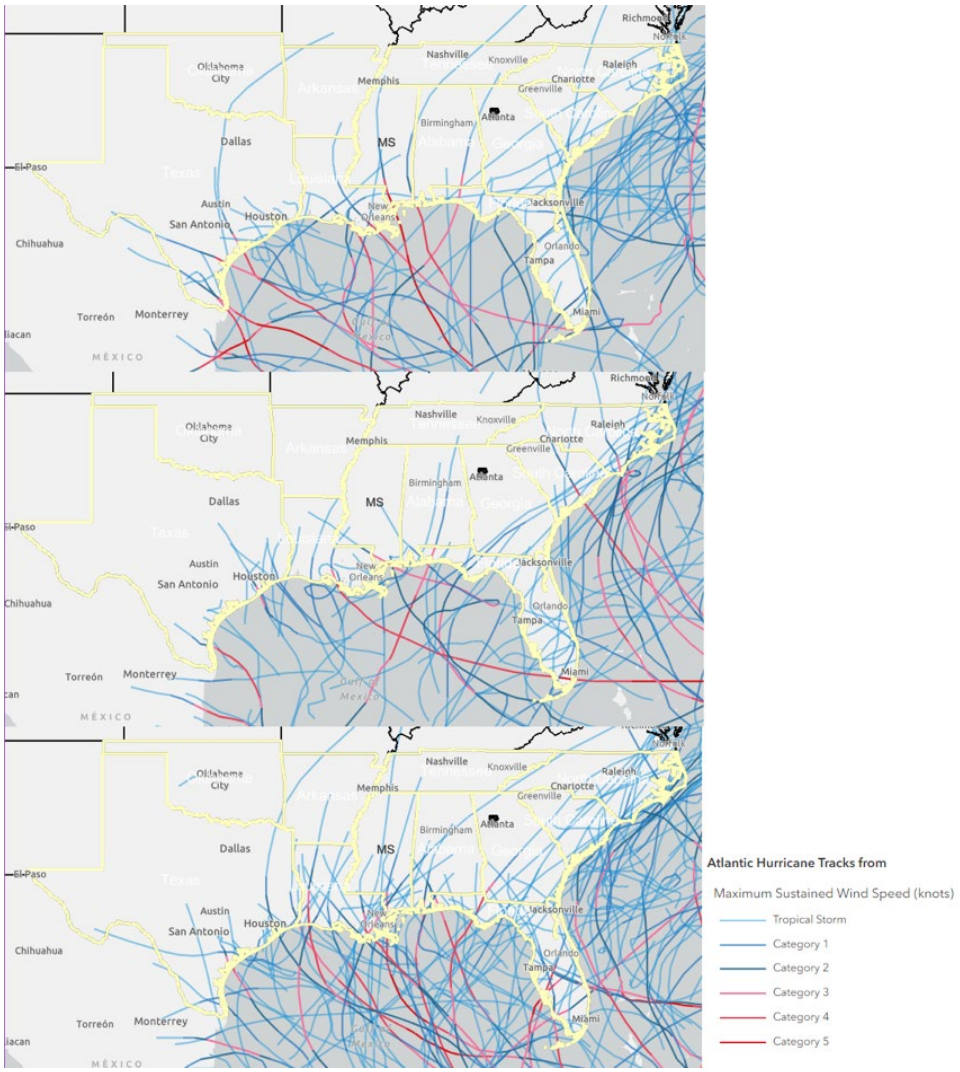


Figure 25a: Historic hurricane paths affecting the state of Georgia 1961-2020. Generated from GIS map prepared by project team. Data Source from the National Hurricane Center and Central Pacific Hurricane Center

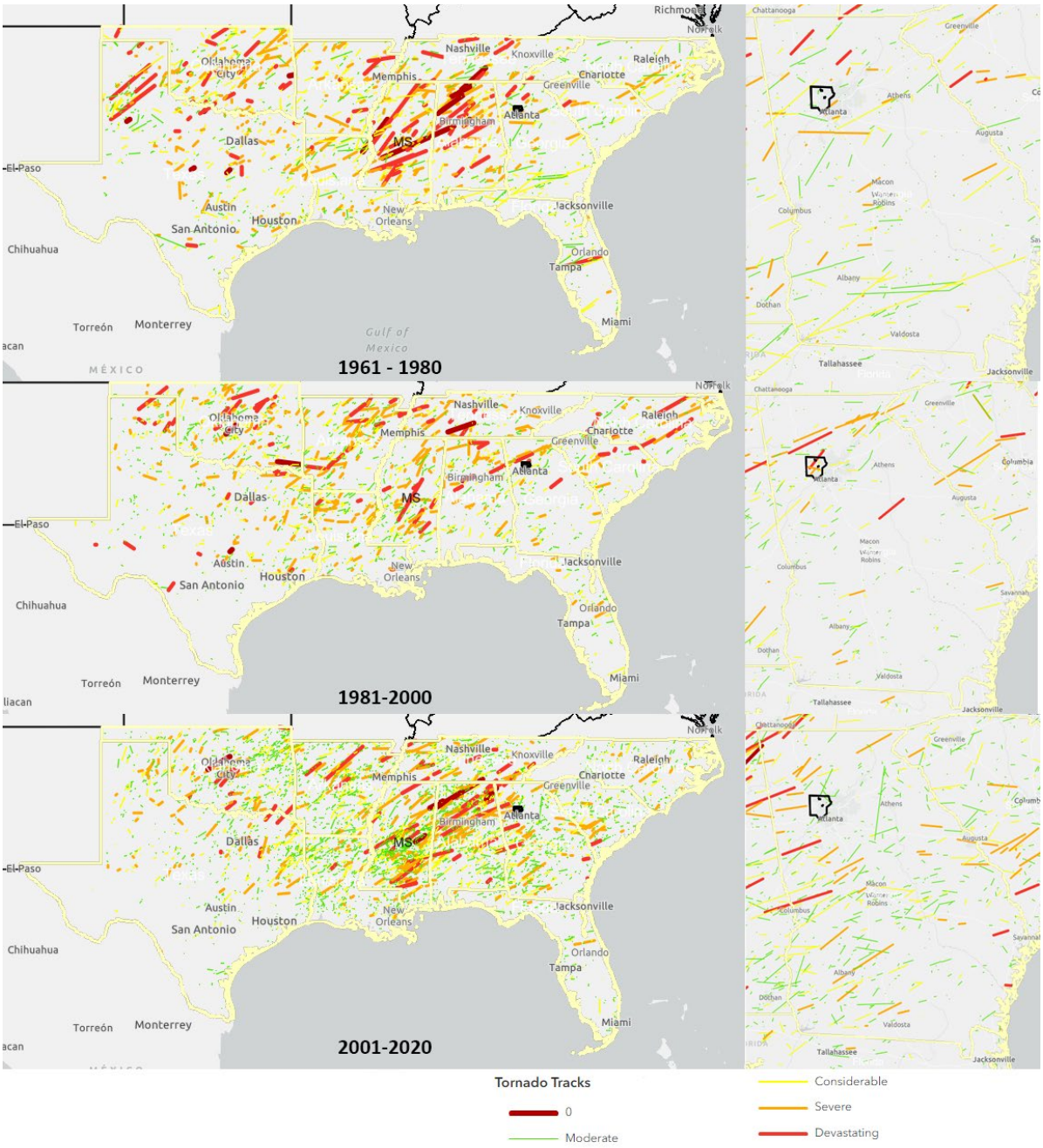


Figure 25b: Historic tornado paths affecting Georgia 1961-202

Fires

The Risk Factor assigns both Kennesaw and Marietta a risk factor of (1) or minimal for Fire Risk. It cites only two wildfires within 20 miles between 1984 and 2022, the most recent having burned 4sq miles of forest about 10 miles north from Kennesaw or 18 from Marietta. Fires do remain a threat in case of long and pronounced drought events, particularly in heavily forested areas to the North of the Kennesaw campus.

Extreme Low Temperatures

In December 2022, Georgia experienced near-record-breaking freezing temperatures, as measured by the weather station in Dobbins Air Reserve Base station near the Marietta campus. Daily minimum temperatures ranged between 9-27°F and winds gusted up to 45 mph.[24] The extreme winter weather days took a toll on the agricultural industry throughout the state, including KSU's own field station which lost its entire winter crop. In KSU, other peer institutions and in buildings throughout GA, the extreme weather days also caused frozen pipes to burst and millions in damage to buildings. The event in Georgia is one in a growing list of low temperature events in parts of the country that don't normally see such cold temperatures – most notably, the winter storm that left large swaths of Texas in the dark in February 2021.

To date, there is limited data and no clear trends that fully account for the rise of these types of events. The most hypothesized cause in the case of the February 2021 event in Texas attributes the freeze to the polar vortex, which has been previously linked to similar occurrences in other parts of the northern hemisphere. NOAA defines the polar vortex as a "band of strong westerly winds that forms in the stratosphere between about 10 to 30 miles above the North Pole every winter. The winds enclose large pools of extremely cold air". It further explains that, "When the Arctic polar vortex is especially strong and stable it encourages the polar jet stream, down into the troposphere, to shift northward. The coldest part of the air stays in the Arctic. When the vortex weakens, shifts, or splits, the polar jet stream often becomes extremely wavy, allowing warm air to flood the Arctic and polar air to sink down into the mid-latitudes."[25]

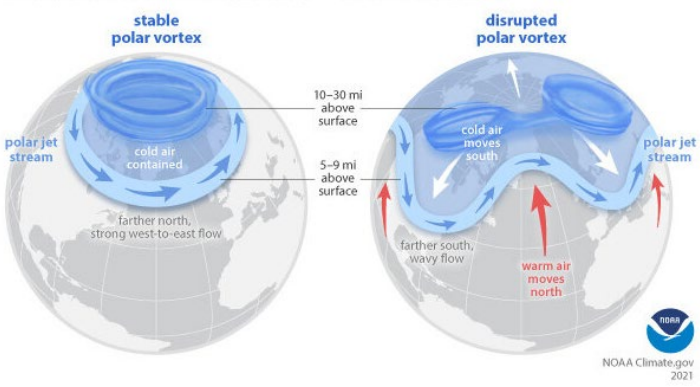


Figure 26 : NOAA Model of the Polar Vortex Source : https://www.climate.gov/news-features/understanding-climate/understanding-arctic-polar-vortex.

Models studying the relationship between warming trends and the polar vortex remain split, with some models predicting warmer temperatures will continue to weaken and destabilize the vortex while others show the opposite. In the absence of more definitive data and modeling, it is challenging to predict whether we will continue to experience these periods of extreme cooler weather nor their extent and frequency.

C.2 Impact

Extreme weather events increase the likelihood of loss of power, fuel shortages, transportation challenges, and threaten to cut off the most vulnerable KSU student populations from access to food and water. Given the increased likelihood of extreme weather events, there is an opportunity to expand KSU's emergency preparedness plan to include resiliency measures beyond the immediate aftermath of a weather event.

C.3 Assets & Opportunities

Several KSU's buildings are already provided with emergency fuel-powered generator backup power, and in a handful of cases, electric-charged batteries. These secondary sources of power are designed to keep the basic functions of the building, and in the cases of some laboratory buildings, to prevent the loss of valuable research to inconsistent energy supply.

Renewables and Microgrids

A secondary benefit of the installation of a separate renewable system is the potential for continued service, at some capacity, in case of a general blackout. A local PV or wind system can provide emergency power. While a renewable source is preferable, other types of microgrids can provide similar redundancies. In 2021 Georgia Tech, in partnership with Georgia Southern, installed a 1.4-megawatt natural gas, diesel, fuel cell and battery storage microgrid in the Tech Square area of midtown[26]. The installation is part of a living learning lab research project to understand how such systems interact with the larger grid in cases of shutdowns and when connected to large, complex data centers, like the one installed in GT's CODA building. Research from the project may inform the best use of microgrids to provide redundancy and resiliency options for university campuses.

D. Air Quality

D.1 Conditions

Ozone Concentration

As an increasingly urban county, Cobb faces air quality challenges common to the urban South. Among those challenges, the Georgia Environmental Protection Division recognizes ground-level ozone can be harmful to human health in high concentrations.[27] Ground-level Ozone is formed through a chemical reaction between volatile organic compounds (VOC) and NOx when exposed to sunlight. As a result, it represents the most concern during the summer months when higher solar radiation, longer daylight hours, and higher temperatures are at their peak. In Cobb County, the primary contributors of emissions are vehicles and industrial combustion engines, representing 45% and 17% of NOx, respectively. While individual source emissions have decreased significantly since the 1970s as fuel sources have changed and new regulations have taken effect, the proliferation of vehicles, along with longer commuting and traffic times, has become the largest source of emissions in the county.

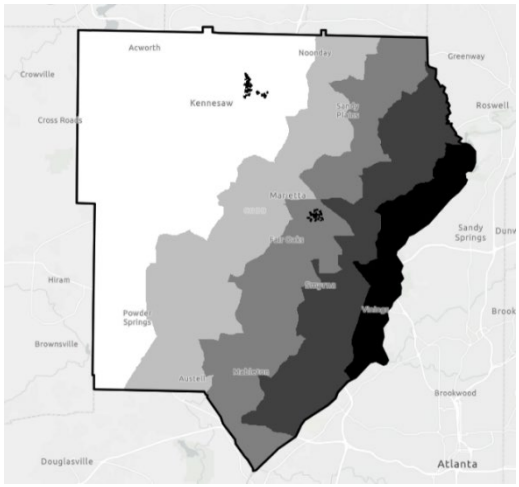


Figure 27a Cobb County Ozone Concentration map. Generated from GIS map prepared by project team. Data Source: USEPA Fused Air Quality Surface[28]

Particulate Matter

The second pollutant of concern is particulate matter under 2.5 microns in diameter ($PM_{2.5}$). The small particles are made up of microscopic solids or liquid droplets suspended in the air. Sources of $PM_{2.5}$ are forest fires, industrial processes, and combustion. These tiny particles represent a direct threat to human health as they can be inhaled deeply into the lungs and cross into the bloodstream. PM2.5 is considered hazardous when it reaches concentrations of 12. The Marietta campus has been measured to have mean concentrations of 10.28-10.37, while the Kennesaw Campus' mean levels are slightly lower at 10.19-10.27.

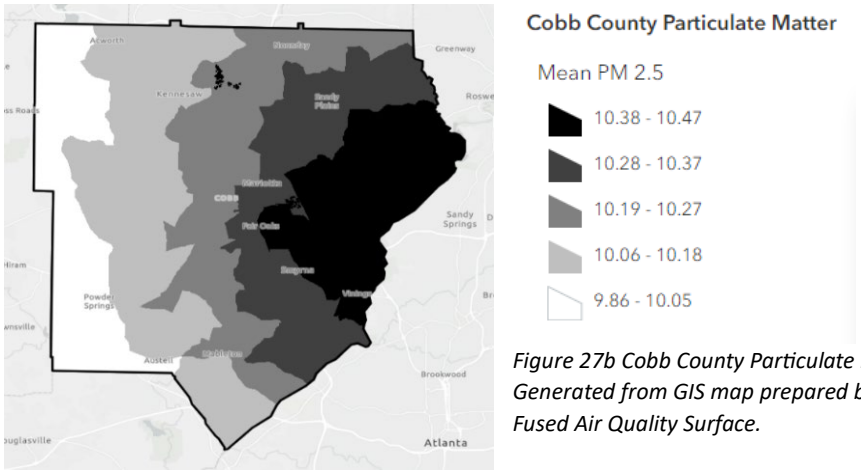


Figure 27b Cobb County Particulate Matter Concentration map. Generated from GIS map prepared by project team. Data Source: USEPA Fused Air Quality Surface.

D.2 Impact

Measurement

Air quality measuring and monitoring remains a challenge for much of Cobb County, which currently only has a single monitoring station. Much of the modeling is done with data from neighboring Fulton County's stations. More monitoring is needed to more accurately model ozone and PM levels throughout the county and within campuses.

Sources

As a university, the average age of KSU's population is well outside the ages when respiratory illnesses are of greatest concern: young children and the elderly, air quality remains a concern for those left vulnerable by respiratory illnesses or other health considerations and those that spend much of their time outside. KSU's reliance on motor vehicles represents a significant source for localized emissions, as does long idling times in parking garages.

D.3 Assets & Opportunities

Transportation

Cobb Forward, Cobb County's Transportation Plan Cobb [29], includes a series of recommendations and project proposals that target reducing traffic congestion on major arteries, as well as projects dedicated to providing safe pedestrian and cycling trails to facilitate and encourage other forms of transportation. A traffic map of Cobb County highlights significant congestion around both campuses underlining the importance for the university to collaborate with the county as well as the neighboring CID to ensure alignment between university expansion projects and planned transportation improvements.

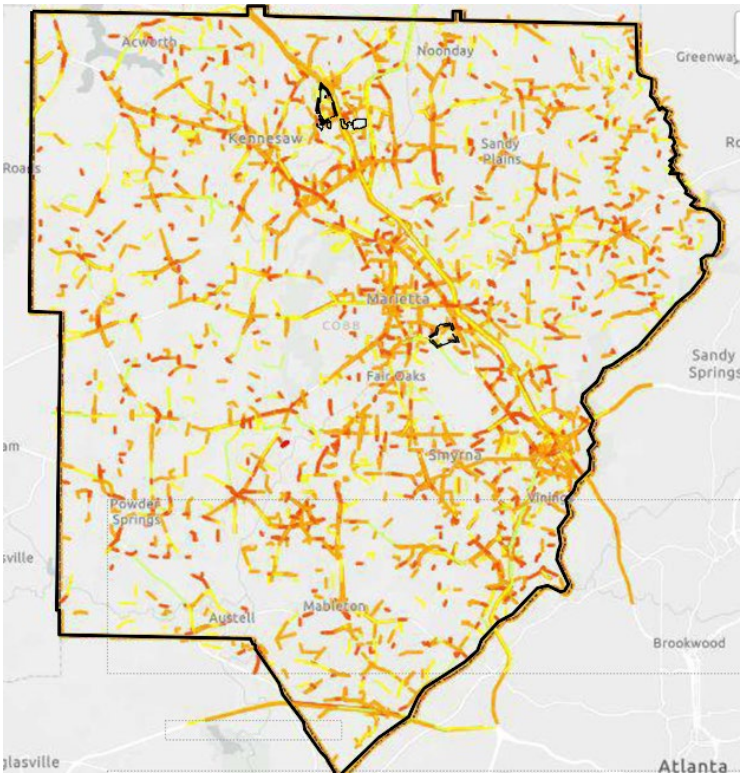


Figure 28: Snapshot of traffic jams within Cobb County[30] Made in ArcGIS Pro from CobbForward Plan.

Results from a recent transportation survey of the KSU community showed university commuters averaged 19.6 miles in each direction. Results represented 132 students, 51 faculty and 123 members of the staff. Among respondents, 223, the vast majority reported traveling to campus in a fuel powered car or motorcycle, followed by 18 or 5% of respondents reported taking a bus to campus and 4% walk to campus. Of those that

reported regularly traveling between campuses, 75% reported driving in a personal vehicle as opposed to only 24% taking one of KSU's Big Owl Buses regularly.

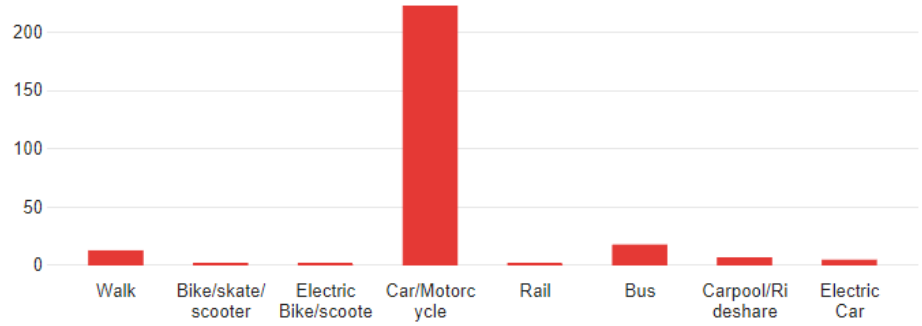


Figure 29a: Commute to campus mode of transportation data from survey conducted in Fall of 2023.

Motor-Vehicles

The significant percentage of single-vehicle commuters results in crowded parking garages and parking lots – particularly around class change times. The crowded lots, in turn, result in long wait times and harmful idling which contributes to pollution, though there is currently no recorded data showing average idling times. The survey supports the premise that 73% of the Kennesaw community commutes by car, it is a significant contributor to local traffic and highlights the importance of incentivizing other forms of transportation.

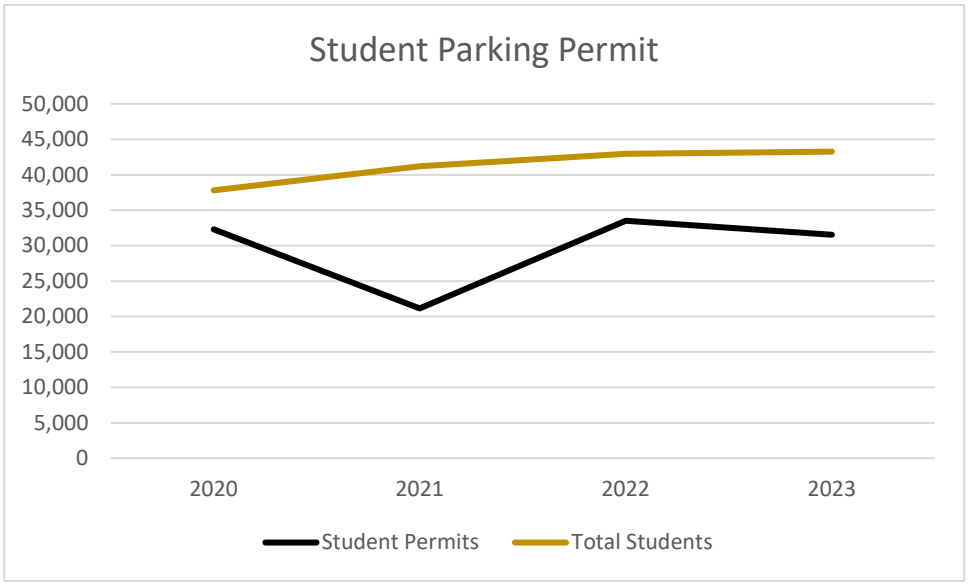


Figure 29 b: Parking permits sold 2020-2023. Permit data provided by Campus Services. Student enrollment from university Fast Facts.

- "Park it Once" policy

KSU increasingly encourages a "Park it once Policy" reinforced by KSU's Big Owl Bus service which connects central parking locations with the rest of campus. As it is, the vast majority of the KSU community commutes by car, the busy parking lots during class change times support this "park it once policy" as maneuvering through the lots and finding parking can be a disincentive in and of itself at key times during the day. Economy lots located at the margins of the main campus also encourage students to park as they arrive on campus and either walk or bike through campus and in between classes.

Diversified Parking Passes

A greater variety of parking pass options may allow drivers to customize their selections to optimize other commuting alternatives. Georgia Tech, for example, offers several types of parking permits at different rates. Parking options include carpooling permits which are purchased as groups of two or more and have eligibility requirements for members of the group to ensure carpooling is actually feasible. A "Smart-Park" permit charges an annual fee that then allows the user to pay for daily parking at a reduced rate. This model encourages the use of alternate modes of transportation, allowing cyclists and bus riders to switch to driving their vehicle only on days of inclement weather while saving the steeper visitor parking costs. "Evening and Weekend" parking permits similarly allow for parking on the weekend when public transportation systems are running on a reduced schedule for community members often needing to travel to campus on the weekends, but that would prefer to use public transit at other times. UGA allows for monthly parking options and less expensive zone-specific parking which mirrors the economy lot option at KSU. The monthly options allow for alternative modes of transportation in mild weather months.

Georgia Commuter Options

Additional incentive alternatives may be available through the Georgia Commuter Options program from the Georgia Department of Transportation. The program offers financial incentives, recommends pre-tax solutions, facilitates the implementation of carpooling and ride matching programs and provides engagement and on-site education opportunities.

- EV Vehicle Infrastructure

Currently, there are two electric vehicle charging stations in each of five lots between both campuses, resulting in 8 chargers in Kennesaw, and 4 in Marietta. A project in progress will upgrade the existing chargers and add 21 more on Cartersville Drive. Two of the new 21 will be designated ADA spots, the first designated ADA on either campus. For the time being, KSU charging stations are intended to remain exclusively for the use of the KSU community and require a parking pass in order not to be ticketed.

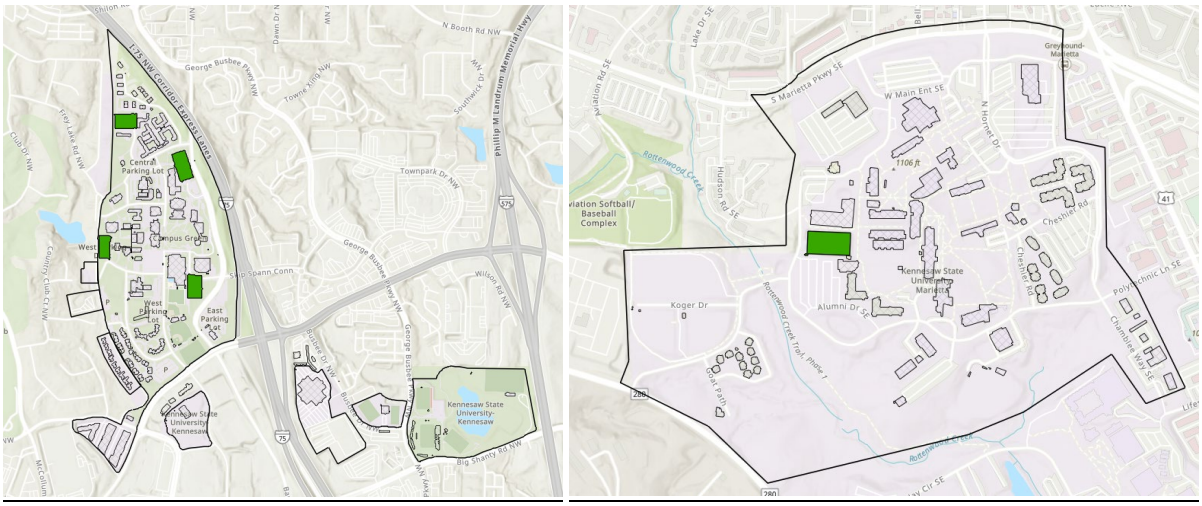


Figure 30: EV charging stations, Kennesaw – Marietta campuses.

The Town Center Community Improvement District (CID) commissioned a project earlier this year to estimate and identify the need for additional charging stations in the area immediately around Town Center and extending up to the Kennesaw campus. KSU was invited to participate as a stakeholder. For the study's purposes, KSU's chargers were not included in the calculations for public use. The study primarily used the federal EV proliferation target of 50% by 2050 to calculate the necessary expansion of the infrastructure, though less aggressive targets were also considered. The project identified a series of pilot project locations to be prioritized for fast charger installations. Preferred locations were identified as large commercial areas and the airport.

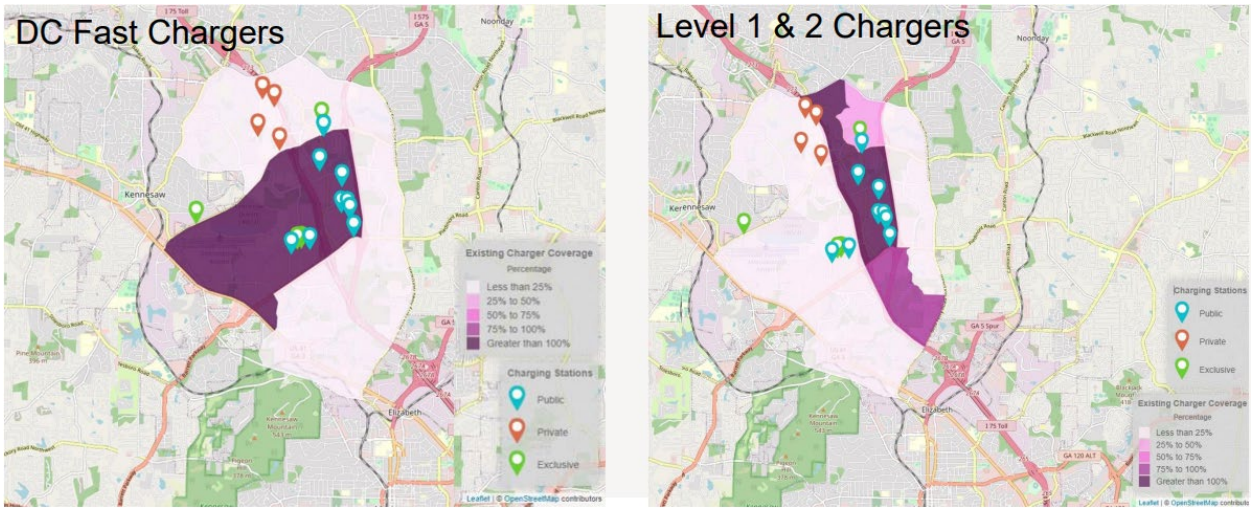


Figure 31: Current coverage of existing charging stations. From Town Center Community Electrification LCI Study. October 11, 2023 Report[31]

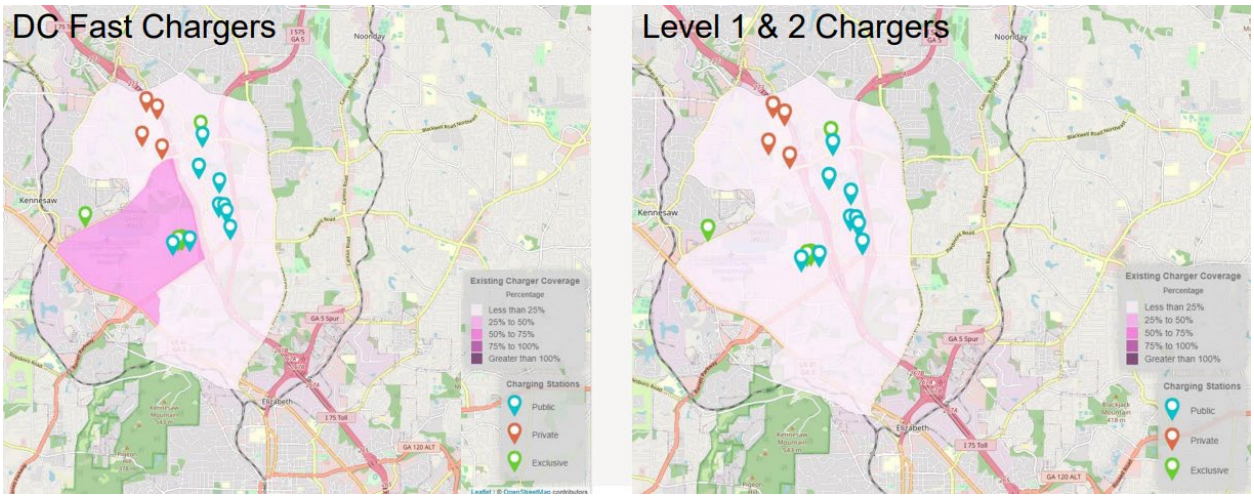


Figure 32: Future Charging Coverage 2030 (50% EV's by 2030). From Town Center Community Electrification LCI Study. October 11, 2023 Report.

EV Network Incentives

Given KSU's proximity to the highway, Town Center, as well as several large commuter hubs, there is an opportunity to consider developing partnerships with nearby businesses, and local transportation authorities to maximize charger utilization and minimize installation costs. These would require the university to consider the possibility of opening charging stations to the broader community.

- Public Commuter Networks

Existing Commuting Options Beyond the Campus

CobbLink

Routes serving the Kennesaw Campus (Figure 33)

R10 – Connects both campuses to Cumberland and Atlanta Marta.
40 – Local eastern connection to Town Center and Marietta Transfer Station (MTS).
45 – Local western connection to Town Center and MTS.

Routes serving the Transfer Station near the Marietta Campus

10 – Local connection to Cumberland and Midtown Atlanta Marta.
R10 – Connects both campuses to Cumberland and Atlanta Marta.
15 – Local western connection to Cumberland Transfer Station.
20 – Local South Cobb Pkwy connection to Cumberland Transfer Station.
30 – Local connection to HE Holmes Marta Station
40 – Local connection to Town Center and Kennesaw Central Parking.
45 – Local western connection to Town Center.
50 – Local eastern Route to Cumberland Transfer Station.
101 – Express connection to Marta Civic Center and Five Points Stations.

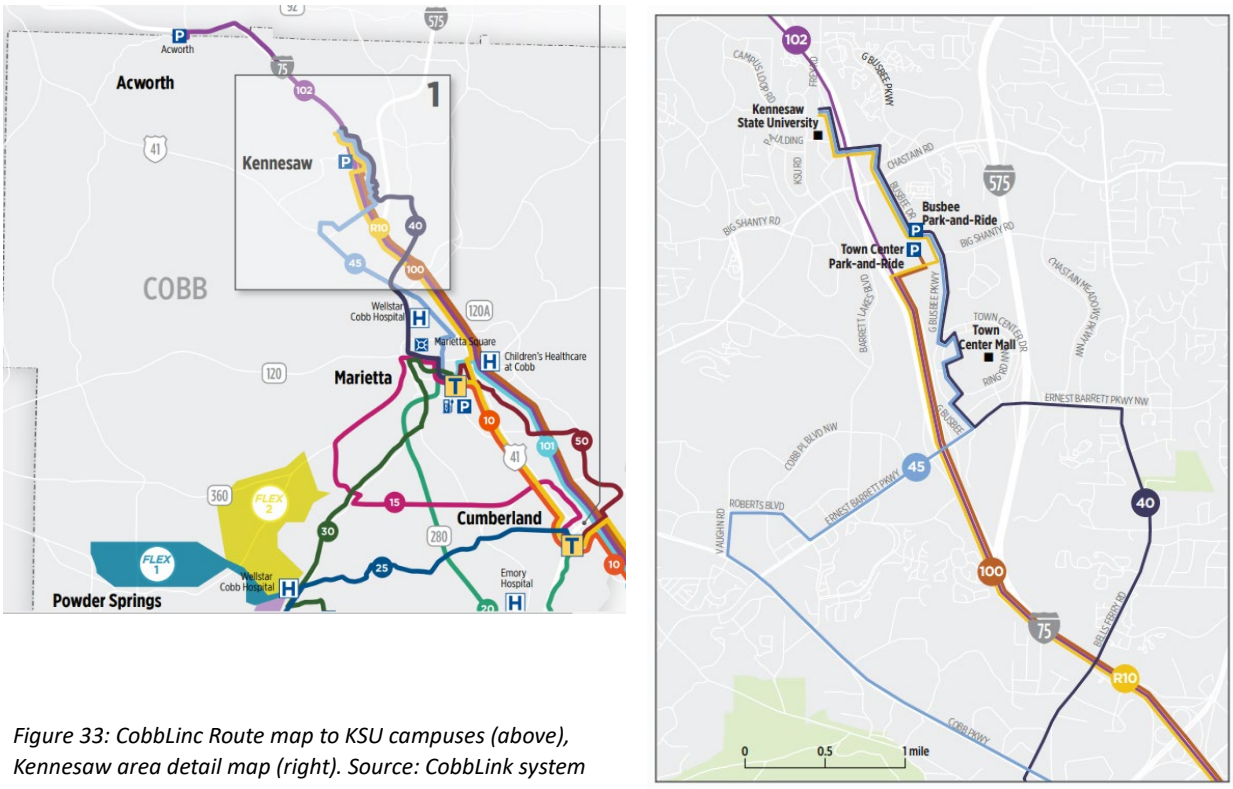


Figure 33: CobbLinc Route map to KSU campuses (above), Kennesaw area detail map (right). Source: CobbLink system Map.

Except for the 102 bus, which offers express service Acworth to Atlanta, KSU serves as the most northern stop in the Cobb Link system, leaving no public transit commuter options for those looking to come to either campus from areas even just north of the Kennesaw campus. As the routes below will show, there are similarly no bicycle or pedestrian routes connecting the campus to the North, making the planned Noonday Creek route that will connect to Woodstock of primary importance.

The Xpress Transit system runs several routes past both campuses but does not make stops in either one, and most of their routes are only inbound to Atlanta in the mornings and outbound in the afternoons, discouraging their use for those looking to commute to campus during regular working hours. Routes 484 and 485 both commute to the Park and Ride location just north of KSU's field station. Routes 480 and 483 make stops at Town Center – Big Shanty Park and Ride.

Most bus services offered by CobbLink are limited to stops within 1.5 miles from the I-75 artery. Expanded "Flex" service is provided by shuttle in three zones near downtown Austell and Powder Springs. These areas serve commuters not within walking distance of any of the major bus routes. The shuttle provides service by either reservation or walk-up in its main stops.

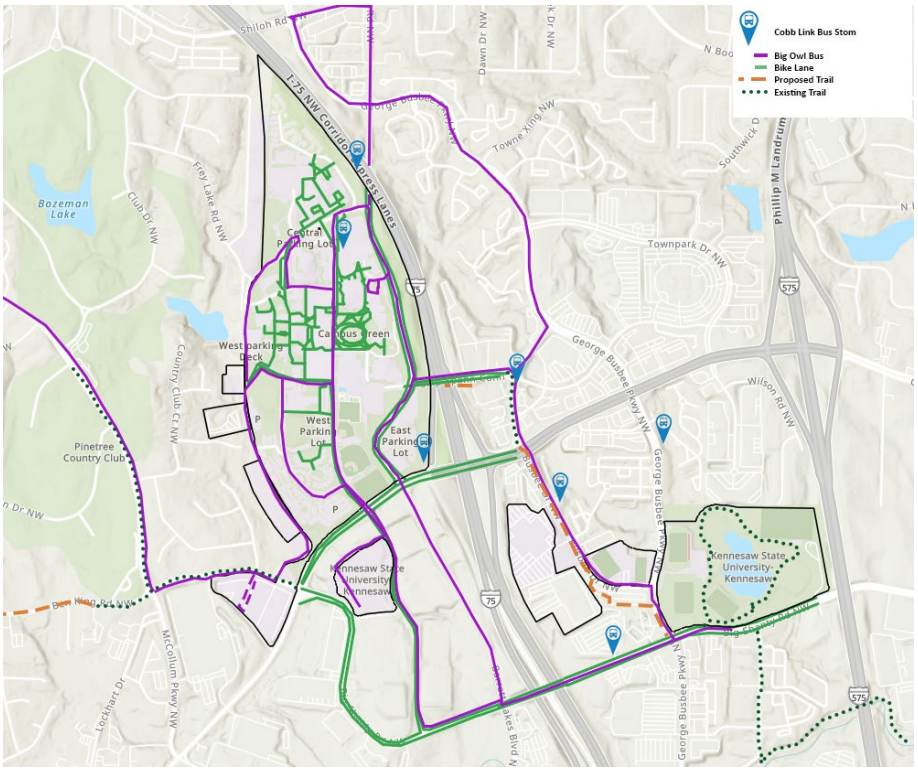


Figure 34: Existing shuttle service overlayed with existing and proposed pedestrian and bike paths, Kennesaw. Source: Proposed bike route data from CobbForward plan.

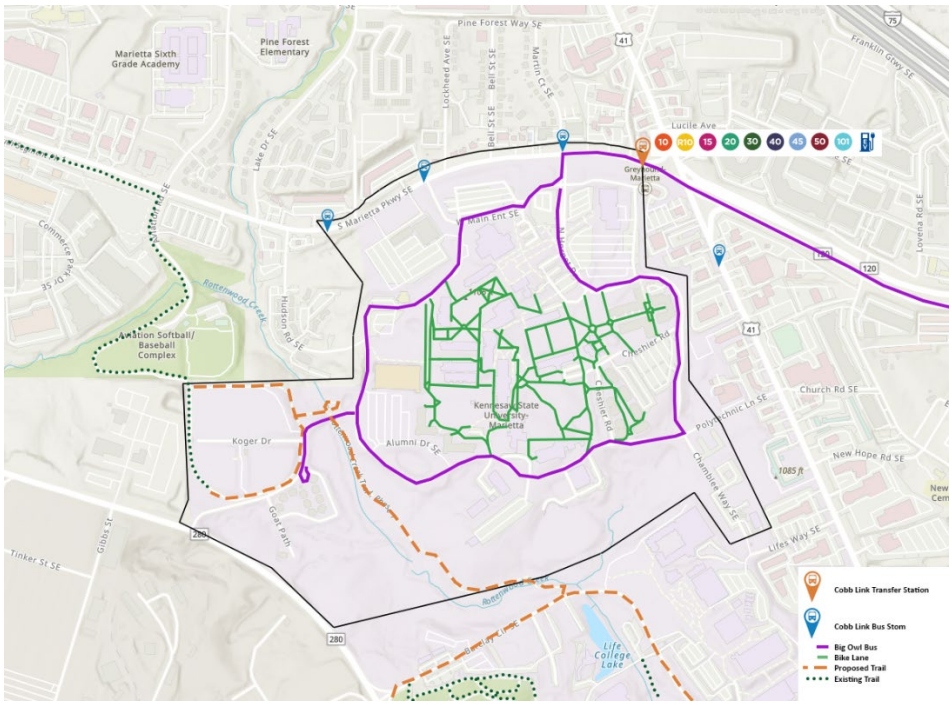


Figure 35: Existing shuttle service overlayed with existing and proposed pedestrian and bike paths, Marietta. Source: Proposed bike route data from CobbForward plan.

❖ KSU's Big Owl Buses

Kennesaw's Big Owl Buses serve 8 regular routes and 2 weekend shopping routes and have provided over 17 million passenger miles travelled. The longest route connects the Kennesaw campus to the one in Marietta, where it also completes the campus loop. Shopping routes connect each campus to WalMart, and the West Campus Route travels about 1.5 miles out of the campus to the West 22 housing complex. All other routes stay within the Kennesaw campus or connect to nearby apartment complexes within a half mile of boundaries.

Optimize Bus and Shuttle Network Connectivity

The Transportation Survey conducted in the Fall of 2023 revealed the cost of public transportation as one of the main disincentives for using public transportation. Several other Universities have established relationships with local public transportation entities to provide students, faculty and staff passes, at a reduced rate, pre-tax, or in some cases at no cost to their communities. KSU could consider partnerships with CobbLink, Xpress and Marta to provide easier alternatives to students.

Cobb's plan also identified needs and priorities for Pedestrian and Bicycle network improvements. To prioritize related projects, CobbForward created an Index to identify the greatest area of needs. Kennesaw campuses fell in the areas identified as 6-9 on a scale of 30, see Figure 36. The plan identified 205 miles of proposed trail to add to the 30 miles either existing or in construction. Of the (8) trails prioritized by the project, the Chattahoochee River Trail, the Rottenwood Creek Trail, and the Noonday Creek Trail represent critical connections for campus. KSU has the opportunity to collaborate with Cobb County in implementing these key pieces for our pedestrian and bicycle infrastructure.

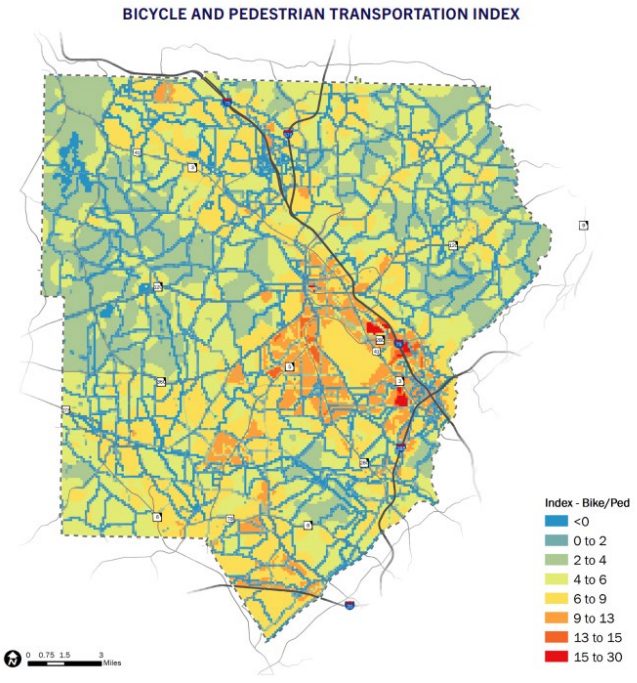


Figure 36: Bicycle and Pedestrian Transportation Index from Cobb County's Cobb Forward Plan recommendations

- Cobb County's Growing Trail Network

Main Bike Routes from the Kennesaw Campus:

(1) Town Center: Near the Kennesaw Campus, the existing bike lane that extends south to Big Shanty Road Trail and to the East connects to Town Center via the Town Center Connector
(2) Noonday Creek Trail (Proposed) which extends North and east for 3.8 miles into Woodstock.
(3) Downtown Kennesaw (Proposed) Existing extends behind Chastain Point to the Pinetree Country Club. Proposed extension would run to Downtown Kennesaw (Ben King – Big Shanty + Cherokee Street Trail)
(4) Marietta Campus: (connectors proposed) Existing Noonday Creek Trail to Kennesaw Mountain – River Trail and from Downtown Marietta to Rottenwood Creek University Trail

Main Bike Routes from the Marietta Campus:

(1) To downtown Marietta: (proposed connector) Rottenwood Creek University Trail to downtown

- Bike Infrastructure

Current Bicycle infrastructure on campus includes bicycle signage and bicycle parking locations. A proposed project for the Kennesaw campus seeks to extend the bike lane on Kennesaw State University Road along Owl Dr. from the campus core to the front door of the Prillaman Health Science Building. Other improvements create safer intersections and curbs throughout the Kennesaw campus. This project specifically targets pedestrian and bike safety in the center of the campus.

- Electric Bicycles

In the past, KSU encouraged student use of alternate vehicles by developing programs and amenities that support bicycles. Prior to the Covid Pandemic, KSU was under contract with Electric Bike Company Zagster which resulted in an average of 2,000 trips per month with an average of 2 miles per trip. The length of the trips suggests that the bicycles were used mostly within campus and the close surrounding commercial areas, but that they were rarely used between campuses. KSU is currently looking for a new contract to replace the Zagster bicycles and is doing so in collaboration with the Town Point CID who is similarly replacing their contract. Electric bicycles would use the existing bicycle infrastructure.

- Bike Friendly Campus

In 2022, KSU was recertified as a Bike Friendly University at a Bronze Level. As a result of the certification, the reviewers made recommendations to be able to be granted "Silver" in the next certification period. Whether KSU pursues the certification in the future or not, the suggestions should be considered as best practices. A summary follows below, and the full extent of recommendations and reference standards can be found in the Feedback Reports for both campuses (Appendix 3)

Review and implement recommendations from Bike Friendly Campus Feedback Report

*Prepare a "Complete Streets" or "Bicycle Accommodation" policy

*Work with city of Marietta and Cobb County to improve network connectivity

*Upgrade the quality of existing bike parking and adopt bike parking design standards that meet APBP guidelines.

*Consider developing an Occasional Parking Pass option for commuters by offering single-day parking pass options.

*Develop a comprehensive bicycle education program.

*Appoint a staff member as official Bicycle Program Manager or create new position

*Establish annual budget to ensure implementation of bike plan.

*Conduct regular research on bicycle usage.

*Improve wayfinding from campus to the off-campus trail network and vice versa.

*Consider implementing car restrictions or car free zones.

*Lower the speed limit on campus to 20 mph.

*Provide traffic calming measures

*Consider creating bike lanes, buffered bike lanes, or cycle tracks.

*Consider creating colored bike lanes.

*Consider incorporating Bike Boxes.

*Provide free-standing bike repair stations

*Provide covered parking where possible

*Provide students with long-term bike storage options between semesters and through the summer.

- Outdoor Recreation Center and Bike Shop

The Bike Shop in the Outdoor Recreation Center (ORC) has long served as the hub of cycling on campus. Currently, it runs two separate bike rental programs allowing students to pay a fee to rent a bike by the semester, or to borrow a bicycle on an "as-needed" basis free of charge. Rental bikes are maintained at no cost to the students. Similarly, any KSU student can bring bicycles into the ORC for a free tune-up and only incur the cost of additional parts.

The ORC also supports and encourages bicycle use through their weekly Friday morning bike rides, hosted, and led by staff members from the Bike Shop and The Cycling club.

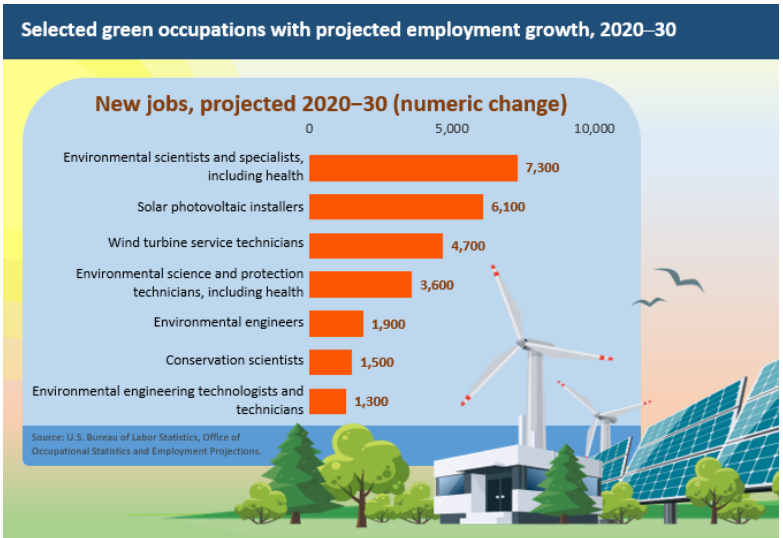
- Bike Rescue Program

Re-launched in Fall 2023, the Bike Rescue Program represents a collaboration between Kennesaw State Police Department, Campus Services, the Bike Shop, and the Office of Sustainability to divert abandoned bicycle waste from the landfill while providing low-cost bicycles for the KSU community. Housing and Office of Sustainability staff are charged with identifying abandoned bicycles on campus. Students are given 30 days to identify tagged bicycles before they are removed, and an additional 30 days to claim removed bicycles. Bicycles deemed abandoned are processed by the KSU Police Department and donated to the Office of Sustainability and the Bike Shop for disposal. Bikes that cannot be salvaged are stripped for parts and recycled. Bicycles that are appropriate for repair, received a no cost tune-up and cleaning from the Bike Shop staff and are made available to the KSU community in two ways (1) bikes are given, free of charge to students identified through the CARE and ASCEND programs, (2) bikes are donated to Student Organizations who sell them at inexpensive prices to help fund student initiatives. Still in its first cycle, the Bike Rescue Program should be carefully monitored to assess staffing needs, unforeseen costs, and to monitor waste diversion from the landfill.

Part II. Economic Conditions, Assets and Opportunities
A: Conditions & Impact

Green Jobs

The Bureau of Labor Statistics (BLS) defines green jobs in two ways: (1) "Jobs in businesses that produce goods or provide services that benefit the environment and conserve natural resources", or (2) "Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources."[32] Using that definition, the BLS identified the green jobs expected to grow most rapidly in the current decade. As shown in Figure 37, a considerable number of the occupations expected to grow are related to renewable energy, environmental engineers, and scientists.



Occupation	Median annual wage, 2021[1]	Employment, 2020	Employment, projected 2030	Typical entry-level education
Environmental engineers	$96,820	52,300	54,300	Bachelor's degree
Environmental scientists and specialists, including health	76,530	87,100	94,400	Bachelor's degree
Conservation scientists	63,750	25,300	26,800	Bachelor's degree
Wind turbine service technicians[2]	56,260	6,900	11,700	Postsecondary nondegree award
Environmental engineering technologists and technicians	48,390	17,300	18,600	Associate's degree
Solar photovoltaic installers[3]	47,670	11,800	17,900	High school diploma or equivalent
Environmental science and protection technicians, including health	47,370	34,200	37,800	Associate's degree

Note: None of these occupations typically requires work experience in a related occupation for entry.
[1] Wage data exclude self-employed workers.
[2] This occupation typically requires long-term on-the-job training to attain competency.
[3] This occupation typically requires moderate-term on-the-job training to attain competency.
Source: U.S. Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections.

Figure 37: Green Jobs with projected employment growth 2020-2030. Source:" Green *growth: Employment projections in environmentally focused occupations," Career Outlook*, U.S. Bureau of Labor Statistics, April 2022.

GA Industries and Context

With a gross domestic product (GDP) of over $600 billion in 2020, Georgia is considered a "business-friendly" state, and it is home to the world headquarters of more than a dozen Fortune 500 companies. Economic activity ranges from manufacturing to services and agriculture. Data available from the Bureau of Labor Statistics as of Summer 2023 shows that the key areas of employment in Georgia experiencing current growth and expected to continue to grow in the next nine years are Professional Services, Health Care, Social Assistance, and Leisure and Hospitality. Showing more moderate growth are mining, construction, and utilities, as well as transportation and warehousing. Conversely, manufacturing and agriculture both show moderate declines in the next decade.

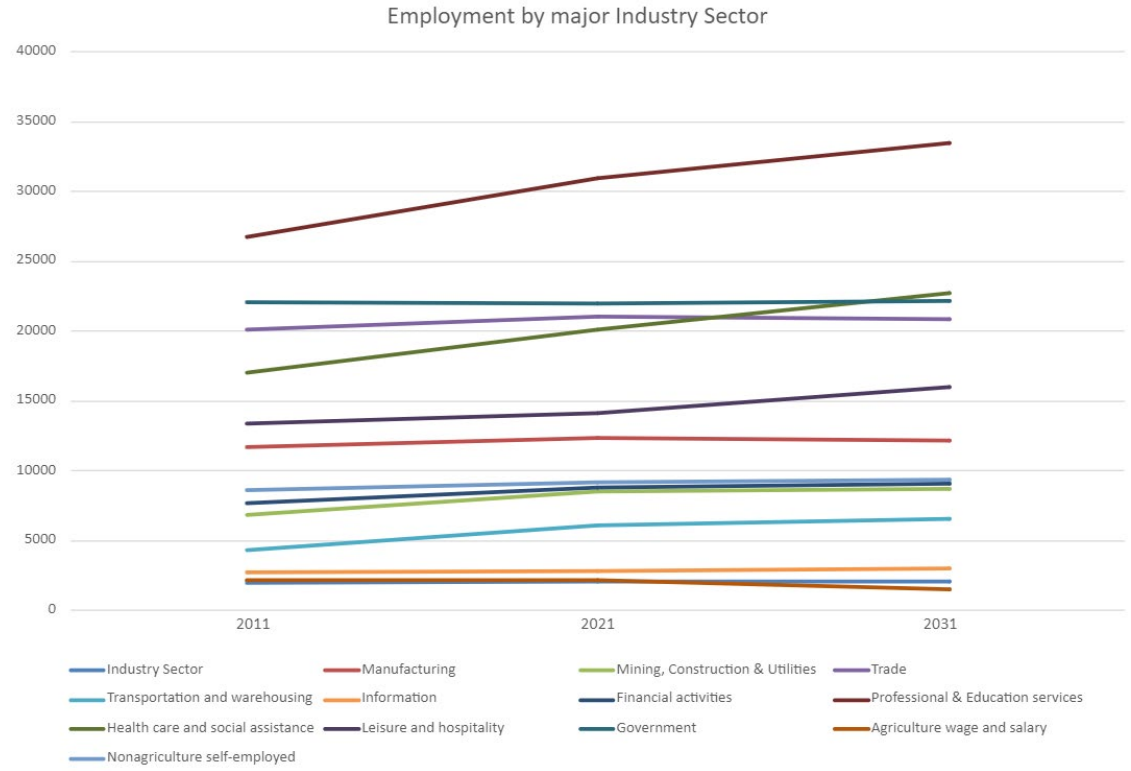


Figure 38: Georgia employment (In thousands) by major industry sector. Produced by project team. Data from Georgia Bureau of Labor Statistics

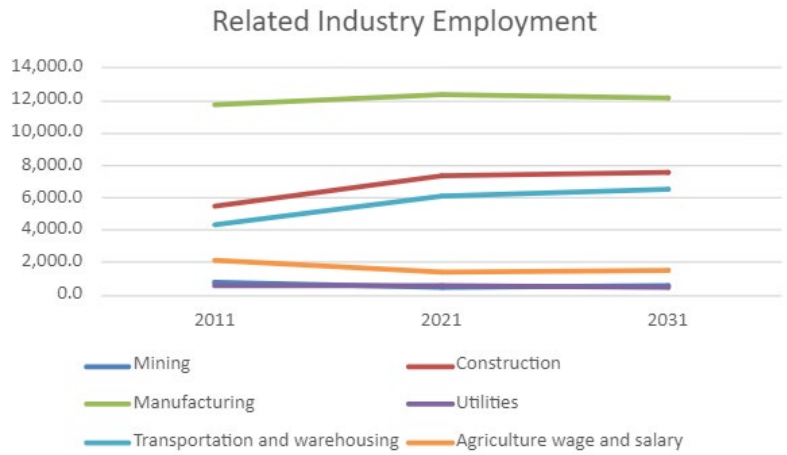


Figure 39: Georgia employment (In thousands) by industry sectors related to green jobs. Produced by project team. Data from Georgia Bureau of Labor Statistics

In contrast to these projections, or perhaps as a reaction to them, recent investments and job growth as reported by the Office of the Governor have focused specifically on manufacturing. In January of 2023, Governor Kemp touted that advanced manufacturing, automotive, aerospace, and food processing accounted for nearly 75% of new jobs added in 2022 and 84% of investments. Of these, investments in electric vehicles and automotive and manufacturing of its component's parts are critical to green jobs in the state.

Electric Vehicles

In July of 2021, Governor Kemp announced the creation of the Georgia Electric Mobility and Innovation Alliance. The partnership is spearheaded by the Department of Economic Development and includes members from the state government, industries, electric utilities, non-profits, and other stakeholders. The Alliance's mission is to set objectives and policies that support the growth of the electric mobility industry in the state. Less than two years later, Governor Kemp touted significant progress as evidence of the initiative's success: "International companies have been valued partners in creating a closed-loop electric mobility supply chain and accounted for 23% of state projects since July 1, 2022."[33] The Hyundai Motor Group Metalant America EV facility, announced in 2021, is described as the largest economic development project in state history.[34] The list below includes projects announced directly by the Governor's Office since the summer of 2022 and is not comprehensive of all EV or green manufacturing related projects in GA.

Green Manufacturing Projects Announced in GA			
EV Manufactureer	Product	Investment	Jobs
Hyundai Motor Group Metaplant America (HMGA) EV facility	EV	$6,300,000,000.00	8,500
Rivian	EV	$5,000,000,000.00	7,500
Kia expandion	EV	$200,000,000.00	200
		$11,500,000,000.00	**16,200**
EV Suppliers			
SK Battery America	EV support	$2,750,000,000.00	200
FREYR Battery	EV support	$2,570,000,000.00	700
Denkai America	EV support	$430,000,000.00	250
Seoyon E-HWA	EV support	$76,000,000.00	630
Sewon America	EV support	$300,000,000.00	740
PHA	EV support	$67,000,000.00	400
Seohan Auto Georgia	EV support	$72,000,000.00	180
NVH Korea	EV support	$72,000,000.00	160
DAS Corp	EV support	$35,000,000.00	300
Daesol Ausys	EV support	$72,000,000.00	140
Hyundai Industrial Corps	EV support	$24,000,000.00	100
Hwashin	EV support	$126,000,000.00	460
		$6,594,000,000.00	**4,260**
Other Green Industries			
SungEEl Recycling Park Georgia, LLC	Battery Recycler	$37,000,000.00	104
Qcells renewable energy solutions	Solar PVs	$2,500,000,000.00	3300
Hanwha Advanced Materials Georgia, Inc.	Qcell supplier	$147,000,000.00	160
Anovion Technologies	Lithium battery materials	$800,000,000.00	400
Green Georgia LLC,	Green Construction Materials	$59,000,000.00	125
Pratt Industries	Recycled Paper products	$120,000,000.00	125
		$3,663,000,000.00	**4,214**
Total proposed new "Green" Jobs		**$21,757,000,000.00**	**24,674**

Figure 40: GA manufacturing project investments committed in 2023. Source: Commitments communicated in Governor Kemps press releases in 2023.

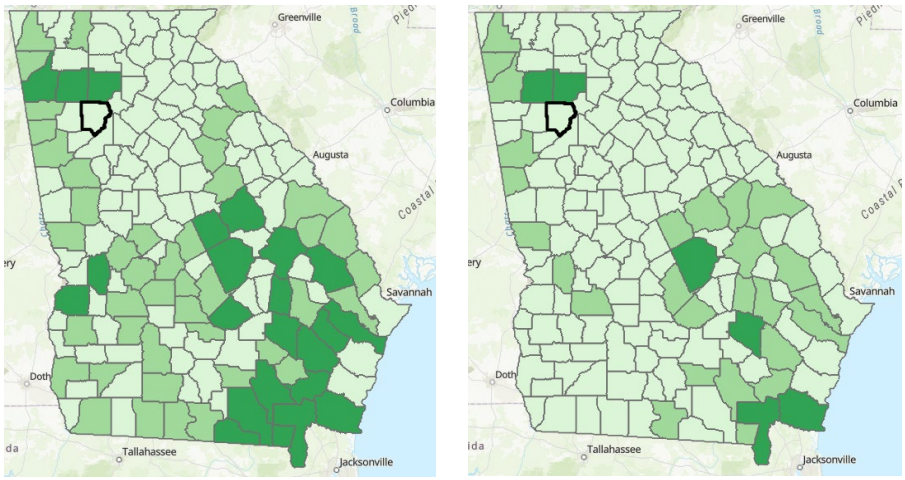
Renewable Energy

Along with electric vehicle manufacturing, Georgia has also seen investments from solar panel manufacturing companies. Considered to be one of the "top ten" states for solar energy production, solar photovoltaic (PVs) are the fastest growing source of power in Georgia. As of last year, Georgia had an estimated 3,769 megawatts of total solar capacity installed, according to the "Solar in the Southeast" report[35] produced by the Southern Alliance for Clean Energy (SACE), a nonprofit clean energy advocacy group. That's up by more than a quarter from 2,970 megawatts in 2021.

The most important factor driving up solar use is Congress passing the sweeping Inflation Reduction Act, which includes programs like a $9.7 billion grant that further bolsters rural electric co-ops' ability to provide clean energy services at prices that are comparable to private utilities. An example of a major investment into solar technology is the $2.5 billion manufacturing plant in Dalton, Georgia by Hanwha Qcells. Investments from solar PV manufacturing companies and their suppliers reduce the supply chain challenges that have plagued the solar industry for decades by making the panels available locally. A long-term plan for Georgia Power to add 2,300 megawatts of renewable energy by the end of the decade was approved by the state's utility regulators last year. Solar distributed-generation is expected to reach 200 megawatts by 2025 and utility-scale renewable energy – mainly solar – is projected to reach 2,100 megawatts by 2029.

Agricultural

Trends presented by data from the Bureau of Labor Statistics and land use data show a general declining trend in jobs associated with agriculture and in the acreage of land dedicated to that purpose. Similarly, land use mapping data shows land dedicated to agricultural production has decreased for the majority of the state since 2011. (Figures 40 & 41). In 2023, the continued relevance of industry to the state was underscored by the State Legislature which passed two separate bills dedicated to its protection. First, HB 545 established the Agricultural Commodity Commission for Citrus Fruits. The creation of the commission recognizes the growing industry for citrus fruits in Georgia, which has only taken hold in recent years. The second piece of legislation was SB 220 which created the Georgia Farmland Conservation Fund to purchase conservation easements for agricultural land. The bill creates value for the property owners, relieving the pressure from development and safeguarding the agricultural capacity of the state.



2011 2021

Figure 41: Agricultural land (in acres) in 2011 and 2021. GIS map created by the project team. Data from the Georgia Department of Revenue

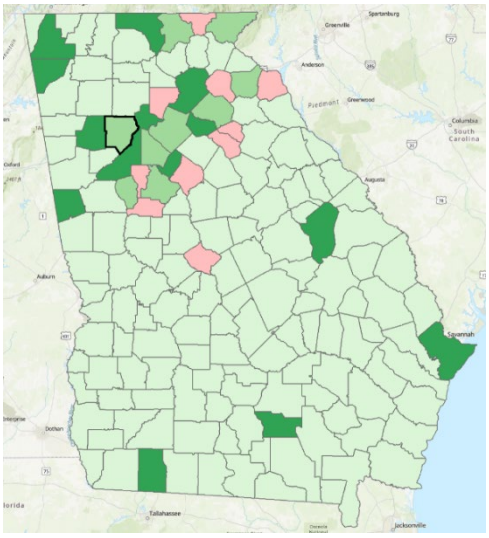


Figure 42: Agricultural land use (in acres) change 2011-2021. GIS map created by project team. Data from the Georgia Department of Revenue.

Lumber and Timberland

In 2004, Georgia Senate Bill 356 created the Georgia Carbon Sequestration Registry. "The goal of the registry is to provide forest landowners, municipalities, and public and private entities with an official mechanism for the development, documentation, and reporting of carbon sequestration projects undertaken in Georgia."[36] The registry creates an incentive and subsidy for Georgia lumber forests by creating additional value for the lumber material. In 2020, the registry was expanded to include construction materials, which also creates a carbon offset opportunity for KSU if it chooses to grow with Georgia lumber as it would be able to sell the carbon offsets for the carbon "locked" in the building materials for the life of the building. Despite challenges during the pandemic, the lumber industry continues to see significant investment and growth throughout the state.

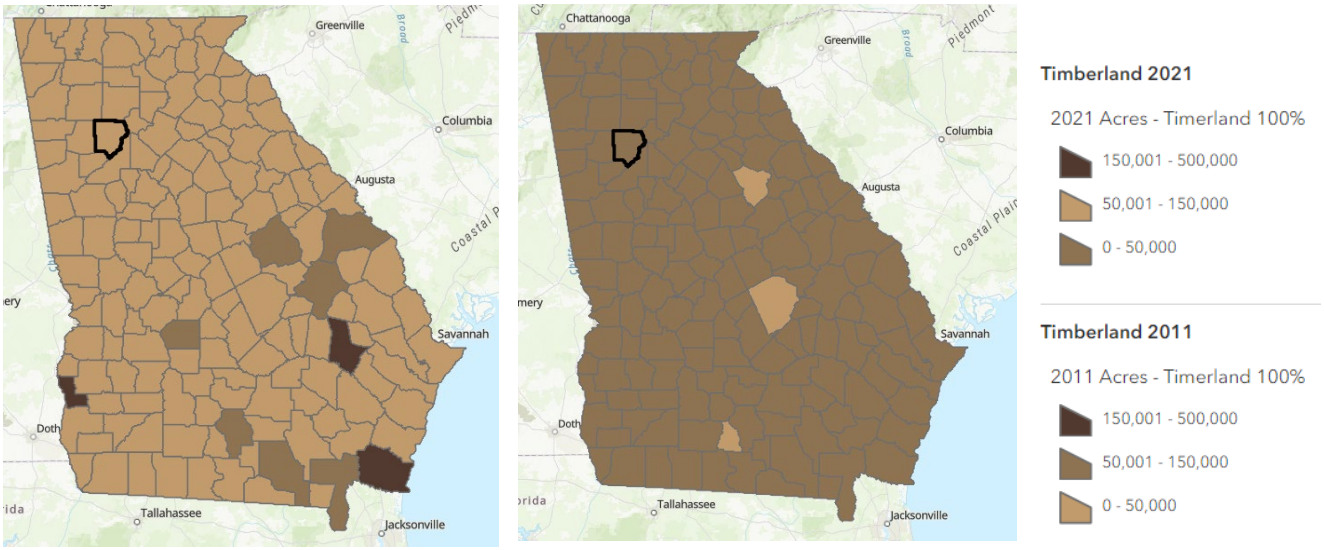


Figure 43: Timber land (in acres) in 2011 and 2021. Data from the GIS map created by project team. Data from the Georgia Department of Revenue.

B. Assets and Opportunities

- KSU Industrial and Engineering Systems Degree & Industrial Engineering Technology

Industrial Manufacturing Degrees

Bachelor's degrees in manufacturing operations and supply chains have recently been cut from the curriculum. Opportunities for Interdisciplinary engineering degrees in Electrical Engineering and Industrial Design and Manufacturing would be particularly aligned with current industries of growth in Georgia.

- Renewable Energy Engineering Minor

KSU currently offers a minor in Renewable Energy Engineering, which provides students an opportunity to examine different renewable energy sources including solar, hydrokinetic, wind, geothermal and learn energy efficiency aspects of sustainable energy systems. The program is multidisciplinary in nature and developed in collaboration between the Electrical Engineering and Mechanical Engineering departments at the Southern Polytechnic College of Engineering and Engineering Technology.

Renewable Energy Master's Concentration

As the demand for renewable energy engineers is expected to grow as a result of recent state investments and policy discussed above, KSU has an opportunity to expand the renewable energy curriculum to its graduate student population. Both UGA and GT have created similar programs. (Appendix 5)

- KSU Field Station

The 25-acre property 2.5 miles from the Kennesaw campus is an active farm as well as an interdisciplinaray resarch facility. The farm provides produce to KSU's dining halls and provides work study opportunities for students. Current research is listed below.

- Applied integrated crop science
- Semi-automated mushroom production
- American Chestunt tree restoration
- Urbanization and the impact on starlings
- Food Forest
- Forensic Anthropology

Field Station Optimization

Agriculture adaptation: As agriculture in GA seeks to adapt to changing weather patterns and warmer temperatures, the field station presents an opportunity for KSU to participate in research supporting the industries adaptation and prepare students with the skills necessary to practice in the evolving field.

Pollinator Support

Students have consistently called for a project to support a KSU beehive and planting pollinator crops. As pollinators are crucial to agriculture, the field station presents a great opportunity for KSU to develop this area of student interest and research.

USG Partnerships

UGA's uGarden and Georgia State's urban vertical farming projects present opportunities for data sharing, collaboration and enhancing the student experience by offering exposure to different types of farming under different conditions.

Community support

Currently, produce grown on the Field Station and not sold to the dining halls is donated to the CARE pantry, and in that small way, the field station contributes to fighting food insecurity. The Food Forest, in particular, under the leadership of Dr. Jason Rhodes and Dr. Vanessa Slinger-Friedman, have carried their model for sustainable urban cultivation to communities throughout the metro Atlanta area. Continuing to increase the visibility of the Field Station and the research conducted there to students in the main campuses as well as to the local community would accelerate its impact in fighing local food insecurity and potentially spur additional research opportunities.

Part III. Research and Curriculum

A. Curriculum

In addition to curriculum related specifically to the green industries noted above, universities around the country have begun to offer courses as well as degrees dedicated to sustainability. In many cases, those are directly aligned with a green industry, such as the renewable energy or agriculture degrees discussed previously, in others, they are dedicated interdisciplinary programs designed to cover a cross section of topics related to sustainability and to lead directly into sustainable administration and management positions that require a broader familiarity with the field. Several of our USG peer institutions have begun to develop dedicated and interdisciplinary programs. See Appendix 4 for a summary list.

- Sustainability Courses

Currently there is no single source for identifying Sustainability Courses offered by KSU. In February of 2023, The Office of Sustainability circulated a "Sustainability Course Survey" through the Associate Deans of the college. Faculty and courses targeted for the survey were identified through a keyword search of the course catalog and submitted course syllabi for specific terms associated with Sustainability. The Survey received responses for 105 individual courses of which 86 were reported to be either "Sustainability Focused" or "Inclusive" of Sustainability topics. The College of Architecture and Construction Management accounted for nearly half of the responding courses, followed by the College of Engineering.

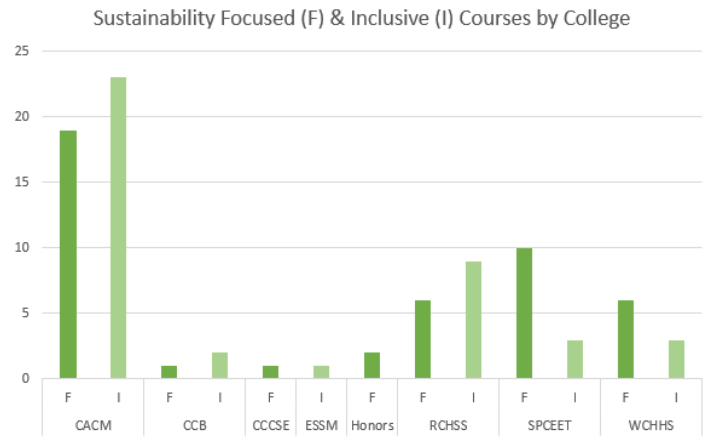


Figure 44: Count of Sustainability Courses offered by college. Data collected by Office of Sustainability Sustainable Course Survey.

The Sustainability Course Survey also sought to collect data on courses teaching the United Nations Sustainable Development Goals (UNSDGs), which had been a part of the framework taught in the Sustainability Across the Curriculum workshops. Of the 86 responding courses, 38 reported teaching about one or more of

the goals. Sustainable Communities was the one most often reported, which is likely due to the predominance of courses teaching Sustainability in the Architecture department.

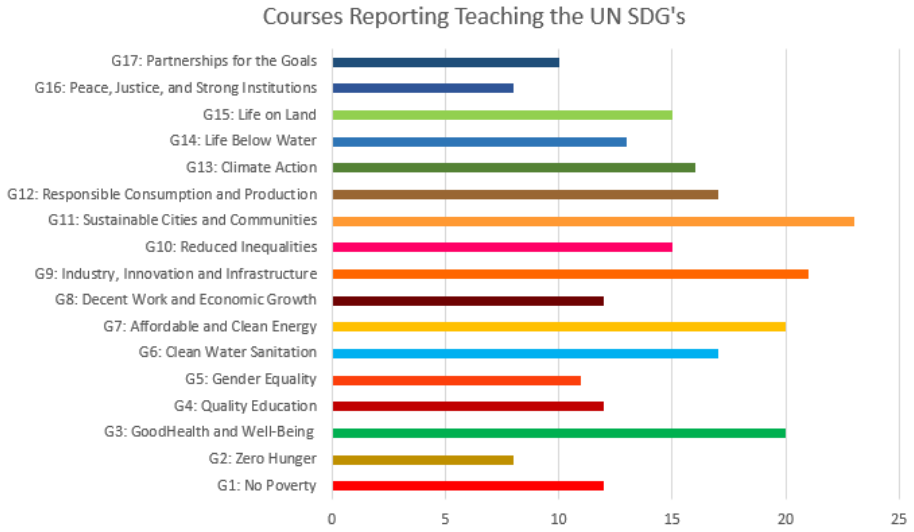


Figure 45: Count of Sustainability courses reporting to teach on the UNSDGs. Data collected by Office of Sustainability Sustainable Course Survey, February 2023.

The Office of Sustainability will continue to publish courses on its website, but KSU could try to find a way to measure course enrollment and advertising. It should also consider creating an identifier in the course catalog.

General Education Core Requirement

The University of Iowa recently created a Core Requirement, ensuring that a large percentage of their students who graduate from the university are exposed to at least one course that addresses basic concepts related to Sustainability. Currently, the Sustainability General Ed requirement applies only to degrees from the College of Liberal Arts and Sciences, the College of Public Health, and the College of Education.[37] Alternatively, sustainability modules can be incorporated into the core requirements of core classes in each field.

Sustainability Degrees

As of the date of this report, KSU has only minors focused on sustainability, though the degrees in Environmental Science and Environmental Engineering have numerous sustainability-related requirements. The Renewable Energy Engineering minor and the Environmental Studies minor may be considered sustainability-focused. Additionally, in 2017, faculty in the Department of Geography & Anthropology submitted a proposal to the Dean's Office for the "Environmental Studies and Sustainability" degree in 2017. While the proposal was not selected to proceed to the Board of Regents at the time, it remains a strong structure from which a future program may be developed. Appendix 4 offers a summary list of related degrees offered by USG schools. In general, and included in KSU, the Sciences offer the most related degrees, followed by engineering. It is worth noting, however, that most programs that explicitly mention sustainability are either cross listed between several departments or

are listed as being “Interdisciplinary”. Among these are: UGA’s Interdisciplinary Certificate in Sustainability, Georgia Tech’s Master in Sustainable Energy and Environmental Management, and Georgia State’s Bachelor of Interdisciplinary Studies in Environmental Science, Urban Studies, and Global Studies. In addition to these, Georgia Southern has recently established the School of Earth, Environment and Sustainability, which in addition to the Environmental science degrees offers Environmental Sustainability Interdisciplinary Minor and Major.

Interdisciplinary Degree/Certificate

As evidenced by the number of Interdisciplinary Degrees offered by the USG sister institutions, an interdisciplinary approach to sustainable education is appropriate. KSU’s Interdisciplinary Studies Department may prove a natural fit for the development of individual courses, certificates or degrees focused on sustainability.

Several Honors courses at KSU have already been dedicated to the UN SDGs (Prof. Jairo García) or Sustainability more broadly (taught by Office of Sustainability). Because Honors courses are available to all honor students regardless of their degree, they are an opportunity to offer sustainable education across the student population.

B. Faculty Offerings

Sustainability Across the Curriculum Faculty Workshops

During his tenure as Director of Sustainability at Kennesaw State University, Dr. R.C. Paul established the “Sustainability Across the Curriculum” program which provided training and resources for faculty looking to teach on the Sustainable Development Goals in the classroom. A list of the faculty who participated in the program is provided in Appendix 4.

KSU should consider gauging the interest of new faculty members in participating in a similar program. Existing faculty that previously participated in the “Sustainability Across the Curriculum” workshops have expressed an interest in facilitating the group, if appropriate course releases or supplemental pay could be secured.

C. Sustainability Education Frameworks

United Nations Sustainable Development Goals

- RCE Greater Atlanta

Established in 2017, the Georgia chapter of the United Nations Regional Center of Expertise, the RCE of Greater Atlanta brings together universities and colleges from across Atlanta metro region together with nonprofit, community, government, and business partners. Through the RCE, KSU students, faculty, and staff have access to a network of expertise, resources, and opportunities that complement their sustainable education, provide community and service-based research and learning opportunities.

- SDG Futures Fellowship

The Office of Global Education launched the SDG Futures Fellowship prior to the pandemic. From its beginning, the SDG Futures Fellowship seeks to educate participating students on the United Nations Sustainable Development Goals while providing opportunities to have local impact through partnerships with local community partners and non-profits. In 2022-2023, the fellowship was granted an AGREC grant to expand the fellowship to the other 10 RCE Greater Atlanta-affiliated higher education institutions to expand the service opportunities and opportunities for regional impact of the students' projects.

The Fellowship hosts 20-30 students each year as feasible depending on community partners. Last year, three KSU students took part in the cohort of 27. This year, four KSU students are participating. The program is co-managed by Kris Chatfield of GT's Center for Sustainable Communities Research and Education, and María del Mar Ceballos of KSU's Office of Sustainability, in partnership with Shae Smith of KSU's Office of Global Education.

The Fellowship offers members of the KSU community an opportunity to network with peers in other institutions throughout the State and provides hands on service-learning opportunities for our students. The Fellowship is being funded through an AGREC grant in the 2023-2024 academic year but will not be eligible to apply for a third-year grant and will require additional funding to continue.

- SDG Community of Practice

In the absence of a KSU's own "Sustainability Across the Curriculum" faculty training program, the Office of Sustainability has partnered with the RCE Greater Atlanta who currently hosts quarterly faculty training workshops as part of its Community of Practice. The workshops are open and free of charge to all KSU faculty. Interested participants are also invited to participate as facilitators.

- Engineering One-Planet

In 2023, the College of Engineering successfully applied for a grant from the Lemelson Foundation to institutionalize the SDG's using the Engineering for One Planet (EOP) framework. The 2-year project intends to: (1)

enhance faculty learning through a year-round community of practice, (2) increase the course-based opportunities for students to gain exposure and skills in sustainability by aligning the framework to required courses, and (3) develop a sustainable infrastructure of curricular and co-curricular efforts that incorporate the EOP framework. The grant provides funding and training for professors to develop and implement new courses that leverage the EOP framework as well.

4. Living Learning Lab

A living learning lab is a way for university researchers to conduct studies *in vivo*, based on experimentation and an integration of research and innovation in real-life situations. Living learning labs are dynamic spaces where ideas and solutions can be co-created and tested through partnerships between students, faculty, and communities in real-world environments. KSU's Living Learning Lab programs currently include OwlSwap and the Food Forest at the Field Station. OwlSwap addresses issues of environmental and social equity in the fashion industry through action, education, and experiential opportunities in the local, regional, and international community to bring about a swap to more sustainable lifestyle habits. The KSU Food Forest, in development on 1/3 acre at the KSU Field Station, serves as a model of sustainable urban cultivation, and demonstrates the potential of food forest systems to mitigate climate change and promote food security and health. Through the Office of Sustainability and the Norman J. Radow College of Humanities and Social Sciences, KSU has a new Living Learning Lab Coordinator, and programs will continue to expand in the coming year.

Sustainable Research Inventory

At present, there is no comprehensive list of on-going research related to Sustainability. Communication and collaboration may be improved with the development of an interdisciplinary list of related research maintained by the Office of Sustainability and made publicly available.

Living Learning Lab Formalization

To maintain consistent collaboration between researchers and university operations and administration staff, there is a need for a formalized and replicable documentation process for on-going, and potential Living Leaning Lab opportunities.

5.. Student Organizations

EcoOwls

The EcoOwls are a registered student organization (RSO) committed to the health and well-being of the planet. This RSO strives to cultivate positive environmental change throughout KSU by sponsoring student leadership opportunities such as initiating student-led projects, attending conferences, and networking with those in green industries. Past events have included hosting a Sustainability Film Series, A Climate Change Theatre Action

Event with a collection of plays and original works about climate change and social justice, National Pumpkin Seed Day, and workshops to maintain the campus Oasis.

Adopt-A-Stream at KSU

Adopt-A-Stream at KSU is a student-led organization that contributes to Georgia's Adopt-A-Stream program. Members participate in water testing in Kennesaw's watershed, travel to local environmental science sites and participate in research.

KASU Chapter Association of Energy Engineers

The KSU chapter of AEE regularly invites industry professionals to present on energy efficiency and sustainability topics related to renewable energy. Participation in the club offers students opportunities to attend conferences and apply for professional grants.

WACA

The Wildlife Animal Conservation Association (WACA) consists of any student at Kennesaw State University who has a love for nature and its wild animals. The purpose of the organization is to focus on wildlife as a whole and how every species is important to its surrounding ecosystem.

KSU Student Government Association - Director of Sustainability

Previously the Senator for Sustainability, the Director, represents and advocates for sustainability initiatives within the Student Council.

Conclusion

Historical trends, as well as modeled projections, indicate that both KSU campuses are likely to experience warmer temperatures and increased precipitation and EHE days in the coming decades. Armed with this information, the university has an opportunity to invest in infrastructure and operational improvements to mitigate the projected impact and build resiliency.

Around our campuses, similar effects will impact historically significant industries in the state, such as agriculture and lumber. Existing research and university staff have the potential to help inform and support the state's adaptation in the coming decade and to educate students equipped with the experience and skills to continue and drive those adaptations in the decades to follow.

Investments made by the state in green technologies have created new and expanded existing career tracks in the green job market, particularly around EVs and renewable energy manufacturing and infrastructure. Given its existing curriculum in renewable energy and the interdisciplinary nature of its Engineering school, KSU is well-positioned to develop a curriculum that prepares students to fill those local jobs and opportunities in both the short and long term. The Field Station and the Learning Living Lab initiative are poised to help support existing and new research opportunities that study and test agricultural, engineering, and operational technologies, processes and practices that facilitate the adaptation to the changing climate trends across all of its colleges.

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Appendix 1: Climate Action Plan Progress Summary

Commitment	2016	Current Status
Facilities Life Cycle Management		
Annual GHG	Last recorded 2022	Submitted to SIMAP, 2022
Sustainability Plan for KSU	Proposed 2018	Scheduled to Kick off 2024
Purchasing Carbon Offsets	Proposed	$0
Efficient Lighting & Rebates	Proposed	LED Renovations and rebates, ongoing
Increased Metering and dashboard	26 Buildings	Expected 100% FY 24
Submetering systems	Proposed	0%
Expand Dashboard to include water and gas	Proposed	Partial water dashboard
Motion sensors in new classroom/offices	Proposed	Phased-in new construction
Install EV charging stations	Proposed	In select parking locations, adding 21 in FY24
Develop renewable energy strategies for campus fleet	Proposed	Some EV golf carts, electric landscaping equipment pilot FY 24.
Waste Management and Procurement		
Water-Hub Technology, reusing waste water	Proposed	
Composting	Dining back of house	Office of Sustainability: Starbucks, Dunkin + Breakroom pilot program
Event Recycling	Proposed	
Recycling in Housing	Proposed	Pilot program Fall 2023
Develop System for collecting vegetable oil	Cobb County	
Prioritizing Native Plants and replacing lawns	Proposed	
Rainwater collection	Proposed	
Develop campus tree plan to maximize tree plantings	Proposed	
Expand recycling program	Proposed	Transitioned to multi-stream recycling in all indoor spaces FY22/23.
Increase access to nearby trails, bike and public transit	Proposed	Bike campus Bronze certification. Additional trails.
Academics and Engagement		
Farm to campus educational opportunities		Ongoing
Alternative Energy Innovation Center		
Minor in Renewable Energy Engineering Technology		Ongoing
Seek grants to fund workshops and events		$0
Expand Sustainability Research		Created Learning, Living, Lab Coordinator Position FY 24
Sustainability @ KSU course		Honors Discovery Fall 23/Spring 24
Education to encourage behavioral changes		Focus on recycling. Tabling content development.
Enhanced visibility of KSU efforts		Office of Sustainability. Created 2022

Appendix 2: KSU LEED Credit Summary

		Kennesaw Campus			
		Science Laboratory	Siegel REC Center	Education Building	
	LEED v2009	Silver	Silver	Silver	
	Sustainable Sites	**19/26**	**23/26**	**18/26**	**64.10%**
	Construction activity Pollution prevention	R	R	R	3
	Site selection	1/1	1/1	1/1	3
	Development density and community connectivity	5/5	5/5	5/5	3
	Brownfield reevelopment		1/1		1
	Alternative transportation - public transportation access	6/6	6/6	6/6	3
	Alternative Transportation - bicycle storage and changing rooms		1/1		1
	Alternative Transportation - low emitting and fuel efficient vehicles		3/3		3
	Alternative Transportation - parking capacity	2/2	2/2	2/2	2
	Site Developent - protect or restore habitat				0
	Site Development Maximizing Open Space	1/1	1/1	1/1	3
	Stormwater Design - quantity control	1/1	1/1		2
	Stormwater Design - quality control	1/1	1/1	1/1	3
	Heat island effect - non-roof			1/1	1
	Heat island effect - roof	1/1	1.1	1/1	3
	Light Pollution reduction	1/1			1
	Water Efficiency	**6/10**	**3/10**	**2/10**	**53.08%**
	Water use reduction (prerequisite)	R	R	R	3
	Water efficient landscaping	4/4			1
	Innovative waste water technologies				0
	Water use reduction	2/4	3/4	2/4	3
	Energy & Atmosphere	**16/35** **0.46**	**10/35** **0.29**	**11/35** **0.31**	**35.24%**
	Fundamental commissioning of the building energy systems	R	R	R	3
	Minimum energy performance	R	R	R	3
	Fundaental Refrigerant Management	R	R	R	3
	Optimize energy performance	12/19	3/19	6/19	3
	On-site renewable energy				0
	Enhanced commissioning	2/2	2/2	2/2	3
	Enhanced refrigerant management	2/2	2/2		2
	Measurement and verification	3/3	3/3	3/3	3
	Green Power				0
	Materials and Resources	**6/14**	**4/14**	**4/14**	**33.33%**
	Storage and collection of recyclables	R	R	R	2
	Building reuse- maintain existing walls, floors and roof				0
	Building reuse - maintain interior non-structural elements				0
	Construction waste management	2/2	2/2	2/2	3
	Material reuse				0
	Recycled Content	2/2	2/2	2/2	3
	Regional Materials	2/2			1
	Rapidly renewable materials				0
	Certified wood				0
	Indoor Environmental Quality	**9/15**	**9/15**	**10/15**	**62.22%**
	Minimum IAQ perfromance	R	R	R	3
	Environmental Tobacco Smoke (ETS) control	R	R	R	3
	Outdoor air delivery monitoring		1/1	1/1	2
	Increased ventilation	1/1			1
	Construction IAQ management - during construction	1/1		1/1	2
	Construction IAQ management - before occupancy	1/1		1/1	2
	Low-emitting materials - adhesives and sealants	1/1	1/1		2
	Low-emitting materials - paints and coatings	1/1	1/1	1/1	3
	Low-emitting materials - flooring	1/1	1/1	1/1	3
	Low-emitting materials - composite wood and agrifiber products	1/1			1
	Indoor chemical and pollutant source control		1/1	1/1	2
	Controllability of systems - lighting		1/1	1/1	2
	Controllability of systems - thermal comfort	1/1	1/1	1/1	3
	Thermal comfort - design	1/1	1/1	1/1	3
	Thermal comfor - verification		1/1	1/1	2
	Daylight and views - daylight				0
	Daylight and views - views				0
	Innovation	**2/6**	**4/6**	**4/6**	
	Innovation in design				0
	LEED Accredited Professional				0
	Regional Priority	4/4	3/4	2/4	
	Regional Priority	1/1			1
	Introduction/Other	1/1	1/1		2
	Project Information Form 1	1/1	1/1	1/1	3
	Project Information Form 2	1/1	1/1	1/1	2
	Water suse reduction				0

		Marietta Campus (SPSU)			Kennesaw Campus		
		ETC	Design Building II	Student Housing	The Commons	Prillaman	
	LEED V2.2	Silver	Silver	Silver	Gold	Gold	
	Sustainable Sites	**9/14**	**9/14**	**9/14**	**9/14**	**9/14**	**64.29%**
	Construction activity Pollution prevention	R	R	R	R	R	5
	Site selection	1/1	1/1	1/1	1/1	1/1	5
	Development density and community connectivity	1/1	1/1	1/1	1/1	1/1	5
	Brownfield reevelopment						0
	Alternative transportation - public transportation access	1/1	1/1		1/1	1/1	4
	Alternative Transportation - bicycle storage and changing rooms	1/1	1/1	1/1	1/1	1/1	6
	Alternative Transportation - low emitting and fuel efficient vehicles			1/1			1
	Alternative Transportation - parking capacity	1/1	1/1		1/1	1/1	4
	Site Developent - protect or restore habitat						0
	Site Development Maximizing Open Space			1/1	1/1	1/1	3
	Stormwater Design - quantity control	1/1	1/1	1/1			3
	Stormwater Design - quality control	1/1	1/1	1/1	1/1	1/1	5
	Heat island effect - non-roof	1/1	1/1	1/1	1/1	1/1	5
	Heat island effect - roof	1/1	1/1	1/1	1/1	1/1	5
	Light Pollution reduction						0
	Water Efficiency	**4/5**	**4/5**	**4/5**	**4/5**	**3/5**	**76.00%**
	Water efficient landscaping - reduce by 50%	1/1	1/1	1/1	1/1	1/1	5
	Water efficient landscaping - no potable water use or no irrigation	1/1	1/1	1/1	1/1		4
	Innovative waste water technologies						0
	Water use reduction - 20% reduction	1/1	1/1	1/1	1/1	1/1	5
	Water use reduction - 30% reduction	1/1	1/1	1/1	1/1	1/1	5
	Energy & Atmosphere	**4/17**	**4/17**	**5/17**	**3/17**	**8/17**	
		0.24	**0.24**	**0.29**	**0.18**	**0.47**	**28.24%**
	Fundamental commissioning of the building energy systems	R	R	R	R	R	5
	Minimum energy performance	R	R	R	R	R	5
	Fundaental Refrigerant Management	R	R	R	R	R	5
	Optimize energy performance	2/10	3/10	3/10	2/10	5/10	5
	On-site renewable energy						0
	Enhanced commissioning	1/1	1/1	1/1		1/1	4
	Enhanced refrigerant management	1/1		1/1	1/1	1/1	4
	Measurement and verification					1/1	1
	Green Power						0
	Materials and Resources	**5/13**	**4/13**	**5/13**	**6/13**	**7/13**	**41.54%**
	Storage and collection of recyclables	R	R	R	R	R	5
	Building reuse- maintain 75% of existing walls, floors & roof						0
	Building reuse- maintain 95% of existing walls, floors & roof						0
	Building reuse - maintain 50% of interior non-structural elements						0
	Construction waste management - divert 50% from disposal	1/1	1/1	1/1	1/1	1/1	5
	Construction waste management - divert 75% from disposal	1/1	1/1	1/1	1/1	1/1	5
	Material reuse - 5%						0
	Material reuse 10%						0
	Recycled Content - 10% (post-consumer + 1/2 pre-consumer)	1/1	1/1	1/1	2/1	2/1	5
	Recycled Content - 20% (post-consumer + 1/2 pre-consumer)						0
	Regional Materials - 10% extracted, processed and manufactured regionally	1/1	1/1	1/1	1/1	1/1	5
	Regional Materials - 20% extracted, processed and manufactured regionally	1/1		1/1	1/1	1/1	4
	Rapidly renewable materials						0
	Certified wood					1/1	1
	Indoor Environmental Quality	**9/15**	**10/15**	**7/15**	**12/15**	**10/15**	**64.00%**
	Minimum IAQ perfromance	R	R	R	R	R	5
	Environmental Tobacco Smoke (ETS) control	R	R	R	R	R	5
	Outdoor air delivery monitoring	1/1	1/1			1/1	3
	Increased ventilation						0
	Construction IAQ management - during construction	1/1	1/1	1/1	1/1	1/1	5
	Construction IAQ management - before occupancy				1/1	1/1	2
	Low-emitting materials - adhesives and sealants	1/1	1/1	1/1	1/1	1/1	5
	Low-emitting materials - paints and coatings	1/1	1/1	1/1	1/1	1/1	5
	Low-emitting materials - carpet systems	1/1	1/1	1/1	1/1	1/1	5
	Low-emitting materials - composite wood and agrifiber products	1/1	1/1		1/1		3
	Indoor chemical and pollutant source control	1/1			1/1	1/1	3
	Controllability of systems - lighting		1/1		1/1	1/1	3
	Controllability of systems - thermal comfort		1/1		1/1		2
	Thermal comfort - design	1/1	1/1	1/1	1/1	1/1	5
	Thermal comfor - verification	1/1	1/1	1/1	1/1	1/1	5
	Daylight and views - daylight 75% of spaces						0
	Daylight and views - views for 90% of spaces			1/1	1/1		2
	Innovation	**3/5**	**3/5**	**5/5**	**5/5**	**5/5**	
	Innovation in design				1/1		
	LEED Accredited Professional				1/1		

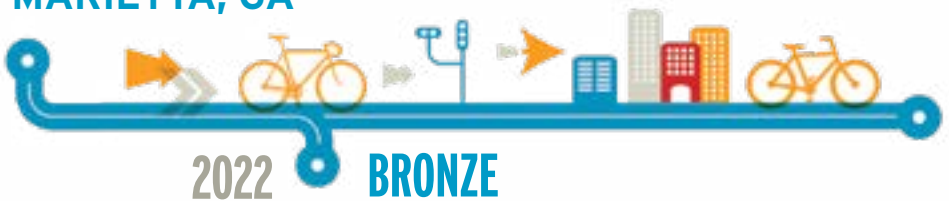
Appendix 3: Bike Friendly Campus Feedback and Recommendations

BICYCLE FRIENDLY UNIVERSITY

Feedback Report

KENNESAW STATE UNIVERSITY - MARIETTA CAMPUS

MARIETTA, GA



2022 BRONZE

CONGRATULATIONS! THE LEAGUE OF AMERICAN BICYCLISTS HAS DESIGNATED KENNESAW STATE UNIVERSITY - MARIETTA CAMPUS AS A BICYCLE FRIENDLY UNIVERSITY AT THE BRONZE LEVEL. Reviewers were very pleased to see the current efforts and dedication to promoting cycling for transportation and recreation on your campus. Congratulations on your leadership!

CAMPUS PROFILE

BIKE PROGRAM WEBSITE: BIKE.KENNESAW.EDU

INSTITUTION TYPE	STUDENT ENROLLMENT	% OF STUDENTS LIVING OFF-CAMPUS	CAMPUS ROADWAY MILES	% OF ROADS UNDER UNIVERSITY CONTROL
National/Regional University	10,746	86%	6.87	41%
CAMPUS TYPE	STAFF & FACULTY	AVERAGE DISTANCE TO CAMPUS	PATHWAY MILES	CAMPUS SIZE
Suburban	536	9 miles	4.42	193 Acres

Below, reviewers provided key recommendations to further promote bicycling at Kennesaw State University - Marietta campus along with a menu of additional pro-cycling measures that can be implemented in the short and long term. We strongly encourage you to use this feedback to build on your momentum and continue to improve your campus for bicyclists.

There may also be initiatives, programs, and facilities that are not mentioned here that would benefit your bicycling culture, so please continue to try new things to increase your ridership, safety, and awareness!

HIGHLIGHTS OF KENNESAW STATE UNIVERSITY - MARIETTA CAMPUS'S 2022 BFU APPLICATION INCLUDE:

- *Marietta Campus Bike Shop*
- *Proximity to Gateway Marietta Community Improvement District (CID)*
- *Expansion of the Mountain to River & Rottenwood Creek trails*
- *Collaborations with non-profits such as GA Commute Options*
- *Incoming Freshman bicycling trips*
- *Annual participation in the City of Marietta's Mountain to River Trail fest*
- *KSU Bike Ped-Advisory Committee*

KEY STEPS TO SILVER:

- ***Adopt a Complete Streets or Bicycle Accommodation policy and continue to expand the bike network through the use of appropriate low-stress bicycle facilities. Work closely with the City of Marietta to improve network connectivity on and around campus. (See Engineering)***
- ***Continue to increase the amount of high quality bicycle parking at popular destinations on campus, and to upgrade the quality of all existing bike parking to meet APBP guidelines. Adopt Bike Parking Design Standards or Guidelines to ensure that all future racks meet APBP guidelines. (See Engineering)***
- ***Consider developing an Occasional Parking Pass option for commuters by offering single-day parking pass***

options for those who want to drive less often and use alternative modes such as biking or transit more often. Consider also offering a Trade-in/Cash-out incentive program for employees who trade in or decline a parking permit and choose to bike, walk, or take transit to work instead. (See Engineering and Encouragement)

» *Develop a comprehensive bicycle education program including regular bicycle safety and maintenance classes, information sessions, or rides. Host a League Cycling Instructor (LCI) seminar to increase the number of local LCIs qualified to teach these classes on campus. (See Education)*

» *Appoint a staff member as official Bicycle Program Manager or create a new position. (See Evaluation & Planning).*

» *Establish a dedicated annual budget to ensure successful implementation of your campus bike plan, as well as to commit the administration to providing ongoing support of the bicycle program and related expenses. (See Evaluation & Planning).*

» *Conduct regular research on bicycle usage by conducting regular manual counts or installing automated bike counters, and distributing a regular satisfaction survey to students and employees to better understand barriers to cycling. (See Evaluation & Planning)*

» *Improve signage from the campus to the off-campus trail network, and vice-versa.*

See the following menu of additional recommendations to learn how your campus can improve in these and other areas to become more bicycle-friendly.

ENGINEERING

Campus Roadway & On-Road Bicycle Network

» Encourage your surrounding community to work toward the Bicycle Friendly Community (BFC) designation. See the League's Bicycle Friendly America Toolkit for advocates including PPT slide presentations, scripts, and digital and printed resources to promote the Bicycle Friendly Community program to your local government leaders: www.bikeleague.org/bfa/toolkit. Learn more about the BFC program at bikeleague.org/community.

» Work with Marietta to increase and improve connectivity of the on-road bicycle network on and around your campus. Below are several recommendations for specific infrastructure types to consider to ensure your bike network meets national standards and best practices. Ensure that your campus and community both follow a bicycle facility selection criteria that increases separation and protection of bicyclists based on levels of motor vehicle speed and volume.

» Consider implementing car restrictions or even car-free zones on campus to increase safety by reducing the potential for conflicts between cars and bicyclists and pedestrians.

» Lower the speed limit to 20 mph on campus streets. Speed has been identified as a key risk factor in road traffic injuries, influencing both the risk of a road traffic crash as well as the severity of the injuries that result from crashes. For instance, pedestrians and cyclists have a 90% chance of survival if hit by a car traveling at a speed of 20 mph or below, but less than a 50% chance of surviving an impact of 30 mph or above. Learn more about speed management techniques from NACTO: https://bit.ly/NACTO_Speed. The United Nations Road Safety Collaboration developed a Speed Management Manual for policymakers at https://bit.ly/WHOSpeed.

» Place wayfinding signage at strategic locations around

campus. By helping bicyclists more easily and conveniently navigate your campus, you will help them to focus on riding more safely and predictably, for the benefit and safety of everyone. Here are some best practices from the Washington, DC Area Council of Governments: https://bit.ly/DcWayfind. Learn more about bike route wayfinding signage and markings system best practices from NACTO: https://bit.ly/NACTO_wayfind.

» Consider adding speed tables to on-campus streets to calm traffic and reduce the speed of on-campus traffic to levels that are safer for cyclists and pedestrians. Learn more about speed tables from NACTO: https://bit.ly/NACTO_SpeedTable.

» Consider converting any existing low-speed/low-traffic streets on campus into bicycle boulevards through additional traffic calming measures. Learn more at https://bit.ly/NACTOBikeBlvds.

» Your application indicated that your campus does not have bike lanes, buffered bike lanes, or cycle tracks. Consider adding these to your campus where possible. A great first step could be checking out guides to bike lanes by NACTO at https://bit.ly/NACTOBikeLanes and the Pedestrian & Bicycle Information Center at https://bit.ly/PedBikeBikeLanes. Buffered bike lanes or cycle tracks offer an added layer of protection from conventional bike lanes and raise the comfort level for people bicycling. The buffer separation also allows for curb access and space for a car door to open if the buffered bike lane is next to car parking. Learn more about them at the NACTO website: https://bit.ly/NACTO_BufferedLanes.

» Consider creating colored bike lanes on campus to boost cyclist visibility and improve safety, particularly in conflict areas such as intersections and near on-street car parking. Learn more from NACTO: https://bit.ly/NACTO_ColorLanes.

» Consider increasing cyclist safety by adding protected bike lanes or cycle tracks to your campus roads, including by adding physical barriers or additional space to existing painted bike lanes to increase separation and protection. Protected bicycle facilities are particularly critical on higher speed roads and those with higher levels of motor vehicle traffic, to provide low-stress bikeways for all ages and abilities. Check out NACTO's guide to cycle tracks at https://bit.ly/NACTOCycleTrack.

» Bike Boxes, typically used at signalized intersections, are a great tool to consider to increase visibility and comfort for people on bikes. Bike boxes can be used to make turning at intersections safer especially where there may be conflicts between motorists and bicyclists. Read more about the benefits and uses of bike boxes on NACTO's website: https://bit.ly/NACTO_BikeBoxes.

» Pilot/demonstration projects featuring bike facilities or traffic calming measures can be instrumental ways to show what your vision is for the use of the street space. Many cities work with local entities to pilot projects to gather feedback and test out an idea before building and selecting a permanent design. Oftentimes organizations host or build their own demonstrations to show what they would like to see. Examples of pilots/demonstrations are pop-up bike lanes, parking protected bike lane demonstrations, and a pop-up bike/bus lane. Learn more about pilot/demonstrations by reading these articles: Temporary and Pop-up Bike-Ped Infrastructure (https://bit.ly/EcoCount_PopUp), Pop-Ups for Safe Routes to School (https://bit.ly/SRTS_PopUp), and Tactical Urbanism Guide (https://bit.ly/TacticalUrbanismGuide).

» Consider implementing automated (e.g. camera or video) speed enforcement for motor vehicles on your campus roads, and/or work with your local community to do the same on roads on and around your campus. When considering this mechanism, take into consideration ways to implement it that are equitable and do not further existing disparities for marginalized communities. For more information about this, read BikePedInfo's Whitepaper: https://bit.ly/PedBikeInfo_

AutoEnforcement and these Streetsblog articles about the pros and cons of automated enforcement: https://bit.ly/StreetsBlog_ProConRedLightCamera and https://bit.ly/StreetsBlog_AnalysisSpeedCameras.

» Work with your city, county, and state to develop right-on-red restrictions for motor vehicles at signalized intersections to improve safety for bicyclists and pedestrians on your campus.

Campus Off-Road Bicycle Network

» Increase the network of shared use pathways on your campus, and be sure to upgrade all shared use paths to 10-foot widths if possible. A great first step could be checking out guides to shared use pathways by the FHWA at https://bit.ly/FHWASharedUsePath and https://bit.ly/STARSharedUsePath.

» Work to reduce the potential for conflicts between bicyclists and pedestrians on your campus. Actions could include introducing parallel but separate pathways for bicyclists and pedestrians, dismount zones for cyclists, signage and marking on shared use paths, and developing an education/awareness campaign.

Engineering Policies and Design Standards

» Adopt a campus-wide Complete Streets policy and offer implementation guidance for staff. By adopting a Complete Streets policy, institutions direct their transportation planners and engineers to routinely design and operate the entire right-of-way to enable safe access for all users, regardless of age, ability, or mode of transportation. This means that every transportation project will make the street network better and safer for drivers, transit users, pedestrians, and bicyclists – making your campus a better place to live, work and study. Find resources from the National Complete Streets Coalition at https://bit.ly/CompleteStreetsBFU.

» Adopt a campus-wide Bicycle Accommodation Policy or Resolution to ensure that all pathway and building construction projects on campus consider and accommodate optimal bicycle access. See the University of Mississippi's Bicycle & Pedestrian Accommodation policy at https://bit.ly/OleMiss_BikeAccPol or the University of Arizona's policy at https://bit.ly/UAZ_BikeAccPol.

» Develop a comprehensive Transportation Demand Management (TDM) program to promote bicycling, walking, transit, and other alternatives to Single Occupancy Vehicle (SOV) driving on campus. Learn more about Stanford's TDM strategies at https://bit.ly/StanfordTDM. See Yale's "Transportation Options" site for a great example of the kinds of resources this program should make available at https://bit.ly/YaleTDM. A strong TDM program should be accompanied by a planning document such as Georgetown University's 2016 Transportation Demand Management Plan: https://bit.ly/GTU_2016TDM or the University of Miami's 2020 Mobility Plan: https://bit.ly/UMiami_Mobility.

» Develop an implementation checklist to monitor and ensure the progress of your engineering policies and programs. An implementation checklist is a great way to celebrate accomplishment milestones while keeping track of work yet to be done.

» Create a design manual or guidance document to establish bicycle-friendly design standards for all bicycle facilities built or maintained on your campus. Michigan State University includes bicycle facility design guidance in their general Site Design Guidelines, which helps campus planners and engineers adhere to national safety standards and best practices for facilities such as bike lanes and bike parking. Find their recently updated guidance at https://bit.ly/BFU_MSUDesignGuide. Ensure that your design guidance adheres to AASHTO, MUTCD, and NACTO standards. Check out design resources at https://bit.ly/PBIC_Engineering.

» Provide ongoing training opportunities for engineering and planning staff related to accommodating bicyclists, to ensure that your bicycle accommodation policy or complete streets policy are followed and enforced.

Many State DOTs offer courses and trainings, so check in with your state DOT to see what is available. For example, PennDOT offers Local Technical Assistance (LTAP) courses which you can see here: https://bit.ly/PennDOT_LTAP and Portland State University's Transportation Research and Education Center (TREC) offers a training/workshop which you can see here: https://bit.ly/PortlandState_BikePedTraining.

» Ensure that your bicycle program coordinator has some oversight over and input into the fulfillment of engineering projects for your campus to ensure that bicyclists are considered and accommodated. If no such role exists, designate an existing staff member as the coordinator or develop a new position, and be sure that the person filling this role has access to the training, guidelines, and resources necessary.

» Provide ongoing training opportunities for engineering and planning staff related to accommodating bicyclists. Learn more at https://bit.ly/NHI_FHWA_Training.

» Consider providing professional memberships to the Association of Pedestrian and Bicycle Professionals (APBP) for one or more related staff. APBP provides its members with access to a dynamic online community of peers and experts across the country, monthly webinars on related topics, a mentor program, and more. Learn more at www.apbp.org.

» If you aren't able to hire staff internally with expertise in bicycle and pedestrian-specific planning and engineering, hire outside consultants to train your staff and review your plans to ensure they appropriately accommodate bicyclists. Consider creating a campus-wide policy that commits to only hiring project consultants and advisors who have bike/pedestrian qualifications for all future campus roadway, path, or building construction projects. The Association of Pedestrian and Bicycle Professionals (APBP) is a great place to find consultants with this specific expertise in your area. Search their member directory at www.apbp.org.

» Increase the frequency of bike lane, path, and trail sweepings to keep cyclists safe. Develop a policy or standard operating procedure that mandates the regular and proactive sweeping or cleaning of lanes, paths, and trails at least as frequently as roadways are cleaned, if not more frequently.

» Address potholes and other roadway hazards for bicyclists in a time sensitive manner to keep your bicyclists comfortable and safe. Develop a policy or standard operating procedure that mandates that potholes are filled within 24-48 hours of being reported.

» Ensure that pathways are adequately cleared of snow and ice for the safe passage of bicycles in the winter. Develop a policy or standard operating procedure that mandates that both on and off-road bike facilities are cleared of snow and ice at the same time as vehicle travel lanes on campus. If you do not have the equipment to handle this task, ensure that you include it in the appropriate departmental budget.

» Develop a mechanism that will allow cyclists to report hazards to traffic engineers and planners, such as a hotline or an online reporting tool. Allow your students and staff to provide feedback, be it through an online form or an in-person forum. If your city, town, or community has a public 311 reporting tool make it known to your students, staff, and faculty. Consider also using existing social media accounts, a campus bike listserv, or other in-person opportunities to regularly engage with bicyclists and solicit their feedback throughout the year.

» Consider having the Bicycle Program Manager and/or Campus Bicycle Advisory Committee or campus equivalent be part of the construction and detour project to make sure that appropriate accommodations are being made for bicyclists. This will go a long way to include any necessary planning and coordination that needs to happen and prevent possible overlooked aspects that are specific to the needs and considerations of bicyclists.

- Develop a policy or standard operating procedure to ensure that alternative accommodations for all on- and off-road bikeway facility closures are always provided and maintained during construction if bikeways are impacted by that construction. Such a policy should also require that all temporary accommodations be well-marked or communicated, and should be just as accessible (if not more) to anyone walking, biking, or rolling as the original facility it is replacing.
- Make sure that the appropriate signage and markings are used to notify users of changes and alternative routes during construction. Advance notice of these accommodations will go a long way to help folks make appropriate plans for travel, especially for those with ADA needs.
- Even if a construction project doesn't specifically impact dedicated bike facilities, know that the roads affected are likely still used by cyclists, and so it is important to still include bicycle-specific or inclusive wayfinding signage for all construction projects. Consider developing a new policy or amending your existing construction policy to include bicycle-inclusive or specific signage as a standard part of all future construction projects on campus.
- Provide the expected timeframe of work on all construction wayfinding signage to help users know what to expect, and be as communicative about the process as possible
- Always provide temporary bike parking during construction whenever any existing rack(s) become obstructed. Beginning/end of trip bicycle parking is essential for accommodating cyclists on your campus, even during construction. If temporary bike parking can not be provided within close proximity of the original impacted racks, then provide clear signage to help bicyclists find the closest temporary or permanent alternative racks, including clear way-finding and expected timeframe for the work.
- Consider offering a live, interactive campus map of current construction projects on your website. This is particularly useful when there are multiple projects going on with detours or obstructions to typical travel routes, so that coordination and communications can be found in a central location. See Stanford's Head's Up Campaign website for a great example: https://bit.ly/StanfHeadsUp.
- Develop a bike parking ordinance or campus-wide policy requiring a minimum amount of bike parking at all new and existing buildings. Check out this guide to passing an effective bicycle parking ordinance at https://bit.ly/BikeOrdinance.
- If applicable, expand your bike parking ordinance/policy to include all parking garages, in addition to new and existing buildings. Check out this guide to passing an effective bicycle parking ordinance at https://bit.ly/BikeOrdinance.
- To help ensure that end-of-trip facilities and bike parking needs are considered for all new campus buildings and future developments, consider policies such as allowing bicycle parking to substitute for car parking and requiring all new developments to meet at least Silver-level LEED standards. Learn more about LEED at www.usgbc.org/leed.
- Develop an engineering policy or guidance document that recommends or requires end-of-trip facilities such as showers and lockers are available in non-residential buildings to encourage more people to commute from off-campus by bike. One of the most common excuses people use to not commute by bike is that they don't have a shower at their destination. Lockers can help bike commuters find a place to safely store their belongings while on campus, reducing the need to drive and rely on vehicles for personal storage.
- Develop bike parking design standards for your campus that conform to the Association for Pedestrian and Bicycle Professionals (APBP) bike parking guidelines. The APBP guidance offers useful information for selecting and installing appropriate bicycle parking that

is safe and secure. Find the latest versions of the APBP Bicycle Parking Guidelines here: http://bit.ly/APBP_BikeParking.

» Cargo and adaptive cycles come in all shapes and sizes, and your campus bicycle parking should accommodate this full range, including hand bikes, tricycles, recumbents, and various models of cargo bikes. Strengthen your campus bike parking standards to include strong accessibility requirements. Check out these resources to learn more: Ground Control Systems ADA Accessible Bike Parking (https://bit.ly/GCS_AccessibleBikeParking) Colorado State University's Policy for Inclusivity (https://bit.ly/CSU_InclusivePolicy) Turvec's guide to accessible cycle parking (https://bit.ly/Turvec_AccessibleCycleParking).

» Not only do ebikes (electric/pedal-assist bikes) need to be charged to work properly, but they need a place to do this. Develop a plan to install ebike charging stations on your campus to accommodate current and future ebike users' needs. E-bikes are often also already more expensive than "acoustic" bikes, and so your ebike users on campus will also appreciate additional security options for their ebike parking, such as key-card access indoor bike rooms – making a great opportunity for charging stations. Once charging stations are available on your campus, be sure to communicate and advertise their availability so that anyone who is considering using an ebike knows that they will have the opportunity to charge their bike once on campus.

End-of-Trip Facilities for Bicyclists

» Install additional stand-alone public repair stations on campus to ensure that they are easily accessible in all areas of campus. See what UC Santa Barbara and Stanford are doing at https://bit.ly/UCSBrepair and stanford.io/2KFqtQu. Provide guidance on your campus map or website on where the stations are located and what they have to offer, like Portland State University does (see https://bit.ly/PSUFixit). Make sure air pumps are also available. Free access to an air pump allows for students and bike commuters to properly maintain their bicycles and promotes a culture of bicycling on campus.

» If locker rooms are available in non-residential campus buildings, make sure that access to these lockers are offered as a benefit for bike commuters, not as an additional cost to students and employees who use sustainable, active transportation to travel to and from campus.

Bicycle Parking and Storage

» Increase the amount of high-quality bicycle parking on campus to meet growing demand. See the basics of bike parking at https://bit.ly/APBP_BikeParking, and learn more about campus-specific bike parking considerations at https://bit.ly/GroundControl_Guide.

» Provide covered bike parking on your campus, particularly near residence halls and buildings where staff, faculty, or students may park their bikes for more than an hour at a time. Covered bike parking protects bikes from sun and precipitation, thus potentially adding years of life to a bike. It is more comfortable and more convenient for bike owners, and it is a great way of illustrating how the administration cares and welcomes bicycling.

» Introduce bike lockers on campus to provide more secure and weather-proof bike parking options on campus. Students will be more likely to bring bicycles to campus knowing that they are safe from theft and the elements. See how Northern Arizona University made their lockers look great with custom wraps: https://bit.ly/NAU_BikeLockers_Pic and preview NAU's Bike Locker registration form here: https://bit.ly/NAU_BikeLockers_Form. See how the University of Wisconsin-Madison offers paid bicycle parking via bike lockers and cages at https://bit.ly/UWMBikeParking.

» Consider constructing a bike station to provide centrally-located, secure, indoor parking for cyclists. The Bike

Center at the University of Minnesota (see: https://bit.ly/UMBikeCenter) is a great example of a bike station that can serve as a hub for commuters providing repair services, shower and locker facilities, and bike route and event information.

» Create an indoor bike room for students and commuters to securely store their bicycles. Indoor bike rooms provide additional protection from the weather and offer cyclists increased peace of mind. Portland State University has a successful permit program for its indoor bike garages: https://bit.ly/PSUBikeRoom. The University of Kentucky recently opened its first indoor bike room, complete with 60 secure bicycle parking spaces, showers, lockers, a fix-it station, and water bottle fillers. Learn more at https://bit.ly/UK_IndoorBikeRoomNews.

» Increase the security of your campus bike parking through the use of bike cages and other secure parking areas. Students and commuters will feel more comfortable bringing their bicycles to campus knowing they are safe and secure. See how the Boston University Medical Campus utilizes bike cages at https://bit.ly/BUMCBikeCages. See how the University of Wisconsin-Madison offers paid bicycle parking via bike lockers and cages at https://bit.ly/UWMBikeParking.

» Offer students long-term bicycle storage options over winter and summer breaks, and for the duration of the semester if they are away from campus. Such options can alleviate students' worries regarding security or the logistics of transporting a bicycle to and from campus each semester, and can offer a new potential revenue stream for bike facilities and programming on campus. See an example of semester-long storage options at Loyola University Chicago's student-run ChainLinks Bike Shop at https://bit.ly/LUChainlinks.

» Consider offering bike valets at events throughout the year to solve parking issues at well-attended events such as sports games. At Ohio University Athen Campus, the office of sustainability partners with their transportation and athletics departments to offer the Bobcat Bike Valet services at home football games, staffed through their student Climate and Sustainability Ambassadors. Learn more at https://bit.ly/BFU_BobcatBikeValet. In addition to on-campus partnerships, contracting with your local bike non-profit is another way to offer a bike valet service and support your local bike advocates. Here are a few examples of how to do it: Propel ATL (atlantabike.org/bikevalet) and SF Bicycle Coalition (https://bit.ly/SFBikeValet).

» In addition to bike valet services during special events, consider year-round bike valet services to make biking as accessible and welcome as possible! See what the University of Arizona is doing to encourage bicycling through an all-year free daily bike valet: https://bit.ly/UA_Valet. In Portland, Oregon Health & Science University (OHSU) partners with Go By Bike to offer free valet bike parking to students, employees, and the general public every day, Monday-Friday 6am-7:30pm: https://bit.ly/OHSU_Valet.

» Providing temporary bike racks or corrals for special events is a great way to offer additional space for bicycle parking at an event and encourage people to bike to these events instead of driving and worrying about finding or paying for car parking. Partnering with your events department or city to find additional equipment to use as bike racks is a great way to accommodate this temporary yet predictable and reoccurring need.

» Continue to upgrade all campus bike parking so that 100% of your racks conform to the Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guidelines. Find the latest APBP Guidelines at https://bit.ly/APBP_BikeParking, and learn more about campus-specific bike parking considerations at https://bit.ly/GroundControl_Guide.

Multi-Modal Transportation Accommodations

» Your application indicated that automobile parking permits are currently made available for over 80% of your total campus population. Establishing a more

limited number of parking permits or beginning to charge a fee for parking permits will help your students and employees recognize the true cost of parking: Motor vehicle parking spaces can cost thousands of dollars to construct, hundreds to maintain annually, and are an inefficient use of land. As bike ridership increases on your campus, consider reducing the quantity of parking available by repurposing the land. One car parking space can easily provide ten bicycle parking spaces and the construction of a bicycle parking space can cost 30 to 300 times less than a car parking space. See https://bit.ly/CostsofParking, https://bit.ly/ParkingLandUse, and https://bit.ly/CarvBikeParking for more information and sources.

» Consider increasing the vehicle parking permit fee for students and employees who drive to/on campus. The additional financial resources could be spent on bicycle and pedestrian infrastructure and amenities. Making it more expensive to park on campus will also encourage commuters to carpool or try alternative modes of transport.

» Consider introducing an 'Occasional Parking Pass' option as an alternative to the annual or semester-long parking permit for motor vehicles. This option will offer employees and students who commute from off-campus more flexibility to only drive and park a motor vehicle on campus on rare occasions when needed, and to rely on more sustainable and active forms of transportation such as biking, walking, and transit for the majority of their commutes. If someone has already paid for parking their car on campus everyday, they are much less likely to make even incremental choices to occasionally use other modes instead. See an example of an occasional parking pass policy from the University of Pennsylvania: https://bit.ly/Penn_OccPass.

» Develop a trade-in or cash-out incentive program for students and employees who opt to trade-in or decline a vehicle parking permit. Many universities and other major employers are beginning to offer these kinds of incentive programs to alleviate the demand for vehicle parking, and to further incentivize alternatives like biking, walking, and public transit. See the University of Kentucky's Cash Out program details here: https://bit.ly/BFU_UKY_CashOut. Learn more about these types of offerings in this StreetsBlog Article: https://bit.ly/StreetsBlog_CashOut.

» Reduce the number of students who bring a car to campus by setting limits on parking passes or permits for certain groups, such as first-year-students, on-campus residents, or even all undergraduate students. Some campuses have even set a limit for parking permits for off-campus students that is based on the proximity of their housing to campus.

» It's great that all of your campus transit vehicles are equipped with bike racks to accommodate transporting bikes. Provide education on using transit bike racks such as the following video from Spokane Transit: https://bit.ly/Spokane_BikesBusRack.

EDUCATION

Awareness Campaigns & Information Sharing

» The League offers a series of educational videos that can easily be downloaded or shared online. Topics range from How to Choose a Bicycle, to proper steering, signaling, and intersection positioning on a bike. Use these videos to educate your students, faculty, staff, and visitors on bicycling basics. Use the videos as part of new student/employee orientation, or as a prerequisite to accessing the campus bike share program. Make these videos available on your website and share on social media to promote bike safety education to broader audiences, including parents and prospective students. View and download the videos at: bikeleague.org/ridesmartvideos.

» If your campus has safety or informational presentations for incoming students, faculty, and staff, make sure there is a component of those presentations that covers bike safety and the various amenities and services for bikes

on campus and in the surrounding community.

- Include information about bicycling on campus in the student handbook. Topics covered should include basic safety tips, rules of the road for your campus, community, and/or state, relevant policies or campus-wide rules, amenities and services such as bike parking locations, bike registration, organized rides, classes, related clubs, and more.
- If your campus distributes welcome packets to new students and/or employees, make sure bicycling topics are included here as well. Check out the webpage that Stanford dedicated to educate new students about biking on their campus at https://bit.ly/BikeNewStudents.
- Incorporate bicycling information into parent outreach to reach more students and encourage families to consider all transportation options for their students. The University of Illinois has used a parent newsletter to communicate safe cycling resources and tips to parents: https://bit.ly/ILParentOutreach.
- It is essential to continually make both motorists and cyclists aware of their rights and responsibilities on the road. Continue to expand your education campaign promoting the "Share the Road" message. Consider Stanford's multi-pronged approach to Bike Safety through events and programs such as a bike safety Dorm Challenge, a bike safety campaign led by Sprocket Man (https://bit.ly/SprocketMan), and a bike safety pledge detailed at https://bit.ly/StanfBikePledge. See below for more ideas to educate both bicyclists and motorists about roadway safety.
- Organize a campaign of public service announcements to educate your university community on sharing the road safely. Check out some of the promotion that Emory has done to support their Why Not? Campaign at https://bit.ly/EmoryWhyNot and see Harvard's LOOK safety campaign at https://bit.ly/HarvardLOOK.
- Expand the reach of your bicyclist education programs by introducing a bike ambassador program like Colorado State University's RamBassador program (https://bit.ly/RamBassadors), UCI Irvine's Bike Ambassador program (https://bit.ly/BikeUCI_Amb) or The College of William & Mary's Bike Ambassadors program (https://bit.ly/WMBikeAmb).
- Advance cyclist safety on campus by providing educational materials with bike registration or as a prerequisite for bike share program users.
- Expose motorists on your campus to 'Share the Road' and 'Bicycle Friendly Driver' education by providing related information in all campus drivers' education or with all parking permits. Consider requiring a 'Share the Road' test or Bicycle Friendly Driver training and quiz as a prerequisite to purchasing a parking pass or permit on campus. Work with a local League Cycling Instructor to offer the League's Bicycle Friendly Driver curriculum (https://bit.ly/BFDriver) to all motorists accessing your campus.
- Explore new ways to incentivize safe bicycling and driving behavior through new technology and mobile apps. For example, "This App Saves Lives" (TASL) is a free mobile app that rewards drivers (and cyclists!) who abstain from phone-based distracted driving (and biking!). With TASL, drivers earn points and rewards for time spent driving undistracted. Learn more about TASL at https://bit.ly/BFU_TASL, or download the iOS App directly at: apple.co/38nkPm7 and use referral ID "LEAGUEBFU" at sign-up.
- TASL's new 'Parent Portal' feature allows the parents of young drivers to monitor and reward their child's safe driving behavior. Share this Parent Portal overview (PDF) in your next parent newsletter, along with the code "LEAGUE30" for them to receive 30% off any Parent Portal subscription: https://bit.ly/TASLParentPortalOverview. Learn more about the TASL Parent Portal at: https://bit.ly/BFU_TASL_Parents.

Classes & Training

- Consider adding regularly scheduled classes, workshops, information sessions, or educational rides to teach your students, faculty, and staff about bicycling safety and other relevant topics. The League offers a full curriculum through our Smart Cycling program, and certifies individuals through the League Cycling Instructor (LCI) to be able teach the Smart Cycling curriculum to bicyclists and motorists in their community. You may already have a local LCI in your area that can help teach classes on campus. Consider also reaching out to your local bike shops and advocacy groups if you do not have the capacity to offer classes or just to leverage work that they might already be doing and can be offered to your campus community. See the detailed recommendations below for more ideas to bring more formal bike education to your campus!
- Make sure you're promoting your classes to as many people on campus as possible, and that you're offering classes often enough and at times and locations that work for as many students, staff, and faculty as possible. Host classes during orientations or other convenient times for students, staff and faculty. Work with other departments, campus clubs, and student organizations to offer tailored classes and reach specific audiences where they are. Consider adding new language and accessibility accommodations if needed, and also consider how and where classes are advertised.
- Incorporate introductory classes for your campus community to help new and returning riders. Helping new or beginner riders gain confidence and skills to ride will go a long way to getting more people on bikes and helping to create a welcoming and bicycle friendly university.
- Offer Smart Cycling or traffic skills courses on a regularly scheduled basis or contact your local bicycle group to see if there are classes in your area that could be promoted to students and employees. Ideally the instruction would incorporate a classroom portion as well as on-road training. The classroom portion of the Smart Cycling curriculum is available online at https://learn.bikeleague.org. For more information visit: https://bit.ly/BFURideSmart.
- Ensure that your campus community is familiar with and understands the rules of the road and traffic laws for your state, community, and campus by including these topics in any bike safety classes offered. This will help ensure the safe and proper usage of bicycle facilities, user behavior, and predictability while out on the road or in traffic. While state and local laws may vary, the League offers a handy webpage covering basic common rules of the road, here: https://bit.ly/SmartCyclingRules. Check with your local or statewide advocacy groups to see if similar resources are available specific to your city or state.
- Offer Cycling Skills classes including on-bike instruction on campus regularly or contact your local bicycle group to see if there are classes in your area that could be promoted to students and employees. Aim to present these opportunities to students and non-students alike on at least a monthly basis. For more information visit: https://bit.ly/BFURideSmart.
- Offer Bicycle Commuter Classes on campus, or contact your local bicycle group to see if there are classes in your area that could be promoted to students and employees. Aim to present these opportunities to students and non-students alike on at least a monthly basis. Boise State University offers a free weekly bike commuter class called the Bronco Biking Class out of their Cycle Learning Center: https://bit.ly/BroncoBikeClass. For more information and ideas visit: https://bit.ly/BFURideSmart.
- Team with an on-campus or local bicycle group, bicycle shop or a League Cycling Instructor in your area to offer maintenance workshops on campus. Aim to offer these opportunities at least quarterly to reach a wider audience of students and employees. A short tutorial on how to change a flat can empower a person to ride their bike more often.
- While one can ride a bike in any outfit, what to wear is a

frequent question that comes up for bicycle commuters, and is an excellent topic to include in intro biking or bike safety classes. Being able to speak to all weather and seasonal issues can especially help students, staff, and faculty that may be new to the area and unfamiliar to the elements for your region. There are many resources on this topic including this video and webpage from the League: https://bit.ly/SmartCylingWear.

» Help your bicyclists ride year-round by including education on safely riding in rain, ice, and snow (if applicable). Help students and employees understand what gear they should consider using for inclement weather, as well as what riding techniques will help keep them safe in slippery road conditions.

» Choosing the right size bike can be the difference between an enjoyable and comfortable ride or one that feels intimidating and uncomfortable. Offer a class that covers basic bike fitting and how to choose a bike to help new riders on your campus learn about finding the best bike for them. Oftentimes, partnering with your local bike shop or outdoor store is a great place to start to bring someone to a campus event, fair, or safety presentation to talk about the wide range of bike options available.

» Bicycling should be offered regularly within physical education course offerings. Arizona State University offers a semester-long Physical Activity Class titled Outdoor Cycling for Fun and Fitness (https://bit.ly/ASUCyclingPE).

» Offering a class about multimodal trip options is a great way to integrate different transportation modes and allow for flexibility when traveling. Helping your students, staff, and faculty to better understand how to combine trip modes is an excellent way to take advantage of all that is offered. Invite your local or campus transit system to biking events – for example, many campuses have a bus bike rack that can be used to help new riders practice putting their bike on the bus. The University of Pittsburgh describes how their campus ID integrates with the local bike share system and the city wide bus system here: https://bit.ly/BFU_PittPOGOH.

» For new cyclists or cyclists who are new to your campus, knowing how to get around is essential to feeling confident when opting to travel by bike. Consider offering a class about route finding to help people in knowing about all their options to get from one place to another and let folks know which is the most comfortable and low-stress to use while using a bicycle.

» In addition to educating cyclists, consider adding safety education for drivers on your campus, including driving commuters, fleet operators, delivery drivers, or anyone else operating a campus-owner motor vehicle. The League is helping keep all road users safe by offering the Bicycle Friendly Driver training, which all League Cycling Instructors (LCIs) now have the ability to teach. The training aims to educate motorized vehicle drivers about how and why bicyclists travel the roadways in the ways they do with the objective of developing a shared understanding for all users. Contact a local LCI to bring this curriculum to your campus. Learn more about the Bicycle Friendly Driver curriculum here: https://bit.ly/BFDriver.

» In any bicycling class or information session offered, be sure to include tips about local bicycling resources and amenities, both on and off campus in the surrounding community. Nearby trails or recreational facilities, local bike shops or co-ops, and bike clubs, advocacy organizations or committees are all great details to make sure your campus community is aware of. Work with your local bicycle advocacy organization to come up with a resource list for your campus community to help bridge the gap beyond campus. Having ways for your campus to get involved with and resources for understanding local bicycle issues will help folks feel informed and included in the bicycle community that you are creating. Find a list of local advocacy groups, bike clubs, shops, and other potential partners to work with or highlight here: https://www.bikeleague.org/bfa/

search/map?bfaq=30060.

- Offer a class or training about bike advocacy to help your campus community become an effective and engaged group of local changemakers. Advocacy comes in many forms, from writing letters to the editor, to attending public meetings, to filing reports with the city. Offering training to teach people the skills necessary to do this will help to build a Bicycle Friendly University. Partnering with your local bike advocacy organization is a great way to offer this training, and they may already have existing classes you could advertise or bring to campus. For example, in Seattle, Cascade Bicycle Club offers an annual advocacy training: https://bit.ly/Cascade_AdvocacyTraining.
- Partnering with your campus sustainability office or health/wellness department is a wonderful way to collaborate and offer a class about the benefits of bicycling. Many times, campus employees can receive health benefit points or work to integrate bicycle benefit programs through the university. Work with your campus to create a class or workshop about the benefits of bicycling.
- As part of your safety or commuter classes or workshops, be sure to offer on-bike instruction. On-bike instruction allows students, especially novice riders, to gain experience biking and to feel more comfortable handling a bike or navigating in traffic before they try to do it on their own. Having a fleet of bikes in a variety of sizes and models, or free bike share passes, for this on-bike instruction will reduce barriers and increase access for new cyclists.
- Consider creating online or virtual bike safety and maintenance learning opportunities to increase ease and accessibility for these topics. While in-person and on-bike/hands-on instruction is essential for gaining direct experience and practice riding or doing repairs, many topics can be covered through online instruction, videos, interactive quizzes, or webinars. Check out the League's new online learning center to further expand your bike safety education offerings on campus: https://learn.bikeleague.org. New learning modules are being added regularly, including interactive bike safety quizzes that complement the Smart Cycling curriculum that all LCIs are equipped to teach.
- Start a bicyclist and motorist ticket diversion program. Students given a citation are offered an opportunity to waive fees for violations by attending a bicycling education course. This should include a classroom and on-road component. See U.C. Davis' Bicycle Education and Enforcement Program at https://bit.ly/UCDavisBEEP.
- Partner with local government, organizations, or advocacy groups to expose students to real-world applications in their bicycle-related courses.
- Work with a local League Cycling Instructor (LCI) to expand your bike education and to improve your bike safety and related classes. Find a list of existing LCIs in your area at https://bikeleague.org/map/?community=30060.
- Encourage members of your campus community to become trained and certified as LCIs. Having an LCI on campus can advance safe cycling education on your campus. Learn how at https://bit.ly/BFULCI. In addition to having staff and/or faculty become certified as LCIs, consider a peer-to-peer education model by training students as LCIs to increase the effectiveness and reach of your bicycle education on campus. Arizona State University hosts an LCI Seminar on its campus once every 18 months to maintain enough LCI-certified students to sustain their peer education model. LCI-certified students are then paid by the school to teach bicycle safety classes to other students, allowing the campus to offer a wide variety of bicycling classes year-round. See the full list of Bike Classes available at ASU at https://bit.ly/ASULCI.
- Host an LCI seminar on campus to increase the number of active local LCIs. Learn how to host an LCI seminar at https://bit.ly/Host_LCI_Seminar.

» Start a motorist education program for your institutions' professional drivers including campus transit operators, campus safety, law enforcement, emergency responders, facilities and maintenance staff, and anyone else who may operate a university-owned vehicle. See San Francisco's Frequent Driver Education at https://bit.ly/SanFranDriverEd and the League's Bicycle Friendly Driver curriculum (https://bit.ly/BFDriver) which is based on Fort Collins' successful Bicycle Friendly Driver Program at https://bit.ly/FC_Bike_Friendly_Driver. Consider making Bicycle Friendly Driver training a prerequisite for employment or part of ongoing professional development for all transit operators and other professional drivers on campus.

ENCOURAGEMENT

Bicycle Culture, Support, and Promotion

» Promote cycling throughout the year by hosting frequent organized bike rides for students, staff, faculty, and community members. Encourage novice riders to participate as a way to learn more about navigating the campus on a bike, and include safety instruction before each ride. See Champlain College's weekly rider series, ChampRiders Cruise, at https://bit.ly/ChampRiders.

» Emphasize the importance of bicycling on campus by encouraging your President or Chancellor to lead or participate in an annual bike ride. See how Marquette University's President led a ride to celebrate the opening of a new bike share dock on campus at https://bit.ly/MarqBublr.

» Show off your campus' bike-friendliness by offering campus bike tours! Bike tours of campus can be a great way to distribute information to incoming students and staff while promoting your campus' bike friendly culture. Talk to your admissions office about incorporating bike rides and bike tours to their offerings for prospective students and their families. Alfred University takes their campus bike tours to the next level with a 14-pedal, seven-seat bike! See for yourself at https://bit.ly/AlfredBikeTour.

» Demonstrate the university's commitment to bicycle infrastructure by having a trail construction or maintenance day, either on campus or in the community, and recruit students and employees to participate.

» Participate in the National Bike Challenge as a campus! The National Bike Challenge offers prizes, community, and friendly competition to encourage daily ridership. Anyone can sign up for free anytime! Learn more at https://bit.ly/NatBikeChallengeBFU.

» Celebrate bicycling as a mode of sustainable transportation by scheduling a campus car-free day. See the example set by Princeton at https://bit.ly/PrincetonCarFreeDay.

» Launch a bike buddy or mentor program. A bike mentorship program that teams experienced cyclists with newcomers is a great way to encourage and educate. Mentors can offer advice on bike routes, appropriate gear, safe riding and much more. It also gives new commuters a support group to rely on and often makes them feel more secure and excited about their first few rides. Learn about UCLA's Bike Buddies program: https://bit.ly/UCLA_BikeBuddies.

» Establish a formal incentive program for those who bike commute. This could include such benefits as cash incentives, car share discounts, or coupons for local bike shops. Check out the University of Minnesota's ZAP Bike Commuting program through Dero ZAP (https://bit.ly/UMZap) and see how Harvard encourages employees to bike to work through the Bike Commuter Tax Benefit: https://bit.ly/Harvard_CommuterBenefits. The University of Kentucky has a successful Bike Voucher Program as one of its many incentive options for students and employees who opt to not drive to/on campus: https://bit.ly/UK_BikeVoucher.

» Having dedicated social media accounts for your campus biking program is a great way to easily reach students,

staff, and faculty where they already are online. It's also a good way to run contests, engage directly with more people, and show off your work to new and prospective students and employees. Keeping it regularly updated will go a long way to keep your campus community engaged with your Bicycle Friendly University work. Some great examples of schools already doing this include UT Austin (www.twitter.com/bikeut) NC State University (www.twitter.com/ncsuwolftrails) Rice University (www.facebook.com/RiceTDM) University of Florida (www.instagram.com/bikesuf/).

» Promote cycling for everyone! Gear specific events towards women, non-English speakers, people of color, low-income students, the LGBT+ community and the ADA community. Make sure all communities feel welcome and can access cycling!

» Ensure that your marketing and admissions departments promote the bicycle-friendliness of your campus to current and prospective students and employees. Cycling is an important lifestyle choice for more and more young people and catering to these interests will improve your institution's competitiveness.

» Encourage students who are passionate about bicycling as a sustainable, healthy, and fun mode of transportation to form a student-run bike advocacy club or group to help improve the campus and community for biking. Check out how the University of Vermont's Bicycle User Group (B.U.G.) helps build bike culture on their campus at https://bit.ly/UVBikeCultureVid. Learn about the University of California, Santa Barbara's Associated Students Bike Committee's various projects and programs to help make their campus even more bicycle-friendly at https://bit.ly/UCSBBikeAssoc.

» Form an Employee Bike Commuter Club to foster a culture of support and to more effectively distribute news and information to staff, faculty and student employees who commute to campus by bike. Check out UCLA's Commuter Club at https://bit.ly/BruinComClub.

» Consider also applying to the Bicycle Friendly Business (BFB) program as an employer to further tackle the issue of faculty and staff commuting habits. Many colleges and universities have found it useful to participate in both the BFU and BFB programs to more fully address employees and commuters' needs. Learn more at bikeleague.org/business.

» Encourage the use of bicycles as official vehicles for any departments on campus, such as facilities and maintenance, landscaping, campus safety or police, emergency responders, etc. This increases the safety of cyclists and pedestrians by reducing motorized traffic on campus, and it also allows the employees greater access to areas on campus that may be out of reach for motorized vehicles.

» Begin having Public Safety officers patrol campus on bikes, as it gives enforcement officers a better understanding of the conditions for cyclists and to view campus from the perspective of handlebars. The University of Texas at Austin has a full-time Mountain Bike Unit: https://bit.ly/UTAustinBikePolice.

Access to Bike Share, Bicycle Equipment, and Repair Services

» Increase the number of bikes available in your bike share system. A successful campus bike share system is a convenient, cost effective and healthy way of encouraging students and employees to make short trips by bike. To increase the bikeshare options on your campus, consider a home-grown program such as the University of Louisville's free daily check-outs and long-term bike loans through recycled and refurbished bikes: https://bit.ly/ULBikeShare, or bring in an established and experienced bikeshare or micromobility vendor to your campus, such as Lime (https://bit.ly/BFU_lime).

» In addition to making short- and long-term bike share options available for students, consider offering a departmental bike share program for faculty and staff in various academic and administrative units. The University of Florida refurbishes abandoned bikes on

campus to supply its departmental program, providing bicycles at no cost to enable UF faculty and staff to conduct campus business. Any campus unit at UF can request a Department Bike Share bicycle through a convenient online form. Free maintenance and repairs are included as part of the program, as well as a lock and a helmet with each bike. Learn more about UF's program at https://bit.ly/UF_DBS.

» Consider offering a fleet of cargo bikes for campus staff and student workers. Cargo bikes can be useful alternatives to vehicle fleets when employees need to make frequent trips or haul goods on campus, and offer a healthy, sustainable, and economic alternative to driving. Learn how the City of Madison launched a successful e-cargo bike pilot for city staff at: https://bit.ly/ecargo_webinar.

» Electric pedal-assist bikes are a great way to break down barriers for people who want to bike. If you don't have these bikes as part of your campus or community-wide bike share fleet, advocate to have them included. See how Portland State uses their city's bike share electric bikes here pdx.edu/transportation/biketown.

» It's great that your campus has a co-op or bike center. Below are some ideas of additional services you could offer at your bike center to expand its role on campus, reach more newcomers, and meet the needs of more campus cyclists.

» The campus bike center would be a perfect place to consider offering bike valet services from. Such a service could also act as an employment or volunteer opportunity for students, and potentially as a revenue source to help support the center.

» Consider initiating bike messenger services out of the campus bike center. Such a service could also act as an employment or volunteer opportunity for students, and potentially as a revenue source to help support the center.

» Invite your campus' bike-related clubs and groups to utilize the bike center as a meeting place.

» Develop a bike giveaway program to help increase access to bicycling for more students on campus. NYU's Office of Sustainability hosts an annual bike giveaway each fall, by raffling off a few dozen bicycles for students free-of-charge. Learn more at https://bit.ly/NYU_bikegiveaway.

» Start a free helmet giveaway or subsidy program, or partner with a local bike shop to offer students coupons or discounts on helmets. See the helmet promotions through Stanford's Bike Safety Pledge at https://bit.ly/StanBikeSafety and the "Helmet Hair Don't Care" Pledge at UC Davis at https://bit.ly/UCDavisHelmetHair.

» Start a bike light giveaway program or partner with a local bike shop to offer students coupons or discounts on bike lights. Hosting a free bike light giveaway event every fall around daylight savings time is a great way to get these important safety accessories to every bicyclist on campus, and also provides an opportunity to register bikes and educate riders on safe riding and related campus resources. Learn about Light the Night, the annual light giveaway event at the University of Illinois at Urbana-Champaign at https://bit.ly/UofILights.

Bike Theft and Loss Prevention

» Consider having free bike lock giveaways for students to get high-quality bike locks into the hands of more riders.

» To help curb bike theft on your campus, develop a program that allows students to trade in older, less effective bike locks with high-quality U locks. The University of Colorado Boulder has a successful Bicycle Lock Swap Program where students can trade in a cable lock for a free U-lock: https://bit.ly/BoulderLockSwap. Similarly, Boise State University offers $5 off the price of a new U-lock for anyone training in an old cable lock at their Cycle Learning Center (campus bike shop). See their bus ad for the program here: https://bit.ly/BoiseLockTrade.

- Upgrade your paper bike registration system to an online registration service such as Bike Index (https://bit.ly/BFU_BikeIndex) or Project 529 (https://bit.ly/BFU529) to increase convenience and accessibility, as well as to streamline the process of recovering lost, stolen, and abandoned bicycles.
- Curb bike theft on campus by increasing educational opportunities about proper locking techniques. Even if a student or staff member has a high-quality bike lock, that doesn't mean they necessarily know the best way to use it. Post signage, use handouts, or offer demonstrations to teach proper locking to ensure that a rider will return to ALL of their bike.
- Develop a marketing campaign to educate students on how best to lower their chances of bike theft, including proper lock usage, best types of locks, most secure racks on campus for long-term storage, and other considerations.
- Work with campus and/or city police to implement a Bait Bike Program to help curb bike theft on campus. Learn about how the University of California, Berkeley's Bait Bike program helped reduce bike thefts by 45% in one year at https://bit.ly/CalBaitBike, and how the University of Wisconsin – Madison's Police Department reduced bike thefts by 40% in the first year of their Bait Bike program at https://bit.ly/UWMBaitBike.
- Abandoned Bikes can be a major problem on campuses, taking up valuable real estate on bike racks, attracting thieves, creating challenges for maintenance or construction crews, and causing visual eyesores with rusty, neglected frames or other bike parts. If your campus faces these problems, consider developing a system to routinely tag and remove suspected abandoned bikes from bike racks at the end of each school year. Be sure to tag the bikes well in advance to give owners fair warning about the impending removal, and make campus-wide announcements so that anyone with a rarely-used bike knows to check on their bike to make sure it isn't mistaken for abandoned.
- Develop a clear policy and process for bicycle owners to reclaim their bike if it has been mistaken for abandoned or otherwise impounded. Publicize this policy and process so that bike owners know exactly who to contact or where to go to retrieve their bike, including a reasonable timeline for how long the campus will hold on to an abandoned bike from the date of impoundment. Consider students who are off campus for the semester, studying abroad or away for other reasons, in the development of such a policy and timeline to ensure that they don't miss the window for reclaiming their bike, especially if the campus doesn't offer reasonable long term storage and bike registration options.
- A digitized or online tracking system can help streamline your abandoned bike tagging/removal system so that bike owners can more easily claim and reunite with their bike if it has been mistaken for abandoned. Some online bike registration systems have built-in tools to help campuses with this problem, such as Bike Index's Impound tool: https://bit.ly/BFUBikeIndex.

Route-Finding Support

- Great job offering some bike mapping options for your campus community. Below are some ideas to further improve and expand the map-related resources you make available on your campus.
- Add bicycle amenities such as bike lanes, bike parking, showers, lockers, and fix-it stations to your online campus map. Yale has an interactive map highlighting all their bike racks and other bike-related facilities, as well as a way for students to suggest additions to update and improve the map (https://bit.ly/YaleBikeMap). As part of their Bike Commuter Shower Access Pass program (https://bit.ly/GATechShowerPass), Georgia Tech includes showers on their bicycle amenities map: https://bit.ly/BFU_GATechMap. Several schools have used Google Maps to build interactive online maps of their campus bike facilities. See Oklahoma University's OU Bike Inventory at https://bit.ly/OUBikeInvent, the

Georgetown University Bicycling Map at https://bit.ly/GUBikeMap, and the American University Bike Map at https://bit.ly/AUBikeMap for examples.

» Offer printed bike maps for distribution that include on- and off-road bike routes. Printed campus maps can also serve as a great method to provide bike education and information to more people. Include bicycle amenities such as bike lanes, bike parking, nearby bike shops, and fix-it stations on your printed map as well.

» In addition to campus bike maps, develop and offer an online route-finding service for student and staff cyclists interested in journeying to or from further off campus. Many schools have used online programs and tools such as RideAmigos (https://bit.ly/BFU_RideAmigos) to manage a variety of Transportation Demand Management functions, including route-finding assistance for students and employees. See UC Berkeley's RideAmigos site as an example: https://bit.ly/UCBerkeley_RideAmigos.

EVALUATION & PLANNING

Staffing and Committees

» Appoint a full-time staff member as Bicycle Program Manager or create a new position. A Bicycle Program Manager works with the campus administration, advocates, local elected officials, law enforcement, transit providers and the general campus community to build partnerships and implement facilities and programs that increase the number of students, faculty and staff that are safely bicycling and walking. This staff person should also work closely with the Bicycle Advisory Committee, review development proposals to ensure that bicycle requirements are incorporated and to assess bicycling impacts, develop and implement educational and promotional programs, write grant proposals, serve as the public contact for bicycling inquiries and complaints, educate other staff about facilities standards and guidelines, and coordinate with neighboring communities, transit agencies and other departments to implement policies and projects. See this report on the importance of Bicycle & Pedestrian program staff: https://bit.ly/BikePedStaff.

» Encourage your Bicycle Advisory Committee to meet more often, ideally monthly. Having an official Bicycle Advisory Committee (BAC) that meets frequently is critical to building support for bicycle improvements as it ensures that the bicycle program is held accountable to the campus population and surrounding communities. Colorado State University's Campus Bicycle Advisory Committee (CBAC) has a robust and representative membership that meets monthly and shares meeting agendas and minutes online: https://bit.ly/CSU_CBAC.

» Include more stakeholders in the Bicycle Advisory Committee to ensure that the members of the committee reflect the diversity and ability levels of cyclists on your campus. Consider adding representatives from: any student or employee Bicycle User Group(s) on campus, student government, health and wellness team members, local city/county/regional government staff, International Student Affairs or similar group or department, or any other groups, departments, or individuals that should be represented.

» Reach out to your campus Office of International Student Affairs, Diversity & Inclusion, Multicultural Affairs, or similar offices or student groups to promote cycling's accessibility and inclusivity on your campus.

Planning, Funding, and Implementation

» It's good that bicycling is included in your general campus master plan, but to further strengthen your school's commitment to bicycling, consider creating a comprehensive bicycle-specific master plan. Ensure that the plan serves as a guide for the long-term physical and programmatic vision for your campus, and focus on developing or completing a seamless cycling network that emphasizes and creates short distances between residential buildings and popular destinations such as

classroom buildings, dining halls, recreational facilities and transit stops. Compliment infrastructure planning with encouragement, education, and inclusive outreach programs to increase accessibility and usage. Develop a clear vision statement and set ambitious but attainable targets and specific, measurable goals. The overarching goal should be to increase the percentage of trips made by bicycle on campus and the number of people who can easily choose bicycling for transportation and recreation. Check out University of Minnesota's 2019 Bike Plan at https://bit.ly/UMNBikePlan and Montana State University's 2017 Bike Plan at https://bit.ly/MontanaStateBikePlan as two great examples of bike-specific campus plans. This Road Map to developing a bike plan may also be a helpful resource to consider: https://bit.ly/ImplementBikePlan.

- **Develop a dedicated annual budget to guarantee consistently available funds for your bicycle program and campus bicycle expenses. Below are some ideas for potential sources of funding for an ongoing dedicated budget.**
  - Utilize any current automobile parking fees on campus as a revenue source for your campus' bicycle expenses or introduce such fees.
  - Use the revenue generated from any on campus traffic citations as a funding source for the campus' bicycle expenses.
  - Lobby the university administration to set aside a dedicated annual budget for the university's bicycle expenses.
  - Consider reaching out to potential revenue sources external of the university by applying to grants or other private donors.

Evaluating Ridership & Bicyclist Satisfaction

- Develop a more robust count program to track ridership on your campus among employees (faculty and staff), to assess needs for additional facilities and services, and to measure the successes of your bicycle program! Below are several ideas to consider for a successful bike count program.
- Consider installing automatic bicycle counters on your campus to better gauge ridership on an ongoing basis. Look into tools such as EcoCounter for automatic electronic counters at https://bit.ly/EcoCounter or video detection tools such as Numina (https://bit.ly/BFUnumina). Learn about UCLA's automated bike counter and publicly available ridership data at https://bit.ly/UCLABikeCounter and https://bit.ly/UCLARidershipData. See how the University of Minnesota uses the Dero ZAP Program to track and reward ridership on their campus at https://bit.ly/UMZap.
- Begin conducting periodic manual counts, and consider participating in the National Bicycle and Pedestrian Documentation Project at https://bit.ly/NatBikePedDoc.
- Conducting periodic bike rack counts is an easy way to estimate bicycle usage on campus, and allows you to inventory and assess the quality and quantity of available bike parking.
- Take advantage of online, self-reporting or app-based services like Strava Metro (https://bit.ly/BFUstrava) or Love To Ride (https://bit.ly/NatBikeChallengeBFU) to increase your data collection. At Michigan State University, the home-grown MSU Mobility app collects location and motion data from iPhone users while inside the MSU geo-fenced campus. It uploads these data anonymously to a secure MSU server, and the aggregation of these mobility data provides campus planners with a deeper understanding of how pedestrians, bicyclists, and motorists move across MSU's campus at any given time. Learn more at https://bit.ly/MSUMobilityApp.
- Distribute a satisfaction survey to students and faculty at least every other year. Analyze responses to assess barriers, and direct resources according to demand and the needs of bike commuters. See how Southern Illinois

University Carbondale reported on their Campus Bicycle Survey results: https://bit.ly/SIUSurvey. Carnegie Mellon University even offers a year-round online satisfaction survey that can be completed by students, employees, and visitors anytime: https://bit.ly/CMUBikeSurvey.

Evaluating & Improving Safety Outcomes

- Ensure that there is a mechanism for bicyclists on campus to report any bicycle/automobile, bicycle/bicycle, and bicycle/pedestrian crashes on campus to the appropriate campus and/or community authorities. Record and track this data and utilize it to identify any points prone to conflict and develop a strategy to reduce them.
- Expand efforts to evaluate crash statistics to produce a specific plan to reduce the number of crashes on campus. Available tools include Intersection Magic (https://bit.ly/IntMagic) and PBCAT (https://bit.ly/PBCAT). See the report Bicyclist Fatalities and Serious Injuries in New York City, 1996-2005, at https://bit.ly/NYCBikeFatalities.
- **Pass additional campus laws or ordinances that protect cyclists and pedestrians, including the following:**
  - Develop penalties for motorists who fail to yield to a bicyclist when turning.
  - Institute a policy specifically penalizing motorists who 'door' bicyclists.
  - Promote the well-being of cyclists on your campus by making it illegal to harass a cyclist.
  - Consider exploring new policies that would ban cars from parts of campus or develop policies to prohibit residential students from bringing a car to campus.

Other Evaluation & Assessment Tools

- To help make the case for increased investments in bicycling on your campus, consider partnering with a local organization or campus department to conduct impact assessments that help demonstrate and quantify the positive impact and return on investment for bicycling improvements. From sustainability, to economics, to equity and mobility, to health & wellness, to safety, there are many benefits to quantify and capture through a study or impact assessment. Here are some examples: The University of Arkansas was included in a Walton Family Foundation-funded economic impact study for the Northwest Arkansas Region: https://bit.ly/Walton_NWAEconStudy. See Minnesota State University, Mankato's environmental impact study at https://bit.ly/MankatoEnviro.
- Conduct a Bicycle Level of Service (BLOS) or Bicycle Level of Traffic Stress (BLTS) Assessment for your campus. Knowing the level of service you provide when it comes to bicycle infrastructure, or lack of it, will go far in assessing your campus and prioritizing areas in need of improvements. You can find an example of how Boston has integrated a BLOS for their city here https://bit.ly/Boston_BLOS.
- Conduct a campus-wide bike parking study or audit. Having an up-to-date list or inventory of your bike parking, including details such as the quantity, quality, usage, and APBP-compliance status of each rack, will go a long way to maintaining and offering places for people to park their bikes as well as identify where there are missing gaps or other opportunities for improvement. A great detail to include in your audit, for example, are the areas where people are currently locking bikes to things other than bike racks, such as trees or fences, to show where there is unmet demand. Consider partnering with a student club or organization to help recruit volunteers to conduct such an audit, or partner with a faculty member to turn this into a class project. Consider developing a GIS database of your bike racks including the details listed above along with current photos of all racks.
- Conduct a comprehensive mobility or travel behavior survey or study, at least once every 4-5 years on campus. This helps you to develop benchmarks and track changes over time in travel behavior and

patterns for all modes, including the preferences, barriers, and satisfaction, and safety levels for different modes and across different socioeconomic groups. Be sure to include staff, students, and faculty, and to capture demographic and other socioeconomic information about survey respondents to give full context to the information collected. For a great example, see Michigan State University's 2019 Spartans Sociomobility Centennial Survey: https://bit.ly/MSU_SocioMobilitySurvey.

» **League reviewers were pleased to see the following improvements planned for your campus in the coming year and beyond, as quoted below from your application. We look forward to hearing about your progress on these efforts in your next renewal application, and welcome updates in the interim if you have any announcements or progress reports in the meantime!**

» *"The Rottenwood creek trail will help connect KSU's Marietta Campus to more homes & businesses in Marietta as well as the Chattahoochee River National Recreation Area trail system. This will give the local community a safe way to travel between their homes, campus, and the parks and businesses in Marietta"*

FOR MORE IDEAS & BEST PRACTICES, PLEASE VISIT THE FOLLOWING **BICYCLE FRIENDLY UNIVERSITY** RESOURCES ONLINE:

» www.bikeleague.org/university

» https://bikeleague.org/bfa/university/faq/

» https://bikeleague.org/bfa/university/resources/

» https://bikeleague.org/bfa/award-database/

PLEASE ALSO SEE THE ATTACHED SURVEY DOCUMENT FOR ADDITIONAL COMMENTS AND FEEDBACK FROM BICYCLISTS ON YOUR CAMPUS.

BICYCLE FRIENDLY UNIVERSITY

Feedback Report

KENNESAW STATE UNIVERSITY - KENNESAW CAMPUS

KENNESAW, GA

2022 BRONZE

CONGRATULATIONS! THE LEAGUE OF AMERICAN BICYCLISTS HAS DESIGNATED KENNESAW STATE UNIVERSITY - KENNESAW CAMPUS AS A BICYCLE FRIENDLY UNIVERSITY AT THE BRONZE LEVEL. Reviewers were very pleased to see the current efforts and dedication to promoting cycling for transportation and recreation on your campus. Congratulations on your leadership!

CAMPUS PROFILE

BIKE PROGRAM WEBSITE: BIKE.KENNESAW.EDU

INSTITUTION TYPE	STUDENT ENROLLMENT	% OF STUDENTS LIVING OFF-CAMPUS	CAMPUS ROADWAY MILES	% OF ROADS UNDER UNIVERSITY CONTROL
National/Regional University	32,237	86%	14.3	41%
CAMPUS TYPE	STAFF & FACULTY	AVERAGE DISTANCE TO CAMPUS	PATHWAY MILES	CAMPUS SIZE
Suburban	1,608	20 miles	4.46	350 Acres

Below, reviewers provided key recommendations to further promote bicycling at Kennesaw State University - Kennesaw campus along with a menu of additional pro-cycling measures that can be implemented in the short and long term. We strongly encourage you to use this feedback to build on your momentum and continue to improve your campus for bicyclists.

There may also be initiatives, programs, and facilities that are not mentioned here that would benefit your bicycling culture, so please continue to try new things to increase your ridership, safety, and awareness!

HIGHLIGHTS OF KENNESAW STATE UNIVERSITY - KENNESAW CAMPUS'S 2022 BFU APPLICATION INCLUDE:

- *KSU Bike Shop*
- *Outdoor Adventures bike share/rental program*
- *KSU Cycling Team*
- *Beginning Mountain Biking and Beginning Cycling classes*
- *Work with Southern Off Road Bicycling Association*
- *Educational collaborations with non-profits such as GA Commute Options*
- *Incoming Freshman bicycling trips*
- *Clean Commute Maps*
- *KSU Bike-Ped Advisory Board*

KEY STEPS TO SILVER:

- *Adopt a Complete Streets or Bicycle Accommodation policy and continue to expand the bike network through the use of appropriate low-stress bicycle facilities. Work closely with the city to improve network connectivity on and around campus. (See Engineering)*
- *Continue to increase the amount of high quality bicycle parking at popular destinations on campus, and to upgrade the quality of all existing bike parking to meet APBP guidelines. Adopt Bike Parking Design Standards or Guidelines to ensure that all future racks meet APBP guidelines. (See Engineering)*
- *Consider developing an Occasional Parking Pass option for commuters by offering single-day parking pass*

options for those who want to drive less often and use alternative modes such as biking or transit more often. Consider also offering a Trade-in/Cash-out incentive program for employees who trade in or decline a parking permit and choose to bike, walk, or take transit to work instead. (See Engineering and Encouragement)

» *Expand educational efforts to reach more students, staff, and faculty annually by offering more classes in a wider variety of topics for both cyclists and motorists. Host a League Cycling Instructor (LCI) seminar to increase the number of local LCIs qualified to teach bicycle safety classes. (See Education)*

» *Appoint a staff member as official Bicycle Program Manager or create a new position. (See Evaluation & Planning).*

» *Establish a dedicated annual budget to ensure successful implementation of your campus bike plan, as well as to commit the administration to providing ongoing support of the bicycle program and related expenses. (See Evaluation & Planning).*

» *Conduct regular research on bicycle usage by conducting regular manual counts or installing automated bike counters, and distributing a regular satisfaction survey to students and employees to better understand barriers to cycling. (See Evaluation & Planning)*

» *Improve signage from the campus to the off-campus trail network, and vice-versa.*

See the following menu of additional recommendations to learn how your campus can improve in these and other areas to become more bicycle-friendly.

ENGINEERING

Campus Roadway & On-Road Bicycle Network

» Encourage your surrounding community to work toward the Bicycle Friendly Community (BFC) designation. See the League's Bicycle Friendly America Toolkit for advocates including PPT slide presentations, scripts, and digital and printed resources to promote the Bicycle Friendly Community program to your local government leaders: www.bikeleague.org/bfa/toolkit. Learn more about the BFC program at bikeleague.org/community.

» Work with Kennesaw to increase and improve connectivity of the on-road bicycle network on and around your campus. Below are several recommendations for specific infrastructure types to consider to ensure your bike network meets national standards and best practices. Ensure that your campus and community both follow a bicycle facility selection criteria that increases separation and protection of bicyclists based on levels of motor vehicle speed and volume.

» Consider implementing car restrictions or even car-free zones on campus to increase safety by reducing the potential for conflicts between cars and bicyclists and pedestrians.

» Lower the speed limit to 20 mph on campus streets. Speed has been identified as a key risk factor in road traffic injuries, influencing both the risk of a road traffic crash as well as the severity of the injuries that result from crashes. For instance, pedestrians and cyclists have a 90% chance of survival if hit by a car traveling at a speed of 20 mph or below, but less than a 50% chance of surviving an impact of 30 mph or above. Learn more about speed management techniques from NACTO: https://bit.ly/NACTO_Speed. The United Nations Road Safety Collaboration developed a Speed Management Manual for policymakers at https://bit.ly/WHOSpeed.

- Place wayfinding signage at strategic locations around campus. By helping bicyclists more easily and conveniently navigate your campus, you will help them to focus on riding more safely and predictably, for the benefit and safety of everyone. Here are some best practices from the Washington, DC Area Council of Governments: https://bit.ly/DcWayfind. Learn more about bike route wayfinding signage and markings system best practices from NACTO: https://bit.ly/NACTO_wayfind.
- Consider adding speed tables to on-campus streets to calm traffic and reduce the speed of on-campus traffic to levels that are safer for cyclists and pedestrians. Learn more about speed tables from NACTO: https://bit.ly/NACTO_SpeedTable.
- Consider converting any existing low-speed/low-traffic streets on campus into bicycle boulevards through additional traffic calming measures. Learn more at https://bit.ly/NACTOBikeBlvds.
- Your application indicated that your campus does not have buffered bike lanes or cycle tracks. Consider adding these to your campus where possible. Buffered bike lanes or cycle tracks offer an added layer of protection from conventional bike lanes and raise the comfort level for people bicycling. The buffer separation also allows for curb access and space for a car door to open if the buffered bike lane is next to car parking. Learn more about them at the NACTO website: https://bit.ly/NACTO_BufferedLanes.
- Consider creating colored bike lanes on campus to boost cyclist visibility and improve safety, particularly in conflict areas such as intersections and near on-street car parking. Learn more from NACTO: https://bit.ly/NACTO_ColorLanes.
- Consider increasing cyclist safety by adding protected bike lanes or cycle tracks to your campus roads, including by adding physical barriers or additional space to existing painted bike lanes to increase separation and protection. Protected bicycle facilities are particularly critical on higher speed roads and those with higher levels of motor vehicle traffic, to provide low-stress bikeways for all ages and abilities. Check out NACTO's guide to cycle tracks at https://bit.ly/NACTOCycleTrack.
- Bike Boxes, typically used at signalized intersections, are a great tool to consider to increase visibility and comfort for people on bikes. Bike boxes can be used to make turning at intersections safer especially where there may be conflicts between motorists and bicyclists. Read more about the benefits and uses of bike boxes on NACTO's website: https://bit.ly/NACTO_BikeBoxes.
- Pilot/demonstration projects featuring bike facilities or traffic calming measures can be instrumental ways to show what your vision is for the use of the street space. Many cities work with local entities to pilot projects to gather feedback and test out an idea before building and selecting a permanent design. Oftentimes organizations host or build their own demonstrations to show what they would like to see. Examples of pilots/demonstrations are pop-up bike lanes, parking protected bike lane demonstrations, and a pop-up bike/bus lane. Learn more about pilot/demonstrations by reading these articles: Temporary and Pop-up Bike-Ped Infrastructure (https://bit.ly/EcoCount_PopUp), Pop-Ups for Safe Routes to School (https://bit.ly/SRTS_PopUp), and Tactical Urbanism Guide (https://bit.ly/TacticalUrbanismGuide).
- Consider implementing automated (e.g. camera or video) speed enforcement for motor vehicles on your campus roads, and/or work with your local community to do the same on roads on and around your campus. When considering this mechanism, take into consideration ways to implement it that are equitable and do not further existing disparities for marginalized communities. For more information about this, read BikePedInfo's Whitepaper: https://bit.ly/PedBikeInfo_AutoEnforcement and these Streetsblog articles about the pros and cons of automated enforcement: https://bit.ly/StreetsBlog_ProConRedLightCamera and

https://bit.ly/StreetsBlog_AnalysisSpeedCameras.

» Work with your city, county, and state to develop right-on-red restrictions for motor vehicles at signalized intersections to improve safety for bicyclists and pedestrians on your campus.

Campus Off-Road Bicycle Network

» Increase the network of shared use pathways on your campus, and be sure to upgrade all shared use paths to 10-foot widths if possible. A great first step could be checking out guides to shared use pathways by the FHWA at https://bit.ly/FHWASharedUsePath and https://bit.ly/STARSharedUsePath.

» Work to reduce the potential for conflicts between bicyclists and pedestrians on your campus. Actions could include introducing parallel but separate pathways for bicyclists and pedestrians, dismount zones for cyclists, signage and marking on shared use paths, and developing an education/awareness campaign.

Engineering Policies and Design Standards

» Adopt a campus-wide Complete Streets policy and offer implementation guidance for staff. By adopting a Complete Streets policy, institutions direct their transportation planners and engineers to routinely design and operate the entire right-of-way to enable safe access for all users, regardless of age, ability, or mode of transportation. This means that every transportation project will make the street network better and safer for drivers, transit users, pedestrians, and bicyclists – making your campus a better place to live, work and study. Find resources from the National Complete Streets Coalition at https://bit.ly/CompleteStreetsBFU.

» Adopt a campus-wide Bicycle Accommodation Policy or Resolution to ensure that all pathway and building construction projects on campus consider and accommodate optimal bicycle access. See the University of Mississippi's Bicycle & Pedestrian Accommodation policy at https://bit.ly/OleMiss_BikeAccPol or the University of Arizona's policy at https://bit.ly/UAZ_BikeAccPol.

» Develop a comprehensive Transportation Demand Management (TDM) program to promote bicycling, walking, transit, and other alternatives to Single Occupancy Vehicle (SOV) driving on campus. Learn more about Stanford's TDM strategies at https://bit.ly/StanfordTDM. See Yale's "Transportation Options" site for a great example of the kinds of resources this program should make available at https://bit.ly/YaleTDM. A strong TDM program should be accompanied by a planning document such as Georgetown University's 2016 Transportation Demand Management Plan: https://bit.ly/GTU_2016TDM or the University of Miami's 2020 Mobility Plan: https://bit.ly/UMiami_Mobility.

» Develop an implementation checklist to monitor and ensure the progress of your engineering policies and programs. An implementation checklist is a great way to celebrate accomplishment milestones while keeping track of work yet to be done.

» Create a design manual or guidance document to establish bicycle-friendly design standards for all bicycle facilities built or maintained on your campus. Michigan State University includes bicycle facility design guidance in their general Site Design Guidelines, which helps campus planners and engineers adhere to national safety standards and best practices for facilities such as bike lanes and bike parking. Find their recently updated guidance at https://bit.ly/BFU_MSUDesignGuide. Ensure that your design guidance adheres to AASHTO, MUTCD, and NACTO standards. Check out design resources at https://bit.ly/PBIC_Engineering.

» Provide ongoing training opportunities for engineering and planning staff related to accommodating bicyclists, to ensure that your bicycle accommodation policy or complete streets policy are followed and enforced. Many State DOTs offer courses and trainings, so check in with your state DOT to see what is available. For example, PennDOT offers Local Technical Assistance

(LTAP) courses which you can see here: https://bit.ly/PennDOT_LTAP and Portland State University's Transportation Research and Education Center (TREC) offers a training/workshop which you can see here: https://bit.ly/PortlandState_BikePedTraining.

» Ensure that your bicycle program coordinator has some oversight over and input into the fulfillment of engineering projects for your campus to ensure that bicyclists are considered and accommodated. If no such role exists, designate an existing staff member as the coordinator or develop a new position, and be sure that the person filling this role has access to the training, guidelines, and resources necessary.

» Provide ongoing training opportunities for engineering and planning staff related to accommodating bicyclists. Learn more at https://bit.ly/NHI_FHWA_Training.

» Consider providing professional memberships to the Association of Pedestrian and Bicycle Professionals (APBP) for one or more related staff. APBP provides its members with access to a dynamic online community of peers and experts across the country, monthly webinars on related topics, a mentor program, and more. Learn more at www.apbp.org.

» If you aren't able to hire staff internally with expertise in bicycle and pedestrian-specific planning and engineering, hire outside consultants to train your staff and review your plans to ensure they appropriately accommodate bicyclists. Consider creating a campus-wide policy that commits to only hiring project consultants and advisors who have bike/pedestrian qualifications for all future campus roadway, path, or building construction projects. The Association of Pedestrian and Bicycle Professionals (APBP) is a great place to find consultants with this specific expertise in your area. Search their member directory at www.apbp.org.

» Send relevant staff to conferences and in-person trainings focused on bicycle planning and infrastructure. The annual National Bike Summit is a great place for your staff to connect with their peers and learn about best practices from around the country. Learn more about the Summit at bikeleague.org/summit, and find highlights from past Summits at www.youtube.com/user/bikeleaguevideo.

» Increase the frequency of bike lane, path, and trail sweepings to keep cyclists safe. Develop a policy or standard operating procedure that mandates the regular and proactive sweeping or cleaning of lanes, paths, and trails at least as frequently as roadways are cleaned, if not more frequently.

» Address potholes and other roadway hazards for bicyclists in a time sensitive manner to keep your bicyclists comfortable and safe. Develop a policy or standard operating procedure that mandates that potholes are filled within 24-48 hours of being reported.

» Ensure that pathways are adequately cleared of snow and ice for the safe passage of bicycles in the winter. Develop a policy or standard operating procedure that mandates that both on and off-road bike facilities are cleared of snow and ice at the same time as vehicle travel lanes on campus. If you do not have the equipment to handle this task, ensure that you include it in the appropriate departmental budget.

» Develop a mechanism that will allow cyclists to report hazards to traffic engineers and planners, such as a hotline or an online reporting tool. Allow your students and staff to provide feedback, be it through an online form or an in-person forum. If your city, town, or community has a public 311 reporting tool make it known to your students, staff, and faculty. Consider also using existing social media accounts, a campus bike listserv, or other in-person opportunities to regularly engage with bicyclists and solicit their feedback throughout the year.

» Consider having the Bicycle Program Manager and/or Campus Bicycle Advisory Committee or campus equivalent be part of the construction and detour project to make sure that appropriate accommodations

are being made for bicyclists. This will go a long way to include any necessary planning and coordination that needs to happen and prevent possible overlooked aspects that are specific to the needs and considerations of bicyclists.

» Develop a policy or standard operating procedure to ensure that alternative accommodations for all on- and off-road bikeway facility closures are always provided and maintained during construction if bikeways are impacted by that construction. Such a policy should also require that all temporary accommodations be well-marked or communicated, and should be just as accessible (if not more) to anyone walking, biking, or rolling as the original facility it is replacing.

» Make sure that the appropriate signage and markings are used to notify users of changes and alternative routes during construction. Advance notice of these accommodations will go a long way to help folks make appropriate plans for travel, especially for those with ADA needs.

» Even if a construction project doesn't specifically impact dedicated bike facilities, know that the roads affected are likely still used by cyclists, and so it is important to still include bicycle-specific or inclusive wayfinding signage for all construction projects. Consider developing a new policy or amending your existing construction policy to include bicycle-inclusive or specific signage as a standard part of all future construction projects on campus.

» Provide the expected timeframe of work on all construction wayfinding signage to help users know what to expect, and be as communicative about the process as possible

» Always provide temporary bike parking during construction whenever any existing rack(s) become obstructed. Beginning/end of trip bicycle parking is essential for accommodating cyclists on your campus, even during construction. If temporary bike parking can not be provided within close proximity of the original impacted racks, then provide clear signage to help bicyclists find the closest temporary or permanent alternative racks, including clear way-finding and expected timeframe for the work.

» Consider offering a live, interactive campus map of current construction projects on your website. This is particularly useful when there are multiple projects going on with detours or obstructions to typical travel routes, so that coordination and communications can be found in a central location. See Stanford's Head's Up Campaign website for a great example: https://bit.ly/StanfHeadsUp.

» Develop a bike parking ordinance or campus-wide policy requiring a minimum amount of bike parking at all new and existing buildings. Check out this guide to passing an effective bicycle parking ordinance at https://bit.ly/BikeOrdinance.

» If applicable, expand your bike parking ordinance/policy to include all parking garages, in addition to new and existing buildings. Check out this guide to passing an effective bicycle parking ordinance at https://bit.ly/BikeOrdinance.

» To help ensure that end-of-trip facilities and bike parking needs are considered for all new campus buildings and future developments, consider policies such as allowing bicycle parking to substitute for car parking and requiring all new developments to meet at least Silver-level LEED standards. Learn more about LEED at www.usgbc.org/leed.

» Develop an engineering policy or guidance document that recommends or requires end-of-trip facilities such as showers and lockers are available in non-residential buildings to encourage more people to commute from off-campus by bike. One of the most common excuses people use to not commute by bike is that they don't have a shower at their destination. Lockers can help bike commuters find a place to safely store their belongings while on campus, reducing the need to drive and rely on vehicles for personal storage.

- Develop bike parking design standards for your campus that conform to the Association for Pedestrian and Bicycle Professionals (APBP) bike parking guidelines. The APBP guidance offers useful information for selecting and installing appropriate bicycle parking that is safe and secure. Find the latest versions of the APBP Bicycle Parking Guidelines here: http://bit.ly/APBP_BikeParking.
- Cargo and adaptive cycles come in all shapes and sizes, and your campus bicycle parking should accommodate this full range, including hand bikes, tricycles, recumbents, and various models of cargo bikes. Strengthen your campus bike parking standards to include strong accessibility requirements. Check out these resources to learn more: Ground Control Systems ADA Accessible Bike Parking (https://bit.ly/GCS_AccessibleBikeParking) Colorado State University's Policy for Inclusivity (https://bit.ly/CSU_InclusivePolicy) Turvec's guide to accessible cycle parking (https://bit.ly/Turvec_AccessibleCycleParking).
- Not only do ebikes (electric/pedal-assist bikes) need to be charged to work properly, but they need a place to do this. Develop a plan to install ebike charging stations on your campus to accommodate current and future ebike users' needs. E-bikes are often also already more expensive than "acoustic" bikes, and so your ebike users on campus will also appreciate additional security options for their ebike parking, such as key-card access indoor bike rooms – making a great opportunity for charging stations. Once charging stations are available on your campus, be sure to communicate and advertise their availability so that anyone who is considering using an ebike knows that they will have the opportunity to charge their bike once on campus.

End-of-Trip Facilities for Bicyclists

- If locker rooms are available in non-residential campus buildings, make sure that access to these lockers are offered as a benefit for bike commuters, not as an additional cost to students and employees who use sustainable, active transportation to travel to and from campus.

Bicycle Parking and Storage

- Increase the amount of high-quality bicycle parking on campus to meet growing demand. See the basics of bike parking at https://bit.ly/APBP_BikeParking, and learn more about campus-specific bike parking considerations at https://bit.ly/GroundControl_Guide.
- Provide covered bike parking on your campus, particularly near residence halls and buildings where staff, faculty, or students may park their bikes for more than an hour at a time. Covered bike parking protects bikes from sun and precipitation, thus potentially adding years of life to a bike. It is more comfortable and more convenient for bike owners, and it is a great way of illustrating how the administration cares and welcomes bicycling.
- Introduce bike lockers on campus to provide more secure and weather-proof bike parking options on campus. Students will be more likely to bring bicycles to campus knowing that they are safe from theft and the elements. See how Northern Arizona University made their lockers look great with custom wraps: https://bit.ly/NAU_BikeLockers_Pic and preview NAU's Bike Locker registration form here: https://bit.ly/NAU_BikeLockers_Form. See how the University of Wisconsin-Madison offers paid bicycle parking via bike lockers and cages at https://bit.ly/UWMBikeParking.
- Consider constructing a bike station to provide centrally-located, secure, indoor parking for cyclists. The Bike Center at the University of Minnesota (see: https://bit.ly/UMBikeCenter) is a great example of a bike station that can serve as a hub for commuters providing repair services, shower and locker facilities, and bike route and event information.
- Create an indoor bike room for students and commuters to securely store their bicycles. Indoor bike rooms

provide additional protection from the weather and offer cyclists increased peace of mind. Portland State University has a successful permit program for its indoor bike garages: https://bit.ly/PSUBikeRoom. The University of Kentucky recently opened its first indoor bike room, complete with 60 secure bicycle parking spaces, showers, lockers, a fix-it station, and water bottle fillers. Learn more at https://bit.ly/UK_IndoorBikeRoomNews.

» Increase the security of your campus bike parking through the use of bike cages and other secure parking areas. Students and commuters will feel more comfortable bringing their bicycles to campus knowing they are safe and secure. See how the Boston University Medical Campus utilizes bike cages at https://bit.ly/BUMCBikeCages. See how the University of Wisconsin-Madison offers paid bicycle parking via bike lockers and cages at https://bit.ly/UWMBikeParking.

» Offer students long-term bicycle storage options over winter and summer breaks, and for the duration of the semester if they are away from campus. Such options can alleviate students' worries regarding security or the logistics of transporting a bicycle to and from campus each semester, and can offer a new potential revenue stream for bike facilities and programming on campus. See an example of semester-long storage options at Loyola University Chicago's student-run ChainLinks Bike Shop at https://bit.ly/LUChainlinks.

» Consider offering bike valets at events throughout the year to solve parking issues at well-attended events such as sports games. At Ohio University Athen Campus, the office of sustainability partners with their transportation and athletics departments to offer the Bobcat Bike Valet services at home football games, staffed through their student Climate and Sustainability Ambassadors. Learn more at https://bit.ly/BFU_BobcatBikeValet. In addition to on-campus partnerships, contracting with your local bike non-profit is another way to offer a bike valet service and support your local bike advocates. Here are a few examples of how to do it: Propel ATL (atlantabike.org/bikevalet) and SF Bicycle Coalition (https://bit.ly/SFBikeValet).

» In addition to bike valet services during special events, consider year-round bike valet services to make biking as accessible and welcome as possible! See what the University of Arizona is doing to encourage bicycling through an all-year free daily bike valet: https://bit.ly/UA_Valet. In Portland, Oregon Health & Science University (OHSU) partners with Go By Bike to offer free valet bike parking to students, employees, and the general public every day, Monday-Friday 6am-7:30pm: https://bit.ly/OHSU_Valet.

» Providing temporary bike racks or corrals for special events is a great way to offer additional space for bicycle parking at an event and encourage people to bike to these events instead of driving and worrying about finding or paying for car parking. Partnering with your events department or city to find additional equipment to use as bike racks is a great way to accommodate this temporary yet predictable and reoccurring need.

» Continue to upgrade all campus bike parking so that 100% of your racks conform to the Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guidelines. Find the latest APBP Guidelines at https://bit.ly/APBP_BikeParking, and learn more about campus-specific bike parking considerations at https://bit.ly/GroundControl_Guide.

Multi-Modal Transportation Accommodations

» Your application indicated that automobile parking permits are currently made available for over 80% of your total campus population. Establishing a more limited number of parking permits or beginning to charge a fee for parking permits will help your students and employees recognize the true cost of parking: Motor vehicle parking spaces can cost thousands of dollars to construct, hundreds to maintain annually, and are an inefficient use of land. As bike ridership increases on your campus, consider reducing the quantity of parking available by repurposing the land. One car parking space

can easily provide ten bicycle parking spaces and the construction of a bicycle parking space can cost 30 to 300 times less than a car parking space. See https://bit.ly/CostsofParking, https://bit.ly/ParkingLandUse, and https://bit.ly/CarvBikeParking for more information and sources.

» Consider increasing the vehicle parking permit fee for students and employees who drive to/on campus. The additional financial resources could be spent on bicycle and pedestrian infrastructure and amenities. Making it more expensive to park on campus will also encourage commuters to carpool or try alternative modes of transport.

» Consider introducing an 'Occasional Parking Pass' option as an alternative to the annual or semester-long parking permit for motor vehicles. This option will offer employees and students who commute from off-campus more flexibility to only drive and park a motor vehicle on campus on rare occasions when needed, and to rely on more sustainable and active forms of transportation such as biking, walking, and transit for the majority of their commutes. If someone has already paid for parking their car on campus everyday, they are much less likely to make even incremental choices to occasionally use other modes instead. See an example of an occasional parking pass policy from the University of Pennsylvania: https://bit.ly/Penn_OccPass.

» Develop a trade-in or cash-out incentive program for students and employees who opt to trade-in or decline a vehicle parking permit. Many universities and other major employers are beginning to offer these kinds of incentive programs to alleviate the demand for vehicle parking, and to further incentivize alternatives like biking, walking, and public transit. See the University of Kentucky's Cash Out program details here: https://bit.ly/BFU_UKY_CashOut. Learn more about these types of offerings in this StreetsBlog Article: https://bit.ly/StreetsBlog_CashOut.

» Reduce the number of students who bring a car to campus by setting limits on parking passes or permits for certain groups, such as first-year-students, on-campus residents, or even all undergraduate students. Some campuses have even set a limit for parking permits for off-campus students that is based on the proximity of their housing to campus.

» All transit vehicles such as campus shuttles and buses should accommodate bicycles with bike racks or with access on the vehicle. See this report on integrating bicycling and transit: https://bit.ly/BikeTransitReport. Provide education on using transit bike racks such as the following video from Spokane Transit: https://bit.ly/Spokane_BikesBusRack.

EDUCATION

Awareness Campaigns & Information Sharing

» The League offers a series of educational videos that can easily be downloaded or shared online. Topics range from How to Choose a Bicycle, to proper steering, signaling, and intersection positioning on a bike. Use these videos to educate your students, faculty, staff, and visitors on bicycling basics. Use the videos as part of new student/employee orientation, or as a prerequisite to accessing the campus bike share program. Make these videos available on your website and share on social media to promote bike safety education to broader audiences, including parents and prospective students. View and download the videos at: bikeleague.org/ridesmartvideos.

» If your campus has safety or informational presentations for incoming students, faculty, and staff, make sure there is a component of those presentations that covers bike safety and the various amenities and services for bikes on campus and in the surrounding community.

» Include information about bicycling on campus in the student handbook. Topics covered should include basic safety tips, rules of the road for your campus, community, and/or state, relevant policies or campus-

wide rules, amenities and services such as bike parking locations, bike registration, organized rides, classes, related clubs, and more.

» If your campus distributes welcome packets to new students and/or employees, make sure bicycling topics are included here as well. Check out the webpage that Stanford dedicated to educate new students about biking on their campus at https://bit.ly/BikeNewStudents.

» Incorporate bicycling information into parent outreach to reach more students and encourage families to consider all transportation options for their students. The University of Illinois has used a parent newsletter to communicate safe cycling resources and tips to parents: https://bit.ly/ILParentOutreach.

» It is essential to continually make both motorists and cyclists aware of their rights and responsibilities on the road. Continue to expand your education campaign promoting the "Share the Road" message. Consider Stanford's multi-pronged approach to Bike Safety through events and programs such as a bike safety Dorm Challenge, a bike safety campaign led by Sprocket Man (https://bit.ly/SprocketMan), and a bike safety pledge detailed at https://bit.ly/StanfBikePledge. See below for more ideas to educate both bicyclists and motorists about roadway safety.

» Organize a campaign of public service announcements to educate your university community on sharing the road safely. Check out some of the promotion that Emory has done to support their Why Not? Campaign at https://bit.ly/EmoryWhyNot and see Harvard's LOOK safety campaign at https://bit.ly/HarvardLOOK.

» Expand the reach of your bicyclist education programs by introducing a bike ambassador program like Colorado State University's RamBassador program (https://bit.ly/RamBassadors), UCI Irvine's Bike Ambassador program (https://bit.ly/BikeUCI_Amb) or The College of William & Mary's Bike Ambassadors program (https://bit.ly/WMBikeAmb).

» Advance cyclist safety on campus by providing educational materials with bike registration or as a prerequisite for bike share program users.

» Expose motorists on your campus to 'Share the Road' and 'Bicycle Friendly Driver' education by providing related information in all campus drivers' education or with all parking permits. Consider requiring a 'Share the Road' test or Bicycle Friendly Driver training and quiz as a prerequisite to purchasing a parking pass or permit on campus. Work with a local League Cycling Instructor to offer the League's Bicycle Friendly Driver curriculum (https://bit.ly/BFDriver) to all motorists accessing your campus.

» Explore new ways to incentivize safe bicycling and driving behavior through new technology and mobile apps. For example, "This App Saves Lives" (TASL) is a free mobile app that rewards drivers (and cyclists!) who abstain from phone-based distracted driving (and biking!). With TASL, drivers earn points and rewards for time spent driving undistracted. Learn more about TASL at https://bit.ly/BFU_TASL, or download the iOS App directly at: apple.co/38nkPm7 and use referral ID "LEAGUEBFU" at sign-up.

» TASL's new 'Parent Portal' feature allows the parents of young drivers to monitor and reward their child's safe driving behavior. Share this Parent Portal overview (PDF) in your next parent newsletter, along with the code "LEAGUE30" for them to receive 30% off any Parent Portal subscription: https://bit.ly/TASLParentPortalOverview. Learn more about the TASL Parent Portal at: https://bit.ly/BFU_TASL_Parents.

Classes & Training

» Offer your existing classes more often to reach more people, or consider adding new classes to cover a wider variety of topics. Consider partnering with a local League Certified Instructor (LCI) to host classes. They have access to a wide array of class curriculums to offer in classroom or outdoor settings. You can find a list of

local LCIs here: bikeleague.org/content/find-instructor Additionally, reaching out to your local bike groups is a great way to be able to offer classes if you do not have the capacity to do so or to leverage work that the group might already be doing and can be offered to your campus community.

» Help your bicyclists ride year-round by including education on safely riding in rain, ice, and snow (if applicable). Help students and employees understand what gear they should consider using for inclement weather, as well as what riding techniques will help keep them safe in slippery road conditions.

» In addition to educating cyclists, consider adding safety education for drivers on your campus, including driving commuters, fleet operators, delivery drivers, or anyone else operating a campus-owner motor vehicle. The League is helping keep all road users safe by offering the Bicycle Friendly Driver training, which all League Cycling Instructors (LCIs) now have the ability to teach. The training aims to educate motorized vehicle drivers about how and why bicyclists travel the roadways in the ways they do with the objective of developing a shared understanding for all users. Contact a local LCI to bring this curriculum to your campus. Learn more about the Bicycle Friendly Driver curriculum here: https://bit.ly/BFDriver.

» Offer a class or training about bike advocacy to help your campus community become an effective and engaged group of local changemakers. Advocacy comes in many forms, from writing letters to the editor, to attending public meetings, to filing reports with the city. Offering training to teach people the skills necessary to do this will help to build a Bicycle Friendly University. Partnering with your local bike advocacy organization is a great way to offer this training, and they may already have existing classes you could advertise or bring to campus. For example, in Seattle, Cascade Bicycle Club offers an annual advocacy training: https://bit.ly/Cascade_AdvocacyTraining.

» Consider creating online or virtual bike safety and maintenance learning opportunities to increase ease and accessibility for these topics. While in-person and on-bike/hands-on instruction is essential for gaining direct experience and practice riding or doing repairs, many topics can be covered through online instruction, videos, interactive quizzes, or webinars. Check out the League's new online learning center to further expand your bike safety education offerings on campus: https://learn.bikeleague.org. New learning modules are being added regularly, including interactive bike safety quizzes that complement the Smart Cycling curriculum that all LCIs are equipped to teach.

» Start a bicyclist and motorist ticket diversion program. Students given a citation are offered an opportunity to waive fees for violations by attending a bicycling education course. This should include a classroom and on-road component. See U.C. Davis' Bicycle Education and Enforcement Program at https://bit.ly/UCDavisBEEP.

» Partner with local government, organizations, or advocacy groups to expose students to real-world applications in their bicycle-related courses.

» Work with a local League Cycling Instructor (LCI) to expand your bike education and to improve your bike safety and related classes. Find a list of existing LCIs in your area at https://bikeleague.org/map/?community=30144.

» Encourage members of your campus community to become trained and certified as LCIs. Having an LCI on campus can advance safe cycling education on your campus. Learn how at https://bit.ly/BFULCI. In addition to having staff and/or faculty become certified as LCIs, consider a peer-to-peer education model by training students as LCIs to increase the effectiveness and reach of your bicycle education on campus. Arizona State University hosts an LCI Seminar on its campus once every 18 months to maintain enough LCI-certified students to sustain their peer education model. LCI-

certified students are then paid by the school to teach bicycle safety classes to other students, allowing the campus to offer a wide variety of bicycling classes year-round. See the full list of Bike Classes available at ASU at https://bit.ly/ASULCI.

» Host an LCI seminar on campus to increase the number of active local LCIs. Learn how to host an LCI seminar at https://bit.ly/Host_LCI_Seminar.

» If you aren't able to host an LCI seminar on campus in the near future, consider subsidizing the costs for students and employees to attend certification seminars elsewhere to increase the number of active LCIs in your area. Find a list of scheduled LCI seminars at https://bit.ly/LCI_Seminar_Schedule.

» Expand your bike safety education program to include Bicycle Friendly Driver training for all operators of university-owned vehicles. Law enforcement and safety officers in particular, including volunteer patrol students or staff, as well as emergency responders, should serve as a model for safe driving on campus. See San Francisco's Frequent Driver Education at https://bit.ly/SanFranDriverEd and the League's Bicycle Friendly Driver curriculum (https://bit.ly/BFDriver). Consider making this training a pre-requisite for employment or part of ongoing professional development for any professional drivers on campus.

ENCOURAGEMENT

Bicycle Culture, Support, and Promotion

» Emphasize the importance of bicycling on campus by encouraging your President or Chancellor to lead or participate in an annual bike ride. See how Marquette University's President led a ride to celebrate the opening of a new bike share dock on campus at https://bit.ly/MarqBublr.

» Show off your campus' bike-friendliness by offering campus bike tours! Bike tours of campus can be a great way to distribute information to incoming students and staff while promoting your campus' bike friendly culture. Talk to your admissions office about incorporating bike rides and bike tours to their offerings for prospective students and their families. Alfred University takes their campus bike tours to the next level with a 14-pedal, seven-seat bike! See for yourself at https://bit.ly/AlfredBikeTour.

» Celebrate National Bike Month, including Bike to Work Day and Bike to School Day on campus annually. Learn more about National Bike Month at bikeleague.org/bikemonth.

» Demonstrate the university's commitment to bicycle infrastructure by having a trail construction or maintenance day, either on campus or in the community, and recruit students and employees to participate.

» Celebrate bicycling as a mode of sustainable transportation by scheduling a campus car-free day. See the example set by Princeton at https://bit.ly/PrincetonCarFreeDay.

» Launch a bike buddy or mentor program. A bike mentorship program that teams experienced cyclists with newcomers is a great way to encourage and educate. Mentors can offer advice on bike routes, appropriate gear, safe riding and much more. It also gives new commuters a support group to rely on and often makes them feel more secure and excited about their first few rides. Learn about UCLA's Bike Buddies program: https://bit.ly/UCLA_BikeBuddies.

» Establish a formal incentive program for those who bike commute. This could include such benefits as cash incentives, car share discounts, or coupons for local bike shops. Check out the University of Minnesota's ZAP Bike Commuting program through Dero ZAP (https://bit.ly/UMZap) and see how Harvard encourages employees to bike to work through the Bike Commuter Tax Benefit: https://bit.ly/Harvard_CommuterBenefits. The University of Kentucky has a successful Bike Voucher Program as one of its many incentive options

for students and employees who opt to not drive to/on campus: https://bit.ly/UK_BikeVoucher.

» Having dedicated social media accounts for your campus biking program is a great way to easily reach students, staff, and faculty where they already are online. It's also a good way to run contests, engage directly with more people, and show off your work to new and prospective students and employees. Keeping it regularly updated will go a long way to keep your campus community engaged with your Bicycle Friendly University work. Some great examples of schools already doing this include UT Austin (www.twitter.com/bikeut) NC State University (www.twitter.com/ncsuwolftrails) Rice University (www.facebook.com/RiceTDM) University of Florida (www.instagram.com/bikesuf/).

» Promote cycling for everyone! Gear specific events towards women, non-English speakers, people of color, low-income students, the LGBT+ community and the ADA community. Make sure all communities feel welcome and can access cycling!

» Ensure that your marketing and admissions departments promote the bicycle-friendliness of your campus to current and prospective students and employees. Cycling is an important lifestyle choice for more and more young people and catering to these interests will improve your institution's competitiveness.

» Encourage students who are passionate about bicycling as a sustainable, healthy, and fun mode of transportation to form a student-run bike advocacy club or group to help improve the campus and community for biking. Check out how the University of Vermont's Bicycle User Group (B.U.G.) helps build bike culture on their campus at https://bit.ly/UVBikeCultureVid. Learn about the University of California, Santa Barbara's Associated Students Bike Committee's various projects and programs to help make their campus even more bicycle-friendly at https://bit.ly/UCSBBikeAssoc.

» Form an Employee Bike Commuter Club to foster a culture of support and to more effectively distribute news and information to staff, faculty and student employees who commute to campus by bike. Check out UCLA's Commuter Club at https://bit.ly/BruinComClub.

» Consider also applying to the Bicycle Friendly Business (BFB) program as an employer to further tackle the issue of faculty and staff commuting habits. Many colleges and universities have found it useful to participate in both the BFU and BFB programs to more fully address employees and commuters' needs. Learn more at bikeleague.org/business.

» Encourage the use of bicycles as official vehicles for any departments on campus, such as facilities and maintenance, landscaping, campus safety or police, emergency responders, etc. This increases the safety of cyclists and pedestrians by reducing motorized traffic on campus, and it also allows the employees greater access to areas on campus that may be out of reach for motorized vehicles.

» Begin having Public Safety officers patrol campus on bikes, as it gives enforcement officers a better understanding of the conditions for cyclists and to view campus from the perspective of handlebars. The University of Texas at Austin has a full-time Mountain Bike Unit: https://bit.ly/UTAustinBikePolice.

Access to Bike Share, Bicycle Equipment, and Repair Services

» Increase the number of bikes available in your bike share system. A successful campus bike share system is a convenient, cost effective and healthy way of encouraging students and employees to make short trips by bike. To increase the bikeshare options on your campus, consider a home-grown program such as the University of Louisville's free daily check-outs and long-term bike loans through recycled and refurbished bikes: https://bit.ly/ULBikeShare, or bring in an established and experienced bikeshare or micromobility vendor to your campus, such as Lime (https://bit.ly/BFU_lime).

- In addition to making short- and long-term bike share options available for students, consider offering a departmental bike share program for faculty and staff in various academic and administrative units. The University of Florida refurbishes abandoned bikes on campus to supply its departmental program, providing bicycles at no cost to enable UF faculty and staff to conduct campus business. Any campus unit at UF can request a Department Bike Share bicycle through a convenient online form. Free maintenance and repairs are included as part of the program, as well as a lock and a helmet with each bike. Learn more about UF's program at https://bit.ly/UF_DBS.
- Consider offering a fleet of cargo bikes for campus staff and student workers. Cargo bikes can be useful alternatives to vehicle fleets when employees need to make frequent trips or haul goods on campus, and offer a healthy, sustainable, and economic alternative to driving. Learn how the City of Madison launched a successful e-cargo bike pilot for city staff at: https://bit.ly/ecargo_webinar.
- Electric pedal-assist bikes are a great way to break down barriers for people who want to bike. If you don't have these bikes as part of your campus or community-wide bike share fleet, advocate to have them included. See how Portland State uses their city's bike share electric bikes here pdx.edu/transportation/biketown.
- It's great that your campus has a co-op or bike center. Below are some ideas of additional services you could offer at your bike center to expand its role on campus, reach more newcomers, and meet the needs of more campus cyclists.
- The campus bike center would be a perfect place to consider offering bike valet services from. Such a service could also act as an employment or volunteer opportunity for students, and potentially as a revenue source to help support the center.
- Consider initiating bike messenger services out of the campus bike center. Such a service could also act as an employment or volunteer opportunity for students, and potentially as a revenue source to help support the center.
- Invite your campus' bike-related clubs and groups to utilize the bike center as a meeting place.
- Develop a bike giveaway program to help increase access to bicycling for more students on campus. NYU's Office of Sustainability hosts an annual bike giveaway each fall, by raffling off a few dozen bicycles for students free-of-charge. Learn more at https://bit.ly/NYU_bikegiveaway.
- Start a free helmet giveaway or subsidy program, or partner with a local bike shop to offer students coupons or discounts on helmets. See the helmet promotions through Stanford's Bike Safety Pledge at https://bit.ly/StanBikeSafety and the "Helmet Hair Don't Care" Pledge at UC Davis at https://bit.ly/UCDavisHelmetHair.
- Start a bike light giveaway program or partner with a local bike shop to offer students coupons or discounts on bike lights. Hosting a free bike light giveaway event every fall around daylight savings time is a great way to get these important safety accessories to every bicyclist on campus, and also provides an opportunity to register bikes and educate riders on safe riding and related campus resources. Learn about Light the Night, the annual light giveaway event at the University of Illinois at Urbana-Champaign at https://bit.ly/UofILights.

Bike Theft and Loss Prevention

- Consider having free bike lock giveaways for students to get high-quality bike locks into the hands of more riders.
- To help curb bike theft on your campus, develop a program that allows students to trade in older, less effective bike locks with high-quality U locks. The University of Colorado Boulder has a successful Bicycle Lock Swap Program where students can trade in a cable lock for a free U-lock: https://bit.ly/BoulderLockSwap. Similarly, Boise State University offers $5 off the price

of a new U-lock for anyone training in an old cable lock at their Cycle Learning Center (campus bike shop). See their bus ad for the program here: https://bit.ly/BoiseLockTrade.

» Upgrade your paper bike registration system to an online registration service such as Bike Index (https://bit.ly/BFU_BikeIndex) or Project 529 (https://bit.ly/BFU529) to increase convenience and accessibility, as well as to streamline the process of recovering lost, stolen, and abandoned bicycles.

» Curb bike theft on campus by increasing educational opportunities about proper locking techniques. Even if a student or staff member has a high-quality bike lock, that doesn't mean they necessarily know the best way to use it. Post signage, use handouts, or offer demonstrations to teach proper locking to ensure that a rider will return to ALL of their bike.

» Develop a marketing campaign to educate students on how best to lower their chances of bike theft, including proper lock usage, best types of locks, most secure racks on campus for long-term storage, and other considerations.

» Work with campus and/or city police to implement a Bait Bike Program to help curb bike theft on campus. Learn about how the University of California, Berkeley's Bait Bike program helped reduce bike thefts by 45% in one year at https://bit.ly/CalBaitBike, and how the University of Wisconsin – Madison's Police Department reduced bike thefts by 40% in the first year of their Bait Bike program at https://bit.ly/UWMBaitBike.

» Abandoned Bikes can be a major problem on campuses, taking up valuable real estate on bike racks, attracting thieves, creating challenges for maintenance or construction crews, and causing visual eyesores with rusty, neglected frames or other bike parts. If your campus faces these problems, consider developing a system to routinely tag and remove suspected abandoned bikes from bike racks at the end of each school year. Be sure to tag the bikes well in advance to give owners fair warning about the impending removal, and make campus-wide announcements so that anyone with a rarely-used bike knows to check on their bike to make sure it isn't mistaken for abandoned.

» Develop a clear policy and process for bicycle owners to reclaim their bike if it has been mistaken for abandoned or otherwise impounded. Publicize this policy and process so that bike owners know exactly who to contact or where to go to retrieve their bike, including a reasonable timeline for how long the campus will hold on to an abandoned bike from the date of impoundment. Consider students who are off campus for the semester, studying abroad or away for other reasons, in the development of such a policy and timeline to ensure that they don't miss the window for reclaiming their bike, especially if the campus doesn't offer reasonable long term storage and bike registration options.

» A digitized or online tracking system can help streamline your abandoned bike tagging/removal system so that bike owners can more easily claim and reunite with their bike if it has been mistaken for abandoned. Some online bike registration systems have built-in tools to help campuses with this problem, such as Bike Index's Impound tool: https://bit.ly/BFUBikeIndex.

Route-Finding Support

» Great job offering some bike mapping options for your campus community. Below are some ideas to further improve and expand the map-related resources you make available on your campus.

» Add bicycle amenities such as bike lanes, bike parking, showers, lockers, and fix-it stations to your online campus map. Yale has an interactive map highlighting all their bike racks and other bike-related facilities, as well as a way for students to suggest additions to update and improve the map (https://bit.ly/YaleBikeMap). As part of their Bike Commuter Shower Access Pass program (https://bit.ly/GATechShowerPass), Georgia Tech includes showers on their bicycle amenities map:

https://bit.ly/BFU_GATechMap. Several schools have used Google Maps to build interactive online maps of their campus bike facilities. See Oklahoma University's OU Bike Inventory at https://bit.ly/OUBikeInvent, the Georgetown University Bicycling Map at https://bit.ly/GUBikeMap, and the American University Bike Map at https://bit.ly/AUBikeMap for examples.

» Offer printed bike maps for distribution that include on- and off-road bike routes. Printed campus maps can also serve as a great method to provide bike education and information to more people. Include bicycle amenities such as bike lanes, bike parking, nearby bike shops, and fix-it stations on your printed map as well.

» In addition to campus bike maps, develop and offer an online route-finding service for student and staff cyclists interested in journeying to or from further off campus. Many schools have used online programs and tools such as RideAmigos (https://bit.ly/BFU_RideAmigos) to manage a variety of Transportation Demand Management functions, including route-finding assistance for students and employees. See UC Berkeley's RideAmigos site as an example: https://bit.ly/UCBerkeley_RideAmigos.

EVALUATION & PLANNING

Staffing and Committees

» Appoint a full-time staff member as Bicycle Program Manager or create a new position. A Bicycle Program Manager works with the campus administration, advocates, local elected officials, law enforcement, transit providers and the general campus community to build partnerships and implement facilities and programs that increase the number of students, faculty and staff that are safely bicycling and walking. This staff person should also work closely with the Bicycle Advisory Committee, review development proposals to ensure that bicycle requirements are incorporated and to assess bicycling impacts, develop and implement educational and promotional programs, write grant proposals, serve as the public contact for bicycling inquiries and complaints, educate other staff about facilities standards and guidelines, and coordinate with neighboring communities, transit agencies and other departments to implement policies and projects. See this report on the importance of Bicycle & Pedestrian program staff: https://bit.ly/BikePedStaff.

» Encourage your Bicycle Advisory Committee to meet more often, ideally monthly. Having an official Bicycle Advisory Committee (BAC) that meets frequently is critical to building support for bicycle improvements as it ensures that the bicycle program is held accountable to the campus population and surrounding communities. Colorado State University's Campus Bicycle Advisory Committee (CBAC) has a robust and representative membership that meets monthly and shares meeting agendas and minutes online: https://bit.ly/CSU_CBAC.

» Expand your Bicycle Advisory Committee's time to focus more of its time on bicycle-specific issues.

» Include more stakeholders in the Bicycle Advisory Committee to ensure that the members of the committee reflect the diversity and ability levels of cyclists on your campus. Consider adding representatives from: any student or employee Bicycle User Group(s) on campus, student government, health and wellness team members, local city/county/regional government staff, International Student Affairs or similar group or department, or any other groups, departments, or individuals that should be represented.

» Reach out to your campus Office of International Student Affairs, Diversity & Inclusion, Multicultural Affairs, or similar offices or student groups to promote cycling's accessibility and inclusivity on your campus.

Planning, Funding, and Implementation

» It's good that bicycling is included in your general campus master plan, but to further strengthen your

school's commitment to bicycling, consider creating a comprehensive bicycle-specific master plan. Ensure that the plan serves as a guide for the long-term physical and programmatic vision for your campus, and focus on developing or completing a seamless cycling network that emphasizes and creates short distances between residential buildings and popular destinations such as classroom buildings, dining halls, recreational facilities and transit stops. Compliment infrastructure planning with encouragement, education, and inclusive outreach programs to increase accessibility and usage. Develop a clear vision statement and set ambitious but attainable targets and specific, measurable goals. The overarching goal should be to increase the percentage of trips made by bicycle on campus and the number of people who can easily choose bicycling for transportation and recreation. Check out University of Minnesota's 2019 Bike Plan at https://bit.ly/UMNBikePlan and Montana State University's 2017 Bike Plan at https://bit.ly/MontanaStateBikePlan as two great examples of bike-specific campus plans. This Road Map to developing a bike plan may also be a helpful resource to consider: https://bit.ly/ImplementBikePlan.

- **Develop a dedicated annual budget to guarantee consistently available funds for your bicycle program and campus bicycle expenses. Below are some ideas for potential sources of funding for an ongoing dedicated budget.**
  - Utilize any current automobile parking fees on campus as a revenue source for your campus' bicycle expenses or introduce such fees.
  - Use the revenue generated from any on campus traffic citations as a funding source for the campus' bicycle expenses.
  - Lobby the university administration to set aside a dedicated annual budget for the university's bicycle expenses.
  - Consider reaching out to potential revenue sources external of the university by applying to grants or other private donors.

Evaluating Ridership & Bicyclist Satisfaction

- Develop a more robust count program to track ridership on your campus among employees (faculty and staff), to assess needs for additional facilities and services, and to measure the successes of your bicycle program! Below are several ideas to consider for a successful bike count program.
- Consider installing automatic bicycle counters on your campus to better gauge ridership on an ongoing basis. Look into tools such as EcoCounter for automatic electronic counters at https://bit.ly/EcoCounter or video detection tools such as Numina (https://bit.ly/BFUnumina). Learn about UCLA's automated bike counter and publicly available ridership data at https://bit.ly/UCLABikeCounter and https://bit.ly/UCLARidershipData. See how the University of Minnesota uses the Dero ZAP Program to track and reward ridership on their campus at https://bit.ly/UMZap.
- Begin conducting periodic manual counts, and consider participating in the National Bicycle and Pedestrian Documentation Project at https://bit.ly/NatBikePedDoc.
- Conducting periodic bike rack counts is an easy way to estimate bicycle usage on campus, and allows you to inventory and assess the quality and quantity of available bike parking.
- Take advantage of online, self-reporting or app-based services like Strava Metro (https://bit.ly/BFUstrava) or Love To Ride (https://bit.ly/NatBikeChallengeBFU) to increase your data collection. At Michigan State University, the home-grown MSU Mobility app collects location and motion data from iPhone users while inside the MSU geo-fenced campus. It uploads these data anonymously to a secure MSU server, and the aggregation of these mobility data provides campus planners with a deeper understanding of how

pedestrians, bicyclists, and motorists move across MSU's campus at any given time. Learn more at https://bit.ly/MSUMobilityApp.

» Distribute a satisfaction survey to students and faculty at least every other year. Analyze responses to assess barriers, and direct resources according to demand and the needs of bike commuters. See how Southern Illinois University Carbondale reported on their Campus Bicycle Survey results: https://bit.ly/SIUSurvey. Carnegie Mellon University even offers a year-round online satisfaction survey that can be completed by students, employees, and visitors anytime: https://bit.ly/CMUBikeSurvey.

Evaluating & Improving Safety Outcomes

» Ensure that there is a mechanism for bicyclists on campus to report any bicycle/automobile, bicycle/bicycle, and bicycle/pedestrian crashes on campus to the appropriate campus and/or community authorities. Record and track this data and utilize it to identify any points prone to conflict and develop a strategy to reduce them.

» Expand efforts to evaluate crash statistics to produce a specific plan to reduce the number of crashes on campus. Available tools include Intersection Magic (https://bit.ly/IntMagic) and PBCAT (https://bit.ly/PBCAT). See the report Bicyclist Fatalities and Serious Injuries in New York City, 1996-2005, at https://bit.ly/NYCBikeFatalities.

» **Pass additional campus laws or ordinances that protect cyclists and pedestrians, including the following:**

  » Develop penalties for motorists who fail to yield to a bicyclist when turning.

  » Institute a policy specifically penalizing motorists who 'door' bicyclists.

  » Promote the well-being of cyclists on your campus by making it illegal to harass a cyclist.

  » Consider exploring new policies that would ban cars from parts of campus or develop policies to prohibit residential students from bringing a car to campus.

Other Evaluation & Assessment Tools

» To help make the case for increased investments in bicycling on your campus, consider partnering with a local organization or campus department to conduct impact assessments that help demonstrate and quantify the positive impact and return on investment for bicycling improvements. From sustainability, to economics, to equity and mobility, to health & wellness, to safety, there are many benefits to quantify and capture through a study or impact assessment. Here are some examples: The University of Arkansas was included in a Walton Family Foundation-funded economic impact study for the Northwest Arkansas Region: https://bit.ly/Walton_NWAEconStudy. See Minnesota State University, Mankato's environmental impact study at https://bit.ly/MankatoEnviro.

» Conduct a Bicycle Level of Service (BLOS) or Bicycle Level of Traffic Stress (BLTS) Assessment for your campus. Knowing the level of service you provide when it comes to bicycle infrastructure, or lack of it, will go far in assessing your campus and prioritizing areas in need of improvements. You can find an example of how Boston has integrated a BLOS for their city here https://bit.ly/Boston_BLOS.

» Conduct a campus-wide bike parking study or audit. Having an up-to-date list or inventory of your bike parking, including details such as the quantity, quality, usage, and APBP-compliance status of each rack, will go a long way to maintaining and offering places for people to park their bikes as well as identify where there are missing gaps or other opportunities for improvement. A great detail to include in your audit, for example, are the areas where people are currently locking bikes to things other than bike racks, such as trees or fences, to show where there is unmet demand. Consider partnering with a student club or organization to help recruit volunteers to conduct such an audit, or partner with a faculty

member to turn this into a class project. Consider developing a GIS database of your bike racks including the details listed above along with current photos of all racks.

» Conduct a comprehensive mobility or travel behavior survey or study, at least once every 4-5 years on campus. This helps you to develop benchmarks and track changes over time in travel behavior and patterns for all modes, including the preferences, barriers, and satisfaction, and safety levels for different modes and across different socioeconomic groups. Be sure to include staff, students, and faculty, and to capture demographic and other socioeconomic information about survey respondents to give full context to the information collected. For a great example, see Michigan State University's 2019 Spartans Sociomobility Centennial Survey: https://bit.ly/MSU_SocioMobilitySurvey.

» **League reviewers were pleased to see the following improvements planned for your campus in the coming year and beyond, as quoted below from your application. We look forward to hearing about your progress on these efforts in your next renewal application, and welcome updates in the interim if you have any announcements or progress reports in the meantime!**

» *"The Big Shanty Trail will be a paved trail that connects KSU's Kennesaw Campus to Downtown Kennesaw. This will give the local community a safe way to travel between their homes, campus, and the parks and businesses in Downtown Kennesaw."*

FOR MORE IDEAS & BEST PRACTICES, PLEASE VISIT THE FOLLOWING **BICYCLE FRIENDLY UNIVERSITY** RESOURCES ONLINE:

» www.bikeleague.org/university

» https://bikeleague.org/bfa/university/faq/

» https://bikeleague.org/bfa/university/resources/

» https://bikeleague.org/bfa/award-database/

PLEASE ALSO SEE THE ATTACHED SURVEY DOCUMENT FOR ADDITIONAL COMMENTS AND FEEDBACK FROM BICYCLISTS ON YOUR CAMPUS.

Appendix 4: USG Sustainability-Related Degrees and Programs

	SCIENCES	ENGINEERING	DESIGN	INTERDISCIPLINARY	OTHER
UNIVERSITY OF GEORGIA	○ Certificate in Sustainability ○ Certificate in Environmental Ethics ○ Minor in Ecology ○ BS in Ecology ○ AB in Ecology ○ Master of Science in Ecology ○ Master of Science in Integrative Conservation and Ecology ○ Master of Science in Integrative Conservation and Sustainability ○ Master of Science in Conservation Ecology & Sustainable Development ○ PhD in Ecology ○ Master of Science in Policy and Sustainability, Community Forestry and Arboriculture, Forest Biology, GIS or Wildlife Sciences ○ Master of Natural Resources ○ Master of Forest Resources ○ PhD in Community Forestry and Arboriculture, Environmental Education, Forest Biology, GIS, Parks, Recreation and Tourism, Wildlife Sciences	○ Certificate in Coastal Oceanographic Engineering ○ BS Environmental Engineering ○ Masters in Agricultural Engineering ○ Masters in Civil and Environmental Engineering ○ PhD in Biological and Agricultural Engineering ○ PhD in Engineering: Energy Systems Emphasis, Environmental and Water Emphasis, Resilient Infrastructure Systems Emphasis	○ PhD, Environmental Design & Planning ○ Environmental Ethics Certificate Program	○ Interdisciplinary Certificate in Sustainability	○ Sustainable Food Systems Certificate
GEORGIA INSTITUTE OF TECHNOLOGY	○ Minor in Environmental Science ○ Minor in Environmental Chemistry ○ Minor in Meteorology ○ Minor in Climate Change ○ Environmental Physics ○ Minor in Ocean Sciences ○ Minor in Geophysics ○ Bachelor of Science in Atmospheric and Oceanic Sciences ○ Graduate certificate in Astrobiology ○ PhD in Ocean Science and Engineering ○ Graduate certificate in Astrobiology ○ Master in Atmospheric Science, Professional Track ○ Graduate certificate in Astrobiology ○ PhD in Ocean Science and Engineering ○ PhD in Quantitative Biology ○	○ Minor in Energy Systems ○ Bachelors in Environmental Engineering ○ Master of Science in Environmental Engineering ○ PhD Environmental Engineering ○ Professional Masters in Sustainable Electrical Energy	○ Minor in Sustainable Development and Construction ○ Minor in Sustainable Cities ○ Undergraduate Certificate in Sustainable Architecture ○ Master of Science in Architecture, concentration in High Performance Buildings ○ Master of Science in Urban Analytics	○ Minor in Global Development ○ Minor in Sustainable Cities ○ Master of Sustainable Energy and Environmental Management ○ Master of Science in Global Development ○ Graduate certificate in Global Development	○ Undergraduate certificate in Sustainable Business ○ MBA Sustainability Concentration ○ MCRP/Master of Science in Public Policy
GEORGIA STATE UNIVERSITY	○ Bachelor of Science in Geoscience and Urban Studies			○ Bachelor of Interdisciplinary Studies in Environmental Science ○ Master of Interdisciplinary Studies Urban Studies ○ Social Justice Certificate ○ Bachelor of Interdisciplinary Science in Global Studies	○ Sustainability Certificate ○ Bachelor of Science in Geosciences, Environmental Geosciences Concentration ○ Master of Public Health, Environmental Health ○ PhD Environmental Health Concentration ○ Urban Studies Minor ○ Doctorate in Urban Studies

GEORGIA SOUTHERN	○ Bachelor of Science in Sustainability Science ○ Master in Environmental Science ○ PhD in Environmental Science		○ Environmental Sustainability Interdisciplinary Minor ○ Environmental Sustainability Interdisciplinary Major	○ Environmental Health (COPH)
GEORGIA COLLEGE & STATE UNIVERSITY	○ Sustainability Certificate			
DALTON STATE UNIVERSITY	○ Minor in Sustainability ○ Bachelor of Science in Environmental and Sustainability Studies			
UNIVERSITY OF WEST GEORGIA	○ Bachelor of Science in Geography (Environmental Sustainability Track) ○ Bachelor of Science in Geology (Environmental)			○ Certificate in Sustainable Business
VALDOSTA STATE UNIVERSITY	○ Minor in Environmental Studies ○ Bachelor of Science in Environmental Geoscience, Environmental Sustainability Track			
KENNESAW STATE UNIVERSITY	○ Minor in Environmental Studies ○ Minor in Environmental Science ○ Bachelor of Science in Environmental Science	○ Minor in Environmental Engineering ○ Bachelor of Science in Environmental Engineering ○ Minor in Renewable Energy Engineering		